Entry, Competitiveness and Exports: Evidence from Firm Level Data of Indian Manufacturing

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Abstract:

The industry and trade policy regimes in India have witnessed drastic changes since 1991. The dismantling of the industrial licensing system and thereby allowing free entry to and exit from the industry of firms in 1991 followed by the WTO induced trade liberalization leading to substantial reduction in tariffs and gradual softening of foreign investment regulations, particularly in the context of foreign direct investment since 1995, may have had significant impact on the state of competitiveness in India industries. In this paper an attempt has been made to evaluate the effects of trade and industrial policy changes on domestic competitiveness for select Indian industries during post-liberalization period. Though there exists a pool of empirical literature focusing on the state of competitiveness in India, the link between theoretical models underlying the empirical analysis is not often strong. Moreover, a section of the literature focuses on a combination of firm and industry data for drawing conclusions on firm behavior, which may not reflect the actual scenario. Given this background, the present paper attempts to provide a unified approach to examine the inter-relationships between entry and competitiveness within a consistent oligopolistic market framework. The empirical analysis of the present study, carried out on the basis of firm data for 14 sectors over 1990-2008, indicates that Indian industry have shown considerable changes over the last decade in terms of entry and competitiveness. An overall decline in concentration is witnessed between the two end points, which signify the importance of newer entry in the markets. The Price-Cost Margin however behaves differently for different sectors, which could be explained by the differing level of spillover of technical changes as a result of increased pressure of competition due to liberalization. Demand curve is generally found to be inelastic and declines over the period. The relationship between the size of the firms and their export volume turns out to be significantly positive.

Key words: Competitiveness, entry, industrial liberalization, trade liberalization
JEL Classifications: F12, L50

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I. Introduction:

How does entry affect competitiveness in an industry and hence welfare? Conventional wisdom suggests that entry in an oligopolistic industry reduces market power of existing firms and thereby reduces price-cost margins and improves consumer welfare[1]. The aforesaid partial equilibrium result holds good in a general equilibrium situation as well (Barua and Pant, 1995). Considering an open economy Cournot model, Agarwal and Barua (2004) have shown that the limiting case of entry in such a model confirms a competitive outcome.

In the aftermath of the WTO induced liberalization policies of trade and foreign direct investment, much attention has been drawn to the debate whether entry has significantly affected the market structure in the industrial sector of the Indian economy or not. The evidence from recent empirical studies in this area is found to be ambiguous[2]. In a recent analysis on the theory and evidence of market power in Indian manufacturing, Das and Pant (2006) have argued that "the new industrial policy has not been able to foster competition"[3], confirming the earlier findings by a number of researchers[4].

One limitation of the existing empirical studies on India using firm-level data is however their dependence on more than one source of rather unrelated data for estimating the price-cost margins in industries[5]. This raises doubt as regards the reliability and also comparability of their estimates. The present study is an attempt to provide a unified

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1 See, Mas-Colell, Whinston and Green (1995), p. 412.

2 For instance, studies by Athreye and Kapur (2003), Kambhampati and Kattuman (2003), and Barua and Chakraborty (2006) have observed decline in *industrial concentration* in India during the post-liberalization period. However, the findings on price-cost margins are conflicting. While Krishna and Mitra (1998) observed significant decline in price-cost margins immediately after the post-liberalization period, Srivastava et al (2001), Balakrishnan and Babu (2003), Goldar et al (2004), and Kambhampati and Parikh (2003) observed rising price-cost margins in Indian industries.

3 Das and Pant (2006), p. 75.

4 See note 2.

5 Firm data provided by the PROWESS database do not provide any information on quantity of output produced or quantity of labor used for production by firm. As a result, researchers depend largely on *Annual Survey of Industries* (ASI) data for some proxy estimates of labor (wage rate) or output.

model of measurement of price-cost margins using the same source of data. In addition, it intends to observe the relationship between firm size, marginal cost structure and exports.

The basic theoretical model underlying the current empirical exercise is based on the segmented market hypothesis as put forward in a series of papers by Agarwal and Barua (1993; 1994; 2004). The main arguments of these papers are that entry liberalization (whether *internal or external*) would result in (a) increase in aggregate exports, (b) reduction in industrial concentration, (c) decrease in price-cost margin, and (d) increase in social welfare. It is immaterial whether the firms are of domestic or foreign origin. Thus, the ongoing WTO induced reforms (*external liberalization*) and the reforms carried out in India since 1991 *(internal industrial liberalization*) are expected to significantly affect the performance of the manufacturing sector of Indian economy (Kambhapati and Parikh, 2005).

The paper is organized as follows: Section II describes the basic theoretical model to provide empirically testable propositions of the effects of entry liberalization on market performance. A review of the literature is provided in Section III and in Section IV we propose an econometric estimation model to test the propositions described in Section II. Analysis of the econometric estimation results as well as other findings is provided in Section V. Section VI draws a few policy conclusions based on the current analysis.

II. The Model

The basic model used here assumes that the firm behaves like a discriminating oligopolist as between domestic and foreign markets. The variables used in the analysis are defined as follows:

V.1. x^i is the output of the i^{th} firm;

V.2. N is the number of active firms;

V.3. X is the industry output, i.e., $X = \sum x^i$, i = 1,…… N;

V.4. q_d^i is the domestic sales of the i^{th} firm;

V.5. Q_d is the total domestic demand, i.e., $Q_d = \sum q_d^i$, i =1, …. N;

V.6. $f(Q_d)$ is the inverse demand function in the domestic market;

V.7. P_f is the international price;

V.8. q_f^i is the export of the i^{th} firm, where $x^i = q_d^i + q_f^i$, i = 1 ….N;

V.9. Q_f is the aggregate exports of the country, i.e. $Q_f = \sum q_f^i$, i = 1 ….N;

V.10. Q_{-i} is $\sum q_d^j$ j for j =1,…. N; i $\neq$ j.

The following *assumptions* are made in the current context:

A.1. the inverse demand function $f(Q_d)$ is twice continuously differentiable and $f' < 0$.

A.2. the cost function of the i^{th} firm C (x^i) is twice continuously differentiable and C (0) = 0 implying that firm can freely exit from the market by producing a zero output. Further, the average cost, AC, is strictly U-shaped with minimum attained at x^* where $x^* > 0$.

A.3. The profit function for the i^{th} firm (i = 1,…..N)

$$\Pi^i = f(Q_d).q_d^i + P_f.q_f - C(x^i) \qquad [1]$$

A.4. Profit maximization under Cournot assumptions gives the first-order conditions:

$$\frac{\partial \Pi^i}{\partial q_d^i} = q_d^i . f'(Q_d) + f(Q_d) - C'(x^i) = 0, \forall i. \qquad [2]$$

and

$$\frac{\partial \Pi^i}{\partial q_f^i} = P_f - C'(x^i) = 0, \forall i. \qquad [3]$$

The profit function is assumed to be strictly concave in q_d^i and q_f^i, so that,

$$\frac{\partial^2 \Pi^i}{\partial q_d^{i\,2}} = q_d^i . f''(Q_d) + f'(Q_d) - C''(x^i) < 0 \qquad [4]$$

and, $$\frac{\partial^2 \Pi^i}{\partial q_f^{i\,2}} = -C''(x^i) < 0 \qquad [5]$$

And the Hessian, H, is negative definite, that is,

$$-\lambda^i . f'(Q_d) + q_d . f''(Q_d) - C''(x^i) > C''(x^i) \qquad [6]$$

We further assume that the country is too small to be able to influence the world price so that it behaves in the international market as a price taker. The domestic market is however segmented by tariff policies so that no imports occur, and the domestic oligopoly exists independently of the world economy. Each firm, therefore, behaves as an oligopolist in the domestic market and a perfect competitor in the world market, and maximizes profits as a discriminating oligopolist.

Given the first-order conditions [2] and [3], it is possible to derive some important empirically testable propositions about market performance and competitiveness. The first two propositions relate to firm size, firm cost conditions and export to total turnover ratios. Thus,

P1: If the marginal costs of the firms are identical then it follows from [2] that all firms will produce the same level of output which implies that export shares[6] of firms would also be the same. But if the marginal costs differ, the more efficient firm will produce larger volume of output although the domestic sales of the firms will be equal irrespective of the costs conditions by [2] and [3] above[7]. This can be verified for any pair of firms i and j from the equations [2] and [3] as follows:

$$f(Q_d) + q_d^i . f'(Q_d) = C'(x^i) = P_f = C'(x^j) = f(Q_d) + q_d^j . f'(Q_d) \qquad [7]$$

This implies that if marginal costs, $C'(x^i) \neq C'(x^j)$, then the above equality is maintained at different levels of output. That is, $x^i > x^j$ if $C'(x^i) < C'(x^j)$ or vise versa

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6 Export share is defined as $\frac{q_f^i}{x^i}$ for the i[th] firm. Thus, $\frac{q_f^i}{x^i} = \frac{q_f^j}{x^j}$ if $x^i = x^j$.

7 This is true for all firms exporting. If however, some firms are not exporting but only sell in the domestic market then equation [3] is redundant and therefore for a non-exporting pair of firms i and j, $q_d^i \neq q_d^j$.

and if $C'(x^i) = C'(x^j)$, then $x^i = x^j$. However, $q_d^i = q_d^j$, irrespective of the cost conditions by [2] and [3].

P 2: The larger (smaller) firm sells a smaller (larger) share of its output in the domestic market[8]. As a corollary, the larger (smaller) firm sells a larger (smaller) share of its output in the export market[9]. Thus, *firm size and export to total turnover ratios are positively related.*

Now, a few propositions relating the effects of entry on firm output, industrial concentration, price-cost margins and profitability and consumer welfare are considered below.

P 3: As entry occurs, provided the second order-conditions of profit maximization is satisfied, the firm output will be unaffected since the world price is given (condition [3] above).

P 4: Entry of firms implies that the firm's share in the domestic market declines (thus *industry concentration falls*) and therefore the firm's export share rises. However, aggregate domestic sales rise with the entry of firms leading to a fall in prices and therefore increase in consumer welfare.

P 5: As entry of firms occurs in the industry, in the limiting case price converges to marginal cost[10]. Thus, *entry leads to decline in the price-cost margins.*

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[8] If $C'(x^i) < C'(x^j)$ then $x^i > x^j$, that is, firm i is larger then firm j; but since $q_d^i = q_d^j$ by [2] and [3], $\frac{q_d^i}{x^i} < \frac{q_d^j}{x^j}$.

[9] Suppose $q_d^i + q_f^i = x^i$ and $q_d^j + q_f^j = x^j$ so that $\frac{q_d^i}{x^i} + \frac{q_f^i}{x^i} = 1$ and $\frac{q_d^j}{x^j} + \frac{q_f^j}{x^j} = 1$. Then, if $x^i > x^j$, in that case, given $q_d^i = q_d^j$, $\frac{q_d^i}{x^i} < \frac{q_d^j}{x^j}$ and hence $\frac{q_f^i}{x^i} > \frac{q_f^j}{x^j}$.

[10] See Agarwal and Barua (2004).

III. Review of Empirical Literature

There exist a number of studies that attempt to examine the state of competition and competitiveness in Indian industries as a consequence of entry liberalization policies followed in India since 1991. Several studies conducted during the pre-liberalization period showed that concentration ratios had been quite high in India owing to various factors, including both economic as well as policy-driven ones (Monopoly Inquiry Commission, 1966; Gupta, 1968; Ghosh, 1974, 1975; Sandesara, 1979; Sawhney and Swahney, 1974; Katrak, 1980; Apte and Vaidyanathan, 1982).[11] On the other hand, recent studies with large and medium sized firms note decline in concentration ratios during the post-liberalization period (Athreye and Kapur, 2003; Kambhampati and Kattuman, 2003; Barua and Chakraborty, 2006).

On the issue of price-cost margins, earlier studies before liberalization have generally revealed a positive relationship between price-cost margin (PCM) and industrial concentration trends (Sawhney et al, 1973; Rao, 2001). It is also observed that industries exhibit higher values of PCM if import competition in those industries is relatively low but export orientation is high and has high levels of protection (Katrak, 1980). However, while the evidence of a significant decline in PCM for several industries was noted immediately after liberalization (Krishna and Mitra, 1998), more recent studies revealed an increase in the PCM for several industries (Srivastava et al, 2001; Balakrishnan and Babu, 2003; Goldar et al, 2004; Das and Pant, 2006). Different explanations are offered to explain this phenomenon. For instance, Kambhampati and Parikh (2003) explained rising PCM in terms of export intensity of a sector, that is, higher the export to sales ratios observed in an industry, higher is also the PCM for those industries[12]. On the other hand, Goldar et al (2004) cited the declining share of labour in

[11] The studies broadly agreed over the fact that profitability is higher in industries with higher concentration ratios. ".. the margins are higher in industries with relatively little import competition, high export orientation and high rates of protection." Katrak (1980), p. 75. However, Apte and Vaidyanathan (1982) concluded that nature of licensing controls across industries does not affect performance in a significant manner.

[12] This is possible if exporting leads to fall in excess capacities of firms. However, this is unlikely as it violates the second-order condition of profit maximization. As shown by Agarwal and Barua (1994), for a price taking firm selling in export and domestic markets, the equilibrium always takes place on the rising segment of the cost function. Focusing on the determinants of PCMs for OECD countries

The value-added as a major factor behind rising PCM[13]. Das and Pant (2006) argued that entry liberalization did not lead to the expansion of the middle-sized firms but instead it had led to expansion of firms at the lower end of the spectrum. In their leadership model, such expansion of the tiny firms could not significantly affect the dominance of the leader firms in the industries.

The empirical studies discussed above however have certain limitations. First, the empirical analysis undertaken in several studies are not supported by any rigorous theoretical framework, barring the exception of Das and Pant (2006). Second, even where theoretical model is present such as in Das and Pant (2006), the underlying model is set up in a purely closed economy framework and therefore the model is incapable of considering the impact of trade. Third, some of the above-mentioned studies often derive a concordance and use the firm balance sheet data (PROWESS) as well as aggregate industry data (*Annual Survey of Industries*, ASI) since the balance sheet data do not provide information on output or labour. However, the two sources of data are otherwise quite unrelated and hence the reliability of the estimates and their comparability with each other are questionable. Fourth, domestic firms may also undergo dynamic technical changes under the pressure of entry of efficient foreign firms. As a result, a rise in PCM may be associated with a fall in prices as well provided the reductions in costs are more that proportionate of the fall in prices. The effect has not been adequately addressed in the existing literature.

The present study intends to provide a unified model of estimating the level of concentration, price-cost margins and exports, which is an attempt to bridge the gap in existing literature. Based on the open economy oligopoly model as discussed in Section I, the demand and cost functions are parameterized for the econometric estimation of price-cost margin and the elasticity of demand. The advantage of the unified model is that it can estimate all relevant measures of market performance by using a single data source

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between 1970-2003, Boulhol (2005) explained the rising trend by financial market development, capital mobility and the weakening of workers' bargaining power.

[13] The weakness of this argument lies on the fact that a decline in the share of labour and therefore a rise in the share of capital would result from a relative decline in the rate of return on capital and a rise in the wage rates. But by itself this does not ensure any increase in profitability.

and able to show the inter-linkages between concentration, price-cost margins and exports in terms of the model.

IV. Data Source and Methodology

a. Data

The PROWESS data (CMIE) provides most of the information that is required for the testing of the propositions as put forward in Section II above. For example, PROWESS provides data on firm level total turnover (sales) and its decomposition into domestic and exports sales. These data are classified according to the industry code. Thus, it is possible to test propositions P1 and P2 relating to exports intensity and firm size and also marginal costs.

Fourteen sectors[14] from 1990 to 2008 are considered for the analysis which provides the scope for a fair comparison of the current observations with pre-liberalization and pre-WTO accession period scenario. The selection of industries has been based on two criteria, one, a moderate share in India's export basket (roughly more than 0.8 percent) and two, relatively higher values of the Intra-Industry Trade index. The detail data on firm-level entry scenario across the sectors is provided in **Table 1**. It is observed that the number of firms has shown a consistent increase over the sample period.

It is observed from **Table 2** that the overall importance of the selected sectors in India's export basket has declined from 65.34 percent in 1996-97 to 57.94 percent in 2008-09. However, a closer analysis reveals that the decline is owing to the performance of textile and garments, leather and rubber sector, while all other sectors are witnessing proportional increase in India's export basket. **Table 3** shows the firm-level outward orientation (captured by average export-sales ratio) of the selected sectors, which reveals that export intensity has increased over the period.

[14] The selected sectors include: automobile, chemical, electrical, electronics, garments, gems and jewelry, leather, machinery, pharmaceuticals, plastic, rubber, steel, textile and transport equipments.

The methodology adopted in the empirical estimation is discussed briefly in the following section.

b. Methodology and the underlying Model

For the purpose of estimation of price-cost margins and export intensity from the firm level data, it is required to parameterize the inverse demand function assumed in A1. Therefore, an iso-elastic demand function as defined by [8] below is considered here to relate domestic price and quantity demanded at any given point in time.[15] This demand function is further assumed to be time invariant.

$$Q_D = A.P_d^{-\varepsilon} \qquad [8]$$

In equation [8], P_d denotes the domestic price, Q_D is defined as the aggregate domestic demand and ε is the elasticity of demand. It is assumed that the firms belonging to an industry produce a homogenous product and all active firms play Cournot competition. Thus, *in equilibrium all firms face the same price*. It is also assumed that the domestic market is segmented from the world market and that the firms differ in their cost structures. From the first-order maximization condition of profit maximization subject to the demand function [8], the price-cost margin for each firm as a percentage of the price is derived in the following manner:

$$\frac{(P_d - c'_i)}{P_d} = \frac{s_i}{\varepsilon} \qquad [9]$$

where c'_i is the marginal cost and s_i[16] is the share of the i^{th} firm in the domestic market demand and ε is the elasticity of demand, which is constant.

If firms are also engaged in export then the division of output between domestic market and export is determined by the conditions [2] and [3] simultaneously. But the firm output is determined by the marginal cost conditions and the foreign price (see footnote 7), the firm output is unaffected by entry as long as the foreign price is infinitely

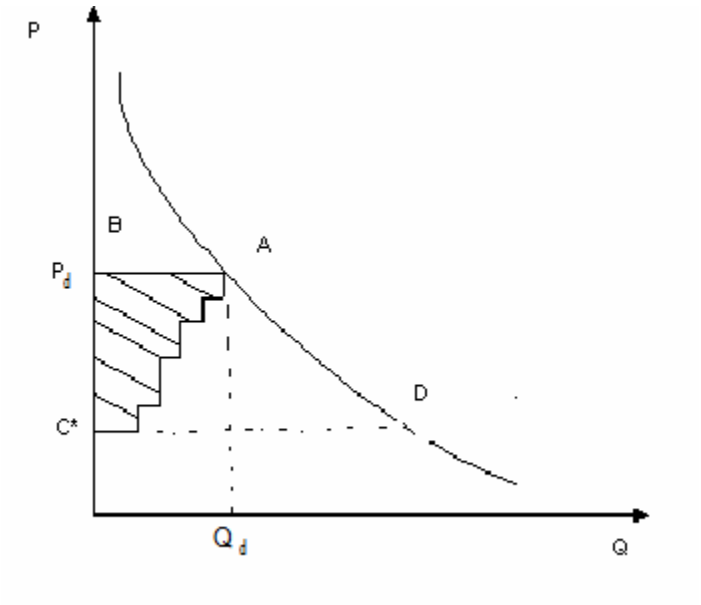
[15] The assumption of the iso-elastic demand function is not necessary for the analysis. It is assumed here for simplicity.

[16] $s_i = \frac{q_d{}^i}{Q_d}$, where Q_d is the aggregate domestic demand.

elastic as assumed in our model. Therefore, *Proposition P1* and *Proposition P2* above describe the relationship between sharing of output between domestic market and export market, given the firm cost conditions. For instance, if marginal costs differ across firms and the *firms do not export*, then the equilibrium of the industry is shown with **Diagram 1**, where P_d is the equilibrium price, Q_D is the aggregate market demand and c* is the marginal cost of the most efficient firm.

The diagram represents the standard closed economy situation. The length of the horizontal step gives the amount that each firm sells in the market and the vertical distance between the steps represents the differences between the marginal costs of a firm with respect to the most efficient firm. If the most efficient firm were to supply the entire market, then the market equilibrium would have been at D, and the price charged would have been c*. Therefore, the *loss in consumer surplus* as a result of equilibrium price being above c* is the area given by the region ABCD. The shaded area, ignoring fixed costs, measures the firm's profits. However, if the firms also export then by *Proposition P2*, it is obtained that the domestic sales of the firms must be the same irrespective of the cost conditions and hence the diagram below does not depict the case when firms are exporting.

Diagram 1: Equilibrium of the Industry when firms do not export



If there is information on the market shares of each firm and the elasticity of demand, then from equation [2] it is possible to estimate the price-cost margin as a percentage of prices for each firm. But while from PROWESS data it is possible to have information on s_i, no information on firm marginal cost is available. Hence for the estimation, equation [2] is rewritten by summing up across all firms which gives us the following expression:

$$P_d \left\{1-\frac{1}{n\varepsilon}\right\}= \bar{c} \qquad [10]$$

Thus, if we have the information about the elasticity of demand and the number of firms then we can estimate the price cost margin from [10]. Unfortunately, we do not have sufficient information to estimate the elasticity of demand from [10] as it requires data on price and quantity demanded. Similarly, it is not possible to estimate the cost function since PROWESS data does not provide the figures representing the quantity of output being sold by the firms. However, PROWESS data provide the sales by firms in both domestic and export markets separately[17]. Now, consider the total sales of the ith firm s_i, as consisting of

$$S_i = P_d\, q_i^d + P_f\, q_i^f \qquad [11]$$

where both P_d and P_f are the same across all firms at the point of equilibrium. If the domestic average tariff rate in the industry is t, then the following relationship is obtained,

$$P_d = P_f\,.(1+t) \qquad [12]$$

In other words, value of exports can be expressed in domestic price using equation [12]. For determining tariff rate, the current analysis sources the relevant data points at HS 6-digit level for the selected industries from the various annual volumes of customs tariff handbook and the mean tariffs constructed in this manner are used. The S_i constructed in this manner is symbolized as S_i^* from now on.

[17] In this paper we shall try to estimate the cost function from the sales data assuming a iso-elastic cost function.

$$S_i^* = P_d q_i^d + P_f q_i^f (1+t) \quad [13]$$

Expressing equation [13] in domestic prices alone, we have:

$$S_i^* = P_d (q_i^d + q_i^f) \quad [14]$$

Since all firms face the same price, therefore, S_i^* may be treated as output of a firm multiplied by some constant. Summing over all firms from equation [14] we get:

$$S^* = P_d X \quad [15]$$

We assume that the cost function of a firm is iso-elastic in output, i.e.,

$$C_i = x_i^{\beta} \quad [16]$$

We use S_i^* in the place of x_i as we cannot observe the quantities directly. For regression purpose, equation [16] can be written in the following form:

$$\ln C_i = \beta \ln S_i^* + \mu_i \quad [17]$$

Here the error term μ_i is not connoted with log terms, because it is taken as a multiplicative factor in the original equation. Now from equation [17], β can be estimated and hence the total output *X* can be derived from equation [16] in the following manner:

$$x_i = C_i^{\frac{1}{\beta}} \quad [18]$$

Therefore, the industry output is henceforth represented by:

$$X = \sum x_i \quad [19]$$

Given the industry sales as in equation [15], dividing equation [15] by equation [19], the estimated industry price is obtained.

Now, the firm output that is estimated can be used for estimating marginal cost in the following manner:

$$C_i = \gamma + \delta x_i + e_i \quad [20]$$

Estimating equation [20], the values of δ could be obtained. It is clear that from estimated marginal cost and industry price, PCM can be calculated by considering only the data from PROWESS database. Similarly the elasticity of demand can be determined with the same set of data from equation [10].

V. Results

With *trade liberalization*, the monopoly power of the firms in the industry is expected to decline, leading to (1) reduction in industry concentration, which in turn is expected to lead to a (2) decline in the price-cost margin of the industry. Further, increase in number of firms within an industry due to *entry liberalization* is likely to result an (3) increase in the *elasticity of the domestic demand* curve since more firms implies availability of greater number of varieties for the consumer.[18] The validity of these hypotheses is tested in the Indian context. The empirical estimates of industry concentration levels, price-cost margins, elasticity of demand and importance of size variable on export behaviour are provided below.

A. The Concentration Measures

The *Herfindahl index* for overall sales for select years is presented in **Table 4**. An overall decline is witnessed, barring certain sector specific exceptions. For instance, gems and jewelry, leather, textile etc. has witnessed decline in concentration in general. However, automobile and transport sector has witnessed increase in concentration during 1990-95. During 1995-00, a similar trend has been noticed in chemical, non-electrical machinery, rubber and textile. During 2000-05, several sectors like automobile, electrical, electronics, garments, pharmaceuticals, plastic, rubber, transport etc. revealed rising concentration trends. This signifies the importance of entry, both by foreign-origin as well as domestic ones since 1991, with the foreign firms playing a key role in several sectors.[19] However, while the concentration ratio has undergone a change, interestingly the relative positions of the major players have not.

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[18] Chemberlin (1969) argues that, ".. the larger the number of sellers in the market, the greater the elasticity of demand for each seller." p. 282. However, we are not referring to the market demand function for each seller, but the aggregate demand function, which can be derived from the underlying equilibrium condition. Therefore, any change in elasticity may be the result of the change in the parameter of the utility function, which essentially means a change in the utility function itself.

[19] Redington (India) Ltd Novartis India Ltd., G E Plastics India Ltd. and Bata India Ltd. in electronics, pharmaceuticals, plastics and leather sector respectively could be cited here. But the transition has been strongest in transport sector, where a number of foreign firms, namely – Maruti Udyog Ltd., Hyundai Motor India Ltd., Motor Industries Co. Ltd., Daewoo Motors India Ltd., Ford India Ltd. etc. remain among the key players.

The above-mentioned point can be proved with the help of **Table 5**, which counts the number of common market leaders between two periods.[20] It is observed that most of the sectors have witnessed compositional change after liberalization, and newer industry leaders have emerged. The rate of the change has however varied across sectors. For instance, in sectors like automobile, textile and rubber several firms dominate the industry in 2005, who have retained their position since 1990. On the other hand, in sectors like leather, pharmaceuticals and plastic, a completely new set of industry leaders have emerged in 2005, indicating efficiency gains by the newcomers / erstwhile marginal players. Interestingly, the relative stability for the export market is found to be lower as compared to the domestic market, which signifies greater competition in the external market.

B. The Price-Cost Margin (PCM)

Before going to the PCM analysis, the role of foreign presence in the Indian market needs to be understood with the help of **Tables 6** and **7**, which analyzes foreign presence in domestic and foreign market respectively.[21] It is observed from **Table 6** that over the years foreign presence has increased for automobile, electrical, electronics, iron and steel, leather, non-electrical machinery, plastic and transport equipments, but decreased for chemicals, garments, pharmaceuticals, rubber, textile etc. In case of export sales, **Table 7** reveals that while foreign presence increases for automobile, electronics, garments, iron and steel, leather, rubber, transport equipments, the same decreases in chemicals, electrical, non-electrical machinery, pharmaceuticals, plastic and textile. The overall PCM level in a sector has been significantly influenced by the level of foreign penetration (i.e., entry and competition) within that sector.

Table 8 provides the estimates of PCM for various industries. A few interesting observations can be made. First, a general rise in PCM is observed over 1990 to 1995 simultaneously with the decline in concentration ratios. Second, several sectors have

[20] The interpretation of the number '5' in first row, last column is that, if the exporting firms in the automobile sector are ranked according to their value of exports in 1990 and 2005, then there are 5 common firms among the top ten list.

[21] The foreign owned firms include both private foreign firms as well as firms coming under foreign business Groups.

shown an increase in PCM over 1995 to 2000 as well (textiles, chemicals, electronics, iron and steel, pharmaceutical etc.). Third, an increase in PCM is noticed for several categories over 2000 to 2005 as well (electrical, electronics, garments, leather etc.). A declining trend in the last reported year 2008 has been observed, which may be explained by the decline in the number of reported firms.[22] While at the first sight this finding appears to be a bit inconsistent, a little introspection reveals that such a possibility may arise if more efficient firms, particularly foreign firms, enter the industry after the liberalization. Alternatively, spillover of technical changes across all firms as a result of increased pressure of competition due to liberalization may explain this scenario.[23]

C. Elasticity Trends

The elasticity estimates for the selected are shown in **Table 9**. It is observed that the demand curve is generally inelastic, barring the exception of automobile in 1993, gems and jewelry in 1991, leather in 1992 and rubber in 1990, 1991 and 1994. The comparison between the two end years, 1990 and 2008 reveals that the value of elasticity has declined over the period. In case of some industries (electrical, leather, non-electrical machinery), elasticity increased over 1995 to 2000, but declined in the following period.

D. Firm Size and Exports

Given the considerable increase in the number of exporting firms, the overall export-sales ratio of the industries has also increased.[24] In our next step, we examine the validity of the relationship between *firm size and export intensity* as propose in *Proposition 1 & 2*.[25] The results for the 14 industries chosen on the basis of their importance in India's export basket are summarized in **Table 10**. It is observed from the correlation coefficients that the relationship between the size of the firms and their export

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22 The decline is caused by incomplete updating of the firm data by PROWESS, rather than actual exit of firms.

23 A higher PCM for the foreign firms can be explained by the higher average productivity growth of the foreign-affiliated firms vis-à-vis the domestic firms (Banga, 2003).

24 It is observed from the fitted curves that barring the exception automobile and chemical, where export intensity has marginally declined, in all other sectors the intensity has increased in the post-1995 period.

25 For the relationship between firm size and export, we consider total assets in a particular year as a suitable proxy of firm size.

volume is significantly positive in all cases supporting the *Proposition P 2* above that larger firms usually tend to export more, though the degree differed across the sectors. This result is in line with the industry-level analysis of Barua and Chakraborty (2004). Further support to the result comes from Melitz model (2003), which argued that exposure to trade induce only the more productive firms to enter the export market. This result holds good in the Indian scenario as well (Kumar and Pradhan, 2007).

VI. Conclusion

The current analysis focuses on the effects of increased market access due to entry liberalization policies on India's exports and industrial performance. India's trade expansion during the post-reform period has been consistent with the standard HOS theory of trade, without any drastic reallocation of resources in the industrial sector. This is possible in a monopolistic market structure where trade liberalization may lead to increase in the size of the exporting firms' production and a decline in the level of production of the import-competing firms and also if domestic market is segmented by high domestic tariffs in comparison to the world tariffs.

The analysis under an oligopolistic market framework shows that liberalization has led to a lowering of the concentration ratio and a rise in the PCM in general. The coexistence of the rise in PCM, despite declining concentration can be explained by the fact that the cost structure of the firms might have declined more significantly as compared to the decline in market power. In addition, the elasticity of demand did not show any significant change, barring certain exceptions. The inelastic point of the demand curve in equilibrium is also responsible for the rise in PCM. Finally, the size of the firms and their export volume is found to be positively related, indicating better performance of the export-oriented firms on the external front.

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Table 1: Number of Firms included in the analysis

	Number of firms	1990	1995	2000	2005	2008
1	**Automobiles**	19	22	28	24	27
2	**Chemicals**	260	674	760	859	675
3	**Electrical**	101	203	218	243	207
4	**Electronics**	76	275	517	692	548
5	**Garments**	9	49	76	101	84
6	**Gems & Jewelry**	6	44	57	86	59
7	**Iron & Steel**	159	402	499	525	452
8	**Leather**	7	49	47	62	42
9	**Non-Electrical Machinery**	126	227	245	295	237
10	**Pharma**	79	245	283	333	271
11	**Plastic**	51	224	262	295	221
12	**Rubber**	26	65	74	106	74
13	**Textiles**	241	585	593	674	617
14	**Transport**	106	202	330	320	282

Table 2: Importance of Selected Sectors in India's Overall Export Basket (%)

	Sectors	1996-97	2000-01	2002-04	2004-05	2008-09
1	**Automobile / Transport**	2.69	2.09	2.13	2.95	3.27
2	**Chemical**	3.67	4.41	4.76	5.10	4.67
3	**Machinery and Equipment**	5.69	6.11	6.02	6.44	9.54
4	**Pharmaceuticals**	2.01	2.12	2.66	2.47	2.78
5	**Cotton Textiles**	13.93	10.88	9.20	6.91	4.45
6	**Garments**	13.44	15.10	13.29	10.23	7.28
7	**Gems and Jewelry**	14.26	16.67	17.25	17.28	15.32
8	**Iron and Steel**	4.19	4.83	5.82	7.82	7.15
9	**Leather**	3.25	3.14	2.51	2.02	1.26
10	**Plastic**	1.20	1.57	1.90	2.52	1.37
11	**Rubber**	1.01	0.81	1.00	0.91	0.84
	Total	65.34	67.73	66.54	64.64	57.94

Table 3: Export-Orientation Trends of Selected Firms (%)

	Industry	1990	1995	2000	2005	2008
1	**Automobiles**	3.77	7.23	4.20	7.59	9.35
2	**Chemicals**	4.52	7.83	9.94	15.69	18.32
3	**Electrical**	4.77	4.64	4.53	6.79	6.96
4	**Electronics**	3.79	4.05	5.26	5.31	3.99
5	**Garments**	61.04	48.50	54.18	55.34	45.40
6	**Gems & Jewelry**	67.72	74.64	70.77	82.34	77.21
7	**Iron & Steel**	3.04	7.69	9.49	14.62	14.11
8	**Leather**	38.26	39.07	35.58	40.30	39.76
9	**Non-Electrical Machinery**	4.34	5.72	6.40	9.78	10.98
10	**Pharmaceuticals**	7.87	13.71	18.33	30.06	34.43
11	**Plastic**	2.57	6.20	8.16	19.02	16.47
12	**Rubber**	5.85	9.46	7.69	13.29	14.67
13	**Textiles**	5.86	15.34	20.04	22.47	24.54
14	**Transport**	3.69	6.56	4.81	8.03	9.68

Table 4: Harfindahl index Trends in industries (Overall Sales)

	HHI	1990	1995	2000	2005	2008
1	**Automobiles**	0.151	0.189	0.122	0.133	0.134
2	**Chemicals**	0.019	0.013	0.019	0.014	0.015
3	**Electrical**	0.029	0.023	0.023	0.027	0.033
4	**Electronics**	0.083	0.035	0.024	0.036	0.049
5	**Garments**	0.208	0.047	0.044	0.058	0.052
6	**Gems & Jewelry**	0.253	0.113	0.095	0.085	0.128
7	**Iron & Steel**	0.206	0.118	0.080	0.061	0.050
8	**Leather**	0.530	0.150	0.144	0.096	0.104
9	**Non-Electrical Machinery**	0.101	0.057	0.071	0.056	0.072
10	**Pharma**	0.030	0.019	0.018	0.023	0.022
11	**Plastic**	0.188	0.110	0.088	0.103	0.064
12	**Rubber**	0.100	0.089	0.109	0.115	0.134
13	**Textiles**	0.016	0.008	0.009	0.009	0.009
14	**Transport**	0.074	0.079	0.051	0.055	0.056

Table 5: Relative Stability in Market Structure: Presence of top 10 Firms (Number)

	Sectors	1990 and 1995		1990 and 2000		1990 and 2005	
		Domestic	Export	Domestic	Export	Domestic	Export
1	Automobiles	7	6	7	6	7	5
2	Chemicals	5	4	6	4	5	2
3	Electrical	5	4	5	4	6	3
4	Electronics	7	5	7	1	4	3
5	Garments	-	-	4	2	1	2
6	Gems and Jewelry	-	-	5	5	3	4
7	Iron & Steel	7	4	5	2	2	2
8	Leather	-	-	5	4	4	0
9	Non-Electrical Machinery	9	6	7	5	6	4
10	Pharmaceuticals	7	2	0	0	1	0
11	Plastic	6	3	5	1	4	1
12	Rubber	10	7	7	5	5	4
13	Textiles	6	6	5	3	3	2
14	Transport	8	5	6	7	6	6

Table 6: Foreign Presence in Domestic Sales (%)

	Sectors	1990	1995	2000	2005	2008
1	Automobiles	18.61	25.05	37.09	36.29	31.81
2	Chemicals	29.68	24.57	27.96	23.81	21.87
3	Electrical	28.16	22.76	23.43	27.33	29.39
4	Electronics	11.65	15.43	20.91	25.29	17.70
5	Garments	2.09	1.92	1.85	0.40	1.92
6	Iron & Steel	0.47	1.23	1.59	1.32	0.94
7	Leather	17.46	35.11	32.09	21.90	23.85
8	Non-Electrical Machinery	13.85	17.20	17.87	21.13	18.89
9	Pharmaceuticals	49.05	35.51	28.25	24.68	16.99
10	Plastic	4.50	3.74	4.54	4.68	6.15
11	Rubber	5.94	5.21	8.38	5.21	4.86
12	Textiles	3.03	2.17	2.31	0.74	0.37
13	Transport	16.78	20.66	27.39	28.01	25.98

Table 7: Foreign Presence in Export Sales (%)

	Sectors	**1990**	**1995**	**2000**	**2005**	**2008**
1	Automobiles	15.79	26.87	35.58	53.02	35.83
2	Chemicals	47.52	30.88	32.40	25.49	18.98
3	Electrical	32.51	44.03	40.46	36.43	31.87
4	Electronics	4.90	13.36	38.71	51.67	43.05
5	Garments	0.00	0.34	2.72	0.26	2.59
6	Iron & Steel	0.56	1.36	2.53	1.53	0.99
7	Leather	3.91	4.06	2.71	6.89	4.84
8	Non-Electrical Machinery	36.83	25.70	38.17	38.98	29.91
9	Pharmaceuticals	46.98	27.90	24.89	26.05	16.36
10	Plastic	18.66	3.98	3.90	3.40	5.82
11	Rubber	0.67	4.15	2.19	5.29	2.22
12	Textiles	8.34	2.92	1.77	0.84	0.65
13	Transport	17.32	25.91	28.32	39.34	28.78

Table 8: The Price Cost Margin Results in the Market Segments – Industry-wise

(Percentage)

Industry	Automobiles	Chemicals	Electrical	Electronics	Garments	Gems & Jewelries	Iron & Steel	Leather	Non-Electrical Machinery	Pharmaceuticals	Plastic	Rubber	Textiles	Transport
1990	0.126	0.062	0.104	0.041	-	-	0.137	-	0.041	0.197	0.197	0.015	0.087	0.091
1991	0.124	0.129	0.175	0.060	0.213	0.086	0.135		0.019	0.212	0.222	0.017	0.295	0.071
1992	0.337	0.058	0.177	0.147	0.138	0.222	0.010	0.043	0.054	0.039	0.228	0.039	0.105	0.177
1993	0.043	0.112	0.222	0.105	0.174	0.211	0.082	0.068	0.083	0.108	0.083	0.012	0.107	0.117
1994	0.118	0.143	0.142	0.263	0.188	0.293	0.165	0.267	0.271	0.084	0.379	-0.007	0.165	0.134
1995	0.247	0.159	0.158	0.160	0.334	0.244	0.289	0.288	0.218	0.225	0.225	0.062	0.188	0.183
1996	0.164	0.191	0.165	0.157	0.330	0.233	0.147	0.366	0.153	0.198	0.299	0.035	0.174	0.203
1997	0.220	0.322	0.111	0.178	0.185	0.249	0.228	0.337	0.171	0.212	0.248	0.091	0.205	0.156
1998	0.225	0.318	0.017	0.245	0.224	0.184	0.266	0.602	0.113	0.300	0.339	0.021	0.181	0.226
1999	0.169	0.352	0.075	0.222	0.446	0.248	0.319	0.634	0.177	0.219	0.373	0.044	0.293	0.199
2000	0.188	0.343	0.093	0.212	0.283	0.229	0.392	0.287	0.161	0.451	0.451	0.093	0.397	0.304
2001	0.136	0.315	0.135	0.228	0.283	0.260	0.336	0.455	0.200	0.236	0.398	0.070	0.293	0.175
2002	0.101	0.348	0.085	0.254	0.306	0.243	0.298	0.373	0.238	0.300	0.428	0.077	0.345	0.232
2003	0.142	0.305	0.105	0.235	0.306	0.244	0.349	0.402	0.295	0.297	0.332	0.038	0.294	0.185
2004	0.130	0.300	0.100	0.220	0.342	0.271	0.327	0.397	0.234	0.278	0.327	0.109	0.300	0.245
2005	0.134	0.303	0.139	0.226	0.366	0.245	0.325	0.443	0.180	0.318	0.318	0.081	0.270	0.278
2006	0.134	0.294	0.254	0.253	0.326	0.240	0.272	0.444	0.224	0.212	0.360	0.052	0.294	0.212
2007	0.100	0.272	0.197	0.265	0.187	0.189	0.234	0.273	0.237	0.239	0.425	0.124	0.262	0.108
2008	0.096	0.278	0.200	0.235	0.243	0.151	0.280	0.177	0.165	0.216	0.315	0.110	0.237	0.180

Source: Calculated by authors

Table 9: Elasticity Results in the Market Segments – Industry-wise

(Percentage)

Industry	Automobiles	Chemicals	Electrical	Electronics	Garments	Gems & Jewlleries	Iron & Steel	Leather	Non-Electrical Machinery	Pharmaceuticals	Plastic	Rubber	Textiles	Transport
1990	0.417	0.062	0.095	0.318	-	-	0.046	-	0.192	0.064	0.099	2.609	0.048	0.103
1991	0.426	0.024	0.049	0.164	0.391	1.291	0.038		0.344	0.047	0.059	1.898	0.011	0.108
1992	0.156	0.048	0.045	0.065	0.454	0.409	0.406	2.312	0.103	0.216	0.052	0.712	0.027	0.039
1993	1.119	0.020	0.032	0.067	0.319	0.316	0.047	0.863	0.060	0.063	0.110	1.790	0.023	0.049
1994	0.404	0.013	0.038	0.018	0.166	0.114	0.018	0.110	0.018	0.062	0.016	-2.642	0.011	0.038
1995	0.184	0.009	0.031	0.023	0.061	0.093	0.009	0.071	0.020	0.018	0.020	0.247	0.009	0.027
1996	0.265	0.008	0.029	0.021	0.054	0.091	0.018	0.056	0.027	0.019	0.014	0.426	0.009	0.023
1997	0.198	0.005	0.047	0.018	0.093	0.091	0.012	0.064	0.025	0.020	0.017	0.161	0.008	0.030
1998	0.185	0.004	0.311	0.012	0.074	0.113	0.010	0.037	0.038	0.013	0.013	0.660	0.009	0.020
1999	0.228	0.004	0.062	0.010	0.034	0.073	0.007	0.034	0.023	0.016	0.011	0.298	0.005	0.019
2000	0.190	0.004	0.049	0.009	0.047	0.077	0.005	0.074	0.025	0.008	0.008	0.145	0.004	0.010
2001	0.284	0.004	0.034	0.008	0.049	0.062	0.006	0.049	0.021	0.015	0.010	0.191	0.005	0.018
2002	0.368	0.004	0.054	0.007	0.042	0.064	0.007	0.058	0.016	0.012	0.009	0.159	0.004	0.015
2003	0.293	0.004	0.038	0.006	0.033	0.054	0.006	0.044	0.012	0.010	0.011	0.267	0.004	0.017
2004	0.285	0.004	0.039	0.006	0.030	0.043	0.006	0.042	0.014	0.010	0.010	0.087	0.004	0.012
2005	0.298	0.004	0.030	0.006	0.027	0.047	0.006	0.036	0.019	0.009	0.011	0.116	0.005	0.011
2006	0.248	0.004	0.016	0.006	0.031	0.054	0.007	0.041	0.016	0.014	0.010	0.213	0.004	0.015
2007	0.333	0.005	0.022	0.006	0.064	0.074	0.008	0.075	0.016	0.013	0.009	0.092	0.005	0.029
2008	0.386	0.005	0.024	0.008	0.049	0.112	0.008	0.135	0.026	0.017	0.014	0.123	0.007	0.020

Source: Calculated by authors

Table 10: Correlation Coefficients of Marginal Cost, Size and Exports

	Correlation Coefficients of MC, Size & Exports	1990			1995			2000			2005			2008		
		MC & Size	MC & Exports	Exports & Size	MC & Size	MC & Exports	Exports & Size	MC & Size	MC & Exports	Exports & Size	MC & Size	MC & Exports	Exports & Size	MC & Size	MC & Exports	Exports & Size
1	**Textiles**	-0.35[a]	-0.56[a]	0.43[a]	-0.11[a]	-0.15[a]	0.53[a]	-0.03	-0.04	0.48[a]	-0.07[c]	-0.08[b]	0.49[a]	-0.07[c]	-0.05	0.71[a]
2	**Automobiles**	-0.24	-0.31	0.96[a]	-0.19	-0.26	0.93[a]	-0.14	-0.18	0.84[a]	-0.14	-0.18	0.73[a]	-0.36[c]	-0.29	0.71[a]
3	**Chemicals**	-0.33[a]	-0.54[a]	0.41[a]	-0.13[a]	-0.19[a]	0.51[a]	-0.03	-0.04	0.64[a]	-0.06[c]	-0.07[b]	0.37[a]	-0.06[c]	-0.05	0.49[a]
4	**Electrical**	-0.29[a]	-0.52[a]	0.67[a]	-0.13	-0.27[a]	0.67[a]	-0.16	-0.27[a]	0.58[a]	-0.12[b]	-0.16[b]	0.77[a]	-0.12[c]	-0.09	0.65[a]
5	**Electronics**	-0.19[c]	-0.39[a]	0.25[b]	-0.12[b]	-0.15	0.39[a]	-0.07[b]	-0.09[b]	0.26[a]	-0.05	-0.06[c]	0.21[a]	-0.06	-0.04	0.37[a]
6	**Garments**	-0.74[b]	-0.64[c]	0.25	-0.22	-0.29[b]	0.12[c]	-0.20[c]	-0.28[b]	0.12	-0.06	-0.12	0.06	-0.10	-0.06	0.79[a]
7	**Gems & Jewelry**	-	-	-	-0.25[c]	-0.24	0.08	-0.23[c]	-0.13	0.26[b]	-0.09	-0.07	0.12	-0.31[b]	-0.27[b]	0.96[a]
8	**Iron & Steel**	-0.15	-0.12	0.72[a]	-0.04	-0.03	0.80[a]	-0.02[c]	-0.01	0.81[a]	-0.03	-0.02	0.57[a]	-0.03	-0.03	0.60[a]
9	**Leather**	-	-	-	-0.17	-0.08	0.04	-0.28[c]	-0.15	0.11	-0.12	-0.06	0.02	-0.34[b]	-0.33[b]	0.41[a]
10	**Non-Electrical Machinery**	-0.47[a]	-0.40[a]	0.29[a]	-0.09	-0.09	0.55[a]	-0.12[b]	-0.12[c]	0.67[a]	-0.11[b]	-0.10[c]	0.80[a]	-0.16[a]	-0.13[b]	0.54[a]
11	**Pharma**	-0.46[a]	-0.71[a]	0.52[a]	-0.12[b]	-0.12[b]	0.98[a]	-0.10[c]	-0.18[a]	0.57[a]	-0.07	-0.13[b]	0.64[a]	-0.16[a]	-0.10[b]	0.90[a]
12	**Plastic**	-0.23[c]	-0.23[c]	0.1	-0.11[c]	-0.08	0.43[a]	-0.05	-0.03	0.66[a]	-0.03	-0.03	0.89[a]	-	-	0.87[a]
13	**Rubber**	-0.59[a]	-0.78[a]	0.90[a]	-0.38[a]	-0.43[a]	0.88[a]	-0.30[a]	-0.29[b]	0.83[a]	-0.19[b]	-0.19[c]	0.68[a]	-	-	0.66[a]
14	**Transport**	-0.11	-0.14	0.89[a]	-0.11	-0.15[b]	0.92[a]	-0.04	-0.04	0.82[a]	-0.03	-0.03	0.77[a]	-0.08	-0.07	0.75[a]

Note: a, b and c imply level of statistical significance at 1 percent, 5 percent and 10 percent respectively.