

Export Performance of Selected Engineering Goods Industries in India from 1975-76 to 1990-91

**By
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**A Thesis Submitted to the Avinashilingam Institute for
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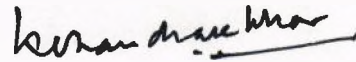
**In partial fulfilment of the requirements for the Degree of
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CERTIFICATE

This is to Certify that Dissertation entitled “**Export Performance of the Selected Engineering Goods Industries in India From 1975-76 to 1990-91**” submitted to the **Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore** in partial fulfillment of requirements for the award of the degree of Doctor of Philosophy in Economics is a record of original research work done by **Mrs. V. RAJAM**, Lecturer (Selection Grade), Department of Economics, Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore under my supervision and guidance and the Dissertation has not formed the basis for the award of any Degree/Diploma/Associateship/Fellowship or Similar title to any candidate of any other University or Institute.

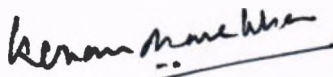
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DECLARATION

I hereby declare that the matter embodied in the thesis entitled **“Export Performance of the Selected Engineering Goods Industries in India From 1975-76 to 1990-91”** is the result of investigation carried out by me in Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore under the supervision of **Thiru K. Chandrasekar, M. A., Ph.D. (USA)**, Professor of Money and Banking, Avinashilingam Institute for Home Science and Higher Education for Women (Deemed University), Coimbatore and it has not been submitted for the award of any Degree/Diploma/Associateship/Fellowship of any other University or Institute.


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CHAPTER I

INTRODUCTION

CHAPTER - I

INTRODUCTION

Trade is considered as an engine of economic growth of nations. There are many examples wherein countries have attained rapid economic transformation due to increase in trade . Japan, Germany and newly industrialised economies have witnessed rapid economic progress due to their concerted efforts in the area of trade known as 'export-led growth' International trade enables a country to specialise and export things at a cheaper rate than other suppliers to the world market. The growth of foreign trade increases the country's National Income and ultimately economic well being of the people.

Today's world is marked by multiplications of wants and unequal development of different regions. People now use several goods and services considered very essential while they had not been even in existence a few decades back.

Computer, advanced communication technology, transport facilities render human life comfortable but they also make the gap between haves and have nots wider. Trade can bridge the gap by the transfer of not only goods and services but also technology for producing them more cost effectively. In this situation, international trade is of strategic importance for economic development of both developed and developing countries.

The classical and neo-classical economists have fully recognised the importance of international trade in the growth process of a nation and considered it to be a key and a 'propulsive' sector of any open economy (Salam, 1994).

Benefits of trade

No country can be self-sufficient and no country can produce all the products it requires economically when compared to the prices at which it can obtain the same products from other countries. This emphasizes the inter-dependence of the countries and the direct and indirect benefits of trade. Enabling function of trade to produce higher levels of output at lower cost; to break the vicious cycle of poverty and to promote economic development are its direct benefits. Indirect benefits of foreign trade of a country are that (i) it enlarges the size of the market, scope of specialisation and greater use of machinery; (ii) encourages invention and innovation; (iii) raises labour productivity; and (iv) lowers cost. Indirectly, foreign trade helps achieve also high growth potential through educative effect. It also smoothen the balance of payments and inflationary pressure. Foreign trade transforms the existing production function powerfully pushing them upwards and onwards. The major trading countries who have contributed constructively and substantially in enhancing the total value of global trade are the United States of America, Germany, Japan, France, the United Kingdom, Italy, Canada, South Korea and China, but trade mostly among them. In other words, trade within the region grew substantially faster than the world trade. In 1990, intra-regional trade in goods accounted for 61 per cent of world trade in goods of European Community 41 per cent for Asia and 35 per cent for North America. Over 60 per cent of the trade of the Pacific rim nations stays within the area (Cherunilam, 1994).

Regional Co-operation

Regional integration schemes tend to increase intra-regional trade, for example, trade between the 12 members of European Community increased from about 40 per cent of total world trade in 1960 to 60 per cent in 1990.(Cherunilam,1994).

There seems to be a world wide tendency towards forming new regional arrangements and strengthening of the existing ones. Inspired by the European Economic Community, several regional integration schemes have been formed by the developing countries, particularly in Latin America and Africa. However, none of them could become a commendable success. That has contributed to the emergence of powerful trade blocks, much to the disadvantage of developing countries. Partly, this may be explained by the inward looking and import substitution policies of the developing countries. It is by the mid 1970's that these countries recognised the importance of the trade and the outward looking policies began to capture the imagination of policy makers. In the years that followed, unilateral and non-discriminatory trade liberalisation became the order of the day and regionalism was pushed into the background. The situation, however changed by the end of the 1980's and to-day regionalism is 'back with vengeance'. In its current incarnation, regionalism has engulfed all the major players in the world economy. Latin American countries are eager to join with the North American Free Trade Agreement. The possibility of the division of the world into three major trading blocks America, Europe and East Asia is a distinct possibility. To be precise about 25 countries account for nearly 84 per cent of the world trade. Three countries namely, United States, Germany and Japan contribute nearly one-third of the world trade. This trend should be halted and reversed to make international trade more competitive so that the developing countries can

also benefit by trade for a rapid growth of their economies. The experience of India is a typical case.

Indian Experience

India's foreign trade has shown tremendous progress in absolute value. The total value of India's international trade has gone up from Rs. 1,250 crores in 1950-51 to nearly Rs.19,000 crores in 1980-81 and to Rs.1,71,305 crores in 1994-95 (Dutt, *et al.*, 1996). In contrast to this tremendous growth in absolute value, the relative share of the country in the world trade has only declined from two per cent in 1950 to one per cent in 1960; to 0.7 per cent in 1970 and further to 0.4 per cent in 1980. At the end of 1992, it was just 0.56 per cent, much less than that of small countries like Taiwan and Singapore (Cherunilam, 1994). The major reasons for this small per centage share in the world trade are (a) heavy dependence on agriculture with low and poor productivity; (b) poor per-capita income; (c) low level of investment; (d) lack of skill and technology; (e) weak infrastructure and (f) the high cost of industrial development. Thus the country has very little cost advantage in the foreign trade and in an international economic environment, where the scales are tilting heavily in favour of developed countries. India has to look into these causes to plan her future development.

Policy

The trade performance of India can be explained by the country's trade policies. For a long period, since Independence, India followed a trade policy that can be described as export pessimism. In the context of centralised planning, the concept of protection to the domestic industries had a strong favour for import restriction, while the low status of economic development and low productivity in agriculture left little scope for export and

the growth of Indian foreign trade was slow and halting. However, by the beginning of the Fourth Five Year Plan, there were problems of balance of payments which compelled the planners to take stock of the situation and the trade policy found a change - export promotion with import restriction. Imports were encouraged only for industries with export commitments. Policy encouraged institutional development and incentives for export and the export picked up. By the end of 1980's the need for a more liberal trade policies was recognised. It was a radical departure from past system of controlled trade (inward oriented and protectionist policies) by giving a strong market orientation. The new trade policy(of 1990) has three specific goals viz: (i) priority for exports (ii) market orientation of trade and (iii) self balancing mechanism. The market orientation of trade policy is that the trade is to be conducted in terms of the market prices and its profitability is to be determined by the market related gains and losses which is too natural outcome of the dismantling of number of controls and easing of many restrictions on imports and exports of the country. This self-balancing mechanism helps in the avoidance of balance of payments deficits. The self balancing mechanism had been provided in three stages; (i) Exim Scrip and partial convertibility of rupee which were introduced in August 1991. Under this scheme, the exporters were entitled to sell 30 per cent of the foreign exchange earned by them in the free market, (ii) partially convertible rupee (1992) operated through the Banking System and eliminated the need for the issue of licenses or exim scrips. Under this system, all receipts from current transactions were, as before, continued to be surrendered to the authorised dealers (Sixty per cent of these was paid in rupees at the market rate and forty per cent at the official rate of exchange), (iii) the rupee became fully convertible in current accounts in 1993. That is, the entire foreign exchange earned by the exporters in respect of current account is now converted into rupees at market rates while

export subsidies were totally abolished, several institutional and financial supports made the procedure simple and kept the trade free of controls. When these drastic changes were being made by India, there had been beneficial changes in the rest of the world.

Global Development in Trade

The concern of the Nations of the world regarding exploitative trade practices of a few countries with tariff and non-tariff barriers and unilateral actions restricting trade with select countries for reasons not related to the trade, encouraged them to find a new instrument for ensuring fairly competitive and non-discriminatory trade practices. The General agreement on Tariff and Trade (GATT) in several rounds of negotiations attempted to establish a system of non-discriminatory trade practices. In its eighth round at Uruguay, it adopted a very comprehensive treaty called Dunkel Draft Treaty (DDT). It expanded the scope of trade negotiations by adding trade in agricultural products, services and trade related matters, to the conventional field of trade in manufacturers. Most nations signed the treaty and a new world Institution - World Trade Organisation (WTO) was born on April, 15, 1994 and it started functioning from early 1995. The highlights of this new initiative are : 1. A cut in custom duties from 40 per cent to an average of five per cent of the price of an imported product. 2. Non-tariff barriers such as quotas are banned except in special circumstances. 3. Promotion of multilateral trading system in preference to bilateral trade; 4. 'Most-favoured nation' treatment - under it any concession given to a member country is automatically applicable to other member countries of GATT (i.e. non discriminatory basis and trade (Agarwal, 1995).

In this new trade scenario, trading countries have the following benefits (Agarwal, 1995).

1. With restrictions on the import of agricultural goods by developed countries; reduced, the developing countries can expand their export of agricultural products
2. Agro-based industries also can export more
3. Export expansion will be further accelerated in the context of barrier less trade
4. Imports will cost less

India has ratified DDT and then joined WTO and it has above opportunities opened to it, to be complementary to her New Economic Reform Policies. But its success depends upon its ability to respond to the new opportunities.

Indian Trade Pattern

The structure of Indian exports is typical of a developing economy. India has traditionally been an exporter of agricultural raw materials and agro-based manufactures. India's traditional exports consisted of raw jute and manufactures, raw cotton and manufactures, tea, oil seeds, hides and silk. However, since 1960s, under the impact of industrialisation, export of non-traditional items was gaining in importance. These items include engineering goods, handicrafts, pearls, precious and semi- precious stones and jewelleryes made of them, iron and steel, iron ore, chemicals, ready made garments, fish and fish preparations. These goods constitute more than 50 per cent of India's exports in 1994. The fact that some of these non-traditional items such as engineering goods, handicrafts, readymades etc. have established themselves in the markets of even the most advanced countries shows that they would continue to be a part of India's exports in the years to come.

Engineering Goods

This change in the composition of Indian trade is beneficial to earn precious foreign exchange, badly needed to sustain growth and modernisation of its industries and infrastructure. Annual exports of some of the important traditional and non-traditional goods are presented in Table 1.

Table: 1. Annual Exports of Principal Commodities From India.

(Rs. crores)

Sl.No	Items	1960-61	1970-71	1980-81	1985-86	1990-91	1992-94
1	Coffee	2	25	214	265	252	555
2	Tea	195	148	426	626	1070	978
3	Fruits and Vegetable	7	18	116	206	335	727
4	Cotton yarn and Manufacture	11	75	2577	574	2100	4837
5	Leather and leather products	39	72	337	770	2566	4139
6	Iron and Ores	27	117	303	579	1049	1357
7	Tobacco	25	33	141	170	263	461
8	Engineering goods	13	130	727	954	3877	9874
9	Cashew	30	52	140	225	447	1044
10	Readymade garments	n.a	9	378	1067	4012	8091
11	Handicrafts	n.a	70	894	1881	6167	14936
12	Fish and fish preparation	7	31	213	409	960	2538
13	Rice	-	5	224	196	462	1287

Source: Reserve Bank of India Bulletin and Report on currency and finance.

The volume, value, composition and direction of engineering exports of any country can be taken as the barometer of its industrial advancement. It could be seen that the export of engineering goods has recorded a phenomenal growth since the 1970's. By 1994, it touched Rs 9,874 crores. Production of engineering goods is about 31 per cent of India's Gross Domestic product at current prices. It accounts for about 30 per cent of country's total industrial production. Besides, it has 30 per cent share in the total industrial investment, 36 per cent in value added, 30 per cent in industrial employment, 62 per cent in industrial licenses issued and 67 per cent share in foreign collaboration.

Indian engineering goods are exported to more than a hundred countries. In 1960-61, about 91 per cent of exports of engineering goods was directed to Asian and American countries. As against this, in 1984-88, the share of engineering exports going to the developing countries has fallen to 44 per cent and that to developed countries rose to 32 per cent; while the eastern trading block accounts for 24 per cent. Although Indian engineering goods are exported to a large number of countries world over, the bulk of the exports goes hardly to 25 countries (Arora, 1993).

Within the industrial sector, the engineering industry plays a crucial role in the economic development of the country. It is the key to economic development with its close linkages with every other sector of the economy.

The Indian engineering industry has registered significant developments during the past four decades. The country has developed a strong diversified technological and industrial base. In most of the manufactured goods, the country has achieved self-sufficiency. As far as infrastructural facilities are concerned, the country developed a good system of air services, roadways, ports, telecommunication and power. The Indian

Railway system is the third largest reservoir of technical and scientific man power next only to U.S.A. and U.S.S.R. Some of the manufacturing plants set up in India are among the largest in the world, such as BHEL, Bharat Earth Movers and Hindustan Power Equipment and Machine Tools. Development of all these industries has been helped by the engineering industry in a large measure. To a smaller extent, it has supported agriculture with tractors, harvesters, thrushers, diesel engines, pumps, excavators, power sprayers and other agricultural machineries. Further, the forward and backward linkages provided by the engineering industry has contributed to the setting up of ancillary and auxiliary industries. Since most of these industries were set up in the small sector, it can be said that the engineering industry has in an indirect way contributed to the growth of small scale industries in the country. In fact, the impact of import substitution on the development process of the economy is not as pronounced in other sectors of the economy as it is in the engineering sector. Thus engineering industry meets the increased demand/needs of agricultural, capital goods, construction, infrastructure, transport, power and mining sectors of the economy, besides catering to the defence and nuclear equipments. Hence, the engineering industry is rightly titled the 'Mother Industry'. Therefore, the development of Indian economy and the achievement of self sufficiency in various sectors depend to a very large extent on the development of the engineering industry. In otherwords, the engineering industry can be described as 'Prime mover' of the economy.

Problem Focus

India is a developing economy. It has made significant progress in the development of agriculture, manufacture, services and infrastructure; yet it has to further accelerate its growth process to catch up with the rest of the world. It needs transfer of

technology, investable funds and know-how to promote domestic industries and for export. Foreign aid, external and internal borrowings may meet the requirements only partly. A really sustainable and non-inflationary development is possible only by the expansion of its foreign trade, contributing significantly to the foreign exchange reserves. While the export of the processed farm products continues to be important and has vast future potential ; it is the export of non-traditional goods that contribute to large value additions in foreign exchange. Among the non- traditional export goods, engineering goods have a large share at present and still further expansion of the export of engineering goods is both desirable and possible. Therefore, it is necessary to study the export performance of engineering goods industry in the past with a view to understanding the future prospects. The present study meets this need, by analysing trend composition value addition and variation in foreign trade of India in engineering goods. Exports of engineering goods are studied and compared with the growth of the economy (GDP) and total exports (of all goods and services) of the country.

Objectives

Therefore, overall objective is to assess the export performance of engineering goods industry of India and to evaluate the future potentials. Specific objectives of the study are :

- i. to study the trends in GNP, total export and export of engineering goods from India and its composition and direction during last two decades, to understand the relative importance of engineering goods;
- ii. to understand the inter- relationship between GNP, total export and export of engineering goods;

- iii. to evaluate the performance of exports of selected engineering goods industries in terms of growth, instability, factor productivity and technological progress.
- iv. to analyse the inter regional variations in exports;
- v. to identify the problems in export of engineering goods and possible remedies for them from the experience of select engineering industries; and,
- vi. to discuss the prospects for improvement in the export of engineering goods and the policy measures required to help it.

Hypotheses

Above objectives require the following hypotheses to be empirically verified.

- i. Indian export of engineering goods has registered a significant growth.
- ii. Engineering goods had significantly contributed to the gross value of total exports of India and to GNP growth.
- iii. However, inter year variations in value of engineering goods export is so large as to cause instability in growth
- iv. Production in engineering industries is economically efficient and it is not a constraint for export

Scope

This study analyses the past trends, inter year variations in export of engineering goods from India and relates it to the total export and GNP. Therefore, the results would show the contribution of engineering goods in foreign exchange earning and growth of the economy. Since they are high value adding non-traditional exports, their beneficial impact on the economy can be appreciated. The study also focused attention on inter regional variations and the problems of the engineering industry. The results of this analyses will identify areas that need attention to remove inter-regional disparities and

constraints in growth of the engineering industry by appropriate policy support. Particular attention will be drawn to the investment, infrastructure, imports and technical know-how required for encouraging rapid growth of the engineering goods industry. Specific problems identified by the study will thus be useful not only to the policy makers but also to the producing firms.

Limitations

However, such studies in India are limited by several deficiencies in data. Therefore, all the limitations that applied to ASI, EEPC, CII. data did apply to the data used in the present study. The problems faced by the engineering industries were restricted to those located in Coimbatore District only and they might not be representative of all India situation. However, Coimbatore is the major contributor and hence the problems listed may be relevant but generalization should be done with care.

Organisation of Thesis

This thesis is organised into five chapters as follows:

CHAPTER:I INTRODUCTION

The importance of trade, trade policy of India, problem focus, objectives, hypotheses, scope and limitations of the study are stated.

CHAPTER:II REVIEW OF LITERATURE

An objective review of past studies related to the subject of the present study is presented.

CHAPTER:III METHODOLOGY

Choice of the subject, sources of data and tools of analyses are described and concepts are defined.

CHAPTER:IV RESULTS AND DISCUSSION

Results of analysis are presented and discussed to draw inferences related to the specific objectives.

CHAPTER:V SUMMARY AND CONCLUSION

A summary of work done and salient findings is presented, conclusions are drawn and their policy implications are stated.

CHAPTER II

REVIEW OF LITERATURE

CHAPTER - II

REVIEW OF LITERATURE

A review of the past studies is very useful to understand various aspects of the problem taken up for the research, to select tools of analysis; to define concepts and to decide the methods of measuring variables. Hence, the studies and publications on export in general and of engineering goods, trade policies of India and benefits of trade were reviewed. A brief account of the review is presented in this chapter under the following heads.

1. Trade and Development
2. Studies on Trade and Development
3. Trade Policy of India
4. Studies on Trade Policy
5. Indian Experience
6. Trade in Engineering Goods
7. Composition of Engineering Exports
8. Region wise Engineering Exports of India
9. Studies on Engineering Goods Exports

Trade and Development

In theory two different views on International Trade had prevailed. The classical and the neo classical economists attached so much importance to international trade in a country's development that they regarded it as an engine of growth, as observed by Jhingan, (1988). Direct and indirect benefits of trade were identified by them. The

direct benefits of trade was an increase in National Income, helping break the vicious circle of poverty and promote economic development. The indirect of benefits of trade were: enlarging the size of the market, the scope for specialisation in production, greater use of machinery, invention, innovation, higher labour productivity, low cost of production, all leading to economic development. More specifically, i). trade provided material means (capital goods, machinery and raw and semifinished materials), indispensable for economic development. ii); trade was considered as the means and vehicle for the dissemination of technological knowledge, the transmission of ideas, skills, managerial talents and entrepreneurship. iii); trade, served as a vehicle for the international movement of capital especially from the developed to the under developed countries; iv). trade was the best anti monopoly policy and the best guarantee for the maintenance of a healthy degree of free competition (Haberlery, 1971).

Contrary to the classical trade doctrine, an opposite view was given by Prebisch, Singer and Myrdal who did not attach much importance to international trade. They opined that historically international trade had retarded the development of less developed countries (LDC). According to them, international trade had impeded development in three ways; (i) a strong backwash effect, (ii) trade operated with a fundamental bias in favour of the richer and progressive regions and in disfavour of the less developed countries, (iii) the operation of the international demonstration effect through foreign trade had adversely affected capital formation in LDCs, (iv) there had been a secular deterioration in terms of trade of LDCs which implied that there was an international transfer of income from the poor to rich countries and that the gains from the international trade had gone more to developed countries at the expense of the former (Jhingan, 1988)

According to Nurkse, the factors which deteriorate the demand for exports from LDCs were summarised by Cairncross (1971). They were: (i) change in industrial structure in favour of heavy industries with a low content of imported raw materials, (ii) the rising share of services in total output of advanced countries, (iii) the low income elasticity of consumer demand for many agricultural products, (iv) agricultural protectionism, (v) economies in the use of raw reprocessing of scrap, and (vi) the introduction of synthetic materials. However, Nurkse had failed to take into account the price factor adversely affecting the developing country exports.

The solution prescribed in the 1950s by Nurkse and several others was an inward looking or import substitution strategy. However, in India and several Latin American countries, where the import substitution strategy had been extended far, had only hampered economic progress. On the other hand, countries which after a certain period of import substitution strategy, shifted emphasis to export promotion (eg. South Korea) achieved impressive economic growth (Nurkse, 1984). Thus, trade can help LDCs also if only they protect themselves against possible exploitation.

One such efforts was South - South Co-operation (SSC) in trade *ie.* economic co-operation among Developing Countries (ECDC) was recognised (*ie.*, a crucial challenge that the developing countries faced collectively to strengthen and diversify South - South Co-operation, but it succeeded little.

On the otherhand, Newly Industrialising Countries (NIC's) such as S. Korea, Taiwan, Singapore and Hongkong experienced a very high rates of export - led

growth. After completing the first phase of import substitution, these NICs shifted the emphasis to export promotion.

Therefore, if the past experience were any guide, free open trade was disadvantageous to the less organised countries (LDCs) and their interest was in import substitution - an inward looking policy; but not for long. After a short period of import substitution, the LDC had to develop capabilities and attempt to export led growth. Such a strategy was possible and highly beneficial as evidenced by the NIC's. This was the lesson for India - the single largest country in the south.

Implications of Theory

Further different theories of international trade conflicted both as to the predicted direction of trade and to the gains from such trade. Most of the discussion centred on manufactured rather than primary products because as pointed by Alfered (1976) three important factors were responsible for slow growth of exports of primary commodities to developed countries. They were i) trade restrictions, ii) a continuous increase in the relative importance in the developed countries of engineering industries in comparison with the textile, clothing and iii) mode of operations of transnational corporation.

The Heckscher - Ohlin trade theorem predicted trade between unlike economies and that the gains from trade were greatest where conditions were most dissimilar. On the other hand, Linder (1961) opined that the direction of trade for manufacture products was likely to be the opposite of what the classical theory predicted. It was expected to be greatest between similar countries and least for dissimilar countries. He argued that the nature of products consumed varied with income level of the countries

at equal stage of development. Innovation and production were undertaken first for the home market, exports followed once home market was established.

According to Robertson (1940) trade was considered to be not simply a device for achieving productive efficiency but as an 'Engine of Growth'.

Economists like Kindleberger (1958) and Ball, (1962) pointed out the circumstances under which an increase in exports might lead to a decrease in the rate of economic growth was refuted by Marsell (1964).

According to Tarshies, (1962), a change in exports would certainly lead to some change in both consumer expenditure and imports, and would probably also lead to a change in the expenditure of business firms upon plant and equipment and of government upon goods and services.

According to Marsell (1964) Kindleberger's case appeared to be too weak to be helpful as a guide; because, his hypothesis of foreign trade as a lagging sector was based on the idea of a higher degree of specialisation coupled with the lower transformation capacity confronted with a declining rate of economic growth. Thus the economy over specialised in certain export products, might be difficult because of the declining world demand for the products. This diminished World demand, explained in terms of Engle's Law or by the Scientific innovation of increasing efficiency in raw material consumption in manufacturing process, which happen as a result of a strong demonstration effect.

Prebisch, (1964) and Myrdal (1968) argued that accrual of the gains from trade is biased in favour of the advanced countries. According to them, the theory of

international trade was largely developed on the abstract assumption of international mobility of factors of production. According to them, a widening of markets strengthened the countries whose manufacturing industries had the external economies, while the developing countries were continuously in danger and their small scale industry and handicrafts were out competed by cheap imports from the industrial countries. As a result, wages and exports remained low as the supply of unskilled labour was unlimited. Therefore, they concluded that movement of capital from rich to poor countries had led to a lopsided pattern of development. Moreover, a regular deterioration in terms of trade of the developing countries implied that there had been an international transfer of income from the poor to the rich countries and that the gains from trade had gone more to the developed countries at the expense of the former, thereby reduced the level of real income and hence the capacity for development.

According to Ranis (1964), less developed countries should treat trade not as an engine of growth but as an additional efficient machine of production at its disposal transforming exports as inputs into imports as output.

Rani's observation was the most scientific explanation of the role of exports in five different stages of development which were: (i) exports are the engine of growth, (ii) import substitution sets the pace; (iii) unbalanced growth may set off structural inflation, (iv) the propensity to import is reduced by breaking bottlenecks; and in (v) the final stage, where despite a low import propensity, a ceiling is set to the growth rate of a natural economy by the potential rate of growth of exports (Halder, 1976). This indicated that exports acted either as an accelerator or as a promoter of the growth process, but export growth was not economic growth itself.

Ball, *et al* (1966), had studied the impact of internal demand pressure on British exports performance. According to them, apart from the cost of production and pressure of domestic demand, supply constraints in export industries also influenced the price competitiveness and physical availability of exports.

Emery's (1967) investigation on export of 50 countries suggested that higher rates of economic growth was associated with higher rates of export growth; ie. (i) a significant correlation (0.82) between the growth rate of exports and that of GNP, (ii) an increase of one per cent GNP for every 2.5 per cent boost in its exports were identified.

According to Johnson (1967), escalated tariff structures and other protectionist commercial policies adopted by the advanced countries had discriminated against exports from developing countries. So, according to him, trade barriers abroad worsened a country's export competitiveness, whereas trade preferences led to an improvement in it.

Mcgeehan (1968) had shown that the relative shares of individual countries in the world export volume were inversely related to their initial level of prices and changes in these share were related to changes in comparative export prices of the different countries. Further, he had pointed out that non-price factors such as quality, design and marketing were also equally important in determining the competitive position of a country. According to him, tariff and non-tariff barriers in importing countries also exercise and influence on the export competitiveness of a country.

A study by Paul *et al.*, (1970) showed that export competitiveness was closely associated with comparative export prices. They quantified the causes for the

change in Net Domestic Export price (NDEP). They found that part of NDEP was explained by the difference in the prices of inputs (eg. raw materials) and wage cost per unit of production between India and her competitors.

Myint, (1971) had identified three advantages from exports. They were: (i) 'educative effect' of exports of learning by doing process; (ii) exports overcome the narrowness of the domestic market and widen the scope for specialisation, raise the productivity of resources through the growth of specialised skill and the introduction of specialised techniques and capital equipment in the export sector; (iii) exports provide a market outlet for the surplus productive capacity of the subsistence sector which would have remained under utilised in the absence of trade.

According to Nayyar *et al*, (1976) a country's export performance is influenced by a variety of factors such as: (i) growth in world demand, (ii) change in the commodity composition of its exports (iii) change in the market distribution of its exports and (iv) changes in competitiveness; which depend on a number of factors which are: (a) export prices; (b) prices of the related commodities in the world market, (c) trade policies and (d) non price factors (v) foreign incomes and elasticity of foreigners demand for goods entering the export trade of the country.

An empirical study in the case of India for the period 1950-71 by Agarwal, (1976) showed that there existed a strong and significant relationship between exports and economic growth as indicated by the R^2 value that varied between 0.73 and 0.89. According to him, on an average, one per cent increase in the earnings of total exports and manufactured exports independently resulted in 0.73 per cent and 0.55 per cent rise in total domestic product respectively.

Studies on Trade and Development

Alejandro (1973) favoured exports from developing countries to developed countries, for improvements in the balance of payments of under developed countries. The direction of developing countries trade mattered; because, developing countries were the victims of the chronic disease of 'dependencia'.

Frances, (1976) suggested that colonial trade patterns imposed a straight jacket on developing countries which led to bias away from potentially more lucrative trade with one another; because of transport, marketing and financial constraints.

Moreover, Havrylyshyn, (1981) argued that the trade of the developing countries was better with industrialised countries because of opportunities for learning by doing, the shared technology requirement of south and advantages of appropriate technology supposedly embodied in capital goods produced by developing countries.

Wolf, *et al.*, (1983) pointed out that exports from developing to developed countries of the world influenced by their trade policies and the rate of growth of economy. The rising protectionism and slower growth of industrial countries had adversely affected exports of developing countries. The phenomenon had led many to advocate a shift in the emphasis towards South - South trade.

Bond, (1987) argued that in many ways trade in primary commodity exports was no longer as important as it was once. According to him, the countries lost considerable market share to industrial countries between 1965 and 1980, mainly because of growing processing capacity in developing countries, increase in population and protectionist policy for primary products in developed countries of the world.

Edward, (1987) examined the role of foreign trade and export expansion as causes of economic growth. A simultaneous equation model relating to exports to income growth through their effects on capital goods imports was formulated. The model was tested against the data of five economies, Hongkong, Japan, Singapore, Korea and Taiwan. In the three economies, Hongkong, Korea and Singapore all the hypothesized relationships in the model had been established. The results for Taiwan was not completely satisfactory, as the hypothesis of a close link between investment and capital goods import was not valid. However, in view of the high explanatory power of export on income in the case of Taiwan, it might be possible to take the view that capital goods import in Taiwan affected income growth via some determinants other than investment. This model largely failed in the case of Japan for the study period 1950-70.

Ram, (1987) in her study tried to provide estimates of two models of the export growth linkage for 88 countries on the basis of annual time series data for each, for two sub periods 1960-72 and 1973-82 for several LDC' groups. The fit of the model was good in most cases and the role of exports in growth seemed predominantly positive.

Bibek (1988), studied development and South-South co-operation of the developing countries in the world trading system. It revealed that tariff and non-tariff barrier imposed on the manufactured goods imported from developing countries were higher compared to that on the imports from developed countries. During the sixties and seventies, exports of developing countries grew inspite of protection policies of the developed countries. However, in the eighties and the nineties, the trade restriction policies against the exports of manufactured goods from developing countries were more severe. Further, from eighties onwards, developed countries witnessed a low rate of

economic growth and a high rate of unemployment compared to the earlier decades which had caused a sharp decline in world trade.

However, improvements in technology helped to increase labour productivity by using more capital. The rise in labour productivity helped to improve the earnings of the labour in developed countries and the developing countries were forced to pay very high cost to get the benefits of improved technology (UNCTAD, 1992).

The export and import policies of India had undergone a change since independence. With liberal export-import policies, a fair degree of openness of a country was expected, whereas the restrictive trade policies were expected to bring about a fall in the degree of openness of a country.

Augustin, (1990) in his study of exports and economic growth examined the extent to which the export performance differences explained economic growth in African countries. He compared the estimates of the export import with those for other LDC's for the period 1960-80. The export impact was found to be some what smaller for African countries than for other LDC's but the differences were not statistically significant.

The study conducted by Rao, (1990) revealed that India's export policy was consistent with domestic economic policies and programmes. The choice of products for export promotion was based on the premises of long term comparative advantage and optimum utilisation of domestic natural resources and man power. The trends in India's exports over the years indicated the exports of manufactured goods were quite important for the development of exports in developing countries. In India, with its large reservoir of

manpower and abundant natural resources, there was ample scope for the export of value added items and labour intensive manufactured goods, he concluded.

However, Bansuri, (1991) argued that the supposed link between policy orientation and trade regime was not borne-out in practice as shown by on the studies by Hughes and Singh, (1991), Taylor (1991) and Fishlow (1991). He defined trade openness as the ratio of export of GDP. With the increase in the ratio of exports of GDP, trade openness of the country could increase. However, Panchumukhi (1987) measured trade openness by the ratio of exports plus imports to GDP.

Esfahani, (1991) found that the major contribution of exports to the GDP growth rate was to relieve the import shortage that many semi-industrialised countries (SIC) had confronted. According to him, export promotion policies as a superior development strategy for SIC had found support in the statistically significant correlations established between export expansion and output growth. The positive export-GDP association was attributed to the possible externalities of competition in the world markets - eg., efficiency of resources allocation, economies of scale and various labour training and 'demonstration' effects. The study showed the correlation which was due to the contribution of exports to the reduction of import 'shortages' which restricted the growth of output in many SIC's. In this sense, the study reiterated that export promotion was particularly important for countries which cannot obtain sufficient foreign aid or capital. A simultaneous equations model was attempted to deal with simultaneously problem between GDP and export growth rates.

An attempt was made by Bhatt, (1994) to measure export competitiveness for India and to examine the role of exchange rate policy in export

competitiveness. The study concentrated on price competitiveness, used several indices, such as : a) relative export prices (EPI), ie. the ratio of the unit value index of exports of India to a weighted average of unit price index of exports of its competitors; b) relative whole sale prices (WPI) ie., India's whole sale price index divided by a weighted average of the indices of its competitors whole sale prices; c) relative profitability of exports (PEI) ie., the ratio of India's export unit value index to its wholesale price index; and d) index of import price competitiveness (IPI) ie., India's wholesale price index divided by the unit value index of its imports.

The study found an un-impressive performance of Indian exports during 1973-89, particularly during the 80s. It was due to relatively low competitiveness. It was also found that subsidies and incentives for export promotion did not ensure better export competitiveness during 1973-1989. Depreciation of exchange rate of rupee had no influence on any measure of competitiveness except the export price competitiveness. Further, an inverse relationship was observed between depreciation of Indian rupee and export price competitiveness. However, some positive relationship between depreciation of Indian rupee and export price competitiveness was found for commodities such as spices, tobacco and coffee.

According to Goswami, *et al.*, (1994), continuous changes in the nature, norm, direction, conditionalities, dimension, technique of production skills, elasticities of demand and supply, and over and above all, the socio-economic or politics-economic equations witnessed by world trade over the last century and a half had rationally eroded the very base of the theory of international trade. The traditional and classical theories

with classical forte of 'Comparative cost advantage' or 'Equilibrium Base' or 'Factor Endowment Base' were now seen to be inadequate.

The present status of the theory of International trade had deviated in complete character from its precedents. It was a compendium of so many factors and determinants that no single factor was responsible for the present day theory of international trade.

The study had identified the following as ingredients of the present theory of international trade. They were: 1) international trade is more capital market oriented, yoked to competition than to cost comparativeness or cost considerations at the source; 2) it is more 'market oriented' than logically settled and agreementatively concluded; 3) it is more open than generally subsidised; 4) It is more universally projected than insularly protected; 5) it is more pragmatic than ritually practiced; 6) it is more 'innovative' than peremptorily arbitative; 7) it is more and more 'capital market fed finance' oriented than 'IMF corrective - loan fed' prompted; (8) trade enhancement of diversification is sought and furthered more through the abolition or reduction of trade levies, taxes, restrictions, rules and laws than through their imposition and finally 9) there is a tug of war between the commercial hawks of 'industrial prowess' on the one hand and the 'hawk to be-pigeons' on the other.

Taylor, (1994) argued that Chile was a success of liberalisation on the basis of its rapid export-led growth since mid - 1980's. The country went through a very long transition towards the free market under a very tough military government. Despite their use of the best IMF medicine, they did not succeed in stabilising inflation and output losses till exports took off.

A study conducted by Attri, (1995) confirmed a (1) strong positive relationship between level of export and level of GNP in selected 12 developing countries over the period 1960-80. It also revealed that the relationship was 'Secular' rather than 'cyclical'; (2) The study also confirmed a very close relationship (secular) between level of exports and level of GNP; (3) Investment emerged the most powerful variable in affecting the process of economic growth in all the developing countries under study. The study established that stimulus to growth in some of the developing countries was essentially 'internal', as emphasised by Nurkse; 4) The study admitted the fact that the presence of economies of scale mechanism in case of Brazil, Yugoslavia, India, Panama, Philliphine and Mexico (Only during 1971-80) needed further investigations. However, mechanism of export led growth ie., balance of payment effect on investment had not been proved to hold in any of the developing countries.

Dhar, (1995) studied anatomy of the emerging trading system in which he stated the benefits of the Uruguay Round agreement. According to him, world income would grow by U.S. \$ 213 billion by 2002 (at 1992 prices) and more than two-thirds of the increment would accrue to the developed countries. The study pointed out that even though China was not a member of the WTO, it had increased its trade tremendously in the past decade. It was projected as the other large beneficiary. It was projected that Africa could lose more than two and a half billion dollars and India would gain about 4.5 billion dollars. Such differences in gains as between different groups of countries showed the significant characteristic of the emerging multilateral trading system.

According to Hariharan, (1995) in the present world trading system, the prospects for the growth of trade of developing countries was not bright. Therefore, he

suggested that the developing countries must organise themselves in their regional groupings and develop common policies for their exports to developed countries to regulate effectively the supply of their products in order to control the fluctuations in their prices. The study observed the data on trade between regional groupings of South Asian Association for Regional Co-operation (SAARC) and Association of South East Asian Nations (ASEAN). During 1978 to 1987, exports of SAARC countries to ASEAN grew from 252.3 millions of US dollars, to 680.4 millions of US dollars. During the same period, exports of ASEAN to SAARC countries grew from 706 millions of US dollars to 2265.9 millions of U.S. dollars, worked out to an average linear growth rate of 22.09 per cent per annum, as per the IMF Direction of Trade statistics.

RBI data on the exports of India also revealed the potential for the improvement of trade relations with other developing countries. During 1984-85 to 1992-93, exports of India to developing countries had increased from Rs. 1,439 crores to Rs.12,148 crores *ie.*, exports had gone up by more than 8.4 times in this period. Exports to Asian developing countries alone had registered a ten fold increased during 1984-85 to 1992-93. In the total exports of India, the share of developing countries had increased from 12.25 per cent to 22.77 per cent whereas the share of Asian developing countries had grown from 6.47 per cent to 14.82 per cent during the same period.

Thus the evidence of trade data between ASEAN and SAARC and the exports from India to other developing countries revealed the potential for the promotion of trade. Hence, the study suggested that regional groupings of developing countries need to play a significant role in the future trading system through their effective integration and

co-ordination of trade policies for the improvement of their bargaining power and terms of trade.

Sinha, (1996) in her study on globalisation stated that a large number of developing countries had failed to open up to the world economy. It created severe disparities and threat of a slowly integrating economic world. According to the study, favourable conditions projected in the industrial countries, including stable energy prices, low interest rates and inflation, reduced budget deficits and advancement in communication and transportation technology had created an environment highly conducive to market liberalisation. Further, the study stated that the process of globalisation was uneven over time and across space *ie.*, the inequalities and asymmetries implicated in the process led to uneven development in the late nineteenth century mostly for economic reasons.

The study concluded that in the context of globalisation and trade policy, India's trading position in relation to the size of its economy, was depressingly low. India did not figure even among the first 30 leading exporters though in imports it held the 30th place in 1955, according to global trade data. With a total of 62 billion dollars in two way trade, India's place was less than one-fourth of China's total of 280 billion dollars, roughly half of Thailand's 125 billion, 40 per cent of Malaysia's 146.5 billion and less than three-fourth of Indonesia's 87 billion dollars, which was an eye opener for India's future action towards globalisation.

Above discussion emphasized the need for increasing export of non-traditional goods by the developing countries because primary goods had little advantage and their domestic demand was fast increasing leaving little surplus for export. Another point that

emerged from the discussion was that the trade among countries of the south had a good potential. These inferences are significant for India which has potentials for export of non-traditional goods; important among them being engineering goods. The policy of the government is a crucial determinant of both the size and the pattern of trade. Therefore, a review of trade policy of India is called for.

Trade Policy of India

In India, trade had remained for many years completely regulated by the government. Government control of foreign trade started in India in the early years of the Second World War, when import control was introduced as a war time measure under the Defence of India Rules in 1940. The primary objective was to conserve foreign exchange resources and to restrict physical imports so as to reduce the pressure on the limited shipping space available. After the end of the War, the Defence of India Rules lapsed and hence, in September, 1946 the emergency provisions (continuance) ordinance was promulgated to continue the import control measures. This was ultimately replaced by the Imports and Exports (control) Act, 1947, which was replaced by the Foreign Trade Development and Regulation Act. Its objectives were to: (i) conserve the foreign exchange resources and to allocate the scarce foreign exchange resources in accordance with National priorities; (ii) control the import of inessential and harmful items. (iii) ensure adequate availability of required goods within the country; (iv) protect domestic industries and to (v) prevent anti-social activities.

Only recently, the policy found significant change for the trade policy of India into three distinct periods could be seen. First period was a period of export pessimism covering the period of the first two five year plans; second period was an era of

export promotion and import restriction. Third period marking a drastic change towards an open system was most recent from 1991.

i. Period of export pessimism :

During the first two Five Year Plans, (Bhagwati, ^{and Desai,} 1970), it was the export promotion pessimism which reflected in the neglect of export promotion and Government bias against exports. The export controls, quotas and duties, created inflationary pressures and the policies aimed at promoting domestic consumption inhibited the expansion of export earnings. There was also a sluggishness in the world market for India's traditional exports. Other factors which inhibited India's exports were the high costs of manufacture and non-price factors such as poor reliability and quality. The increasing trade deficit during the Second Plan necessitated a fresh thinking on exports and since the middle of the second plan period, measures were initiated to step up exports.

ii. Era of export promotion and import restriction

During the Third Plan, the institutional frame work for promoting export was broadened and strengthened and certain fiscal incentives like drawback of import duty and refund of excise duty and income tax concession were introduced. A major development was the devaluation of the Indian rupee (on June 6, 1966) by 36.5 per cent, it was resorted partly to obviate the need for administering a system of export incentive schemes, and partly due to the failure of the schemes to generate self-sustaining exports (Cherunilam, 1994).

Subsequent to the devaluation, export promotion were attempted through adjustment in export duties and in cash assistance, modification of import facilities for exporting units and industries and strengthening of credit arrangements for exports.

Export Policy Resolution, 1970

Realising the country's potential for achieving a rising level of exports, an export policy resolution was passed with the objectives; i) to expand, diversify and strengthen the domestic production base so as to generate more exportable surplus; ii) to strengthen and develop the export marketing infrastructures required for export; iii) to develop overseas markets; and, iv) to provide incentives to give boost to the export sector.

The oil price hike in the early 1970's pushed India's trade deficit up. Hence export promotion assumed added importance. Several committees on Import-Export Policies and procedures (Alexander Committee, 1978), Committee on Export Strategy for eighties (Tandon Committee, 1980) Committee on Trade Policies (Abid - Hussain Committee, 1984) had critically examined trade policies, procedures and promotion schemes. As a result of the recommendation of these committees, a number of measures were taken to promote exports. These measures included: i) liberalisation of industrial and import policies to encourage production of export goods; ii) development of export processing zones; iii) promotion of hundred per cent export oriented units; (EDUs) iv) rationalisation and v) simplification of schemes of exports assistance and incentives.

By the later half of the eighties, during the seventh Plan, (1985-90), fourteen broad sectors were identified by the government as thrust sectors in the overseas markets without in any way minimising the importance of increased exports from other sectors. The export growth accelerated substantially in the late 1980s and the scope for export led growth of the economy brightened.

iii. Towards an open system

By mid 1991, new economic policy was announced making a drastic departure from the past. The trade policy reform was an integral part of it. The salient features of trade policy reform were:

- i) Exchange rate adjustment - To make the exchange rate more realistic and to encourage exports and discourage imports, the Rupee was devalued.
- ii) The role of subsidies in export promotion was substantially reduced by abolishing the cash compensatory support (CCS) because CCS, was a serious drain on the exchequer. Further, export subsidies were criticised by International Organisations. The loss to the exporters due to the abolition of the CSS was expected to be more than compensated by the devaluation and the revised scheme of Import Replenishment Licence (REP) renamed as exim (Export - Import policy).
- iii) Liberlisation of imports by substantially eliminating licensing, quantitative restrictions and regulatory and discriminatory controls. There was a considerable reduction in the import duties also.
- iv) procedural simplification and the
- v) convertibility of the rupee.

A new Export Import Policy was announced in 1992, co-inciding with the Eighth Five Year Plan (1992-1997). The salient features of the (Exim) policy were; a) liberalisation; b) negative list; c) export promotion imports and d) other modifications.

The Exim Policy substantially eliminated licensing, quantitative restrictions and other regulations and discretionary controls. However, there was a negative list of

goods, the import or export of which was a) prohibited; b) restricted through licensing or otherwise or c) canalised. In the canalisation, the import or export of the goods concerned were done only by the designated agency like the STC, or other organisations pertaining to particular products such as Indian ~~Oil~~ Corporation (IOC) for Petroleum Products.

Under the Export Promotion Capital (EPCG) Scheme, capital goods imports were permitted at concessional rates; ~~of~~ customs duty, subject to export obligation. ^{has been liberalised.} Export Houses, Trading Houses and Star Trading Houses were eligible for the facility of self-certification under the Advance Licensing Scheme and also acquired ISO 9000 or BIS 14000 certification of quality.

iv. Other modifications were : i) Export oriented units and export processing zones were given greater autonomy. ii) Benefits such as duty exemption schemes, duty drawback schemes and exemption from terminal excise duty were extended to Deemed Exports. iii) The new policy had reiterated the crucial role of the Export Houses, Trading Houses and Star Trading Houses. iv) The new policy recognised the role of the Export Promotion Councils. Thus, the Exim Policy acknowledged that a) trade can flourish only in a regime of substantial freedom and b) recognised the need for reasonable stability of the policy by making the duration of the policy, five years.

Studies on Trade Policy

For long, India had followed a policy of export promotion and aggressive import substitution and the trade grew but sluggishly and the balance of payment crisis appeared frequently. Therefore, the policy underwent a drastic change in 1991, when the government of India adopted an outward looking policy with emphasis on liberalization and globalisation of the economy. Hence, a review of studies on Trade policy is attempted.

Ahluwalia, (1991) argued that total factor productivity and industrial growth had turned around for good and attributed them to the liberalisation policy. According to him, the low level of total factor productivity and output growth in 1960's and 1970's were attributed to supply side bottlenecks caused by import substitution policies. The policy intervention in the industrial sector, which started off with dramatic positive results elsewhere, turned out to be a failure in India.

Verma, (1993) analysed the future relevance of structural policies in the context of emerging trends in the global environment. According to him, the Indian economy faced a number of serious problems : (a) a large fiscal deficit has paved the way for a net borrowing from the Reserve Bank of India; (b) a highly unfavourable foreign trade ratios, caused by an excess of imports over exports *ie.*, an excess of demand for foreign exchange over its availability; c) low level of efficiency economy wise that resulted in huge wastage of resources; d) excess of the supply of labour over the demand causing a rise in unemployment; e) recessionary situation in the industrial sector, f) stagnant agricultural output and g) poor growth prospects in the economy in addition to h) a serious inflationary problem.

According to him, the global dis-orders as well as insufficient coordination in the macro economic policies in the world economy had not only aggravated the complexities of continuous stalemate in the style and substance of North-South inter dependence since 1960 but also led to the increasing concern with South-South co-operation. He further argued that i) excessive regionalisation of the world market; ii) excessive technological confrontation among G-7 countries were the two important developments witnessed during the last four decades.

In his opinion, the structural change will not help the Indian economy to compete with the MNCs, because it will affect the domestic production and thereby incentives to the producers would be killed; consequently, India would remain an exporter of primary products and importer of finished products.

Madhur, (1994) analysed Asian experience and argued for an outward oriented policy for a dynamic manufacturing export sector. There had been a trend towards decreasing government intervention in the area of trade policy, whereas earlier reformers like Taiwan and Korea had intervened quite intensively. He found that the pace of economic reforms was faster than that of Taiwan and Korea. The past experience of trade and exchange reforms in developing Asia did not indicate any unique pattern of sequencing of trade and exchange reforms. ASEAN and South Asian countries had placed more emphasis on liberalising foreign investment and other capital flows than Korea and Taiwan. Thus Indian trade policy has good chances of success.

A critical appraisal on the theory of international trade was attempted by Mukherjee, (1994). He observed that the present day international trade theory showed a maze of the co existence, conflict and enmeshing of the material conditions of the theory of comparative advantages, global movement of the productive factors and goods but especially export-import of capital and migration of skilled labour, and operation of tariff and non-tariff barriers in international trade. The author pointed out that the integration of capital and labour markets emphasised in the Uruguay Round, (1994), had only reiterated and rediscovered the old postulates of modern theory of trade. Moreover, the high tariff and non-tariff barriers of the U.S.A. and West European countries in the past decades

greatly helped them foster economic growth and developed measures to form a new variant of trade theory, in which the developed capitalist countries reaped the maximum benefit at the cost of the rest of the world. As a result, the developing countries lost nearly \$ 300 billion a year on the average due to the unequal exchange in the trade with the developed countries.

Patibandla (1994) ascertained that a market economy was viable only when there were certain minimum efficiency in functioning of social, economic and legal institutions. According to him, most of the developing countries including India did not satisfy the conditions. The conditions specified in Arrow-Debreu general equilibrium model were not applicable to less developed countries. With pervasive market failure, the market economy in LDCs tended to a low level of equilibrium trap. It was one of the possible outcomes of the present trade policy approach in India.

According to Acharyya, (1995) one peculiar aspect of India's technological development was that whatever little innovation that had taken place was 'minor' innovation, including adaptation of process to indigenous raw materials, instead of major innovations at the frontier of technology. The study observed that liberalisation had a positive impact on the decision to export through quality innovation which depended on the nature and intensity of domestic rivalry, as well as on the opportunities in the foreign markets. The study found that the required degree of liberalisation to induce the monopolist to innovate varied with the level of investment in cost innovation (F), and the success rate (q), and positively with the level of investment in quality innovation (F_q) and the gain from cost innovation ($C - \underline{C}$). Thus, there was no agreement among the experts

on the likely impact of the new economic policy and exim policy on the economy- its growth and trade inclusive.

Bajpai, (1995) argued that trade policy reform measures accompanied by stabilisation measures neither helped to achieve macro stability nor the sustainable growth. He argued that the assumption in reforms were guided by rules of thumb and underlined general equilibrium model of the economy for which the standard rules apply was an unrealistic portrayal of most of the developing countries. The author further pointed out that it was important to attain and maintain fiscal discipline. The IMF's approach had prolonged the process and invariably failed to yield the desired results.

According to Bhatt, (1996), measures undertaken under economic reforms in India included decontrol and deregulation of industry and service sectors, disinvestment of public sector undertakings, opening of the economy for foreign investment and steps to integrate the economy into world system. According to him, during the post reforms (1991-95), India had made some significant achievement in economic growth, industrial production especially capital goods industries, export sector, foreign investment. A multiple regression analysis showed that growth rates in GNP, per capital income, agriculture had risen in post-reform period whereas it had fallen in other sectors. In industrial sector, there was a mixed response to economic reforms. However, in external sector, there was a significant improvement in the post-reform period. Thus reforms had helped the trade.

According to Dubey^{and Bhatnagar} (1996) major reforms in trade policy and procedures since the announcement of new exim policy for 1992-97, had accelerated India's transition towards globally oriented economy by stimulating exports and

facilitating import of essential inputs as well as capital goods. The study concluded that after globalisation, the composition of export had changed, the share of manufactured goods had increased and the share of raw materials and agricultural products had declined. This shift in favour of non-traditional goods in export, would be beneficial to the country.

According to Prathimakumari, (1996) the determination of trade policies of a country had been greatly influenced by the collapse of 'Bretton woods system (1944)' in 1973 and adoption of a monetary system based on flexible exchange rate by the IMF. To her, theoretical and empirical developments of 1950 to 1973 showed that: i) Prebisch and Singer (1950) the LDC exports were of the nature of declining their own terms of trade; ii) Nurkse (1962) found that the developed countries were unable to accommodate LDCs exports; iii) Bhagwati and Ramaswamy (1963) opined that the best policy was to provide more market orientation and information to the domestic producers. The study reviewed the works that had already been done, concluded that the outward looking policy of India would help to accelerate economic growth of the country.

Indian Experience

The Government of India launched the process of industrialisation as a conscious and deliberate policy for economic growth in early fifties. It anticipated that the engineering industry alone could promote the base for industrialisation, the thrust contemplated by the Five year plans.

The real beginning in the field of industrialisation was made under Second Five Year Plan [1956-61] by adopting 'Basic Industries Approach' and because of lack of indigenous entrepreneurship and capital, the growth and expansion of public sector in industrial development of the country was accepted. Considerable emphasis was laid on

the development of a core of industries such as iron and steel, non-ferrous metals, petroleum, fertilizers, petro-chemicals and heavy engineering. As a result, there was a rapid increase in the production of machine tools, diesel engine for automobiles, bicycles, power driven pumps, sewing machines by the end of Second Five Year Plan. As a result of the approach followed by the Second Five Year Plan, the growth rate of All Industry and Engineering industry was at 7 per cent and 9 per cent (CII, 1994).

During the Third Plan Period (1961-66) also, the growth rate of All Industry and Engineering Industry was high at 9 per cent and 22 per cent, inspite of several lapses and difficulties. The three factors which contributed to a successful and spectacular achievement in the rates of industrial and engineering growth were: (1) emphasis on industrialisation in economic policies ;(2) the heavy oriented strategy of industrialisation (3) substantial investments made and the capacities created in the industrial sector.

The industrial deceleration during the Fourth Plan Period severelly affected the all industry in general and Engineering industry in particular. As a result, the rate of growth industrial sector fell short of 3.7 per cent from 9 per cent in the Third plan; the growth rate of engineering industry was also at a level of 5.8 per cent as compared to 21.8 per cent in the Third Plan. It had its impact on employment, income, regional disparities and urban growth during the period 1965-75 (Heggade,1994).

The Government of India issued a large number of directives and instructions to various development organisations and financial agencies apart from nationalisation of commercial banks, the MRTP Act of 1969 and consequent establishment of MRTP commission in 1970, nationalisation of non-insurance business. Therefore, the Fifth Plan envisaged a general growth in industrial output at around 8.2 per

cent. The planned increase in the value output of engineering industries was from Rs.2,700 crores in 1973-74 to Rs. 5,200 crores by the end of 1978-79. But the growth rate of industrial output during the Fifth plan was only 6.2 per cent and it was 6.7 per cent in engineering industry. This was due to the fact that 15 engineering industries were allowed the facility of automatic growth of capacity at 15 per cent per annum or upto a ceiling of 25 per cent in plan period.

The overall outlay envisaged in the Sixth Plan (1980-85) on large industries and mineral works was around RS. 20,407 crores. Against the target of seven per cent growth per annum in the industrial production, the growth rate realised was only 5.9 per cent. A fall in the growth rate of all industry implied a fall in the growth rate (5.6 per cent) of engineering industry too.

A large number of factors like sluggishness of demand, low rate of capacity utilisation consequent upon low rate of expansion of domestic demand, imposed a constraint. It was mitigated only to a limited extent by export markets. Power and transport bottlenecks, labour unrest, tight supply of raw materials, rise in import cost, licensing difficulties, oil-price hike, international inflation accounted for the arrest of growth of Indian industries (Gosh, 1981).

Therefore, the Sixth plan recognised the need for incentives for efficient engineering units to grow and created flexible opportunities for increased production at minimum cost. Among the incentives, duty free import of raw materials, components and machinery, relative cash compensatory support (RCCS) upto 20 per cent as for the manufactured electric items had commendable impact on exports

A favourable industrial investment in the economy facilitated the Seventh Plan (1985-90) which concluded with an industrial growth of 8.5 per cent per annum exceeding the plan target of 7 per cent in manufacturing sector with a weight of 77.11 in the index of industrial production. Within the manufacturing sector, engineering industry, with a weight of 30.50 had recorded a persistent growth of 11.7 per cent against the target of 10.5 per cent.

Thus, the industrial growth in general and growth of engineering industry in particular had shown variations through the period 1951-1990 which were grouped into the period of high growth (1951-1961); the period of decline (1965-75); the period of slow recovery and steady increase in the growth (1975-1990). The industry in India had been able to achieve significant strides in the direction of diversification of industrial base, acquisition of scientific, technical and managerial skills, enlargement of capital and consumer goods (Heggade, 1994).

The favourable industrial climate continued in 1990-91 also and helped a growth rate of 8.2 per cent in industrial production and 13.4 per cent in engineering goods production. The years 1991-92 and 1992-93 witnessed a sudden fall in the industrial growth rate, it was a negative rate of (-) 5.0 per cent for the whole of industries, while (-) 1.5 per cent in engineering industry. It recovered to 0.4 per cent in 1993-94 (CII, 1995).

A number of factors attributed to the slow progress of industrial growth in 1993-94. They were: (a) inherent adjustment lags in the process of restructuring, (b) slow down in investments and imports, (c) high rates of interest and corporate taxes and (d) poor utilisation of inventories (Rajkapila *et al.*, 1995).

The new consensus on export led growth envisaged a thorough restructuring of the economy, pegged on industrial sector, mainly on the engineering export sector. Together with the Central Government's industrial trade and financial sector reforms as part of structural adjustment programmes, many State Governments had come out with industrial policies for promoting industries. The Foreign Direct Investments (FDI) from Non Resident Indians (NRIs) had boosted the industrial growth in India to eight per cent in 1994-95. Similarly, a substantial jump in the growth rate to 14.5 per cent in 1994-95 compared to 0.4 per cent in 1993-94 was seen in exports of engineering goods (Rajkapila *et al.*, 1995).

The trends in the value of trade as a whole consisted of two components namely imports and exports. In India, the total turn over (*ie.*, the value of imports plus the value of exports) had gone up in 1991-92 by as much as 84 times over 1950-51. On the whole, it was low in the initial years, and high in the later years. In the fifties, the annual average value of trade was very low at little over Rs. 1,400 crores. In the sixties and seventies, the growth accelerated with the annual average of Rs. 2,450 crores and Rs. 8,260 crores respectively. In eighties, it was at Rs.33,000 crores. In 1990-94, it was 1,07,000 cores (Agarawal, 1996). In the total value of trade, imports had a much larger value than export^{value}, resulted in deficit in the balance of trade. The unsatisfactory performance of trade compelled the Government to expand export so as to attain growth with stability in the economy.

Exports and Growth

With regard to the importance of exports expansion, two different views prevailed all over the world. The first view regarded exports as an engine of growth

whereas the second view opposed the earlier view, treated export, as an essential component determined by domestic growth.

Exports as an engine of growth

The concept of export led growth worked on the assumption of the vast international market with unlimited opportunities, it included expectations of limitless demands, technological advancements and competitive/efficient allocation of resources. If realised, it could be translated into the modernisation of the domestic economy with high growth rates. In otherwords, export led growth strategy provided 'demand stimulus to growth' because of the unlimited world market opened up. Since market was not a constraint, entrepreneurs had the liberty to decide their plans. Monopoly was not a constraint on the plant size, as there was less likelihood of such organisation emerging. On the other hand, competition promoted plants of economic size.

Though the export led growth was justified on the above grounds, it was not suitable for the Indian economy for several reasons. First, for the economy of India big in size and low in level of development, the above strategy was of little relevance compared to small countries like Korea and Taiwan. Secondly, even the re-allocation of resources in favour of export industries may not be feasible because of the shortage of resources and rigidities in mobility of resources. Thirdly, the protectionist barriers in the developed countries did not allow the unhindered expansion of exports to these countries.

Therefore, it was feared that the policy of export led growth was expected to affect the scope of maneuverability to achieve the important desirable objectives might not succeed because of difficulties in tailoring domestic production structure to the

demand of the international markets and difficulties in meeting social needs within the country.

Growth-led export policy

Due to the above reasons, it was suggested that India could adopt strategy of 'Growth led-exports' which regarded exports as a means of earning foreign exchange to pay for imports. Therefore, export items were selected with a view to earn foreign exchange, through specialisation in the export sector which could be suited to India on several grounds. This policy insisted that since the constraint for economic growth was on the supply side, priority should be given to domestic growth and export should be the outcome of growth for the Indian economy. Selective approach in respect of export goods and specific measures to promote exports of these goods were desired. For the domestic growth, and also to produce export goods, India needed many sorts of imports of intermediate and capital goods. However, the strategy of export led growth did not go well with the strategy of import substitution; rather they were contradictory. It was an inward oriented strategy based on a regime of protection.

A number of studies highlighted the need for contribution of export to economic growth and supported the export led growth strategy. Few other studies had supported the growth-led-export strategy for India.

Studies on Export

The classical and neo-classical economists attached much importance to international trade. According to them, trade was considered to be not simply a device for achieving productive efficiency, but as an 'Engine of Growth' (Robertson, 1940).

According to Nurkse, (1961) in the twentieth century trade which was an 'engine of growth' had not worked powerfully as it was in the nineteenth century. This, according to him was due to the slow down in the rate of expansion of demand in the industrial countries for the traditional exports of the developing countries. He gave six reasons for the slow increase in demand in the industrial countries. They were: 1. the composition of industrial production in the advanced economies shifted away from 'light' industries in favour of 'heavy' (such as engineering and chemicals); 2. the rising share of services in total output of advanced industrial countries tended to cause their raw material demand to lag behind the rise in their national product; 3. low income elasticity of demand for primary products; 4. agricultural protectionism; 5. the rise in synthetic materials and 6. the fall in the raw material input/output ratio.

Myrdal (1968) and Raul Prebisch (1964) argued that accrual of the gains from trade was used in favour of the advanced countries. They opined that international trade had impeded development. They criticised the comparative cost doctrine. According to the classical doctrine, movement of labour and capital between countries was not necessary for bringing about a development towards equalisation of factors, prices and consequently, earnings and income. (Meier, *et al.*, 1976). pointed out that the theory of international trade was largely developed on the abstract assumption of international mobility of factors of production. According to them, a widening of markets strengthened the countries whose manufacturing industries had the external economies were continuously in danger and their small scale industry and handicrafts were out competed by cheap imports from the industrial countries. As a result, wages and exports remained low as the supply of unskilled labour was unlimited. Therefore, they concluded that movement of capital from rich to poor countries had led to a lopsided pattern of

development. Moreover, a regular deterioration in terms of trade of the developing countries implied that there had been an international transfer of income from the poor to the rich countries and that the gains from trade had gone more to the developed countries at the expense of the former, thereby reduced the level of real income and hence the capacity for development.

Singer (1950) like Prebisch (1964) argued that the low income elasticity of demand in the industrial countries for the primary products of developing countries had partly contributed to the secular decline in the prices of primary products in terms of manufacturers.

On the other hand, Caincross and Bieda, (1962) supported the supply deficiency thesis. According to Caincross, higher population growth, low elasticity of output and export, taxes, rather than slowly increasing external demand had caused the lag in the exports of the developing countries. Similarly, Bieda asserted the fact that the volume of exports of many developing countries had remained constant with export unit values risen. It was strong case for the supply deficiency thesis. In short, on the supplyside, the economic policies pursued by the developing countries such as maintenance of an over valued exchange rate, export taxes, import substitution and inadequate allocation of resources were to be blamed for their lagging exports.

There have been analytical studies in the context of Indian economy around whether export can be used as a vehicle of economic growth or not. According to Michaely (1977); Balassa (1978), Tyler (1981) and Cline (1982) export can not only promote growth of national income but also may have scale effects and externalities. Further, Kavoussi (1984) studied the impact of export growth on total factor productivity,

while Balassa (1981) and Chow (1987) explored empirically the relation between export growth and growth of manufacturing industries.

Kantawala (1991) examined the growth of Indian exports (between 1970-71 and 1980-81) of primary commodities and that of manufactured commodities. He also studied the changes in the share of developed, under developed, NIC, OPCC countries and USSR. It was found that the share of miscellaneous manufactured goods, in total exports of manufactured goods to developed countries had increased. There was also an increase in the share of machinery and transport equipment in the total exports of manufactured goods to under developed countries. The exports of miscellaneous goods to developed countries and of machinery and transport equipments to under developed countries showed an up trend. Further the share of developed countries, under developed countries and NIC had declined in total Indian exports between 1970-71 and 1980-81, whereas it increased in the case of OPCC countries and USSR. Whereas the majority of the earlier studies showed either increase in trade among developing countries or between developed and developing countries.

Trade in Engineering Goods

By its pre eminent positive and higher levels of growth in the industrial sector, engineering industry had thrown up surplus enough for an impressive export performance. The volume, value composition and direction of engineering exports in any country can be taken as the barometer of industrial advance. However, studying the emerging patterns of growth, that characterize specific industry categories had gained significance from both theoritical and empirical perspectives. In the developing countries, such analytical studies help to know the pattern of growth that had evolved over the years

in its industrial system. In the present study, an attempt is made to discuss the dimensions of the growth of engineering industries in India to capture the aggregate performance during the period 1975-76 to 1990-1991. If industrialisation is a sine - qua non of economic development, within the industries sector, the engineering industry plays a crucial role in the economic development of a country.

In India, engineering industry is said to have had its origin with an establishment of Railway Workshops during the last century. The engineering industry got encouragement during the World War I (1914-18) and especially during the period of World War II, (1939-45). Most of the machinery used were imported from England, Germany, Japan, United States and other advanced countries. World War II resulted in stoppage of imports of machinery from European Countries and since 1941 also from Japan. These countries were busy with the production of war materials for themselves. Ships could also not be spared for formal commercial purposes. Besides, the demand for Indian Engineering Goods increased from countries like middle East and Far East. All these gave a great stimulus to India's engineering industry .

In order to improve the domestic production of engineering industry, the Government of India passed the Machine Tool Control Order, 1941 and appointed a Machine Tool Controller. His job was to attend to production improvement and import of machinery. He introduced a system of licenses for manufacturing machinery. It was said to be the beginning of modern engineering industry in India.

Industries producing railway wagons, diesel engines, pumpsets, ships, sewing machine tools, chemical products, metallurgical goods etc., came into existence. Engineering industry could be classified into two broad categories (1) Heavy Engineering

industry or capital goods industries such as industrial machinery, electric power machinery, transmission line towers, fabricated steel structures wires and cables, wagons and coaches, machine tools, earth removing equipments etc. and (2) light engineering industry or consumer durable industries which produce auto parts, bicycle parts, hand tools and cutting tools, diesel engine and parts, batteries, typewriters, motor cycles, razor blades, refrigerators, watches, clocks, T.V. radio, tape- recorder etc.,

The Government of India started a big plant namely Hindustan Machine Tool Factory at Jalhalli near Bangalore and it gave a big boost to the engineering industry in India (Ramaswamy, 1991). Most of the heavy engineering industries are established in Public Sector, mostly with technical collaboration with Soviet Union, United States, United Kingdom, West Germany, Italy and others.

The important heavy engineering public sector units are Heavy Electricals (India) Limited and Bharat Heavy Electricals Limited (BHEL). They are engaged in the manufacture of specialised heavy electrical equipments such as power transformers, industrial tractor, motors, equipment for railway electrification, turbo alterations, hydraulic turbines and generators, hydro electric generating sets. The Chithranajan Locomotives Works at Varanasi produces locomotives both diesel and electric models. The Tata Engineering and Locomotive Company at Jamshedpur (a private sector engineering unit) produces meter gauge locomotives and spare parts. The Integrated Coach Factory (ICF) at Perambur (1955) manufactures Passenger Coaches. The Garden Research Workshop in Calcutta and Cochin Shipyard form a part of India's Engineering Complex (Sivaya and Das, 1983).

There was a growing recognition of India's competence and capacity not only in the field of highly sophisticated plants and equipments and consumer durables but also in its capacity to undertake civil and construction works and other consultancy services, (Punj, 1980) which had increased the output of engineering industries in India.

Iron and Steel Industry, a root for the establishment of the engineering industry links primary and consumer goods industries, it provided the basic raw materials. The production of steel in India by the five Integrated Steel Plants namely, Bhilai, Durgapur (West Bengal), Rourkela, Bokara and ISCO had increased tremendously over the years *ie.* the production of crude steel had increased from 6,965 thousand tonnes in 1985-86 to 8,089 thousand tonnes in 1993-94. Similarly, the production of saleable steel had also increased from 6,004 thousand tonnes in 1985-86 to 7,032 thousand tonnes in 1993-94, a growth rate above 15 per cent (Rajkapila *et al.*, 1995).

Therefore, tracing the growth of some important engineering industries such as mechanical and electrical and electronics will throw light on the growing importance of engineering industry in India.

Mechanical Engineering Industries

Output of machine tools increased from a value of Rs.3.0 million in 1950-51 to Rs.10,296 million in 1991-92. Production of consumer durables such as sewing machines increased from 33,000 in 1950-51 to 1,21,000 in 1992-93. According to market survey (1991), the total production of automobiles in 1950 was around 4,000. By 1980, it had grown to around a half a million. By 1989-90, it exceeded the level of two millions. Two wheelers were at the top with a production of 1.75 millions in 1989-90.

Production of cars was put at 1,77,190, commercial vehicles at 97,586, three wheelers at 83,294 and jeeps at 37,803.

In short, automobile industry had grown to such an extent that it reached a position to export motor cars and two wheelers. Kinetic Honda exported 972(000s) vehicles in 1994 followed by LML (Poona) with 315(000s) and Bajaj auto (Poona) with 274 (000s). Escorts(Punjab) took the lead in motor cycle exports with 787(000s) followed by Hero Hond with 677(000s), Bajaj auto with 542(000s) vehicles. Maruti Udyog (Delhi) Limited took the lead in car exports with 17,000(000s) in 1993-94 (Stephen, 1995).

In short, India's export of capital goods had gone up from a paltry sum of one million dollars in 1961-62 to 10 million dollars in 1970-71 and 160 million dollars in 1988-89 *ie.*, a more than hundred fold increase in less than three decades (Dillip, *et al.*, 1990).

Electrical and Electronic Engineering Industries

Among the electrical goods and equipments, the production of electrical fans increased from 0.20 million in 1950-51 to 5.2 million in 1992-93; the number electric lamps increased from 15 million in 1950-51 to 366.3 million in 1992-93, radio receivers from 54 thousand to 245 thousands, aluminum conductors from 1.7 thousand tonnes to 24.1 thousands tonne in 1992-93; power transformers from 0.18 million KVA to 34.1 million KVA and electric motors from 0.10 million hp to 5.4 million hp. There was also a remarkable growth of Indian Software Exports valued at Rs.71 crore in 1987-88 to Rs.700 crore in 1993-94 (Sew, 1995).

In 1992-93, 63.8 per cent of the total engineering exports were electronic goods, computer software 21.0 per cent; industrial machinery 9.1 per cent, complete vehicles 7.6 per cent, aluminum products 5.8 per cent, bicycle and parts 5.5 per cent, managerial and technical services 4.2 per cent, integrated coach engines and compressor 3.8 per cent, auto parts 3.7 per cent and hand cutting and small tools 3.1 per cent (Arora, 1995).

To conclude, engineering goods occupied the most important place in India's exports. In 1960-61 they brought only Rs.10 crores worth of foreign exchange (less than one per cent of the total export) in 1992-93 the exports were valued at about Rs.7,118 crores (*ie.* 12.5 per cent of the total commodity exports), occupying the third position among the country's exports (Dewett *et al.*, 1995). It reflected the changing pattern of the country's exports as a result of industrialisation and also the importance of engineering goods.

Composition of Engineering Exports

During the initial years, engineering exports from India consisted of a few simple items, most of household goods. Subsequently, the composition of engineering exports had undergone a phenomenal change. The items of engineering exports were broadly classified as capital goods, consumer durables, steel and pig-iron based items, non-ferrous products, computer software and consultancy services.

The capital goods such as all kinds of industrial plant and machinery, machine tools, electric power machines, switch gear, transmission line towers, constituted about 39 per cent of total engineering exports. Consumer durables such as auto-parts,

bicycles and parts, sewing machines, storage batteries, diesel engines, air compressors constituted 35 per cent (Sen, 1990).

Export of steel based and non-ferrous items was negligible. A declining trend was also visible in the share of management and technical services from as high as 7.42 per cent in 1982-83 to only 3.7 per cent in 1987-88. The share of electronics and software was fast rising from 19 per cent in 1987-88; 22.2 per cent in 1990-91; 21 per cent in 1992-93 from as low as 5.57 per cent in 1982-83.

However, inspite of the widening of the export range, about 20 items contributed to more than 60 per cent of engineering exports in 1987-88 (Sen, 1995). Based on 1992-93 data, the service items contributed 63.8 per cent of the total engineering exports.

Regionwise Engineering Exports of India

Indian engineering goods are exported to more than a hundred countries. Once upon a time, the markets in the developing countries of Asia and Africa constituted India's major markets. Even in 1960-61, about 91 per cent of India's engineering exports were directed to these developing countries. As against this, in 1988-89, the share of engineering exports to the developing countries had fallen to 44 per cent, and developed countries accounted for 32 per cent. The eastern trading bloc accounted for 24 per cent, this indicated that Indian products were accepted by the developed countries (Chaunilam, 1994).

More specifically, Indian exports to Asia and Africa declined from 96.2 per cent in 1956-57 to 42.6 per cent in 1991-92. On the other hand, engineering exports to

Europe and America, which were less than one per cent in the mid-fifties, accounted for 32.0 per cent in 1992-93. The shift in the directional pattern of Indian engineering exports reflected mainly entrepreneurial ability and several product / capacity adjustments within the country.

Major markets that accounted for 54.8 per cent of the total exports in 1992-93 were: USA (10.2 per cent); Singapore (5.7 per cent); UAE (5.0 per cent); UK (4.8 per cent); Japan (4.1 per cent); Srilanka (4.1 per cent); Germany (3.7 per cent); Nigeria (3.1 per cent); Italy (3.0 per cent); China (2.6 per cent); Thailand (2.2 per cent); Iran (2.1 per cent); Egypt (1.6 per cent); Tanzania (1.3 per cent) and Australia and Ireland (1.3 per cent) (Arora, 1993).

Studies on Engineering Goods Exports

This experience and experiments of India had received attention of several studies in the past. A brief review of these studies is presented below :

According to Punj (1980), in recent years, the export profile of India had undergone a considerable change and in it, export of engineering goods, had a large share. Starting with the nominal export of Rs.5 crores in 1956-57 engineering goods exports took 25 years to reach the targeted figure of Rs.1,000 crores. Recently, engineering industry had emerged as an exporter of projects in the field like sugar mills, cement mills, textile mills, thermal boilers, high tension / extra-tension, transmission lines, etc. Their export performance by major groups between 1956-57 and 1978-79 showed that the per centage contribution of engineering industries to total export of capital goods industries was 10 per cent in 1956-57 and it increased to 38 per cent in 1978-79. The per centage contribution of primarily steel and pig-iron based items and non-ferrous based items to total exports

had declined considerably over 1956-57 to 1978-79. The author had suggested that Indian engineering industries had to adopt their short term and long term strategy in the context of conditions prevailing nationally and internationally.

Sivaya and Das (1983) pointed out that engineering industries were first set up at the beginning of the century mainly to meet the requirements of the railways and public works department, and World War II. It meant stoppage of imports of machinery from European countries and since 1941 also from Japan. These countries were busy with the production of war materials for themselves. Besides, the demand for Indian engineering goods increased in countries of the Middle East and the Far East. All these gave a great stimulus to the engineering industry. As a result, industries producing railway wagons, motor tyres, pumpsets, diesel engines, ships, sewing machines, machine tools, chemical products, metallurgical goods etc. came into existence.

Sandhu and Sodhi (1985) had analysed the production function for engineering goods industries in punjab, estimated the output elasticities with respect to labour and capital, returns of scale and substitution elasticity between labour and capital for two points of time, *Viz*, 1972-73 and 1977-78 in a single survey for 65 units.

To estimate the various elasticity and returns to scale, the authors have experimented with two forms of production function *viz.*, cobb Douglas. (CD) and constant elasticity of substitution (CES) for each and every for the periods 1972-73 and 1977-78 separately.

The study found that the estimate of capital elasticity being greater than labour productivity in the engineering goods industries (except, agricultural implements),

pointed out to the scope for greater use of capital, relative to labour, in these industries. The increasing returns of scale as estimated signified the scope for economies of scale in the engineering goods industries . There were no substantial capital labour substitution possibilities, especially in machine and printing machinery industries which indicated that changing relative factor prices had ranged only a marginal substitution of capital for labour input in these industries.

Monthly commentary(1986) had reviewed the growth and competitive efficiency of India's engineering industry from 1970-71 to 1985-86. The study pointed out that the drastic control of costs or the provision of much higher incentives were essential to recover the competitive quality of Indian engineering industry in practically every field.

Much of the handicaps that weigh on the Indian engineering industry resulted from the failure to control infrastructural costs and administered prices of elements which were very important for the engineering industry. Even upto 1980-81, cash compensatory support and Duty Drawbacks were just sufficient to cover losses in most cases of exports. But since then although cash compensation has risen, costs have risen much more. Therefore, even the latest scheme on cash compensatory support introduced on 1st April, 1986, failed to provide the incentives to the engineering industries to grow.

Basu observed that (1987) engineering industry in India was once the top foreign exchange earners recording growth rates of 30 per cent in the 60's and 25 per cent in the seventies. But it slumped badly in the eighties. Between 1980-81 and 1986-87 engineering exports did grow at a rate of four per cent per annum as against 11 per cent in

total exports. Non availability of steel and non ferrous metals were identified as major constraints for increasing output.

Patil, (1989) explained that engineering industry in India had contributed to exports more than any other industry. It accounted for about 11.9 per cent of the total exports in 1989-90. Though the engineering industry was capital intensive, it provided direct employment to millions of people. Its indirect employment potential was also large. The contribution of the engineering industry to the central and state exchequers by way of taxes and duties was quite substantial. The engineering industry was also the source for the growing pool of expertise and the development of technical man power.

Kaur, (1988) analysed instability of total earnings as well as the earnings from selected export commodities (*ie.* Traditional and non traditional) from 1970-71 to 1979-80, on a two time series basis. The required data for traditional items (Jute, tea and cashew) were collected from government of India, Ministry of commerce and for the non traditional commodities from Engineering Export Promotion Councils (EEPC).

The coppock's instability index had been used in the study. The algebraic from of it is:

$$V \log = \frac{\sum \left[\log \frac{(Y_t + 1)}{Y_t} (-m) \right]^2}{T - 1}$$

The Instability Index (I - I) = $\text{antilog } \sqrt{(V \log - 1)} \times 100$

Y_t = Value of countrys exports in year t

T = the number of years minus 1;

m = the arithmetic mean of the difference between the logs of Y_t and Y_{t+1} , and Y_{t+1} and Y_{t+2} , etc.

V log = the log arithmic variance of the series.

The study found that among the commodities studied, the traditional exports have shown the highest degree of instability followed by non traditional. The commodity wise details also revealed that instability was caused by fluctuations both in export prices and the volume of exported.

The growth trend in Engineering Exports during the last two decades had been studied by Ken, (1990). The study found that about 20 items contributed to more than 60 per cent of engineering export. The cargo handling cost, huge sheltered domestic market, severe competition from the newly industrialised countries such as South Korea, Taiwan were some of the factors related to problems in exporting engineering products.

Sen, (1990) observed that engineering industry in India was more than eight decades old, had picked up momentum during the fifties and sixties when it recorded a compound annual growth rate of 14.9 per cent and 7.9 per cent respectively. The author explained the importance of engineering goods in terms of its share in India's GDP, the local investment, value added, employment and exports. According to him, India's share in the world export of engineering goods was hardly 0.3 per cent in 1990.

Regionwise Indian engineering export to Asia and Africa declined from 44 per cent in 1970-71 to 29.8 per cent and in 87-88 to 11.4 per cent in 90-91 respectively. Europe constituted India's dominant trading partner in engineering products. Its share went up from one per cent in 1970-71 to 3.8 per cent in 1987-88, that to America rose from 4.6 per cent in 1970-71 to 11 per cent in 1987-88. The author has also pointed out some of the problems of Engineering Exports.

There was a huge sheltered domestic market where quality norms are not enough, but prices were lucrative so overseas markets were given only secondary importance. Moreover, engineering industries suffered from a plethora of problems such as raw materials uncertainty in supply and infrastructural deficiency and irregular power supply etc. Quality of engineering goods suffered from backward and outdated technology. Severe competition from the newly industrialised countries such as South Korea, Taiwan, China and Brazil was another constraint. The Eastern region which in the mid-fifties pioneered and accounted for two thirds of the engineering exports today accounted for 16 to 17 per cent only.

Singh, (1990) analysed the different facets of the growth and structure of bicycle industry, such as growth performance, market concentration ancillarisation, import of cycle and cycle parts into India from 1951 to 1987. The study found that various factors such as market concentration, size of the firm, technological opportunity, level of diversification, lack of research, barrier to entry and few government policies had hampered the growth of R&D in the industry.

Bhargava, (1991) studied the growth of automobiles industry in India. In 1989, eight states in India viz. Gujarat, Maharashtra, Delhi, West Bengal, Tamil Nadu, Uttar Pradesh, Kerala and Karnataka possessed nearly 80 per cent of cars. The compound growth showed that Tamil Nadu witnessed the highest growth of 38 per cent over 1987 followed by Kerala and Delhi with 37 per cent and 34 per cent growth respectively. While analysing the performance of select cars viz. Hindustan Motors, Premier Automobiles, Maruti Udyog, Standard Motors in terms of production and sales he pointed out that in World car industry, the share of India was a low of 0.5 per cent in 1988-89, which was less

than that of Taiwan, Yugoslavia and Korean republic; whereas Japan, USA including Canada, West Germany and France contributed 68.4 per cent.

Bhasin, (1991) found that on an average, during the last four years (1987-88 to 1990-91), the contribution of engineering exports to National Export was about eight per cent. The mode of exports included direct export of commodities and manufactured products, and also indirect export of engineering technology through consultancy, civil construction and turn key projects and setting up joint ventures abroad.

According to Jaspal, (1991) the unprecedented trade policy reforms brought about a new dynamism in the engineering sector. The growth in the export in the first half of the current year in itself was a complement to the Government for such a radical change. A general review of the performance during the first half of the current year revealed that there had been a regular positive growth in export.

According to Ramaswamy, (1991) inspite of its importance, engineering industry was in critical position till about 1951-52. Due to the Korean war, it staged a remarkable recovery. The Government of India started a big plant namely Hindustan Machine Tool Factory at Bangalore, that gave a big boost to several engineering industries in India.

Ahluwalia, (1992) while measuring productivity and growth in Indian manufacturing pointed out that for the first half of the eighties, export performance was poor. It was not until 1987-88 that exports began to move up. The three years from 1987-88 to 1989-90 witnessed export growth of 19 per cent in dollar terms per annum which was twice the rate of growth in the preceding five years. Bhasin, (1992), pointed

widening bilateral trade deficit with Iran might be bridged to a reasonable extent by increasing exports of engineering goods to the Iranian market.

A study by the Financial Express Bureau, (1992) showed that in 1990-91 non-traditional exports, valued at Rs.16,596 crores, accounted for a little more than 51 per cent of the country's total export earnings. According to a study (1992) undertaken by the confederation of Indian Industry, during the two decades, the country's share in both total exports and engineering exports declined from 0.6 per cent in the early seventies, to 0.3 per cent 20 years latter. Thus, India had not kept pace with the growth of world exports. Regarding region-wise export, the study pointed out that, Europe continued to be the main stay of engineering exports. *ie.*, 36 per cent (Rs.1,395 crores) of India's products. Other main markets for Indian Engineering goods were Asia, America, Africa and Australia. The Indian exports to the above regions had registered a sharp decline from about 44 per cent to just 27 per cent, during the two decades.

Khurshid, (1992) underlined the need for quality and aggressive marketing in context of global competition not only from the developed nations but also from exporters of the newly industrialised countries. The importance of quality and price were emphasized.

Kumar, (1992) opined that measures like 100 per cent convertibility of export earnings at market rates, improvement of infrastructure, duty-free and greater financial support for the Engineering Export Promotion Council (EEPC) for promotional activities could greatly increase exports of engineering goods from India.

Miranda, (1992) reviewed the export performance of several goods such as electrical lamps, electric fans, radio receivers, storage batteries, dry cells, domestic refrigerators and concluded it was a sad story in the case of many products except a few like storage batteries, dry cells and domestic refrigerators which had recorded an increase in output from 1971 to 1988. Regarding the performance of light mechanical engineering industries, the output of Hurricane - lanterns had steadily decreased over the years 1971 to 1987, whereas the production of typewriters had steadily increased except for a few years where there was a decrease in production over the previous year.

The output of bicycles recorded a lower increase of 9.1 per cent during 1987-88 compared with 10.2 per cent in the last year, on account of poor performance of two companies. The production of sewing machines and wrist watches recorded a decline. With regard to the production of Razor, there was always a positive growth over the time. Rationalisation of licensing policy, removal of upper limit for capacity and upgradation of technology enabled the electronics industry to perform well in the recent years.

The growth of the tertiary sector, rural prosperity and demonstration effect, employment of women, urbanisation and modernisation, were the factors responsible for the remarkable performance and growth of electrical, electronics and light mechanical engineering industries in India. There could be better performance if some of the basic problems such as the procedural delays, devaluation, high tariffs on imports, lack of infrastructural facilities, unfair competition were solved.

The engineering industry created the demand push for infrastructure. The engineering industry also manufactured railway wagons, heavy commercial vehicles, and ships which were essential for improvement of infrastructural facilities. Metals and

Machines provided not only the foundation of modern industrial civilization, but also the pillars up which the present day industrial structure was built up. Thus, the study found a close linkage between the overall growth in industrial outputs and that of the engineering industry in India.

Pradhumma, (1992) argued that the substantial increasing deficit in India's balance of trade and the sharp decline in her foreign exchange reserves were the pointers to the urgency for stepping up the export, for the sustained economic development of the country. He pointed out that engineering goods had recently emerged as a significant ingredient of Indian export mix with huge export potential. He indicated that the automobile sector was the largest exporter of consumer durables. With the increase in the vehicle number on roads and day to day technical innovation, there was an immense potential for export of automobile parts. USA, Canada, Belgium - Luxemburg - Germany, UK, France, Italy, Spain, Netherlands and Sweden were the major importing countries of motor vehicle components in the world. India's share in the world export of auto-component was just 0.06 per cent. In the export of the engine parts electrical parts, suspension and breaking parts were good earners; while drive transmission and steering parts did not do well. The study indicated the major hurdles were the bureucracts control, poor quality of goods, low productivity, inadequate transportations and communication facilities and the large domestic protected market.

The study further pointed out that the majority of Indian manufacturers were not quality conscious, their exposure to export market were insufficient; complicated and tedious paper-work were another reasons for them showing little interest in exporting their products. The performance of auto-parts was erratic; however the share with respect

to the overall exports of engineering goods was five per cent which remained unchanged over the past decade. The short comings in the export of autoparts were: the high industrial cost, transportation cost, lending rate, inadequate production base, technology gap, poor presentation. There was the need for a shift towards export of value added items rather than material exports. On the one hand, the study recommended production of quality goods through quality circles, increased productivity through inculcating a culture of human labour as a resource. On the other hand, Government should act as a catalyst to facilitate trade by liberalising its trade policy.

According to Mavani, (1994) the excise duty adversely affected over 4,000 units including foundaries, and ancillaries and agricultural diesel pumpsets; despite exemption granted to units with Rs.30 lakhs orders of turn over.

An estimate by Industrial Economist, (1994) showed that the output of global electronics reached \$ 700 billion in 1990 and was expected to reach \$ 1.3 billion by 2000 AD. In comparison, the Indian electronics industry reached an output level of a little over \$ 4.1 billion (about Rs.1,32,000 million) in 1993, representing roughly 0.8 per cent of the global production of electronics industry.

The computer industry recorded a 13.4 per cent growth in 1993. Production of mini/micro system increased from 92,000 numbers in 1992 to 1,10,000 in 1993. There was a significant growth in the production of telecom equipments; particularly in electronic switching system, TAX, PABX and transmission equipments. There were over 1000 units in the country manufacturing a wide variety of components, which increased from Rs. 2,150 crore in 1992 to Rs.2,550 crore in 1993. The soft ^{ware} market had grown from Rs.225 crore in 1985-86 to about Rs.1,250 crore in 1993. The direct

employment in electronics industry increased from 1.30 lakh in 1981 to about 3 lakh in 1993. The study drew attention to the guiding principles such as selectivity, infrastructure, focus and linkage adopted by Taiwan, Singapore, Hongkong and Korea and stressed the need for India to increase its investments in this sector so as to make a bigway for modernisation.

Singh, (1994) analysed the recent trends in the exports of engineering goods from India and the annual growth rate during the past few years. In the changed context of economic liberalisation, exposure of Indian industries to greater competition with free import of technology and lowering of customs duty, the maintenance of buoyancy in engineering exports called for dynamic marketing strategy. He pointed out that engineering exports started exhibiting dynamism with the annual growth rate much higher than the overall export growth rate. This revealed the fact that the share of engineering goods in total exports, which was less than 10 per cent till 1989-90, rose to 10.8 per cent in 1990-91, 11.4 per cent in 1991-92 and further 12.7 per cent in 1992-93. He pointed out that the value of export had nearly doubled between 1990-91 and 1992-93 to a record of Rs. 6,780 crores.

Singh, (1994) analysed the 'Government Procurement and Technological capability of Indian Electrical Equipment Industry'. Twenty nine companies engaged in the manufacture of generation and transmission equipments accounted for nearly 90 per cent of the output of the organized private sector. Exports were negligible by the power equipment manufactures in general and the sample companies in particular.

The study concluded that the emphasis in government procurement on cost effectiveness, reliability and fewer number of 'packages' for a given project were common

features of the power projects in most of the countries. For developing countries, they also represented relevant considerations in the effort to acquire greater technological capability in the capital goods sector.

The association of cost minimisation, quality, vertical integration and modernisation of works with firm's performance brought out the role of government policy in promoting technological capability of firms that manufactured power and transmission equipments in India. There was a negative and significant relationship between cost-to-sales and performance and a positive significant relationship of raw material expenses, vertical integration and modernisation of works with performance.

Venkatachalam, (1994) showed that India's exports of engineering goods recorded a notable increase in recent years. According to him, the Western Region had emerged as the mainstay of engineering goods exports, comprising not only of traditional items like steel, pig iron and items based on non-ferrous metals but also capital goods, turnkey projects, consumer durables as well as technical and management consultancy exports. He further stated that the share of the western region in total engineering exports was around 40 per cent.

According to Vijayaraghavan, (1994) the contribution of engineering industry to the economy was immense as it employed about 2.37 million persons. Its

weight in the index of industrial production was 30.4 and it accounted for over 30 per cent of total of industrial output in India. The growth of this industry has been helped by assimilation of technology and spate of collaborations. Nearly, 39 per cent of India's engineering exports come from the capital goods sector, followed by consumer durables with a share of 31 per cent in 1990-91. Keeping with the requirements of the home industry which was arguably the largest in the world in terms of installed spindleage, the textile machinery industry had geared itself to meet the demand which had grown from Rs.10 crores in the 50s to well over Rs. 500 crores in 1990-91. It also exports over 20 per cent of its production annually.

D'costa *et al.*, (1995) analysed the growth of automobile industry in India. According to them, the new economic policy had created a conducive climate for the automobile industry to grow and export motor cars and two wheelers of the Indian automobile.

According to a Market Survey, (1995) the automobile industry in India was a victim of lack of coherent National Policy. Automobile manufacturing started in the country in the late 1940's when Brazil and South Korea had no automobile industry and Japan's car industry was only marginally larger than India's. Yet, India's car production in 1992-93 was barely a quarter of Brazil's, a tenth of South Korea's and one sixth of Japan.

The survey showed that automobile industry provided direct employment to 20,000 families and indirect employment to 10 million families, provided revenue to the Government to the tune of Rs.166,150 million. The year 1993-94 was the turning point when sales increased to 2.3 million at Rs.1,30,060 million. In short, the automobile

industry was making satisfactory progress on all important fronts which bridged the technological gaps. Further, the six foreign tie ups viz., i) DCM Daewoo; ii) Sipani Rover; iii) Hindustan Motors - General Motors; iv) Mahindra - Ford; v) Tata Daimler Benz and vi) Premier Automobiles Ltd. Peugeot led to redesigning engines and vehicles.

A high penetration of two wheelers in the market *ie.* one in twenty men in the age group of over 16 year had a two wheeler which showed an increase of production of two wheelers from 1,08,576 units in 1970-71 to 16,053,366 units in 1991-92.

Foreign collaboration had helped the two wheelers segment to make rapid progress in the 1980's. Despite of an increase in total sales of scooters in India, the tax burden on the automobile industry continues to be on the high side. At present, two wheelers attracted excise duty at 15 per cent. The industry pleaded for significant cut in these duties. The industry had brought into effect 22 safety standards. The main features of the new production - systems were a) the low emission vehicles by 2001 AD. b) automation c) Indexing and bench making d) simultaneous engineering e) increasingly greater use of Flexible Machining System (FMS) and transfer lines which were expected to build up a socially sensitive, economically strong and intensely competitive automobile industry.

Satya, (1995) showed that the Machine tool industry in India with an annual turn over of about Rs.8,000 million, provided employment both directly and indirectly to more than 50,000 persons. It was estimated that by 2000 AD, the Machine tool consumption would reach the value of Rs. 40 billion, particularly for the computerised numerically controlled machines (CNC).

According to him, the factors which attributed to poor performance on the export front were; a) growing domestic demand; b) cost dis-advantage because of high import cost; c) inadequate marketing promotion facilities abroad; d) the partially inverted duty structure which had a lower import duty on full machines and higher duty on critical components etc.

Roopa, (1996) examined the trends in India's exports and imports; estimated the marginal and average propensities to exports and the elasticities of demand for exports and imports during the last four decades. Trends in exports and imports were estimated by using the following linear equation.

$$(1) \quad E = a + bt + e_1$$

$$(2) \quad I = c + bt + e_2$$

where

E = Export

I = Import

t = Time in Years 1,2,.....,T

a, b, c, d are parameters to be estimated. e_1 and e_2 are error terms.

Marginal and average propensities for the export and import were estimated from the following linear equations.

$$(3) \quad E = \alpha_0 + \alpha_1 y + e_3$$

$$(4) \quad I = \beta_0 + \beta_1 y + e_4$$

where,

y = net national product at factor cost

E and I are as defined above

e_3 and e_4 are error terms.

$\alpha_0, \alpha_1, \beta_0, \beta_1$ are propensity to be estimated

The analysis showed that India's exports and imports showed statistically significant increasing trend during the last four decades. The linear regression result showed that the regression coefficient was not only positive but also significant at 1 per cent level. The income elasticity of demand for export was 2.80 indicated that one per cent increase in national income led to more than two per cent increase in export during 1967-1990.

An over view

Above reviews have brought to focus the importance of trade for economic development of any country. Particularly for the developing countries in the Third world. Trade enables growth, diversification of production, and brings technical know how and sophisticated machineries and equipments by import. All these help not only modernisation and industrialisation of the economy but also a change in attitude of the people for a progressive development. India is no exception. Fortunately, the planners in India had recognised the need and placed high priority for industrialization, but equally important emphasis on trade was absent. A period of export pessimism, and import substitution policy was not very favourable for the foreign trade and balance of payment crisis appeared frequently and at times seriously. Then the country realised the need for a revolutionary change. The New Economic Reform Policy (NERP) of 1990 and its thrust on export led growth are recent, but mark a definite break with the past. To her advantage, changes in the international trade scenario had also become favourable for free trade with GATT, Dunkel Draft, and W.T.O.

Therefore, in the years to come, export will be a major contribution to the growth of Indian economy. A review of the past experience clearly showed that primary

agricultural products (traditional goods) have a clear cost advantage for the country in the international trade. However, the prospect of export of non-traditional goods is also good as witnessed in the uptrend in export of these goods, since the mid-eighties. Among the non-traditional goods, engineering goods are the most important. They included heavy engineering goods (earth mover, boilers, transformers and the like), electronic goods, computer software and construction services. Therefore, a study of the export performance of the engineering goods and their constraints will be useful to identify policy options to be used for sustainable development of the engineering goods industry-for their high technological input, and high value addition. This need is met by this study.

CHAPTER III

METHODOLOGY

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METHODOLOGY

This study on export performance of Indian engineering goods industry used both secondary data on macro variables and primary data for a few select engineering goods. The sources of data, method of collection of primary data, tools of analysis used and other details of methodology are presented in this chapter.

Selection of the problem

The engineering industry which included heavy and light mechanical engineering industries and heavy and light electrical engineering industries produce capital goods such as power transformers, automobiles, diesel engines, railway wagons, machine tools, electric motors etc. Besides these capital goods, this industry produces also durable consumer goods such as typewriters, bicycles, sewing machines, razor blades, radio receivers, electric fans, refrigerators etc. The metals and machines not only provide the foundation of modern industrial civilization, but also the pillars on which the present day industrial edifice is built; it is evident from a close linkage between the overall growth in industrial output and that of engineering industry in India. Industrial production increased by 6.6 percent per annum in Second Five Year Plan to 8.2 percent per annum in 1994-95. It was accompanied by an increase in production of engineering goods from 8.7 percent in Second Five Year Plan to 11.3 percent in 1994-95. (EEPC, 1995).

The engineering industry accounts for 32.2 percent of number of units of all industry, 36 per cent of value added, 31 percent of gross value of output; and 30 per cent of investment. In the total Research & Development (R & D) expenditure of all

the industries, engineering industry shared 66 percent; it employed over 25 lakh persons (Arora, 1993).

Though there was an increase in engineering production, the increase was not steady. The overall growth rate of engineering industries in India in the past forty five years was fluctuating and the industrial take-off was still incomplete.

Therefore, an attempt is made in this study to analyse the performance of a group of engineering industries and they belong to the factory sector. Among factory sector industries in India, the industries belonging to engineering group are basic metals (code 33); metal products (code 34); non electrical machinery (code 35); electrical machinery (code 36); transport equipment (code 37); and other industries (code 38).

Selection of Industries:

Out of the industries in the group (33-38) as given in the annual survey of industries (ASI), 15 industries were purposely chosen on the basis of the continuity in the export from 1975-76 onwards. (The 15 identified industries had industry classification code numbers of 343, 350, 351, 354, 357, 358, 360, 361, 362, 364, 370, 372, 375, 376 and 380) based on the details of item wise export provided by the export engineering promotion council, (EEPC), Calcutta. These industries were grouped by Standard Industries Committee on the basis of their products and production. The details of the selected industries group with their products and code numbers are given in Appendix-I. For them secondary data were collected and analysed.

Sources of Secondary Data

The sources of secondary data for the present study were many. The information on number of factories, fixed capital, working capital, number of workers, total emoluments, fuels consumed, materials used, total output, value of output, depreciation, net value added, production, and export were collected from the following sources.

1. Annual Survey of Industries (ASI), central statistical wing, summary results, factory sector, various issues from (1975-76 to 1990-91).
2. Directorate General Commercial Intelligence and statistics, Calcutta.
3. Export records maintained by Engineering Export Promotion Council, EEPC. Head Office, Calcutta for the period 1975-76 to 1985-86
4. The details of export for the remaining period 1985-86 to 1990-91 were provided from the records of EEPC, Zonal Office, Chennai.
5. Electronics and computer software export promotion council, New Delhi.
6. Economic survey (various issues) Ministry of Finance, Economic Division, Government of India.
7. India (various issues) Ministry of Information and Broad Casting, New Delhi.
8. Regional level of engineering export industries particularly at Coimbatore district, records maintained by EEPC, Chennai.
9. Details on engineering production at Coimbatore collected from the records maintained by EEPC, Chennai.

10. Details on industrial output, engineering output during the Plan period at National level, collected from the statistical year book, published by confederation of Indian Industries (CII), Chennai, 1990-91.
11. Details on structure of Indian exports and imports were collected from Reserve Bank of India, Bulletin and Report on currency and finance, Bombay.
12. Details on gross national product and its sectoral pattern, net national product, per capita national product, at current and constant prices (1980-81) were collected from the various issues of Economic Survey, Government of India, New Delhi.

With a view to understanding the problems of engineering goods industries, a list consisting of the industries in Tamil Nadu was obtained from EEPC, Zonal Office, Chennai. From the group, 62 firms located in Coimbatore district were selected for the study. The details of the selected industries are given in Appendix- II. The exporters of engineering goods industries in Coimbatore district were classified into four broad groups as follows:

- (a) Merchant Exporter (EM); who individually exports the engineering goods abroad
- (b) small scale industrial units (SSI), were those with total investment on plant and machinery between Rs. 60 lakhs and one crore rupees.
- (c) medium and large scale manufacture (MLS) ^{Don't} where the investment on plant and machinery was in the range of Rs. one crore to Rs. five crores
- (d) export houses (EH) had investment on Plant and Machinery to the value of Rs. five crores and above.

Primary Data

The Primary data for the study of these selected engineering goods industries were collected and analysed to understand the problems faced by the engineering industries as a group as listed by A. S. I. A structured schedule was administered to collect information about the problems of the industry vide Appendix-III.

A pilot study was conducted at the initial stage of the study to find out the extent of response from industries. The schedule was modified to accommodate more details of the problems faced by the industries in exporting their products to meet the competitive challenges from abroad.

Period of Study:

The reference period of the study was 1975-76 to 1990-91. The choice of this period (16 years) was governed by the following considerations. The period covered all the major political changes, viz , short term Janata regime in 1978 and set back to it in 1984. The Congress government and emergency rule between 1975 and 1978 and second Congress rule from 1984 to 1988, the Janata dal rule for 1989 and 1990 and again, the Congress rule in 1990. All these changes had an impact on industrial growth. Further, industrial deceleration of the late sixties had thrown a challenge to the industrial growth during the seventies and the eighties. The early seventies was characterised as the period of industrial recovery and late seventies and early eighties had become a crucial period particularly because of oil crisis in the world and economic recession faced by all the nations of the world which affected Indian industrial growth too. All these changes paved the way for the introduction of New Economic Policy

(NEP) by 1991. In other words, India which was essentially a mixed economy with a larger proportion of capital stock in the private sector, came under interventionist regime with controls, licenses, numerous regulations and a philosophy of Public Sector Management of infrastructural and other enterprises. In due course, India witnessed sluggishness and bureaucratic slow down and experienced parallel economies with generation of black money; drying up of resources, huge budgetary deficits and a balance of payments crisis. Although the policies of privatisation and globalisation were introduced by late Prime Minister Shri Rajiv Gandhi, in 1985, these policies found practical application only from 1991. It marked a shift from primacy of public sector enterprises to private firms, from price and quantity controls to demand based supplies and prices; in essence from diktat to the market forces. Thus the period 1975-76 to 1990-91 marked a critical phase in the industrial development of the country in general and of engineering goods industries in particular. Hence the choice of the period for this study.

Tools of Analysis

The first objective of the study paid attention to the trends in GNP, total exports and export of engineering goods. The third objective was to know the growth of export of selected engineering goods. For the purpose a linear trend equation of the following form was used.

$$Y_i = a + bt + u$$

Where Y_i is the variable i studied i. e GNP, total exports, aggregate engineering goods exports, export of selected engineering goods.

t = Trend variable for $t = 1, 2, \dots, 15$, $t = 0$ being 1975-76

u = Error term

a, b were parameters to be estimated with the expectations $a > 0, b > 0$

The trend equations were estimated by ordinary least squares method.

The same time series data were used to study cyclical variations and instability in export of engineering goods - aggregate and also select goods. Five year moving average method was used to study the cyclical variations. Coppock's Instability index and Cuddy and Valle instability index are found suitable to measure inter year variations in a time series. A choice between them was not clear so both the measures were used. First logarithmic variance is obtained as

$$V \log = \frac{\sum \left[\log \left(\frac{Y_t + 1}{Y_t} \right) (-m) \right]^2}{T - 1}$$

Where $t = 1, 2, \dots$

$T = 15$

$V \log$ = Logarithmic variance of the ^{series}

Y_t is the value of export of engineering goods in year t

for $t = 1, 2, \dots, T$

m = arithmetic mean of the differences between Y_t and Y_{t-1}

Then the instability index I_x is calculated as

$$I_c = (\text{Antilog } \sqrt{V \log - 1}) \times 100$$

Cuddy and valle index was defined as

$$I_x = CV \sqrt{1 - R^2}$$

Where, CV = is coefficient of variation of time series data

R^2 = is the coefficient of multiple determination of the trend equation, adjusted for the degrees of freedom.

The suggestion is to fit both linear and log-log trend equations and to use one R^2 of the better fit. If R^2 is not statistically significant, it is taken not to be different from zero and then CV is the best measure of instability. The exercise is carried out in this study. Agreement of values of the two instability indices I_c and I_x is a source of confidence in the value of the estimates. It is evaluated.

These indices were estimated for quantity value and unit value of engineering goods exports to know the relative importance of quantity exported and value realised the latter being influenced by the administered exchange rate that prevailed during the period of study.

The growth of real GDP is taken as a measure of economic growth Y . On the basis of the conventional production function framework, the following general (aggregate) production function was specified.

$$Y = f(L, K, X, A, M) \dots\dots\dots (1)$$

Where

Y = real GDP in Rs. Crores (1980-81 prices)

L = Labour input

K = Capital input

X = Total export

A = Agricultural Production

M = Manufacture

Taking total differential and rearranging the terms the following growth equation was derived.

$$\dot{Y} = a + b\dot{L} + C \left(\frac{I}{Y} \right) + d\dot{X} + e\dot{A} + g\dot{M} + u \dots\dots (2)$$

Where a dot over a variable indicates its rate of growth and I/Y is investment/output ratio and a and u are regression constant and error term respectively.

The rate of growth of real GDP is $\dot{Y}$. Rate of growth of population is taken as a proxy for growth of labour force, investment / output ratio is computed from constant price series. Constant price data were used to measure annual growth rates of exports ($\dot{X}$), agricultural production ($\dot{A}$) and manufacture ($\dot{M}$). Data for the study period are presented in Appendix-IV for the years 1975-76 to 1990-91.

By another equation the relationship between total exports and engineering goods exports was studied.

$$\text{Log (AEX)} = B_0 + B_1 \log (\text{EEX}) + e. \dots \dots (3)$$

Where

AEX = Aggregate export

EEX = Engineering goods export

B_0, B_1, B_2 are parameters to be estimated and e the stochastic error term. The two equations (2 & 3) are related through aggregate export denoted by X in 2 and AEX in 3, *ie.*, $\text{AEX} = X$. To take care of this condition, the equation 3 was first estimated and the estimated values of AEX were used for X in the equation 2 and it was estimated, next. Alternatively equations 2 and 3 could be taken to constitute a system of simultaneous equations and estimated by the two stage least squares method.

Estimated equations were evaluated first for their validity to draw inferences with the help of the value of the coefficient of multiple determination (R^2); its statistical significances (F test) and the sign of the regression coefficients *visa-vis* the a priori expectation of them. Regression coefficients themselves were evaluated with the help of student's 't' test. All statistical tests were carried out for five percent and one percent levels of significance. Problems of heteroskedasticity auto-regressive errors and multi-collinearity were attended to, but they posed no serious problem in this study.

Simple tabular analysis and ranking technique were used to study regional variations in export of engineering goods. Problems and remedies for them were studied with the help of frequency distribution of problems / remedies stated by the respondents selected for primary data.

Concepts and definitions:

The operational definition of the concepts used in the study are the same as given in the Annual Survey of Industries (ASI) of the Government of India as:

Reference Year: For ASI, the accounting year was from 1st April to 31st March next. Alternatively it was referred to as the financial year ending March. For example financial year ending March '86 referred to the period from April 1, 1985 to March 31, '86.

Registered factory: was one registered under sections 2 m(i) and 2 m (ii) of the Factories Act 1948. The section 2 m (i) and 2 m (ii) referred to any premises where ten or more workers are employed or were working on any day of the preceding 12 months and in any part of which manufacturing process was being carried on with the aid of power or was ordinarily so carried on or wherein 20 or more workers are working or were working on any day of the preceding 12 months and in any part of which a manufacturing process was being carried on without the aid of power, or was ordinarily so carried on.

Gross output was defined to include the ex factory value of products and by-products manufactured during the accounting year. It also included the receipt for non-industrial services rendered to others, the receipt for work done for others on materials supplied by them, value of electricity sold and net balance of goods sold in the same condition as purchased. The terms: gross output, value of output and total output were used in the text interchangeably to mean the same thing.

Fixed capital represented the depreciated value of fixed assets owned by the factory as on the closing day of the accounting year. Fixed assets were those which had normal productive life of more than one year. Fixed capital covered all types of assets, new or used, or own or constructed, deployed for production, transportation living or recreational facilities, hospitals, schools etc, for factory personnel. It included the fixed assets of the head office allocable to the factory and also the full value of assets taken on hire purchase basis. (whether fully paid or not) but excluded interest element. It excluded intangible assets and assets solely used for post manufacturing activities such as sale, storage, distribution and so on.

Working capital: was the sum total of the physical working capital and the cash deposits on hand and at bank and the net balance of amounts received over amounts payable at the end of the accounting year. Working capital, however excluded unused overdraft facility, fixed deposits irrespective of duration, advances for acquisition of fixed assets, long term loans including interest thereon.

Total persons engaged: related to all persons engaged by the factory whether for wages or not, in work connected directly or indirectly with the manufacturing process and included all administrative, technical, clerical staff as also labour engaged in production of capital assets for factory's own use. This was inclusive of persons holding supervisory or managerial positions or engaged in administrative office, store keeping section and welfare section, watch and ward staff, sales department and also those engaged in the purchase of raw materials etc., and the production of fixed assets for the factory. It also included all working proprietors and their family members who were actively engaged in the working of the factory even without any pay and the unpaid

members of the co-operative societies who worked for the factory in any direct and productive capacity.

The number of workers or employees was an average number obtained by dividing man days worked by the number of days the factory had worked during the reference year. In case of factories, where only repair, maintenance or construction activity was carried on the average was calculated by dividing the man days worked by the number of days on which repair and maintenance/construction work was carried on.

Total emoluments were the sum of all remunerations paid to all employees plus imputed value of non-monetary benefits, in money terms.

Fuel consumed: represented total purchase value of all items of fuel, lubricants, electricity, water etc., consumed* by the factory during the accounting year except those which directly entered into products as materials consumed. It excluded that part of fuels which was produced and consumed by the factory in manufacture i.e., all intermediate products and also fuels consumed by the employees as part of amenities. It included quantities acquired and consumed from allied concerns, their book value being taken as their purchase value and also the quantities consumed in production of machinery or other capital items for factory's own use.

(Note: In summary reports published for 1973-74 to 1979-80 total persons engaged was termed as employees)

Material consumed represented the total delivered value of all items of raw materials, components, chemicals, packing materials and stores which actually entered into the production process of the factory during the accounting year. Also included the cost of all materials used in the production of fixed assets including construction of work for factories own use. It, however, excluded all intermediate products consumed during the accounting year.

Total inputs comprised gross value of fuels, materials etc. consumed (as defined above) and also other inputs viz. , (a) cost of non industrial services received from others, (b) cost of materials consumed for repair and maintenance of factories fixed assets including cost of work done by others to the factories fixed assets; (c) cost of contract and commission work done by others on materials supplied by the factory; (d) cost of supplies and products reported for sale during last year and used for further manufacture during the accounting year and (e) purchase value of goods sold in the same condition as purchased.

Net value added was the increment to the value of goods and services that was contributed by the factory and was obtained by deducting the value of total inputs and depreciation from value of output.

* the word consumed is used in the macrosense of 'used up'. It does not mean use for personal satisfaction. In fact they are factors used in production

Net income represented the factory shares of employees and entrepreneur in the value added and was obtained by deducting the rent paid and interest paid from net value added.

Depreciation was consumption of fixed capital due to wear and tear and obsolescence during the accounting year and was taken as provided by the factory owner or was estimated on the basis of cost of installation and working life of the fixed assets.

Gross Domestic Product (G.D.P.)

Gross Domestic Product is the money value of final goods and services produced in the domestic territory of a country during an accounting year. In other words, Gross Domestic Product is the income generated by the factors of production during a year within the country from its own resources. It does not include the income earned from abroad through foreign trade sector.

Net Domestic Product (N.D.P.)

Net domestic product is the sum total of money value of all final goods and services produced in the country in a year excluding depreciation cost.

$$\text{Net domestic Product} = \text{Gross Domestic Product} - \text{Depreciation}$$

Gross National Product (G.N.P.)

Gross National Product or Gross National Income is the total measure of the flow of goods and services at market value resulting from current production during a year in a country including net factor income from abroad.

$$\text{G.N.P.} = \text{G.D.P.} + \text{Net factor income from abroad}$$

Net National Product

The Net National Product is the sum total of money value of final goods and services produced in an economy in a year excluding depreciation cost and including net factor income from abroad.

$$\text{Net National Product} = \text{Gross National Product} - \text{Depreciation}$$

Per Capita Income

Per Capita Income refers to the average annual income of the people of a country. It is derived by dividing the National Income by the population.

$$\text{Per Capita Income} = \frac{\text{National Income}}{\text{Population}}$$

All the above macro variables were measured in both market prices and factor cost and also in current and constant (1980-81 prices). Values measured in current market prices are called nominal values; while the values at factor cost at constant prices (1980-81 prices) were called real values.

Then, real value of Net National Product is called National Income while that of per capita income is called per capita real income.

Real NNP per capita is denoted by 'y' and its annual rate of growth ($\frac{dy}{dt}$ or $\frac{\dot{y}}{y}$) is taken as a measure of economic growth.

$$\frac{\dot{y}}{y} = \frac{\frac{dy}{dt}}{y} = \text{which shows the percentage growth per annum}$$

Other models used for estimating production elasticities of capital and labour and technological progress would be discussed in the next chapters for the sake of convenience.

CHAPTER IV

RESULTS AND DISCUSSION

CHAPTER - IV

RESULTS AND DISCUSSION

The performance of engineering industries in India in export during the period from 1976 to 1991* was the subject of this study. It was analysed for growth pattern, instability, contribution to the economic growth of the country and productivity. The results of analysis are presented in this chapter and discussed with reference to the objectives set out in the first chapter. The growth of the economy and industries is discussed first.

Macro Variables

National Income or Gross National Product (GNP) and its sectoral pattern mirrors the macro flow of goods and services and the economic structure of the economy. The Net National Product (NNP) per capita is the measure of economic growth of the economy. Their values for selected years are presented in Table 2

Table:2. Gross and Net National Products of India

Years	Gross National product at factor cost (Rs. crore)		Net National Product at factor cost (Rs. crore)		Per capita Net National Product(Rs)	
	At Current Prices	At 1980- 81 Prices	At Current Prices	At 1980- 81 Prices	At Current Prices	At 1980- 81 Prices
1	2	3	4	5	6	7
1950-51	8, 938	42, 644	8,575	40,454	238.8	1,126.9
1960-61	15,182	62,532	14,242	58,602	328.2	1,350.3
1970-71	39,424	89,465	36,503	82,211	674.7	1,519.6
1980-81	1,22,772	1,22,772	1,10,685	1,10,685	1,630.1	1,630.1
1990-91	4,70,269	2,08,481	4,18,074	1,86,446	4,983.0	2,222.2
1994-95	8,39,504	2,45,603	7,44,883	2,17,041	8,237.4	2,400.9

Source: Economic Survey, 1995-96, pp.S3-S4.

* Here 1976 and 1991 refers to the financial year ending March 1976 and March 1991 respectively. In official records they are shown as 1975-76 and 1990-91. For convenience the above format is used in this study without any loss of information.

There were two notable features in the growth performance of the economy since the First Plan. First, a significant up trend in the growth of National income was seen. At current prices, GNP had increased from Rs.8,938 crores in 1951 to Rs.8,39,504 crores in 1995, nearly 100 folds, while it was from Rs.42,644 crores to Rs.2,45,603 crores (at 1980-81 prices)-nearly six folds, during the same period. Thus real product had increased at rates significantly lower than that of nominal GNP.

Similarly, net national product (NNP) had increased from Rs.8,574 crores in 1951 to Rs.7,44,883 crores in 1995. At 1980-81 prices also, there was an increase in NNP from Rs.40,454 crores in 1951 to Rs.2,17,041 crores in 1995.

Per capita Net National Product (PNNP) at current prices increased from Rs.238.8 to Rs.8,237.4, while the growth was from Rs.1,126.9 to Rs.2,400.9 at constant prices during the period 1951-95. Thus, the real growth of the economy (at constant prices) was very significantly smaller than the growth in nominal values, revealing an inflationary trend. The growth in real income per capita was still slower, because of rapid increase in the size of human population of the country.

Growth Rates:

These trends were more precisely shown by the annual compound growth rates for the decades and the first half of the 1990's. The growth rates are presented in Table 3.

Table:3. Annual Compound Growth rate of Gross and Net National Products in India.

Periods	(Percent/Year)					
	GNP		NNP		NNP percapita	
	At current Prices	At 1980-81 Prices	At current Prices	At 1980-81 Prices	At current Prices	At 1980-81 Prices
1950's	5.4	2.9	4.9	2.7	2.6	0.4
1960's	6.4	0.9	6.1	0.6	3.6	-1.8
1970's	16.7	5.8	16.4	5.8	14.2	3.8
1980's	15.4	0.5	14.7	-0.1	12.4	-2.1
1991-95s	18.5	6.7	18.8	6.7	16.7	4.8

Note:i) GNP, NNP-are gross and net national products at factor cost

ii) Decadal growth is measured by annual compound growth rates.

It could be seen that there had been a steady increase in the annual compound growth rate (CGR per year in %) from the 1950's to 1991-95 in all nominal values (current prices) of all the variables (GNP, NNP and Per capita income). In real values - at constant (1980-81) prices - the growth rates were 2.9 per cent, 2.7 per cent and 0.4 per cent in GNP, NNP and NNP per capita respectively during the 1950's, the first decade of planned development showing the strong effects of population growth on the NNP per capita. In the next decade, (1960's) there was a deceleration in each of the three variables. The annual growth rates were as low as 0.9 per cent in GNP, 0.6 per cent in NNP and (-) 1.8 per cent in NNP per capita, showing that the growth of population had overtaken the growth of NNP, that too significantly. Uncertain agricultural production due to failure of monsoon in six out of 10 years and war with China were the major causes for the decline. A break through was possible with the introduction of new high yielding varieties of crops in the mid - sixties. Their rapid spread, nearing full adoption by the mid - 1970's helped by normal rainfall for all but two years in 1970's, helped

country end the decade with high growth rates in the variables. The GNP and NNP at constant prices grew by 5.8 per cent, while NNP per capita grew by 3.8 per cent per annum. This recovery was however not sustained in the next decade and the growth rates were dismal. The annual growth rates in GNP, NNP and per capita NNP in constant prices were 0.5 per cent, (-) 0.1 per cent and (-) 2.1 per cent respectively. The negative value in NNP itself was a cause for concern. The country had suffered the worst balance of payment problem, high rate of inflation and not surprisingly political upheavals. The present decade began with its response to the problem situation with the policies of liberalization and globalization - a drastic departure from command economy to market oriented economy. The results seemed to be a turn for the better as shown by the growth rates of the macro variables of economic growth. In constant prices, the annual compound growth rate of GNP and NNP was 6.7 per cent, while it was 4.8 per cent in NNP per capita - an all time highest since 1951. Was it a change for the real gains or just a rising part of a cycle, only time would show. But there is optimism everywhere that the market oriented growth would be sustainable, because free market would promote efficiency in production and distribution. The outward looking strategy implied in the policy of globalization would assign export a leading role in the process of economic development. Therefore, the past trends in total export were studied next, with the view to understanding its significance.

Performance of Exports

Indian rupee was devalued in 1966-67 and revised values of exports at 1980-81 prices were not available for few years between 1966-67 and 1974-75. Therefore, further detailed analysis was restricted to the period 1976 to 1991. Year wise

details are presented in Appendix V. Data are examined for intervals of five years to study changes in total exports and engineering exports in actual values for the end of the periods as well as mean and CV for the period in Table 4.

Table:4. Changes in GNP, Total Exports and Engineering Export of India for 1976-1990.

(In Rs Crores)								
GNP		Total Export		Engineering Export		Engine	Share	
	Value/ Mean	C.V (%)	Value/ Mean	C.V (%)	Value/ Mean	C.V (%)	%	C.V
1976	1,04,660		4,042.00		408.00		10.0	
Mean	1,11,215	5.68	5,078.50	12.47	575.25	19.62	11.5	9.72
1980	114379		6,459.00		737.00		11.0	
Mean	1,28,850	7.70	7,950.60	16.29	963.60	15.12	12.0	10.54
1985	2,07,109		11,570.0		1,150.00		10.0	
Mean	1,98,239	39.31	14,214.00	24.30	1,390.40	27.34	9.6	5.10
1990	4,02,930		27,681.00		3,145.00		11.0	

Note: All values at 1980-81 prices, Mean - average per year for period of five years.

As could be seen in the table, GNP was Rs.1,04,660 crores in 1976 and increased slowly to Rs.1,14,379 crores in 1980 the average of the five years being Rs.1,11,215 crores with a small coefficient of variation (5.68 per cent). During this period total exports increased from a value of Rs. 4,042 crores to Rs. 6,459 crores, the mean and CV being Rs.5,079 crores and 12.47 per cent. It marked relatively larger increase and larger variation in export than in GNP. The large variation in export might be explained by the emphasis on export in the policy and programmes of the government and the struggle of the developing economy in competing with international competitors. Of the total export, Rs.408 crores was the share of engineering exports (10 per cent) in 1976. It went upto Rs.737 crores in 1980, the average for the period being Rs.575.25 crores and the CV was 19.62 per cent. The share of engineering exports in total export

increased from 10 per cent to 11 per cent, with a CV of 9.72 per cent. Thus, absolute value of engineering exports varied more (19.62 per cent) than its relative share in total export 9.72 per cent only. Thus, engineering exports had shown both growth and stability in its contribution to total exports.

Similar changes were seen in GNP, total exports and engineering exports in other periods also. The GNP had grown to Rs.4,02,930 crores in 1990 - nearly four fold increase in a period of 15 years. Compared to it total exports and engineering exports increased only three times. What was more important was the significant increase in CV of all the three variables during 1985-90, but a significant fall in the CV of percentage share of engineering exports in total exports (only 5.10 per cent). Thus engineering exports had maintained a share of 10 per cent to 11 per cent of total exports but it had achieved more stability in the recent years. This would show the importance of engineering exports for total exports from India and justified the present study.

Regional Pattern

Another aspect of engineering export is its regional distribution. Indian engineering products were exported to over 120 countries, both developing and developed. Until mid - seventies, a major part of India's engineering exports was directed to Asia and Africa. In the early eighties, the scenario changed substantially, with the share of developed countries rising gradually. During this period, the East European Countries emerged as a big market for Indian engineering products. The export to U.S.S.R. had fallen considerably after the disintegration of erst while Soviet Union. This short fall was however, made good by larger exports to other developed countries.

Regionwise exports of Indian engineering products between 1975-76 and 1990-91 are shown in Table 5.

Table:5. Export of Engineering goods from india-regionwise for selected years.

Regions	Year	(Rs.Crores)			
		1975-76	1980-81	1985-86	1990-91
I. ASIA					
a)South East		230.30	425.74	327.00	975.00
		(56.41)	(49.13)	(32.54)	(30.22)
b) West		117.74	232.63	207.00	715.00
		112.56	193.11	120.00	260.00
II. AFRICA		67.31	172.58	138.00	351.00
		(16.480)	(19.91)	(13.73)	(10.88)
III.EUROPE		81.42	173.35	418.00	1395.00
		(19.94)	(20.00)	941.59)	(43.24)
a)East		43.93	78.67	325.00	775.00
b)West		37.49	94.68	93.00	620.00
IV. AMERICA		22.67	80.31	109.00	465.00
		(5.55)	(9.26)	(10.85)	(14.41)
a)North		18.69	75.08	105.00	340.00
b)Central		0.40	0.32	-	-
c)South		3.11	4.41	3.00	125.00
d)Caribbean islands		0.47	0.50	1.00	-
V.OCEANIC ISLANDS		0.63	2.19	2.00	-
		(0.15)	(0.25)	(0.200)	(-)
VI. AUSTRALIA		5.91	12.37	11.00	40.00
		(1.46)	(1.42)	(1.09)	(1.24)
a)Australia		NA	NA	9.75	40.00
b)New Zealand		NA	NA	1.25	-
TOTAL		408.24	866.54	1005.00	3226.00
		(100.00)	(100.00)	(100.00)	(100.00)
Index		100.00	212.26	246.18	790.22

Note:i) Figure within () are percentages to column total.

ii) Index is with 1975-76=100

It revealed that the share of Indian engineering exports to South East and West Asia declined from 56.41 per cent in 1975-76 to 30.22 per cent in 1990-91 and

that to Africa improved in 1980-81, but declined thereafter to 10.88 percent in 1990-91. India's engineering exports to oceanic islands remained less than one per cent between 1975-76 and 1990-91. On the other hand, engineering export to Europe, America Oceanic islands and Australia which had a share of 27.1 percent in 75-76, rose to 59 per cent in 1990-91. This shift in the directional pattern of Indian engineering exports, away from Asia and Africa to America, Europe and Australia was a pointer to the growing acceptability of Indian engineering products in the developed world. However, in absolute value (at current prices) the export increased very significantly - to all the regions and consequently total export increased nearly eight folds during the period (Index was 790.22 with 1975-76 = 100). The reason was that export to different regions grew at different rates, the developed world providing the lead.

Therefore, it was analysed in further details with country-wise details of exports of engineering goods from India. In exports to 120 countries, India had been exporting engineering goods continuously to 28 countries during 1975-76 to 1990-91, which showed that one fourth of the countries in the world had accepted and purchased Indian engineering goods and they provided an assured market for the export.

The exports of engineering goods, destination wise for the major importers (28 countries) are shown in Appendix VI. Annual average value ($\bar{X}$) of the exports and the coefficient of variation (CV %) for the inter year variation, during the period 1976-91, are estimated and presented in Table 6.

Table:6. Ranking of Destination Countries for Export of Indian Engineering Goods.

Regions/ Countries	Mean	Rank	C.V (%)	Rank R ²
<u>ASIA</u>	<u>433.54</u>	—	<u>39.65</u>	
<u>South East Asia</u>	<u>240.52</u>	—	<u>61.31</u>	
1.Bangladesh	53.42.	2	61.34	14
2.Indonesia	18.39	11	83.54	24
3.Japan	13.69	15	102.92	27
4.Malaysia	23.22	8	80.86	20
5.Nepal	20.84	10	51.44	10
6.Singapore	28.16	6	94.94	26
7.Srilanka	34.42	5	61.01	13
8.Thailand	15.30	13	71.10	15
<u>WEST ASIA</u>	<u>187.70</u>	—	<u>29.38</u>	-
9.Bharain	4.92	23	29.39	2
10.Iran	27.56	7	50.11	8
11.Iraq	21.33	9	58.15	11
12.Jordan	4.60	24	76.58	17
13.Kuvait	16.92	12	51.41	9
14.Oman	10.08	17	30.00	3
15.Soudiarabia	34.64	4	29.31	1
16.Turkey	3.73	25	92.48	25
<u>AFRICA</u>	<u>41.36</u>	—	<u>51.75</u>	-
17.Y.A.R	7.04	21	35.69	4
18.Algeria	3.02	26	78.89	19
19.Ghana	5.51	22	72.78	16
20.Tanzania	14.49	14	47.48	6
21.Tunisia	0.89	28	108.33	28
22.Uganda	10.41	16	44.70	5
<u>EUROPE</u>	<u>64.96</u>	—	<u>78.60</u>	-
23.Holland.	8.09	19	47.68	7
24.Italy.	9.67	18	82.23	21
25.U.K	47.20	3	83.16	23
<u>AMERICA</u>	<u>115.07</u>	—	<u>82.50</u>	-
26.Canada	7.49	26	77.05	18
27.Caribbean Island	0.96	27	60.38	12
28.U.S.A	106.62	1	83.08	22
TOTAL	654.93	—	51.81	-

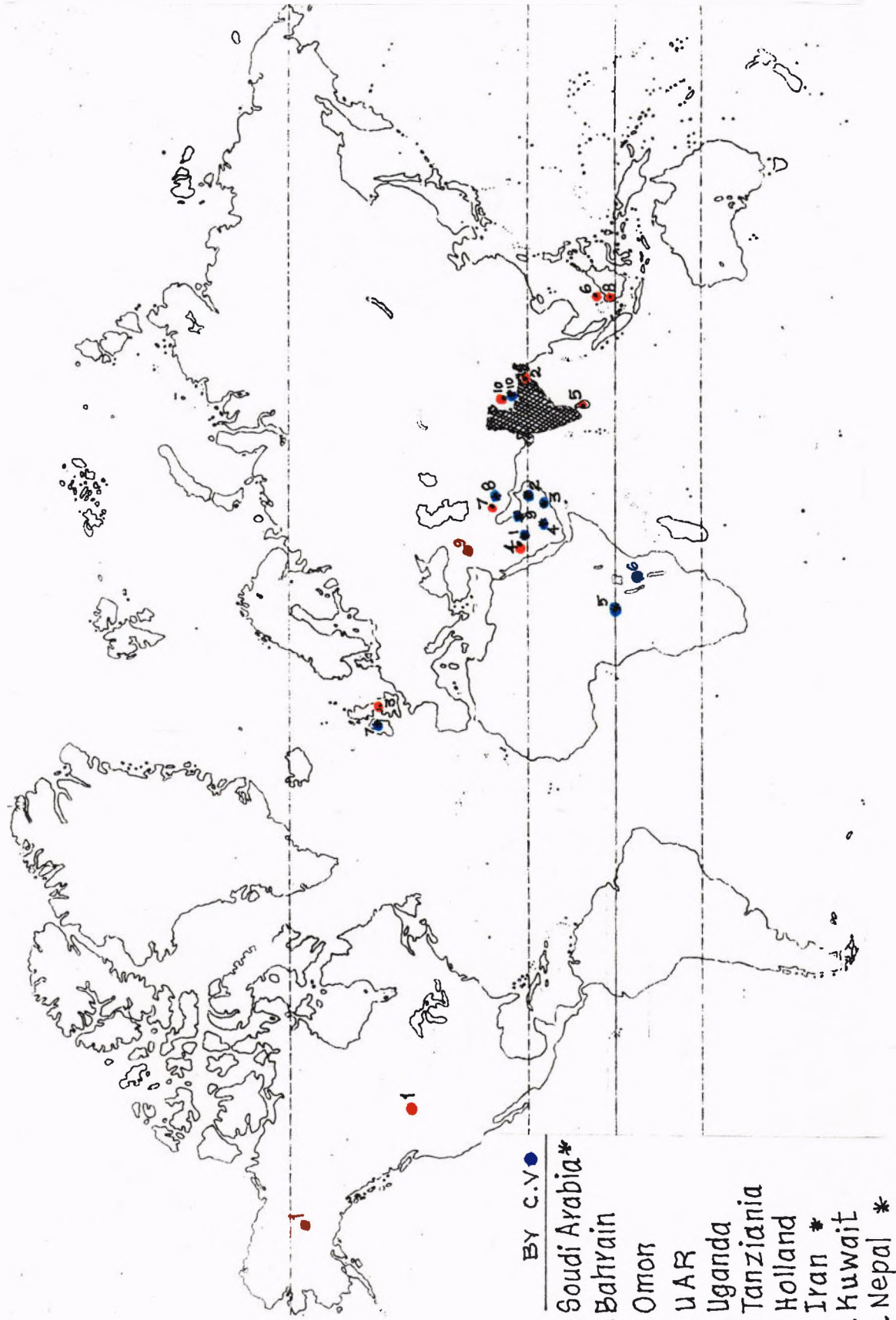
Note: R¹-Descending order of mean; R²-Ascending order of C.V.

Total for Asia would exceed total for reported countries because there are countries each with negligible share.

The mean annual value of exports was ranked in the descending order while the CV was ranked in the ascending order. Thus the first rank would show the largest average annual export and lowest CV. Larger the number of rank, lower would be the mean value of export and larger would be CV. and hence export was less stable. As could be seen in the table, U.S.A. ranked first in terms of average annual sales but 22nd by C.V. Thus it is the most important importer, however with very large instability in it. Bangladesh ranked second and 14th in terms of mean and CV of exports respectively and hence it was relatively more assured market for Indian Engineering exports. U.K, Soudiarabia, Srilanka, Singapore, Iran, Malaysia, Iraq and Nepal ranked third to 10th by average annual value of exports and their CV varied in ranks between 1 and 23. Soudiarabia ranked fourth by mean value of exports but first by CV. thus emerging the most stable market for export of engineering goods. In general, Asian countries, USA and UK were the major destinations for the export of engineering goods from India, the latter two having a high degree of instability in it. Among the African countries, Tanzania was important for its 14th rank in mean and sixth rank in CV, while YAR and Uganda were small importers but with very small CV also. Holland was a small market (rank 19) but with a small CV (rank 7), other countries had smaller markets with larger instability in them.

To bring the stable markets into sharp focus, the countries with top ten ranks are listed in Table 7. and indicated in the world map Figure. 1.

TOP TEN DESTINATIONS FOR EXPORT OF ENGINEERING GOODS FROM INDIA.



BY MEAN ●	BY C.V. ●
1. U.S.A	1. Saudi Arabia *
2. Bangladesh	2. Bahrain
3. U.K	3. Oman
4. Saudi Arabia *	4. U.A.R
5. Sri Lanka	5. Uganda
6. Singapore	6. Tanzania
7. Iran *	7. Holland
8. Malaysia	8. Iran *
9. Iraq	9. Kuwait
10. Nepal *	10. Nepal *

* Countries appearing in both groups

Table:7. Top ten destinations by mean of Export and its C.V.

By Mean			By C.V.		
Rank	Country	Mean Export (Rs.Crores)	Rank	Country	Mean Export (Rs.Crores)
1	U S A	106.62	1	South Arabia*	34.64
2	Bangladesh	53.42		Bahrain	4.92
3	U.K	47.20	3	Omon	10.08
4	Soudi Arabia*	34.64	4	Y A R	7.04
5	Sri Lanka	34.42	5	Uganda	10.41
6	Singapore	28.16	6	Tanzania	14.49
7	Iran*	27.56	7	Holland	8.09
8	Malaysia	23.22	8	Iran*	27.56
9	Iraq	21.33	9	Kuwait	16.92
10	Nepal*	20.84	10	Nepal*	20.84
	Total	394.41		Total	154.99
	%	60.68		%	23.67

Note: %- Percentage to average annual total export of Rs 65,4.93 Crores.

* Countries appearing in both groups.

As could be seen in the table, by the size of market (mean annual value of export by India, USA, Bangladesh, U.K, Soudiarabia, Srilanka, Singapore, Iran, Malaysia, Iraq and Nepal were the important destination. By the criterion of low instability, Soudiarabia, Bahrain, Omon, YAR, Uganda, Tanzania, Holland, Iran, Kuwait and Nepal ranked top ten ie had smaller CV. Soudiarabia, Iran and Nepal appeared in both the lists showing their importance not only for the value of their imports of engineering goods of India but also for their relative stability in them. Other markets would need special attention to expand Indian export and to reduce instability where it was large. On an average, the top countries accounted for nearly 61 per cent of total export of engineering goods from India. The countries with relatively more stability accounted for only 23.67 per cent of total export.

Sectoral Pattern

Total export of Indian engineering goods could be broadly classified into three categories viz., (a) consumer durables, (b) Capital goods (producer durables) and (c) others. The categories were defined as follows.

Consumer Durables

Auto parts, bicycle and parts, hand tools and cutting tools, diesel engines and compressors, mechanical pumps, heating and cooling equipment, electric fans and parts, electronics, batteries, sewing machines, knitting machines, electrical accessories and appliances, scientific and surgical instruments and ball bearings are the major engineering goods classified as consumer durables.

Capital goods

Industrial plants and machinery, complete commercial vehicles, wagons and coaches, coastal vessels and ships wires and cables, electrical power machinery and switch gears and machine goods are the producer durables called productive assets or capital goods.

Other engineering goods

Primarily steel and pig iron based items, non-ferrous products (pressure cookers, aluminium utensils etc., aluminium products, E.P.N. swares and other non-ferrous products) , management and technical services, electronics and software, steel pipes and tubes, wire products of all types (nettings, electrodes and ropes) in industrial

fasteners, iron castings are other engineering goods that entered export markets. Units producing them were classified as three sectors. Then there were three sectors of the Indian Engineering Exports. Sectorwise export of engineering goods for select years and averages for the whole period of 1975-76 to 1990-91 are shown in Table 8.

Table:8. Export of indian engineering goods - sectorwise

		(Rs Crores)			
		Consumer Durable	Capital Goods	Others	Total
1975-76	Value	181.41	168.98	57.83	408.22
	%	44.44	41.39	14.17	100.00
1980-81	Value	365.50	304.40	204.30	874.20
	%	41.81	34.82	23.37	100.00
1985-86	Value	439.60	400.70	254.70	1095.00
	%	40.15	36.59	23.26	100.00
1990-91	Value	1025.00	1250.00	975.00	3250.00
	%	31.54	38.46	30.00	100.00
Whole Period		449.84	423.84	405.92	1279.60
(Mean value)					
	%	35.15	33.12	31.72	100.00
C.V	%	48.26	67.63	89.34	67.70

Source i) Engineering Export Promotion Council Annual Reports.

ii) All Values are at current prices.

iii) %- percentages to row totals.

iv) C V. in percentage for the period

As could be seen in the table, the value of exports of all the three sectors and consequently total export increased during the period, of courses the values were in current prices. This was particularly seen for the year 1990-91 marking a big jump. For the period as a whole average annual export of consumer durables was Rs.449.84 crores and it shared 35.15 per cent of the total export. The value of capital goods was Rs.423.84 per year on an average and it was 33.12 percent of the total; while the figures for other

engineering goods were Rs.405.92 crores and 31.72 per cent respectively. The percentage shares of consumer durables and capital goods in total exports were 44.44 and 41.39 respectively in 1975-76, and it was 14.17 per cent only for other engineering goods. The percentage share of consumer durable steadily decreased to 31.54 in 1990-91, while that of capital good decreased to 34.82 in 1980-81 but recovered to 38.46 in 1990-91. There was remarkable rise in the percentage share of other engineering goods from 14.17 in 1975-76 to 30 per cent in 1990-91. Consequently in 1990-91 and for the whole period, the three sectors had almost equal shares in total export. As measured by the coefficient of variation, the instability in export was least for consumer durables (CV is 48.26 %)), but much larger for capital goods (CV is 67.63 %) and still larger for other engineering goods (CV is 89.34%). Therefore, relatively stable market for consumer durables must be protected from the declining percentage share. Capital goods export is recovering and the up trend should be sustained and the instability be reduced. Increasing acceptance of other engineering goods by the world market should be promoted, but more importantly attention would be needed to infuse stability in it.

Engineering Goods Production

The value added in the sector of registered manufacturing units in the country, and among them engineering units are presented for the years from 1975-76 to 1990-91 in Table 9.

Table:9. Share of Engineering Goods in Total Manufacture.

(Value in Rs.Crores)

Year	Value Added		% @	Engineering Exports	% @@
	Registered Manufacturing	Engineering Units			
1975-76	5,830.60	2,255.80	38.69	408.22	18.10
1976-77	6,640.53	2,540.75	38.26	551.68	21.71
1977-78	7,293.22	2,651.86	36.36	623.96	23.53
1978-79	8,371.04	3,063.20	36.59	716.93	23.40
1979-80	9,606.05	3,557.92	37.08	736.68	20.71
1980-81	10,597.13	4,186.14	39.50	874.17	20.88
1981-82	12,510.69	5,249.86	41.96	1,046.98	19.94
1982-83	14,446.96	5,991.34	41.47	1,160.00	19.36
1983-84	16,265.54	6,670.95	41.01	1,000.00	14.99
1984-85	1,00,328.00	6,958.20	6.93	1,150.00	16.53
1985-86	1,01,016.00	7,759.27	7.68	1,095.00	14.11
1986-87	97,957.00	8,016.85	8.18	1,150.00	14.34
1987-88	1,02,596.00	9,283.54	9.04	1,448.00	15.60
1988-89	1,04,077.00	1,220.03	11.72	2,109.00	17.28
1989-90	1,07,092.00	14,165.35	13.11	3,145.00	22.20
1990-91	1,10,179.00	17,293.17	15.69	4,245.00	24.55

Note :i) All values are at current prices.

ii) @ - shows percentage of engineering goods in total value added by the registered manufacture units in India.

iii) @@ - percentage of exports to value added by Engineering units.

Source :i) Annual Survey of Industries Central Statistical Organization, Department of Statistics, Ministry of Planning, Government of India.

ii) Engineering Export Promotion Council, Calcutta.

As could be seen in the table, the engineering goods accounted for 38.69 per cent of total value added by all the registered manufacturing units in 1975-76. With small inter year variations it went up to 41.47 per cent in 1982-83. The very next year there was a fall to 41.01 per cent, but it dropped drastically to 6.93 per cent in 1984-85 to recover only moderately thereafter. It was 15.69 per cent in 1990-91. This decline in the relative share of engineering goods in the total manufacture was however not due to a fall in value added by the engineering good producers. Rather, it was due to relatively faster

growth of other units in the registered manufacturing sector than the growth of engineering goods units. When the value added by engineering goods units increased from Rs.2,356 crores in 1975-76 to Rs.1,7293 crores in 1990-91 (nearly eight fold rise, of course at current prices) that for other manufacturers increased during the same period from Rs.5, 831 crores to Rs.1,10,179 crores. Therefore, the uptrend in engineering goods production could be maintained to support a similar trend in export of engineering goods.

Export of engineering goods varied around 20 per cent of total value added for the years 1975-76 to 1982-83. Then it dropped to 14.11 per cent in 1985-86 but rose again in the following years to reach 24.55 per cent in 1990-91. To export 24.55 per cent of value added production had expanded by nearly eight folds from Rs.2,256 crores to Rs.17,293; it was no mean achievement. It showed in a small way increasing levels of production for export.

Thus, the export of Indian engineering goods has made significant progress serving several destinations with a variety of goods. Its growth over the years is equally impressive. In this section growth trends in export of Indian Engineering goods in general and that of selected engineering industries are discussed.

India Vs World

Another aspect in export of engineering goods from India was its comparative performance with total export of engineering goods in the world.

In step with their high profile in the national economy, engineering exports have recorded a higher rate of growth vis-a- vis world trade in engineering goods. Year wise growth rate of engineering exports of India and the world are given in Table 10.

Table :10. Export of Engineering Goods : India, world compared

Year	Percentage change over previous year	
	World	India
1975	17.50	79.41
1976	18.00	17.61
1977	18.50	35.14
1978	19.50	13.10
1979	19.50	14.90
1980	16.60	2.75
1981	2.40	18.70
1982	(-)-2.60	19.70
1983	1.00	10.80
1984	8.00	(-)-13.80
1985	6.00	15.00
1986	20.60	(-)-4.80
1987	18.20	5.00
1988	18.00	25.90
1989	17.50	45.60
1990	15.25	49.10
1991	14.00	3.33

Note: i) All figures are simple percentage over the value of the previous year.

ii) values were in current prices

Source: GATT and World Economic Indicators - 1993-94

Engineering Export Promotion Council, Calcutta.

The maximum growth registered by Indian engineering exports during the three decades had been 49.1 per cent in 1990 as against 20.60 per cent for the world in 1986. Data in table (10) show that, apart from being high, the export growth rates of engineering goods for India and the world were fairly stable in the period 1975-80. In India, 1975 and 1977 were very good years. In the first half of the 'eighties', there were wide fluctuations in these growth rates which resulted presumably, from the industrial

recession then gripping the world. With economic revival, the situation changed for the better from 1986 onwards.

The healthy trend continued till 1989-90 but, in 1990-91 export of Indian engineering goods declined sharply due to global industrial recession. However, the export of engineering goods for the world registered small change evident from the fall in the decline from 1986 - 1991. Against only a 3.33 per cent growth for India it was 14 per cent for the world. For India, the fall from 49.10 per cent increase in 1990 to just 3.33 per cent in 1991 was very large. It could be attributed to the political instability and change of Government in 1990-91.

The significant positive growth in export of engineering goods is beneficial to the growth of the economy. In the literature, the crucial role of exports in promoting economic growth was demonstrated by a close association between GNP and export expansion. For various reasons, export had to be promoted because it provided opportunities to achieve (a) economies of scale and growth; (b) export markets helped mitigate the effects of domestic recession; and (c) higher exports facilitated larger imports and enabled to increase in consumption levels and economic welfare. Therefore, the growth of engineering exports was studied for its relationship with the economic growth (as measured by GNP), and total of all exports. As a first step, the growth trends of the three variables viz, . GNP, total exports and engineering exports were studied.

Trend Analysis:

A linear trend equation of the following form was fitted for studying growth trends. Estimated equations are presented in Table 11.

Table: 11. Estimated Linear Trend Equations.

Variable		Intercept	Trend	R ²	F Value
GNP	Coefficient	88,181	6,642.09 **	0.95 **	262.84 **
	Standard Error		(409.6903)		
	t Value		16.21		
Total export	Coefficient	(-)1,169	1,544.63 **	0.78 **	50.50 **
	Standard Error		(217.3682)		
	t Value		7.11		
Engineering exports	Coefficient	(-)13	152.055	0.73 **	37.61 **
	Standard Error		(24.7928)		
	t Value		6.13		

- Note: i) * - Statistically significant at 5 percent level.
 ** - Statistically significant at 1 percent level..
 ii) The data relates to the period from 1976-1991
 iii) All values are at current prices in Rs.Crorers
 iv) d.w. test indicated no auto correlation of errors.

As could be seen in the table, all the equations had good fit with statistically highly significant value of R² and the positive sign of the trend coefficient as expected a priori. First equation showed the trend in GNP. The linear trend could explain 95 per cent variation in GNP during the period from 1976 to 1991. GNP of India at current prices increased on an average at the rate of Rs.6,642 crores per year. It was accompanied by an increase of Rs.1,545 crores per annum in total exports. In the total exports, the value of engineering goods exported was Rs.152 crores per annum. Thus

there was movement in the same direction in all the three variables and it suggested a significant contribution of export to GNP growth.

Export of selected engineering goods

Average annual increase in the export of engineering goods accounted for 9.84 per cent of all exports from India. This contribution came mostly from fifteen major engineering goods industries as listed in Appendix I. The trends in export of goods by each of these fifteen industries were studied by fitting the same linear trend equation used for total exports. The trend was studied for the groups also. The estimated equations are presented in Table 12.

As could be seen in the table all but four of the fitted equations had statistically significant value for R^2 and F values were large. Therefore, these equations were valid to draw inferences. The coefficient of trend variable had the positive sign as expected, and all of them were statistically significant at one per cent or five percent levels. Thus all these industries had registered a positive and significant uptrend in the export of their products. Average annual export of the industries, varied from one industry to another. However, all the values were measured in Rs. crores in current prices. Therefore, it might be interpreted that the value of coefficients of the trend variables showed annual addition to export, evaluated at mean levels. For example, export of hand tools and hardwares increased at the rate of Rs.2.84 cores per annum during the period of study (1976-1991). It was Rs.0.857 crores for agricultural machineries and so on.

The four exemptions were the equations fitted for (1) electrical appliances for home use (364); (2) Ship and boat building equipments (370); (3) Railway wagons (372)

Table:12 . Linear Trend Equations Fitted for Export of Fifteen Selected Engineering Goods Industries and their Group.

Sl.No.	Industries/Groups	a	Trend coefficient	SE(b)	t	R ²	F
1	Hand tool & Hardware (343)	23.27	2.84**	0.617	4.62	0.60	21.30
2	Agri.Machinery (350)	1.58	0.857**	0.182	4.71	0.61	22.18
3	Machinery & Equipment for mining(351)	(-)21.73	5.177**	1.134	4.56	0.60	20.83
4	Machinery for Industries other than for food(354)	(-)13.16	7.797**	1.477	5.28	0.67	27.86
5	Machine tool&parts(357)	(-)20.80	8.377**	1.908	4.39	0.58	19.28
6	Computing&Accounting Machinery&parts(358)	(-)10.35	2.769**	0.522	5.31	0.67	28.15
7	Electrical Machinery(360)	17.74	1.363**	0.473	2.88	0.37	8.32
8	Wire,Cable,Optical fibre(361)	7.237	3.794**	0.737	5.15	0.65	26.51
9	Primary cells/Batteries(362)	(-)2.96	4.594**	0.391	11.75	0.91	137.97
10	Electrical Appliance for household uses(364)	11.10	(-)0.198 NS	0.163	(-)1.21	0.10	1.47
11	Ship&Boat building equipment(370)	(-)3.36	1.602NS	0.856	1.87	0.20	3.50
12	Railway Wagons(372)	14.53	(0)166NS	0.469	(-)0.35	0.01	<1
13	Motor cycle,Scooter(375)	64.33	2.525NS	2.058	1.23	0.10	1.51
14	Bicycles&parts(376)	6.313	5.773**	1.042	5.54	0.69	30.69
15	Medical,surgical&Scientific measuring equipments(380)	(-)2.289	1.859**	0.691	2.69	0.34	7.24

Note: i) Equation was $Y = a + bt + u$

where Y is value of export of industry i, for $i=1,2,\dots,15$

ii) Values of Y are in Rs. Crores at current prices.

iii) Figures within () are industry code number(as in Appendix I)

iv) All the trend coefficients are significant at 1 % level .(see t values)

v) There was no problem of auto correlation

vi) ** significant at 1 per cent level, NS = Not significant

and (4) motorcycles and scooters (375). It might be noted that these were non-traditional goods that entered foreign market very recently (less than five years) and to establish themselves they might need some more years. Except for them, the significant uptrend seen in export of all other (11) industries would allow a generalization that engineering exports were rising. These fifteen industries accounted for a share of more than 81.50 per cent of total production of all engineering industries in the country. Therefore, they were selected for detailed study. Before that, the relationship between total exports and the engineering exports was studied to understand the contribution of engineering industries to the total export by India.

Contribution to total exports:

The contribution of engineering industries to the aggregate export by India was studied with the help of a log-log function. The estimated equation is presented below:

$$\begin{aligned} \ln(\widehat{TE}) = & 5.715 + 0.47999 \ln(EEX)^{**} \\ & (0.09420) \\ & t = 5.10130 \quad \dots \quad (1) \\ R^2 = 0.65 & \quad F = 25.96 \quad n = 16. \end{aligned}$$

During the period of time series studied, the engineering exports significantly contributed to the aggregate exports of all commodities by India. The elasticity of total exports (of all goods) with respect to the export of engineering goods was 0.47999 and it was statistically significant at one per cent level. Therefore, an increase in engineering exports by one per cent from its annual average level would increase total exports by 0.47999 per cent at its mean level. The value of R^2 being 0.65 would show that nearly

65 per cent variation in total exports of India could be explained by the export of engineering goods, both in value terms at current prices. Thus, the engineering exports was shown to be very important in total exports of India and the foreign exchange earning, in turn. Therefore, engineering industries contributed to the growth of the economy in two ways. Firstly, by direct value addition including export earnings and secondly through imports enabled by the foreign exchange earned. The imports helped development of other (non-engineering) industries in the country. Therefore, the contribution of engineering industries to the GNP was studied. As direct addition to GNP was a simple arithmetic contribution to the growth in GDP was important.

Engineering exports and growth

Economic growth was measured by real Gross Domestic Product (denoted gdp to imply real value) per capita. Change in it depended upon the size of population (pop), capital output ratio (R) and export (Ex) (that helped earning foreign exchange to import technology and machineries for other sector). In as much as agricultural production was not totally free from the influence of agro climatic condition - inspite of achieving a small degree of resilience - any change in it would have a direct and immediate effect on gdp . Therefore, percentage change in agricultural production over that in the previous year (Δagr) was also included as an explanatory variable. Similarly, percentage change in manufacture ($\Delta manu$) was also included to take account of industrial growth. The gdp was measured in Rs. crores at constant (1980-81) prices; population in million persons and export in Rs. crores at current prices. The estimated log-log equation is presented in Table 13 below. The data for this function are as presented in Appendix IV.

Table:13. Relationship between Real GDP and Export in India. (log-log function).

	Estimated Coefficient	SE	t	Significance levels
1. Real gdp per capita	11.3311	8.3787	1.3524	-
2. Population	-4.8467	1.4840	-3.2660	1 %
3 .Export.	-0.0357	0.0144	-2.4740	5 %
4. Output/Capital (R)	1.8803	0.8528	2.2049	-
5. Δ agri	0.3302	0.0228	14.1225	1 %
6. Δ manure	0.4559	0.0488	9.3479	1 %
Note: $R^2 = 0.9769$ $F = 174.71$ $n = 15$				

As could be seen in the table, the estimated equation had the best fit with a value of 0.98 for R^2 and expected sign for all the coefficient. The variables included in it, could explain 98 per cent of variation in real gdp, per capita (economic growth). As expected, growth of population and export would reduce gdp per capita and it was significant. By definition, gdp excludes net value of foreign trade (ie Export - Import). Therefore, a negative and significant coefficient of the variable export would mean that there had been significant level of export. It was not surprising because there had been a very intensive efforts to increase exports since the mid-sixties. Output / capital ratio was not statistically significant showing that capital formation in the country was not adequate. The annual changes in both agricultural and manufacturing production had positively contributed to the growth of gdp per capita. Thus, both the output and export of the country had been rising during the period studied. However, to understand the contribution of export to national income it was necessary to relate export to GNP.

Export-led Growth

A summary of the implication of the theory highlighted that there are three different views on the relationship between trade and development (growth) - positive, negative and an eclectic view. The positive view as expounded by classical and neo-classical economists state that foreign trade can be propelling force in development process. In recent times, the experience of many developing countries like South Korea, China, Hong Kong and Singapore justifies the claim of the classical economists that trade plays a 'positive role' in the developmental process.

In contrast to the above view, Gunnar Myrdal, (1968) argued that market forces will tend cumulatively to accentuate international inequalities, and a quite normal result of unhampered trade between two countries of which one is industrial and the other underdeveloped, is the initiation of cumulative process towards the improvement of the former and stagnation of the latter. Ela Myint (1971), Prebisch (1964), Ragnar Nurkse (1961) have supported the Myrdal's view in their works.

Eclectic view is a mix of the positive and negative views. The essence of development through the trade model is that the export sector should not remain an enclave separate from the rest of the economy, but an integrated process should be established. The integratives process will be stronger under the following conditions:

- i. The higher is the growth rate of the export sector, the greater is the direct impact of the export sector on employment and personal income.
- ii. The expansion of exports has a learning effect in terms of increasing productivity and instilling new skills.

- iii. The more the export sector is supplied through domestic inputs instead of imports, the more the distribution of export income favouring those with a marginal propensity to consume domestic goods instead of foreign goods.

Since the mid - sixties, there had been a change in the hypotheses on the relationship between export and economic growth from export pessimism to export optimism in several developing countries including India. The policy of import substitution gave way to the policy of export expansion for the development of the industrial sector of their economies. The studies by Emergy (1967), Lubidz (1973), Balassa (1978), Feder (1982), Kavoussi (1984), Ram, R. (1987), and Attri (1995), proved a positive association between export and economy's output and that exports played a key role as an additional variable for economic growth. This was in agreement with the view of the classical and the Neo - classical economists. According to them, foreign trade is an 'engine of economic growth'. In contrast, the structuralists believed that trade would hurt poor countries causing deterioration in their terms of trade. In between these two extreme views lies the elective view. According to this view three distinct relationships could be conceived of between the export sector and the rest of the economy in the process of economic growth. Exports might be (a) leading; (b) balancing or (c) a lagging sector of the economy.

In the first case the expansion of exports would lead to economic growth through stimulating investment and technological change. Kaldor, (1971) postulated that export would stimulate industries with economies of scale. Even if consumption was curtailed, the export demand would encourage investment in export oriented industries. Then

economic growth would come through capital formation and higher share of manufacturing in the growth of output and the process would be cumulative. Furthermore, the expansion of export would solve the problem of balance of payments and allow import of technology and associated inputs, helping further growth of the economy and expansion of export. Thus there existed a strong case for export led growth. To test this hypothesis of export-led growth, a multiple linear regression of the following form was considered

$$Y = f(X, ma, Ag, I)$$

Where Y, X, ma, Ag were GNP, export, manufacturer and agricultural output all in values (Rs. crores) and I is the ratio of investment to output. There was one limitation with this model. In a time series, it would imply that Y was regressed on its components X and ma, because $Y = C + I + G + X - M$ and X and ma might have high collinearity. These problems were solved by 'detrending' the values of the variables. Therefore, the estimable model was a linear regression model of the following form

$$Y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + e$$

Where y, X_1 , X_2 , X_3 and X_4 were residuals in their trend equations rather than the observed values of these variables. The estimated equation is presented in Table :14

Table: 14. Estimated Multiple Linear regression Model for Export-led Growth.

		Coefficient	SE	t	Level of Significance	
GNP	(y)	a ₀	1.2613	1.9897	0.6339	-
Export	(x1)	a ₁	0.0326	0.0143	2.2797	*
Manufacture	(x2)s	a ₂	0.0216	0.0088	2.4602	*
Investment Ratio	(x3)	a ₃	3.5206	1.2631	2.7873	*
Agriculture	(x4)	a ₄	0.3782	0.1178	3.2105	**
R ² = 0.9235 **		F = 113.5712 **		D.W = 1.0137		n = 16
Note : All Variables are detrended. * - 5 per cent level; ** - 1 per cent level						

As could be seen in the table, estimated model had a very high explanatory power and the partial regression coefficient of all the variables were statistically significant and all had positive sign. The problem of multi collinearity was not encountered. Export, investment, and growth of both agricultural and manufacturing production contributed to the growth of the economy. These results conclusively showed a strong positive relationship between the size of export and the level of GNP. It also revealed that the relationship was secular rather than cyclical. This result was in agreement with the findings of Khan (1995) that in the Indian context export growth favourably affects the rate of economic growth over and above the contribution of domestic production in agriculture and manufacture. There appears to be an integrated pross supporting elective view more than the neo classical view.

It would be informing to recall the results presented in equation (1) wherein the elasticity of total export with respect to engineering exports was seen to be positive and statistically highly significant. Read with the above result that export led growth was statistically significant, inference was clear; engineering -exports had a significant and

beneficial impact on economic growth. This was to be expected because, engineering goods accounted for 14 per cent to 24.55 per cent of total value of manufacturers (vide Table 9) and around 10 per cent of total exports even while the latter was increasing from the value of Rs.4,042 crores in 1976 to Rs.27, 681 crores in 1990 (vide Table 4). Thus, the hypothesis of the export led-growth stood verified to be true, atleast for the period of the study. An outward looking policy of export promotion adopted in 1990 would therefore help the country to achieve faster rate of economic growth and commendable.

Compound growth rates

Above simple average annual growth rates would show the short run changes only. However, export of any country to be sustainable would require a significant and positive secular growth rate and it could be measured by the compound growth rates. Therefore, compound growth rates were estimated with the help of the model (linear in log) described earlier for GNP, total export, engineering exports and exports of the selected engineering industries from the time series data for the period from 1976 to 1991. The estimates are presented in Table 15.

Table 15. Estimates of Annual Compound Growth Rates of Production and Exports

(%)

Sl.No.	Variables	Code No.	CGR for	
			Production	Export
1.	GNP (Current prices)	-	4.33	-
2	Total Exports	-	-	13.34
3.	Engineering Exports for Selected Industries	-	-	12.13
4.	Hand tools and Hardware	343	10.60	6.21
5.	Agricultural Machinery	350	6.63	10.16
6.	Machinery and Equipments - mining	351	16.42	31.11
7	Machinery for manufacturing industries	354	14.12	16.62
8.	Machine tools and parts	357	13.08	17.75
9.	Computing and Accounting Machinery	358	13.86	26.97
10.	Electrical Machinery	360	16.89	4.96
11.	Wires, Cables, optical fibre	361	14.50	9.43
12.	Cells and Batteries	362	12.90	16.18
13.	Electric Home Appliances	364	13.97	(-)1.98
14.	Ship and boat building	370	4.40	5.56
15.	Railway wagons	372	15.40	(-)4.56
16.	Motor cycle and scooters	375	26.29	2.14
17.	Bicycles and parts	376	18.21	10.32
18.	Medical, Surgical Scientific	380	15.96	12.16

Note: All values of the variables in money terms at current prices for the period 1976- 1991 (16 years)

As could be seen in the table, GNP of India had grown at the rate of 4.33 per cent per annum. Compared to this, total exports had grown at an annual rate of 13.34 per cent and it could be explained by the emphasis placed on export in successive five year plans especially since the mid 1970's. The growth rate of 12.13 per cent per annum for the engineering exports was very close to that of total exports from India. Among the selected industries, the machinery and equipments for mining had the largest annual growth rate of 31.11 per cent followed by computing and accounting machines (26.97 per cent), machine tools and parts (17.75 per cent), machineries for other industries (16.62 per cent)

and cells and batteries (16.18 per cent). It might be seen that all these high export growth industries produced goods with high technological inputs. Electric home appliances and railway wagons had negative growth rates in exports, but large and positive growth rates (13.97 per cent and 15.40 per cent) in production because the domestic demand for these products was vast expanding. Industries producing bicycles, agricultural machinery's and wires, cables and optical fibres registered growth rates of around 10 per cent in export and more than 14 per cent in production. Medical, surgical and scientific equipment's had grown at 15.96 per cent in production and 12.16 per cent in export, other industries had very small growth rates for export but large growth rates in production. Thus, the scenario represented the typical conditions of a developing economy, where significant growth rates in production was seen in almost all the major industries but the success in export was seen only in relatively fewer industries either because the domestic demand was increasing or the access to export market was limited by the ability of the country to compete with the rest of the suppliers to the world. One of the reasons for small and even negative annual average compound growth rate in export might be the instability in it (ie) large inter year variations in export. As production of all the selected industries had shown high growth rates the small and even negative growth rates in export might be due to difficulties in penetrating the global market and continuing the market share. These difficulties contributed to inter year variations in export and that could be studied with the help of instability index.

Problem of Instability in Export

Violent and frequent fluctuations in prices, quantity and total value of exports have a serious adverse impact on the growth of the economy of the less developed countries. It would be more important for India as a strong relationship was seen to exist between her exports and national income. Instability in export of India - a developing country - deserves attention "because of its effects on the level of living, rate of economic growth, distribution of income and wealth. It is also important for its effects on policies" (Kaur and Singhal¹, 1988). A convenient way to measure instability in export was Coppock's Instability Index.* It is a measure of average inter year percentage variation, adjusted for trend. Estimated instability indices are presented in Table 16.

Table:16. Coppock's Instability indices for Export of Selected Engineering Industries

Sl.No.	Exporting Engineering Industries	Instability	
		Index	Rank
1.	Hand tools and Hardwares	15.01	15
2.	Agricultural Machinery	35.38	8
3.	Mining Machinery and Equipments	44.27	6
4.	Machinery for Manufacture	24.78	13
5.	Machine tools and parts	36.08	7
6.	Computing and Accounting Machines	58.12	3
7.	Electrical machinery	33.46	10
8.	Wires, Cables, optical fibres	34.06	9
9.	Cells and batteries	16.92	14
10.	Electrical home appliances	30.58	11
11.	Ship and boat building	117.62	1
12.	Railway wagons	61.23	2
13.	Motor cycle and Scooters	44.61	5
14.	Bi-cycles and parts	28.31	12
15.	Medical, surgical, scientific equipments	45.51	4
16.	Total Exports	43.71	--

Note: i. Index measure average annual percentage change in value of exports in current prices; ii. Ranks in descending order of value of index.

¹ Narinder Kaur and K.C. Singhal, India's Export Instability, Margin, 21(1): 54-61, 1988

* given,
$$V \log = \frac{\sum (\log \frac{Y_t + 1}{Y_{t-1}} - m)^2}{T-1}$$

instability index (IC) was anti log $\sqrt{V \log - 1} \times 100$. Where V log is logarithmic variance of time series of X (for t = 1, 2 N)

Total export had a high a value as 43.71 for Coppock's instability index. Average annual variation of 43.71 per cent in trend corrected values of exports was large, showing that export of engineering goods from India suffered from wide inter year variation and efforts to reduce this would improve export performance of engineering goods. Largest instability was seen for ship and boat building industry because India had to face a stiff competition from European countries that had advanced technologies (index is 117.62). For the same reason export of railway wagons and computing and accounting machines also had large variation as shown by indices of 61.23 and 58.12 respectively. Only hand tools and hardwares (15.01) and cells and batteries (16.92) had values of instability index smaller than 20. Other industries had instability indices in values of exceeding 24.78 (say 25). Thus, most of the engineering industries faced uncertainty and risk in producing for export and their efforts to reduce the risk would have a high pay-off not only to them but also to the country in foreign exchange earning.

Cuddy and Valle's Index of Instability

Cuddy and Valle² suggested an alternate method of estimating instability index which took into account the explanatory power of the trend equation by introducing a correction factor to the coefficient of Variation (CV) of time series data. the index was estimated as

$$I_x = C_v \sqrt{1 - \bar{R}^2}$$

Where I_x was Cudde-Valle index of instability

C_v was coefficient of variation of the time series data

$\bar{R}^2$ was the coefficient of determination of trend equation

(2) J.D.A. Cuddy and Bella Valle, P.A. 1978: 'Measuring the Instability of Time Series Data'. OBEAS 40: 79-85.

Both linear and log trends were fitted, the higher value of $\bar{R}^2$ was taken for the correction only if it were statistically significant (ie) only if the estimated equation had high explanatory power. If the value of $\bar{R}^2$ was small even though it was statistically significant, CV was taken as the best measure of instability. Thus, the choice was among CV, CV corrected for $\bar{R}^2$ of linear trend as that for log trend. The estimated instability indices for the export of selected engineering industries are presented in Table 17.

Table:17. Cuddy and Valle Index of Instability for Export of Selected Industries

Sl.No.	Exporting Engineering Industries	Instability	
		Index	Rank
1.	Hand tools and Hardwares	14.68	15
2.	Agricultural Machinery	32.66	8
3.	Mining Machinery and Equipments	42.10	6
4.	Machinery for Manufacture	24.11	13
5.	Machine tools and parts	32.90	7
6.	Computing and Accounting Machines	56.34	3
7.	Electrical machinery	29.56	10
8.	Wires, Cables, optical fibres	30.08	9
9.	Cells and batteries	15.95	14
10.	Electrical home appliances	29.38	11
11.	Ship and boat building	109.87	1
12.	Railway wagons	59.99	2
13.	Motor cycle and Scooters	42.29	5
14.	Bi-cycles and parts	26.22	12
15.	Medical, surgical, scientific	43.63	4
16.	Total Exports	39.714	-

Note: (Repeat from T.16)

As could be seen in the table, ranking of the industry by the instability index was the same as that for Coppock's index, without any exception. The values of index numbers were uniformly large than those for Cuddy-Valle for exports of all the industries. Thus Coppock's measure indicated larger instability than Cuddy Valle measure.

However with a lone exception for ship and boat building instability index of Coppock exceeded the corresponding Cuddy-Valle index by not more than five percentage points. Therefore, both the methods might be considered equally valid to measure instability the Cuddy-Valle index being explicit in correction for the trend and having specific attention to the value of $\bar{R}^2$ of the trend equation. Both the measures lead to the same inference that instability in the export of engineering goods was large and would need attention of the policy makers because a reduction in instability in export would have similar effect on economic growth.

Cyclical Variation

Apart from the trend and irregular variations there may be cyclical variation in the annual time series data and it is important for export. Therefore, index of cyclical variation was constructed by the method of three year moving average for total export and export of engineering goods of India. To know the effect of cyclical variations in export and G.N.P. and vice-versa the index was constructed for G.N.P. also. The estimated indices are presented in Table 18 below.

Table:18. Indices of Cyclical variation in G.N.P., Total Export and Engineering Exports of India

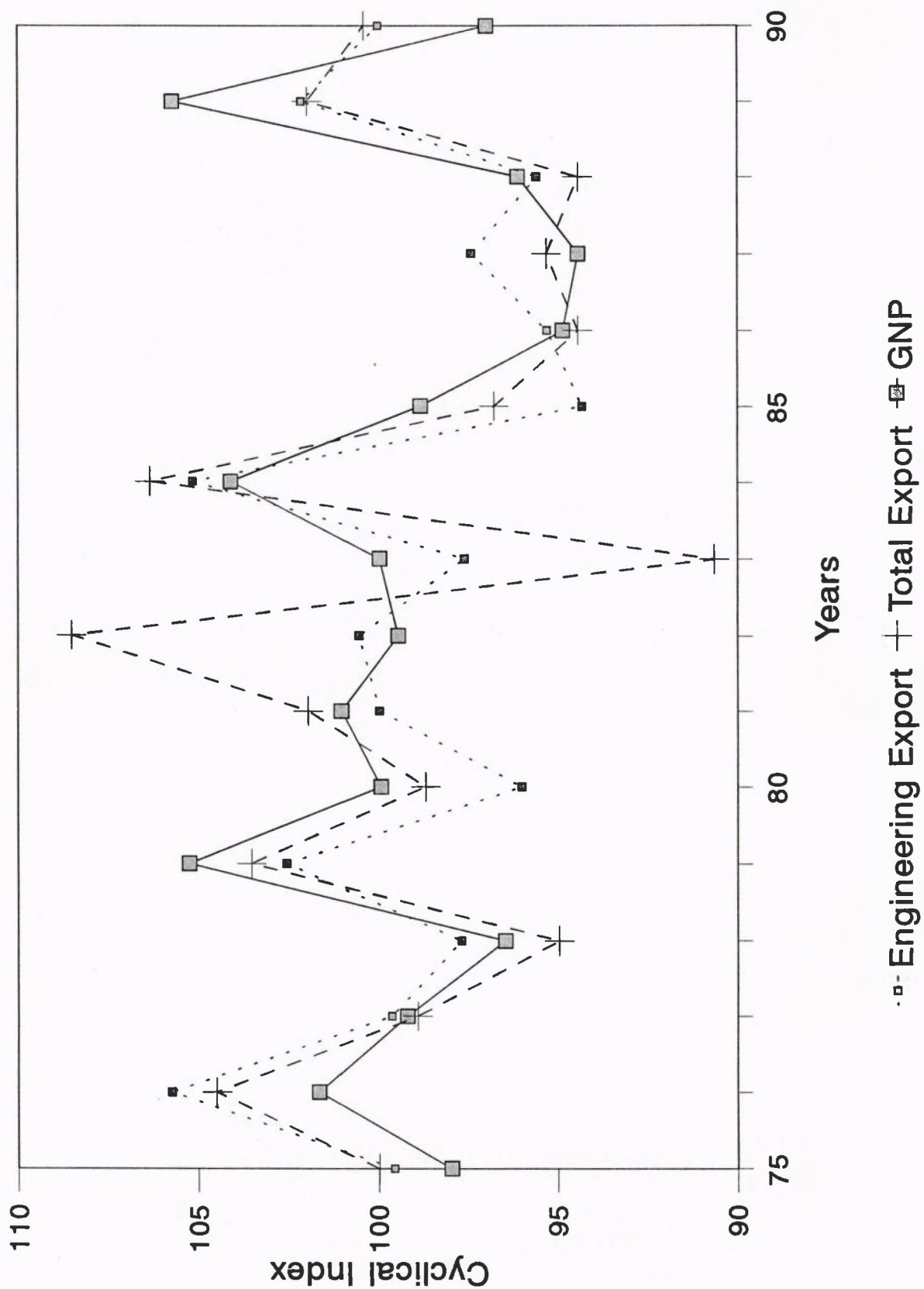
Years	Index of Cyclical Variation (%) in		
	Engineering Exports	Total Exports	GNP
1975 - 1976	99.56	99.98	97.67
1976 - 1977	105.74	104.49	101.64
1977 - 1978	99.63	98.91	99.20
1978 - 1979	97.67	94.94	96.46
1979 - 1980	102.54	103.52	105.25
1980 - 1981	95.99	98.67	99.92
1981 - 1982	99.95	101.94	101.02
1982 - 1983	100.52	108.51	99.44
1983 - 1984	97.58	90.63	99.96
1984 - 1985	105.15	106.32	104.09
1985 - 1986	94.30	96.76	98.82
1986 - 1987	95.29	94.42	94.84
1987 - 1988	97.39	95.29	94.42
1988 - 1989	95.56	94.40	96.10
1989 - 1990	103.12	101.95	105.71
1990 - 1991	99.99	100.38	96.97
Range	94.30 to 105.15	94.40 to 106.32	94.42 to 103.71

Note:i) Based on three year moving average

ii) Data for few years before 1975-76 and after 1990-91 were available to workout three year moving averages for all the stud years.

As could be seen in the table above, the index of cyclical variation moved closely around hundred. In no case the index deviated by larger than seven percentage points on either side of 100. For all the three variables, the range was narrow between 95 and 106 showing that there was little cyclical variation in export of engineering goods, total exports and GNP of India during the study period from 1975-76 and 1990-91. It should be remembered here that the study period did not cover the period of New Economic Policy. Then, the inference was that the dynamic changes in export of engineering goods, total exports and GNP were more secular than cyclical, inspite of significant

Fig.2.Cyclical Variation in Selected Variables.



random variation as shown by the index of instability. The strong secular trend in engineering exports and total exports would suggest a good prospects for growth and exports in the years ahead. The indices of cyclical variation are shown in Fig 2.

One way of sustaining the uptrend in export of engineering goods and for minimizing instability in it is to improve production efficiency so as to reduce the unit cost of production enabling the firms to earn larger profit even with the given levels of product prices in domestic and foreign market. Therefore, the performance of engineering industries was studied in terms of productivity of capital and labour and capital intensity.

Productivity of Capital:

The engineering industries require huge investment of capital. Therefore, return to the capital is a major factor influencing their performance and the return to the capital depends on three important features of capital namely; (I) its size, (ii) the quality of capital particularly its technology vintage and (iii) the intensity of its use. Insufficient investment will make the size of capital inadequate, while over investment may result in under utilization. Technological progress in production may cause obsolescence of capital and necessitate replacement. Intensity of use would bring in the operation of law diminishing returns. If the firms in the engineering industry are assumed to be operating in the rational (second) zone of production the average productivity will be declining and any more upward may be the result of modernisation which means replacement with technologically advanced capital stock. With this basic expectation, return to the capital

is studied for selected years for the 15 engineering industries by the capital productivity ratio defined as:

$$\text{Capital Productivity Ratio} = \frac{\text{Net value added}}{\text{Gross fixed capital}}$$

both the values being measured in constant (1980-81) prices. Measured this way, the ratio indicates return in rupees for a rupee worth of capital employed in the industry. The time series data for the years 1975-76 to 1990-91 were used and the ratios were computed for all the years, for each of the engineering industries. The ratios were then compared for their values in five year intervals. The estimated ratios are presented in Table 19 below.

Table:19. Capital Productivity Ratio in Engineering Industries of India in Selected Years.

Sl.No	Engineering Industries	Capital Productivity Ratio in			
		1975-76	1980-81	1985-86	1990-91
1	Hand tools and Hardwares	1.05	1.07	0.80	0.97
2	Agricultural Machinery	0.76	0.90	1.54	1.58
3	Mining Machinery and Equipments	0.89	0.90	0.91	0.96
4	Machinery for Manufacture	0.76	0.74	1.00	0.85
5	Machine tools and parts	0.98	1.08	1.39	0.99
6	Computing and Accounting Machines	0.90	1.25	1.18	0.54
7	Electrical machinery	0.88	0.86	2.46	1.23
8	Wires, Cables, optical fibres	0.71	0.99	0.47	0.50
9	Cells and batteries	0.78	1.05	1.20	0.77
10	Household Electrical Appliances	1.39	1.23	1.35	0.80
11	Ship and boat building	2.09	0.96	1.37	1.24
12	Railway wagons	1.05	1.03	0.84	0.79
13	Motor cycle and Scooters	0.59	0.93	0.62	0.85
14	Bi-cycles and parts	0.75	1.09	0.66	0.81
15	Medical, surgical, scientific	0.68	1.05	0.93	0.82
	All	0.98	1.02	1.13	0.94.

Note - @ other than food

As could be seen in the table above, for the whole of engineering industries of India, the capital productivity ratio was 0.98 in 1975-76. It showed that net value added per rupee of capital stock in Rs. 0.98 (98 paise). The capital productivity improved to 1.02 in 1980-81 and further to 1.13 in 1985-86, but declined to Rs. 0.94 in 1990-91. Thus the returns to capital was not small and net value added per rupee of capital was around Rs.1.

Capital invested in industries proceeding (i) agricultural machinery (ii) mining machinery had steady rise in productivity while that in other industries showed variations up and down. It revealed varying degree of intensity of capital use. The positive values seen for the net value added (after removing inflationary effect by the use of 1980-81 constant prices) showed that the return to capital was not small.

Labour Productivity

Similarly productivity of labour was studied. It was measured by the labour productivity ratio (LPR) defined as

$$\text{LPR} = \frac{\text{Net value added in 1980-81 prices}}{\text{No. of persons employed}}$$

This ratio would show the net value added per employee per year and at constant prices; it was a measure of real value productivity. The LPR estimates for different engineering industries of India are compared for select years in Table 20.

Table:20. Labour Productivity Ratios in Engineering Industries of India in Selected Years

Sl.No.	Engineering Industries	Labour productivity Ratios in			
		1975-76	1980-81	1985-86	1990-91
1	Hand tools and Hardwares	7.50	5.82	6.13	4.01
2	Agricultural Machinery	8.61	5.49	6.77	4.88
3	Mining Machinery and Equipments	6.73	7.21	7.69	8.99
4	Machinery for Manufacture	18.17	16.59	21.40	40.84
5	Machine tools and parts	6.36	5.91	8.52	6.00
6	Computing and Accounting Machines	11.47	12.64	14.37	27.88
7	Electrical machinery	12.60	14.60	17.32	39.78
8	Wires, Cables, optical fibres	5.38	5.47	6.11	6.98
9	Cells and batteries	8.38	10.49	13.20	14.56
10	Household Electrical Appliances	7.27	6.71	11.77	13.15
11	Ship and boat building	1.67	2.93	3.33	3.68
12	Railway wagons	4.90	4.20	5.62	8.32
13	Motor cycle and Scooters	6.70	9.70	16.90	21.34
14	Bi-cycles and parts	5.41	6.82	7.60	8.93
15	Medical, surgical, scientific	4.83	4.63	9.48	14.17
	All	7.69	7.98	10.62	15.13

Note : @ other than food

As could be seen in the table, labour productivity ratio in engineering industries as a whole had nearly doubled from 7.69 in 1975-76 to 15.13 in 1990-91. It showed that at (1980-81) constant prices, the productivity per employee per year increased from Rs.7,690 to Rs. 15,130 over the period of 16 years. The increase was small in the five years ending 1980-81, but it was significantly large (to Rs.10,620 from Rs. 7,980) in the next five years ending 1990-91. In India, employees enjoyed 65 days of holidays with pay. Therefore the productivity per worker related to 300 days of work in a year. Then the productivity per day (usually of eight hours) increased from Rs.25.63 to Rs. 50.43 both at constant prices. Thus labour productivity in engineering industry had doubled

during the period of study. The increase in labour productivity was steady in all but three engineering industries. The exceptions are (i) hand tools and hardware, (ii) agricultural machinery and (iii) machine tools and parts. In them uptrend seen upto 1985-86 dipped in 1990-91. Among the engineering industries the highest labour productivity was seen in manufacturing industries, followed by electrical industries, computing and accounting machines, cells and batteries and Household appliances in that order. The lowest productivity was seen in ship and boat building. Thus, productivity of labour varied much among the engineering industries, but in majority of them the trend was to rise.

The significant improvement in labour productivity might have come from improvement in their skill either by experience or by special training, recognition and/or incentive offered by the management. It would be then endogeneous technological progress. There was no data to isolate and measure this. The improvement in productivity might also have been made possible by increasing use of capital per worker; the capital generally coming with technology embodied in it. New investment and modernisation of existing machines might have contributed to this. In both the case (increase in capital stock and modernisation) the aggregate value of capital stock would increase valued at 1980-81 constant prices, it would be the measure of real increase in capital stock. Then, the ratio of this (real) value of capital stock, to the labour employed was a measure of capital intensity (CI) stated as

$$CI = \frac{\text{Gross Fixed Capital (at 1980-81 prices)}}{\text{Number of persons employed}}$$

It would show the value of real capital per worker (in Rs.000). The dynamic changes in capital intensity is shown in Table 21.

Table:21. Capital Intensity in Engineering Industries of India in Select years

Sl.No.	Engineering Industries	Capital Intensity in			
		1975-76	1980-81	1985-86	1990-91
1	Hand tools and Hardwares	63.98	94.05	172.58	320.06
2	Agricultural Machinery	79.01	87.06	149.28	315.55
3	Mining Machinery and Equipments	60.44	114.64	173.45	468.75
4	Machinery for Manufacture	108.31	115.40	140.69	355.32
5	Machine tools and parts	69.49	92.93	140.47	384.14
6	Computing and Accounting Machines	76.24	82.63	239.40	422.22
7	Electrical machinery	77.97	91.37	165.84	299.67
8	Wires, Cables, optical fibres	86.70	88.00	185.61	302.56
9	Cells and batteries	73.49	92.74	171.36	338.34
10	Household Electrical Appliances	56.64	78.54	201.96	312.68
11	Ship and boat building	37.64	103.16	187.29	281.70
12	Railway wagons	74.71	89.29	203.01	286.74
13	Motor cycle and Scooters	68.73	92.65	281.08	421.27
14	Bi-cycles and parts	87.87	86.36	168.07	294.89
15	Medical, surgical, scientific	88.58	163.49	214.34	426.35
All		81.97	99.97	188.43	349.78

Note - @ other than food

As could be seen in the table, capital intensity steeply increased over the years, nearly fourfold within a period of 16 years. It was a sign of modernisation and technological advancement in production. This increase for the industry as a whole is also seen. Among them, manufacturing, computing and accounting, motor cycles and scooter and medical and scientific industries registered very high intensity. The capital intensification was significantly larger in the five years ending 1990-91 than in the previous periods. Thus, modernisation (for which capital intensity was taken as a proxy) had found very significant progress in recent years. This had resulted in significant rise in labour productivity. With better machines and technology embodied in them,

engineering industries were able to improve productivity on the whole and labour productivity in particular (vide Table 20).

The strong relationship between labour productivity and factor intensity was further studied with the help of simple linear correlation coefficients.

Correlation analysis

The Simple linear correlation coefficients r estimated for the association between labour productivity (Q/L) and factor (capital) intensity (K/L) are presented in Table:22.

As could be seen in the table, all but three correlation coefficients were statistically significant at one per cent level. The estimated correlation coefficient had negative sign and were not statistically significant at five per cent level for three industries viz., i) Hand tools and hardware (343), ii) Machine tools and parts (357) and (iii) Railway wagons (372). The lone exception was agricultural machinery industry (350) for which the correlation coefficient was statistically significant at five per cent level and had a negative sign. Therefore, the inference was that capital intensity (K/L) had a positive and significant effect. On labour productivity, in 11 out of 15 engineering industries, but had no effect in three industries (343, 357 and 372), but a negative effect in agricultural machinery. The negative effect in the lone case could be interpreted as excessive use of capital in a relatively labour intensive production condition. For the engineering industries as a whole the correlation coefficient was 0.789. It was statistically significant at one per cent level and had a positive sign. Thus, production in engineering industries was, at least in majority of them, capital intensive. These statistically significant simple linear correlation coefficients suggested the need to study production function.

Table 22. Correlation coefficients for Q/L and K/L in Engineering Industries

S.No.	Engineering Industries	Code	r
1		343	-.439 NS
2	Hand tools and Hardwares	350	-0.500 **
3	Agricultural Machinery	351	0.977 **
4	Mining Machinery and Equipments	354	0.883 **
5	Machinery for Manufacture	357	-0.040 NS
6	Machine tools and parts	358	0.980 **
7	Computing and Accounting Machines	360	0.903 **
8	Electrical machinery	361	0.992 **
9	Wires, Cables, optical fibres	362	0.909 **
10	Cells and batteries	364	0.879 **
11	Household Electrical Appliances	370	0.977 **
12	Ship and boat building	372	-0.439 NS
13	Railway wagons	375	0.898 **
14	Motor cycle and Scooters	376	0.693 **
15	Bi-cycles and parts	380	0.981 **
16	Medical, surgical, scientific		0.789 **
All			

r - Correlation coefficient

NS - Not significant even at 5 per cent level

* - Significant at 5 per cent level

** - Significant at 1 per cent level

Production Function

Production function analysis of engineering industries - in fact for any industry - is very useful because it provides answer to very important questions: (I) whether the industry in question enjoys economies of scale; (ii) whether firms in the industry use factors of production efficiently which helps making inter-firm comparisons in resource allocation; (iii) whether the returns to a particular input are increasing or decreasing so as to ascertain the need for subsidizing or the scope for taxing the particular input and (iv) whether there exists any substitution possibility between inputs and to what extent. Therefore, production function analysis is done for the selected engineering goods

industries of India with the help of the time series data available for the study. Efficiency in production of engineering industry assumes importance because it acts as the basic support to all the modern industries.

In the production function analysis, the first step is the choice of functional form. There are two alternate forms of production function in wide use viz., (i) Cobb Douglas (CD) and (ii) Constant Elasticity of Substitution (CES) production functions. The CD function for two factor inputs has the form:

$$Q_t = A K_t^\alpha L_t^\beta e^{u_t} \quad \dots \quad (1)$$

Where,

- Q_t = production measured by value added in constant (1980-81) prices
- K = Capital
- L = Labour
- u = Stochastic disturbance term

A, α, β are parameters to be estimated

e = base to natural log.

For this function, α and β are elasticities of production with respect to capital and labour respectively; $\alpha + \beta$ = returns to scale and the elasticity of substitution is unity ($\sigma = 1$). The estimate form of CD production function is usually in linear transformation. If the assumption ($\sigma = 1$) is valid, then the following form is preferred.

$$\ln Q_t = a + b \ln L_t + c \ln K_t + u_t \quad \dots \quad (2)$$

Where,

$$a = \ln A \quad b = (\alpha + \beta - 1)$$

If there were the problem of multicollinearity arising from the inter dependence capital and labour to some extent an alternative form was suggested. It was

$$\ln (Q/L)_t = a + b \ln L_t + C \ln (K/L)_t + u \dots \dots (3)$$

It allows the use of ordinary least squares (OLS) method of estimation. The value of β can be obtained as $\beta = b - (C-1)$.

The second option is to use the CES production function specified for two factor inputs as:

$$Q_t = \gamma [1 - \delta K_t^{-\rho} + \delta L_t^{-\rho}]^{-\nu/\rho} e^{u_t} \dots (4)$$

Where,

γ, δ, ρ and ν are the parameters of the model (3) to be estimated. Q, K, L being the same as defined above for C.D. It can be shown that for C.E.S. production function.

$$\text{Production elasticity of capital (K)} = \left(\frac{1 - \delta}{\nu/\gamma(\rho/\nu)} \right) Q_t^{\rho\nu} / K_t^{\rho}$$

$$\text{Production elasticity of Labour (L)} = \delta [\nu/\gamma(\rho/\nu)] [Q_t^{\rho\nu} / L_t^{\rho}]$$

$$\text{Returns to scale} = \nu$$

$$\text{Elasticity of substitution (} \sigma \text{)} = 1 / (1 + \rho)$$

However, for all its sophistication CES production function is difficult to estimate directly especially when the number of observations are not sufficiently large. It is not even possible to make simple transformation to an estimated form. However, Kmenta¹ suggests an approximation to CES, which allows estimation of parameters. It is of the form:

$$\ln (Q/L)_t = A + B \ln L_t + C \ln (K/L)_t + D [\ln (K/L)_t]^2 + u_t \dots \dots (5)$$

Where,

$$A = \ln \gamma$$

$$B = (\nu - 1)$$

$$C = (1 - \delta)$$

$$D = -0.5 \nu \rho \delta (1 - \delta)$$

In the form OLS method can be applied². The values of the structural parameters can be detrieved from the estimated values of the coefficients in (5) as follows.

$$\gamma = e^A ; \nu = (\beta + 1) \quad \delta = 1 - (C / \nu)$$

$$\rho = -D / 0.5 \nu \delta (1 - \delta)$$

Now, there is the choice between CD and CES functions. A comparision of (2) and (5) shows that only difference between them is the presence of an extra term D in (5). When this coefficient turns out to be significantly different from Zero (t-test)³ the CD form is rejected in favour of CES form and vice-versa.

The CES production function (5) was estimated for each of the 15 engineering industries and for their aggregates. In all the cases, the coefficient D was not statistically significant and R^2 were all low and so the CD function was chosen in preference to CES. This result was not totally unexpected because the CES production function was based on the assumption of independence of (Q/L) and (K/L). The variables was in fact dependent as shown by the statistically significant simple linear correlation coefficients for majority of the engineering industries (vide Table 22). This dependence affected the value of elasticity of substitution; it would not be constant. An option was to fit variable elasticity of substitution (VES)⁴ function as:

$$\ln (Q/L)_t = \beta_0 + \beta_1 \ln (W_t) + \beta_2 \ln (K/L)_t + u_t - \dots \dots \dots (6)$$

-
1. J. Kmenta, 'On the Estimation of CES Production Function'. International Economic Review. (1): 180-189, 1967.
 2. H.S. Sandhu and T.S. Sodhi, 'Production function Analysis for Engineering Goods Industry in Punjab - A Case study' Margin 17(3): 66-74, 1985.
 3. With due consideration to the value of R^2 - the coefficient of multiple determination adjusted for the degrees of freedom.

This performed no better than CES, probably because of very rough estimate of W for a heterogeneous group of workers in the engineering industries. Therefore, the final choice was (2) or (3). However, to include the measure of neutral technological progress an exponential time trend⁵ was included in (1) as

$$Q_t = A K_t^\alpha L_t^\beta e^{\gamma t} e^{u_t} \quad \dots \quad \dots \quad \dots \quad (7)$$

which on log transformation added a new term (D_t) to (2) as:

$$\ln Q_t = a + \alpha \ln K_t + \beta \ln L_t + \gamma_t + u_t \quad \dots \quad \dots \quad (8)$$

The model in (8) represents the estimable form of CD production function corresponding to (2). Similarly, equation corresponding to (3) is defined as:

$$\ln (Q/L)_t = a + \alpha \ln (K/L)_t + \beta' \ln (L)_t + \lambda_t + u_t \quad \dots \quad \dots \quad (9)$$

where $a = \ln A$, $\beta' = (\alpha + \beta - 1)$ and $\lambda = \ln \lambda$

The required estimate of the parameter β of model (3) appears implicitly in the estimated form (9). So it is worked out from the relationship.

$$\beta^* = \beta' - (\alpha - 1) \quad \dots \quad \dots \quad \dots \quad (10)$$

Above specified equations (8) and (9) were estimated for each of the 15 engineering industries and their aggregate (16th equation of the same form) and the better fit as decided by the value of R^2 and agreement of the sign of the coefficients of the variables with the a priori expectations concerning them, was chosen. It happened that in all cases the form (9) showed the better fit than the form (8) and the former was retained to draw inferences. Antilog of $\hat{a}$ and $\hat{\lambda}$ in equation 9 would be the value of A and γ respectively in equation (7). The estimated values of the parameters and the test statistics are presented in Table 23.

4. M. Chandrasekaran and Bhavani Sridharan. "Productivity Trends in Cotton Industry in India". Indian Economic Journal, 41(2): 61-70, 1993; 5, *ibid*.

Table:23. Estimated Log -log Production Functions for Engineering Industries of India

Industry Code	Estimated Values of Parameter					dw
	A $\hat{a}$	B α	C β	D γ	R ²	
343	0.628 NS (0.493)	0.603 ** (94.401)	0.142 NS (1.814)	0.042 * (2.562)	0.96 ** (200.68)	1.22
350	1.774 NS (1.009)	0.597 * (2.634)	0.209 * (2.613)	0.106 ** (7.873)	0.98 ** (326.02)	1.31
351	1.816 NS (0.987)	0.745 * (4.249)	0.10 NS (0.294)	0.136 ** (19.53)	0.89 ** (142.24)	1.18
354	2.206 NS (1.892)	0.875 ** (4.763)	0.063 * (2.689)	0.012 NS (1.282)	0.87 ** (62.41)	0.92
357	0.815 NS (0.486)	0.813 ** (3.988)	0.291 NS (1.274)	0.019 NS (0.706)	0.82 ** (163.69)	1.15
358	2.314 NS (1.679)	0.799 ** (13.843)	0.168 NS (1.940)	0.018 NS (1.979)	0.795 ** (91.17)	1.45
360	1.871 NS (1.698)	0.601 ** (4.758)	0.165 ** (7.854)	0.118 * (2.678)	0.88 ** (62.41)	0.90
361	2.186 NS (1.067)	0.834 ** (9.149)	0.278* (2.387)	0.011 NS (0.438)	0.807 ** (66.35)	0.76
362	2.377 NS (1.948)	0.653 ** (4.184)	0.006 NS (0.053)	0.041 * (2.971)	0.803 ** (30.312)	0.56
364	0.357 NS (0.982)	0.873 ** (13.41)	0.190 * (2.781)	0.007 NS (0.662)	0.764 ** (47.68)	0.41
370	2.192 NS (1.117)	0.724 ** (13.062)	0.334 ** (3.823)	0.018 NS (2.173)	0.95 ** (291.60)	1.25
372	2.211 NS (1.697)	0.485 ** (3.669)	0.001 NS (0.174)	0.073 ** (3.672)	0.493 * (8.16)	1.20
375	2.910 NS (2.003)	0.864 ** (13.851)	0.151 * (2.192)	0.013 NS (1.134)	0.789 ** (58.30)	0.81
376	1.272 ** (3.298)	0.794 ** (10.812)	-0.015 NS (-0.114)	0.001 NS (0.083)	0.443 * (12.93)	1.14
380	1.240 NS (1.016)	0.758 ** (15.381)	0.120 NS (1.394)	0.034 ** (4.663)	0.93 ** (98.961)	0.78
All	1.385 NS (1.896)	0.695 ** (4.112)	0.169 * (2.018)	0.044 * (2.312)	0.871 ** (39.362)	1.91

Note : A= e^a, B, C, D as defined in equation 9

Figures within () denote t and F values;

NS = Not significant

* Significant at 5% level

** Significant at 1% level

In all equations d.w. was not significant

The log-log factor intensive Cobb Douglas has production functions estimated by ordinary least square method and presented in Table:23 were all valid to draw inferences in all the cases. The value of adjusted coefficient of multiple determination (R^2) was statistically significant in all the equations and the elasticity coefficients of capital and labour (α and β) had the expected positive sign in all but one coefficient of labour. The exception was the coefficient of labour in engineering industry of bicycle and parts (code No.376), it was not statistically significant even at five per cent level of significance. Thus all the estimated equations were useful to explain the production relationship. Though the equations were based on time series data for rather a short span of 16 years, there was no problem of AUTO regressive errors as shown by the statistically non significant values of 'd' statistics in all the equations. In all but one equation, the regression constants were not statistically significant showing that there was no serious problem of omitted variables or approximation of functional form. For the engineering industry producing bicycles and parts (code 376), the regression constant was statistically significant at one per cent level indicating omission of some relevant variable probably industry specific. It was for this industry that the elasticity coefficient of labour had the unexpected negative sign, but it was tolerated because the coefficient was not statistically different from zero. The value of R^2 was very low at 0.443 – the lowest among the 16 equations. Thus the equation for bicycle industry had a relatively poor fit, yet it was valid for interpretation with very low explanatory power. The explanatory power of other equations varied from 49.3 per cent ($R^2 = 0.493$) for railway wagons (Code 372) to 98 per cent ($R^2 = 0.98$) agricultural machinery (Code 350). For the engineering industries as a whole (equation 16) the value of R^2 was 0.871 showing that the specified variables could

explain nearly 87 per cent of variation in value of production per worker, the regression constant was not statistically significant and the coefficients α of capital per worker (K/L), β of labour and λ of technology had positive sign and were statistically significant and there was no problem of auto regressive error (d.w = 1.91). Therefore, it was possible to evaluate resource use efficiency and returns to scale in the selected engineering industries and their aggregate with the help of the estimated regression equations. However, it would be convenient to derive parameters of the structural equation (3) from the estimated form (9) and with the help of the relationship stated in (10). The derivation of the values of the structural parameters could be seen in Appendix VII. The derived values of the structural parameters are presented in Table 24 for each of the 16 equations presented in Table 24.

Table: 24. Structural Parameters of C.D Production Function @

Industry code	A	α	β	γ	ν
343	1.874	0.603	0.539	1.043	1.142 *
350	5.894	0.597	0.612	1.112	1.209 *
351	6.147	0.745	0.265	1.146	1.010 NS
354	9.079	0.875	0.188	1.012	1.063 NS
357	2.259	0.813	0.478	1.019	1.291 *
358	10.115	0.799	0.369	1.018	1.168 *
360	6.495	0.601	0.564	1.125	1.165 *
361	8.900	0.834	0.444	1.011	1.278**
362	10.773	0.653	0.353	1.042	1.006 NS
364	1.429	0.873	0.317	1.007	1.190 **
370	8.954	0.724	0.610	1.018	1.334 **
372	9.125	0.485	0.516	1.076	1.001 NS
375	18.357	0.864	0.287	1.031	1.151 *
376	3.568	0.794	0.191	1.001	0.985 NS
380	3.456	0.758	0.362	1.035	1.112 *
All	3.995	0.695	0.474	1.045	1.169 *

Note : @ Refers to Equation (3)

$$A = e^a$$

$$\gamma = e^\lambda$$

See Appendix VIII for α , β and ν

γ = Scale parameter $\alpha + \beta$

NS= Not significant

*= Significant at 5% level

**=Significant at 1% level

Neutral Technology

As shown in Table 24, the value of A varied from 1.429 in electric home appliances (364) to 18.357 in motor cycle and scooter industry (375) the value being 3.995 for the aggregate of all engineering industries. The values indicated productivity (value added per worker), independent of the influence of changes in the values of the explanatory variables. As the dependent variable was measured in Rs. 1,000, the productivity per worker was seen to vary from Rs. 1, 429 to Rs. 18.537 per year. The effect of neutral technological progress was studied by the value of the coefficient γ of exponential time trend variable. In the estimated form, it was represented by λ . In seven of the 15 industrywise equations (for 343, 350, 351, 360, 362, 372 and 380) and for the aggregate of engineering industries the coefficient (λ) was statistically significant, while it was not significant in the other (eight) engineering industries. Thus the neutral technological progress was as important as the non neutral (biased) technological progress in engineering industries of India. The value of this variable (γ) varied from Rs. 1,01 to Rs. 1,46 per worker per year among the engineering industries and Rs. 1045 for the aggregate.

Production Elasticity

The structural parameters α and β showed production elasticities of capital and labour respectively. The elasticity of production with respect to capital evaluated at centroid and ceteris paribus varied from 0.485 for railway wagons (372) to 0.875 for manufacturing industries (354), the value being 0.695 for the aggregate. These positive but less than unity value of production elasticities of capital revealed that all the

engineering industries were using capital in the rational zone. All they would need was to adjust the use of capital in response to changes in factor γ product price ratios and within the zone.

The production elasticity (β) of labour varied from 0.188 for manufacturing (354) to 0.612 for agricultural machinery (350) the value being 0.474 for the aggregate. All the values were positive and less than unity again showing that the use of labour in engineering industries of India was in rational production zone, individually and in the aggregate.

Further, production elasticity of capital was larger than that of labour – that too very significantly in all but two engineering industries indicating that production in most of the engineering industries would respond to capital than to labour. Thus production in these industries was capital intensive. In other words, production technology was capital biased, probably because technology came embodied in capital. The two exceptions are agricultural machinery (350) and railway wagon (372) wherein production elasticity of labour was larger than that of capital - of course the difference was small. The production technology in these two industries was labour intensive. In the aggregate, the engineering industries in India followed capital intensive technology.

Returns to Scale

In Table 24, the returns to scale was shown by v and it was nothing but $\delta + \beta$. Its value varied from 0.985 for bicycle industry (376) to 1.334 for ship and boat building industry (370) the value being 1.169 for the aggregate of all engineering industries. For

five of the fifteen industries, the values of v were not statistically different from unity and for them it was constant returns to scale. The industries were (i) mining machinery (351); (ii) machinery for manufacturing (354), (iii) cells and batteries (362), (iv) railway wagons (372) and (v) bicycles and parts (376). For all other (10) industries the value of v was larger than unity and significantly different from unity, showing increasing returns to scale. Thus majority of engineering industries of India produced with increasing returns to scale. For the aggregate also it was the same increasing returns to scale. This increasing returns to scale in majority of the engineering industries showed that the assumption of constant returns to scale for the C.D. production was not valid. The production function should therefore allow for estimation of returns to scale. This requirement justified the inclusion of $\ln L$ in (9) (unrestricted form) in preference to the model without $\ln L$) restricted form.* It would not be difficult to see that when $\alpha + \beta = 1$ the variable $\ln L$ drops out because its coefficient is zero. The unrestricted form used in this study avoided the problem of high multi collinearity between K and L and allowed estimation of the returns to scale (v). This model found use in the works of Pendse *et al.*, and Sandhu and Sodhi.

 Pendse, N.G., L.M.S. Baghal and S.K. Chaubey, (1996): 'Productivity Trends and Technological Change in Vanaspathi Ghee Industry in Madhya Pradesh', **Indian Journal of Economics**, 46(303): 499-500.

H.S. Sandhu, and T.S. Sodhi. op.cit.

* It would not be difficult to see that when $\alpha + \beta = 1$ the variable $\ln L$. Drops out because its coefficient $\beta^1 = (\alpha + \beta - 1)$

Export from Tamil Nadu:

After evaluating engineering industries of India for their growth, instability, productivity returns to scale and technology, the final exercise was to study their problems. The analysis so far was based on secondary time series data for the industries. This source of data did not provide any information on problems of the industries, it required primary data. Fortunately, it was possible to select engineering industries for most of the groups in Coimbatore itself. The primary data from these industries were collected and studied for their operational problems. But, the basic question was: whether the problems reported by the units in Coimbatore could be generalised for the engineering industries of India. This generalisation was possible only if the units selected in Coimbatore were atleast approximately representative of the units in India. This aspect was examined first by studying the share of Tamil Nadu in Engineering goods exports of India and second by comparing capital and labour productivities and capital intensity, for the Coimbatore units with all India estimates already discussed.

Share of Tamil Nadu

The details of exports of engineering goods at all India, South India and Tamil Nadu levels and the percentage share of Tamil Nadu in all India and South India exports of engineering goods are presented in Table 25.

Table: 25 Exports Of Engineering Goods from Tamil Nadu, South India to All India from 1975-76 to 1990-91

Year	All India Engg. Export Rs.crores	South India Exports Rs. crores	Tamil Nadu Exports Rs. Crores	% age of T.N.Exports to All India	% age Share of South India to All India Exports
1975 - 76	408.22	71.36	21.00	5.14	17.48
1976 - 77	551.68	82.71	28.00	5.07	14.99
1977 - 78	623.96	92.85	37.06	5.93	14.88
1978 - 79	716.93	98.35	40.15	5.60	13.71
1979 - 80	736.68	100.25	42.25	5.73	13.60
1980 - 81	874.17	102.97	49.27	5.63	11.78
1981 - 82	1046.98	123.35	50.13	4.79	11.79
1982 - 83	1160.00	127.59	44.06	3.79	10.98
1983 - 84	1000.00	135.59	46.43	4.64	13.55
1984 - 85	1150.00	143.85	66.46	5.77	12.50
1985 - 86	1095.00	138.70	54.27	4.95	12.66
1986 - 87	1150.00	186.71	82.17	7.14	16.23
1987 - 88	1448.00	221.80	72.56	5.01	15.31
1988 - 89	2109.00	275.04	117.53	5.57	13.04
1989 - 90	3145.00	365.75	153.70	4.88	11.62
1990 - 91	3250.00	475.00	228.50	7.03	14.61

Source : Engineering Export Promotion Council, Calcutta

Note : South India Exports included, Exports of Engineering Goods from Tamil Nadu, Karnataka, Kerala and Andhra Pradesh.

As could be seen in Table 25, Tamil Nadu, had maintained a share of 3.79 per cent to 7.14 per cent in total exports of engineering goods from India over the period from 1975-76 to 1990-91. Its share in export of engineering goods from South India varied from 11.62 per cent to 17.48 per cent during the same period (1976 to 1991). Thus Tamil Nadu remained important for engineering industries by its share in export of engineering goods.

In Tamil Nadu, Production of engineering goods was seen to be concentrated in Cioimbatore, Salem and Chennai. In total production of engineering goods.

Coimbatore accounted for more than 40 per cent since 1976. Therefore, Coimbatore was selected for the study.

Engineering Industries in Coimbatore

All the engineering industries located in Coimbatore and registered with the Engineering Export Promotion Council (EEPC), Chennai were listed and a sample of 62 firms (nearly 24 per cent of the total) were selected by simple random sampling method. Their distribution among different categories is shown in Table 26.

Table: 26 Categorywise Distribution of export companies of Engineering Goods in Coimbatore

Sl.No.	Item	No	Percentage
1	Merchant Exports (ME)	9	14.51
2	Small Scale Units (SSI)	21	33.87
3	Medium and Large Exports (ML)	30	48.38
4	Through Export Houses (EH)	2	3.22

Medium and large scale exporters were predominant among the export oriented engineering industries of Coimbatore with a share of 48 per cent in the total number of sample units. Small scale industries closely followed with a share of 33.8 per cent. Merchant exporters and those exporting through export houses were relatively fewer.

Of the 62 companies surveyed 28 per cent had fifty or fewer employees seventy per cent of the companies had annual export to the value of Rs. 370 to Rs. 400 lakhs. The companies with more than 100 employees used both computers and manual methods to keep their market information. What was important for the purpose of the study was their classification by their type of products for comparing them with the 15 categories of

engineering goods industries discussed for the all India. Such details of production of the sample units are presented in Table 27.

Table 27. Classification of sample Engineering Firms of Coimbatore by the Type of Products

Sl.No.	Type of Products	Code No.	Sample Firms	
			No.	%
1.	Hand tools and hardwares	343	4	6.45
2.	Agricultural machinery	350	7	11.27
3.	Mining machinery	351	-	-
4.	Manufacturing machines	354	11	17.74
5.	Machine tools and parts	357	2	3.23
6.	Computing and Accounting machines	358	-	-
7.	Electrical machines	360	4	6.45
8.	Wires, cables, optical fibre	361	-	-
9.	Cells and batteries	362	-	-
10.	Home appliances	364	31	50.0
11.	Ship and Boat building	370	-	-
12.	Railway wagons	372	-	-
13.	Motor cycles and Scooters	375	-	-
14.	Bicycles and parts	376	-	-
15.	Medical and Scientific equipment	380	3	4.84
16.	All		62	100.00

As could be seen in the table, seven of the 15 engineering industries of India found representation in the sample of engineering firms of Coimbatore. Of them, the most important industry was the electric home appliances industry (364), accounting for 50 per cent of all engineering firms in the sample. The wet grinders, mixers and domestic pump sets of small H.P. were specialities of small scale units of engineering industry in Coimbatore. Pumpsets of various types viz., monoblock, jet, submersible and turbine model in horse power varying from 3HP to 10 HP were the major agricultural machineries produced in Coimbatore. Minor Product of this category were bund former,

buck scraper, iron ploughs, seed sand turmeric treatment drums, seed drills, sugarcane crushers and thrashing machines. This group ranked third. Coimbatore had more than 50 textile mills, 500 power looms and a large number of handlooms in textile industry. Textile and jaggery making industries were the major manufacturing industries of Coimbatore. To meet their requirements of spare parts and accessories there were several small scale engineering enterprises and a few large scale units. They ranked second with a share of 17.74 per cent of the total sample units. Hand tools and hardwares required for various industries were also produced by small scale units. Large enterprises produced machine tools for other engineering units. Starters, electric switches and spares were also produced and they accounted for 6.45 per cent of total number of sample units in Coimbatore. Medical and Scientific equipments and tools were produced to a small extent. Thus, engineering industry in Coimbatore was much diversified and had the support of a large domestic market. It enabled them to avail advances in technology and produce goods meeting the quality standards expected for export. Their own associations of SSI and MLE, the merchant exports (ME) and Export houses (EH) helped the growth of export of engineering goods from Coimbatore.

Thus engineering units in Coimbatore had no representation to engineering industries of India producing (1) mining machinery (351), (ii) computer and accounting units (358), (iii) wires, cables and optical fibres (361), (iv) cells and batteries (362), (v) ship and boat building (370), (vi) railway wagons (372), (vii) motor cycle and scooters (375) and (viii) bicycle and parts (376) which were special nature with no base (in resources or expertise) to support them locally. However, the sample units of engineering industries of Coimbatore did however have representation for all other major categories

of industries and that allowed generalisation of the findings to some extent. By way of further verification of this chain, the seven categories of engineering industries of Coimbatore were compared with their counter parts at all India level for three efficiency measures viz., capital productivity (Q/K), labour productivity (Q/L) and capital intensity (K/L). Estimates are presented in Table 28.

In the table, a value of R greater than unity would show larger value of the measure for Coimbatore than that for all India and a smaller value of R would show a larger value of the measure for all India. For example the value of 0.92, for R of capital productivity for industry 343, would show that the capital productivity was smaller for Coimbatore than that for all India in hand tools and hardware industry (343). Other values of R could be interpreted in the same way. What was important for the present study was whether the ratios (R) was significantly different from unity. In the absence of sufficient data to estimate variances and to use F test, a simple test was used. Any value not deviating from unity by more than 10 per cent was taken to be not significantly different from unity. In other words, values for Coimbatore sample units should not exceed or fall short of the values for AI by more than 10 per cent. Then, any value of R in the range from 0.91 to 1.10 was taken to be not significantly different from unity implying that the sample units and all India industry were comparable at their mean level. By this test, only engineering industries producing home appliances differed in capital productivity and labour productivity ratios between Coimbatore and all India units in Coimbatore had significantly larger capital and labour productivity ratio than that for all India. This could be explained by the specialisation of Coimbatore units in electrical home appliances.

Table 28. Comparison Efficiency Measures for Engineering Industries of Coimbatore and All India

Sl.No	Category of Engineering Industries	Code No.	Capital Productivity Ratio			Labour Productivity Ratio			Capital Intensity (K/L)		
			AI	Co	R	AI	Co	R	AI	Co	R
1	Hand tools and Hardware	343	0.97	0.89	0.92	4.01	4.25	1.06	320.06	329.66	1.03
2	Agricultural machinery	350	1.58	1.69	1.06	4.88	5.08	1.04	315.55	287.15	0.91
3	Manufacturing Machinery	354	0.85	0.86	1.01	40.84	40.16	0.98	355.32	415.72	1.17*
4	Machine tools and parts	357	0.99	1.03	1.04	6.00	5.85	0.98	384.14	407.19	1.06
5	Electrical machinaries	360	1.23	1.18	0.96	39.78	34.67	0.87	299.67	503.45	1.68*
6	Home appliances	364	0.80	1.46	1.83*	13.15	26.90	2.05	312.68	268.90	0.86
7	Medical and Scientific	380	0.82	0.76	0.93	14.17	13.75	0.97	426.35	460.46	1.08

Note: 1. Figures for All India refer to the estimates for 1990-91

ii. Figures for Coimbatore are sample means for 1990-91

iii. AI = All India; Co = Coimbatore; R = Ratio of the measure to Co to that for AI

Even in Capital Intensity (K/L) ratio only two industries, namely Manufacturing (354) and Electrical (360) machineries had R values significantly different from unity. Thus in majority of the cases engineering industries in Coimbatore were on par with those at all India level in terms of capital productivity, labour productivity and capital intensity. This allowed generalization of problems found in Coimbatore engineering enterprises to the engineering industries in India in general. Problems of specific to particular engineering industry category could not be generalized. With this background the problems of engineering industries in general were identified.

Identification of problems

Problems of engineering industries were identified with the help of open ended questions that encouraged the entrepreneurs to think and response in their own way.

Structured questions were deliberately avoided because it might put answer into their mouth and might allow little thinking. But there is difficulty in bringing different responses into a common list and it was solved by grouping similar responses that differed only in the way of expression. The major problems identified this way and the number of respondents reporting them are listed in Table 29. Problems specific to particular industry were omitted because their probability was too small.

Table 29. Problems of Engineering Industries

Sl.No	Problems	No.of Firms Reporting	Relative frequency %	Rank
1.	Uncertain demand causing instability in export	36	58.06	10
2.	Complex procedure	59	95.16	3
3.	Several controls	51	82.26	6
4.	Frequent policy changes	29	46.77	12
5.	Absence of reliable trade information	42	67.74	9
6.	Inadequate transport facilities	54	87.10	4
7.	Poor communication facilities	50	80.65	7
8.	Lag in market intelligence	32	51.61	11
9.	Power cuts-announced and unannounced	60	96.77	2
10.	High cost of coal and petroleum energy sources	53	85.48	5
11.	Difficulty in Institutional credit	46	74.19	8
12.	Difficulty in modernisation of production technology	26	41.94	13
13.	The gulf crisis and internal problems of African countries	25	40.32	14
14.	Un-fair trade restrictions by developed countries	22	35.48	15
15.	Poor government support for trade promotion	61	98.39	1
16.	Labour problems causing delay in delivery of products	32	51.61	11

Note: % percentage of sample firms reporting the problem in the total of 62 firms

As could be seen in the table, the most important (top ranking) problem was the poor government support for trade promotion. Their complaint was that the government did not help them with information on market potentials, infrastructure and credit from banks. The cost of credit when it was available was too high for most of the small scale operators. The problem of inadequate supporting services was especially severe and it found reflection in the second rank going to power cuts - announced and more often unannounced stoppage of supply of electricity which was fully the monopoly of the government. Inadequate transport facilities (rank 4) more specifically support of railway

wagons and shipping services, high cost of energy sources (rank 5), poor communication facilities (rank 7) and difficulty in institutional credit (rank 8) supported the complaint of poor government support (rank 1) because there had all been in the domain of public sector and the recent liberalisation policy had just begun*. Yet, the government had a very strong control on those industries, with the policies of license, regulation and quota which allowed little room for private initiative by such organisations as federation of Indian Industries Association of Engineering Industries, Federation of Small scale industries and the merchant exporters. It was reasonable therefore to find high ranks for several controls (rank 6) and complex procedure (rank 3).

In the circumstances, the engineering industries depended more on domestic market than on export. Therefore, their export was by residual approach - that is struggling to sell surpluses in markets abroad rather than producing for export. This was also partly due to absence of reliable trade information(rank 9) and instability in export for want of a steady demand and the presence of much instability in export (rank 10). The lag in market intelligence (rank 11) would explain this situation (rank 11). Labour problems such as strike, slow-down, indiscipline and resistance to any effort for mechanisation and frequent policy changes (rank 12) were also problems, but the industries took them as the fact of their life and worked within that constraint. This was not an encouragement for export and efficiency in production.

*in the last year (1991) of the period of this study. The policy of liberalisation began in June 91, even by 1995, no reliable data was available to study its impact

The gulf-crisis - slow growth of the economics of African countries and their balance of payment difficulties (rank 14) and unfair trade restrictions by developed countries (rank 15) such as super 301 and restriction on textile export had their impact on engineering industries which were suppliers of machineries to them. But these problems had lowest ranks because the engineering industries had still managed to achieve a steady uptrend in export. They did realise that the export potential was very high and they could scale new heights in export, if the government were less restrictive and more helpful. This was the opinion of all the sample firms and their most important demand was for market intelligency, liberal credit supply and adequate infrastructure. All these demands had found place in the recent package of globalisation policy. Hence, one could expect significant growth in production and export of engineering goods industries of India, in the years ahead.

A check

However there were several problems in export by India identified by several committees appointed by the government and not reported by the sample firms of engineering industries in Coimbatore. The Alexander Committee (1978), the Tandon Committee (1980), Hussain Committee (1984) identified the following problems explaining poor export performance of India.

1. absence of integrated view (ie) well knit objectives, policies and programmes,
2. delayed recognition of export opportunities and lag in action
3. faceless presence in world trade
4. poor technology, low productivity, un-economic scale of operation, time and cost over run, all making Indian products less competitive in the world market.

5. poor quality image and renege**
6. Structural weakness - slow to pick up booms and quick to pick up sluggishness
7. Operational constraints such as too many controls, procedural complexities, lack of stability in policies and inadequate trade information.

All but two of these, problems for Indian export in general found mention by engineering industries with varying ranks for them and were discussed above.

The two important omissions were problems (4) and (2). Earlier results showing significant and positive productivity ratios for both capital and labour and high capital labour ratio (K/L) in engineering industries of India and the presence of increasing an constant returns to scale in most of the engineering industries showed that problem of low productivity, uneconomic scale of operation was not very serious for them. But (a) the poor technology and (b) time and cost over run were real problems as shown by the complaint of difficulty in modernization (Sl.No.12 in Table 29), but it had a very low rank. So more important problem not finding place in the response of the sample units was that of poor quality image and renege. If found existing, these were the problems reflecting poor quality of the service of the firms and hence they might have gone unreported. Therefore, the firms were visited for a second time to find answer to the following two specific questions.

- (A) Was there any complaint from importers on quality of the products,
- (B) Was there any complaint of delayed supply and violation of contractual obligations?

** It means going back on a contract and failure to fulfil the contractual obligations and poor after sales services all causing unreliability of Indian exporters.

The period covered for this enquiry was the five years ending 1995. Invariably the answer was a definite 'no' by all the sample units. With this answer, the Engineering Export Council Calcutta was approached to know if there were any cases of complaint of poor quality and failure to meet contractual obligations by the importers of Indian Engineering goods during the last five years. The answer was again an emphatic 'no'. This check proved that quality and trade services were no constraints for the export of engineering goods from India, while they were problems in other exports especially manufacturers. Therefore, given the freedom to act (removing controls, and providing infrastructural support and policy incentive, the engineering industries of India would grow fast in production, export and production for export and the result would be significant benefits to the economy in terms of foreign exchange earning, technological progress, income and employment. It is the potential for the new economic policy (of 1991) to exploit.

CHAPTER V

SUMMARY AND CONCLUSIONS

CHAPTER - V

SUMMARY AND CONCLUSIONS

This chapter presents a summary of work done viz., the problem focus, objectives, methodology and findings. The hypotheses of the study are empirically tested and conclusions are drawn. The implications of the conclusions for policy on engineering industries for their growth, diversification and export are finally stated.

The Problem

During the fifty years of Independence, India has achieved good progress. Despite the three fold increase in human population, the country has achieved self-sufficiency in food grains and most of the agricultural raw materials and developed a strong and diversified technological and industrial base. It has the third largest reservoir of technological and scientific manpower. Some of the manufacturing plants set up in the country are among the largest in the world. The engineering industry has contributed much to this growth through value addition, employment of labour and export. Yet, India shares only a very small portion of the world market for engineering goods. Therefore, there is an immense scope for exploiting the world market potential by improvement in the quality and competitiveness of the Indian engineering goods. The engineering industry, which is next only to gems and jewellery and textiles in size of production, has a good future; since the government has rightly identified it as an engine of economic growth. Therefore, dynamics of engineering industries - growth, diversity, stability - are

important for the economic development of the developing economy in India. These aspects are receiving attention in this study.

Objectives

Therefore, this study was undertaken with specific objectives of; (i) evaluating the trends in G.N.P, total export and export of engineering goods from India, and (ii) understand the inter-relationship between G.N.P., total exports and export of engineering goods; (iii) to evaluate the performance of selected engineering goods; (iv) to analyse the inter regional variations in exports; (v) to identify the problems of export of engineering goods and possible remedies for them from the experience of select engineering industries and (vi) to discuss the prospects for improvement in the export of engineering goods and the policy measures required to help it.

Methodology

In the annual survey of industries, (ASI) engineering industries are listed in group (33-38), from the list, 15 industries were purposely chosen on the basis of the continuity in the export from 1975-76 onwards. (The 15 identified industries had industry classification code numbers of 343, 350, 351, 354, 357, 358, 360, 361, 362, 364, 370, 372, 375, 376 and 380) based on the details of item wise export provided by the export engineering promotion council, (EEPC) Calcutta. These industries were grouped by Standard Industries Committee on the basis of their products and production. In addition 62 firms located in Coimbatore district were studied to understand the problems of engineering goods industries. The study is based on secondary data relating to the annual time series for the period 1975-76 to 1990-91. The primary data were collected from the

units selected in Coimbatore district by personal interview method for the year 1995-96. To study the growth of production and export simple linear trend equations were used. Indices of instability developed by (a) Coppock and (b) Cuddy and Valle were used to measure instability in export, while three-years moving average was used to study cyclical variations. The impact of export on G.D.P was studied with the help of a conventional production function where the percentage rate of growth in real GDP at factor cost was regressed on percentage growth rates of labour input, capital input, total export, agricultural production and manufacturing production.

Another log-log function was estimated to study the relationship between total export and engineering exports of India. Attempts were also made to evaluate labour productivity and capital productivity in engineering industries and Indian economy for a comparative analysis. Finally, simple tabulation and ranking techniques were used to analyse the problems of engineering units in Coimbatore district.

Findings:
Contribution

There were-two important features in the growth of the economy. First, a significant uptrend in growth of National income was seen; second the real product increased at significantly lower rates than nominal G.N.P. The growth of real income per capita was still smaller due to rapid increase in the size of human population in the country. Estimates of compound growth rates, G.N.P, N.N.P and P.C.I gave reasons to be optimistic about future trends.

The share of engineering exports in total export of India increased from 10 per cent to 11 per cent only, showing that absolute value of engineering exports varied more than its relative share in total export. Thus, export of engineering goods had growth and stability in its contribution to total export. Thus, engineering exports were important for the country.

Destinations

Indian engineering products were exported to more than 120 countries. There was a shift in the direction of Indian engineering exports from Asia and Africa to America, Europe and Australia and it implied increasing acceptability of Indian engineering goods by the quality conscious of developed countries of the world.

Export of Indian engineering goods found concentration in 28 countries. Analysis of share of major importers (destination countries) showed that in general Asia, U.S.A. and U.K. were the major destinations. Among the African countries, Tanzania was important. Saudi Arabia, Iran and Nepal appeared in lists of both largest importers and minimum CV in them. The top 10 countries accounted for 60.68 per cent of total export and the countries with more stability accounted for only 23.67 per cent of total exports. Thus, both size and instability of exports deserved attention in export promotion for engineering goods.

Pattern

The pattern of export of engineering goods showed an uptrend in absolute value of all the three sectors viz., consumer durables, capital goods and others. The composition

changed in favour of 'other goods' from consumer durables and capital goods. The 'other goods' included metals, software, electronics, softwares, management and technical services, showing increasing sophistication and value-addition in Indian engineering exports.

Trends

An uptrend in engineering goods production helped a similar trend in export of engineering goods. The concept of production for export was catching up. With only a few exceptions, the increase in export of Indian engineering goods was significantly larger than that in the world as a whole during the period 1976-1991. There were significant and positive trends in GNP, total export and engineering reports showing significant contribution of export of engineering goods to the growth in GNP.

There were 15 major groups in the engineering goods exported. There were significant uptrends in export of 11 of the 15 groups, the four exemptions being (a) electrical home appliances, (b) ship and boat building equipments, (c) railway wagons and (d) motor cycles and scooters. They were non-traditional goods and recent additions to export.

Export had significantly contributed to economic growth through a reduction in the difference between export and import. Further analysis conclusively showed that the export of engineering goods had a significant impact on economic growth and the hypothesis of export led growth found support.

Growth rates

The growth rate of engineering exports (12.13 per cent per annum) was nearly three times the growth rate of GNP (4.33 per cent) during the period of 1976-1991 - a period marked by intensive efforts to promote export, allowing imports to help export which brought with it technology for modernisation of production of production of non-traditional export goods. Consequently, (a) machineries for mining, (b) computing and accounting machines, (c) machine tools and parts, (d) machineries for manufacturing industries and (e) cells and batteries registered high growth rates (exceeding 16.18 per cent per annum) in export. Significant growth rates in production was seen in all but two of the 15 engineering industries (in CGR larger than 10 per cent per year). Even the two exceptions (agricultural machinery and ship/boat buildings) had growth rate of 6.63 per cent and 4.40 per cent respectively. Thus all the engineering industries had grown fast but relatively fewer industries had success in export. It was the typical condition of a developing economy with problems of penetrating global market.

Instability

One reason was that instability in the export of engineering goods was large and all were not able to manage the risk arising from it. The large values of instability index (both Coppeck measure and that of Cuddy and valle agreeing) was free from trend effect. In annual time series, cyclical fluctuations and irregular variations were the two possible sources of instability. Analysis of cyclical variation showed that it was small revealing that the dynamic changes in export of engineering export (and also total exports) were

largely due to secular trend, while instability was due to random variation - a source of business risk.

Factor Productivity and Intensity

Capital productivity ratios showed that the returns to capital were positive and not small. productivity of labour (net of the cost) was also large; per man day (of eight hours) of labour it increased from Rs. 25.63 to Rs. 50.43 during the period of study - both figures being in 1980-81 prices. One factor contributing to it was the capital intensity - a proxy for modernization and technological progress. The capital intensity had significantly increased over the years in each of the engineering industries and consequently in their aggregate. Simple correlation coefficient between labour productivity and capital intensity had a positive and statistically significant value in 11 out of 15 engineering industries, not significant in three and significant with negative sign in one viz., agricultural machinery. Therefore, significant contribution of capital intensity to labour productivity was the rule with a few exceptions.

Production function

Production function analysis indicated neutral technological progress in seven of the engineering industries studied and in the aggregate. In other engineering industries it was biased. Production elasticity of both capital and labour capital was positive but had value less than unity in each of the engineering industries and hence in the aggregate also. The elasticity of production with respect to capital was larger than that for labour in all but two industries and in the aggregate. Thus production in engineering industries responded more to capital than labour, agreeing with the strong positive correlation

between labour productivity and capital intensity seen earlier. The returns to scale was constant for five engineering industries and increasing for 10 industries and in the aggregate.

Problems

Problems of engineering industries were identified from the primary data collected from 62 sample units selected in Coimbatore district. Though the same was not totally representative for the all India, the generalization was possible to a limited extent in view of the significant share of engineering industries in Coimbatore in the total exports from South India and that of South India to total exports from India. Further, the average factor productivity and factor intensity of the sample units were close to those of the comparable categories, at all India level. This was however a weak support and would need further verification. Therefore, the problems identified from the primary data were compared with those listed by Cherunilam from the report of the several committees. Sixteen problems were identified from the primary data. They included poor government support, controls, frequent policy changes, complex procedures, lack of infrastructure and trade information and difficult situations in importing countries. Labour problems and financial constraints and power cut were problems in production to sustain export and to win confidence of the buyers abroad.

A check with the problems stated by the expert committees on exports, revealed that poor quality image and reneging were important problems not reported by the sample units, because it would be a sad commentary on themselves. When specifically asked, the answer was the expected negation. This was checked with the engineering export

Promotion Council and it conclusively proved the absence of these problems. Therefore, quality of the product and observation of export obligations had no room for complaint with engineering goods exporters of India.

Conclusion

Above summary of findings was useful to verify the hypotheses of the study and to draw conclusions. The first hypothesis of the study was that 'Indian export of engineering goods had registered a significant growth'. Results of analysis of growth trends and compound growth rates showed that the coefficient of trend variable for engineering exports was statistically significant and had a positive sign (vide T 11) for the aggregate and for 11 out of 15 engineering industries studied (vide T.12). Compound growth rates (CGR) for engineering exports (vide T.15) was 12.13 per cent and it varied between 2.14 to 31.10 among the industries. Only electric home appliances and railway wagons had negative C.G.R; largely due to the increase in domestic demand, because growth rate of their production was very large or due to absence of cost advantage. Thus with only two exemptions, the first hypothesis was found to be true for the Indian engineering industries.

The contribution of engineering industries to total export was significant (vide equation-1 on p.111) Though exports reduced real income per capita (vide T.13), its contribution to the growth in GNP was positive and statistically significant (vide T.14). This verified the second hypothesis of the study to be true (ie) engineering goods had significantly contributed to both total exports and GNP.

However, the significant growth was marked by a strong secular trend, weak cyclical fluctuations (vide table 18) and large irregular variations year to year. The irregular variation was a source of business risk and it was measured by the instability indices of Coppock and Cuddy and Valle (vide T. 16 & 17). Both the indices led to the same conclusion that instability was large. Thus, the third hypothesis that 'Inter year variations in value of engineering goods export is so large as to cause instability in growth' was empirically verified to be true.

Production in engineering industries is economically efficient and so it is not a constraint for export. This the fourth hypothesis of the study and it is shown to be true by the results of analysis of factor productivity and production function. Productivity of both capital and labour was large and productivity ratios were also positive (vide T.19 & 20). The capital intensity had increased significantly over the year and with it, the productivity of labour too increased (vide T.22).

There was significant technological progress neutral in some cases and capital intensive in others. Increasing returns to scale and factor use at levels within the economically rational zone of production and modernization as implied by the rising capital intensity etc. pointed out to efficient production and the capacity to expand so as to sustain the uptrend in production.

However, the engineering industries suffered from several problems which limit their ability to export. Poor government support, buy extensive control, frequent policy changes, complex procedure are causes of operational problems. Inadequate supply of

credit, infrastructure, especially poor trade information, transport and communication facilities are the problems. It is a good comment on the export of engineering goods that poor quality image and reneging are not their problems. Therefore, export of engineering goods has good potential and deserves attention of the policy.

Policy implications

Above conclusions have specific policy implications. They are briefly stated below:

- There is good scope to increase the export of high value adding, non-traditional goods of engineering industries. Production, quality of products and the fulfilment of trade obligations are no constraints. Therefore, engineering exports deserve encouragement. Yet, export is seen to be based on residual approach (ie) finding buyers for the exportable surpluses. Encouragement to export has to come by the concept of production for export by making available infrastructure and trade information, in time.
- More specific attention is necessary to minimise instability which is large and a source of business risk, especially to those exporters in small scale industries. The reduction in instability is possible only by providing comprehensive and reliable trade information on potential markets and quality standards. This must receive top priority in policy as it is reported to be the reason for the complaint of poor government support that had the first rank among the problems.

- More sophistication and still higher value addition in engineering industries are possible by allowing liberal import of technology, capital goods and investment capital. An outward looking policy placing faith on the export led growth will help.
- Indian engineering industries are seen to suffer from serious bottlenecks of inadequate infrastructure, credit and complicated procedure for export. The problem of penetrating global market is not small. Only high quality of products, strict adherence to delivery schedule and comparative price advantage will help. Results show that these are within the reach of Indian engineering industries. Then the real need seem to be an integrated policy providing for trade information, quality control, infrastructure and incentive for private initiatives through collective bargaining and healthy completion.

The New Economic Policy (1991) with its emphasis on liberalization, globalization and infrastructural development for adequate supply of market information, transport communication, quality control, insurance and credit is therefore a step in the right direction. Faithful, efficient and timely implementation of the policy is therefore the need of the hour to meet the policy implications above stated. The pay off to the policy will definitely be high in terms of export led growth. It means more foreign exchange earning, rapid technological progress and higher income and employment for Indian economy. The engineering industries are then, the engine of this prospective real growth.

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APPENDICES

APPENDIX - I

LIST OF SELECTED INDUSTRIES

Sl.No.	Code	Industry
1.	343	Manufacture of Hand tools and Hardware
2.	350	Manufacture of agricultural machinery and equipment and parts theor of
3.	351	Manufacture of Machinery and equipment used by construction and Mining Industries
4	354	Manufacture of Industrial Machinery for other than food and textile Industries
5	357	Manufacture of Machine tools,. their parts and accessories
6	358	Manufacture of office computing and accounting machinery and parts
7	360	Manufacture of electrical industrial machinery apparatus and parts theor of
8	361	Manufacture of insulated wires and cables including manufacture of optical fibre cables
9	362	Manufacture of accumulators, primary cells and primary batteries
10	364	Manufacture of electric fans and electric/electro thermic domestic appliances and Parts theor of
11.	370	Ship and Boat building
12	372	Manufacture of railway/tramway wagons and coaches and other railroad equipment
13	375	Manufacture of Motor-cycles and scooters and parts (including three wheelers)
14	376	Manufacture of bicycles, cycle-rickshaw and parts
15	380	Manufacture of medical, surgical, scientific and measuring equipment except optical equipment

Source: Government of India, Central Statistical organisation Department of Statistics,
Ministry of Planning, Annual Survey of Industries (ASI),
Summary Results For Factory Sector, New Delhi.

APPENDIX - II

SAMPLE ENGINEERING FIRMS FROM COIMBATORE

Sl.No.	Name of the company	Status
1.	Ahura Welding Electrodes Mfrs.Ltd. Coimbatore	SSI
2.	Arun Agencies, Coimbatore	SSI
3.	Allied Engineering Industries, Coimbatore	EH
4.	Auto Shell Casts Private Limited, Coimbatore	SSI
5.	AKS Paper Mill Plant Suppliers (P) Limited, Coimbatore	DGTD
6.	CPC (P) Ltd., Coimbatore	DGTD
7.	Dhandayuthapani Foundary Private Ltd., Coimbatore	DGTD
8.	D' Engg. Pvt. Ltd., Coimbatore	DGTD
9.	DPF Electricals, Coimbatore	DGTD
10.	Elgi Equipments Ltd., Coimbatore	DGTD
11.	Elgi Tyre & Tread Ltd., Coimbatore	DGTD
12.	Elgi Ultra Appliances Ltd., Coimbatore	ME
13.	Eltex Super Castings Ltd. Coimbatore	DGTD
14.	Fasto Controls P. Ltd. Coimbatore	SSI
15.	Gedee Weiler Pvt. Ltd., Coimbatore	DGTD
16.	Ganapathy Engg. Mfrs. P. Ltd., Coimbatore	SSI
17.	Interfit India Ltd., Coimbatore	DGTD
18.	KEI Engineers, Coimbatore	ME
19.	K.U. Sodalamuthu and Co. P. Ltd., Coimbatore	SSI
20.	Kumar Engg. Works, Coimbatore	SSI
21.	KLRF Sheet Metal Industries, Coimbatore	SSI
22.	Kirthika Enterprises, Coimbatore	ME
23.	Lakshmi Card Clothing Mfg. Co. Ltd., Coimbatore	DGTD
24.	Lakshmi Machine Works Ltd., Coimbatore	DGTD
25.	L.G. Balakrishnan and Bros.Ltd., Coimbatore	DGTD

APPENDIX -II (Contd.)

Sl.No.	Name of the company	Status
26.	Lakshmi Ring Travellers (Cbe) Ltd., Coimbatore	DGTD
27.	Lakshmi Textile Exporters Ltd., Coimbatore	EH
28.	Lakshmi Automotive Loom Works Ltd., Coimbatore	DGTD
29.	Lakshmi Synthetic Mfrs. P. Ltd., Coimbatore	DGTD
30.	Mayflower Pumps and Compressors, Coimbatore	ME
31.	Mouli and Sons Engineers Pvt. Ltd., Coimbatore	SSI
32.	MAK Controls, Coimbatore	SSI
33.	Needle Industries India Ltd., Nilgiris	DGTD
34.	Pandian Engg. Industries, Nilgiris	SSI
35.	Premier Instruments and Controls Ltd., Coimbatore	DGTD
36.	PSG and Sons Charities, Coimbatore	DGTD
37.	Premier Polytronis Ltd., Coimbatore	DGTD
38.	P.Raju Naidu Sons Enggt. Works, Coimbatore	DGTD
39.	P.S.G. Industrial Inst. Coimbatore	SSI
40.	Revathi -CP Equipment Ltd., Coimbatore	DGTD
41.	Roots Industries P. Ltd., Coimbatore	SSI
42.	Rangamma Steels and Malleables, Coimbatore	DGTD
43.	Rangavale Industries, Coimbatore	SSI
44.	Sam Exports, Coimbatore	ME
45.	Sri Ramakrishna Steel Industries Ltd., Coimbatore	DGTD
46.	Soverign Engineers (P) Ltd., Coimbatore	SSI
47.	Servall Engg. Foundry P. Ltd., Coimbatore	DGTD
48.	Sri Ranganathar Inds., Coimbatore	SSI
49.	Shanthi Gears Ltd., Coimbatore	DGTD
50.	Statex Exporters, Coimbatore	ME

APPENDIX - II Contd.)

Sl.No.	Name of the company	Status
51.	Sharp Electrodes P. Ltd., Coimbatore	SSI
52.	Schuttee Meyer Impex (P) Ltd., Coimbatore	ME
53.	Salem Steel Plant, Coimbatore	DGTD
54.	~~Tenassories Mfg.~~ Coimbatore	DGTD
55.	Textool Co. Ltde., Coimbatore	DGTD
56.	Texmo Precission Casting Coimbatore	DGTD
57.	Velumani Engg. Industry, Coimbatore	SSI
58.	VGP Honing Industries, Coimbatore	SSI
59.	Veejay Marketing, Coimbatore	ME
60.	Venus Technical Services, Coimbatore	SSI
61.	Universal Radiators (Exports)	ME
62.	Uni Drivelines Pvt. Ltd., Coimbatore	SSI

APPENDIX - III

INTERVIEW SCHEDULE

(To elicit information on experiences and problems faced by the firms Exporting engineering products from Coimbatore)

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed University), Coimbatore - 641 033.

I. General

- 1.1. Name of the Company
- 1.2. Location
- 1.3. Age of the Company
- 1.4. Type of Organisation : Partnership/JSC - Public/Private

II. Export Performance

- 2.1. Kindly give details of the following for the past 10 years

Years	Total Exports (Qty.)	Value in Rs./Cores
1981-82		
1982-83		
1983-84		
1984-85		
1985-86		
1986-87		
1987-88		
1988-89		
1989-90		
1990-91		

- 2.2. Mention the prime export destinations for product of your company

	Quantity	%	Value in Rs.
1. U.S.A.			
2. Middle East			
3. Western Europe			
4. East and South East Asia			
5. Africa			
6. If any other, mention			

.....PTO

III. Experience

3.1. For how many years you have been exporting your products/services

Products	Services
1. 5-10 years	
2. 10-15 years	
3. 15-20 years	
4. 20-25 years	
5. 25 and above	

3..2. Are you able to succeed in realising your target set in exports: Yes/No

3.3. If it is 'Yes' what are the reasons for your success in realising the target?

- 1.
- 2.
- 3.
- 4.
- 5.

3.4. If it is 'No' what are the reasons for the failure of realisation of the target set in exports?

External difficulties	Internal difficulties
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

.....PTO

3.5. How do you find out a true picture of the business opportunities available abroad

1. Through published documents
2. Through business associations with clients and partners
3. Through appointed representatives abroad
4. If any other source, kindly mention

3.6. Do the above mentioned sources provide you relevant information to exploit the full potential of the market **Yes/No**

3.7. If 'No' give the reasons

IV. Collective Efforts

4.1. Apart from your membership in Engineering Export Promotion Council, are you a member of any other forum. please specify name and since when?

- a) Confederation of Indian Industry (CII)
- b)
- c)
- d)
- e)

4.2. Do these associations really help you to grow? **Yes/No**

4.3. How do they help your business?

1. By conducting Seminars/Workshops/Conferences etc.
2. Conducting competition
3. Arranging face to face meetings with various Government Departments and other Institutions like Banks etc., at regular intervals
4. Conducting trade fairs
5. If any other specialised services they render kindly mention

.....PTO

4.4. How do you involve yourself to make the best use of your membership?

- 1.
- 2.
- 3.

V. Technological Progress

5.1. Regarding technology upgradation, do you find that you are in an advantageous position in international market vis-a-vis your competitors in terms of

- a. Product design
- b. Finish
- c. Specific features
- d. Raw material substitutes

5.2. Mention the specific measures that need to be taken in the context of re-orientation of marketing methods especially after the unification of Europe

- 1.
- 2.

5.3. In the wake of the sudden declaration in overseas projects business particularly in the Gulf Region, what are the steps taken by you to expand your exports?

VI. Promotional Efforts

6.1. Can you give your views regarding the promotion of trade among developing countries

- 1.
- 2.
- 3.
- 4.
- 5.

.....PTO

6.2. Due to debt problems and the ubiquitous foreign exchange shortages, a number of developing countries in both Asia and Africa have curtailed their purchases of industrial products. In this situation what is your suggestion to maintain the traditional markets for our engineering exports.

1.

2.

3.

VII. Suggestions

7.1. Can you suggest some steps which could promote the export of Indian Engineering Goods.

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7.2. How the Government of India can help you?

APPENDIX - IV

DATA FOR EXPORT AND GROWTH RELATION (At 1980-81 prices)

Year	Population (Million persons)	Investment (Output/Capital)	Exports	(Rs.Crores)	
				Agriculture production	Manufacturing production
1950-51	363.2	954	3496	24204	6451
1951-52	369.2	1188	3394	24615	6719
1952-53	375.6	772	2787	25387	6790
1953-54	382.4	909	2491	27309	7250
1954-55	389.7	1070	3090	28119	7839
1955-56	397.3	1469	3209	27890	8642
1956-57	405.5	1959	2889	29404	9372
1957-58	414.0	1843	2862	28149	9408
1958-59	423.1	1785	2468	30941	10025
1959-60	432.5	1996	2711	30670	10732
1960-61	442.4	2544	4169	32793	117790
1961-62	452.2	2438	4185	32866	12685
1962-63	462.0	2916	4147	32329	13532
1963-64	472.1	3266	4413	33091	14932
1964-65	482.5	3735	4180	36068	16013
1965-66	493.2	4390	3782	32310	16418
1966-67	504.2	5437	3066	31892	16874
1967-68	515.4	5334	2926	36501	17288
1968-69	527.0	5113	3218	36478	18219
1969-70	538.9	6285	3250	38805	19821
1970-71	551.3	7177	3484	41385	20209
1971-72	563.9	7986	3457	40661	20793
1972-73	576.8	8130	3843	38752	21545
1973-74	590.0	11824	4213	41468	21966
1974-75	603.5	13379	4794	40919	22361
1975-76	617.2	14811	5982	46183	23507
1976-77	631.3	16721	7147	43656	25658
1977-78	645.7	18765	7079	47929	27437
1978-79	660.3	24266	7329	49039	29959
1979-80	675.2	25278	7169	43005	28963
1980-81	688.5	30880	6711	48536	29828
1981-82	703.8	36089	7101	51547	32092
1982-83	718.9	36634	7483	51190	33471
1983-84	734.5	41488	7601	56531	36541
1984-85	750.4	45406	8330	56547	38844
1985-86	766.5	55889	7378	56841	40602
1986-87	782.7	63427	7845	56259	43404
1987-88	799.2	78572	9130	56559	46287
1988-89	815.8	99456	10756	65756	50324
1989-90	832.6	121838	13564	67064	55597
1990-91	951.7	145731	14323	69862	59125
1991-92	867.8	148715	17176	68395	58470
1992-93	883.9	172908	19328	71746	5908

APPENDIX - V

DATA ON MACROVARIABLES

	Gross NationalProduct at factor cost		Gross NationalProduct at factor cost		All Exports (Rs.Crores)	Engineering Exports (Rs.Crores)
	At Current Prices	At 1980- 81 prices	N.I. At Current Prices	N.I. At 1980-81 Prices		
1975-76	70946	104660	64623	954.33	4042.25	408.22
1976-77	76303	1059966	69523	96253	5142.25	5514.68
1977-78	87118	113903	79749	103670	5404.26	623.96
1978-79	93724	120302	85298	109466	5726.26	716.93
1979-80	102595	114379	92324	102937	6458.76	736.68
1980-81	122772	122772	110685	110685	6710.7	874.17
1981-82	143256	129928	128797	117140	7802.97	1046.98
1982-83	158761	133299	141875	119704	8907.70	1160.00
1983-84	185779	143861	166550	129392	9872.00	1000.00
1984-85	207109	149256	185018	133808	11569.80	1150.00
1985-86	232370	155365	206133	139025	11012.00	1095.00
1986-87	258225	161535	228402	144242	12452.00	1150.00
1987-88	292232	168121	258891	149787	15741.00	1448.00
1988-89	348207	185277	309286	165751	20295.00	2109.00
1989-90	402930	198082	357931	177552	27681.00	3145.00
1990-91	468059	207488	416495	185683	32553.34	3250.00
Mean	203149.12	144639	181348.7	130033	11960.70	1279.10
S.D	118428.66	31423.4	104532.6	27563.6	8047.05	821.10
C.V.	58.29	21.72	57.64	21.19	67.27	64.19

Note : Since 1966-67, the figures are given in post devaluation rupees.

Source : Government of India, Economic survey, 1991-92 and 1992-93. p.S3

APPENDIX - VI

EXPORT OF INDIAN ENGINEERING GOODS - COUNTRYWISE FOR MAJOR IMPORTERS FOR 1975-76 TO 1990-91
(Value In Lakh Rupees)

Year/Countries	Asia	E. Asia	Bangladesh	Indonesia	Japan	Malaysia	Nepal
1975-76	23029.64	11774.39	1857.88	1204.18	708.33	1661.94	927.43
1976-77	31582.27 (37.14)	11717.72 -0.48	2614.78 40.74	1319.63 9.59	602.97 -14.87	1086.70 -34.61	844.26 -8.97
1977-78	32557.17 (3.09)	13516.37 15.35	1718.05 -34.29	1889.50 43.18	131.92 -78.12	1688.63 55.11	1023.12 21.19
1978-79	34776.74 (6.82)	17913.07 32.53	2348.39 36.69	1375.16 -27.22	314.62 138.49	2282.06 35.38	1019.66 -0.34
1979-80	37344.26 (7.38)	18861.29 5.29	2897.47 23.38	1733.17 26.03	148.78 -52.71	2861.61 25.40	1200.02 17.69
1980-81	42573.61 14.00	23263.30 26.34	4536.65 56.57	2549.20 47.08	892.54 499.91	2642.32 -7.66	1684.39 40.36
1981-82	46655.39 9.59	19089.19 -17.94	3796.45 -16.32	2304.22 -9.61	1446.19 62.03	1699.34 -35.69	1434.51 -14.84
1982-83	466.00 -0.12	19090 -	4893 28.88	1900 -17.54	1300 -10.11	140 -17.62	1760 22.69
1983-84	46550 -0.11	19000 -0.47	5060 3.41	1200 -36.84	1250 -3.85	1350 -3.57	2400 36.36
1984-85	40400 -13.21	20200 6.32	5980 18.18	760 -36.61	1165 -6.80	1260 -6.67	3200 33.33
1986-86	32700 -19.06	20700 2.48	6070 1.51	490 -35.33	945 -18.88	1130 -10.32	3660 14.38
1986-87	30700 -6.12	18200 -12.08	6500 7.08	800 63.27	1200 26.98	1400 23.89	2000 -45.36
1987-88	40500 31.94	25500 40.11	7000 7.67	800 -	1300 8.33	2000 42.86	3400 70.00
1988-89	47200 16.54	32500 (27.45)	6700 -4.29	1500 87.50	1000 -23.08	2400 20.00	2800 -17.65
1989-90	63000 33.47	4200 (29.23)	8500 26.87	2500 66.67	4000 300.00	3400 41.67	4200 57.14
1990-91	975000 54.76	71500 (70.24)	15000 76.47	7100 184.00	5500 37.50	8900 161.76	1800 50.00

APPENDIX - VI (Contd.)

Year/Countries	Singapore	Sri Lanka	Thailand	West Asia	Bharien	Iran	Iraq	Jordan
1975-76	955.99	1063.33	662.60	11255.25	452.75	2247.08	2382.83	85.47
1976-77	1272.20 33.08	1575.35 48.15	916.19 38.27	19864.55 76.49	703.69 55.43	2844.68 26.59	1914.49 -19.65	484.39 466.74
1977-78	1390.60 9.31	2687.83 70.62	1082.59 18.16	19040.80 -4.14	627.20 -10.87	3254.98 14.42	1535.63 -19.79	243.20 -49.79
1978-79	1840.57 32.36	3941.00 46.62	1106.21 2.18	16863.67 -11.43	532.60 -15.08	2384.08 -26.76	1832.45 19.33	409.83 68.52
1979-80	1674.57 -9.02	3908.77 -0.82	1155.14 4.42	17382.97 3.07	326.52 -38.69	2555.88 7.21	2150.78 17.37	214.67 -47.62
1980-81	1691.58 1.02	4159.97 6.43	2158.38 86.85	19310.31 11.08	439.15 34.49	4262.37 66.77	2582.30 20.06	214.38 -0.14
1981-82	2001.78 18.34	2510.39 -39.65	2072.85 -3.96	27566.20 42.75	725.14 65.12	6552.29 53.72	5389.32 108.70	371.69 73.38
1982-83	2020 0.91	2500 -0.41	1200 -42.11	20540 -25.49	680.20 61.80	4560 -30.41	3720.00 -30.97	370.25 -0.39
1983-84	2028 0.40	2460 -1.60	780 -35.00	16620 -19.08	420.40 -38.19	2250.49 -50.65	2465 -33.74	360 -2.77
1984-85	2035 0.35	2300 -6.50	720 -7.69	14375 -13.51	360.00 -14.37	1750.60 -22.21	1010 -59.03	355 -1.39
1985-86	2250 10.57	2370 304	620 -13.89	12000 -16.52	360.00 -	1930 10.25	960 -4.95	350 -1.41
1986-87	1900 -15.56	1600 -32.49	800 29.03	12500 4.17	600 66.67	1200 -37.82	300 -68.75	500 42.86
1987-88	3000 57.84	3000 87.50	1200 50.00	15000 20.00	350 -41.67	2300 91.67	800 166.67	300 -40.00
1988-89	3900 30.00	5600 86.67	2500 108.33	22000 46.67	300 -14.29	1000 -56.52	1700 112.50	700 133.33
1989-90	5000 28.21	6000 7.14	2800 12.00	30000 36.36	400 33.33	2200 120.00	3200 88.24	800 14.29
1990-91	12100 142.00	9400 56.67	4700 67.86	26000 -13.33	600 50.00	2800 27.27	2200 -31.25	1600 200

APPENDIX - VI (Contd.)

Year/Countries	Kwait	Oman	Soudiarabia	Turkey	YAR	Algeria	Ghana	Tanzania
1975-76	1188.30	579.07	1551.19	58.45	174.43	0.07	94.12	937.64
1976-77	3820.06	850.76	2543.16	94.25	866.53	0.78	115.74	1716.87
	221.47	46.92	63.95	61.25	396.78	1014.29	22.97	83.11
1977-78	2889.43	885.70	3521.82	41.95	768.07	0.03	300.54	1457.53
	-24.36	4.11	-0.60	-55.49	-11.36	-96.15	159.67	-15.11
1978-79	2496.31	653.20	3869.19	100.38	1051.76	15.50	274.51	2735.76
	-13.61	-26.25	9.86	139.28	36.94	51566.67	-8.66	87.70
1979-80	1827.07	864.58	4593.00	366.27	1038.35	289.85	139.46	2410.99
	-26.81	32.36	18.71	264.88	-1.28	1770	-49.20	-11.87
1980-81	1747.63	931.38	4606.08	8.50	962.80	82.68	704.13	1650.60
	-4.35	7.73	0.28	-97.68	-7.28	-71.47	404.90	-31.54
1981-82	2406.12	1441.23	4398.95	135.03	939.73	750.46	352.92	1494.94
	37.68	54.76	-4.50	1488.59	-2.40	807.67	-49.88	-9.43
1982-83	2040	1325	3325	145	625	640	462	940
	-15.22	-8.08	-24.41	7.38	-33.49	-14.72	30.91	-37.12
1983-84	1765	1220	3200	225	535	580	925	720
	(-13.48)	(-7.92)	(-3.76)	(55.17)	(-14.40)	-938	100.22	-23.40
1984-85	1125	1050	2650	300	420	405	1280	600
	-36.26	-13.93	-17.19	33.33	-21.50	-30.17	38.38	-16.67
1985-86	760	925	2170	325	475	360	1460	615
	-32.44	-11.90	-18.11	8.33	13.10	-11.11	14.06	2.50
1986-87	800	400	2500	600	500	400	300	1200
	526	-56.76	15.21	84.62	5.26	11.11	-79.45	95.112
1987-88	800	1200	3200	800	600	200	500	800
	-	200	28.00	33.33	20.00	-50.00	66.67	-33.33
1988-89	1000	1100	3600	850	800	300	500	1500
	(25.0)	(-8.33)	(12.50)	(6.251)	(33.33)	(50.00)	(-)	(87.50)
1989-90	1400	1400	5000	920	900	400	800	1800
	(40.00)	(27.27)	(38.89)	(8.24)	(12.50)	(33.33)	(60.00)	(20.00)
1990-91	1000	1300	4700	1000	600	400	600	2602
	(-28.57)	(-7.14)	(-6.00)	(8.70)	(-33.33)	(-)	(-25.00)	(44.44)

APPENDIX - VI (Contd.)

Year/Countries	Tunisia	Uganda	Holand	Italy	U.K	Canada	U.S.	Caribbean Islands
1975-76	25.03	98.30	303.82	207.05	1237.72	315.40	1553.72	46.92
1976-77	12.37	159.82	1227.35	276.38	1697.81	376.42	2739.60	135.14
	-50.58	62.58	303.97	33.48	37.18	19.35	76.33	188.02
1977-78	10.97	986.91	480.10	296.80	1917.29	363.40	3612.73	71.89
	-11.32	517.51	-60.88	7.39	12.92	-3.46	31.87	-46.80
1978-79	30.90	516.02	474.91	312.59	3041.53	-	5085.55	50.58
	181.68	-47.71	-1.08	5.32	58.64	-	40.77	-29.64
1979-80	109.78	989.50	460.85	505.29	3378.50	587.62	6740.64	21.83
	255.28	91.76	-2.97	62.61	11.08	-	32.54	-56.84
1980-81	77.70	1343.63	532.22	718.10	2572.20	477	7030.97	5048
	-29.22	35.79	15.49	41.28	-23.87	-18.83	4.31	131.24
1981-82	69.27	930.71	508.41	540.15	3060.14	601.98	6148.14	42.3
	10.85	-30.73	-4.47	-24.10	19.00	26.0	-12.8	-16.4
1982-83	68	1020	602	620	3080	595	61.80	74
	-1.83	9.59	18.41	14.66	0.63	-1.01	-0.14	76.06
1983-84	62	1100	680	730	3165	540	7250	82
	-8.82	7.84	12.96	17.74	2.76	-9.24	18.08	10.81
1984-85	55	1150	720	825	3210	520	8235	95
	-11.29	4.55	5.88	13.01	1.42	-3.70	13.59	15.85
1986-86	50	1165	750	905	3250	505	9915	100
	-9.09	1.30	4.17	9.70	1.25	-2.88	20.40	5.26
1986-87	25	1800	800	925	4500	600	12200	50
	-50.00	54.51	6.67	2.21	38.46	18.81	23.05	-50
1987-88	125	1000	1300	1300	6000	700	13500	150
	400	-44.44	62.50	40.54	33.33	16.67	10.66	200
1988-89	100	1300	1200	2000	8500	1200	20300	160
	(20.0)	(30)	(7.69)	(53.85)	(41.65)	(11.43)	(3.37)	(6.67)
1989-90	200	1600	1400	2500	11000	2000	28000	200
	(100)	(23.08)	(16.67)	(16.67)	(29.41)	(66.67)	(37.93)	(25.0)
1990-91	400	1500	1500	2800	15900	1900	32100	210
	(100)	(-6.25)	(7.14)	(12.00)	(44.55)	(-5.00)	(14.64)	(5.00)

Note: i. Figures in parenthesis () are percentage change over previous year value

ii. All values of exports are at current prices

APPENDIX - VII

DERIVATIVES FROM C.D. PRODUCTION FUNCTIONS

Sl.No.	α	β'	$\beta = \beta^1 - (\alpha - 1)$	$\nu = \alpha + \beta$	e^a
1.	0.603	0.142	0.539	1.142 *	1.874
2.	0.597	0.209	0.612	1.209 *	5.894
3.	0.745	0.010	0.265	1.010 NS	6.147
4.	0.875	0.063	0.188	1.063 NS	9.079
5.	0.813	0.291	0.478	1.291 *	2.2575
6.	0.799	0.168	0.369	1.168 *	10.115
7.	0.601	0.165	0.564	1.165 *	6.495
8.	0.834	0.278	0.444	1.278 *	8.900
9.	0.653	0.006	0.353	1.006 NS	10.773
10.	0.873	0.190	0.317	1.190 **	1.429
11.	0.724	0.334	0.610	1.334 **	18.954
12.	0.485	0.001	0.516	1.001 NS	9.125
13.	0.869	0.151	0.287	1.151 *	18.357
14.	0.794	-0.015	0.191	0.985 NS	3.568
15.	0.758	0.120	0.362	1.112 *	3.456
16.	0.695	0.169	0.457	1.169 *	3.995

Note: i. Derived from production functions presented in Table 23.

ii. Value of the structural parameters (α , β , $\alpha + \beta$, e^a) are taken to Table 24.