CHAPTER III
THE ANALYTICAL FRAMEWORK

In the critical review of the trade theories of imperfect competition in the previous chapter, the significance of 'firm size' dimension in trade (or exports), either in implicit or explicit exposition, depends on the type of imperfect market structure characterized and the type of imperfect market conditions imposed. The issues that comes out of these models, like R&D and innovation, scale economies, and market power etc., for their implications on firm size might have certain generalizable connotations. But the way these factors operate through, 'firm size' dimension, in explaining exports depends on the type of domestic market imperfect market structure conditions characterized. It is necessary to recapitulate, that the analysis, here, is based on a given imperfect market structure (at a point of time) and compare across firm size groups, on the basis of the above issues. Some of these issues, themselves, can be the causes of an imperfect market structure. For example, as mentioned in the previous chapter, firm level internal scale economies at a high magnitude can transform a competitive or monopolistic competitive structure into a monopoly. But this is not really the concern, here.

In the present chapter, some of the above issues, through firm size dimension, are analyzed on the basis of
the abstracted (from the prevalent conditions) and characterized domestic market structure of the industry in consideration and the country (India) specific conditions, to derive possible issues and hypotheses regarding the export behaviour of different size group firms (within an industry). Before raising the analytical issues, the following analysis characterizes some of the country and industry specific conditions and abstracts the domestic structure, prevalent.

1) Basic Country and Industry Level Characteristics

In general, developing countries are characterized to be semi and unskilled labour abundant and capital and skilled labour scarce. But the Indian factor, especially labour, markets are more complex and segmented than the generalization. Over the years the Indian (planned) economy has been able to generate abundance in several types of skilled labour and human capital but at the same time certain specific skilled labour scarcities coexist. The factor market segmentation, resultant of prevalent economic duality, not only resulted in factor price differentials and differences in access to factors of production in general and also in specific skills and capital, across industries and firms. As far as technology is concerned, although the import substitution strategies followed generated considerable level of indigenous technological

2. See Chaterjee (1989) and Deepak Lall (1980)
activity and base, of its own kind, significant amount of technologies are imported from the developed countries and most of the technological level is considered to be of older vintage. Apart from this, due to the nature of the domestic demand and the industrial and trade (the import) policies and differences in access to imported technologies, there are significant levels of technological distances between firms, operating within broad groups of industries.³

As far as the industrial base and external economies aspects is concerned, it is generally argued that the government policies of import substitution and planned industrialization had created a large industrial base with a high cost economy.⁴ The strategy followed is said to have resulted, at macro level, not only in inefficiency in allocation of resources and high cost industrial structure but also in anti-export bias. Apart from this, the existence of large (supposedly inefficient) public sector, monopolizing the production of several raw materials and intermediates, is said to have resulted in material costs and prices much above international level (for example steel prices), as a result of which there can be significant external diseconomies. But on the other hand, the industrialization process over the years did generate its own dynamics, with emergence of

³. See Panchamukhi (1978)
⁴. See Bhagwati and Srinivasan (1975) and also Ahluwalia (1985)
several industries which generated certain kind of technological change and dynamic comparative advantage in trade.\textsuperscript{5}

If one examines the consumption and demand patterns, the income distribution aspects will turn out to be significant in determining the size of the India's domestic market. The highly skewed income distribution characteristic of the country, from the Engles law, not only fragments the market but also causes significant differences in the nature of domestic demand in terms of price and income elasticities. Because of the highly skewed income distribution due to low wages, high rents and the concentration of savings and wealth, major part of total income goes to the minority rich, the minority who do not constitute a large market for any single manufacture product.\textsuperscript{6} The rich demand a large variety of both, homogenous and differentiated manufactured goods in small quantities, more in line with consumption patterns of the developed countries.\textsuperscript{7} As a consequence, the market for the manufactured products tend to be small (compared to the developed countries) and "inelastic" (with low scale economy potential).\textsuperscript{8} The polarization of income distribution (in the Indian

\textsuperscript{5} See Lall (1982)
\textsuperscript{6} See Guha (1981)
\textsuperscript{7} Also See Stewart (1984)
\textsuperscript{8} On the other hand, it is argued, in the recent times, that the growing Indian middle class (which is supposed to constitute about 100 million) does comprise of a large market for manufactured products.
context) could result not only in fragmentation of production capacities but also to spacial distribution of firms on vertical product differentiation plane; different group of firms catering to income and price elasticities of demand separately for manufactures of different quality segments. These features can be said to be quite relevant in majority of the Indian industries.

2) The Basic Characteristics of the Indian Engineering Industry

The Indian engineering industry was established and promoted in furtherance of import substitution objective. India's strategy of planning and import substitution has resulted in the emergence of large number of industries within the engineering sector, producing a wide range of final and intermediate engineering products. The government's industrial and trade policies resulted in several institutional factors in the form of regulated supply of crucial raw materials, restrictions on the growth of large firms, the promotion of Small Scale Sector (SSI) and coexistence of predominant public sector. The Government policies, the existence of high degree of economic duality and entry, expansion and exit barriers have lead to high level of dispersion and heterogeneity in the size, technology level and market conditions under which firms operate in most of the engineering industries.

As far as the international trade aspects of the industry is concerned, the industry, especially the final product manufacturers, is heavily protected from imports under restrictive imports of certain kinds of capital and intermediate goods. As the industry is promoted to achieve import substitution, an overwhelming proportion of its output is directed to the domestic market. The industry started exporting noticeably since the mid sixties due to the domestic recession and the active export promotion schemes undertaken by the government. The exports of the industry are highly diversified. The spectrum ranges from simple consumer goods and metal manufacturers to industrial machinery and transport equipment.

It has often been observed that the exports of several of the engineering products are not sufficiently competitive in the world market, because a wide variety of industrial regulations and an overdose of import substitution policies lead to high cost and inefficient production. The government policies are supposed to have resulted in a general anti-export bias and also in significant deviation of production of several categories of engineering products from the natural comparative advantage of the country. In order to reduce the anti-export bias, the exports of the industry are made subject to substantial amount and variety of

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9 See Nayyar (1976)

10 See Bhagwati and Srinivasan (1975) and Panchamukhi (1978)
export subsidies. Apart from these negative aspects of trade, on the other hand, the import substitution and industrial policies did generate dynamic comparative advantage in several categories of engineering products over the years, especially in intermediate products. This is in line with Keesing's findings that comparative advantage of LDC's in their exports (mainly to other LDCs) lies in non-traditional industries such as capital goods and engineering industries that are not necessarily labour intensive.11 This advantage is linked to their use of special skills such as industrial management, technological acquisition, marketing and design and product development. India had developed a large indigenous capital goods sector. Like other semi industrialized nations, India could have comparative advantage in exports of certain intermediate products, but also in industries that make intensive use of inputs from the domestic capital goods sector.

From the above aspects, it can be seen that India's engineering exports are governed not only by supply side comparative advantage factors but also significant institutional factors, like government policies.12 In such a scenario, where market imperfections and institutional factors play a dominant role in a given industrial structure, like in the Indian context as mentioned earlier, firm

11 See Keesing (1979)
12 See Panchamukhi (1978)
level exports, especially the revealed exports need not be governed by supply side real relative advantages.

4) Conceptual Definition of Firm Size

So far, firm size concept, i.e. large and small firm, has been used in a broad sense. One has to take into notice, firm size concept could be industry and also country specific with strong relative connotations. A firm which is called large (or small) in one country need not be large (or small) in another country. Generally the firms which are categorized to be large in developing countries will tend to be small compared to firms which are called large in developed countries. Similarly comparing firms across industries may not be totally justified as it requires to take into notice of the technological and market structure conditions in distinct industries.

Conceptually firm size can be examined from absolute and relative aspects based on the production and market structure characteristics of any industry. The absolute aspect of firm size is examined in terms of fixed costs or assets incurred by a firm. The relative aspect can be viewed in terms of firms' market share (sales turnover) or market power under a given market structure of an industry.

The nature of technology determines the amount of fixed costs to be incurred by a firm to be set up and to survive in an industry. Under the given state of the art, the absolute aspect gives the minimum absolute
viable size of a firm (in terms of fixed assets) to exist and the resulting feasibility for the existence of different sized firms in an industry. For example, in the heavy engineering industry, the minimum viable size (in production) could be large and the dispersion in the size distribution across firms in the industry may not be large. As mentioned earlier, in the light engineering industry, the dispersion in size distribution across existing firms could be large because of the nature of technology and factor and product market segmentations.

The relationship between a given state of technology and the absolute minimum viable firm size is not necessarily a fixed one. For example, in a highly vertically disintegrated production structure, a firm manufacturing a heavy engineering product need not be large in absolute sense if it is mostly an assembler of different components produced by other firms. In a highly vertically disintegrated production structure a firm which is small in terms of fixed inputs (the absolute size) need not be small in terms of sales turnover or market share. Secondly, the relative aspect in terms of market power and the absolute aspect of firm size are not independent of each other in a situation where, apart from the technology conditions, the market structure conditions like entry and expansion barriers also determine the amount of fixed inputs to be incurred by a firm to be set up and survive in an industry.
The Government of India distinguishes between large and small firms mostly by the fixed or net assets criteria (the absolute aspect). Firms with plant and machinery below Rs. 35 lakhs come under Small Scale Industries (SSI) Sector and the limit for the ancillary sector is Rs. 45 lakhs. Firms with net assets above and equivalent to Rs. 100 crores are considered MRTP (Monopoly and Restrictive Trade Practices) units. Firms falling in between the MRTP and SSI sectors are generally called DGTD (Directorate General of Technical Development) units. In the above definition sales turnover or market shares of firms is not taken into account. In certain industries, in giving excise duty concessions to the SSI sector, limits are imposed on the sales turnover. In several light engineering industries, as observed in the field study, there are quite a few firms registered as SSI units with significant levels of sales turnover ranging from Rs. 50 lakhs to Rs. 7 or 8 crores, yielding, certain degree of market power.

In distinguishing between and raising issues for, large and small firms, the above definition is not strictly followed. The need for the deviation arises out of the drawbacks of net assets definition of firm size. A broad criteria in terms of sales turnover is used. A small firm is taken to be one with sales ranging from Rs. 10 lakhs to Rs. 6 crores. The small firms falling below the lower limit are not considered as these firm mostly operate in the unorganized sector catering to local markets and do not come into exports.
picture. The upper limit is based on the assumption that small firms tend to achieve higher output with low fixed inputs and also on the above mentioned field study observation. Medium firms are taken to be those with sales ranges from Rs. 6 crores to Rs. 40 crores and the large are those with sales turnover above Rs. 40 crores. Although these limits should be industry specific within the engineering industry on the basis of the conceptual definition, the broad criteria is used to raise issues at the aggregate level. Since a generalized distinction of a medium firm at aggregate level may not be applicable at disaggregate level, some of the issues derived for the large and small firms would overlap for medium firms. For generalization purposes, in raising the issues the small and medium firms (S&M) are clubbed together.


The market structure that can be abstracted from the existing conditions is in terms of 'long-tailed' market structure, in which a few large firms at the top ladder take the major share of an industry's output (or sales) and large number of small and medium (S&M) firms share the rest. In case of the light engineering industries the characterization is straightforward. This is because, as mentioned above, in these industries the nature of technology permits the coexistence of large and small firms in producing the

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13 See Desai (1982)
final product. In the case of the Indian light engineering industries this type of market structure is a common feature due to the existence of factor and product market segmentations and also the government's industrial policies. Apart from this, several products in the industry are reserved for exclusive production of the small scale industries. In such a market structures the large firms at the top are the leaders while the S&M firms are generally the follower firms.

In case of the heavy engineering industries the long tailed market structure characterization is not straightforward. This is because the nature of technology in these industries does not permit the existence of small firms in producing the final product. Small firms can exist in these industries in producing the intermediates and components in a vertically disintegrated production structure (vertical intra-industry specialization). In the Indian heavy engineering industry the role of S&M firms is primarily through rapid ancillarization that has taken place during the last two decades. The growth of ancillary small firms producing intermediates is facilitated not only by the government policies but also by the factor market segmentations. In the

14 Large firms, operating in the organized sector markets generally cater to income elastic domestic demand. Small firms, generally operate in the unorganized factor markets and cater to (low quality) price elastic domestic demand.

15 See Nagraj (1984)
production of certain intermediates small firms have cost advantages due to their labour intensive techniques and also due to access to the unorganized labour at lower wages. In this type of long tailed market structure, the ancillary S&M firms face derived demand and directly depend on the large firms, which produce the final products, to sell their output. As a result, the large final product manufacturers can reap monopsony market power possibilities.

The graphs I, II, III and IV give the size distribution of firms in a set of sample of firms in the engineering industries, which show the long-tailed market structure characterized. Graph I show the distribution for the sample of 100 firms in the engineering industry as whole and the other show for sample of firms from three sub-group light engineering industries. The interesting aspect of the distribution in the sub-group industries is that there is almost a dip in the middle, which shows absence or low dominate number of medium sized firms.

In the long-tailed market structure characterized, following Porter's (1979) approach, the large and S&M firms can be taken to be two distinct strategic size groups. 16 The few large firms at the top of the ladder may behave like typical oligopolists.

16 In this approach, an industry is viewed as composed of cluster or group of firms, where each group consists of firms following similar strategies in terms of key decision variables.
The Long-tailed Market structure.
Aggregate Engineering Industry.

Graph - 1

Total Sales Turnover (ZS), Firm Size by Rank (1985/86)
The Long-tailed Market structure.
Hand, small and cutting Tools Industry.

Firm Size (ZS) by Rank (1983/84)

Total Sales Turnover (Millions)
Total Sales

(Theousands)

Firm Size (ZS) by Rank (1983/84).

Diesel Engines and Parts Industry.

The Long-tailed Market Structure.

Graph - 3
Total Sales Turnover

(Thousands)

Firm Size (ZS), by Rank (1983/84)

Steel Tubes and Pipes Industries

The Long-Tailed Market Structure

Graph - 4
and may be, more or less, immune to the behaviour of S&M firms. The large number of small firms face competitive conditions (to recapitulate the usage of the term 'competitive conditions' does not strictly follow the neo-classical definition of perfect competition). A small firm face competition not only from the other small firms but also from the large firms. In case of the long-tailed market structure of the light engineering industries small firms face direct competition from the large firms. In case of the long-tailed market structure of the heavy engineering industries, large number of small firms, which sell to a few (large final product firms) buyers may face monopsony restrictive practices from the large.

6. The Analytical Issues

In deriving the analytical issues for the Indian industry, the following assumptions (based on stylized facts) are made:

1) Since India is a marginal exporter in the international markets for engineering goods, the analysis draws primarily upon domestic market conditions, under the assumption of small country in the world market. Even if there are effects of changes in the world markets on India's exports, one can assume the nature of the effect is homogenous across the size groups of firms.

2) The market structure, as characterized above, is the long-tailed structure. The existing technology of the industry in consideration in broad terms,
permits coexistence of large and small firms. In case of the heavy engineering industry, the technology can be assumed to be of vertically separable or disintegrated production processes, so that small firms can exist in intermediate manufacturing.

3) Firms' behavior is assumed to be rational depending on the objectives which could be:
   - i) Profit maximization
   - ii) Minimization of losses in the short run
   - iii) Sales maximization

4) As in Linder's analysis, a firm's exports are taken to be an outcome of its domestic activity or reaction to the domestic market conditions.

5) The effect of certain external diseconomies like the domestic steel prices (in comparison to international price) are assumed to be uniform across all size groups.17

6) The domestic market is taken to be protected from imports.

17 But differences in accessibility to the raw materials like steel, which is mostly produced by the public sector, across size groups are not assumed away.
III. I. Domestic Market Structure:
Firm Size and Exports.


As discussed in the previous Chapter, in the theoretical models of imperfect competition, whether in partial or general equilibrium framework, firm size implications are not explicit. The reason is obvious because most of these models assume a simple monopolistic competition or Cournot behavioural assumptions. In the following analysis, a theoretical framework is brought out in order to bring out certain hypotheses regarding the export behaviour of large and small firms, resulting out of domestic market equilibrium. This is done in view of the long-tailed market structure characterized earlier. The underlying assumption is that international and domestic markets are segmented (because of trade policies).

The co-existence of strategic size groups, in the long-tailed structure, is in terms of a few large (oligopoly) firms taking major share of an industry's total sales and large number of small firms sharing the rest. Large firms can be taken to be having certain degree of domestic market power while large number of small firms within the industry face competitive conditions. The competitive conditions of small firms can be observed in terms that they face competition from each other and also
from large firms. In the world market all firms are price takers.

Large firms, as a strategic size group, can be taken to arrive at oligopoly or monopoly equilibrium in the domestic market, which determines their export behaviour. In such a scenario, under segmented market approach, exports can be observed to be a result of the possibility of price discrimination between domestic and export markets. The export orientation or propensity of a firm can be defined as follows:

\[ S_i = \text{total sales}, \quad E_i = \text{exports} \]

In a straightforward long-tailed structure (as in light engineering industries), a small firm face price competition from other small firms and non-price competition in terms of brand names and after sales service etc from the large firms. One way, small firms could attract buyers away from the brand names of large firms is selling the product at far lower prices than large firms, by producing the output at lowest costs possible. Large firms could charge higher prices due to their domestic market power attained through brand names and advertising etc. Therefore, this market behaviour could be one of the reasons for the (equilibrium) co-existence of large and small firms with different cost and price conditions (at a point of time) in an industry. Although how the market structure (or the starting equilibrium) came about in the Indian industry is beyond the scope of the thesis, to recapitulate, it is observed to be a result of the product and factor market segmentation and the government industrial policies etc.

Slightly in similar lines, but at industry level, White (1974) theoretically compares across standard price discriminating monopoly and perfectly competitive market structures for the possible extent of exports in these structures. He showed that when the domestic industry is protected from imports, a price discriminatory monopoly structure could result in more exports than perfectly competitive structure. This is because, under a given production capacity, a price discriminating monopolist (in the domestic market) who is a price taker in the world market, could restrict domestic sales to higher price and increase export volume in search of maximizing producers surplus.
\[ DS_i = (S - E)_i, \text{ domestic sales.} \]
\[ (E/S)_i = (1 - DS/S)_i, \text{ export orientation.} \]

The profits of a firm:
\[ Ti = (P_d Q_d + P_e Q_e)_i - TC_i \]

\( P_d \) and \( Q_d \) are price and quantity of domestic sales.
\( P_e \) and \( Q_e \) are price and quantity of exports.
\( TC = \) total cost.

Total profits would be maximum when \( MR_d = MRe = MC \), i.e. the marginal revenue in the domestic market \( (MR_d) \) and marginal revenue of exports \( (MRe) \) and marginal cost \( (MC) \) are equal (in a simple price discriminating monopoly).

The extent of export propensity of large and small firms depend on their domestic prices, quantity they can sell (in the domestic market) and their cost conditions.

If we assume that the large firms are collusive oligopolies, large firms can be simplified to a monopoly situation. If we assume \( 'P_d' \) for small firms is higher than \( 'P_e' \), small firms may not be able to export at all while large firms can always export because of their ability to price discriminate, (as long as their domestic demand curve is steeper than the export demand curve). If \( 'P_d' \) for small firms is lower than \( 'P_e' \), small firms will have higher propensity to export than large firms. Even if \( 'P_d' \) of small firms is equal to \( 'P_e' \), they may have higher propensity to export if they could not sell as much as they (could produce) desire in the domestic market, (at the price \( 'P_d', \) they face). This aspect will be discussed later.

Under a fixed production capacity, if the monopoly (collusive) large firms could realize far higher price than
'Pe' and exploit the negatively sloped domestic demand curve, rather than becoming price takers in the world market, their propensity to export will be minimal (as Glejser (1980) found).

The export possibilities of large firms, simplified to a monopoly situation under the assumption of collusion, with or without production capacity constraint is illustrated in Diagram I.A. Under certain conditions, if there is production capacity constraint, whatever the cost conditions are (either increasing, decreasing returns), large firms may not export at all as there can be a corner solution. In Diagram I.A, the marginal cost (MC) curve is taken to be 'U' shaped, i.e., scale economies vanish after a level of output. The world market price is taken to be 'Pe'. Initially if we assume there is no production capacity constraint, profit maximizing monopolist will sell 'QQd' in the domestic market at price 'Pd' and export at the quantity of 'QdQe'. If we impose production capacity constraint at 'Qp', firm will stop its output at 'Q1' and sell only in the domestic market at price 'Pl'. The monopolist will not export at all as exporting results in losses (because marginal cost remains higher than marginal revenue of exports). But due to other objectives, a firm might still export to the extent of 'Q1Qp' by taking losses (to the extent of 'stlk'). This possibility will be discussed later in the context of the Indian industry.

If we take non-collusive oligopoly situation, the possible outcomes will be more complex as it depends upon the type of oligopoly rivalry between the strategic group
of large firms. One of the possible outcomes could be that the extent of export orientation of a large firm, within the strategic size group, can be a result of its standing with respect to other large firms in the oligopoly rivalry for the (supernormal) profits in the domestic market. This is because the extent of sales and prices, a large firm can realize in the domestic market could depend upon the type of oligopoly rivalry between large firms.

The domestic market equilibrium price and market shares, large firms arrive at in the domestic market could determine the extent of a large firms exports. Large firms could arrive at tacit profit maximizing (respective) market shares in the domestic market. The firms whose production capacities are higher than its (oligopoly) strategic domestic market share could undertake exports to the extent of excess capacity. Exports will not be undertaken at the cost of the strategic domestic share in order to safeguard its domestic market power or standing. The respective market shares of large firms might be a result of their tacit understanding or imposed by the most dominant or leader large firm on rest of large firms. The extent of exports of a large oligopoly firm may function as one of the means of entry barriers of safeguarding its domestic market power like 'excess capacity' factor. Under the condition of fixed production capacity, if a large firms strategic domestic market share increases, it may withdraw output allotted to exports, in order to increase its sales in the domestic market. Similarly if it's strategic
domestic share decreases, it will increase its export volume.

The above possibilities can be explained on the basis of oligopoly domestic market equilibrium, under specific assumptions. There are two firms '1' and '2' producing a homogenous or a differentiated product. Both firms can be taken to have an equal level of fixed production capacity. If we take a simple Cournot duopoly case where both firms produce a homogenous product with identical costs, both firms will have equal domestic market shares. If we take:

e = elasticity of demand; DS1 and DS2 are domestic sales of firms 1&2.

MC = marginal cost.

\[ Pd\left(\frac{1-DS1}{e}\right) = MC1, \quad Pd\left(\frac{1-DS2}{e}\right) = MC2; \quad \text{where} \quad MC1 = MC2. \]

In such case DS1 = DS2. In this case if the firms export, they should export at identical levels.

In the case when MC1 < MC2, then DS1 could be higher than DS2. If there is no capacity constraint, firm '1' will have higher domestic market share and also may have higher exports. On the other hand if there is capacity constraint firm '2', with higher costs might export more. This can be explained by Stakelberg's leader and follower firm approach. Firm '1', with lower costs can be the leader and, say, it knows the market demand and the supply (MC) curve of firm '2'. Firm '1' goes about maximizing its profits and sets its price and quantity where it's profits are maximum (MR1 = MC1). In order to avoid uncertainty (of price rivalry), firm '2', which has higher costs, has to
accept the price and also come to a market sharing understanding. 20 The outcome would not be a profit maximizing equilibrium to the follower. Both the firms are price takers in the world market. As a consequence of the domestic market equilibrium, the follower firm might have to sell lower quantity than the leader firm in the domestic market. Due to this it will have higher excess capacity, which, in turn, pushes the follower to export at higher intensity.

The above argument can be illustrated by Diagram I.B. D1 and D2 and MC1 and MC2 are the demand and marginal cost curves of firms '1' and '2'. 'Pw' is the world price line. The leader firm '1' sets the domestic market price at 'P' and sells quantity of 'OX1', where it's profits are maximum. The follower firm (2), accepts the price and sells a quantity of 'OX2' in the domestic market. Both firms have same capacity constraint 'CN'. Under the capacity constraint, the leader firm keeping it's strategic domestic equilibrium price and quantity, would export 'X1Xw1' (without capacity constraint it will export 'X1Xw3'). The follower firm will export 'X2Xw2' (where it's MC2 curve cuts the world price line from below) which is higher than the exports of firm I, the leader. 21

20 For the leader firm to maximize it's profit, he has to make sure that the follower will not only follow his price but also sell at the right quantity in the domestic market.

21 The following gives numerical proof to the argument. Under their existing production capacity, both firms can produce a quantity of 80 units. The follower firm's supply curve; 
\[ S2 = 0.4P \] \[ (i) \] 
Total market demand;
As mentioned before, both large and small firms are price takers in the world market. For small firms even \( P_d \) (the domestic price) might be given and have to adjust to the price and also to the quantity that they can sell.

So, small firms which face, more or less, a horizontal domestic demand curve, will have high export propensity if their domestic price \( P_d \) is lower than the world price \( P_e \). If small firms could produce at costs which are

\[
D = 100 - 0.6 \, P \quad \text{(ii)}
\]

\( C_1(X_1) \) and \( C_2(X_2) \) are the costs of firms 1 and 2.
\( C_1(X_1) < C_2(X_2) \).
At any price, firm 2, the leader supplies;
\[
X_1 = D - S_2.
\]
From (i) and (ii),
\[
X_1 = 100 - P.
\]
\[
P = 100 - X_1.
\]
\[
C_1(X_1) = 4X_1.
\]
The profits of firm 1 are;
\[
W_1 = PX_1 - 4X_1.
\]
Firm 1's profits are maximum where \( MR_1 = MC_1 \).
At equilibrium, firm 1 sets;
\[
X_1 = 52 \quad \text{and} \quad P = 48.
\]
At price of 48 the total market demand = 72. At that price the follower firm will sell a quantity of 19.2 in the domestic market. At this domestic market equilibrium the follower firm will have a lot higher excess capacity, which, in turn, make the follower firm to export at higher intensity. It can be explained by the following Diagram;

\[
D = \text{the total market demand.}
\]
\[
S_2 = \text{firm 2, the follower firm's supply.}
\]
At \( P_2 \) firm 2 will sell 'OXo2'. At price 'P', which is the leader's equilibrium price, the leader firm will sell 'Xoo2X1', and the follower will sell 'OXo2' in the domestic market. The follower firm has lower sales in domestic market, which could push it to have higher export orientation.
lower or equivalent to the world price, their propensity to export will be more (after breaking the entry barriers of export market). This would, especially, be true if the domestic price they face is lower than the world price and also if they can not sell as much as they desire in the domestic market (at the given price). 22

When the total domestic demand at the industry level is given, how much small firms can sell in the domestic market may be a function of how much large firms decide to sell in the domestic market. 23 Large firms may keep certain level of excess capacity as one of the means (in the armor) of imposing effective entry barriers or safeguarding their market power. If the (level of) total industry demand is given and small firms production capacity is set up, under the ignorance of the excess capacity in large firms (then the total production capacity of the industry will be higher than the demand), small firms may be pushed to export markets if large firms decide to produce and sell more in the domestic market at lower prices. This is because the additional sales of large firms at lower prices might eat into the (total) market share of small firms in the industry. Consequently small firms may end up with excess capacity which pushes them to export.

22 A small firm may not be able to sell as much as it desires in the domestic market because of type of competition it faces from the oligopoly large firms and also from other small firms. Because of this reason the 'competitive conditions', small firms face does not coincide with the 'perfect competition' structure. In perfect competition, a firm can sell as much as it desires at a given price.

23 A small firm, even if has lower costs than large firms, it can not be a market leader.
Similar result, but under different conditions, could take place in the long-tailed structure where large and small firms specialize in different production processes in an industry, like in case of the heavy engineering industry. In such industries, as discussed earlier, large number of small firms produce components and intermediates for a few large firms which specialize in the production of final (finished) product. In such a case, if the large final product firms decide to produce less they will reduce their purchase of components and intermediates from small firms. Consequently, (the sub-contracting) small firms may end up with excess capacity which may push them to export market.

Another possibility, a more likely one, is that large firms could retaliate when small firms try to increase their domestic sales or market share, which could push small firms to exports. This is illustrated in Diagram I.C. Small firms can sell in the domestic market at the domestic price \( P_d \) until the quantity of \( OQ_d \) without any reaction from large firms. But the moment small firms try to sell more than \( OQ_d \) in the domestic market large firm could retaliate through restrictive practices like limit pricing and cross-product subsidization (when a large firm is a multi-product firm), etc. Because of this reason small firms price (demand) curve suddenly dips at quantity \( Q_d \) from \( t \) to \( k \) and from point \( k \) it might become downward sloping (or a new lower level horizontal curve \( k_{di} \)). This means small firms have to reduce their price significantly if they want to sell more than \( OQ_d \) in the domestic market, due to the restrictive practices of large firms.
Diagram I.C.
we take 'Pe' as the export (world market) price, small firms will sell 'OQd' in the domestic market and sell 'QdQe' in the export market. Therefore, in this case, small firms get pushed by large firms to export, when they try to expand (in the domestic market).

These are some of the possible and generalized outcomes in a long-tailed market structure. In the following analysis, under the long-tailed market structure characterized for the Indian industry, how large firms derive domestic market power and small firms face competitive pressures is discussed for its implications on their export behaviour. How the cost conditions of large and small firms will be different will be discussed in the later sections on scale economies and technological activity.

III.I.2. The Issues.

Under the existing market structure and policy regime, large (engineering) firms, at the top ladder of the structure, in general, could reap large degree of market power. Most of these firms face large protected domestic markets; the largeness of market size is taken in relation to the installed production capacity. 24 The market power arises out of

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24 The Indian market for most of the manufactured products is considered to be 'sellers markets' as the effective demand is generally higher than the supply under the existing production capacity.
the concentrated market structures and also the protection given from imports. A high degree of domestic market power to the large firms would arise due to some of the following reasons:

1) Large firms can reap high domestic market power due to barriers to entry imposed by the governments industrial policies and the existing market structure. These firms can impose entry barriers by limit pricing, cross product subsidization and also by product marketing through (established) brand names, heavy advertising etc. Even the government industrial policies like the industrial licencing are observed to have worked in favour of the existing large firms. In the words of Pranab Bardhan, 'the rich industrialists, having better connections and better access, have got away with the lion's share, in the bureaucratic allocations of the licenses, thus pre-emptying capacity creation and sheltering oligopolistic profits.'

So the industrial licenses would not only be foreclosed by the large firms but also the cumbersome procedures of the policies were observed to have worked in favour of the existing large firms because of large resources at their disposal.

2) Even the trade policies, like the protection, based on infant industry arguments, seemed to have benefited large houses. It is well known that import substitution strategies usually result in wide

25 See Bardhan (1984, p.41)
26 See Hazari (1986)
variations in effective rates of protection (ERP) across industries. Tariffs on capital and intermediate goods tend to be lower than those on final production. For example, in case of the Indian automobile industry, the ERP's shown by an ICICI study (1985) for 1980-81 shows positive ERP's 8.3 on domestic sales (and 29.2 on exports) for commercial vehicles and negative ERP's of -15.6 on domestic sales (and -22 on exports) for the auto ancillaries. The production of final engineering products, especially in the heavy engineering industry, is dominated by large oligopolistic firms, while the intermediate production is done mostly by S&M firms.\textsuperscript{27} The industries characterized by higher ERP's tend to draw large amount of the country's resources, as the rate of profits and return are generally higher in these industries.

3) Significant amount of domestic market power to large firms arises not only from the final product markets, but also from the input and intermediate product markets (monopsony power). As mentioned earlier, most of the firms in the engineering industry face both final and derived demand as most of the engineering products are assemblages of a number of diverse components and intermediate products. This increases the interlinkages and dependence between firms in the engineering industry. Large firms, at top ladder both in heavy and light engineering industry, can exert high

\textsuperscript{27} See Bruch \& Hiemenz (1983). Their study shows that the structure of ERP's in ASEAN countries seem to have benefited large firms more than S \& M firms.
amount of market (monopsony) power through their accessibility to scarce inputs and intermediates achieved through vertical integration, captive supplies and control of ancillary firms. For example as derived from the field study, in the cutting tools industry, three large firms control the supply of Carbide, a crucial raw material and the rest of the firms in the industry depend on these three large firms for the supply of the raw material as its imports are not allowed.

Table 1 shows the degree of vertical integration for a set of firms in the industry. The vertical integration index is generally calculated by dividing value-added by total sales of a firm. The index varies between 'zero' to 'one'. If it is equal to 'one', the degree of vertical integration is supposed to be hundred per cent.28 The problem involved in this measure is that in several cases the annual sales of firms include inventories built up from the previous year's production. In order to reduce the bias the annual production figures are used in the denominator. In the sample of top one hundred engineering firms (at aggregate level), the index is one half and more or less the same level across all the firms.

4) Large degree of vertical integration is not a necessary condition for a large firm to have market power in the input and intermediate product markets. Even the process of vertical disintegration in the form of ancillarization and sub-contracting can give an amount

28 See Hay and Morris (1979)
Table - 1

Degree of vertical Integration
Engineering Firms

<table>
<thead>
<tr>
<th></th>
<th>1983-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 10 firms</td>
<td>0.44</td>
</tr>
<tr>
<td>Top 20 firms</td>
<td>0.49</td>
</tr>
<tr>
<td>Top 50 firms</td>
<td>0.46</td>
</tr>
<tr>
<td>Top 100 firms</td>
<td>0.45</td>
</tr>
</tbody>
</table>

\[ (-\frac{V}{P}) \]

\[ V = \text{Value-added.} \]
\[ P = \text{Production.} \]

\(^1\) Firm size, here, is taken in terms of total sales in value terms.

Data Source: Confederation of Engineering Industries (CEI).
of monopsony power to large firms. As mentioned earlier, ancillarization and sub contracting between small and large firms, has been quite extensive in several engineering industries. Generally the intermediate industries are crowded by large number of small firms selling the intermediates to a few large final product manufacturers. The large final product manufacturers can not only reap economies arising out of the ancillarization (vertical disintegration), but also can pass on the burden and losses of market fluctuations etc. to the ancillary firms, given the low bargaining strength of the small firms.

5) Large firms can have higher access to imports of raw materials and components etc. not only because of large resources at their disposal but also because of institutional factors like import licenses, etc. working in their favour. It can be observed from Tables 2A and 2B that import propensity of the engineering firms in general is high and the imports are highly dominated by large firms. Given the nature of the domestic market in which there is a premia for imports and higher consumer preferences for the products with higher content of imported inputs and components, higher

29 See Nagraj (1984)

30 See Stigler (1951). The Bicycle industry in Ludhiana in the state of Punjab is an excellent example of this vertical disintegration process and its associated economies. Also see Nagraj (1984)

31 See Panchamukhi (1978)
access to imports may give higher domestic market power.\textsuperscript{32}

6. Large houses realize domestic market power through diversification into multi products. The import substitution and industrial policies seemed to have encouraged firms to produce large range of products rather than focus on a few.\textsuperscript{33} The multi-product strategies by large firms might be aimed at increasing domestic profitability, risk reduction, overcoming the constraints of licencing policies and to make captive supplies of inputs and intermediates products.\textsuperscript{34} Secondly, on a import-substitution cycle, the large houses generally tend to diversify into different branches, where ERP's are high to reap supernormal profits arising out of large degree of protection and also the advantages of initial entrance. The diversification behaviour of large firms might help them to retain monopoly profits in several single product lines. Instead of flooding the market with a single product under a high production capacity, which might depress the prices, it might be more profitable to produce and sell limited quantity of each of it multi-products.

\textsuperscript{32} In Frankennas (1973) words the 'Craze for foreign'.

\textsuperscript{33} See Wolf (1982), p.65

\textsuperscript{34}. In the samples of 100 top engineering firms obtained, there are quite a few large houses with three to six separate registered firms, producing a variety of final and intermediate products.
The above factors give the (dominant) large firms considerable degree of domestic market power. As a result of which, as discussed earlier, they can exploit the negatively sloped domestic demand. But at international markets these firms are price takers. If we assume the oligopoly industry prices (collusive or non-collusive equilibrium prices) are higher (or lower) than the international prices, the large firms can export through price discrimination by market segmentation approach. On the other hand, these firms, given the high profitability of secure domestic market may have low export propensity. It has been observed that several firms in the industry which are in the best position to export have the least incentive to do so given the relatively secure profitability of domestic sales.\(^\text{35}\) So the most likely outcome could be higher the domestic market power (larger the firm size) lower could be the propensity to export. It can be observed from Tables 2A and 2B that exports are concentrated more at lower size categories of firms than at the larger size.

Eighteen out of twenty four large firms interviewed in the field study stated that exports are considerably less profitable than domestic sales. It is generally observed that domestic prices of most of the engineering goods are higher than international prices and are sold in international markets at considerable

\(^{35}\) See Wolf (1982)
### TABLE 2A

**Share of Top 100 Engineering Firms (Rs. Crores) 1983-84**

<table>
<thead>
<tr>
<th></th>
<th>Sales</th>
<th>Exports</th>
<th>Imports</th>
<th>(Exports/ Sales) %</th>
<th>(Imports/ Sales) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 20 firms</td>
<td>10724.9</td>
<td>150.7</td>
<td>1454.2</td>
<td>1.40</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>(32.0)</td>
<td>(12.8)</td>
<td>(26.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom 20 firms</td>
<td>758</td>
<td>19.67</td>
<td>62.80</td>
<td>2.6</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>(2.2)</td>
<td>(1.7)</td>
<td>(1.08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 100 firms</td>
<td>16761.5</td>
<td>392.4</td>
<td>2058.5</td>
<td>2.3</td>
<td>12.2</td>
</tr>
<tr>
<td></td>
<td>(50.0)</td>
<td>(33.0)</td>
<td>(37.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** Figures in the brackets are percentage shares in total engineering industry figures.

Imports refer to imports of raw materials, components and spares consumed.

Maximum value of sales = Rs. 3141 crores.

Minimum value of sales Rs. 30.8 crores.
TABLE 2B

Shares of 76 (sample) firms of Hand, Small and Cutting Tools Industry- Rs. Lakhs - 1983-84

<table>
<thead>
<tr>
<th></th>
<th>Sales</th>
<th>Exports</th>
<th>Imports</th>
<th>(Exports/Sales)%</th>
<th>(Imports/Sales)%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 20 firms</td>
<td>71255</td>
<td>2448</td>
<td>4358</td>
<td>3.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Bottom 20 firms</td>
<td>246</td>
<td>60</td>
<td>0.63</td>
<td>24.0</td>
<td>0.0</td>
</tr>
<tr>
<td>All 76 firms</td>
<td>73533</td>
<td>2894</td>
<td>4402</td>
<td>3.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Maximum value of sales - Rs. 15922 lakhs

Minimum value of sales - Rs. 7.0 lakhs
discounts.\textsuperscript{36} But large proportionate number of large firms do undertake exports, even marginally. Out of the 125 large and medium firms, for which data was obtained, 110 of them have some kind of export presence. Some of the reasons for the revealed exports of large firms could be as follows:

1) As discussed in the theoretical part of this section, the price discriminatory behaviour towards domestic sales and exports could facilitate the protection of domestic monopoly prices. Secondly the exports of large firms could be a result of their strategic oligopoly rivalry in the domestic market. In the field interview, three large firms responded that they undertake exports to restrain the domestic prices from falling (at higher quantity on a downward sloping demand curve).

2) On the other hand, these firms may export to increase their domestic market power. One way it can be achieved, under the given demand characteristic of the country, is by increasing their access to imported inputs, foreign brand names or foreign collaborations. Under the import replenishment policies, exports give access to a firm to foreign exchange and imported inputs and components. As mentioned earlier, given the nature of the domestic demand where there is higher preference to import intensive products, increased access to imports increases domestic profitability and market power.

\textsuperscript{36} See Nayyar (1978) and also Frankenna (1973).
One other way exports can increase a firm's domestic market power is by increasing its bargaining power with the government towards acquiring new licenses, capacity expansion and also foreign collaborations. Two large firms responded in the field interview that exports are undertaken to improve or retain their lobbying power with the government. Since there is pressure from the government to increase foreign exchange earnings, the firms which have certain amount of export performance are better off in lobbying with the government.

Furthermore, export activity could facilitate diversification into new areas and consequent high profits of initial entrance. Five out of twenty four large firms interviewed responded that exports are undertaken even at low profit margins because export activity functions as a window to the world market conditions and trends, which, in turn, helps them to grow in the domestic markets. Export activity exposes the firms to new technologies, products, packaging techniques and advertising methods etc. taking place in the leading world markets. The exposure helps these firms to be first entrant into these new areas in the domestic market. This would help them to reap the benefits of initial entrance into new areas and increase their domestic market power.

3) The revealed exports of large firms could be based on risk-reducing behaviour towards fluctuations in the domestic demand. Firms, in general, may undertake exports
in times of domestic recession in order to reduce underutilization of capacity. In times of excess capacity due to domestic recession, where no domestic sales are possible at the margin, firms may be willing to export at a price lower than the average cost as long as they receive something in excess of their marginal costs in order to recover a part of the fixed costs. India's engineering exports are said to be significantly influenced by domestic recession.37

Four large firms interviewed in the field study responded that long term export presence is viewed as an instrument of reducing risks due to domestic market fluctuations. Since one can not enter export markets all of a sudden during times of domestic recession, it is necessary for these firms to have long term export presence in order to export at larger magnitude during domestic recession. Larger firms could be more prone to the above behaviour, as marginal changes in domestic demand will have substantial impact on them. Since these firms generally operate at higher fixed costs, they seemed to have higher necessity to export in times of domestic recession in order to recover break even costs.

4) One other significant cause behind the revealed exports of (some) large firms is the response mechanism to the institutional factors like the government industrial policies. In case of the hand tools industry, several products are reserved for

37 See Nayyar (1978).
exclusive production of SSI Sector by restricting the growth of existing capacity of large and D.G.T.D. units and the entry of new large units. The existing large units are not allowed to expand capacity in the domestic market but are allowed to expand capacity towards exports. New large firms are allowed to be set up if 80 percent of the production is diverted to exports. Two prominent large firms in the industry, interviewed, responded, to the constraint for their growth by augmenting their export orientation. A new DGTD unit entered the industry by being ninety-five percent export oriented.

In case of S&M firms, as discussed earlier, small firms face competitive pressures in the domestic market. They are not only the follower firms (of the large) but also they face high competitive conditions between themselves. The later possibility arises out of easy entry to the Small Scale Sector due to low fixed costs involved in production, the factor and product market segmentations and also the government policies. In the light engineering industries (like Diesel engines, etc.) the S&M firms generally cater to the price elastic domestic demand. As mentioned earlier, in case of the heavy engineering industry, the important feature is the interdependence between a few large (final product) firms and the large number of small (intermediate product) firms through the vertical disintegration process of production. The production of several intermediate products is reserved
exclusively for Small Scale Industries. The reservation and fiscal incentive policies towards the SSI Sector makes entry into the component industries easier for small firms. This, generally, has resulted in industries like automobiles and bicycles etc. to the existence of large number of small component manufacturers producing intermediates (under low ERP's as mentioned before) for a few final product manufacturers. As a result, as mentioned earlier, small firms, as a generalization, face high competitive conditions in the domestic market.38

Small firms have noticeable level of revealed exports in many engineering industries, as shown in Table 3. The share of the SSI Sector in the total engineering exports is about 27 percent. In industries like bicycles and parts, diesel engines and parts, EPNs wares and hand, small and cutting tools, the SSI share in total exports of the respective industries is significantly high.

1) A major push factor behind the revealed exports of small firms could be severe competitive conditions they face in the domestic market. Under the given characterization of market structure, small firms face high competition in selling their products (both the final light engineering products and the intermediates due to high monopsony power of the large final product firms) and also barriers to expansion in the domestic market. Consequently, small firms would be

38 See Patibandla (1988a)
## ENGINEERING EXPORTS.

### EXPORTS OF SMALL SCALE INDUSTRY (in CRORES).

<table>
<thead>
<tr>
<th>Description</th>
<th>1981-82</th>
<th>1982-83</th>
<th>1983-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Engineering</td>
<td>318.0</td>
<td>340.0</td>
<td>321.0</td>
</tr>
<tr>
<td></td>
<td>(30.3)</td>
<td>(27.2)</td>
<td>(27.4)</td>
</tr>
<tr>
<td>1. Bicycles and parts</td>
<td>26.0</td>
<td>22.0</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>(47.2)</td>
<td>(55.0)</td>
<td>(33.3)</td>
</tr>
<tr>
<td>2. Diesel Engines and Parts</td>
<td>30.0</td>
<td>28.8</td>
<td>21.0</td>
</tr>
<tr>
<td></td>
<td>(37.5)</td>
<td>(48.0)</td>
<td>(42.0)</td>
</tr>
<tr>
<td>3. Steel Tubes and Pipes</td>
<td>6.8</td>
<td>5.1</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>(17.7)</td>
<td>(17.0)</td>
<td>(17.6)</td>
</tr>
<tr>
<td>4. Hand, Small &amp; Cutting Tools</td>
<td>11.3</td>
<td>14.69</td>
<td>15.00</td>
</tr>
<tr>
<td></td>
<td>(23.2)</td>
<td>(31.2)</td>
<td>(33.3)</td>
</tr>
<tr>
<td>5. Transmission Line Towers</td>
<td>1.7</td>
<td>2.38</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>(8.5)</td>
<td>(8.5)</td>
<td>(7.1)</td>
</tr>
<tr>
<td>6. Machine Tools</td>
<td>7.9</td>
<td>8.6</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>(32.2)</td>
<td>(30.7)</td>
<td>(33.3)</td>
</tr>
<tr>
<td>7. Steel Structures, (Fabricated)</td>
<td>10.2</td>
<td>10.2</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>(35.1)</td>
<td>(34.0)</td>
<td>(33.3)</td>
</tr>
<tr>
<td>8. EPNS Wares</td>
<td>10.9</td>
<td>7.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>(49.0)</td>
<td>(87.0)</td>
<td>(64.2)</td>
</tr>
</tbody>
</table>

**Notes:** Small Scale Industry is taken as defined by the Union government prior to 1984. Figures in brackets are percentage shares of SSI exports in the total.

**Source:** CEI. Year Book 1985
pushed to the export market by the domestic market conditions, they face. The international market (with infinitely elastic demand) become a part of their market segmentation response.\textsuperscript{39}

Majority of small firms, interviewed, 45 out of 60 exporting firms, responded that exports are profitable, while, as mentioned earlier, majority of large firms perceive exports as unprofitable activity.\textsuperscript{40} Once these firms are able to break entry barrier into exports, they might be able to produce at world prices (assuming away the quality characteristics of the products).\textsuperscript{41} So, these firms which face restrictive market conditions in domestic market, (from the leader firms), might find the export markets less imperfect.

To cite an example of the restrictive practices, derived from the field interviews, is that in those products in which small firms are cost and price competitive in the domestic market, the multi-product large firms resort to cross-product subsidization in

\textsuperscript{39} The international market for engineering goods is considerably segmented with noticeable markets for low priced intermediate and finished goods; especially in other developing countries. Under the intra industry and preference similarity arguments, the small firms, who cater to price elastic domestic demand, could be in a better position to reap the advantage of representative demand in these markets.

\textsuperscript{40} Most of these firms, although, belong to the hand, small and cutting tools industry, which might have considerable level of comparative advantage in exports, due to labour intensity of production.

\textsuperscript{41} As mentioned before, several intermediate produ industries, like auto-components, dominated by small scale firms are characterized by low or negative ERP's, which would imply domestic prices are lower than import prices.
order to compete with the efficient small firms. The losses incurred in the subsidized products are recovered from the monopoly profits in those products where competition is less.

Furthermore, in case of the component industries, where large number of small firms compete to sell the intermediates to the few large final product firms, due to unequal bargaining strengths, the large final product firms pass on the burden and losses of market fluctuations to ancillary firms. In order to countervail the monopsony power of, and to reduce their dependence for markets on the few large final product manufacturers, several small firms seem to have entered export markets. For example, three small firms interviewed in the field study, expanded and were made to expand their production capacity by the large automobile firms in order to cater to the booming market for automobiles. When the market for automobiles declined, these ancillary firms were left without markets or support from the large firms. Two of these small firms went in for exports.

Furthermore, a few of the sub-contracting ancillary firms responded that they would prefer to sell in the export markets because of prompt payments by the overseas buyers through letters of credit. In the domestic markets, these firms face numerous difficulties in getting payments in time from the domestic purchasers.

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which result in high interest costs and also constraints in the availability of working capital.

2) The other significant reason for the revealed exports of small firms, as mentioned in the case of large firms, is that export activity in turn, might increase a small firm's standing in the domestic market. As observed from the field interviews, a small firm which is relatively successful in the domestic market segments, is very much inclined to break into export markets as it would lead to its growth in the domestic market segments. One intangible benefit seems to be that export activity by an intermediate manufacturer gives him (or her) status and a brand name as an exporter with respect to the domestic buyer firms. This, in turn, increases the firm's bargaining strength in the domestic market.

A couple of small firms, in the hand, small and cutting tools industry responded in the field interview that export activity is undertaken because it makes them highly production efficient due to continuous pressure of export markets to be (cost) efficient. It induces them to keep upgrading their techniques and technology and also to achieve higher organizational efficiency. This response mechanism displays the firm level dynamic economies of export activity, which in turn, augments a firm's performance in the domestic market.

3) The large amount of export incentives provided by the government in the form of duty drawbacks, cash compensatory benefits and import replenishment (see Table
could be a determinant of revealed exports of firms, in general. But the impressions gathered from the field study about the importance of export incentives to small firms are mixed. Only about 30 percent of exporting small firms stated that export incentives play a role in their export decisions.

One of the important market structure outcome of export behaviour of small firms is their unrevealed exports. Those small firms which could not break entry (and expansion) barriers both in the domestic and export markets (due to marketing constraints etc.) may export through other established, especially the large firms. Apart from the market structure conditions, there could be several other supply side factors for the existence of the phenomena, which are mostly beyond the scope. The incidence of the unrevealed exports of small firms, as observed in the field study, seems quite high in the hand, small cutting tools industry. A small firm, interviewed (in Bangalore), which produces carbide tips at a very high quality and cost competitiveness sells considerable amount of the product to an established large firm with a foreign collaboration and a (the so called, foreign) brand name. The large firm, in turn, sells these products both in the domestic and

4) The large firms, which buy the finished and semi-finished products from the small firms, might resell them in the domestic market also at much higher prices with their brand names, which is a different question.
<table>
<thead>
<tr>
<th></th>
<th>Duty Drawbacks</th>
<th>Cash Compensatory Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Tools</td>
<td>3.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Machine Tools</td>
<td>1.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Steel Tubes and Pipes</td>
<td>15.7</td>
<td>15.6</td>
</tr>
<tr>
<td>Castings and Forgings</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Cables</td>
<td>26.9</td>
<td>22.2</td>
</tr>
<tr>
<td>All Engineering Products</td>
<td>8.4</td>
<td>5.9</td>
</tr>
</tbody>
</table>

international markets, at much higher prices with its brand name.
III.II. Scale Economies, Firm Size and Exports

One can argue, as far as the (conventional) static scale economies, internal to a firm, are concerned, they are associated only with large firms or plant size. The dynamic economies, especially of the learning by doing type, could be relevant to both large and small firms. But the incidence and the degree, at which these economies could be realized, could be related to firm size, under specific conditions. In case of external economies, firm size comes into the picture, in terms of internalization of externalities. Even the dynamics of external economies in terms of growth of an industry, changing pools of specific inputs and industrial structure, could be internalized by firms at varying degrees.

The pattern of industrialization, that has been realized in India, as mentioned earlier, did generate considerable level of external economies and also diseconomies. Given the industrial structure and the policy regime, most of the benefits of the external economies, both static and dynamic, could be internalized by the large firms.

If we look at the input generated externalities, as shown before, both the vertical integration and disintegration strategies followed by large firms, could facilitate internalization of the economies in the production of raw materials. Secondly, the
economies of specialization generated through vertical disintegration process through sub-contracting and ancillarization, under the given market structure conditions, could be totally internalized by the large final product manufacturers. 1 As mentioned earlier, the ancillarization and sub-contracting process is quite significant in industries like automobiles and bicycles industry. For example the bicycle industry in Ludhiana, is a notable example of the economies of specialization associated with vertical disintegration. 2 The S&M firms producing the intermediates are generally are quite efficient under specialization with labour intensive techniques. But these economies of specialization by small firms are generally passed on to the large final product manufacturers, due to unequal bargaining strength under the given market structure conditions as discussed before.

Furthermore, the dynamic external economies, in terms of increasing availability of scientific and skilled manpower through the government's policies of subsidized education etc. could be benefitting the larger firms more. The economies in the increasing pools of specific skills could be internalized by the larger firms if they have greater access to these skilled labour and human capital created in the country (than S&M firms).

1 See Annavajula (1989)
2 See Stigler (1951) and Anthony (1987)
On the other hand, the dynamic increasing returns at the industry level and their internalization might not be very significant. These external economies depend on the industrial base and its growth.³ Although the Indian industrialization process created a large industrial base, according to 'Kaldor-Verdon' law, the accrual of dynamic increasing returns are usually significant when the manufacturing has a sustained high rate of growth.⁴ This, in turn, requires an adequately high and rising level of effective demand.⁵ The significance of these dynamic returns for the Indian industry might be low, given some of the findings on India's industrial stagnation and also low growth in effective demand in the country.⁶

If we bring in the international element of external economies, in terms of imports (or trade) of intermediates and components, if there are any international level external economies in the production of these intermediates, they should be benefiting the Indian large firms more than small firms, given their

³ Although we have assumed that external diseconomies, if any, to be of equal magnitude to firms of all sizes categories, these diseconomies could be of lower magnitude to larger firms, if these firms have greater access the governments raw material (like steel) quotas and due to certain pecuniary economies in buying large quantity of raw materials.

⁴ See Kaldor (1966). According to Kaldor, in a cumulative causation, technical progress stimulates economic growth, which in turn induces further technical progress. This results in dynamic increasing returns associated with higher rate of economic growth.

⁵ See Bhaduri (1988).

⁶ See Ahuluwalia (1985) and also Mitra (1977).
higher access to these imports to large firms (as shown before).

The internalization of the external economies by large firms should, on the one side, put them in a better position to export from the supply side aspects (like costs of production etc.) and on the other side, it may increase the domestic monopoly position of these firms with implications on their export orientation.

Economies of Scale Internal to a Firm

In the long-tailed market structure, characterized, few large firms at the top would take up the major share of the market of the industry. Apart from this, protection from imports given to the domestic industry, especially the final product manufacturers, gives the large firms, access to large chunk of the domestic market. This should give scope to Indian large firms to reap both static and dynamic internal economies of scale advantage towards exports.

1) But the first question, as discussed earlier would be whether the domestic market is large enough to realize any significant economies of scale advantage in exports (at international markets). As argued before, if one takes the size of the Indian market in terms of per capita income and income distribution, one can not consider the domestic market large enough to consist of sufficiently large number of consumers with homogenous national tastes. Apart from this, due to the income distribution characteristics, the market gets fragmented with both income and price elastic nature of demand.
patterns. The differentiated consumer goods, mostly demanded by small sized upper income segments, tend to be produced on a small scale. This, in turn, reduces scope for firms to have long production runs to realize any significant levels of the internal economies of scale.

But, on the other hand, there are quite a few engineering industries with large domestic market. For example, India's bicycle industry is supposed to be the largest in the world. But the major part of the demand for bicycles in the domestic market is from the low income strata with the demand curve being highly price elastic whose demand is low quality oriented. So the bicycles produced for the domestic market should tend to reflect the price elasticity characteristics at low quality, while the major part of the world market, especially from the developed countries, is income elastic and high quality oriented. As a result the firms in the industry, to undertake any substantial level of exports, require to differentiate the product produced for exports from the domestic market. This is because export market may require as export market may require significantly a different type of a product from the product produced for the domestic market. If a large firm produces different products for the domestic and export markets, the production runs will be shorter. As a result, (from Linder's representative demand or preference similarity argument) the large firms in the industry might not be

7 See Anthony (1987).
able to realize any significant level of scale economies advantage towards exports.

Secondly, considerable levels of product market segmentations, further reduce scope for scale economies to large firms. A typical illustration to the argument is India's diesel engines industry. Major part of the domestic demand for diesel engines is of highly price elastic nature, oriented towards low horse-powered and low quality engines. Major share of the demand is made by the Indian farmers, who are generally highly price conscious and prefer low quality and sturdy engines for rough usage. High quality or sophisticated engines are not relevant to the pattern of usage by the farmers. About 70 percent of the demand is met by small and medium firms, which are generally cost efficient in producing the low quality engines at low price. The market is scattered all over the country, giving geographical protection to small firms. The large firms are generally unable to compete with the small and medium firms in this segment of the market (low quality and low horse-powered engines). As a result, the domestic market

8 There might be large effective demand for the product in the country, but shared by large number of medium and small firms catering to local markets. In this case the long-tailed market structure characterization may not hold to full extent.

9 See Desai (1984)

10 One of the large firms interviewed in the field study tried to introduce a sophisticated diesel engine into the market with a German collaboration, to cater this segment of the market. But the product was a total failure in the market, due to the nature
for these engines, being scattered all over the country, is shared by large number of small firms, not giving scope for large scale production (by few large firms) to realize scale economies.

Secondly, the large firms in the industry concentrate in the upper segment of the market (above 20 H.P. engines), mainly catering to industrial and urban demand. But the magnitude of the domestic demand is too small to realize any scale economies.

2) The other factor which might reduce the scope for internal economies of scale in length of production runs to the Indian large firms could be the nature of their product diversification behaviour. There might be economies of scale arising out of diversification, in terms of economies in multi-plant operations and economies of scope related to the production of a diverse range of products in a single firm or establishment. But these economies of scale and scope of multi-product strategy largely depends on the scale of operation, the type of the products, and technological 'nearness' between the differentiated products. These economies might be realized mostly at

of the domestic demand.

11 Major part of the world demand is for the high quality engines. The world demand for low quality and low horse powered engines is generally from the other developing countries.

a very large scale of operation. But the potential of these economies to Indian large firms might not be significant, since these firms can not be said to be at a very large scale, compared to international standards.

As discussed earlier, Indian large firms prematurely diversify into a large range of products in search of monopoly profits. Consequently, they may not reach optimal scales of operation in any single product line to realize economies of long production runs. Apart from this, the Indian multi-product engineering firms are said to produce a large variety of less related products. This not only reduces length of production runs, but also scope for economies of specialization in the use of labour and capital equipment, as organizational efficiency requirements tend to be high in multi-product operations.

3) In case of economies of plant size, it has been observed that the industrial licencing and MRTP policies, by restricting establishment and growth of large plants and limiting capacity expansion in production have prevented firms from attaining the critical plant size required to realize any significant economies of large plant size. This is

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13 For example the Japanese large firms which follow multi-product strategies operate at a very large scale and realize these economies, especially in marketing.


15 See Wolf (1982) pp.65-71. Until recently an MRTP firm was defined to be one with net assets worth of Rs.25 crores, which has been increased to Rs. 100 crores
essentially applicable to those industries where the existing technology permits scale economies only at a very large scale of production. In the case of several India's heavy engineering industries (like Tractors etc.) most of the 'large' plants are supposed to be small in comparison to international standards.16

4) The economies of scale (both static and dynamic) in R&D activity, in terms of spreading fixed costs of R&D over larger output, need not be given much importance, given the nature and low level of R&D activity in India, which will be discussed more in detail in the following section.

The incidence and degree of realization of learning by doing economies could be at lower level to larger firms (compared to S&M firms), given their nature of diversification behaviour and also due to the organizational aspects. Diversification into multi-products, reduces scope reduces specialization and increases organizational complexity, which in turn reduce the incidence and degree of realization of learning by doing, especially in production. Furthermore, a large firm generally tend to have large number of separate departments handling separate functions. If these different departments are not properly coordinated resulting in X-inefficiency, the

16 See Desai (1982)
realization and application of learning by doing economies may tend to be low.\textsuperscript{17}

To illustrate the above argument, from the observations made in the field study, on the production floor, technicians (or engineers) might be able to realize certain snags, and possible improvements in the machinery or products during the production process. But generally, in large firms these findings has to be referred to R&D or other departments for their approval and application. If these separate departments are not properly coordinated, the realization and application of these learning by doing economies may not take place, even if they do, it might involve long time durations. So the realization of these dynamic economies (of cumulative experience) in large firms depends on the levels of X-efficiency in these firms.\textsuperscript{18}

The above analysis shows, under the given domestic market and firm level conditions, large firms ability to realize (pre-trade) scale economies advantages towards exports. But on the other hand, trade or exports could function as an extension of the market size, especially for a small country like India, (small country in terms of income), which in turn can lead to scale economies in the form of increased production runs. But to realize this, the initial condition, as discussed in case of the

\textsuperscript{17} See Lebenstein (1980)

\textsuperscript{18} Which depends on the motivation of employers and managers levels of synchronization of different activities, flow of information and also on the market pressure.
bicycle and diesel engines industries, firms have to produce the appropriate product for the world market, which is determined by the nature of the domestic demand. Most of the final engineering products, mostly produced by Indian large firms, may not be appropriate to major part of world markets, while the intermediates produced mostly by S&M firms might find a place in the world market. If the large firms do not have considerable degree of export orientation, realization of these economies of exports by these firms, may tend to be low. On the other hand increase in production runs, and capacity utilization and other dynamics, resulting out of (firm level) exports could be relevant to firms to lower down the size characteristics also. 19

As far as the S&M firms are concerned, the most emphatic economies could be in terms of economies of specialization and dynamic economies in cumulative experience (or growth) and learning by doing. As mentioned earlier, both the economies of specialization and learning by doing are highly correlated.

A model efficient small firm, as derived from the field study, generally tend to specialize in a few product lines, in which its strength lies. These firms are generally managed by technocrat-owner

19 It reiterates Dreze's (1960) argument in which firm size is not crucial determinant of scale economies, but what matters most is the number of items turned out at a given production line. According to Grueble and Lloyd (1975), the most important determinant of productivity or unit costs is not the size of plant but how production is organized within a plant of a given size. This is especially relevant to multi-product firms.
managers, whose involvement in the production process tends to be high, as a result of which, they tend to be highly X-efficient. As these firms generally concentrate in a few product lines they are able to utilize special purpose machinery fully.\textsuperscript{20} This could facilitate considerable turn-out of number of items at a given production line.\textsuperscript{21} High degree of X-efficiency combined with specialization, could lead to economies of specialization (in terms of lower unit costs). This, in turn, could lead to higher realization of learning by doing economies in cumulative experience in the production process due to higher involvement of technocrat owner managers and simpler organizational structure.

To illustrate the above proposition, as observed in the field study, a technocrat owner manager, who has an understanding of the engineering features of the machinery and technicalities of the product, could not only be able to realize the snags that arise and the appropriate solutions but also would be able to take quick decisions in their application.\textsuperscript{22} This would facilitate adoption of machineries to changing

\textsuperscript{20} See Pack (1981).

\textsuperscript{21} For this to happen, the product has to be standardized. If the product has to be produced according to each buyer's specification, it might result in frequent halts in production to get or adjust machinery and also move downtime to more different models.

\textsuperscript{22} The technocrat owner managers of small firms, generally, happens to be those who had worked with large firms for a period time and have branched out on their own. See Desai (1982).
requirements and possible improvements in their operations and also to improvement in the product quality over a period of time.23

These learning by doing economies make a firm cost competitive and given other conditions, lead to its growth and growth in specialized areas, in turn, could result in highly productive cumulative experience. But one of the factors which could be constraining, as observed from the field study, the dynamic economies in growth through specialization of small firms is the Government of India's industrial policies towards the small scale sector. The fiscal incentives and the reservation policies towards the Small Scale Sector (SSI) discourages an efficient small firm to grow out of being a registered small firm. Since it is highly beneficial to remain as a registered SSI unit due to the policies, the efficient small firms tend to grow by premature diversification into multi-plants, (registered under different names) and multi-products rather than in a specialized narrow range. One of the small firms, interviewed in the field study controls six plants registered as SSI units and achieved growth by this type of diversification. This phenomenon, in turn, dissipates the dynamic economies at a very early stage.

23 One small firm in the cutting tools industry, interviewed, in Bangalore, was able to bring in additional technical improvements to a machinery imported from a Swedish firm. The technical improvement was, in turn, was taken by the Swedish firm to be added to new machines manufactured.
From the above analysis, it can be presumed that S&M firms relative advantage towards exports, both in pre and after trade conditions, could be the economies of specialization and the dynamic economies. The after trade dynamics could arise out of possible learning by doing economies in export activity itself, i.e., the absorption and adaptability from the feedback and cumulative experiences from the export activity. Because of their higher X-efficiency, S&M firms might be able to realize these economies more effectively.

One other important relative scale economy advantage in exports across size groups from the domestic conditions is the economies in the internal transport. India is a large country in space wise. Most of the engineering products are exported by sea. So the internal transport costs in transporting the products to the port areas play an important role in F.O.B. prices of exports. There could be substantial economies of scale in the domestic transport depending on the nature of products. For example, in products like steel tubes and pipes and diesel engines, which are bulky, large scale operation is essential to reap the economies in domestic transport. In this context, S&M firms would be at a disadvantage because they operate with small quantities.
III.III. Technological Activity, Factor Endowments and Efficiency Aspects.

In this section, the analysis revolves around the issues of technological behaviour of large and small firms, under the given domestic structure and its implications on comparative efficiency (advantages) across the size groups, in exports. Domestic technological activity and its relation to firm level exports, again, depends on the domestic (demand) market structure and the supply side considerations (like factor endowments). The Indian industry and firms might have their own technological dynamics (in relation to the domestic market), but the query, here is, its relation to exports.

Given the assumption of rational behaviour, technological activity by a firm would be aimed at its market performance, which could be based on short run or long run objectives (under uncertainty). If we have the initial condition that a firm is established to cater to the domestic market first and exports are an offshoot of the domestic activity, the relationship between the technological activity and exports depend on the domestic demand and supply side conditions (which determine the nature of the technological activity).

To illustrate a subset of the above argument, in a Shumpeterian scenario, firm level innovation and
R&D activity tend to take place under monopoly conditions, which assure the appropriability of the benefits of innovation. The innovation, in turn could give a firm a temporary comparative advantage both in the domestic and world market. But on the other hand, firm level technological activity, which could be in terms of innovation, imitation and importation and adaptation might be aimed at augmenting monopoly power (or profits) in the domestic market, which in turn, has implications on firm level export orientation. Secondly, under large degree of imperfect market conditions and institutional factors, technological activity of firms directed towards performance in highly fragmented domestic demand conditions might result in different (strategic group) firms to adopt choice of technology and techniques, which may or may not fall in line with domestic factor endowments and incomes. This, in turn, determine a firm's ability to reap the country specific comparative advantage in factor endowments.

Firm and industry level technological activity that has taken place in the engineering industry during the last thirty five years has been highly complex and diverse, which makes any consistent generalization regarding the technological behaviour and its implications on exports of strategic group firms very difficult. One generalization, as mentioned before, is that the 'creative destruction' or innovation of the developed country type of technological activity is more
or less absent in the industry for (large) firms to achieve the temporary comparative advantage that could be attained through innovation in the world market. Factors like the (small) size of the domestic market, scale of operation, fragmentation of production capacities etc. seemed to have made innovative R&D, with its uncertain results and high fixed costs unprofitable activity to the Indian large firms.\textsuperscript{24} The cost of importing technology are said to be lower to the (large) firms than doing any significant level of innovative R&D. As a result, most of the new technology (new to the domestic market) or movements of the frontier are imported from the developed countries.\textsuperscript{25}

Major part of R&D by firms, which is generally very minimal, was observed to be directed towards adapting the imported technology to local conditions.\textsuperscript{26}

Furthermore, as mentioned earlier, due to the nature of product and factor market segmentation the government policies and unequal access to imported technologies, there is significant levels of technological distance between strategic group firms within given industries. Large firms, generally tend to have higher access to imported technology than S&M firms. Small firms on the other hand operate with indigenous

\textsuperscript{24} See Desai (1980), Lall (1987), Sidhardhan (1988b)

\textsuperscript{25} Desai (1988), Lall (1987)

\textsuperscript{26} See Alam (1988), most firms spend less than one percent of their sales turnover on R&D.
technology and materials. This causes large and S&M firms to operate on different levels of technological frontiers, which, in turn, determines the nature of their technological efforts, capabilities and activities, with implications on their export behaviour.

Major part of the technological activities of large firms could be termed as 'creative importation and creative, may be not so creative adaptation'. The import behaviour of large firms, at the top ladder of the market structure could be a part of their oligopoly rivalry or behaviour towards maximizing or retaining their domestic monopoly profits and market shares. If a large firm imports vintage technology with foreign collaboration and brand name it might be able to increase its market share and profits in the domestic market, under the given nature of domestic demand conditions. The other large firms, in the industry, in order to retain their market shares, might follow and import technology as a part of their

27 Out of the 109 small firms in the sample of the field study, only 9 firms use same kind of imported machinery (generally second hand) and materials, while 95% of large firms use same kind of imported technology and materials.

28 The evidence on the adaptation of imported technology to local conditions is mixed. In some cases firms do significant levels of technological effort in adapting the technology and in other they use them just as they are. (See Lall (1987) and Alam (1988)).

29 In the early part of the 80's, under the technology import liberalization, foreign collaborations with technology imports by the automobile firms became a means of enhancing or retaining domestic market shares and profits. The advertising competition was based on foreign brand names and licenses.
oligopoly rivalry. Furthermore, expenditure or investment on imported technology, and the associated complimentary investment in R&D (in adapting the technology), may be used as an entry barrier by incumbent oligopolies.\textsuperscript{30} If technology imports and associated R&D behaviour by a large firm increases its domestic market power, from the market structure argument, it might reduce its export orientation (or propensity).

From the supply side aspects, imported technology, assuming it is superior to the domestic, should put large firms (which have higher access) in a better position to export, because the ability to acquire technology should result in high productivity and its growth (especially in catching up developing countries like India). But if one observes the technology import and adaptation cycles in India, technology levels of firms supposed to have lagged far behind the world standards. Most of the new (to the domestic market) technologies imported are supposed be of older vintage compared to the technologies in the developed countries.\textsuperscript{31} This, in turn, reduces export

\textsuperscript{30} See Katrak (1985). Imported technologies and R&D behaviour are supposed to be complimentary rather than competitive in the Indian industry. According to Katrak's findings imported technology in India did result in adaptive R&D efforts, but the complimentarity is weaker in case of complex technologies might imply complex technologies are used as they are, without much adaptation.

\textsuperscript{31} Desai (1988). According to Desai many industries which expanded and prospered in India were either insignificant or declining in industrial countries and the firms that produced machinery for them either
possibilities to a large part of the world market (the developed and middle income countries) from the product (or technology) cycle approach.

But, on the other hand, import or operation of older technology might not be a significant constraint in achieving export success, if it is combined with certain domestic (shadow) factor prices and continuous technological effort in adapting and improving the older technologies. The evidence regarding the nature and extent of technological effort of large firms in adapting and improving imported technologies is mixed.\(^{32}\) On one side, the technological progress of Indian firms with imported technology base was observed to be very slow and in many cases stagnant. In the beginning of a collaboration or import of technology, the technological effort and the learning process seemed to be high but in due course it slowed down and the gap between the technology recipient and world standard technology increases.\(^{33}\) The sheltered domestic market was observed to have reduced incentives to undertake substantial technological efforts and cost saving and quality enhancing measures.\(^{34}\) As a consequence, export potential in cumulative technological progress and innovation etc. over the diversified or declined. The technology that has found large markets in India has often been a sideline for European firms.


\(^{33}\) Alam (1988)

\(^{34}\) Bhagwati and Srinivasan (1975)
older vintage technologies imported, could tend to be low.

On the other hand, several large firms in the engineering industries, which imported technologies had shown technological dynamism in adapting them to the domestic conditions, scale considerations and demand requirements. The technological adaption and its associated R&D was generally directed towards producing the products relevant to the price elastic nature of domestic demand and also towards altering (reducing) scales to conform to the domestic market size. As a result the products tends to be at low priced, low quality, sturdy type. Consequently, the adaptive solutions made might be unique to the Indian demand and supply side considerations and the extent of export possibility may get reduced based on the representative demand argument.

As far as the productivity and cost associated with the imported technologies is concerned, it requires proper investment choice, continuous technological effort and learning by doing. Even if we assume that


36 According to Desai (1988), India, at present, produces a large volume of sturdy machine tools and other industrial equipment which were passing out of use in the industrial countries twenty years ago.

37 But there are some industries where firms, on the basis of imported technologies, achieved international quality and price in the products. A World Bank study (1984) gives Indian boilers industry as an example of this technological dynamism. But this phenomenon is only at a marginal level.
the choice of technology under the given information and parameters is made correctly, the costs involved in the beginning might be quite high because of high costs involved in technology transfer and setting up the plant. The cost of technology transfer is observed to exceed fifty per cent of the total cost of a project in developing countries like India.38 This, in turn, reduces the possibility of comparative advantage in exports, at least in the beginning.

But again, generation of comparative advantage with the imported technology requires proper choice of technique on the frontiers (in accordance with domestic factor prices) and optimal movement on the frontier according to changing conditions (a continuous process of adaptation) and also further improvements through learning by doing and proper tuning with the world market conditions. In case of choice of technique, firms, as a generalization, which operate with imported technologies, in India, are supposed to use more labour than the extent of labour used in the similar technologies in the developed countries.39 Although, it might not result in higher comparative costs, since labour in India is much cheaper, it would imply failure to minimize costs and technical inefficiency.

38 Teece (1976). This would be because the available skills, manpower and the prevalent conditions in the developing countries might be quite different from the developed countries where the technology or the machinery is developed.

39 Desai (1980)
The above result shows imported technology being used as it is with more labour than required. On the other hand the imported technology can be changed or adapted towards labour intensity in order to take advantage of the domestic relative factor endowments. But, it has been observed that there is practically no evidence of any effort by the Indian large firms to change imported technologies in a labour intensive direction. The thrust of process engineering efforts by these firms seemed to be towards greater capital intensity and reducing labour intensity. Furthermore, despite the abundance of skilled labour, many firms were observed to be weak on the production management requirements of labour intensive techniques. This would imply that productivity within the plant and also in terms of optimal choice of technique in a macro sense might tend to be lower than the potential. This result indicate that the Indian large firms, operating with imported technology might deviate from the country's natural comparative advantage in skilled and semi skilled labour.

With the rapid technological changes in the developed and middle-income countries, the Indian industry and firms, (in pursuit of catching up), like in several other developing countries, which import technology on a lagged product or technology cycle become dependent on imports for technology upgradation

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40 For detailed analysis of this, see Lall (1987). These firms seemed more inclined to shed labour rather than employ more.
in a continuous process. This is especially true in the absence of significant levels of process and product innovation. In such a scenario, there might be technological imports and activity in relation to domestic market success, but its relevance to exports (especially to the developed countries) would be very minimal.\(^{41}\)

On the other hand, there could be several large firms in specific engineering industries undertaking technological efforts and changes without much dependence on the imported technology. These efforts could be very much in line with the domestic demand and supply side conditions (like the relative factor prices). One such example, once again, could be the bicycle industry. As mentioned earlier, the nature of the domestic demand for bicycles is highly price elastic. Whatever the technological efforts and changes that go into producing the final product are towards reducing costs and price and the making the product sturdy (suited to the Indian conditions).\(^{42}\) Even the technological diffusion and dynamics through inter-firm linkages between the final product (large) and intermediate (small) manufacturers is towards minimizing costs and prices. As a result the final product that comes out is highly

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\(^{41}\) This could be essentially true in case of large engineering firms producing differentiated final products.

\(^{42}\) Anthony (1987). The other industry example could be the Indian tractor industry (Swaraj Tractors Ltd.). See Desai (1982).
suitable to the nature of domestic demand, but the export potential arising out of the technological activity may not be high from the representative demand argument (between the domestic and world market) as domestic and export markets demand different type or quality products.  \[43\]

In a Schumpeterian scenario, it is only monopoly large firms, which should undertake R&D and innovative activity. But empirical evidence shows innovation does take place in small and medium firms, which do not have monopoly position in the market.  \[44\] Most of R&D and innovative activity might be informal in character, mostly undertaken by small firms.  \[45\] Small and medium firms might be very effective in the initial stage of innovation, where large amount of investment and fixed costs are not necessary in molding the R&D and innovation towards product introduction. Apart from this, small and medium firms role in innovation could be very significant in the industries operating with decentralized and disintegrated technologies.  \[46\] In vertically disintegrated technologies, S&M firms producing

\[43\] These products could find a market in other developing countries with similar demand patterns and domestic conditions. But these markets might be of small size.

\[44\] Kamien and Schwartz (1982). Schumpeterian monopoly condition is not necessary, if the small firms innovation are protected from appropriability by Patent laws. As a matter of fact, it seems it is the small and medium firms which produce major part of innovations rather the large firms, in the United States.

\[45\] Scherer (1980)

\[46\] Blair (1972)
intermediate products could be very effective in process innovations.

In India's case, Katrak's study showed that larger firms undertake proportionately less R&D than smaller ones. Sidhardhan found an 'U' shaped relation between R&D intensity (R&D expenditure divided by sales turnover) and firm size for several Indian industries with a sample of firms with sales turnover ranging from Rs.10 million to several thousand millions. This would imply that small firms are as R&D intensive as very large firms. The explanation given for small firms to spend a larger proportion of their sales on R&D is due to the presence of the minimum economies of size. But the nature of R&D done by small firms could be quite different from the large firms. The question, here, would be the implications of the nature of R&D on their exports.

The nature of R&D and product and process innovation by S&M firms can be expected to be very much in line with the nature of domestic demand, in which case, as argued in case of the large firms before, the export possibilities would be low under the technology cycle and representative demand approach. But the major strength of the technological activity of these firms could be that it may fall more in line with the domestic factor endowments. Small firms, as shown before, are generally said to use the indigenous technologies and

47 Katrak (1985)
48 Sidhardhan (1988a)
factors of production more intensely and effectively. Consequently, they might be in a better position to reap the country's comparative advantage in factor endowments more effectively than the large firms operating with imported technologies.

One interesting aspect of some of the engineering industries, is that the product or technology (innovation) cycle and the representative demand arguments in exports, which hold very strongly in the final (differentiated) products, may not hold to full extent in case of certain equipment and intermediate products. In the production of these products, the technological advancement in the developed countries could be generally towards capital augmenting and labour replacing (on the capital intensive part of isoquants), since labour is very expensive in these countries. If we assume that the initial (or in the beginning) technology (or the isoquant) is the same in both in the developed and developing countries, (whether it is imported or indigenous) if the technological change or advancements in the labour abundant developing countries is directed towards labour augmenting, with minor innovations in the machinery and product characteristics, the firms in these countries still would be able to export to the developed countries. Although one can apply this argument to both

88. Imposing the Heckcher - Ohlin assumption.
So the initial technology in developing countries can be
large and small firms, the major determinant factor would be firms ability to reap the country's comparative advantage in labour abundance and certain indigenous technological characteristics at every stage and in a continuous process (over a time period). The above argument is illustrated in the Diagram II. The initial technology in both developed and developing countries is represented by the isoquant QQ1. The capital deepening technological changes in the developed countries is represented by the expansion path 'OA' and the labour augmenting technological changes in the developing countries by 'OB'.

In such a case, S&M firms, which generally concentrate in the production of intermediates and certain equipment, might have a relative advantage in adopting the above type of technological activity towards exports.

One of the major determinants of the nature of S&M firms technological activity and efforts could be the market structure conditions. To recapitulate, small firms both in the final and intermediate industries face severe competitive conditions in the domestic market: price competition between themselves and stretched to considerable period of time with relative production cost advantages in exports despite the capital deepening technological upgradation in the developed countries. But after a stage, the technological advancement in the developed countries might reduce or eliminate the relative cost advantage of the developing countries. In such a case the firms in the developing countries will have to bring in substantial upgradations to sustain their exports. Naya (1985) pp.151, Pack (1981) pp.238.
non-price competition from the large firms. The technological efforts of S&M firms, operating mainly with indigenous technology, given their low access to imported technologies, could be mainly towards minimizing costs and prices. This is because the only way these firms might be able to compete and grow could be through producing the products at very low prices. In the process of minimizing costs (both fixed and variable costs), these firms might be able to not only reap the country specific comparative advantage (in the supply side) but also generates certain kinds of process and product innovations.\footnote{The fact that S&M firms, in the intermediate industries are able to survive and produce under very low and negative ERP's as shown before, would imply these firms do reap the country's comparative advantage.}

The above argument can be substantiated by the technological behaviour of two small firms, in the cutting tools industry, interviewed in the field study. One of them produces carbide tips with a sales turnover of about Rs.90 lakhs and the other produces abrasive cloth and other cutting tools with sales turnover of about Rs. 6 crores. Both the firms are managed by technocrat-owner managers, but in the latter's case about three professional managers were employed. In both the cases, the technological efforts and changes were made possible both in the machinery in operation and in improvements in vertical (quality) product differentiation through high degree of specialization and X efficiency.
How the efficiency of small firms is realized can be in terms of the following stages. The first stage is the choice of the product to be manufactured. Once the optimal choice (which determines the subsequent efficient operation) in relation to the given scale of operation is made, the products, sometimes are developed through R&D by bringing in designs from abroad or other firms.\(^{52}\) The second stage is minimizing the instalment costs of plant and machinery. From the above examples, in the former's case, the cost of machinery is reduced substantially by buying second hand machinery at very low prices and renovating them with new components and parts secured from the domestic and overseas markets. This process not only reduces the overall cost of machinery by 70 to 80 percent of new machinery price but also gives scope for innovation in adapting the machinery for the given (small) scale of operation.

The third stage is the minimization of the variable costs, along with maximum possible utilization of fixed inputs with high involvement of technocrat-owner managers at every stage of operation: 1) location and buying good quality raw materials, 2) in the production process, and 3) marketing.\(^{53}\) In case of the small firm,\(^{52}\) in case of sub-contracting firms, the required designs of intermediates are taken from the large final product firms and after developing according to the specified requirements they are shown to the final product firms for acceptance and sales.

\(^{53}\) Although it sounds like a superman technocrat owner manager, these managers involvement is generally very high, which is a crucial determinant factor behind
manufacturing the carbide tips, in the process of learning by doing, some features of a machinery bought from a Swedish firm were changed in accordance with the problems that arose in the production process. These changes, in turn, were taken by the Swedish firm to be added to the subsequent machinery manufactured.

The variable costs of labour are minimized by employing few permanent skilled labour and temporary semi and unskilled labour. The semi and unskilled labour is a variable input for the small firms as it varies according to the amount of output produced unlike in case of large firms where labour is a fixed input. Secondly, the labour intensity of small firms has to be observed not in terms of number of labour employed, but at the intensity, the given labour employed, is utilized. Most of the small firms, as observed from the field study, make the labour employed to work long hours at full intensity by paying low wages.

Furthermore, because of small magnitude of the output produced, the quality control done by the manager, who has an understanding of the technicalities of the product tends to be high. This process, in turn, helps in upgrading the product quality and changing the a success or sickness of a small firm.

54 Due to Trade Unions and Government regulations.

55 Also see Nagraj (1984) pp.1450. In the sample of 120 S&M firm's data collected about 40 small firms employ only about 6 to 12 permanent labour achieving sales turnovers ranging from Rs. 15 lakhs to Rs. 90 lakhs. The wage rate of the permanent labour ranges from Rs.550 to Rs.850 per month.
product characteristics over a period time. So, what comes out could be a good quality product at low price.\(^5\) The carbide tips produced by the small firm, interviewed, are not exported directly by the firm due to lack of marketing infrastructure. But they are bought at low competitive prices and exported by a large firm with a Swedish collaboration, at higher prices under its brand name.

The above result, as briefly discussed earlier, is an outcome of high degree of specialization and X-efficiency of the technocrat owner managers and the resulting learning by doing economies. This process facilitates not only the stretching of the machineries to a longer period of economic use but also utilization of domestic resources and inputs at their opportunity costs.\(^5\)

From the above analysis it can be observed that an efficient small firm, which employs mostly indigenous (or older vintage) technology might have a higher scope to be technically efficient (at a point of time in static sense), i.e. operating on the given

\(^5\) It has to be taken into notice, the above result and characterization done in view of a model efficient small firm. A considerable number of small firms turn out to be sick units in the Indian industries due to wrong choice of products, bad financial management and constraints in the availability of working capital etc.

\(^5\) The linkage and dynamics of the technological activity, in relation to exports, might be more effective for an exporting firm than for a non-exporter. This is because an exporting firm can have proper feedback from the changing world market conditions and will be able to bring in necessary technological changes and upgradations at the right time to sustain or increase exports. Once the technological upgradations are brought at the right time, the process of stretching the technology would start again.
frontier, due to its pre-investment choice and organizational efficiency. Apart from this, the firm might have higher flexibility to move along the frontier (in adopting the optimal choice of technique) due to the less complexity of the technologies and also because factor inputs like labour is a variable input to these firms. On the other hand a large firm operating with imported technologies might have higher probability of being technically inefficient from the given frontier if the technology is not properly adapted and if there are technological rigidities and complexity. The technological complexity might even restrict movement along the frontier even if one assumes that the firm is operating on the frontier. This, in turn, may result in the technology to deviate from the comparative advantage in the domestic factor endowments through loss of degrees of freedom on the choice of techniques (the input combinations) on a given technology.

One of the implicit argument from the above analysis is the firm level allocative efficiency which can be observed in terms of minimizing costs under the relative shadow factor prices and also in terms of allocative (X-efficiency) efficiency within a firm. To recapitulate, a large firm which has a degree of domestic market power and operates on a downward sloping demand curve, theoretically, would pay the factors of production on the basis of marginal revenue product instead of their marginal productivities. The
marginal revenue product factor pricing behaviour results in the deviation of the factor prices from their true opportunity costs at the country level. Secondly, due to the existence of factor market distortions in the capital markets and labour markets due to trade unions and exit barriers etc., Indian large firms (which have greater access to formal credit and share capital) might be paying lower price to capital and higher price to labour than their shadow prices.

On the other hand small firms which have lower access to formal credit and share capital and higher access to unorganized labour might be paying higher price to capital and lower price to labour, in line with their shadow prices. This, in turn, causes significant differences between the large and small firms in their ability to reap the country's comparative advantage in factor endowments (relative factor prices). 58

Some of arguments presented in the above analysis can be illustrated through the Diagram III. The vertical axis represents capital input (K) and horizontal axis represents labour input (L). Let the isoquant 'Q1Q1' represent the imported technology frontier. The curve MM represents the relative factor price line faced by the large firms. SS is the shadow factor price line

58 From the above two arguments it can be seen that both the technical and allocation efficiency as characterized above are not totally independent of each other; to considerable extent being determined by the nature of technology adopted. Technological rigidities in adapting technology might not only result in technical inefficiency but also restrict a firm from achieving allocation efficiency.
representing the opportunity costs of the factors of production at the country level.

In adapting the imported technology, a large firm may arrive at the isoquant 'Q2Q2' by deviating from the original frontier, 'Q1Q1'. If the firm is at 'a', the extent of technical inefficiency would be 'ab'. Even if the firm arrives on the frontier 'Q1Q1' at point 'b', if there are technological rigidities in its adaptation, it might be stuck at 'b' (the capital intensive part) restricting its movement on the frontier. In such a case the firm may not be able to reach the point 'c' where its costs can be minimized (or profits maximized) resulting in allocative inefficiency to the extent of 'bt'.

But if we take the allocative efficiency in terms of adopting the technical choices subject to the relative shadow price line 'SS', the firm should be at 'e', at which it would be able to take advantage of domestic comparative advantage, if it exists, in factor endowments. In case of the firm which reaches equilibrium at 'C', it will have allocative inefficiency in terms of extent of utilization of factors of production at their opportunity costs at the country level, to the extent of 'cd'.

The isoquants 'Qs1 Qs1' and 'Qs2 Qs2' are taken to represent indigenous or older vintage technology with which S&M firms are assumed to operate. On the isoquant 'Qs1 Qs1' under the given technology it operates with, a small firm which pays shadow prices to the factors of
production, would achieve both technical and allocative efficiency at point 'b'. But if we take technical efficiency in relative sense in terms of deviation from the new vintage or imported technology represented by 'Q1Q1' the small firm will be technically inefficient to the extent of 'fg'. At the point of 'f' a small firm which is paying shadow prices to the factors of production and adopting labour intensive technology and techniques would be using less of capital to the extent of K1K2 and more of labour to the extent of 'lll2', than if the firm had been on the new vintage of technology of 'Q1Q1', and paying shadow prices at the point 'e'. As a result, the technical inefficiency 'gb' of the small firm in terms of deviations from 'Q1Q1', might be compensated by the adoption of labour intensive technology and techniques and by paying the factors of production (especially the labour) their shadow prices. This, in turn, might give an advantage to S&M firms in their exports.

The isoquant 'Qs2 Qs2' presents a case where the indigenous technology is technically more efficient compared to the imported technology represented by 'Q1Q1'.

The other important dimension of allocative efficiency, which might not be captured by the above characterization (and also quantitatively) is the extent of X-efficiency within a firm or plant. 59

59 For a rigorous analysis of X-efficiency aspects and how the neo-classical tools fail to capture it - See Lebenstein (1980).
There would be diseconomies of large scale due to organizational complexity, especially in the case of large multi-product firms. If the production of different products is not properly organized, if there is lack of coordination between different departments and information flow and misallocation of duties to employees, it could result in large degree of X-efficiency. The factors of production especially, labour, may be sub-optimally utilized in terms of deviations from their opportunity costs within the firm or a plant. This slack in efficiency of large firm could be not only because of diseconomies of large scale operations but also due to the market structure conditions. If there is lack of competition, large monopoly firms will not have enough pressure and motivation to minimize costs, which, in turn, may result in large degree of X-efficiency. This could be a very important feature of Indian large firms under the existing market structure conditions and an important determinant of their export ability.

From the above analysis, it can be seen that both the choice of technological frontiers and the choice of technique on the given frontier could be a crucial determinant in a firm's or an industry's ability to take advantage of the supply side factors. Imported technologies (of large firms) if properly chosen may not be sub-optimal but distortions might arise if they are not properly adapted and continuous technological changes are not made. Domestic market distortions, in
terms of the existence of monopoly power, protection from imports, the government policies and the factor and product market fragmentations could facilitate large firms, even with sub-optimal choice and operation of technology, to be able to reap domestic super normal profits. But their technological relevance to exports could turn out to be relatively low. For example, it has been observed in the case of textile machinery industry, South Korea produces semi-automatic looms, while the Indian firms produce modern labour-saving equipment, although India is a relatively a more labour abundant country. The discrepancy was attributed to the protection of the Indian textile and equipment producers, while the Korean industry has been export oriented.60

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60 Pack (1981), p.239.
III.IV. Overseas Investment and Intra-Firm Trade.

Firm Size and Exports.

One of the important outcomes of the domestic industrial structure, the government policies and the technological activity is the overseas investment and technology exports by some of the Indian engineering firms, which in turn can have significant implications on their export behaviour. This is a phenomenon attributable mainly to the large and upper segment of medium size group firms, investing mostly in the other developing countries.

There are certain supply side advantage in terms of availability of certain skilled labour at relatively low wages and specific technological advantages, which could facilitate Indian firms to undertake technology exports, turnkey projects and direct overseas investment (subsidaries) mainly in other developing countries. Apart from this, there are several other reasons why the Indian (large) firms undertake direct foreign investment, which do not fall into the scope in the present context. But, in brief, some of the factors behind the phenomenon could be the constraints in the domestic high cost economy in terms of high cost of domestic and imported inputs, the governments.

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industrial policies, the sluggish domestic demand and also the domestic oligopoly behaviour. 62

Taking the foreign direct investment as an ex post outcome, the question, here, could be what could be the export behaviour of the firms with overseas subsidiaries in contrast to other firms. Table 5 shows a sample of Indian large firms with overseas subsidiaries and their foreign exchange and export earnings.

In the field study, two large DGTD firms with overseas investment were interviewed. One of them belong to the steel tube and pipes industry which had set up a successful subsidiary manufacturing unit in Singapore, with a joint collaboration with a Japanese firm.63 The parent firm in India is supposed to be technologically equally advanced but priced out in exports due to higher cost of domestic steel.64 Despite relatively higher labour costs and no export incentives, the subsidiary in Singapore has been able to manufacture and export internationally competitive steel tubes and pipes. About 80 percent of the total production of the unit is exported to the U.S. and Europe.

The second firm belongs to the diesel engines industry, which had set up assembly units in Bangladesh.


63 There had been about 21 Indian ventures set up in Singapore out of which two survived.

64 The major reason for setting up of the subsidiary in Singapore is said to be the higher steel and freight costs and also restrictive availability of steel in India on account of quotas.
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Data Source: Company Balance Sheets.
and Indonesia to cater to the respective markets. These units mostly assemble the components imported from the parent firm to cater to the respective markets. One of the major factors behind these ventures seemed to be high transport costs in exporting heavy and bulky diesel engines.

There could be countervailing possibilities regarding the export behaviour of (large) firms with overseas investment. If these firms are substituting exports for foreign direct investment, exports of these firms would decline. The probability of the result will be higher, when the subsidiary units tend to achieve high degree of independence from the parent firm. Le Craw's study of direct investment by firms from less developed countries (LDC's) in Thailand, showed that LDC multinationals in Thailand tended to be more independent of their parent firm than other multinationals (from the developed countries).

Secondly, these firms invested in Thailand to protect their markets, which was served by the exports of the parent firm in the beginning, (in which case the subsidiaries might be functioning as substitute for exports by the parent firm). 65

On the other hand, these firms might be able to export through vertical integration with overseas subsidiaries and also due to direct exposure to the

65 Le Craw (1977) pp.450. Le craw's sample of LDC firms investing in Thailand included nine firms from India, six from Taiwan, two from Singapore and three from Malaysia.
foreign markets. These firms could export intermediates and certain machineries to the subsidiary firms, which could be a high possibility, since firms in India were given incentives in the form of import credits by the government to export capital equipment to the subsidiary operations.

Apart from serving the host country markets, the subsidiaries by reaping the host country specific advantages might be able to serve other markets like in the case of the first firm illustrated above. In such a case the parent firms exports through vertical integration can be increased significantly. 66

By setting up the overseas subsidiaries, the high cost of domestic supply factors in India and marketing the products which the firm was previously exporting could be reduced and become equal to those of its competitors. So even if the production in the overseas results in the elimination of certain exports, it may turn other products into exportables.67 Furthermore, the direct and continuous exposure and link with the overseas markets might enable the parent firm to have effective market feedback. This in turn, could facilitate necessary technological changes, towards increasing efficiency and exports.

66 But Le Craws (1977) findings indicate that the LDC multinationals in Thailand produced mostly for the host country’s market and did not undertake (even spill over) exports, pp.450. But the Indian firms in Thailand were found to be extremely efficient and are able to take advantage of the local conditions.