CHAPTER II
REVIEW OF LITERATURE

II.I. Review of Theories of International Trade

In the neo-classical general equilibrium trade theories of comparative advantage, industry and firms are indistinguished due to the assumption of perfect competition. The theories of comparative advantage remain complete on the basis of the assumptions of perfect competition and that there are significant supply side differences between (potentially) trading nations. In brief, under the assumption of perfect competition, constant returns to scale (and static conditions), in Ricardian models trade takes place due to technological (or production function) differences across nations in production of tradeable commodities and in Heckcher-Ohlin (H&O) models, production functions are the same across nations, but trade arises due to factor endowment differences. The concept of the relative factor endowments and the technological differences are highly relevant even in a firm level analysis of the present kind.

The recent developments in trade theory in imperfect market framework went about analyzing international trade by relaxing the assumptions of identical productions functions (free flow of technology)
across nations, perfect competition and constant returns to scale and by giving more importance to demand side factors in the analysis. Firm level analysis of exports through firm size variable becomes germane in the context of the new theories of trade in imperfect market framework, which are basically extensions of the classical theories in different levels. A critical examination of these theories can serve towards formulating the analytical framework regarding the relationship between firm size and export behaviour.

In the perfect competition models, competitive market structure in the product and factor markets and constant returns to scale assure all firms, in an industry, producing a homogeneous product to operate on the most efficient production frontier at zero profit. In these models, obviously, any firm level analysis is ruled out as a firm and industry are indistinguishable. Trade analysis in imperfect market framework or at firm level factors started in search of explanations to the Leontiff Paradox and also later to Grueble and Lloyd's findings on intra-industry trade which disproved H&O theory predictions. ¹

Leontiff showed by estimating capital and labour ratios for the United State's exports and imports under the assumption that imports were produced abroad with the technology, same as it was of the U.S. which was capital abundant and labour scarce country, exported

¹ Leontiff(1953), Grueble and Lloyd(1975).
labour intensive products and imported capital intensive products. This has led to the human capital or knowledge and skill intensities approach to the definition of factors of production and also to the question of whether technology (production functions) of producing a product were isometric across the trading nations. \(^2\) Arrow, Chenery, Minhas and Solow (1961) by estimating C.E.S (constant elasticity of substitution) production function for a set of industries for different countries showed that the countries do not operate on the same production function in the manufacturing industries. Although, it sounds like going back to the good old times of Ricardo's theory of trade arising out of technological differences, the following neo-technology theories were based on more logistics issues like innovation, technology-gap between countries, product life cycles, scale economies and demand factors. In this context firm level factors become very germane.

II.1.1. Technology Gap and Product Cycle Theories.

Entry of the innovative entrepreneur onto the stage is the crucial point of technology gap and product cycle models. The underlying conditions of these models are that the country, where the innovation takes place, has favourable capital labour ratios in terms of physical, human (skills) and knowledge inputs and

\(^2\) Keesing(1966), found that comparative advantage arose out of labour skill intensity of products. This approach is an application of Fisherian theory of capital in terms of physical, human and knowledge capital to international trade.
secondly the flow of technological developments and innovations among countries and firms within the country is not free and instantaneous. As a result of the second condition, the innovating entrepreneur enjoys a (temporary) comparative advantage resulting in domestic production and exports. Three major works, based on the technology gap approach are by Kravis (1956), Posner (1961) and Hufbauer (1970).

The idea of technology gap in Kravis's product availability hypothesis is implicit. International trade takes place because of differences in the availability of certain products among countries. The differences in the availabilities arise out of technological and product innovations. There are two ways by which technological progress causes comparative advantage; one is by reducing costs and other is by creating availability of new vintage products. In Posner's analysis, technology gap and firm level factors come more into focus. The model is based on the assumption that trading (two) countries have similar factor endowments and identical production functions for the established products. The other very important feature is that the producers of either country do not have same level of access to new technology. Under the condition, an innovative firm which creates a new product will acquire a temporary comparative advantage in the product to the other country until the imitation lag is dissipated. The important firm level factor of the analysis is the firm level R&D
expenditure which is crucial for the firm level comparative advantage not only in terms of initial innovation but also the resultant complimentarities (complimentary products) of the innovation.

Innovation and imitation lag are again two sources of comparative advantage in exports in Hufbauer's analysis and characterization of countries in descending 'Pecking' order of technological development. But the notable feature of Hufbauer's analysis is that it portended the importance of the role of a country's demand characteristics, market size and scale economies advantage in international trade.

Vernon's (1966 & 1970) elaborate analysis of trade pattern through product cycle theory not only gave an explanation to Leontiff's paradox but also recognized the role of foreign direct investment by firms (multinationals) in international trade. In simple terms, the temporal cycle of a new product's life begins with its birth through innovation and matures through standardization. The pre-condition to the innovation and standardization to take place in a (developed country) is (equal) access to producers to scientific knowledge and proximity to large market. In the initial phase, when the price elasticity of demand is low, focus is more on the product characteristics rather than on cost conditions. Once the demand for the

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3 Hufbauer (1965&1970)
product expands, there will be increasing tendencies by competitive producers towards standardization of the production process and the product, resulting in mass production. As markets develop abroad the producer (of U.S.A) will start exporting. But after a point it may be more advantageous to set up the production of the product in the foreign markets not only to make use of low labour costs but also to be closer to the market. The last phase is that the subsidiaries might start exporting the product to the parent and other countries. The above product cycle might last from five to twenty years for certain manufactures, where the developing countries come into the picture is in the last phase. 4

In essence, the pertinent firm level factors that can be derived from the above models are firm level innovation and R&D activity and foreign direct investment, which are generally associated to large firms. The other firm level factor that can be derived is the monopoly power, a firm derives out of innovation (for a temporary period of time). The country specific factors that facilitate the above conditions are the size of the (domestic) market (and the scale economies) and the availability of scientific knowledge and skills.

4 But the relevance of the above formulation of product cycle becomes less cogent in the context of recent rapid technological changes taking place with very short intervals. As a consequence the product cycles are supposed to be getting shorter and shorter with substantial implications on the above pattern of trade.
II.I.11. Scale Economies and Trade.

"Division of labour is limited by the extent of the market", although Adam Smith said it in the beginning; the view that economies of scale and specialization can be an independent cause of international trade has become prominent in trade analysis in the recent. Theoretically, scale economies, especially internal to a firm are difficult to tackle as it requires specification of an imperfect market structure, under which any generalized framework, especially in general equilibrium approach is problematic.

II.I.11.a. Scale Economies External to a Firm.

To avoid the above problem of imperfect market structure, until recently economies of scale are assumed to be external to a firm to retain the perfect competition assumption intact. The external economies is the case where returns to scale are constant at the level of firms and social increasing returns take the form of external economies. But these external economies can be positive or negative. In case of the positive economies, cost curves of firms and industry shift downward due to industry's output expansion and also due to several external reasons like increase in skills, efficiency improvements in raw material industries etc. But these economies may not be

5 We have to take into notice, here, the classical trade theory, based on the assumption of perfect competition, is based on the assumption that an industry's is one hundred percent vertically integrated. This means that the industry(or firm's) produces it's
of equal magnitude for all the industries, in which case the slope of the production possibility frontiers does not give ratio of commodity prices. One simple way this problem can be resolved, as Kemp (1970) did is by assuming that external economies are of equal degree in both the industries in consideration.

The external effects can operate from both supply and demand side. If we assume away the demand side effects (and firms are average cost pricing), one can introduce the external economies into the production function of a firm or an industry. With external economies, firm level production can be:

\[ Q = f(Y, e), \]

where

- \( Q \) = the output,
- \( Y \) = the inputs and
- \( e \) = a vector of all possible external influences. 6

The elements of \( e \) could be industry and country specific and also can have international element. 7 Where the external economies are at the industry level, firms production is assumed to have constant returns to scale \(-f(aY, Q) = af(Y, Q),\) where \( Q \) is the industry's output, subject to increasing returns to scale. The industry's output enters individual firm's production function.

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7 In case of internationally tradeable intermediates. See Ethier (1979).
The external economies at industry level may stem from a larger industry supporting production of large quantities and variety of intermediates at lower costs and also the inappropriability of (firm level) innovation (which are actually dynamic economies). 8 The external economies (or diseconomies) may also arise at country level in terms of country size, a country's industrial base also due to increase in the availability of skills and technology endowments. 9

Although in the case of external economies at industry level, we can retain the competitive market structure assumption and comparative advantage across industries, our concern is whether these external economies have any implications on firm specific advantages (within an industry) in exports. One way to look at it is that a firm can internalize the external economies, which would obviously imply market structure to be imperfect. There can be unequal access between firms to certain inputs certain type of (country specific) skilled labour, capital goods and technology. 10 Further, firms may follow vertical integration and merger policies to internalize (and also to achieve monopsony power)


9 Where Median type of externalities, depending on the industrial base, may arise due to interdependence of industries.

10 The unequal access can be a result of factor and product market segmentation.
the economies in the raw material and intermediates production and in the creation of knowledge capital. Even the country size and the extent of industrial base and product market segmentation may facilitate certain (strategic group) firms to have higher ability to internalize the external economies. In this context firm size can be an important determinant of a firm's ability to internalize these economies and the consequent export behaviour of different size groups.

II.I.11.b. Demand Factors and Scale Economies

In so far, the analysis of the above theories is mostly concentrated on supply side factors, although some demand side considerations are implicit in Kravis's availability hypothesis and Vernon's product cycle theory. Demand factors, in terms of nature of domestic and foreign demand, product differentiation and size of the market can have important implications on firm level export behaviour. For example, size of the domestic market will have significant implications on both static and dynamic (learning by doing) economies of scale which in turn have implications on firm level exports. It is useful to derive pertinent insights from the models which consider these demand factors. In this context Dreze's (1960) and Linder's (1961) contribution brings out in a way opposite but cogent arguments.

11 The process of internalization is discussed more in detail in Chapter 111.
By examining the trade pattern of Belgium, Dreze argued that small countries (markets) will have export advantage in internationally standardized products subject to economies of scale. These countries did not have sufficiently large number of consumers with homogenous national tastes to produce differentiated products with economies of scale and at competitive costs. The important determinants of scale economies are the length of production runs and size of the domestic market for the product rather than the size of the industry or firm size. Producers in a small country can not have sufficiently long production runs in the manufacturing of differentiated products to produce and export them at competitive prices. Their comparative advantage lies in specializing in internationally standardized products. In essence, the relevant point that arises out of Dreze's analysis is that a diversified production base (at industry or firm level) in small country markets would result in shorter production runs and reduce scope for scale economy advantage in exports. 12

According to Linder (1961) exports are offshoot of manufacturing activities made for the domestic market, dictated by the majority tastes. The domestic demand for vertically differentiated products is determined by the per capita income levels and

12 This has important implications on Indian industries, which will be discussed in Chapter III.
income distribution. A high per capita income country would tend to produce and export high quality products. The pattern of trade in vertically differentiated products, requiring nearly identical inputs and subject to increasing returns to scale is influenced by the relationship between a country's income distribution and elasticity of demand for quality with respect to income levels. Linder's analysis portended the intra-industry explanation of trade by saying that more similar the demand structures and income levels of two countries the more intensive the trade could be between these two countries.

Similar to the product cycle theories to some extent, Linder argues that a innovation or creation of a new product is made according to discernable domestic demand needs. Later, the product will be exported to the countries of similar demand structure only after saturating the domestic demand. The producer acquires an advantageous position (or production function) by being in proximity with a large domestic market and certain firm specific advantages like technological superiority, managerial skills etc. Apart from this, the crucial point is that the producer having access to large internal market will be able to reap economies of scale without having to incur high distribution costs. In similar line Corden (1970) have also stressed the importance of access to large domestic market to realize scale economies advantage in exports. Unlike in Dreze's
argument, in the above analysis producer in a small country will have a disadvantage compared to the one in a large country, as he has to depend on exports in a large way to reap scale economies. Exporting from the initial stage of the product, itself, would imply higher uncertainty and large distribution costs.

In a theoretical model set in Cournot oligopoly market structure, Krugman (1984) shows that access to large home market through protection can lead to scale economy advantage of exports to a domestic firm over a foreign rival, in a third market. The interesting aspect of the paper is that scale economies take the form of static economies, i.e., declining marginal costs and dynamic scale economies of 'learning by doing'. Protection of (large) domestic market gives a domestic firm an advantage in scale over foreign rivals which translates into lower marginal costs and higher market share in unprotected markets. The important condition for the result is the firm level declining marginal costs. The argument is that protection of the domestic market increases the sales of the domestic firm and reduces the sales of the foreign firm in the home market. Increase in home sales, results in lower marginal costs to the domestic firm for a given level of foreign marginal costs. Consequently this leads to static scale economies advantage of exports for the domestic firm in a third market.
The dynamic scale economies can arise out of declining marginal costs of R&D investment. Protection by increasing the home firm's sales and reducing those of its foreign competitor increases the incentive for domestic R&D at the expense of the foreign firm, which translates into a shift in relative production costs and consequent export advantage to the domestic firm. The form of dynamic scale economies are the learning by doing in which the marginal costs are decreasing function of cumulative output over time. Protection increases the cumulative output of domestic firm and reduces the cumulative output of the foreign rival. As a result it reduces the future (marginal) costs of the domestic firm and increases its comparative advantage in exports. These dynamic economies of learning by doing can be internal to and also external to a firm but internal to an industry or may accrue as a result of the accumulation of manufacturing experience as a whole. 13 This type of economies may create cumulative tendencies between countries and firms, so that countries or firms that acquire an initial advantage in any area where these learning by doing economies are prominent enjoy an increasing advantage over time.

In retrospect, in the above theories, where demand side factors play a predominant role, comparative advantage in exports to industries or firms arise

across countries due to domestic market size differences, preference similarities (or dissimilarities) per capita income differences etc between countries. But, what is relevant for us is that whether these have any implications on factors, not only across countries but also across firms within an industry in the home country. One obvious derivation is that larger firms will be able to attain higher advantage of large domestic market compared to smaller firms as they can take greater share of domestic market. Secondly, if income distribution is highly skewed, it can result in product market segmentation which can result in spacial distribution of firms on a vertical product differentiation plane. Consequently, different firms or strategic size group firms in an industry may concentrate on different quality segments, which in turn, can have implications for their respective export behaviour depending on the nature of demand similarities or the extent of representative demand between the trading nations. 14

II.I.11.c. Intra-industry Trade and Economies of Scale and Specialization.

Economies of scale cause international exchange of (differentiated) goods and international exchange of goods result in economies of scale

14 To illustrate this point, the Indian small firms producing low quality goods would be able to export these goods to other developing countries on the basis of income similarities or the extent of representative demand.
(specialization). The two propositions are the basis of intra-industry trade models of imperfect competition. Grueble and LLoyd's (1967, 1975) empirical observations on pattern of intra-industry trade showed that H&O theoretical predictions did not hold as major part of the world trade was between countries of similar factor endowments in similar but differentiated commodities. Quite obviously they and the following theories looked for answers in relaxing the H&O assumptions of constant returns to scale and perfect competition. What followed was a gamut of heterarchical models based on Chamberlinian monopolistic competition, monopolistic perfect competition, consumer theory and Cournot, Cournot and Nash oligopolies and Baumol's contestable monopolies etc. As mentioned earlier, there can be no generalized theories and outcomes in case of the trade models set in imperfect market conditions as the predictions or the results depend on the kind of market imperfections imposed on the system.

In case of homogenous goods, intra-industry trade can take place due to transport, storage and selling costs differentials across countries. Similar reasons for trade can also apply to differentiated final goods and capital goods. Vertical intra-industry trade or specialization across nations may involve exchange between countries of certain final products.
of an industry for the intermediate products used in the industry. 15

Intra-industry trade between countries of similar factor endowments and technologies can be explained by the presence of firm level internal scale economies in the production of mostly differentiated products. Grueble and Lloyd (1985) give an exposition of the firm level internal economies of scale and specialization, which can be determined by the domestic demand factors, size of the market and extent of horizontal and vertical product differentiation. The scale economies may arise out of the sources: 1) Size of plants 2) Length of production runs 3) Size of firms. Scale economies out of size of plants may arise due to presence of indivisibilities in capital and skilled labour and due to certain engineering features. The longer production runs may result in lower costs because they require less frequent halts in production to set or adjust machinery, less downtime to move different models or products through production lines etc. A larger firm may be able to reap the above economies more if it is specialized and does not produce wider range of goods or models.

The firm level internal economies of scale result in monopoly or oligopoly market structure simply because that the number of firms that can produce

15 See Ethier(1979). Intra-industry trade in intermediates takes place to exploit economies of specialization.
profitably in an industry with scale economies is limited even if there are no formal barriers to entry. Theoretical analysis of internal economies of trade requires specification a market structure based on the logistics like the number of firms in an industry and market size and elasticity of substitution between the differentiated products etc. Market size may determine the number of firms that can exist in a market under scale economies and the consequent market power of individual firms. The extent of elasticity of substitution determines the interdependence between firms in an industry.

Krugman (1979), in a simple model based on Chamberlinian monopolistic competition market structure shows the internal scale economies can be an independent source of international trade. The paper assumes one scarce factor of production, labour and that the number of horizontally differentiated products, each firm producing one of the specifications, to be large. The important implication of the later assumption is that the firm level internal economies are not too large so that large number of firms can exist in the industry. Firms can costlessly differentiate the products. The utility function of the consumers is assumed to be symmetric. All goods are assumed to be produced with the same cost function, with 'labour' used in production being a linear function of output.

\[ L_i = a + bX_i \]

\[ a, b > 0 \]
Li is labour used in producing good 'i'.
Xi is the output of good 'i'.

The presence of 'a', a fixed cost component would imply internal economies in terms of decreasing average costs. Free entry and exit of firms result in zero profit equilibrium. All goods actually produced will be in the same quantity and at the same price.

After deriving the pre-trade equilibrium, the effect of opening of trade is taken to be equivalent to increasing market size. Since there are economies of scale in the case of the single factor, 'L' in cost function, increase in market size, i.e., international trade, leads to economies of specialization on the basis of the argument that 'division of labour is limited by the extent of the market'.

More or less in the same theoretical framework, in a different paper, Krugman (1980) brings in additional factors, i.e., role of large domestic market in trade between countries of similar factor endowments, technology and incomes. Each differentiated product is produced in only one country for the same reason that each good is produced by only one firm. In this model trade occurs because there can be gains from trade as the world economy will produce a greater diversity of goods than either country alone, offering individual a wider range of choice. But in this model, unlike in the
previous one, there is no effect of trade on the scale of production and the gains from trade occur solely through increased product diversity. There is no effect of trade on scale as the model is based on the assumption of constant elasticity of demand. Increase in scale can take place if the demand facing individual firms becomes more elastic as the number of firms increases.

In a situation of 'mirror image countries' Krugman shows similar to Linder's argument, that if the two countries have sufficiently dissimilar tastes, a country will specialize in the industry for which it has the larger home market and each will be a net exporter of the class of goods in which it specializes, under the presence of increasing returns.

The same cost functions for all firms, symmetric utility functions, zero profits, negligible strategic interdependence between firms, costless product differentiation and internal economies of low and equal magnitude; all these simplifying features of the above models indicate presence of no explicit firm specific differential advantages in exports.

In Lancaster's (1980) model, which emphasizes preference diversity as a source of trade, there can be firm specific advantages because horizontally differentiated products enter utility function asymmetrically (Neo-Hotelling approach) and there are costs of adjustment to firms in differentiating the products. Lancaster, borrowing from
his consumer theory, puts major emphasis on product differentiation and preference diversity in a perfect monopolistic competition framework. 16 In this framework the number and design of goods are themselves equilibrium variables and are not specified as initial data. The major deviation of the analysis from perfect competition is mainly through product differentiation, even though there are scale economies but only at small outputs. Lancaster calls it perfect monopolistic competition as it represents the Nash equilibrium of perfectly informed firms facing perfectly informed consumers under conditions of perfect flexibility in choice of specification, absence of collusion and willing entry. This characterization is closely representative of the market conditions in the technologically advanced countries.

In the analysis, the countries are taken to be identical and in each country there are two sectors, agriculture and manufacturing. The later sector produces differentiated goods. Although there is a mention of inter-industry trade, the model concentrates on the intra-industry trade in manufactures.

The major feature of the underlying structure is the specification of product differentiation. Unlike in Krugman's analysis, although all products, actual

16 Lancaster (1971).
and potential, in a product group possess same characteristics, but different products, within the group possess the characteristics in different proportions and individuals are assumed to have preferences over characteristics of goods rather than over collection of goods themselves. The essence of the analysis is the diversity in consumer preferences so that the most preferred goods vary across consumers.

All firms are assumed to have same cost function and the cost functions are assumed to be 'U' shaped implying there are initial scale economies at the product level, defined as falling average cost of production of a good of constant specification for some range of output commencing at the origin. So these scale economies vanish after a point (higher output). The individual firms have two decision variables price and product specification. No two firms produce the same specification. Change of specification results in total loss of scale economies. Competition between firms is through elasticity of substitution between goods (assumed to be greater than 'one') through prices and specifications. At equilibrium the number of firms is large and due to free entry and exit profits are zero. Trade between identical countries take place to increase product diversity in each country as consumers are assumed to endeavour to consume as many different variations as possible.

Lancaster introduces market size differences in the model. The larger country, because of scale economies in
manufacturing will have greater product variety, a lower equilibrium price for manufactures relative to agriculture (operating under constant returns to scale) than in the smaller country. This, he calls it a false comparative advantage in trade.

In essence, pertinent to our objective, Lancaster's analysis has important implications on firm level factors. Firms are faced with more than one decision variables, price and specification and they have to decide on specification before entry and change of specification involves costs. The idea of adjustment costs are important before and after trade. Before trade opens, different firms may have different levels of (potential) advantages towards exports depending on their respective product specification and the elasticity of substitution they face. Once trade opens some varieties which were previously produced at home may now be produced abroad.

Furthermore, as briefly mentioned in Lancaster's analysis, there can be interaction between H&O comparative advantage of inter-industry specialization and scale economy advantage of intra-industry trade. This is generally approached by specifying two sectors; one sector characterized by perfect competition, constant returns to scale and a homogenous good (say Agriculture) and second sector characterized by imperfect market structure, increasing returns.
to scale and differentiated products (say Manufacturing). Dixit and Norman (1984) analyze the intra and inter-industry possibilities of trade by characterizing the differentiated industry by Chamberlinian monopolistic competition and the numeraire (i.e. homogenous) goods industry by perfect competition. The demand side is simplified by assuming homothetic and identical preferences for all consumers with symmetric utility function for the differentiated goods, in both countries. The production functions are the same (for all firms in the differentiated goods sector) for both countries across the two sectors. But there are differences in factor endowments between countries resulting in factor price differentials.

In the model, inter-industry trade depends on the relative factor endowments; if the differentiated goods are more capital intensive, the more capital abundant country will have a comparative advantage in them. The predominant pattern of trade is as one of intra-industry trade if the two countries are of a similar size and have no clear cut comparative advantage across industries. The interaction between intra-and inter-industry trade depends on the extent of differences in relative factor endowments, elasticities of substitution between the differentiated and numeraire goods and the correlation between comparative advantage and country size.

Similar to Dixit and Norman's model, Helpman and Krugman (H&K) derive trade structure in a two
sector and two factor model of interaction between inter and intra-industry trade.\textsuperscript{17} The food sector (Y) is characterized by perfect competition and the manufacturing (X) by Chamberlinian monopolistic competition with internal economies of scale at small magnitude. Although the conclusions that are derived in H&K model are similar to Dixit and Norman's model, H&K introduce more rigorous logistics which turn monopolistic competition structure to oligopoly behaviour in the manufacturing sector.

In H&K's model a measure of firm level economies of scale is specified to be:

$$O(W,X) = \frac{[C(W,X)/X]}{[C_x(W,X)]} = \frac{AC}{MC}.$$  

Where 'w' is the product variety, 'C' costs and 'X' output. And analogously to the degree of scale economies, a measure of monopoly power $R(.)$ is taken to be the ratio of average to marginal revenue:

$$R(.) = \frac{[p/\text{MR}(.)]}{[1 - (1/\text{a}(.))** -1]}$$

Where 'p' is the price and 'a(.)' is the elasticity of demand. $R(.)$ depends on how one introduces 'a' into the equation which can be Lancastrian type of preferences where 'a' is greater than 'one' or Spence Dixit-Stiglitz type where 'a' is a constant. Under profit maximization condition under which:

$$\text{MR} = C(W,X)*, \frac{R(.)}{O(W,X)}$$

\textsuperscript{17} Helpman and Krugman(1985), pp 131-157.
i.e., the ratio of degree of monopoly power to the degree of economies of scale equal one plus the mark up rate on average costs. In the model, in equilibrium the profits are driven to zero due to free entry and exit. As a result, \( R(.) = 0(w, x) \).

In the H&K model conditions isomorphic to the equilibrium conditions in production for a two sector constant returns to scale economy are derived by treating \( 'x' \) as a parameter. The underlying logic is that if \( 'x' \) is held constant, output expansion of manufactured (differentiated) products can be made by increasing the number of firms. With all of the firms looking alike, with same cost function and level of output, this will generate constant returns at the industry level.

In the above analysis of interaction of intra and inter-industry trade, firm level advantages or firm size are neither significant nor explicit. Taking the above framework firm size aspects can be brought in by separating an industry into two (strategic) groups of firms either by vertical disintegration of production process of a product and (or) also by vertical product differentiation in which the cost (or the productions) and demand functions of the two distinct groups of firms are different. By vertically disintegrating the industry we can bring in the vertical intra-industry specialization in which a group of (say, large) firms may specialize in the
production of final differentiated products under increasing returns and the other group (say, small) of firms specialize in a (homogenous) intermediate product under constant returns. The production of final goods can be capital (labour) intensive and the production of intermediates could be labour (capital) intensive. The inter-industry or vertical intra-industry specialization advantages would be determined by the relative factor endowments of countries in consideration. Secondly in case of vertical product differentiation, the two distinct quality products produced by the separate groups of firms may require two different production functions. To illustrate this, higher quality products may require high R&D expenditure and skilled labour etc., which in turn may determine the ability of the separate group firms to reap the country's comparative advantage in factor endowments. The possibilities of this type of trade structure and its implications on the issue of firm size and exports in India's case will be discussed in detail in Chapter III.

II.I.III. Market Power : Scale Economies and Trade.

If we go into the models based on monopoly or oligopoly market structures, one another important dimension, germane to firm level analysis, that can be derived is the firm level monopoly or market power, which has important implications on firm level exports. In the above models of monopolistic competition, firm level market power is non-existent, even if it is there.
in Lancaster's and H&K models due to product specification approach, it is negligible because of free entry and exit firm level profits are zero in equilibrium at average cost pricing. In case of monopolies and oligopolies, apart from the existence of internal economies, the pricing behaviour of firms, governed by their market power, will have important implications on exports. This is crucial especially when firms take the markets, the domestic and international, as segmented and involve in price discriminatory behaviour. As a matter of observation, the world trade is said to be dominated by price-discriminating oligopolies.

A simple (contestable) theory of market structure of monopoly or oligopoly firms not having any market or monopoly power is that of Baumol's (1982) theory of contestable markets. In this market structure, there are internal scale economies resulting in existence of oligopolies or monopoly. But since entry into the market is absolutely free and costless firm level profits are negligible with price in equilibrium being equal to average costs. As the entrant faces no disadvantage in terms of fixed costs, production techniques or product quality compared to the incumbent, any supernormal profits encourage new entry; the threat which forces the incumbent firms to do average cost pricing. Therefore in the presence of increasing returns, contestable markets result in average cost pricing monopoly. In case of more than one firm, an
entrant can undercut the going price and still earn profits because by producing more than any incumbent firm it has lower average costs.\textsuperscript{18} As a result the monopoly market structure turns out to be the most efficient in the presence of scale economies. Obviously, in a monopoly equilibrium of a contestable market, there is nothing called firm specific relative advantages towards exports as there are no other firms in the market (in equilibrium). Since the structure is inconsistent with inefficiency or excess capacity behaviour, the monopolist will reap the scale economy advantage fully and also country level comparative advantage towards exports. But the assumption of costless free entry and exit is highly contestable.

Given the scope of the thesis, when we talk of market power arising out of oligopoly market structure it is mostly in the context of domestic market but not at international level. To illustrate the difference, there can be international oligopoly players like in the case of Brander and Spencers (1984) model of international market share rivalry. In the model, there is one domestic firm and one foreign firm, both competing for a third market. The essence of the argument is in terms of the effect of government export subsidies on the strategic interaction between the domestic and the foreign firms. Domestic government by giving an export subsidy to the domestic firm improves the

\textsuperscript{18} \textsuperscript{18} Helpman & Krugman(1985).pp 68.
relative position of the domestic firm in expand it's market share in a third market. Similar arguments can be derived in case of protecting the domestic firm in the domestic market, as discussed in the case of Krugman's model (1984).

The relevant point that can be derived from the above analysis is that one can treat the domestic firm as a monopoly in the domestic market and export subsidies may facilitate price discriminatory behaviour between the domestic versus foreign sales. A domestic monopolist, who is a price taker in the international market and operates on a downward sloping demand curve in the domestic market can restrict domestic supply at a higher price and channel the rest of the output to exports. In this case firm level domestic market power is a firm specific advantage towards exports.

Brander and Krugman (1983) analyze price discriminatory oligopoly behaviour leading to reciprocal dumping. The model is based on 'segmented market' perception by oligopoly firms; each firm perceives each country as a separate market and makes distinct quantity decisions for the each. A price discriminating oligopolist facing a higher elasticity of demand in foreign market than at home will charge lower price abroad than at home. In essence the model shows that trade between two identical countries in similar products may take place

because of oligopolistic interaction between firms (one domestic and one foreign) in the absence of any of the usual motivations for trade; neither cost differences nor scale economies are necessary. The reciprocal dumping takes place in a simple Cournot duopoly in which the transport cost element of exports plays a crucial role. To illustrate this, Brander and Krugman specify the cost maximization equation of domestic and foreign firms as follows:

\[ \# = X p(Z) + X*p*(Z)* - C(X + X*/g) - F \quad (1) \]

\[ \#* = Yp (Z) + Y*p*(Z)* - C(Y/g + Y*) - F* \quad (2) \]

'Z' is the commodity produced by the two firms. X and Y are the output produced by domestic and foreign firms for their respective domestic consumption. X* and Y* are the output produced by the two firms for their foreign consumption. p and p* denote domestic and foreign country prices. (The asterisks represent foreign country). Marginal cost is a constant 'C' and marginal cost of exports is C/g where 'g' is transport cost; 0 ≤ g ≤1. 'F' indicates fixed costs. One important point to be noticed in the model is that the profit maximizing choice of X and Y are independent of X* and Y*. There can be a possibility where X* is dependent of X, in a domestic oligopoly situation. This possibility in the context of the Indian industrial structure is discussed in Chapter III.1.

In the model, the effective marginal cost of delivering of exported unit is higher than for a unit of domestic sales, which is consistent with higher
marginal revenue under the maximization of $\pi$ and $\pi^*$. Perceived marginal revenue is equal to marginal cost in both markets. This can lead to a two way trade. It is profitable to both firms to do reciprocal dumping as each firm does have a mark up over cost in its export markets although it is smaller than at home; the f.o.b (free on board) price for exports is below the domestic price.

In the above two models, the product produced by the oligopoly players is homogenous. If one introduces product differentiation, either horizontal or vertical, the decision variables in oligopoly will increase and become more complex than in a simple Cournot case. Shaked and Sutton (1984) introduces vertical product differentiation into a (natural) oligopoly model. There is a three stage process of firm level decision making: 1) to enter not to enter the market 2) choosing the quality to produce and 3) deciding the prices. The important part of the process is that firms can not only change their prices but also the quality of the product by undertaking R&D activity. After the third stage all the firms are aware of the competition in prices and quality. If we ignore the entry decision, the (Nash) equilibrium is characterized in two stage game: 1) the choice of quality and 2) the choice of price. The notable feature of the model is that firms incur fixed costs in R&D, which depend on the quality chosen. Secondly, there is income distribution feature
in terms of richer and poorer consumers, whose ability to pay for higher and lower quality differs. Once the choice of quality by each firm is made, increased price competition between the high quality products drive their prices down to a level at which not even the poorest consumers would prefer to buy lower quality products. The essence of the argument is that international trade will increase competition in high quality products and also facilitate the quality producing firms to spread their fixed costs of R&D over larger output. As a result, prices of higher quality products falls down and firms producing low quality product exit from the industry as the market is characterized to sustain only a limited number of firms. The interesting aspect of the model is that in the short run international trade increases price competition and in the long run it reduces the number of firms in the market. The pertinent point to our objective is that fixed costs of R&D incurred by a firm can be a (large) firm specific advantage towards exports. On that basis, one can argue that (large) firms which incur large fixed costs in R&D might be more prone to export to spread the fixed cost over larger output.

One other model in which trade reduces monopoly distortions by increasing competition arising out of expansion of market size is derived by Dixit and Norman (1980). The approach is based on the argument that larger the market more firms there should
be room for and smaller should be the monopoly power by any one firm. They consider an industry producing a homogenous output with increasing returns to scale and assume unrestricted entry and the output of each firm is given by Nash and Cournot equilibrium. Having established the equilibrium they look at the effect of price, output and the number of firms by increasing the number of consumers. They take the opening of trade equivalent to increasing the number of consumers in the economy. Here again, the size of the market works through fixed costs per capita. By lowering fixed costs per capita, a larger number of consumers lead to higher profit and thus encourages entry to the industry. It follows that an expansion of the market will increase output and lower the price of the good, i.e., it will reduce the oligopolistic mark-up of price over marginal cost. Therefore, a larger market reduces monopoly power.

Although the major aspect of the previous two models is the after trade effects rather than pre-trade firm level characteristics leading to exports, one can derive certain relevant aspects. The important aspect is the relationship between market size and firm level monopoly power in a oligopoly setting. In a large market a few large oligopoly firms if they can impose entry barriers either through increasing returns or other barriers, they can enjoy large degree of monopoly power in the domestic market. This, in turn, will have implications on their
export behaviour. Apart from that, there could be firm specific advantages if static and dynamic economies of access to large home market as shown in Krugman's (1984) model.

II.I.IV. Firm level Efficiency Aspects.

In the Neo-technology framework, firm level efficiency differences in terms of costs of production arise out of innovation and R&D activity. Firm level innovation activity can not only bring about new products, but also new production processes (process techniques) which can reduce costs. This, in turn, may give a cost efficiency advantages in exports to the innovative firms. In the monopolistic competition models, which are based on simplified analytical generalizations there are no firm level cost differences, as the models assume uniform cost and production functions for all firms and in equilibrium firms do average cost pricing at zero profits.

In oligopoly market structures firms can produce under differing cost conditions. High cost firms may have lower market shares but continue to produce because a lower market share implies a higher perceived elasticity of demand and a higher marginal revenue.\textsuperscript{20} The cost conditions of firms have significant implications on oligopoly equilibrium. The firms with lower costs will have higher market power and share (given the other conditions) and greater say in setting

\textsuperscript{20} Helpman & Krugman (1985) pp 88.
their favoured price. If there are increasing returns, the firm with the largest market share will tend to set the lowest price as it has an incentive to expand output and take full advantage of the low costs associated with higher output. 21 Given other conditions like brand names and advertising etc, it is arguable that in oligopoly firm level cost conditions are significant determinants of market power and with implications on their export behaviour.

One other crucial outcome of imperfect markets, where firms have downward sloping demand curves to be taken into notice is that factors of production are paid, not equivalent to their respective marginal productivities but equivalent to the marginal revenue products which, in turn, depends on the firm level market power. The marginal revenue product factor prices may deviate from their shadow prices which, in turn, will have implications on the allocative efficiency aspects in the utilization of the factor of production on the basis of the country's comparative advantage.

II.I.V. Intra-firm Trade and Multinationals.

Except in case of the product cycle theory, most of the previous models are based on the assumption that factors of production are immobile across countries. If the assumption is relaxed and let one of the factors, say, capital to be mobile across nations, it

21 See Friedman (1983).
leads to the theories on multinationals and intra-firm trade. These theories analyze the export behaviour of large firms which undertake foreign direct investment.

Intra-firm trade is an outcome of vertical intra-industry specialization by countries in the manufacturing of intermediates and final goods. Vertical intra-industry specialization can be observed from the traditional theories of comparative advantage by relaxing the assumption that an industry is one hundred percent vertically integrated within the each country. The production of intermediates (X) and final goods (Y) may involve different technologies. Comparative advantage in (X) and (Y) can arise out of technological or factor endowment differences across nations.

Ethier (1979) shows that intra-industry trade (between identical countries) is more in intermediates than in final goods. He argues that product differentiation in intermediates is more important as the tastes for variety implicit in the demand for more specialized machine tools, motors, control machines etc may be a higher source of trade and gains from trade than the desire for variety by the ultimate consumers. Therefore, trade in intermediates can envelope both H&O comparative advantage and intra-industry lines.

In the above context, intra-firm trade takes place when firms vertically disintegrate production processes and locate production of final goods and
intermediates in different countries in order to reap
country specific advantages. Lall (1973) and Hellenier
(1981) suggest intra-firm trade by multinationals may
be based on certain advantages which could consist of
organizational or market access or technology access etc
which accrue within firms as compared to trade between
firms. Apart from these, there are several other
theoretical possibilities why firms undertake foreign
direct investment (FDI), for example, growth, market
size constraints etc, most of which are beyond the scope.

In the present context, by taking firm level
foreign investment as an ex post outcome, the probe would
be whether the firms which have undertaken FDI have any
additional advantages in exports compared to the
other firms which have not undertaken FDI. In
general, it is larger firms which are assumed to be
capable of undertaking FDI. If the FDI firms are multi-
product firms they may be able to convert other products
into exportables. Secondly, the FDI firms will be able
to reap economies of specialization in exports
through vertical disintegration. On the other hand
if the FDI firms are substituting FDI for exports
their exports may decline. If the subsidiaries of the
FDI firms become more self-sufficient, it might reduce
their intra-firm trade.22

II.I.VI. The Dynamics of Trade.

Although the major focus of the thesis is on the pre-trade firm level conditions leading to trade, it is necessary to take into account some of the dynamics of (or comparative statics) of after trade effects on the cumulative or cyclical process of firm level exports. In H&O general equilibrium framework international trade causes allocative efficiency across countries by inducing a movement along the production possibility boundary in the direction of comparative advantage. Apart from this, as Haberler (1936) argues trade may shift the transformation curve outward owing to indirect dynamic effects.

In imperfect market framework, the dynamics of trade or exports could be very significant at firm level. Firm level exports may facilitate transmission of technical knowledge and give access to specific materials and skills and also facilitate learning by doing economies. This, in turn, could have significant implications on the subsequent exports of an exporting firm. Furthermore, as in monopolistic competition models, firm level exports can facilitate economies of scale of larger production runs and specialization. Therefore, it is arguable that firm level exports (over a period of time) could shift a firm's cost curves and also improve firm level allocative efficiency, which, in turn, may lead to higher efficiency in subsequent exports. In this context, firm size could be an important variable in determining firm level
ability to absorb these dynamic benefits of exports and on the consequent cumulative exports process.

II.II. The Review of Empirical Studies.

From the theoretical models of trade under imperfect competition, it is scale economies and market power are the two basic heuristic with which explicit and implicit behavioural relationships between firm size and exports can be formulated. Under the basic formulation, there could be several other sub-hypotheses based on factors like R&D activity, risk, market size and industrial organizational issues, like vertical integration, intra-firm trade, firm level costs etc, all of which can be associated with firm size. The review of some of the empirical studies should throw light on the empirical significance of some of these variables and also on some of the methodological issues.

The empirical significance of scale economies in explaining exports are shown by two earlier studies by Hufbauer (1970) and Katrak (1973). Hufbauer formulated the scale economy hypothesis based on a simple version which takes into account only the size advantages which are internal to the industry and empirically tested it for a group of twenty four countries for the year 1965. The scale elasticity parameter 'r' is derived from the following production relation:

$$V = kn^{**r}.$$
\( V \) is the ratio between value-added per man in plants employing \( 'n' \) persons and the average value-added per man for the four digit U.S Census Bureau Industry. \( k \) is constant. The export embodied scale elasticity term for industry \( 'i' \) is \( \xi_{riixi} \), calculated for several countries. Hufbauer observed a positive relation between the scale elasticity and index of the country size measured by the national manufacturing output; GDP and GDP per capita as alternative indicators of size. Hufbauer's results support the scale economies proposition that large countries have greater scope to reap scale economies advantage towards exports than small countries.

Katrak pointed out that Hufbauer's methodology suffer from a major drawback in that the size of individual industries and plants had been ignored. He took into account the inter-industry differences in the relative size of industries for U.K and U.S in observing the importance of scale elasticity parameter in export patterns. This is based on the argument that comparative costs are denoted by comparative output per man. The relative size of industries and the scale elasticities determine the comparative output per man. Industry size was measured by employment. The parameters in the system are:

\[ \text{Nai} = \text{the level of employment in the 'i'th industry in U.S.} \]
\[ \text{Nbi} = \text{the level of employment in the 'i'th industry in U.K.} \]
\[ \text{Naj}, \text{Nbj refer to industry 'j'} \]
ri, rj are scale elasticity parameters for the i'th and j'th industry respectively.

The U.S cost advantage in exports will be greater for the i'th industry than for U.K if:

\[(Nai/Nbi)^{ri} > (Naj/Nbj)^{rj}\].

Katrak's results supported the scale economies hypothesis convincingly.

Glejser's (1980) empirical study of firm level exports for Belgium takes into account scale economies, market power and firm size explicitly. In analyzing the export shares of individual firms, the study takes into account both the determinants of inter-sectoral differences and those of discrepancies among different size firms in the same industry. By means of non-parametric statistics as well as regression analysis at firm level data for about 1446 firms across industries, firm size, industrial concentration, product differentiation, location, information and foreign subsidiaries are shown to be important elements in explaining Belgium's (small country) export behaviour. The pertinent hypothesis that are derived relate to scale economies, market power and foreign subsidiaries arguments. A positive relation between firm level export propensity i.e share of exports in total sales, and domestic sales turnover was expected based on the argument that exports facilitate scale economies extending market size for a small country; exports raise quantity sold at home through a reduction in average costs. The regression results
Glejser obtained refuted the hypothesis. There was a significant negative relation between firm level export propensity and domestic concentration (market power). This supported the argument that dominant firms with monopoly power can exploit the negatively sloped domestic demand at home and can avoid the possibility of exporting as this would involve increasing the demand elasticity and becoming price takers by weakening the oligopolistic interdependence and faculty of collusion. The results support the hypothesis that foreign subsidiaries are a support but not a substitute for exports. If one follows Glejser's proposition that exports raise quantity sold at home through a reduction in average costs, the causality he specified in his regression equation, that exports as a dependent variable on domestic sales is faulty. The causality may be other way round if exports increase domestic sales by reducing average costs.

Two studies that take firm size variable explicitly as the main focus in explaining firm level exports are by Hirch et al (1974) and Aquier (1980).

Hirch et al postulate a positive relation between exports and firm size based on the theoretical proposition derived from the price discriminatory behaviour of large firms. The second supportive argument is that large firms are able to undertake larger investments and higher risks involved in foreign entry. Either in monopoly or
oligopolistic market structure, the necessary condition for the positive result is that large firms in the domestic market face downward sloping demand curves and in foreign market more competitive conditions (the domestic demand curve is steeper than export demand curve). The result is derived under the profit maximization assumption. A price discriminating firm arrives at equilibrium where it's marginal cost and marginal revenues from both domestic and foreign markets are equal. Under the same market conditions and the equilibrium if the firm size is increased it's domestic sales remain the same but the foreign sales increase. As a result the larger firm will have larger exports to total sales ratio.

The argument of Hirch et al is that in a scenario where domestic demand is deterministic and export demand has a stochastic or risk element, larger firms will be able to export more. This is because the larger firms can reduce the random element due to better information systems and due to the possibility of scale economies in reducing the risk elements. They empirically tested the hypothesized positive relationship between firm size and export performance through a simple equation for a cross section data for three countries (Denmark, Holland and Israel) and six industries for the year 1968. The equation formulated is:

\[ \log \text{Exports} = a + b \log \text{Sales} + i. \]

The elasticities estimated were mostly greater
than one and significant supporting the principle hypothesis.

Aquier's (1980) empirical study of the relationship between firm size and export behaviour for the French industry (60 industries were taken) brings out behavioural arguments from the supply and demand side in terms of firm size, efficiency and market power. The methodology adopted is that firms are grouped into size groups: large and small to examine not only the export propensities of different size firms across the groups but also to observe the proportionate number of firms in each size group that undertake exports. Aquier argues that larger firms advantage in exports arise out of spreading fixed costs incurred in selling abroad over a potentially larger volume of exports, which help them to attain 'minimum efficient scale to export'. Furthermore, as mentioned earlier, the other advantage of larger firms is their ability to price discriminate between domestic and foreign markets due to their varying elasticities of demand. The model also encompasses some features of market competition external to the firms. As Aquier argues, the proportion of output exported by the profit maximizing small firms who are generally the (price) follower firms could be more variable than for the large firms, as the small firms domestic demand approaches infinite elasticity, the proportion exported could tend to approach zero or 100 per cent. The propositions were tested both by direct
observation of firm level data for sixty industries and also by regression analysis. The results show that in each and every industry all the largest firms export, very few or none of the smallest do. But the findings reject the proposition that size cum efficiency through scale economies is the only factor that differentiates export performance systematically among size groups. The existence, in almost in every industry of a population of small firms that export, shows that even if the economies of scale in exporting exist, these economies are not so great as to preclude exports for most firms in most industries. On the other hand, the evidence indicate that large firms are better equipped to profit from exports due to their ability to price discriminate between domestic and export markets.

More on operational level rather than on rigorous theoretical logistics, Bruch (1980) examined the significance of firm size in Malaysia's exports of manufactures. Bruch classified small scale establishments (SSE) as those with less than 50 employees, medium scale (MS) with 50 to 99 and large scale (LSE) with above 100 workers. Bruch employed regression and also discriminant analysis for firm level data. His observations indicate that SSE exporters beyond the size of 10 paid full time employees are engaged in exporting as intensive as large scale exporters. The results of the discriminant analysis show that there is a minimum size for exporting and random factors are more important in SSE exports. One
interesting and relevant finding is that the domestic competition variable is significant only for LSE exporters which implies that large firms are generally inward oriented if there is not adequate competition in the domestic market. This result support the negative relation Glejser found between domestic market power and exports for Belgium. Furthermore, Bruch observes that SSE exports are due mostly to the performance of some branches which either are natural resource intensive or make use of indigenous labour intensive technology.

II.II. The Empirical Studies:

The Indian Industry.

In India's case there are a few studies that explain India's exports at an aggregate and macro level. Panchamuckhi (1978) analyses, apart from broad aggregate issues, firm level factors in India's exports across a set of industries. The major feature of the firm level approach in the study is measuring the importance of technological factors in the firm level exports. Firms in different industries are divided into exporting and non-exporting firms. Technological distance between exporting and non-exporting firms was measured for a given structure of factor prices, by estimating output through production

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24 See pp 111-124.
functions. The technological distance between exporting and non-exporting firms is taken as:

$$V(L_i, K_i) - V^*(L_i, K_i),$$

where $V$ is value-added with the production function for exporting firms and $V^*$ is for non-exporting firms.

The major findings of Panchamukhi's exercises for 1968 and 1969 firm level data is that technological distance is rather strongly and positively correlated with the efficiency parameter of the exporting category of firms and rather strongly and negatively correlated with the return to scale parameter. On this basis, Panchamukhi observed that firms of any product group which have distinguished themselves as exporting firms, with larger technological distance from non-exporting firms owe their distinction to the efficiency aspects of technology and inversely to the returns to scale aspect of technology.

Two other papers that take into account of firm size factor explicitly in explaining India's exports of manufactures are by Lall et al (1981) and Sidharthan (1986).

Lall's methodology is based on the formulation of certain broad hypotheses which are tested through an econometric exercise for one hundred engineering firms. A possible negative relation between firm level exports as a proportion of sales and firm size (total sales) is hypothesized. This
is argued to be because India's protectionist environment imparts a very high monopoly power which, in turn, makes domestic sales a lot more profitable than exports to larger firms. On the other hand, in contrast to the above proposition the relationship could be negative based on the argument that if excess capacity is an important factor in determining exports, the capital intensive large firms which are more prone to excess capacities may tend to export more than small firms.

The econometric results indicate that larger firms tend to export more in absolute terms. But, however, at very large sizes, the curve is reversed which is explained by the domestic monopoly power argument. There was no significant negative relation between exports and firm size. This is explained by Lall by excess capacity factor counterbalancing the effect of scale economies or more simply as the effect of government regulations negating the normal working of market forces and producing random effects.

Sidharthan's study under product cycle approach revised to conform to the developing country conditions, tests the significance of firm size along with other variables like capital output ratios, technology levels and pollution intensive production (of foreign subsidiaries) in explaining firm level exports across a sample of industries. Large firms are taken to be the public limited companies and small firms to
be the private limited. By taking slope and intercept dummies to differentiate between the large and small firms in the econometric estimation he found that small firms are not only more export intensive than the large but also their export propensity grew over time. This, in turn, is explained by the observation that small firms concentrate in low technology and labour intensive standardized products where India's comparative advantage is observed to be.