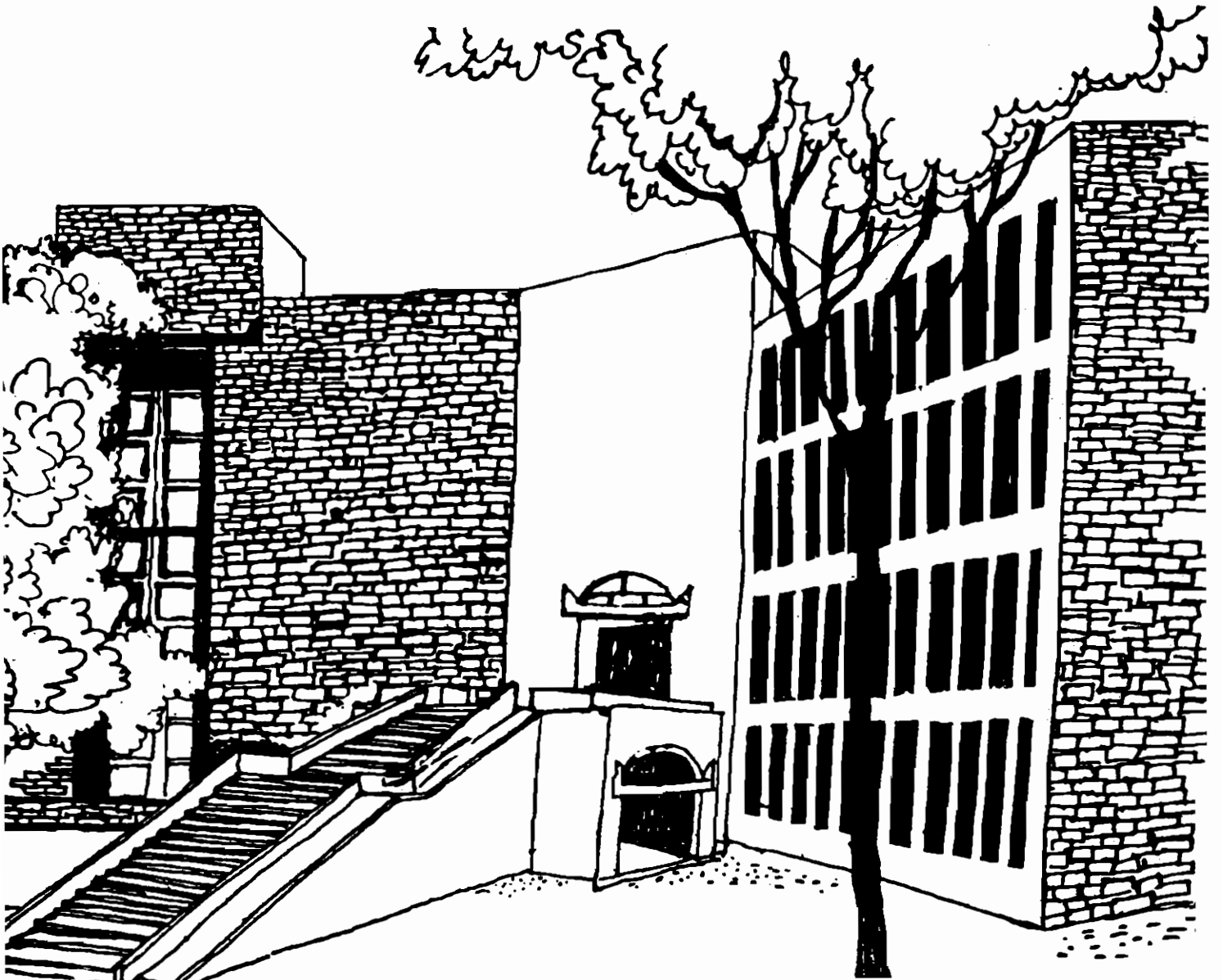




# Working Paper

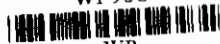


**PROTECTION TO DOMESTIC INDUSTRY:  
AN EMPIRICAL INVESTIGATION**

**By**

**Ashok K. Aggarwal (FPM)**

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**INDIAN INSTITUTE OF MANAGEMENT  
AHMEDABAD-380 015  
INDIA**

## Abstract

Recently there has been widespread debate on impact of protection on performance of domestic industry. It has been argued that protection to the Indian Industry during the last 40 years has resulted in poor performance of the industry in terms of productivity, technological development, low competitiveness because of poor quality of products at very high prices. Could we not have grown at the same rate as some of the Newly Industrialized Countries (NICs) by following the more open policy towards foreign capital and exports rather than following import-substitution path ?

This empirical study attempts to answer some of the questions posed above.

This study examines the extent of protection to the domestic industry for the period 1974-78 (1970s) and 1982-84 (1980s). International average unit values and domestic prices of the industry are used to find the implicit and effective protection. It also examines the impact of protection on relative performance by using three different performance parameters. To study the distortionary effects on production technology it examines the relationship between protection and physical capital intensity.

The main findings of the study are; (i) that protection has increased in the 1980s as compared to 1970s (ii) there is no conclusive evidence about the impact of protection on the performance variables over the two periods (iii) poor performance of Indian exports could not be attributed to the poor price competitiveness of our exports (iv) there is no evidence of distortionary effects of protection on the production technology.

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Protection to Domestic Industry:  
An Empirical Investigation

In recent years there's growing concern at distortions created by protection in the goods, money and factor markets of many developing countries. Thus, adversely affecting their industrial structure and commodity composition of trade ( Khanna (1987)). Various researchers have focussed on the impact of market distortions on export performance and directionality of exports( Krueger (1981), Bhagwati and Srinivasan(1975), Tyler(1983) ). Commercial and industrial policies, such as import restrictions, export tariffs, exchange controls, domestic production subsidies and domestic price controls, all affect relative prices and profitabilities 1/.

State patronage of domestic industry has long been a regular feature of international trade. The Corn laws in England and mercantilist philosophy guided British trade policy until Adam Smith's advocacy of free trade. Despite free trade being the best policy for a nation, prohibitory duties continued to be imposed on the import of foreign goods. Pacey (1990) and Bhagwati and Desai(1970) have given evidence of discriminatory import duties imposed by the British on import of cotton and other kinds of cloth from India to protect the British textile industry from complete ruin. Subsequently, there have been arguments to protect nascent industries from foreign competition, in order to make them grow. There are a number of arguments to protect the domestic industry besides the infant industry argument. Heffernan and Sinclair(1990) give broadly four arguments for protecting the domestic industry. These are a) Infant industry argument b)

Public finance argument c) Unemployment argument and d) Income distribution argument.

During and after the Great Depression, the growth of world trade was curtailed due to the imposition of heavy tariff and non-tariff barriers, aggressive depreciation of currencies by a number of countries following the "beggar thy neighbour" policy. Immediately after the Second World War a troika of institutions (IMF, World Bank and GATT) was created to oversee the growth and development of international trade ( see Bhagwati 1990). Around the same time a number of countries got their independence from the imperial powers. Most of these newly free countries, developing or third world countries as they came to be known, adopted import substitution as a development strategy for political and economic reasons. This was partly due to pessimism about export prospects, a secular tendency for the terms of trade for primary commodities to decline, and need for industrialisation (Prebisch 1959). India, in its pursuit of self-reliance adopted across the board import substitution. Import substitution was sought to be achieved through creating high tariff and non-tariff barriers for imports<sup>2/</sup>.

Not all industries have been subjected to the same level of protection. There was a high premium on lobbying for higher controls on imports (see Panckmukhi 1975, Bhagwati and Desai, World Bank 1987) to earn better returns in a relatively sheltered market. Differential protection enjoyed by different industries can affect their relative performance, which provide signals for market mechanism to allocate resources. Thus, resulting in

inefficient allocation of resources. Ordinary nominal tariff apply to commodities (final) but resources move between economic activities (intermediate inputs). To find out the resource allocation effects of a tariff structure we must calculate the rate of protection for each activity i.e. the Effective Protection Rate (EPR).

According to Cordon (1966, p.222) "The Effective Protection Rate is the percentage increase in value added per unit in an economic activity which is made possible by the tariff structure relative to the situation in the absence of tariffs but with the same exchange rate. It depends not only on the tariff on the commodity produced by the activity but also on the input coefficients and the tariffs on the inputs".

Thus while nominal tariff takes into account the tariff on the finished goods only, the EPR measures the impact of tariff structure not only on the final goods but also on the intermediate goods. It captures the distortions created by the tariff structure in terms of movement of resources between activities. Therefore, EPR is a measure of the degree of protection most relevant for the study of profits (McFetridge, 1973)

**Theoretical Issues:** Theoretically the concept of effective protection assumes that

- a) the physical input-output coefficients are all fixed,
- b) the elasticities of demand for all exports and supply of imports is infinite,
- c) all tradable goods remain traded even after tariffs, other taxes and subsidies, so that the internal price of each importable is given by the foreign price plus tariff,
- d) macro economic policies maintain total expenditure equal to full employment income,
- e) all tariffs are non-discriminatory between nations.

The theory of tariffs has provided us with the concept of effective protective rates to find the resource allocational effects of a tariff structure. The theory provides an indication about the potential pulls rather than the actual movement of resources. The basic theory which was derived for importable input can also be easily extended to include exportables too (Corden 1985). If we order the commodities according to their EPRs, say A, B, C and D in ascending order, then we can say that the resources will move from A towards B and C and the output of A must fall and that of D must rise. However, we cannot say anything about the outputs of B and C without having information on production-substitution elasticities. This is the production effect of tariffs<sup>3/</sup>. Moreover, the pattern of consumption would also shift from high nominal tariff items to low tariff items. Thus the consumption effect will depend on nominal tariff on final goods and production-substitution elasticities. Since it is assumed that there are fixed coefficients of production and import of all tradeables continue, there is no consumption effect of tariffs on inputs.

So far, we have assumed that all goods are tradable. When we introduce non-tradeable goods in the model, we have to take into account certain adjustments arising therefrom. According to Corden (1985) the exchange rate adjustment is essential if we are to fully capture the effects of tariff structure on resource allocation. The basic idea is that because of changes in consumption and production patterns, due to the tariffs and the assumption that aggregate expenditure is maintained equal to full employment levels of income, it must lead to excess demand for or



excess supply of non-traded good and a balance of payment surplus (deficit) . To restore internal and external balance the exchange rate must appreciate(depreciate). An appreciation in the exchange rate is equivalent to a uniform ad valorem import subsidy. This should form an integral part of the calculation of effective protective rates.

There are certain inputs which are not traded internationally ( for example electricity and services) in traded goods. Hence there are no internationally available prices. On the treatment of non-tradables, researchers working in the area have posed the question whether these are to be treated in the same way as tradables or like primary factors. There are two approaches to this issue. Balassa (1965) and Basevi (1966) treat a non-tradable input like any other tradable input with a zero tariff or export subsidy. The basic argument is that in calculating the effective protective rate we are to calculate the value added and for that we should subtract all inputs whether traded or not. The other approach is to treat non-traded inputs in the same way as primary factors.4/.

If there are no traded inputs in non-traded inputs, it is clear that the method proposed above is the correct one. There are two methods for this: the first method lumps non-traded inputs with traded inputs and has come to be known as Balassa method; in the other method non-traded inputs are lumped with value added, and is known as Corden method ( for the details of various methods see Cordon (1975)) But if there are traded inputs in the non-traded inputs then the traded input content of non-traded inputs must be lumped with direct traded inputs 5/.

Besides the problem of non-traded inputs there is the problem of substitution. We have so far assumed that the physical input ratios of material inputs remain constant. But the tariff structure through changes in the relative price structure may induce factor substitution. This problem has been addressed by a number of researchers ( Travis 1964, Leith 1968, Massell 1968, Ramaswami and Srinivasan 1970, Balassa, Guisinger and Schydrowsky 1970, Humphery and Tsukahara 1970, Grubel and Lloyd 1971, Ethier 1972, Ray 1973, Humphery 1975, Humphery and Moroney 1975)6/.

Various researchers have also noted the phenomenon of negative value added ( Soligo and Stern 1965, Ellsworth 1966, Basevi 1966, Lewis and Guisinger 1968, Leith 1968, Guisinger 1969, Tan 1970, Cordon 1971). The concept of negative value added has been regarded as a theoretical possibility where the tariff on inputs exceed the tariff on the final commodity7/. It remains true that that value added can be negative in a protected situation but the possibility of substitution in a free-trade situation would make the value added positive ( see Corden 1985)

The researchers working in this area have widely documented various conceptual and practical difficulties in measuring Effective Protection Rates ( Cordon 1966, Leith 1968, Finger 1969, Bhagwati and Desai 1970, Srinivasan and Ramaswamy 1970, Jones 1971, Panchmukhi 1971).

**Empirical Studies** Earliest estimate of protection to industry in India were derived by Bhagwati and Desai (1970) for the year 1961 and 1962. They estimate total impact of tariffs and other quantitative restrictions (QRs) on imports and on the domestic

value added of the industry. The methodology used is to deflate the domestic value added with the import premium to arrive at c.i.f. values and hence value added at international prices. They consider the use of average unit values as unreliable for unknown reasons. However, they concede that these estimates could not be attached any resource-allocational or directional significance. Nonetheless, they conclude that tariff structure had no stability and it was highly unpredictable. Thus the tariff regime was incapable of providing effective incentives for investment.

Bhagwati and Srinivasan (1975) have estimated effective protection rates for 77 industries for the period 1963-64 and 1968-69. To derive the EPR estimates, they have used direct price comparisons for some sectors while for others premium on import licenses and nominal tariffs rates have been used. They conclude that the foreign trade regime led to a wasteful misallocation of resources and impaired India's progress towards industrial efficiency and growth ( p.225)8/.

A recent study by Nambiar (1983), on protection to domestic industry has challenged the general conclusion reached by earlier studies that foreign trade regime has led to wasteful misallocation of resources among alternative industries and led to the accentuation of under utilization of investment within these industries. Instead of using tariffs and scarcity premia to measure price distortions, Nambiar (1983) has used comparative price information for commodities at disaggregated levels in India and in India's international trade.

Against this background of conflicting evidence the purpose of

the present paper is to :-

- a) Indicate the nature and extent of protection for large manufacturing industries for the period 1974-79 and 1982-84.
- b) To study the changes in the direction of protection structure.
- c) Examine the impact of differential rates of protection on the relative performance of industries.
- d) To test the impact of protection on the production structure within the framework of Krueger-Deardoff
- e) To examine if commodity composition of India's manufactured exports have been consistent with our comparative advantage

### Impact on Performance

Protection has a number of economic effects on different interest groups. For consumers- prices are raised and the choice is restricted, for producers the implications are not clear. Theory predicts that relative resource pulls are influenced by relative rates of protection and these pulls will be manifested in the characteristics of the industries. For example, recent work on protection in developed countries has shown the relatively protected industries to be more labour-intensive, less skill-intensive, frequently geographically concentrated and earning higher profits ( see Baldwin (1982) and Frey (1985)). The evidence on the impact of protection on profitability is conflicting. Hitris (1978) has found that protection has significant impact on profitability, whereas Bloch (1974) and Pagoulatos and Sorensen (1975) find the impact to be insignificant. There is no published account of the impact of protection on profitability or any other performance measure in India.

## Measurement and Methodology

Trade policy instruments in India are sufficiently powerful to create divergence in domestic and international prices<sup>9/</sup>. Now the question that arises is; what is the nature of differential impact created by tariffs, taxes, import restrictions, and other controls on the value added of home industries ?

There are two approaches to this; Tariff Based and Price Based. The tariff based approach domestic prices are assumed to be higher than world price by the amount of tariff on the commodity. It is assumed that transport costs are zero and there is perfect competition in international markets.

Price based approach compares domestic and world prices for the same commodity (sector) and the ratio of the former to the latter is termed as implicit protection. The basic argument is if domestic and international markets were truly competitive and frictionless, the difference in prices would exist only because of transfer costs. Ellsworth (1966) recognised that domestic prices can be lower than c.i.f world prices plus tariff. Leith (1968) argues that if we relax the assumption of infinitely elastic supply, the domestic prices will rise less than world price. Nambiar and Mehta (1987, 1988) has provided evidence of domestic prices being lower than world prices.

For this study we have used price based approach to calculate the EPR. This methodology has been used by Bhagwati and Srinivasan (1975), Nambiar (1983), Willmore (1989). Cordon (1985, p.149) has also suggested the use of comparative price information for obtaining implicit protection when quotas are the principal instruments of protection 10/.

While it may be conceded that using unit values of imports as a proxy for world price may not be accurate, yet these are indicative of the nature and direction of relative protection enjoyed by industries. In using unit values one does not have to make the assumption of tariff affecting the price directly and equivalent to the amount of the tariff. The unit values as a proxy for prices may not show as wide variation from actual prices as unofficial market premium varies on import licenses. One argument against using unit values is that the price differences could exist because of quality differences. However it has been shown that the price differential are too wide to warrant such an assertion<sup>11/</sup>. Moreover, quality differential should normally be obtained from the users. But deciding on the differentials involves a high degree of personal judgement and introduces subjectivity in the data <sup>12/</sup>. Notwithstanding the limitations of unit values in representing actual prices, at present there is no data available on commodity prices traded internationally<sup>13/</sup>. The list of commodities included in the study and the respective Standard International Trade Classification (SITC) codes are given in Appendix 2.

It must be conceded that there are problems regarding the strict comparability of commodities for which prices and unit values have been obtained. For certain commodities like primary commodities, chemicals, metals - the comparability is not such a major problem as in case of machinery and transport equipment. In this regard Nambiar (1983) notes that the problem of product comparability is no different from problems in preparing a time series of price indices for a single country.

For domestic prices, we collected prices for individual commodities for 4 weeks of January 1986, i.e. 4th, 11th, 18th, 25th January 1986. Price quotations for different centres were averaged to obtain the price for the commodity. These weekly prices were then averaged to get a price for January 1986. This average price and the index of January 1986 was used with yearly sectoral indices to derive annual prices of commodities for these years<sup>14/</sup>. The quotation for individual commodities are then grouped according to a weighing system to represent prices for that sector<sup>15/</sup>.

Once domestic and world prices have been obtained for a sector the EPR is calculated by using these alongwith input-output table in the following manner:-

Step 1: If  $X_j$  is the domestic value of output produced in  $j^{\text{th}}$  industry, and  $X_{ij}$  is the value of domestic intermediate inputs from industry 'i' to industry j, then the value added at domestic prices is given by:

$$VA_j^W = X_j - \sum_i X_{ij} \quad (1)$$

Where

$$X_{ij} = P_i * Q_{ij} \quad (2)$$

Q = Quantity  
P = Price

Similarly value added at international prices is given by

$$VA_j^W = [P_j^W / P_j^D] * X_j - \sum_i [P_i^W / P_i^D] * X_{ij} \quad \text{-----}(3)$$

where  $P^W$  and  $P^D$  correspond to unit values and domestic prices respectively.

Step II: Finally the effective rate of protection is obtained in the following manner.

$$EPR_j = \left[ \frac{VA_j^D}{VA_j^W} - 1 \right] \times 100 \quad (4)$$

Regarding non-tradeables we have lumped them with value added as suggested by Cordon.

Once estimates of effective protection for each industry have been derived by using equation 4, we attempt to find the impact of differential protection enjoyed by industries on their relative performance. The model employed is simple regression of profit rates and productivity on effective protection to the industry.

$$Y_{ijk} = a + b X_j$$

Where  $j = 1, 2, \dots, 42$  (for details see appendix 3)

$i =$  Price-Cost Margins (PCM)  
Return on Capital Employed (ROCE)  
Translog Index of Total Factor Productivity (TFP)

$k =$  1970s (Average 1974-78) / 1980s (Average 1982-84)

$Y_{ijk} =$   $i$ th Performance Measure of  $j$ th industry for  $k$ th period

$X_j =$  Effective Protective Rate

It is expected that the slope coefficient would be positive and significant implying that higher protection would lead to higher profitability because of a lack of real as well as potential foreign competition, vis-a-vis an industry enjoying relatively less protection. Its relationship with productivity is less than clear. Though theoretically one may expect a negative relationship, as there would not be any incentive for the



protected industry to improve its efficiency because of a lack of real as well as potential competition. To test the impact of distortions in factor and goods markets we use the Krueger-Deardoff framework. The proposed model is as following:

$$Y_j = a + b X_j$$

Where

$$j = 1, 2, \dots, 42$$

$$Y_j = \text{Physical Capital Intensity}$$

$$X_j = \text{Effective Protective Rate}$$

For the definition and measurement of the variables see Appendix 3.

**Data Requirements** For measuring implicit and effective protection we require the following data :

1. Domestic and International prices for the comparable commodities.
2. Input Output Tables to show inter-sectoral flows.
3. Commodity composition of each of the sectors of Input-Output Table.
4. Correspondence of commodities and its classification as given in Standard International Trade Classification(SITC) Revision 1 and Revision 2.
5. Correspondence between Industry classification given by Annual Survey of Industries(ASI) and the Input-Output Sectors.
6. Weights to combine different commodities in a sector.
7. Profitability and Total Factor Productivity and Capital Intensity for 42 industries

**Data Sources** Data on unit values of commodities has been collected from 'UN Yearbook of International Trade Statistics', 'Commodity Trade Statistics' published by the United Nations and the 'Monthly Statistics of Foreign Trade of India' published by the Directorate General of Commercial Intelligence and Statistics

(DGCI&S), for the years 1974 to 1979 and 1982-83 to 1984-85, for the commodities imported by India from different countries. These unit values have been calculated on the c.i.f. basis. For certain commodities for which comparable price data was not available, price information for Malasiya, Sri Lanka and Brazil have been utilised. These countries were chosen because their trade structure and prices are comparable to ours<sup>16/</sup>.

Domestic prices are collected from wholesale price quotations<sup>17/</sup>. Input-Output tables have been taken from the 'Technical Note on the Sixth Plan' prepared by the Planning commission. The Input-Output table for 1978-79 has been upgraded by the Planning Commission for 1984-85 by using 1984-85 prices and expected changes in the inter-sectoral flows<sup>18/</sup>. The Input-Output table consists of 89 sectors of which 78 sectors represents the primary and manufacturing sectors. The remaining 11 sectors represents the tertiary or services sectors (see appendix 1).

### Results and Discussions

The main findings of the study are as following:

The effective protection as measured by the differentials in value added at domestic and world prices, has increased during the 1980s as compared to 1970s. This result seems contrary to the expectation, that liberalisation has decreased protection in the 80s as compared to 1970s ( see table 3 for the magnitude of protection in the two periods). The implications of this result is that the difference between domestic and world prices have increased during the 1980s as compared to the earlier period. One of the explanations could be that world prices have fallen faster than the domestic economy. It could be because of the reason that

increasing competition in the international markets has led to technological progress, which has made it possible to reduce costs and probably domestic prices have increased faster than world prices.

Secondly, an inter-industry comparison over time could be more illustrative of the dynamic comparative advantage of the industry. The industries which seem to show a clear cut case of comparative advantage are: Tea and Coffee, Leather Products, Cotton Textiles, Sugar, Edible Oils, Petroleum Products, Inorganic Chemicals, Drugs and Pharmaceuticals, Soaps and Cosmetics - all have negative protection rates for the two periods examined (see table 4 and table 1). In some of the cases the protection has declined over the period as is evident from table 4 (Railway Equipment, Plastics, Office Equipment), while for others there are no distinctive trends in the level of protection. The relationship between industrial exports and EPR was found to be insignificant (see table 4). It suggests either the comparative advantage has not been utilised or external trade relations are much more than just economic.

Thirdly, the study seems to suggest that the price competitiveness of Indian exports is not important in explaining the poor export performance of Indian Industry. These results are in conformity with earlier studies by Nambiar (1988) and Agarwal (1984). As is clear from column 5 and 6 of table 1, most of the industries have a ratio of less than one during the 70s and during 80s the same is true for nearly 50% of the industries (33 out of 68, see table 1). It seems that factors other than price like quality, delivery schedules, country image, lack of

information among foreign buyers, product composition of our exports etc. play a greater role. It has significant implications for the strategy towards improving the performance of the external sector. Recently there are instances where the price advantage of Indian goods have been clearly shown. European Economic Community (EEC) has been planning to impose anti-dumping duties on Indian Yarns (see Financial Express, 2/8/91). USA and UK reduced the prices of Castor Oil imports from India by \$3.75, the suppliers will now get Rs.50 per tonne less than what they were getting before the devaluation (see Economic Times 4/7/91)

Fourthly, as suggested by theoretical considerations, the distortions created by the tariff structure would affect the relative performance of the industries, no conclusive evidence towards this end was found. The regression results of the model are given in table 4. None of the performance measures—PCM, ROCE and TFP is significantly related to the EPR for 80s while for the 70s only ROCE is significantly related to EPR. But the sign of the coefficient of this measure is negative which is contrary to our expectations, making it difficult to explain. One tentative explanation could be in terms of the protection to labour market being more than that to the capital<sup>19/</sup>. Here it may be pertinent to mention the conclusions reached by Lucas (1989, 174), who observes "Thus, it seems the primary obstacle to improved industrial performance has been the system of investment controls and that trade liberalization alone would have achieved little".

Fifthly, for the Krueger-Deardoff hypothesis we find that physical capital intensity is negatively significantly related to the protection rates only for 1970s whereas respective

coefficients for the 1980s are insignificant. This also provides some support for our earlier assertion that protection has in fact reduced physical capital intensity thereby providing protection to labour. This result too is contrary to the expectation that higher protection should have led to the higher capital intensity, thereby distorting the production technology in the industry. For a labour surplus economy like ours the results of our study suggest that contrary to the general feeling, protection has not had any distortionary impact on the production techniques in the industry. On the contrary it appears as though the unintended consequences of protection have resulted in reinforcing the true strength of our comparative advantage by having a negative impact on the capital intensity of industry.

#### Summary and Conclusions

The study has attempted to examine the (i) extent of protection to the domestic industry (ii) impact of protection on the relative performance of industry (ii) impact of protection on the domestic production technology. In addition an attempt has also been made to understand the export performance of industries with their comparative advantage in the international markets. The main findings of the study are:

The protection to the industry seems to have increased in the 1980s vis-a-vis 1970s. There is no conclusive evidence of the impact of protection on the performance of industry. It is found that domestic prices of a number of goods are quite low as compared to the international prices denominated in US dollars. It suggests that the price competitiveness of Indian goods is not an explanation in poor export performance of our industry.

Finally, there is no evidence on the distortionary effects of protection on the production technology of the industry. In fact protection has resulted in the resources being allocated to labour intensive industries. However, for the 80s the results do not indicate this allocative preference.

From the foregoing discussions it seems that the case for more open and liberal policies have to be examined in the light of its impact on the domestic economy's production technology and domestic requirements and priorities. Notwithstanding ideological predilection the case for more open and liberal trade policy is less strong than it is made out to be 20/. It may, therefore, be necessary to conduct studies at the more disaggregated levels to control for the errors due to aggregation and to suggest commodity specific policies consistent with our objectives and needs. This study points that issues concerned with trade liberalization are more complex than usually assumed to be. Domestic market factor seems to be more important than external market conditions in explaining the performance of the industry.

#### Limitations of the Study

In the absence of availability of international prices for the commodities unit values of commodities have been used as a proxy for prices. One is not sure to what extent the changes in the unit values would reflect changes in the prices too. Nonetheless it is expected that these differences would not make a significant difference to the estimates obtained.

Secondly, for certain commodities ( see note 15) the units conversions had to be made for comparability in measurement units. While an attempt has been made to be as accurate as

possible in conversions, yet some amount of error is not ruled out<sup>21</sup>. Yet, it would be reasonable to assume that the error may not change the direction of the estimates.

Thirdly, there are problems associated with using of multiple sources of data. Though two of the three sources of our data for international prices are same but the data published by Directorate General of Commercial Intelligence and Statistics can not be assumed to have comparability with the other sources of data. It had to be resorted to because no better data set was available to use. Moreover for some commodities we had to take world price data for other countries, which could create some bias in the estimates.

Fourthly, the definition of a sector poses a problem. Since input-output relationship is based on the degree of aggregation, the results could be different if we change the level of aggregation. Moreover, there is a problem of correspondence between the sectors for which we have computed the protection rates and the industries for which we have performance indicators. The sectoral classification of input-output table is in some cases more aggregative than what is required for our purposes. Thus we have the situation of a sector representing more than one industry.

Fifthly, the possibility of substitution has not been allowed. We have also not made any corrections for adjusting the domestic prices to conform these to f.o.b. values.

Sixthly, the conversion of domestic prices to US dollars have been done by using the official exchange rate. However, the

overvaluation of rupee and consequently higher shadow exchange rate and non-corrections of domestic prices will cancel each other.

Finally, the study has examined the performance of industry for the external sector only. In that it is just a partial analysis.



## Notes

1. Tyler suggests that one policy might affect an industry positively while another may affect negatively at the same time.
2. The various tariff barriers included Basic Custom Duties, Auxliary Duties, and Countervailing Duties. Among non-tariff barriers mainly there was Import Licensing for intermediate goods and also for Capital Goods. The Licenses were subject to strict scrutiny on a case by case basis and were conditional on "essentiality" and "indigenous angle Clearance". Other physical barriers included: Canalisation of Imports by certain govt. agencies, policy of Actual User, Phased Manufacturing Programme, Licensing for Industry, and Govt.purchase preference. Of late a number of these have been relaxed and it is expected that a number of these controls would be eliminated altogether. Also see Bhagwati and Srinivasan (1975)
3. In a two commodity case, if we rank two commodities by their effective tariff, we can infer that resources would then move towards producing the commodity with the higher tariff, this is not true, in a multi commodity model, for commodities in the middle of the chain (excluding the two at each extreme). There are other problems like factor-substitution, and treatment of non-branded goods. For details see Bhagwati & Desai (1975, p. 337).
4. For more details and arguments on this issue see Corden (1985)
5. The details have been spelt out in Corden (1971). Also see Bruno (1972).
6. See Corden (1985) for details of various other issues regarding substitution problem. The evidence regarding the impact of substitution elasticities on the calculation of effective rates is inconclusive. While Ramaswami and Srinivasan (1970), Leith (1968), Humphery (1977) find significant substitution effects: Grubel and Lloyd (1971), Travis (1964), Humphery (1975), Balassa (1970) provides evidence to the contrary.
7. For details see Corden (1985)
8. For details of the sources of data and method see Bhagwati and Srinivasan (1975, 192).
9. Bhagwati and Srinivasan (1975), Bhagwati and Desai (1970), Nambiar (1983).
10. Nambiar (1983) has shown that this methodology is superior to the one which calculates effective rates through tariffs. It has also been shown that the some of the restrictive

assumptions of tariff based approach are far from reality. Also see Nambiar and Mehta (1987, 1988)

11. Nambiar (1983), has shown that prices differ upto 1000% or more and it is not possible to attribute such large differences to quality alone.
12. Adjustments for cost differences between domestic and import products in the transportation to the point of consumption would have been desirable. But this is quite an uphill task for a large sample such as taken in the study.
13. Though Commodity Trade Statistics published by United Nations provides quotations for a large number of items. The unit values serve as prices in case of a number of commodities, e.g. the commodities which are homogeneous in nature and traded in bulk like Wheat, Rice, Cereals, Metals, Chemicals, Fertilizers etc. In case of other commodities however, the unit values serve only a guide to prices. Though a change in the unit values do not necessarily reflect a change in the price levels. The change in the unit values can occur because of changes in either the composition of commodity or the quality of the commodity. This is a serious limitation of the use of unit values as prices.
14. All the indices have 1970-71 as the base year.
15. Weights have been assigned to the individual commodities in the derivation of sectoral prices. The weights used are as given in the derivation of Wholesale Price Index (WPI). For the correspondence between individual commodities and sectoral classification given by Input-Output table published by Planning Commission is given in Appendix 1.
16. For most of the primary commodities, metals, chemicals world prices are equalised through through arbitrage, but for other commodities prices may not be equal. However the differences were not found significant. Quality considerations and other related issues has been debated in Nambiar (1983, 1985). For the issue of law of one price and the principle of arbitrage ( see Richardson 1978, Kravis and Lipsey 1971, 1977, Isard 1977)
17. Weekly index of wholesale prices and price quotations of different commodities is published regularly by the Office of the Economic Advisor, Ministry of Industry, Government of India.
18. We have to assume that the input-output relationship of 1978-79 to prevail for the period 1974-78 and similarly the 1984-85 relationship to prevail for the period 1982-87. If extensive factor substitution had taken place during this period, then the protection rate calculation would be overstated (see Cordon 1985 p.146, Naya and Anderson 1969,

Leith 1968 for details)

19. I am grateful to Prof. Nambiar for clarifications on this point.
20. Mani (1990) has provided an evidence about the increasing import-intensity of Indian Industry during the liberalisation phase. While there has been good growth in the exports but the trade balance have continued to worsen. Apparently the benefits of import liberalisation have not been accrued in terms of increased exports of Industry despite heavy incentives for exports. Secondly the consumption pattern has also been shifting towards more import-intensive goods. The measures initiated during the 80s may have a lagged effect on improved performance of exports.
21. Besides product comparability there is another problem of recording of traded units. International recording of transactions for most of the commodities are available only by weights, while these commodities in the domestic market are quoted in nos and area. We faced the problem of making different measurement units comparable in the case of a number of items. For example Cigarettes and Agricultural Machinery are in nos, Paints and Varnishes are sold in litres, Crude Oil in barells, Plywood, Glass and Leather in square meters, Cloth in meters. Appropriate conversions were made to reduce the units to a comparable levels. Secondly, multiple sources of data had to be resorted to primarily because of this reason. Some of the items for which we found the difficulty, data published by 'Monthly Statistics of Foreign Trade of India' was found to be useful. For certain other commodities we had to use the producer's prices from Annual Survey of Industries.

Table 1 : Implicit and Effective Protection Rates

Data on Domestic and International Prices												
Sector No. Industry†	World Prices ( US \$ )		Domestic Prices ( US \$ )		Nominal Protection ( % )		Value Added 1974-78 Rs. Crore		Value Added 1982-84 Rs. Crore		Effective Protection ( % )	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1 Rice & Prod	306.7	337.2	145.4	316.8	-52.58	-6.85	749.4	812.1	1031.9	978.9	-7.72	5
2 Wheat & Prod	282.3	165.4	181.5	181.5	-49.84	9.72	324.9	373.2	396.8	352.2	-12.94	12
3 Jowar & Prod	215.1	136.2	124.5	228.5	-42.14	67.69	154.6	156.5	143.9	140.7	-1.17	2
4 Bajra & Prod	215.1	136.2	92.8	163.3	-56.85	19.86	59.7	61.9	75.5	73.1	-3.41	3
5 Other Cereals	100.7	132.9	93.8	182.1	-6.89	36.98	115.6	119.0	132.2	124.3	-2.88	6
7 Sugarcane	696.8	2664.9	8.8	17.8	-98.86	-99.33	164.8	175.7	241.2	237.1	-6.66	1
8 Jute	106.1	232.6	134.4	371.8	26.58	59.87	22.3	22.6	24.9	24.6	-1.41	8
9 Cotton	1688.7	1499.7	958.3	1548.9	-48.63	3.28	133.3	135.8	155.6	152.7	-1.84	1
10 Plantations	691.8	2683.4	456.4	1426.2	-33.95	-46.85	98.3	133.3	117.8	115.1	-26.25	1
11 Other Crops	199.1	818.3	153.5	481.4	-22.87	-58.95	1121.5	1136.4	1303.2	1301.6	-1.49	8
12 Milk & Milk P	1172.7	1191.8	1158.4	2523.8	-1.98	111.69	373.7	346.4	465.8	536.6	7.87	-13
15 Fish	298.2	2556.1	122.7	484.2	-57.73	-84.19	93.8	93.1	112.8	111.6	8.77	1
16 Coal & Lignite	159.8	59.9	6.9	28.9	-95.66	-51.73	117.1	119.9	185.9	187.9	-2.28	-1
17 Petroleum	181.9	228.7	21.1	65.1	-79.26	-71.55	41.5	43.2	76.1	77.7	-4.18	-2
18 Iron Ore	16.8	48.6	3.1	7.2	-88.42	-82.37	7.8	7.4	18.8	11.8	-5.41	-1
19 Other Minerals	31.6	38.1	8.7	28.3	-72.51	-32.71	25.3	25.3	54.1	53.8	8.11	2
20 Misc Food P	464.1	934.8	385.8	681.6	-34.11	-27.88	118.5	178.2	141.6	129.3	-38.38	9
21 Sugar	518.8	354.1	272.4	562.7	-46.59	58.93	98.7	168.2	192.4	382.5	-38.35	-36
22 Gur & Khandsari	468.8	193.2	139.6	329.3	-78.22	78.43	43.8	166.3	55.3	136.7	-74.14	-59
23 Vanaspati	1334.5	875.7	812.2	2896.5	-39.13	139.42	49.5	61.2	71.1	75.7	-19.21	-6
24 Edible Oils	743.7	824.5	669.7	1761.7	-9.95	113.68	25.8	58.1	33.9	85.1	-58.23	-68
25 Tea & Coffee	1782.2	4698.5	1816.4	2683.4	-48.29	-42.89	47.3	69.6	62.8	98.9	-32.83	-38
26 Other Beverages	2.4	3.3	1.6	3.5	-31.42	7.74	28.5	24.1	22.6	21.8	-15.88	3
27 Tobacco Mfg.	9687.6	8128.1	11938.5	25614.7	24.18	215.45	77.1	87.2	65.3	48.1	-11.65	62
28 Cotton Textiles	1668.8	1561.9	482.8	885.5	-75.75	-48.43	233.1	328.4	217.7	288.3	-27.24	8
30 Woolen Cloth	4.8	6.2	7.8	12.8	44.96	187.79	27.1	23.8	34.4	5.6	13.67	518
32 Jute Textiles	821.6	894.1	237.7	681.2	-71.87	-32.76	53.2	66.8	72.5	59.2	-28.34	22
34 Misc Tex. P	3677.5	917.9	964.1	2559.5	-73.78	178.85	28.8	41.2	47.7	38.9	-38.16	54
36 Wood Products	551.1	228.4	286.2	785.8	-48.87	256.58	148.7	141.2	188.8	163.5	-8.37	18
37 Paper & Paper P	585.3	478.4	358.8	864.8	-38.58	83.85	58.6	69.9	91.8	68.7	-16.18	33
39 Leather & Lea P	3678.6	4142.9	2886.5	5848.7	-45.34	21.67	44.6	53.5	54.8	51.3	-16.57	5
48 Leather Footwea	1.8	14.8	3.1	8.2	78.83	-44.89	21.9	28.2	27.9	21.8	-22.42	28
41 Rubber Prod.	79.1	121.6	114.8	331.5	44.15	172.61	67.2	71.9	182.8	62.4	-6.49	63
42 Plastics	3.9	8.4	5.7	13.2	44.39	56.63	46.8	42.7	59.7	31.5	7.82	89
43 Petroleum Prod.	126.9	312.9	213.9	684.7	68.58	93.27	48.8	231.5	75.5	295.4	-82.39	-74
44 Misc Pet Prod.	123.2	164.5	14.5	68.6	-88.27	-63.17	28.5	37.9	45.3	55.7	-45.96	-18
45 Inorganic Chem	388.8	328.3	235.3	786.8	-21.79	115.31	42.6	48.2	71.7	73.6	-11.51	-2
46 Organic Chem	2898.8	975.9	378.2	859.1	-87.22	-11.97	7.3	7.8	14.7	12.8	-5.52	22
47 Chem Fertilizr	168.5	137.3	85.6	158.8	-49.19	15.63	165.8	288.1	384.8	212.2	-17.12	43
48 Insecticide	2948.1	5782.3	1296.8	3265.1	-55.92	-42.74	12.4	17.9	23.7	24.8	-38.58	-1

Table 1 : Implicit and Effective Protection Rates

Data on Domestic and International Prices												
Industry	World Prices ( US \$ )		Domestic Prices ( US \$ )		Nominal Protection ( % )		Value Added 1974-78 Rs. Crore		Value Added 1982-84 Rs. Crore		Effective Protection ( % )	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Drugs & Pharma	1452.3	19105.1	25405.4	60570.7	1649.33	217.04	109.5	-587.5	145.8	-29.8	-118.64	-588.00
Soaps & Glycer	1071.6	2169.8	686.3	1677.5	-63.33	-22.69	24.1	25.3	38.1	-81.1	-4.76	-146.93
Cosmetics	4613.9	1928.0	9350.9	21580.3	102.67	1014.70	13.5	14.1	22.5	-51.2	-4.22	-143.93
MM Fibre & Rub	1481.4	1824.3	1621.0	2957.8	9.42	62.13	32.9	41.0	69.8	48.6	-19.60	43.46
Other Chemicals	4455.5	2778.2	1581.1	4000.6	-64.51	44.29	59.9	73.5	93.7	40.9	-18.46	128.98
Refractories	411.2	449.6	139.4	443.8	-66.89	-1.38	49.4	67.8	69.6	79.4	-27.07	-12.32
Cement	130.2	119.9	32.5	108.2	-75.02	-9.79	29.1	38.7	56.0	61.3	-24.89	-8.71
Other Non-Met P	6774.3	1893.6	116.1	285.3	-98.29	-84.93	135.0	177.1	164.0	150.4	-23.76	9.02
Iron & steel	536.3	1135.1	132.0	428.0	-75.39	-62.30	186.9	215.6	267.9	268.7	-13.33	-0.30
Casting & Forg	1507.2	870.7	294.0	919.0	-80.49	4.58	11.4	13.4	34.7	37.9	-14.59	-8.42
Iron & Steel St	818.7	1724.6	147.3	569.7	-82.01	-66.97	22.7	30.6	58.1	69.5	-25.06	-16.35
Non Fer Metals	1917.0	2561.2	2244.7	5307.0	17.09	107.20	89.4	96.3	139.5	82.0	-7.22	70.09
Metal Products	584.7	4524.1	254.3	619.4	-56.52	-86.31	169.2	202.8	244.7	236.8	-16.57	3.31
Tractors & Agr	21956.7	31135.4	3530.4	8847.6	-83.92	-71.58	31.8	39.7	50.8	59.1	-20.09	-14.02
Machine Tools	10302.7	N/A	10533.6	27844.1	2.24	N/A	16.7	19.9	14.5	13.1	-15.91	N/A
Off Dom Com eqp	108.8	590.5	192.9	272.3	77.28	-54.50	10.5	10.4	272.8	174.2	0.93	10.07
Other NE M/C	28.0	69.2	37.0	93.6	35.00	35.40	155.0	161.8	26.4	24.4	-4.20	56.61
Elec Motors	4403.5	1730.7	563.1	1273.8	-87.21	-26.40	13.9	18.2	32.6	2.3	-23.76	8.28
Cable/Wires	4.9	4.8	0.1	0.1	-98.98	-98.23	23.1	22.2	8.6	6.3	4.41	1293.17
Batteries	11.0	21.8	8.0	17.2	-27.44	-20.93	7.6	8.3	12.1	9.1	-8.92	35.89
Elec House	57.0	76.2	20.2	37.7	-65.07	-50.47	8.4	10.0	31.6	32.2	-15.51	32.36
Comm & Elec.	1601.5	670.6	20.6	51.5	-98.22	-92.32	22.1	29.2	60.9	47.6	-24.32	-1.00
Other Elec M/C	1268.7	36978.0	1438.5	3464.1	13.30	-90.63	35.2	43.7	49.4	-61.9	-19.35	27.09
Railway Equip	5045.9	4206.3	12428.7	32005.6	146.31	679.91	26.9	23.1	181.7	102.6	16.70	-179.76
Motor Vehicles	7793.7	12133.4	5702.2	15051.0	-26.04	24.05	59.2	72.0	54.9	52.7	-17.74	77.00
Motor Cy & Bi	297.1	1134.9	169.5	1281.0	-42.95	12.87	40.4	46.5	9.7	10.2	-13.10	4.16
Watches & Clock	14.7	39.6	10.7	18.3	-26.75	-53.77	7.3	8.3	326.8	-72.0	-12.20	-5.25
Misc Mfg Ind.	150.3	3.6	88.5	153.3	-41.00	4129.20	280.3	287.9	1421.7	1350.3	-2.64	-554.16

industries have been omitted from the table as appropriate price data were not available

Table 2

Structure of Protection to Indian Industry  
For the Period 1974-78 and 1982-87

Sr. No.	Rate of Protection (%)	No. of Ind. 1970s	No. of Ind. 1980s
1	$P < 0$	60	26
2	$0 < P < 10$	6	19
3	$10 < P < 20$	2	3
4	$20 < P < 50$	0	9
5	$50 < P < 100$	0	7
6	$P > 100$	0	3
Total		68	67

Notes: Appropriate Data Could Not be Found  
For the 10 Sectors for 1970s and for  
11 Sectors for 1980s ( Machine Tools  
were added to the list)

Sources: Calculated as explained in the text

Table 3

**Selected Inter-Industry Comparison  
of Effective Rates**

Commodity Specification	Price Based Effective Protection Rates ( per				
	1961	1968	1973	1974-78	1982-8
Tea and Coffee	-42.00	-48.00	-47.80	-32.03	-30.93
Leather Products	-72.40	-80.40	-52.00	-16.57	5.12
Chemical Products	-22.20	-21.80	-31.00	N/A	N/A
Organic Chemicals	N/A	N/A	N/A	-5.52	22.89
Man-made Fibres	-332.40	-241.90	-178.00	-19.59	43.46
Rail Equipments	1370.00	1141.50	29950.00	16.70	-179.76
Telephone Equipment	17.60	390.20	-7420.00	-24.32	-1.81
Chemical Fertilizers	111.60	42.30	34.40	-17.12	43.24
Non-ferrous Metals	75.00	57.80	35.20	-7.22	70.10
Electronics	1350.00	360.00	165.80	N/A	N/A
Plastics	26.40	143.90	1240.50	7.82	89.42
Office Equipments	75.00	85.00	454.40	0.93	10.08
Radio	77.80	186.00	391.20	N/A	N/A

Notes: N/A = Not Available

Sources: First three columns have been taken from Nambiar (1983)  
The last two columns have been extracted from table 1

Table 4 : Results of the Regression Model

Equation Number	Dependent Variable	Constant	Effective Protection	R <sup>2</sup>	DW Stat.	F-Stat
1	PCM70	0.23206 (10.96)**	0.003973 (0.59)	0.01	1.31	0.352
	PCMB0	0.20694 (13.97)**	-0.00019 (0.31)	0.003	1.37	0.093
	ROCE70	0.15069 (7.22)**	-0.014 (2.12)*	0.11	2.08	4.514*
	ROCEB0	0.166 (8.13)**	-0.0001 (0.60)	0.0003	1.57	0.009
	TFP70	0.9758 (61.73)**	-0.003 (0.60)	0.01	1.69	0.363
	TFPB0	0.9742 (45.99)**	0.0004 (0.43)	0.005	1.53	0.181
2	PCI(C)70	-33.03 (1.82)*	-1.11 (1.94)*	0.10	2.01	3.75*
	PCI(C)80	75.14 (4.34)	0.006 (0.09)	0.0002	2.02	0.008
	PCI(U)70	30.93 (2.22)*	-8.18 (1.86)*	0.09	1.98	3.456*
	PCI(U)80	67.52 (4.67)**	0.0008 (0.13)	0.001	1.92	0.018
3	EXP70	32.73 (2.50)**	-0.304 (0.74)	0.0152	2.07	0.542
	EXPB0	11.61 (3.32)**	-0.013 (0.85)	0.0202	2.25	0.721
	Δ EXP	46.88 (2.27)*	-0.0012 (0.28)	0.0022	2.18	0.077

▲ Notes: Figures in the brackets are t ratios  
 \*\* Significant at 1% level  
 \* Significant at 5% Level

PCM = Price Cost Margins  
 ROCE = Return on Capital Employed  
 TFP = Translog Index of Total Factor Productivity



EXP = Exports  
PCI(C) = Physical Capital Intensity Corrected for  
Capacity Utilisation  
PCI(U) = Physical Capital Intensity Uncorrected  
70,80 = Averages of the sub-period

## References

Agarwal, M., (1989), "A Comparative Analysis of India's Export Performance, 1965-80", Indian Economic Review, Vol.23, No.2, pp.231-261.

Aggarwal, Ashok K., (1991), Estimates of Fixed Capital Stock in Registered Manufacturing Sector in India, Working Paper No. 937, Ahmedabad, Indian Institute of Management

Balassa, B., (1965), "Tariff Protection in Industrial Countries: An Evaluation", The Journal of Political Economy, Vol.73, No.4, p.573-94.

-----, (1971), "Effective Protection in Developing Countries" in Jagdish Bhagwati, et al(ed.), Trade, Balance of Payments and Growth: Papers in International Economics in Honour of Charles P. Kindleberger, Amsterdam, North Holland Publishing Co.

Balassa, Bela, Guisinger, S. and Schydrowsky, D.M., (1970), "The Effective Rates of Protection and the Question of Labour Protection in the United States: A Comment", Journal of Political Economy, Vol.78, No.5, pp.1150-62.

Balassa, Bela, et al., (1971), The Structure of Protection in Developing Countries, Baltimore, Johns Hopkins Press.

Baldwin, R.E., (1982), "The Political Economy of Protectionism" in J. Bhagwati (ed.), Import Competition and Response, Chicago: Chicago University Press

Basevi, G., (1966), "The U.S. Tariff Structure Estimate of Effective Rates of U.S. Industries and Industrial Labour", Review of Economics and Statistics, Vol.48, No.1, pp.147-60.

Bhagwati, Jagdish, (1990), Protectionism, Massachussets Institute of Tchnology Press.

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

Bhagwati, J.N. and Srinivasan, T.N., (1973), "The General Equilibrium Theory of Effective Protection and Resource Allocation", Journal of International Economics, Vol.3, No.3, pp. 258-281.

-----, (1975), Foreign Trade Regimes and Economic Development: India - A Special Conference Series on Foreign Trade Regimes and Economic Development, Vol.VI, New York, National Bureau of Economic Research.

Bloch, H., (1974), "Prices, Costs and Profits in Canadian Manufacturing: The Influence of Tariffs and Concentration", The Canadian Economic Journal, Vol.7, pp.594-610.

Bruno, M., (1972), "Domestic Resource Costs and Effective Protection: Clarification and Synthesis", Journal of Political Economy, Vol.80, No.1, pp.16-33.

Cordon, W.M., (1966), The Structure of a Tariff System and the Effective Protective Rate, The Journal of Political Economy, Vol.74, No.3, p. 221-237.

-----, (1969), Theory of Effective Protection, Oxford, Oxford University Press

-----, (1971), The Theory of Protection, Oxford, Oxford University Press.

-----, (1975), "The Costs and Consequences of Protection: A Survey of Empirical Work" in F.B. Kenen (ed.), International Trade and Finance: Frontiers for Research, Cambridge: Cambridge University Press

-----, (1985), Protection Growth and Trade: Essays in International Economics, Oxford: Basil Blackwell Ltd.

-----, (1987), Protection and liberalisation: A Review of Analytical Issues, Occasional Paper No.54, August 1987, Washington D.C.: International Monetary Fund

Deardoff, Alan V., (1979), "Weak Links in the Chain of Comparative Advantage", Journal of International Economics, Vol.9, No.2 ,pp. 197-209.

Ellsworth, P.T., (1966), "Import Substitution in Pakistan-Some Comments" Pakistan Development Review, Vol.6, No.3, pp.395-407.

Ethier, W., (1972), "Input Substitution and the Concept of the Effective Rate of Protection", Journal of Political Economy, Vol.80, No.1, pp.34-47.

Finger, J.M., (1969), " Substitution and the Effective Rate of Protection", Journal of Political Economy, Vol.77, No.6, pp.972-75

Frey, B., (1985), " The Political Economy of Protection" in D. Greenaway (ed.)(1985), Current Issues in International Trade : Theory and Policy, London: Macmillan

Goldar, B.N., (1986), Productivity Growth in the Indian Industry, New Delhi: Allied Publishers Pvt. Ltd.

Greenaway, David and Milner, Chris, (1989), " Nominal and Effective Tariffs in a Small Industrializing Economy", Applied Economics, Vol.21, No.4, pp.995-1009.

Grubel, H.G. and Lloyd, P.J., (1971), "Factor Substitution and Effective Tariff Rates", Review of Economic Studies, Vol.38, No.113, pp.92-103

Guisinger, S.E., (1969), "Negative Value Added and the Theory of Effective protection", Quarterly Journal of Economics, Vol.83, No.3, pp.415-33.

Heffernan, S. and Sinclair, P., (1990), Modern International Economics, Oxford: Basil Blackwell Ltd.

Hitiris, Theodore, (1978), "Effective Protection and Economic Performance In U.K. Manufacturing Industry: 1963 and 1968", The Economic Journal, Vol.88, No.349, pp.107-120.

Humphery, D.B., (1969), "Measuring the Effective Rate of Protection: Direct and Indirect Effects", Journal of Political Economy, Vol.77, No.5, pp.834-44.

-----, (1975), "Estimates of Factor-Intermediate Substitution and Separability", Southern Economic Journal, Vol.41, No.2, pp.531-41

Humphery, D.B. and Moroney, J.R., (1975), "Substitution Among Capital, Labour and Natural Resource Products in American Manufacturing", Journal of Political Economy, Vol.83, No.1, pp.57-82

Humphery, D.B. and Tsukahara, T., (1970), "On Substitution and Effective Rate of Protection", International Economic Review, Vol.11, No.3, pp.488-496.

Isard, Peter, (1977), "How Far We Can Push the Law of One Price", American Economic Review, Vol.67, No.5, pp.942-48

Jones, R.W., (1971), "Effective protection and Substitution", Journal of International Economics, Vol.1, No.1, pp.59-81.

Khanna, A., (1987), "Market Distortions, Export Performance, and Export Direction: India's Export of Manufactures in 1970s" in Oli Havrylyshyn (ed.), Export of Developing Countries: How Direction Affect Performance, Washington D.C.: The World Bank

Kravis, I., and Lipsey, R., (1971), Price Competitiveness in World Trade, New York: National Bureau of Economic Research.

-----, (1977), "Export Prices and the Transmission of Inflation", American Economic Review, Vol.67, No.1, pp.155-163.

Kruger, Anne O., (1972), "Evaluating Restrictionist Trade Regimes: Theory and Measurement" Journal of Political Economy, Vol.80, No.1, pp.48-62.

-----, (1977), Growth, Distortions and Pattern of Trade Among Many Developing Countries, Princeton Studies in International Finance 40, Princeton N.J.: Princeton University Press.

-----, (1978), "Alternative Trade Strategies and Employment in LDCs", American Economic Review, Papers and Proceedings, Vol.68, No.2, pp.270-74.

-----, (1981), Trade and Employment in Developing Countries, Chicago: University of Chicago Press.

Leith, J.C., (1968), "Substitution and Supply Elasticities in Calculating Effective Rates of Protection", Quarterly Journal of Economics, Vol.82, No.4, pp.588-601.

Lewis, S.R. and Guisinger, S.E., (1968), "Measuring protection in a Developing Country: The Case of Pakistan", Journal of Political Economy, Vol.76, No.6, pp.1170-98.

Little, I.M.D. Scott, M. and Scitovsky, T., (1970), Industry and Trade in Some Developing Countries, Oxford: Royal Institute of International Affairs and Oxford University Press

Lucas, Robert E.B., (1989), "Liberalization of Indian Trade and Industrial Licensing: A Disaggregated Econometric Model With Simulations", Journal of Development Economics, Vol.31, No.1, pp.141-175.

Mani, S., (1991), "Import Intensity of Indian Industry: A Study of Liberalisation" Economic and Political Weekly, Vol.26, No.27 & 28, pp.1693-96.

Massell, B.F., (1968), "The Resource-Allocative Effects of a Tariff and the Effective Protection of Individual Inputs", The Economic Record, Vol.44, No.107, pp.369-76.

Mishra, S.N., (1986), "Protection Versus Underpricing of Agriculture In the Developing Countries: A Case Study of India", The Developing Economies, Vol.24, No.2, pp.131-148.

Naya, S. and Anderson, J., (1969), "Substitution and Two Concepts of Effective Rates of Protection", American Economic Review, Vol.59, No.4, pp.607-611.

Nambiar, R.G. (1983), Protection to Domestic Industry: Fact and Theory, Economic and Political Weekly, Vol.18, No.1-2, pp.27-32.

-----, (1985), Comparative Prices in a Developing Economy: the Case of India, Journal of Development Economics, Vol.12, No. , pp.

Nambiar, R.G., and Mehta, R., (1987), Effect of Tariffs on Foreign Prices: The Case of India, Economic and Political Weekly, Vol.22, No.24, pp. 942-44.

-----, (1988), "Tariffs and Foreign Prices: Some Further Evidence", Economic and Political Weekly, Vol.23, No.45,46 & 47, pp.2385-2393

Facey, A., (1990), Technology in World Civilisation, Oxford: Basil Blackwell Limited.

Pagoulatos, Emilio and Sorenson, Robert, (1976), "International Trade, International Investment and Industrial Profitability of U.S. Manufacturing", Southern Economic Journal, Vol.42, No.3, pp.425-434.

Panchmukhi, V.R., (1978), Trade Policies of India: A Quantitative Analysis, Delhi: Concept Publishing Company

Planning Commission, Government of India, (1981), A Technical Note on the Approach to Sixth Five Year Plan

Prebisch, Raul, (1959), "Commercial Policy in the Underdeveloped Countries", American Economic Review, Paper and Proceedings, Vol.49, No.2, pp.251-73.

Ray, A., (1973), "Non-Traded Inputs and Effective Protection: A General Equilibrium Analysis", Journal of International Economics, Vol.3, No.2, pp.245-58.

Ramaswami, V.K. and Srinivasan, T.N., (1970), "Tariff Structure and Resource Allocation in the Presence of Factor Substitution" in Jagdish Bhagwati, et al.(ed.), Trade, Balance of Payments and Growth: Essays in the Honour of Charles P. Kindleberger, Amsterdam, North Holland Publishing Co.

Richardson, J. David, (1978), "Some Empirical Evidence on Commodity Arbitrage and the Law of One Price", Journal of International Economics, Vol.8, No.3, pp.341-51.

Soligo, R. and Stern, Joseph, J., (1965), "Tariff Protection, Import Substitution and Investment Efficiency", Pakistan Development Review, Vol.5, No.2, pp.249-270.

Tan, A.H.H., (1970), "Differential Tariffs, Negative Value Added and the Theory of Effective protection", American Economic Review, Vol.60, No.3, pp.107-16.

Travis, W.P., (1964), The Theory of Trade and Protection, Cambridge Mass: Harvard University Press.

-----, (1968), "The Effective Rate of Protection and The Question of Labour Protection in the United States", Journal of Political Economy, Vol.76, No.3, pp.443-61.

Tyler, William G., (1985), Effective Incentives for Domestic Market Sales and Exports: A View of Anti-Export Bias and Commercial Policy in Brazil, 1980-81, The Journal of Development Economics, Vol.18, No.2-3, pp.219-242.

Willmore, Larry, (1989), Determinants of Industrial Structure: A Brazilian Case Study, World Development, Vol.17, No.10, pp.1601-1617.

World Bank, (1987), " India: An Industrialising Economy in Transition", Report No. , New York, World Bank.

Yagci, F., (1984), Protection and Incentive in Turkish Manufacturing: An Evaluation of Policies and Their Impact in 1981, World Bank Staff Working Papers No.660.

Yeats, Alexander J., (1977), "A Comparative Analysis of Tariffs and Transport Costs on Indian Exports", Journal of Development Studies, Vol.14, No.1, pp.97-107.

APPENDIX I  
ANNEXURE VI

SECTOR CLASSIFICATION OF INPUT-OUTPUT TABLE

Sector No.	Name of Sector	Composition of Sectors
(0)	(1)	(2)
1	Rice and products .. ..	Paddy, rice milling.
2	Wheat and products .. ..	Wheat, flour milling.
3	Jowar and products .. ..	Jowar, products.
4	Bajra and products .. ..	Bajra, products.
5	Other cereals .. ..	Maize, Gram and other cereals.
6	Pulses .. ..	Milled & unmilled tur, urad, moong, matar, masur & black gram dal and flour.
7	Sugarcane .. ..	Sugarcane.
8	Jute .. ..	Raw jute.
9	Cotton .. ..	Raw cotton.
10	Plantations .. ..	Tea plantation, coffee plantation, rubber plantation, coconut, copra, tobacco plantation.
11	Other crops .. ..	Groundnut, potato, sesamum, rape and mustard, linseed, castor, mesta, san hemp, dry chillies, black pepper, dry ginger, turmeric, indigo, opium, sweet potato, tapioca, banana, cashewnut, arecanut, cardamom, citrus fruits, grapes, mangoes, other fibres, other oilseeds, other sugars, other dyes and tanning materials, other drugs and narcotics, other condiments and spices, other fruits and vegetables, fodder, miscellaneous food and non-food crops.
12	Milk and milk products .. ..	Milk consumed as such, ghee, butter, lassi.
13	Other animal husbandry .. ..	Agricultural & animal transport services by bullocks, camels, horses, donkeys and ponies etc. Production of raw hides and skins, hair, wool, eggs, honey, raw-silk, bones, horns and hoop, dung, increment in livestock, hunting and trapping.
14	Forestry and logging .. ..	Planting, replanting, conservation of forests, production of fuel including charcoal, felling and cutting of trees and preparation of rough, hewing, shaping of poles, blocks etc. and transportation of logs up to the permanent lines of transport, industrial wood (timber, match and pulp-wood, bamboo, sandal wood, gathering of uncultivated materials such as gums, lacs, resins, forest grown, fruits, nuts, herbs, barks, grass, cane.
15	Fishing .. ..	Rearing and catching of fish, sea weeds, shells, pearls, sponges etc. fish curing viz. salting and sundrying of fish.
16	Coal and lignite .. ..	Coal and lignite mining.
17	Petroleum and natural gas .. ..	Crude petroleum, natural gas.
18	Iron ore .. ..	Iron ore mining.
19	Other minerals .. ..	Manganese ore mining, Bauxite mining, Copper ore mining, Chromite mining, Lead & Zinc ores, gold ores, silver ores, Ilmenite and Rutile, Lime stone mining, Mica mining, Dolomite mining, Apatite, asbestos, barytes, chinaclay, gypsum, Kyanite, magnesite, diamond calcite, ochre, garnet, graphite, feldspar, fireclay, fluorite, quartz and silica, sillimanite, struttite, minor minerals, salt mining and quarrying, chemical stone quarrying, clay and sand pits and chemical and fertiliser, mineral mining, precious and semi precious stone mining etc.
20	Miscellaneous food products .. ..	Slaughtering, preparation, preservation of meat, milk foods and manufacture of dairy products. Manufacture of fruit juices, jams, jellies, pickles etc., canning and bottling of fruits and vegetables. Canning, preserving & processing of fish, crustacean and similar foods. Grinding & processing of cereals manually. Manufacture of bread, biscuits, cakes etc. Common salt, cocoa chocolate and sugar confectionary etc.



## SECTOR CLASSIFICATION OF INPUT-OUTPUT TABLE—contd.

Sector No.	Name of Sector	Composition of sectors
(0)	(1)	(2)
		Cashewnut drying, shelling, roasting etc. Ice, starch processed from maize, tapioca, tamarind etc. Malted food, corn, wheat and oat flakes, multi purpose food, frying of rice, dal and gram, edible cornflour, curry powder, animal food, instant coffee, scented and processed supari, papads, sago and sago products etc.
21	Sugar .. ..	Sugar, raw sugar, molasses.
22	Gur and Khandsari .. ..	Boora, candy and cane gur, Khandsari.
23	Vanaspati .. ..	Hydrogenated oils, Vanaspati ghee.
24	Edible oils .. ..	Edible oils such as linseed oil, mustard oil, sesamum oil, coconut oil, groundnut oil, cotton seed oil, mowrah oil etc.
25	Tea and Coffee .. ..	Blended and unblended black tea leaf grade dust and waste, coffee curing, roasting and grinding.
26	Other Beverages .. ..	Distilling, rectifying and blending of spirits, still wines, beer, malt liquor, country liquor etc. Soft drinks and carbonated beverages, soda water, bottled sweet water.
27	Tobacco manufactures .. ..	Bidi, cigarette, cigars and cheroots, smoking tobacco, Zarda, chewing tobacco, snuff, graded, regraded, undried, stripped and packed tobacco, scraps and stems.
28	Cotton textiles .. ..	Cotton ginning, cleaning and pressing. Finished cotton textile in mills printing, dyeing and bleaching of cotton textiles.
29	Cotton textiles (handloom & Khadi) .. ..	Weaving & finishing of cotton textile in handloom, khadi.
30	Woollen & Silk textiles .. ..	Wool baling and pressing and woollen textiles. Silk fabrics.
31	Art silk fabrics .. ..	Fabrics of art silk and synthetic fibres.
32	Jute textiles .. ..	Jute pressing and jute textiles.
33	Readymade garments .. ..	Cotton, woollen and synthetic fibres knitting in mills. Ready made garments, clothing and tailoring (tailoring job works) made-up textile goods.
34	Miscellaneous textile products .. ..	Thread & thread ball making, Jute, cotton, hemp, sisal, nylon rope, cordage and twines, webbing, narrow fabrics, embroidery work and laces, umbrella manufacture, artificial leather and oil cloth, tarpaulins, tents, sails and other made-up canvas goods. Coir yarn and coir products, linoleum and similar products, gas mantles and other textiles viz. bandage, gauze, dressing cloth etc.
35	Carpet weaving .. ..	Carpet Weaving.
36	Wood products .. ..	Plywood and their products, Sawing & planing of wood, containers made of wood, cane, bamboo, reed, joinery and general wood working, Cork and Cork products and miscellaneous wood, bamboo press products, wooden furniture and fixtures, bamboo, cane furniture and fixtures.
37	Paper, paper products and newsprint .. ..	Pulp-wood pulp, mechanical, chemical including dissolving pulp, paper writing printing and wrapping, paper board and straw board, hard board including fibre board and chip board, paper for packaging including corrugated paper, kraft paper, paper bags, paper containers etc. newsprint.
38	Printing & publishing .. ..	Letter press and lithographic printing and book binding, other printing and including photography (maps, greeting cards, calendars, photo mounts etc.)
39	Leather & leather products .. ..	Tannery & leather finishing, hide leather products except footwear and other wearing apparel, fur products.
40	Leather footwear .. ..	Manufacture and repair of Leather footwear.
41	Rubber products .. ..	Rubber tyres and tubes for motor vehicles, tractors, craft, scooters, motor cycles and cycles, manufacture of rubber footwear. Rubber surgical and medical equipment including prophylactics, balloons, miscellaneous industrial and domestic goods.
42	Plastics .. ..	Synthetic resins and plastic materials, plastic products manufacture celluloid and its articles.
43	Petroleum products .. ..	Products of petroleum refineries.

## SECTOR CLASSIFICATION OF INPUT-OUTPUT TABLE—contd.

Sector No.	Name of Sector	Composition of Sectors
(0)	(1)	(2)
44	Misc. Coal & Petroleum products ..	.. Coke and other miscellaneous products of petroleum and coal.
45	Inorganic heavy chemicals ..	.. Inorganic heavy chemicals.
46	Organic heavy schemes ..	.. Organic heavy chemicals.
47	Chemical fertilizers ..	.. Inorganic organic and mixed fertilizers including manures.
48	Insecticides fungicides & pesticides ..	.. Insecticides, fungicides and weedicides
49	Drugs pharmaceuticals ..	.. Drugs and pharmaceuticals including drug intermediaries
50	Soaps and glycerines ..	.. Soaps and glycerine.
51	Cosmetics ..	.. Perfumes cosmetics and toilet preparations non-edible vegetable oils including solvent extracted oils
52	Synthetic rubber and man-made fibres ..	.. Man. made fibres including regenerated cellulose rayon, Nylon etc. and synthetic Rubber
53	Other chemicals ..	.. Paints, varnishes and lacquers, dye-stuffs including dye-stuffs intermediaries, turpentine and resin, matches, explosives including gun powder and safety fuses, fire works, fine chemicals glue and gelatine, lac including shellac. Waxes and polished textiles auxiliaries and other chemical products.
54	Refractories ..	.. Fire bricks, refractories furnace lining bricks etc. tiles
55	Cement ..	.. Cement (Hydraulic).
56	Other non-metallic mineral products ..	.. Glass-hollowware, glass wool, miscellaneous glassware, sheet and plate glass, laboratory glassware, optical glass, earthen ware and pottery, chinaware and pottery, sanitary ware and whiteware, insulators, mica products, stone dressing and crushing asbestos, cement, hume pipes and other cement and concrete products (including reinforced products) insulating boards grinding wheels and abrasives miscellaneous non-metallic mineral products (lime, asbestos, etc.) shale products.
57	Iron and steel ..	.. Iron and steel (metal), alloy and special steel and ferro alloys.
58	Castings and forgings ..	.. Iron and steel castings and forgings.
59	Iron & steel structures ..	.. Iron and steel structurals, iron and steel pipes.
60	Non-ferrous metals ..	.. Non-ferrous basic metals & alloys.
61	Metal products ..	.. Safes and vaults, metal containers and steel trunks, sanitary and plumbing fixtures and fittings of metal, stoves, hurricane, lanterns, welded products, enamelling japanning and acquering, galvanising, plating and polishing metal products, structural metal products, weights, other metal products, repair of general non-electric machinery, repair of miscellaneous enterprises, metal furniture and fixtures, hand tools and small tools, bolts, nuts, nails screws springs, chains etc. and other metal fittings for shoes, leather, wearing apparel etc. cutlery, locks, type founding, razor blades.
62	Tractors & agricultural implements ..	.. Tractors and other agricultural machinery, equipments and implements.
63	Machine tools ..	.. Machine tools.
64	Office, domestic & commercial equipments ..	.. Computing and accounting machines, calculating machines, typewriters and duplicators.
65	Other non-electrical machinery ..	.. Construction and earth moving machinery, prime movers, boilers and steam generating plants such as diesel engines. Rice, dal and flour mill machinery, oil mill machinery, sugar machinery, tea machinery, textile machinery (such as spinning frames, carding machines, powerlooms, etc. including textiles accessories) jute machinery, paper machinery, chemical machinery, mining machinery, cement machinery, refrigeration plants for industrial use, air conditioners and refrigerators, fire fighting equipment and appliances including fire engines, conveying equipment and bucket elevators, derricks etc. and size reduction equipment, centrifugal etc. air and gas compressors and vacuum pumps (excluding electrical furnaces) ball, roller and tapered bearings, speed and reduction units, weighing machines.

## SECTOR CLASSIFICATION OF INPUT-OUTPUT TABLE—contd.

Sector No.	Name of Sector	Composition of Sectors
(0)	(1)	(2)
65	Other non-electrical machinery—contd.	Miscellaneous non-electrical machinery, metallurgical machinery, filtration and distillation equipment, mixers and reactors, washing machines etc., sewing and knitting machines, arms and ammunition.
66	Electric motors .. ..	Electric motors.
67	Electric cables and wires .. ..	Electric cables and wires.
68	Batteries .. ..	Storage batteries, dry cells.
69	Electrical household goods .. ..	Electrical fans, electrical lamps, fluorescent tubes, miniature lamps etc., household appliances such as electrical irons, heaters etc.
70	Communication & electronic equipments .. ..	Wireless Communication apparatus, radio receivers including amplifying and public address equipments, telephone, telegraph equipment, electronic computer, control instruments, Components and accessories.
71	Other electrical machinery .. ..	Equipment for generation, transmission and distribution of electricity including transformers, miscellaneous electrical machinery including electrical furnaces, signalling equipment, lighting equipment and fittings, x-ray apparatus and tubes etc., electrical repair.
72	Ships and boats .. ..	Ships and other vessels drawn by power, boat building
73	Rail equipments .. ..	Railway locomotives, railway rolling stock
74	Motor Vehicles .. ..	Motor cars, buses, trucks, jeeps, automobile auxiliaries, other motor vehicles, repair of motor vehicles.
75	Motor cycles & bicycles .. ..	Motor cycles, scooters and bicycles and repair
76	Other transport equipment .. ..	Tramway works, aircraft, other transport equipment such as carts, trailers and other material hauling equipment.
77	Watches and clocks .. ..	Manufacture & repair of watches & clocks.
78	Miscellaneous manufacturing industries .. ..	Scientific instruments and surgical instruments, Mathematical surveying and drawings instruments, water, steam and electricity meters, indicating, recording and regulating devices for pressure, temperature, rate of flow, weights, levels etc., photographic and optical goods like lenses, camera, projectors, are lamps etc., jewellery, mints, games and sports goods, musical instruments, fountain pen, pen and pencil making, button making, broom and brushes, sign and advertising displays, toys bones, ivory, horns, hoofs, claws and similar products other manufacturing industries.
79	Construction .. ..	New construction and repair of residential buildings, factory establishments, roads, bridges, multi purpose power projects reclamation of land, bunding, other land improvement, digging of wells, development of other irrigation resources.
80	Electricity, gas and water supply .. ..	Generation, transmission and distribution of electricity, public lighting, manufacture and distribution of coal gas, water gas etc., collection, purification and distribution of water.
81	Railways .. ..	Government railways, private railways services incidental to this transport.
82	Other transport .. ..	Buses, tramways, trucks, taxis, autorickshaws, bullocks (buffalo), horses and other animal drawn carts, cycle, handpulled rickshaw and coolies, shipping, transport by boat, steamer, ferry etc. by canal of rivers and unorganised water transport by sea; air transport & services incidental to these transport.
83	Communications .. ..	Postal, telephones, telegraph services rendered by postal and telephone department and overseas communication services.
84	Trade, storage & warehouses .. ..	Warehousing, cold storage, other storage repositories, and safe deposits when such services are offered as independent service, wholesale and retail trade.
85	Banking and insurance .. ..	Commercial banks, banking department of RBI, other financial companies, industrial development and financial corporations, post office saving bank, cumulative deposit accounts, national saving certificates, cooperative credit societies, Life insurance corporation, postal life insurance and non-life insurance.

## SECTOR CLASSIFICATION OF INPUT-OUTPUT TABLE—contd.

Sector No	Name of Sector	Composition of Sectors
(0)	(1)	(2)
86	Real estate & ownership of dwellings	.. Activities of all types of dealers such as operators, developers and agents connected with real estate, residential houses.
87	Education	.. Education and research.
88	Medical health	.. Medical and health services.
89	Other services	.. Services rendered by hotels, boarding houses, eating houses, cafes, restaurants, canteens etc., religious, legal recreation and entertainment, domestic laundry, cleaning and dyeing, barbers and beauty shops and other personal services, sanitary services etc., wrapping, packing and filling of articles and repair of wooden furniture, public administration and defence.

Appendix 2

Commodity Description and SITC coding of the Commodities

Correspondence With IO Table

Sect No.	Industry Description	SITC Revision 1	SITC Revision 2
1	Rice	042	042
2	Wheat	041	041
3	Jowar	045	045.9903
4	Bajra	045	045.9902
	Barley	043	043
	Maize	044	044
5	Ragi	045	045.1
6	Pulses	051.2	051.2
7	Sugarcane	054.8202	054.8202
8	Jute	264	264
9	Cotton	263.1	263.1
	Rubber	231.1	232
10	Coffee Planta	071.1	071.11
	Chillies	075.1001	075.1001
	Cummin	075.2506+.2507	075.2506+.2507
	Turmeric	075.2	075.2806+.2807
11	Fruits/V	051+052	054+057
	WM Powder	022.3	022
12	Butter K	023	023
15	Fish	031.3	034.1
	Coal	321.4	322
	Coke	321.8	323.2
16	Lignite	321.3	322.3
17	Petroleum	33f	333
18	Iron Ore	281.3	281.5+281.6
	Lime Stone	273.2200	273.2200
	Rock Phosphate	271.3001	271.3
19	Dolomite	278.23	278.23
	Flour	046	046.01
	Canned Juice	053.55	058.5
	Biscuits		048.42
	Bread	048.4	048.4048.41
	Salt	276.3	276.3278.3
	Animal Food	081	081
	Maize Starch	048.8009	048.8009

20	Glucose Malted Food	061.9002 048.8	061.9002 048.8
21	Sugar	061.2	061.2
22	Gur Khandsari	061.1002 061.1	061.1002 061.1
23	Vanaspati	431.2	431.2
	Groundnut Oil	421.4	423.4
	Mustard Oil	421.7	423.9102
	Coconut Oil	422.3	424.3
	Kardi Oil	422.9019	424.9013
	Mahua oil	423	424.9011
24	Cotton Seed Oil	421.3	423.3
25	Tea	074.1	074.1
26	Wine Industry Soft Drinks	112.4	112 111.02
	Cigarette	122.2	122.2
	Bidi	122.1001	122.1001
27	Other Tobacco	121	122.3
28	Cotton Yarn Cotton Textiles	651.3+.4 652	651.3 652
30	Woollen Cloth	655.2	654.2+.3
31	Silk & Art Slk	653.1+.5	654.1
32	Jute Textiles	653.4	654.5
34	Other Textile	653.94	654.5
	Plywood	631.2	634
	Hard Board	641.61	641.61
	Particle Board	634.3203	634.3203
36	Wood Screws	694.0312	694.0312
37	Paper & Paper	641	641
39	TC & F Leather	611	611
40	Leather Footwea	851.01+.02	851.01+.02
41	Tyres and Tubes D	625	625.1+.2+.4 625.91
42	Rbr Bltg Hoses	629.4	628.2 621.05
	Kerosene	332.2	334.2
	Petrol	332.1	334.1
	HS Diesel Oil	332.3	334.3001

43	Aviation Spirit		334.11
	Furnance Oil	332.5	334.5
44	Bechive		335.3
	Soft Coke	321.8	335.42
	Caustic	513.6201+.6202+.3	522.52
	Soda Ash	514.2801to .2809	523.23
	Sulphuric Acid	513.3302	522.22
	Hydrochloric Ac	513.3102	522.2102
	Nitric Acid	513.3401+.3402+.3	522.23
	Calcium Carbide	514.9400	523.9300
	Sodium Hydroxid	514.2303	522.5200
	Bleaching Powdr	514.1301	523.1301
	Copper Sulphate	514.2404	523.1904
	Liquid Clorine	513.2100	522.1300
	Zinc Oxide	513.5101	522.4101
	Oxygen	513.1100	522.1105
	Hydrogen Peroxi	514.9200	523.9100
45	Sodium Bicarbon	514.2908	523.2408
	Formal Dehyde	512.4108	516.2108
	Acetylene	513.2701	522.1801
	Acetic Acid	512.5101	513.7101
46	Benzene	512.1202	511.2200
	Nitrogenous	561.1	562.1
	Phospht	561.2	562.2
47	Pottas	561.3	562.3
	Pesticide		591.1007
48	Insecticide	599.2	591.4
49	Bulk Drugs	541	541
	Soaps	554.1	554.1
50	Glycerine	512.2601+.2+.3	
	Linseed Oil	422.1	424.1
	Castor Oil	422.5	424.5
	Powder		553.0028
	Hair Oil	553.0005	553.0025
	Cream	553.0002+.3+.4	553.0022
	Essential Oils		551.3059
	Camphor	512.4307+.4308	
	Tooth Powder	553.0012	553.0032
	Tooth Paste	553.0014	553.0034
51	Flavouring Esse		553.0059
	Polyester Fibre	266.2102	651.45+651.46
	Polyethylene Mo		583.3
	Low Den		583.1
	PVC Compound	581.2012	
	Resin	581.9202	582.3101
	Poly. F.		266.62

52	Syn. Rub.	651.6	233.1
	Paints & Varnis	544	533.4
	Match Box Wimco	899.3201	899.3201
	Explosives	598	572.1
53	Fuses	571.2101to.2109	572.2
54	Refractories	662.3	662.3
55	Cement	661.2	661.2
	Sheet Glass	664	664.3001
	Tea Set		666.4
	Insulators	723.2101to.2151	773.23
	Sanitary Ware	812.2000	812.2
	AC Cement Prod.	661.8309	661.83
	RCC Hume Pipe	663.6201	663.3201
	Asbestos Brekl	661.83	661.8309
	Grinding Wheel	663.1112	663.1004+.1005
56	Coated Abrasive	663.2011	663.2002
	Pig Iron	681.01	671.2002
	Billet		672.5
	Ingots	681.03	672.4
	Bars & Rods	681.04	673.2
	Wire Rods		673.1
	Rails	681.08to.11	676.01
	Skelp	675.0101+.201+.301	675.0101
57	Corrugated Galv	674.8102	674.9105
58	Casting & Forg	679.1+.2+.3	679
59	Iron & Steel St	691.1	691.1
	Copper	682	682
	Aluminium	684	684
	Zinc	686	686
	Tin	687	687
	Lead	685	685
60	Nickel	683.1+.2	683
	Drums	692.2120	692.1102
	Tin Containers	692.2109	692.4
	Hurricane Lanter	812.4201	812.4201
	Oil Pressure Lp	812.4203	812.4203
	Files & Rasps	695.2231	695.33
	Twist Drills	695.2440	695.4127
	Bolts	694.2102	694.0202
	Carbide Tipped	695.2426+.2601	695.43
	Spanners	695.2211	695.3201
	Locks	698.1109	699.11
61	Furniture	692.1110	821.1102+.91
	Tractors	712.5	722
	Agr Powrh	712.1	721.1201



62	Spryr	719.6401	745.2701	
63	Machine Tools	719.5+729.9201	728.1+736.8+736.9+7	
64	Type Writers	714.1001	751.1	
	Computing M/C	714.2	751.23	
65	Boilers	711.1009to1019	711.1	
	Diesel Engine	711.51+.52+53	713.21+.22	
	ICE	711.5002 to .5046	713.1+.3+.8	
	Triple Cm	717.1102	724.43+.5111+.5119	
	Milling	718.3103	727.1102	
	Tea Machinery	719.8005	728.4806	
	Oil Mill M/C	719.8004	727.2101	
	Concrete Mixer	718.5103		
	B.S.125		728.3301	
	FDP	719.2	742.1+.2+.3	
	Ball Bear	719.7	749.11+.12	
	Compress	719.2201	743.1001	
	Referigerators	725.0101	775.2101	
	Sewing Machine	717.3010	724.21	
	66	Motor AC7.5 H.P	722.1201	716.2101
		AC 50 h.p	722.1202	716.2102
		Motr 100	722.1203+.1204	716.2103
67	Cable/Wires	723.1	773.1	
68	Batteries	729.11	778.1	
	Dry Cells	729.12	778.1102	
69	Ele Lamp	729.2101to.2409	778.2101 to .2902	
	Crompton	725.0303	775.7203	
	CR. Table	725.0304	775.7206	
	Bajaj	725.0305+.0306	775.7203	
	Panels		772.1015	
70	Radio Receivers	724.2002+3+9+11	762.2+.8	
	TV Receivers	724.1001+.1002	761	
	Motor	724.9		
71	Starters	722.2104+.2105+.6	772.1004 to .1006	
	Transformers	722.1301to.1319	771.1	
	Sw.Gears	722.2107to.2129	772.1	
	Oil Circuit Bre	722.2101+.2+.3	772.1001 to .1003	
73	Railway Equip	731.3		
	Railway Equip	732.2	791.1+.2+.3	
74	Cars	732.1	781.0001	
	Truck	732.3	782.1001	
	Bus	732.2	783.1	
	3 Wheel	732.9109	785.1001	
	Motor Cycle	732.9102	785.1002	

75	Bicycle	733.1101	785.2001
77	Watches & Clock	864.0+.1	
	Pen	930+931	885.1+.2
	Tooth Brush	982.2	895.2101
	Comb	982.51	899.7215
	House serv	982.65	899.8500
	Crushed Bones	291.1101to.1109	291.1101
78	Photo Films	862.4101+.4401+2+3882.2102+.2+883	

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 Note: The industry comprises of the the commodities listed till  
 the sector number. .

### Appendix 3

#### Physical Capital Intensity

The Physical intensity of Capital is defined as the amount of fixed capital per worker. We have taken two variants of the measure. The first measure of capital intensity we have used fixed capital per employee corrected for capacity utilization, while for the other measure we have not corrected the capital stock for capacity utilisation

$$PCI_i = [ FC_i / NE_i ] * [ (ND_i / 300) ]$$

Where

- PCI<sub>i</sub> = Physical Capital Intensity of the i<sup>th</sup> industry
- FC<sub>i</sub> = Stock of Fixed Capital in the i<sup>th</sup> industry
- NE<sub>i</sub> = Number of Employees in the i<sup>th</sup> industry
- ND<sub>i</sub> = Number of Days worked ( to correct for the capacity utilization by taking 300 days worked as the bench mark)

Since the data on fixed capital reported in the Annual Survey of industries is not appropriate, we have derived the capital series for all the industries and used that series ( see Aggarwal 1991). The data on the number of employees and the number of days worked have been taken from various issues of ASI.

#### Price Cost Margins

Price Cost Margins have been measured as following:

$$PCM = [ GVA - E ] / Q$$

Where

- GVA = Gross Value Added
- E = Total emoluments
- Q = Total Output

The data on all the variables have been derived from various issues of ASI.

#### Return on Capital Employed

This variable is to measure the Return on Investment (ROI) of different industries.

$$ROCE_i = [ P_i + I_i ] / CE$$

$P_i$  = Profits in  $i$ th industry  
 $I_i$  = Interest Cost in  $i$ th industry  
 $CE$  = Capital Employed

### Translog Index of Total Factor Productivity

Total Factor Productivity (TFP) measures as to how efficiently an industry has employed its resources. There are three different methods of measuring TFP depending on the assumption about the production function in the industry (see Goldar 1986 for details). Though we have calculated all the three indices i.e. Solow, Kendrick and Translog, we have used Translog index for this study as the other two indices are highly correlated while the correlation with Translog index is moderate. The method of calculation of the index is given below:

$$\Delta \log Y = V_k \log K + V_l \log L + V_t \quad (1)$$

Where

$$\Delta \log Y = \log Y_t - \log Y_{t-1}$$

$$\Delta \log K = \log K_t - \log K_{t-1}$$

$$\Delta \log L = \log L_t - \log L_{t-1}$$

$$V_k = 1/2[ V_k(T) + V_k(T-1) ]$$

$$V_l = 1/2[ V_l(T) + V_l(T-1) ]$$

Y = Gross Value Added at 1970-71 prices

K = Fixed Capital stock at 70-71 prices

L = Total Employees

$V_k$  = Share of capital in value added

$V_l$  = Share of Labour in value added

This expression for  $V_t$  in equation 1 is termed the average translog quantity index of technological change. The data for capital has been taken from Aggarwal (1991), while data for other variables have been taken from various issues of ASI. All the variables have been deflated by using single deflation method. In the absence of information we are not in a position to use double deflation method.

### Choice of Sample Industries

Selection of sample was done on the basis of an industry's importance in the manufacturing sector. All industries which produced more than .05% of total output of the manufacturing sector in 1980-81 were chosen. The total number of industries satisfying this criteria was 42.

All the variables used are averages for the two periods.