Technical Report

STRUCTURE OF DEMAND FOR INDIA'S EXPORTS OF SELECTED ENGINEERING GOODS: 1961-1971 (GLOBAL)

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T.R.No.76
July 1975

Indian Institute of Management
AHMEDABAD-15

No. 76

To

Chairman (Research)
IIMA

Technical Report

Title of the report ELASTICITIES OF DEMAND FOR INDIA'S EXPORTS OF SELECTED ENGINEERING GOODS : A GLOBAL

Name of the Author CHARAN D. WADHVA

Under which area do you like to be classified? ECONOMICS

ABSTRACT (within 250 words)

Engineering goods have been a very important dynamic element in the changing structure of India's exports during the last decade. In this research project, we have empirically estimated price and income elasticities of demand for our exports of 48 selected engineering goods to the world market as a whole. This analysis of demand for exports of 48 selected engineering goods from India during the period 1961-71 confirms the hypothesis that most of the engineering products hold a great potential for growth of exports in the coming years. This study would help the exporters and policy makers to understand the structure of demand for our exports of engineering goods and to formulate a strategy for the growth of such exports during the coming years.

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Date 23.6.1975

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STRUCTURE OF DEMAND FOR INDIA'S EXPORTS OF SELECTED ENGINEERING GOODS: 1961-1971*

The demand structure of India's fast growing exports of engineering goods in the recent years has been a little researched subject. The importance of such an analysis as an input for the policy makers in the formulation of an export strategy for these products can hardly be exaggerated.[1] To a considerable extent, the lack of research studies on the structure of export demand for these products is due to the problems of availability of comparable statistical data for a sufficiently long period of time. The general term "engineering goods" comprises of a very large number of hetrogenous goods. The problems are compounded by the fact that it is not easy to identify many relatively standardized engineering goods for which data on the quantity exported is available either in the original source for the national exports, namely, the Monthly Statistics of India's Foreign Trade or in the sources for international data on exports such as the publications of the United Nations. Furthermore, the available statistics do not capture the differences in quality of the product exported over time. An individual researcher analysing the structure of demand for the exports of the selected engineering industries has to work within these constraints.

In a recent paper, Sharma and Wadhva made an attempt to estimate the elasticities of demand for ten selected engineering goods exported by India during the period 1960-61 to 1970-71.[2] The data for this exercise was provided to the authors on their request by the Office of the Engineering Export Promotion Council (set up by the Govt. of India to assist exporters of engineering goods to promote their exports). The number of commodities covered in this exercise are obviously limited as they do not cover on an average more than 15% of the total annual exports of engineering goods from India. The purpose of this Paper is to extend the study of estimation of the demand structure of India's exports of engineering goods to as many commodities as possible using the statistical information compiled by this Council since its establishment in 1959.

The Engineering Export Promotion Council (hereafter called EEPC) has been publishing fairly detailed statistics of aggregate exports by all its membersin its Home Bulletin atleast since 1961. These statistics cover the exports of "engineering goods falling under the purview of the EEPC and relate both to their composition and direction.

The first phase of this study (the present report) covering the period 1961 to 1971 is concerned with the analysis of some of the aspects of the structure of demand for selected engineering goods exported by India to the world as a whole. In the second phase of this project the analysis will be extended to cover the structure of demand of exports of our selected

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*This is the Draft Report on Phase 1 of the work on the Research Project "Estimation of Elasticities of Demand for India's Exports of Slected Engineering Goods" sponsored by the Indian Institute of Management, Ahmedabad. The assistance provided by Messrs Akhilesh Kumar, R.B.Tiwari and P.K.Soman Nair in the collection and processing of statistical data is gratefully acknowledged.

[1] See for example, Mark Frankenna, 'Exports of Engineering Goods from India', Ph.D. Thesis, Massachusetts Institute of Technology, 1971.

[2] O.P.Sharma and C.D. Wadhva, "Some Empirical Evidence on India's Exports of Engineering Goods', Paper presented at the Indian Econometric Conference held at Ahmedabad in January 1973.

engineering goods in selected markets (countries).

The data provided by the EEPC can be regarded as fairly representative of total exports of the relevant commodity from India for a particular year since most exporters of the relevant commodity are members of this Council as it helps the exporters in receiving the benefits of the prevailing export assistance and promotion schemes of the Government of India.

Even so, there are certain problems in using the data provided by the EEPC for an econometric study of the structure of demand of India's exports of engineering goods since 1961. For one thing, the EEPC has been publishing annual statistics of exports of commodities covered by it on the calender year basis upto the year 1965 and on the basis of the financial year (April to March) since the year 1964-65. In splicing these two series to span the period 1961 to 1971 we have assumed that not much distortion will be created in the results of the study by treating the financial year as reflecting the export performance on the basis of the calendar year (for which 9 months are common in both) since it involves only once-for-all change in the statistical procedure for defining the "year" and the same procedure is carried throughout the rest of the period under consideration. Thus, we have taken data for calendar years 1961, 1962, 1963 and 1964 and beginning with the year 1965, started assuming that the data for the financial year 1964-65 is comparable with the calendar year 1964 and so on until the last year 1971 for which data of the financial year 1971-72 is taken. In this way, we have gathered the series of value of quantity of exports of the selected engineering goods for the period 1961 to 1971. Since this period involved the devaluation of the rupee in the middle of 1966, we have taken proper care to estimate the entire series of value of exports in terms of U.S. dollars. Thus, the series on the value of exports of selected engineering goods used by us for the analysis presented in this Paper is in terms of U.S. dollars.

The EEPC has published the data on exports of a wide variety of groupings of engineering goods during the period under consideration; however, data is not available for all the items during each of the years. This is so because every year (especially after the devaluation of the rupee in 1966), quite a few new commodities have been entering the export trade while some others have virtually disappeared. The share of most of the continuing items of exports in total exports of engineering goods has been changing from year-to-year. This phenomenon reflects the dynamic nature of international trade in commodities. However, it creates problems for us in terms of selection of engineering goods for time-series analysis of the structure of their demand in the world market(s). We have confined our slection of engineering products to those on-going products for which continuous data on quantity and value of exports is available in the publications of the EEPC during the period 1961 to 1971. Thus, at this stage, we have not considered those products which entered or dropped out during this period. This has been done to provide maximum possible degrees of freedom for empirical analysis of the structure of demand for exports of selected engineering products.

A further difficulty arises due to the fact that the exports of an engineering good as recorded by the EEPC when summed up over various destinations do not necessarily give comparable aggregate quantum of exports for the aggregate value of exports. This discrepancy arises because value figures for exports of the relevant commodity are recorded for all destinations where such values are positive numbers but quantity figures are not recorded for all destinations even when value figure for the destination in question is recorded in the body of the table. Thus, in the coverage of the value of exports of commodities, we have restricted ourselves to the summation of exports to such destinations for which both quantity data and value data are simultaneously available. This has naturally reduced the coverage of the value of total exports of engineering goods covered by us. Thus the coverage of exports by value in terms of our selected products has been in the range of 40 to 60 per cent of our total annual exports of such goods from the country during the period under consideration.

Considering all these factors, we have selected the following 48 engineering goods for our analysis:

1. Aluminium utensils
2. Aluminium capsules
3. Aluminium foils
4. Aluminium sheets, circles and strips
5. Brass utensils
6. Brass sheets, circles and strips
7. Copper utensils
8. Copper sheets, circles etc.
9. E.P.N.S. Ware
10. Bolts and Nuts
11. C.I. Manhole covers
12. C.I. Pans
13. C.I. Pipes and fittings
14. C.I. Valves
15. Crown Corks
16. G.I. Buckets
17. G.I. Drums and Barrals
18. Hurricane Lantern
19. Iron Anchors
20. Iron cylinders
21. Iron nails
22. Pulleys
23. Railway track material
24. Razor blades
25. Rivets and washers
26. Stainless steel utensils
27. M.S. Pipes and tubes
28. Steel tanks - pressed.
29. Steel trunks
30. Tin plate containers
31. Transmission line towers
32. Wire nails, needle and pins
33. Wire nettings
34. Electrodes
35. Water fittings
36. Cameras (and parts)
37. Flash lights (and parts)
38. Umbrella - complete
39. Diesel engines
40. Borehole turbine pumps
41. Centrifugal pumps
42. Airconditioners (and parts)
43. Typewriters (and parts)
44. Dry batteries
45. Electric fans
46. Electric lamps and bulbs
47. Radios (and parts)
48. Bicycle - complete

An integral part of our analysis of the structure of demand for India's exports of these selected products has been the estimation of elasticities of demand for these products during the period 1961 to 1971. Here again, we faced severe data problems for the estimation of the demand function in a rigorous fashion. Some of these problems and the solutions we devised to get over these problems are mentioned below.

For reasons of availability of statistical data, we have confined our analysis of the elasticities of demand for selected exports of engineering goods from India to the concepts of the income elasticity of demand and the price elasticity of demand. In estimating the demand function, we have considered only the income and the price factors as the independent variables.

Since no estimates of offer prices and international market prices are available for the products selected by us, we have computed the absolute average 'Unit Value' realized over a year using the data on Value and quantity of exports of the particular product provided in the publications of the EEPC. We have used this 'Unit Value' as an indicator of the "price" of the "commodity" in question in our analysis of the structure of demand for our exports of selected engineering goods.

Last but not the least, we have used the United Nations Index numbers of World Gross Domestic Product (G.D.P.) as the indicator of the level of World income for analysing the structure of global demand for exports of selected engineering goods from India. The cut-off period of this study at 1971 has been dictated by the non-availability at present of the index number of World G.D.P. beyond the year 1971.

Having explained some of the design problems of our approach to this study we can directly go to the salient features of the analysis of the pattern of growth and structure of demand of selected engineering products exported from India for the period under consideration (1961 to 1971).

Trend Rate of Growth of Value of Exports of Selected Products

For analysing the trend rate of growth of value of exports of selected products during the period 1961-71, we have fitted an exponential function of the form

$$V_{xt} = a\ e^{bt} \qquad \ldots\ldots \quad (1)$$

where V_{xt} = Value of exports of a particular item at time (year) t;

Thus, $\log_e V_{xt} = \log_e a + bt$

where b indicates the exponential trend rate of growth per unit of value of exports. The results of this exercise are presented in Table 1 in the Appendix. The last column of this Table provides the per cent per annum trend rate of growth.

A look at Table 1 shows that a trend rate of growth is discernible for most of the selected products. Using a two-tail test for the coefficients of the b parameter, we see that the trend rate of growth is significant at 10 per cent level of significance for 37 products. Most of the products have shown a tremendously high (positive) trend rate of growth during this period ranging from the highest level of 793.9 per cent in the case of Iron anchors (product No.19) to the lowest level of (which is still as high as) 12.9 per cent in the case of Railway Track Material (product No.23). It must be mentioned here that such high trend rates of growth for most products have been possible during the period 1961-71 due to the fact that we started out from a very low base level of exports of most of these products in the year 1961. It is noteworthy that Electric Lamps and Bulbs (product No.46) achieved a significant negative trend rate of growth of -17.0 per cent per annum during this period. This perhaps reflects our product becoming highly uncompetitive

(price-wise) in the international markets.

It would be of interest to find out whether the high positive trend rates of growth in the value of exports of most of the selected engineering products noticed in Table 1 are due to a trend rate of growth in the quantum of their exports or simply due to a rising trend of unit value (price per unit) realized or a combination of both factors. For this purpose, we analyse the trend rate of growth of quantum and price (unit value) for our selected products for the period under consideration.

Trend Rate of Growth of Quantum of Exports of Selected Products

We have fitted a function of the following form to compute the exponential trend rate of growth of quantum of exports of selected products:

$$\log_e Q_{xt} = \log_e A + Bt \qquad \ldots\ldots (2)$$

where Q_{xt} = Quantum of Exports of a particular product in year t

B = Trend rate of growth of quantum of exports per unit per year for the product under consideration

t = time (year)

The results of this exercise are catalogued in Table 2 in the Appendix. The last column of this table gives the trend rate of growth of quantum of exports for the various products in terms of per cent per annum rate of growth.

By looking at the results presented in Table 2 we find that the trend rate of growth of quantum of exports is indeed significant for 37 out of 48 engineering products covered by us. In judging the significance of the coefficients of parameter B (reflecting the trend rate of growth per unit per annum), we have again used the two-tail test and a cut off at a 10 per cent level of significance.

Out of these 37 cases where the B coefficient is significant as mentioned above, 35 cases relate to the positive rates of growth varying from 132.1 per cent per annum in the case of Aluminium Utensils (product number 1) to 9.6 per cent per annum in the case of Electrodes (product number 34). Thus, we notice that exports of most of the engineering goods selected by us did experience a trend rate of growth in real terms (quantum). These engineering goods have indeed been a very dynamic and fast growing sector of our export trade during the period under consideration. However, it needs to be stated here again that these high trend rates of growth have been achieved during this period for most of these products due to starting with a quite low base level of exports in 1961.

The remaining 2 cases where the B coefficient is significant relate to the products experiencing negative trend rate of growth during the period under consideration. These products are: Typewriters (-23.1 per cent per annum) and Electric Lamps and Bulbs (-20.1 per cent

per annum). Perhaps, these negative rates of growth in the quantum of exports of these two products reflect our uncompetitive position in the world markets or a deliberate shift in the composition of exports of our engineering products away from consumer-oriented products using relatively low level of technology.

Trend Rate of Growth in the Price (Unit Value) of Exports of Selected Products

We have fitted the following algebraic function for estimating the (exponential) trend rate of growth of price (unit value) of exports of our list of engineering products for the period under consideration:

$$\log_e P_{xt} = \log_e A' + B't \qquad \ldots\ldots \quad (3)$$

where P_{xt} = Price (unit value realized) of exports of a particular product in year t

B' = Trend rate of growth of price (unit value) of the particular product exported

t = time (year)

We present the results of this exercise in Table 3 in the Appendix. The trend rate of growth of price (unit value realized) in terms of per cent per annum rate is listed in the last column of this Table.

We can see from Table 3 that the trend rate of growth of unit value is significant for only 15 products out of which the rates are positive for 9 products and negative for the remaining 6 products. For the products for which the trend rate of growth of unit value is positive and significant, the range is from 31.1 per cent per annum for M.S. Pipes and Tubes (product number 27) to 3.8 per cent per annum for diesel engines (product number 39). For those products for which such a rate of growth is negative range from -82.7 per cent per annum in the case of Wire Nettings to -3.0 per cent per annum in the case of iron anchors. The high rate of growth of quantum of exports for such items as noticed in Table 2 may be due to the lower and lower prices of these products as reflected in the negative trend rate of growth in unit value realized.

ELASTICITIES OF DEMAND FOR EXPORTS OF SELECTED ENGINEERING PRODUCTS

In order to compute the income and price elasticities of demand for exports of selected engineering goods, as mentioned earlier, we tried to estimate the demand function for each of the selected products in the following functional form:

$$Q_x = f(Y_w, P_x)$$

where Q_x = Quantity demanded of the product in the global market;

Y_w = Index number of World Income (G.D.P.) with 1963 as the base year; and

P_x = Price (Average Unit Value) of the product realized by us in the global market.

We tried both the linear version and the log linear (double log) version of the multiple regression model. The log linear form gave better results for most of the selected products during the period 1961-71. Thus, we accepted the log linear demand function of the form:

$$\log Q_x = \log a' + b' \log Y_w + c' \log P_x \quad \ldots\ (4)$$

As is well known, in this form (equation 4), the parameters b' and c' themselves serve as the estimates of income elasticity of demand and price elasticity of demand for the product in question.

The results of this exercise for our 48 products are presented in Table 4 in the Appendix. Even though we have considered only two independent variables, namely Y_w and P_x (in absolute form), the demand function estimated by us has given fairly satisfactory fit (in terms of a reasonable high value of R^2) for a number of commodities as can be seen from Table 4.

Income Elasticity of Demand

By looking at the results presented in Table 4, we find that the income elasticity of demand (as given by the b' coefficients) is statistically significant at 10 per cent level of confidence for 37 products. The income elasticity of demand is positive and greater than unity for 36 out of these 37 products. In fact, the demand for most of these products is very highly elastic with respect to the level of world income. Thus the income elasticity of demand is higher than 2.0 for as many as 35 out of 36 products for which it is statistically significant as mentioned above. Among these 36 products, the highest magnitude of income elasticity of demand is found for Cast Iron (C.R.) Valves as being 17.011 and the lowest for Iron Cylinders bing 1.176. Thus, we conclude that the demand for most of the engineering goods covered by us in this study have been highly income elastic during the period under consideration. This confirms the general belief drawn from the experience of the developed countries that the demand for engineering goods in general is highly income elastic. It is gratifying to note that the income-elasticity of demand as computed by us has been much higher than unity for many of the products under consideration.

One of the curious results of this exercise tabulated in Table 4 is that the income elasticity of demand for our exports of electric lamps and bulbs is negative (-3.730) and is statistically significant at 5 per cent level. This could be due to the fact that the electric lamps and bulbs exported by us are regarded by the foreign buyers as an "inferior" product. This reasoning could further explain the significant declining trend in the quantum of exports of this group as seen by us in Table 2. Thus as the world incomes rise, the consumers shift away from our electric bulbs and lamps either into superior types of electric bulbs and lamps exported by our competitors in the world markets or they switch to other forms of lighting equipment such as fluorescent tubes.

Price Elasticity of Demand

The computed price elasticities of demand for the 48 products covered by this study for the period 1961 to 1971 can be seen from the estimates of coefficients of C' in Table 4.

As may be seen from Table 4, the price elasticity of demand is found to be significant (at 10 per cent level) for only 20 out of 48 products. Out of these 20 products, the price elasticity of demand is negative (as expected a priori in terms of the law of demand) for 18 products. For most of these 18 products (to be exact, for 15 products), demand is price elastic (elasticity being greater than unity). The highest magnitude of price elasticity of demand has been computed for umbrellas at -5.318. Among the products for which the demand has been found to be price inelastic (in terms of the computed price elasticity of demand being less than unity) are: Bolts and Nuts (-0.229); Wire nails, needles and pins (-0.713) and Wire Nettings (-0.849). All these three results are statistically significant. Thus if the nature of these three product groups is any guide, demand is likely to be price-inelastic only for such products which are very cheap (price-wise) and require least sophisticated technology.

Finally, a look at the computed price-elasticities of demand which are statistically significant as classified in Table 4 shows that we have obtained a wrong sign of this elasticity (compared to a priori expectations) for two of our products, namely, Aluminium Utensils (the elasticity being 8.741) and Iron cylinders (the elasticity being 0.963). It is difficult to explain this behaviour of computed price elasticity of demand without further examination of the nature of the demand function for these products.

Conclusion

The analysis of the structure of demand for exports of 48 selected engineering goods from India during the period 1961-71 confirms the hypothesis that most of the engineering products hold a great potential for growth in the coming years if the trends observed in the past continue to operate in the near future. Even the partial analysis of the income elasticity and price elasticity of demand validate the hypothesis that the world income level and the price of the products in question jointly influence the exports of most of the engineering products covered in this study. Perhaps this conclusion can be extended

to the general category of exports of India's engineering goods. It is also evident from the results of this paper that the world income level is a far more important variable influencing the growth of exports of most of our engineering products.than the price variable, though the price variable is quite significant for some of those products. If the results of our exercise have any validity, it would be worthwhile investigating the advisability of concentrating our efforts of export promotion of engineering goods to those products which are identified as highly income elastic and at the same time highly price elastic.

Before closing, it would be worthwhile mentioning the limitations of the above exercise before drawing policy conclusions from our findings. Apart from the constraints imposed by the availability of statistical data which are responsible for the design of the research effort made in this study,the methodology adopted in terms of the estimation of partial elasticities of demand with respect to income and price variables using single equation linear regression model has well known limitations in presenting unbiased estimates of such elasticities. We would require a very complicated and extensive simultaneous equation model for explaining the structure of demand and supply of exports of our engineering goods to present better estimates of the relevant elasticities. This, however, is a very difficult task and the state of art has not progressed to such an extent that it would be possible to formulate a comprehensive simultaneous equation model acceptable to most econometricians. Under the circumstances, it would be necessary in the interests of better decision making to continuously update the estimates of elasticities using the methodology adopted in this study by improving the existing model and supplementing it with the judgement of marketing experts based on other relevant information not considered in our model.

TABLE 1

Trend Rate of Growth of Value (in US $) of Exports of Selected Engineering Goods 1961 to 1971-72

$\log_e V_{xt} = \log_e a + bt$

	Items	Constant term $\log_e a$	Coefficient of time b	t-statistics	R^2	Trend rate of growth (percent per annum)
1		2	3	4	5	6
1	Aluminium utensils	4.515	0.304*	2.561	0.4216	30.4
2	Aluminium capsules	0.809	0.336*	2.318	0.3738	33.6
3	Aluminium foils	-0.658	0.787*	5.621	0.7783	78.7
4	Aluminium sheets, circles and strips	1.683	0.500*	3.507	0.5774	50.0
5	Brass utensils	2.707	0.400*	4.550	0.697	40.0
6	Brass sheets, circle and strips	4.509	0.246*	3.890	0.6271	24.6
7	Copper Utensils	1.784	0.198*	2.882	0.4799	19.8
8	Copper sheets, circles etc.	4.552	-2.031*	-0.288	9.1265	-203.1
9	E.P.N.S. Ware	3.079	-0.440*	6.472	0.8231	-44.0
10	Bolts and Nuts	3.614	0.330*	9.470	0.9088	33.0
11	C.I. Manhole covers	4.898	0.208*	5.497	0.7705	20.8
12	C.I. Pans	1.082	6.095	0.394	1.6998	609.5
13	C.I. Pipes & fittings	5.220	0.266*	5.070	0.7407	26.6
14	C.I. Valves	-2.705	0.871*	8.136	0.8803	87.1
15	Crown corks	4.772	8.267	1.183	0.1346	826.7
16	G.I. Buckets	4.255	0.091	1.498	0.1996	9.1
17	G.I. Drums & Barrels	1.590	0.265*	2.539	0.4174	26.5
18	Hurricane lantern	0.389	0.308*	2.620	0.4326	30.8
19	Iron anchors	1.328	7.939*	2.394	0.3890	793.9
20	Iron Cylinders	3.868	6.181	1.334	0.1651	618.1
21	Iron nails	2.824	7.117	1.658	0.2340	711.7
22	Pulleys	0.347	0.251*	2.587	0.4264	25.1
23	Rly.Track Material	5.715	0.129**	2.077	0.3239	12.9
24	Razor Blades	4.559	8.763	0.944	9.0106	876.3
25	Rivets and Washers	5.993	0.551*	4.852	0.7234	55.1
26	Stainless Steel Utensils	4.133	0.270*	2.323	0.3749	27.0
27	M.S. Pipes & Tubes	5.326	0.495*	5.831	0.7907	49.5
28	Steel Tanks Pressed	3.931	9.080	0.927	8.7176	908.0
29	Steel Trunks	3.831	0.304**	2.170	0.3435	30.4
30	Tin Plate Containers	2.415	0.437*	2.509	0.4116	43.7
31	Transline Towers	4.692	0.380*	4.581	0.6999	38.0
32	Wire Nails, needle and Pins	-0.662	0.699*	7.237	0.8533	69.9
33	Wire nettings	1.205	0.498*	4.026	0.6430	49.8
34	Electrodes	1.229	0.529*	4.357	0.6784	52.9
35	Water fittings	1.299	0.605*	7.022	0.8457	60.5
36	Cameras and Parts	0.280	0.300**	1.971	0.3016	30.0
37	Flash lights and parts	2.398	0.253*	2.336	0.3775	25.3
38	Umbrella - complete	4.695	7.899	0.647	0.0445	789.9
39	Diesel Engines	6.244	0.174*	4.008	0.6409	17.4
40	Borehole Turbine Pumps	2.152	0.360*	2.363	0.3828	36.0

1		2	3	4	5	6
41	Centrifugal Pumps	2.615	0.395*	5.647	0.7799	39.5
42	Airconditioners & parts	0.665	-0.290*	-1.432	0.3965	29.0
43	Typewriters and parts	4.036	-0.164	-1.554	0.2116	-16.4
44	Dry Batteries	4.251	0.196	1.028	0.1050	19.6
45	Electric fans	7.134	6.889*	3.137	0.5224	688.9
46	Electric lamps and bulbs	4.180	-0.170**	-2.059	0.3203	-17.0
47	Radios & Parts	0.845	0.375*	3.503	0.5769	37.5
48	Bicycle - complete	4.842	0.311*	7.726	0.057	31.1

*Significant at 5% level
**Significant at 10% level

TABLE 2

Trend Rate of Growth of Quantum of Exports of Selected Engineering Goods: 1961 to 1971-72

$$\log_e Q_{xt} = \log_e A + Bt$$

Item	Constant term $\log_e A$	Coefficient of time B	t-statistics	R^2	Trend rate of growth (Per cent per annum)
1	2	3	4	5	6
1 Aluminium utensils	4.361	0.287*	2.566	0.4224	28.7
2 Aluminium capsules	-0.951	0.401*	2.665	0.4410	40.1
3 Aluminium foils	-1.083	0.833*	5.949	0.7973	83.3
4 Aluminium sheets, circles & strips	0.899	0.620*	3.497	0.5760	62.0
5 Brass utensils	2.220	0.344*	3.948	0.6339	34.4
6 Brass sheets, circles & strips	4.834	0.197*	2.896	0.4946	19.7
7 Copper utensils	1.317	0.161*	2.399	0.3901	16.1
8 Copper sheets, circles etc.	5.221	-0.140	1.808	0.2664	-14.0
9 E.P.N.S. Ware	1.958	0.375*	5.945	0.7970	37.5
10 Bolts and Nuts	4.921	0.338*	7.892	0.8738	33.8
11 C.I. Manhole covers	2.967	-0.053	0.189	0.0039	-5.3
12 C.I. Pans	3.215	-0.023	0.182	0.0037	-2.3
13 C.I. Pipes & fittings	1.374	0.182*	5.086	0.7418	18.2
14 C.I. Valves	-0.488	0.721*	5.073	0.7409	72.1
15 Crown Corks	5.314	0.123	1.599	0.2213	12.3
16 G.I. Buckets	5.892	0.092	1.381	0.1749	9.2
17 G.I. Drums & Barrels	1.891	0.327*	3.346	0.5544	32.7
18 Hurricane Lantern	1.417	0.291*	2.516	0.4129	29.1
19 Iron Anchors	2.740	0.104*	3.464	0.5714	10.4
20 Iron Cylinders	4.564	0.050	1.302	0.1585	5.0
21 Iron nails	4.034	0.104*	2.619	0.433	10.4
22 Pulleys	1.008	0.293*	3.016	0.5027	29.3
23 Rly. Track material	0.692	0.113*	1.885	0.2831	11.3
24 Razor blades	6.023	0.098	1.178	0.1335	9.8
25 Rivets and Washers	0.761	0.681*	3.986	0.6386	68.1
26 Stainless Steel Utensils	3.149	0.296*	2.276	0.3652	29.6
27 M.S.Pipes & tubes	3.310	0.242	1.706	0.2446	24.2
28 Steel Tanks Pressed	-1.639	0.095	0.873	0.0780	9.5
29 Steel Trunks	3.209	0.2642**	4.867	0.2791	26.4
30 Tin plate containers	2.357	0.502*	2.448	0.3996	50.2
31 Transmission Line Towers	-0.595	0.389*	4.317	0.6744	38.9
32 Wire nails, needle & Pins	-0.497	0.759*	6.809	0.8374	75.9
33 Wire nettings	-3.426	1.321*	6.081	0.8042	132.1
34 Electrodes	2.355	0.556*	4.918	0.7288	55.6
36 Water fittings	2.015	0.500*	7.260	0.8542	50.0

1	2	3	4	5	6
36 Cameras and Parts	-0.102	0.306**	2.084	0.3255	30.6
37 Flash lights and Parts	3.480	0.325*	3.603	0.5905	32.5
38 Umbrella - complete	5.076	0.185	0.739	0.0572	10.5
39 Diesel Engines	0.616	0.136*	2.866	0.4772	13.6
40 Borehole Turbine Pumps	-4.969	0.425*	2.752	0.4570	42.5
41 Centrifingal Pumps	-1.451	0.441*	5.627	0.7787	44.1
42 Airconditioners & Parts	-4.887	0.359*	3.417	0.5648	35.9
43 Typewriters & Parts	0.245	-0.231**	1.842	0.2739	-23.1
44 Dry Batteries	5.402	0.131	0.578	0.0358	13.1
45 Electric Fans	5.329	0.096*	3.649	0.5967	9.6
46 Electric Lamps & Bulbs	6.105	-0.201*	4.072	0.6482	-20.1
47 Radios & Parts	-2.885	0.543*	5.249	0.7538	54.3
48 Bicycle - complete	2.606	0.280	11.128	0.9322	28.0

*Significant at 5% level
**Significant at 10% level

TABLE 3

Trend Rate of Growth of Unit Value (Price) of Exports of Engineering Goods: 1961- 1971-73

$$\log_e P_{xt} = \log_e A' + B't$$

	Items	Constant term $\log_e A'$	Coefficient of time B'	t-statistics	R^2	Trend rate of growth (Per cent per annum)
1	Aluminium utensils	0.190	0.015	1.552	0.2112	1.5
2	Aluminium capsules	1.791	-0.069	1.522	0.2048	-6.9
3	Aluminium foils	0.424	-0.046*	2.447	0.3995	-4.6
4	Aluminium sheets, circles & strips	0.783	-0.121	1.522	0.2046	-12.1
5	Brass utensils	0.485	0.056*	7.225	0.8529	5.6
6	Brass sheets, circles & strips	-0.327	0.048*	4.424	0.6850	4.8
7	Copper utensils	0.466	0.037	1.771	0.2585	3.7
8	Copper sheets, circles etc.	-0.672	0.120*	4.138	0.6555	12.0
9	E.P.N.S. Ware	1.120	0.065*	4.982	0.7339	6.5
10	Bolts & Nuts	-1.306	-0.010	0.271	0.0081	-1.0
11	C.I. Manhole covers	1.920	0.262	1.009	0.1018	26.2
12	C.I. Pans	-2.177	0.087	1.239	0.1456	8.7
13	C.I. Pipes & Fittings	3.846	0.089	1.620	0.2257	8.9
14	C.I. Valves	-2.244	0.152*	1.972	0.3018	15.2
15	Crown Corks	-0.718	-0.019	1.481	0.1959	-1.9
16	G.I. Buckets	-1.546	-0.015	0.545	0.0319	-1.5
17	G.I. Drums & Barrels	-0.289	-0.065	1.813	0.2676	-6.5
18	Hurricane Lantern	-1.032	0.016	0.426	0.0198	1.6
19	Iron Anchors	-1.401	-0.030*	2.440	0.3982	-3.0
20	Iron Cylinders	-0.698	0.011	0.645	0.0442	1.1
21	Iron nails	-1.199	-0.036*	3.573	0.5865	-3.6
22	Pulleys	-0.658	-0.044	1.460	0.1914	-4.4
23	Rly. Track Material	5.022	0.016	0.840	0.0727	1.6
24	Razor Blades	-1.465	-0.013	0.386	0.0163	-1.3
25	Rivets and Washers	-0.693	-0.134	1.636	0.2292	-13.4
26	Stainless Steel & Utensils	0.984	-0.026	1.376	0.1779	-2.6
27	M.S. Pipes & Tubes	0.046	0.311**	2.255	0.3610	31.1
28	Steel Tanks Pressed	5.458	0.041	1.039	0.1072	4.1
29	Steel Trunks	0.625	0.039*	2.486	0.4071	3.9
30	Tin Plate Containers	0.043	-0.063	0.733	0.0563	-6.3
31	Transmissionline Towers	4.707	0.610	0.808	0.0677	61.0
32	Wire nails, needle & Pins	-0.157	-0.063	0.733	0.0563	-6.3
33	Wire nettings	4.634	-0.827*	3.984	0.6382	-82.7
34	Electrodes	-1.123	-0.028	1.113	0.1210	-2.8
35	Water fittings	-0.720	0.105*	2.801	0.4657	10.5

36 Cameras & Parts	0.386	0.007	0.115	0.0015	-0.7
37 Flash lights & Parts	-1.069	-0.075	1.594	0.2202	-7.5
38 Umbrella - complete	-0.383	-0.026	1.134	0.1250	-2.6
39 Diesel Engine	5.627	0.038*	2.307	0.3716	3.8
40 Borehole Turbine Pumps	7.121	-0.065	1.160	0.1300	-6.5
41 Centrifugal Pumps	4.067	-0.046	1.101	0.1186	-4.6
42 Airconditioners & Parts	5.552	-0.070	1.156	0.1293	-7.0
43 Typewriters & Parts	3.786	0.067	1.343	0.1669	6.7
44 Dry Batteries	-1.148	0.063	1.307	0.1596	6.3
45 Electric Fans	2.804	-0.028*	3.892	0.6272	-2.8
46 Electric Lamps & Bulbs	-1.944	0.030	0.755	0.0225	3.0
47 Radios & Parts	3.835	-0.147*	3.570	0.5861	-14.7
48 Bicycle - complete	2.445	0.044	0.993	0.0988	4.4

* Significant at 5% level
**Significant at 10% level

TABLE 4

Income and Price Elasticities of Selected Engineering Exports 1961 to 1971-72

$$\log Q_x = \log a' + b' \log Y_w + c' \log P_x$$

	Item	Constant term $\log_e a'$	Income elasticity b'	t-statistics	Price elasticity c'	t-statistics	R^2
1	Aluminium utensils	-10.464	2.925**	1.828	8.471*	3.248	0.7567
2	Aluminium capsules	-27.966	6.337*	1.996	-0.867	0.767	0.4846
3	Aluminium foils	-67.978	14.900*	4.368	-0.649	0.258	0.8072
4	Aluminium sheets, circles & strips	-36.443	8.516*	2.813	-1.352*	2.208	0.7465
5	Brass Utensils	-25.594	6.150	1.336	0.206	0.050	0.6375
6	Brass sheets, circles & strips	-22.299	5.842*	2.709	-2.469	1.233	0.5727
7	Copper utensils	-12.794	3.153*	2.101	-0.225	0.200	0.4009
8	Copper sheets, circles etc.	5.035	-0.125	0.052	-1.117	1.276	0.3954
9	E.P.N.S. Ware	-22.397	5.014*	2.211	1.578	0.969	0.8087
10	Bolts and Nuts	-87.462	7.007*	15.210	-0.229*	4.341	0.9670
11	C.I.Manhole covers	-14.429	4.319*	7.569	-1.085*	28.054	0.9905
12	C.I. Pans	7.629	-0.023	0.309	0.345	0.547	0.0574
13	C.I. Pipes & Fittings	-14.403	3.675*	4.932	-0.184	0.856	0.7702
14	C.I. Valves	-00.030	17.011*	7.510	-1.270*	2.053	0.8802
15	Crown Corks	-0.812	0.502	0.573	-4.804*	3.752	0.7233
16	G.I. Buckets	-2.270	1.521	1.229	-0.835	1.043	0.2090
17	G.I. Drums & Barrels	-25.402	6.077*	2.710	0.041	0.042	0.5528
18	Hurricane Lantern	-23.822	5.522*	2.451	-0.329	0.314	0.4289
19	Iron Anchors	-6.005	1.951*	2.592	0.035	0.041	0.5750
20	Iron Cylinders	-0.141	1.176*	1.913	0.963*	1.990	0.4554
21	Iron nails	-4.635	2.150*	1.716	0.842	0.583	0.3502
22	Pulleys	-21.828	4.990*	2.409	-0.527	0.476	0.5159
23	Rly. Track Material	-0.125	2.102**	1.699	-0.126	0.100	0.2735
24	Razor Blades	-1.965	1.1881	1.140	0.332	0.373	0.1457
25	Rivets and Washers	-37.963	8.343*	3.623	-1.664*	3.742	0.8711
26	Stainless Steel Utensils	-22.026	5.824*	2.506	-1.216	1.295	0.4775
27	M.S.Pipes & Tubes	-21.461	7.627*	3.705	-2.391**	1.670	0.8309
28	Steel Tanks Pressed	0.709	1.565	0.915	-3.141*	2.080	0.4066
29	Steel Trunks	-22.649	5.912**	1.694	-1.301	0.422	0.3074
30	Tin Plate Containers	-13.407	3.544**	1.630	-4.890*	5.274	0.8697

31 Transline Towers	-19.973	6.810*	4.433	-2.135**	1.575	0.7620
32 Wire nails, needle and pins	-60.257	13.232*	7.199	-0.713*	1.092	0.0907
33 Wire nettings	-50.761	11.379*	2.773	-0.049	3,952	0.9305
34 Electrodes	-40.337	9.155*	3.716	-1.307*	2.065	0.6000
35 Water fittings	-36.654	0.631*	4.049	0.331	0.526	0.0707
36 Cameras and Parts	-24.666	5.404*	1.901	-0.297	0.359	0.3225
37 Flash lights and parts	-25.937	6.605*	3.440	0.367	0.564	0.6242
38 Umbrella - complete	6.146	-0.608	0.473	-5.318*	5.053	0.7763
39 Diesel Engines	-0.057	3.390*	3.265	-1.176	1.319	0.5072
40 Borehole Turbine Pumps	-33.539	7.192*	2.249	-0.539	0.561	0.4024
41 Centrifugal pumps	-32.368	7.559*	5.400	-0.779	1.301	0.0403
42 Airconditioners & Parts	-34.070	6.603*	3.063	-0.027	0.045	0.5000
43 Typewriters and Parts	16.750	-2.471	1.119	-1.421*	1.961	0.5002
44 Dry Batteries	-28.957	6.677*	2.236	-3.737*	3.620	0.6342
45 Electric Fans	9.332	0.403	0.793	-2.562*	2.716	0.0007
46 Electric Lamps & Bulbs	22.929	-3.730*	3.866	0.004	0.015	0.6570
47 Radios & Parts	-14.552	4.206**	1.406	-1.970*	2.349	0.7039
48 Bicycle - complete	-11.673	3.040*	1.901	0.364	0.716	0.3315

*Significant at 5% level
**Significant at 10% level