Liberalization, Trade and Industrial Performance: An Empirical Analysis for India#

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Paper for the APEA conference, Seattle,

Organized by the Research Center for International Economics at the University of Washington, Federal Research Bank of San Francisco, and Freeman Program in Asian Political Economy and Lowe Institute of Political Economy of Claremont McKenna College

July 29-30, 2006

We are grateful to Professor R. M. Stern, Professor Ashok Guha and Professor Sandwip Kumar Das for many helpful comments. We however are fully responsible for all errors remaining.

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Liberalization, Trade and Industrial Performance in India: An Empirical Study

Alokesh Barua and Debashis Chakraborty

Introduction

This paper attempts to examine the impact of economic liberalization on trade and industrial performances for the Indian economy during the last decade. For the purpose of this paper we distinguish economic liberalization in two possible ways. First, we shall define the WTO induced policy measures to liberalize the external relationships of the country in terms of both trade and investment as "*external liberalization*" measures. In contrast to this, the liberalization measures which attempted to dismantle the shackles of various domestic industrial controls such as the industrial licensing and other entry regulations will be termed as "*internal liberalization*". Since 1991 India has gradually abolished most of the internal controls and by the time the WTO came into force in 1995, the Indian economy has become much more liberalized in comparison to what it was half a decade before.

External liberalization policies following WTO reforms while on one hand involve *own tariff liberalization* as well as *liberalization of the entry of foreign firms* in the domestic market, it include reciprocal tariff reductions by others countries simultaneously on the other. Thus, freer trade and entry of firms in both within and outside the country is expected to result is a substantial improvement in market access conditions in manufacturing as compared to the pre-UR period. However the trade policy literature notes the realized market access to be significantly lower than the predicted level (WTO, 2001) and the recently concluded Hong Kong Ministerial declaration of the WTO urged the negotiating group on non-agricultural market access to establish modalities by 30 April 2006.

The basic theoretical model underlying the current empirical exercise is partly based on the segmented market hypothesis as put forward in a series of papers by Agarwal and Barua (1993; 1994; 2004) and Barua and Pant (1995). The main arguments

of these papers are that entry liberalization policies result in (a) increase in aggregate exports, (b) reduction in industrial concentration and (c) increase in social welfare. It is immaterial whether the firms are of domestic or foreign origin. External liberalization through reduction in tariffs allows countries to specialize according to comparative advantage and make it possible for firms to overcome the domestic market size limitations. Thus, it not only leads to improvement in allocative efficiencies but also in scale efficiencies.

The paper is thus organized as follows. Section I briefly discuss the effects of increased market access for the Indian economy in a competitive framework. In Section II we relax the assumption of market imperfection and examine the consequences of increased market access on trade and the performance of industries and firms. Section III draws a few policy conclusions based on the analysis.

Section I: The Perfect Competition Framework

For analyzing the possible effects of increased market access on trade and industrial structure we first consider the standard Heckscher-Ohlin-Samuelson (HOS) model, which predicts that trade liberalization would shift resources away from the industries intensive in the use of the relatively scarce factor to those industries which use the relatively abundant factor of the economy intensively. India being a relatively labor-abundant economy, trade liberalization is expected to shift resources away from the capital-intensive industries towards the labor-intensive industries and consequently the rewards (both nominal and real) to labor would rise and the same to capital will decline. Although the *price effects of the reduction of tariffs* may not be very significant for developed countries as they have already lowered their tariff rates substantially before the UR (Rodrik, 1999) and other existing obstacles to trade (e.g. –anti-dumping measures) successfully insulate their economy from such price effects; the impact may be substantial for their developing counterparts. The theory also suggests that such liberalization will generally increase the welfare level of the economy.

The CGE framework is generally employed for quantitative analysis of the possible effects of unilateral and multilateral tariffs reductions, although the use of an essentially static framework has often been questioned. While Chadha et al (2003) observed that the potential impact of full UR commitments and the DDA commitments on Indian economy are generally consistent with the HOS predictions, the output and employment loss in a number of key sectors as predicted by them has not been observed in realty. While trade as a percentage of GDP increased from 19.44 per cent in 1994-95 to 45.61 percent in 2003-04, the composition of India's trade and the relative positions of export and import shares of HS sections remained broadly unaltered (Barua et al, 2004), suggesting two possibilities. First, there has not been any drastic reallocation of resources in Indian manufacturing due to liberalization and second, expansion in trade may have taken the form of intra rather than inter-industry specialization. The absence of drastic reallocations in resources might be explained by the inflexibilities in the factor market (Hazra and Chakraborty, 2005).

Barua and Chakraborty (2004) argued that India being a labour-abundant country, net trade of a product group should be negatively related to skilled-unskilled wage ratio and capital-labor ratio, but positively related to the industry size.[1] Their empirical findings support the hypothesis, signifying that the net export items of India are generally labor intensive products usually produced by unskilled labors and the size of the industry also affect comparative advantage via externalities. In addition, the WTO dummy, which takes the value of 1 after 1995 and 0 beforehand, also turns out to be highly significant, implying that liberalization has favored export of products intensive in the abundant factor, that is, labour. However, it needs to be noted that in the process of netting the trade flows a significant proportion of it get eliminated, and might downplay the sectoral dynamics.

Section II: Liberalization under Market Imperfections

[1] The net trade figures of various commodities are calculated at HS 4-digit level with the data obtained from DGCIS, Ministry of Commerce. The corresponding production data at 3-digit level are taken from the *Annual Survey of Indian Industries* for 135 industries over 1987-88 to 1997-98. The concordance is done following Debroy and Santhanam (1993) and Chakraborty (2002).

A. Impact on overall Trade and Industry

The prevalence of various forms of market imperfections are widely recognized in trade literature. If markets are segmented even after liberalization from the world market by tariffs and other barriers, then domestic firms can discriminate between the world and domestic markets (Agarwal and Barua, 1993; 1994; 2004) and domestic monopoly can flourish. In other words, the domestic firms can charge higher prices than the tariff-inclusive foreign price, which allows them to survive despite foreign import competition. If both export and import-competing firms are subject to increasing returns to scale (IRS), with liberalization the exporting firms expand in size and thereby move along the downward sloping average cost curve. On the other hand, the import competing firms move up the average cost curve as they reduce their market size. This implies that while the exporting firms are enjoying economies of scale, the importing firms suffer from diseconomies of scale. The net welfare effects are therefore not known.

In the IRS framework, intra-industry trade (IIT), i.e., simultaneous export and import of the same product group has to be considered. Several studies have noted that the IIT indices for India have been increasing over the years, although in a moderate manner (Veeramani, 2001; Chakraborty, 2002; Chakraborty et al, 2004). The segregation of IIT indices in horizontal and vertical specialization shows interesting results. Horizontal IIT is generally associated with trade in commodities differentiated by attributes, while vertical IIT occurs when trade in commodities differentiated by quality takes place. The recent empirical literature has shown that even in trade among developing countries, vertical IIT could explain a substantial proportion.[2] In **Table 1**, the overall vertical IIT trends in twelve manufacturing industries with high trade share and IIT indices are reported at three cross-sections of time – 1988-89, 1999-2000 and 2003-04. While the first period represents the pre-reform scenario, the other two depict the post-WTO changes. The increased market access through multilateral tariff liberalization

[2] The vertical or horizontal specialization in recent literature is defined by the unit value index used widely (Abed-el-Rahman, 1991; Greenaway et al, 1995; Andresen, 2001). The rationale for using UVs is that assuming perfect information, a variety sold at a higher price is in general associated with a higher quality, or, stated otherwise, relative prices reflect relative qualities. This notion is in line with the findings of Stiglitz (1987), which states that even with imperfect information, prices tend to reflect quality.

in the post-1995 period has helped Indian manufacturing export to expand, both to developed as well as developing countries. The fact is part represented in the steady increase in the number of both-way traded items over the sample period. Also it is observed that the IIT for the select groups is predominantly vertical, signifying presence of scale economies.

The existence of scale economies in Indian industries has been noted at times (Krishna and Mitra, 1998). Barua and Chakraborty (2004) by estimating a C-D production function for industries at NIC 2-digit level over 1987-98 observe that the scale efficiency of the factory sector is not uniform; while some industries experience increasing returns, others are characterized by decreasing or constant returns.[3] It is further observed that the NIC-industries characterized by reduction in scale efficiency are associated with a declining trend in net trade of the corresponding HS–industries over the sample period.[4] In other words the import-competing sector in the post-liberalization period has suffered to a certain extent.

B. Impact on opening Trade on Firm Behaviour

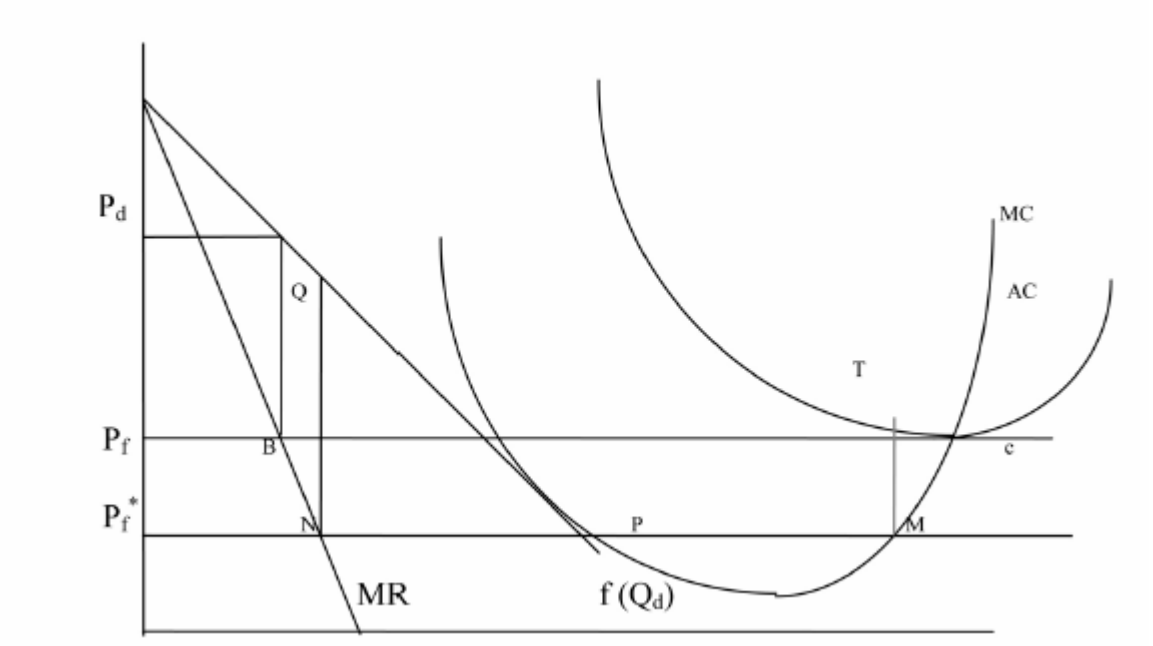
Diagram 1 shows the equilibrium of a typical firm following the framework used by Agarwal and Barua (2004). AC is the firm's average cost curve and C represents its minimum point. P_f, f (Q_d) and MR are the foreign price, domestic demand curve and the marginal revenue curve respectively. According to the diagram, production for the domestic market alone is not viable since the average cost curve lies uniformly above the demand curve. Under the free trade scenario, the firm may produce at point C, with the export and domestic sales to be BC and P_f B respectively. However, if the world price is, say P^*_f, then the possible production point P is not a stable equilibriums. Although the other intersection point M satisfies the first-order conditions, there the unit cost exceeds the marginal cost by an amount TM. The firm is making a profit of NQ per unit of sale in the domestic market, while making a loss on foreign sales as the unit cost is higher than

[3] 1991 has been defined as the liberalization year, since several industrial policy measures were initiated from that point.

[4] The only exception is the wood and paper industry (NIC 27-28), for which the economies of scale has increased in the post-liberalization period despite presence of a trade deficit.

P^*_f. The firm will produce and export only when the profits in the domestic market exceed the loss in exports. Here possibilities of exports may lead to positive production even though no production would take place if there were only domestic sales. The magnification effect of entry liberalization on exports could be verified by the fact that increase in the number of firms leads to a proportionate increase in total industry output, less than proportionate increased in domestic sales but more than proportionate increase in exports (Agarwal and Barua, 2004).

Diagram 1: Equilibrium for a typical firm



C. The Concentration Measures

With trade liberalization the monopoly power of the firms in the industry is expected to decline, leading to decline in (1) industry concentration and (2) price-cost margin. Further, if liberalization brings more varieties in the domestic market or more firms enter there due to entry liberalization then an (3) increase in the *elasticity of the domestic demand* curve after liberalization is also expected. In order to examine these

three effects of liberalization, a firm level analysis is carried for 13 industries chosen on the basis of their importance in India's export basket.[5]

Various pre-reform studies (Monopoly Inquiry Commission, 1966; Gupta, 1968; Ghosh, 1974, 1975; Sandesara, 1979; Sawhney and Swahney, 1974; Katrak, 1980; Apte and Vaidyanathan, 1982) have noted very high concentration in Indian industries.[6] On the other hand, recent studies with large and medium sized firms note decline in concentration during the post-liberalization period (Athreye and Kapur, 2003; Kambhampati and Kattuman, 2003).

The current analysis calculates both 4-firm concentration and Herfindahl index of overall concentration (both domestic sales and export sales) and looks into the dynamics by fitting non-linear time trends on the obtained ratios (**Tables 2** to **4**).[7] It is observed that for sectors like textile, the index has not changed much and always been very low as compared to the other sectors. On the other hand, it has increased for chemicals and decreased considerably for electronics. For other sectors like automobiles although concentration declined initially, it increased in the later years to some extent. The industrial concentration trends in exports and domestic sales are generally in line with the overall concentration trends. The number of firms, foreign as well as domestic, increased after the liberalization exercise (both domestic de-regulation since 1991 and multilateral reform since 1995), and some of the foreign firms are playing a key role.[8] Given the considerable increase in the number of exporting firms, the overall export-sales ratio of the industries has also increased, in line with the analysis explained by **Diagram 1**

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[5] The firm-level data is drawn from the PROWESS database. The sample period for our analysis is 1989-2001, which provides a fair number of observation points before and after WTO accession.

[6] 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), pp. 75. However, Apte and Vaidyanathan (1982) concluded that nature of licensing controls across industries does not affect performance in a significant manner.

[7] The Herfindahl index is defined as $H = \Sigma_i (s_{it})^2$ where s_{it}, is the share of the i-th firm in the industry at time t.

[8] Redington (India) Ltd, Novartis India Ltd., G E Plastics India Ltd. and Bata India Ltd. in electronics, pharmaceuticals, plastics and leather sector could be cited. 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. are in the forefront.

earlier.[9] However, while the concentration structure has undergone a change, interestingly the relative position of the major players has not.[10]

We observe widely varying concentration levels across industries which suggest that the nature of competition may differ within them. Following Sutton (1991), Athreye and Kapur (2003) argued that larger market can accommodate more firms of efficient size and therefore concentration level falls. However, if price-competition is very intense in the industry leading to lower profit margins, firms may not be able to recoup high set up costs and as a consequence equilibrium level of concentration may increase. The current paper attempts to explain the inter-industry variations in concentration levels in terms of set up cost, marketing and technology-intensity in the industries. We measure set up cost by average fixed capital of the industry to total industry sales ratio (SC), marketing intensity by expenditures on advertising to total sales ratio (AD) and technology-intensity by R & D expenditure to total sales ratio (RD). The number of firms (n) in an industry in a particular year and export to sales ratio (EX) are also included among the explanatory variables. A WTO dummy is considered in the analysis, which takes a value of 0 before 1995 and 1 afterwards. In a cross-section time-series pooled framework, the analysis is undertaken for all thirteen sectors over the sample period 1989-2001.

The estimation results are presented in equation (1).[11] It is seen that while the coefficients of RD, AD and SC show positive signs, the same for EX bears a negative sign. The results show that set up cost, technology and marketing factors do explain increase in concentration across industries. On the other hand, increase in export intensity is found favourable in breaking the control of a few over the market. The effect of the number of firms in an industry on concentration is however insignificant. The WTO dummy is negatively related to the Herfindahl index, implying decline in concentration from 1995 onwards.

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[9] 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.

[10] Barua and Chakraborty (2004) noted a high correlation between the rankings of the top 10 firms in 1989 and 2001 for most of the industries.

[11] While * implies 10 percent level of significance, *** denotes 1 percent level of significance.

$$H = 0.080 + (0.096).\ RD + (0.035).\ AD + (0.152).\ SC - (0.001).\ EX + (7.4.10^{-5}).\ n - 0.050.\ (W)$$

(***) (**) (*) (***) (*) (***)

N = 169 $R^2 = 0.62$ F-Statistic = 42.29 Prob > F-Statistics = 0.00

… (1)

D. The Elasticity of Demand

A fall in industry concentration is expected to lead to a decline in the price-cost margin in the industry. Further, increase in number of firms within an industry is likely to affect the elasticity of demand since more firms implies availability of greater number of varieties for the consumer.[12] In order to examine the relationship between concentration, price-cost margins, profitability and loss of consumer welfare, we consider a monopolistically competitive industry where all firms within the industry face the *same price*. This implies that the firms in the industry produce a homogeneous good. We assume that the firms face an inverse demand function:

$$P = f(Q_D),\ f' < 0 \qquad \ldots\ldots\ (2)$$

where P is the price and Q_D be the aggregate domestic demand. We also assume that the domestic market is segregated from the world market and the firms differ in their cost structures. Thus, the maximization problem can be written as:

$$\Pi_i = f(Q_D)q_i - c(q_i), \quad \ldots\ (3) \qquad \text{where } q_i \text{ is the sales of the i-th firm.}$$

The oligopolistic equilibrium condition can be stated as:

$$P\ \{1 - s_i/\varepsilon\} = c'_i \qquad \ldots\ldots\ (4)$$

From (2) we can write the price-cost margin for each firm as a percentage of price as:

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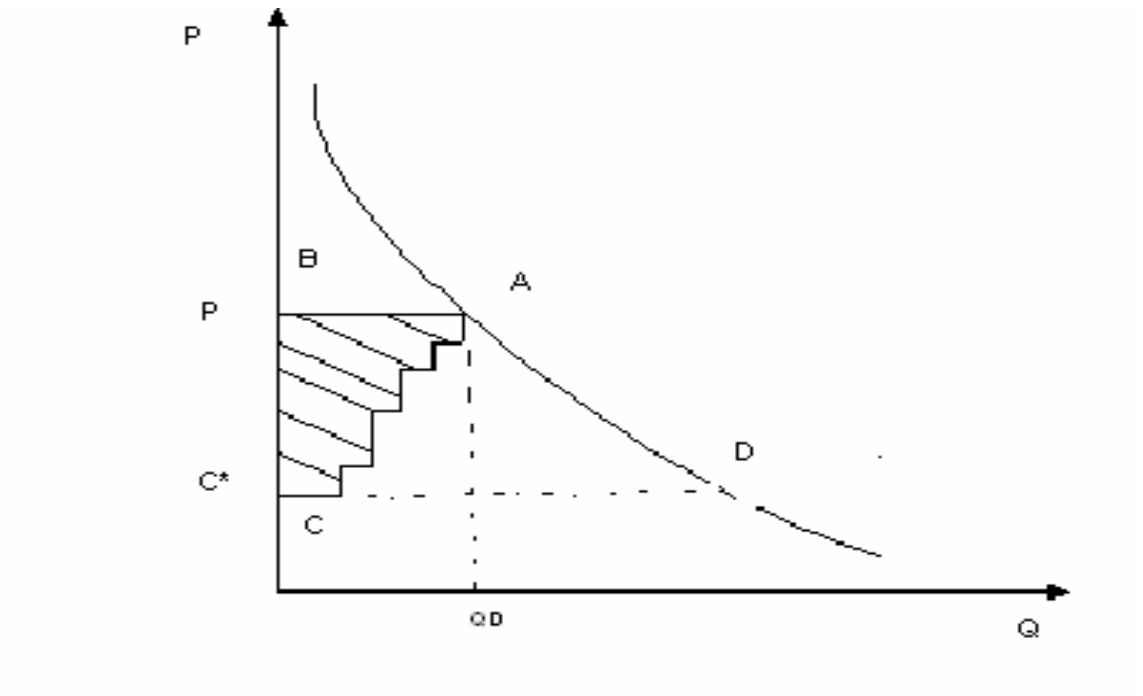
[12] Chemberlin (1969) argues that, ".. the larger the number of sellers in the market, the greater the elasticity of demand for each seller." P. 282. However, we are not referring to the market demand function for each seller, but the aggregate demand function, which can be derived from the underlying 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.

$$(P - c'_i)/P = s_i/\varepsilon \qquad \ldots\ldots\ldots \quad (5)$$

where c'_i and s_i are the marginal cost and the share of the market demand for firm i respectively, and ε is the elasticity of demand.

Diagram 2: The equilibrium of the Industry



Assuming that marginal costs differ across firms, the equilibrium of the industry is shown with **Diagram 2**, where P is the equilibrium price and Q_D is the aggregate market demand. c* is the marginal cost of the most efficient firm. 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 cost 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 price being above c* is the area given by the region ABCD. The shaded area, ignoring fixed costs, measures the firm's profits.

If we have information on the market shares of each firm and the elasticity of demand, then from equation (5) we can estimate the price-cost margin as a percentage of price for each firm. If we assume a constant elasticity of demand curve as shown in equation (6) then a solution of equation (5) becomes explicit.

$$Q_D = A.P^{-\varepsilon} \qquad \ldots\ldots. \quad (6)$$

Since we do not know the elasticity of demand, we try to estimate it by summing (4) across firms, and obtain:

$$P\ \{1-1/n\varepsilon\} = 1/n\ \sum c_i\ = c \qquad \ldots\ldots\ldots\ (7)$$

where n is the number of firms in the industry, and c is average of the marginal costs of all the firms in the industry. Now multiplying both sides of (7) by Q_D, we obtain:

$$P.Q_D\ \{1-1/n\varepsilon\} =\ c.\ Q_D \qquad \ldots\ldots\ldots\ (8)$$

where $P.Q_D$ is the aggregate sales in the industry, which is observable. Thus we can write (8) now as:

$$\{1-1/n\varepsilon\} = c.\ Q_D / P.Q_D \qquad \ldots\ldots\ldots\ (9)$$

From (9) we can estimate the elasticity of demand if we have information on (c. Q_D), i.e., the marginal cost times the aggregate domestic demand. To obtain this, we estimate the cost function in the following form: [13]

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[13] The CD production function is of the form: $f(K,L) = L^{\alpha} K^{\beta}$, $\alpha, \beta > 0$

the conditional factor demand equations and the cost function can be written as,

$$L\ (w, r, q) = q^{(1/\alpha+\beta)}\ .\ (\alpha w / \beta r)^{(\beta/\alpha+\beta)}$$

$$K\ (w, r, q) = q^{(1/\alpha+\beta)}\ .\ (\beta w / \alpha r)^{(\alpha/\alpha+\beta)}$$

and,

$$C\ (w, r, q) = q^{1/(\alpha+\beta)}\ .\ [(\alpha/\beta)^{\beta/(\alpha+\beta)} + (\alpha/\beta)^{-\alpha/(\alpha+\beta)}]\ .\ w^{\alpha/(\alpha+\beta)}\ .\ r^{\beta/(\alpha+\beta)}$$

$$= q^{1/(\alpha+\beta)}\ .\ \theta.\ w^{\alpha/(\alpha+\beta)}\ .\ r^{\beta/(\alpha+\beta)}$$

where, $\theta = (\alpha/\beta)^{\beta/(\alpha+\beta)} + (\alpha/\beta)^{-\alpha/(\alpha+\beta)}$

$$\ln C_i = \ln\theta + \beta_1 \ln q_i + \beta_2 \ln w + \beta_3 \ln r + \mu_i \qquad \ldots\ldots\ldots (10)$$

where, C_i and q_i are costs and outputs of firm i and w and r are the factor prices respectively. μ is the usual error term. We assume that all the firms in the industry face the same factor prices so that we can ignore them in our estimating model. But while the firm data provide us information on costs, it does not give the data on quantity of output produced by firms. However, we have information on the sales of each firm ($P.q_i$), which can be used in our regression equation (11) since all firms by assumption face the same price in equilibrium. So the estimated cost function is given by:

$$\ln C_i = \ln\theta + \beta \ln(Pq_i) + \mu_i \qquad \ldots\ldots\ldots (11)$$

The coefficient β now can be interpreted as the coefficient of the output. Having estimated (11) we differentiate the estimated equation to calculate the marginal cost as follows:

$$\delta \ln C / \delta \ln Q_D = \beta$$

$$\text{or, } Q_D \, \delta C / \delta Q_D = \beta.C$$

$$\text{or, } \quad Q_D \, c = \beta.C \qquad \ldots\ldots\ldots (12)$$

Using (12) in (9) we can now estimate the elasticity of demand for a given number of firms, n.[14] Now the estimated elasticity of demand in (8) could be used to derive the price-cost margin for each firm or for a group of firms. The elasticity trends of the thirteen industries are shown in **Table 5** for four years, 1989, 1991, 1995 and 2001. It is seen that instead of a steady increase, as expected owing to entry of a large number of firms in the post-liberalization period, the value of elasticity has actually declined upto 1995, and increased since then. Furthermore, the elasticities are at a very low level and has not been influenced much even in the post-liberalization period.

E. The Price-Cost Margin

[14] It needs to be noted that for estimating the elasticity here we assume that all firms have identical cost. Since we have assumed a constant elasticity demand function, the estimated elasticity is very unlikely to be affected by differences in costs across firms. Also the average cost function as described above does not conform to the standard U-shaped contour as it continuously decreases with output. Only if we add a quadratic term in output in the function, then the standard U-shaped average cost curve will be obtained.

The above analysis also makes it possible for us to measure the price-cost margin in the industry. Although we assume an identical cost for all firms in determining the elasticities, there is a difference in the realized price-cost margin across the firms present in the industry. To get an idea of the importance of firm-size in determining the price-cost margin, we calculate it separately for various groups within the industry and determine the average price-cost margin separately. The summarized results in **Table 6** show that the margin is substantially higher for the top firms within an industry. It is somewhat surprising to note that while the concentration ratio has declined in the industries, the increasing competition has not been reflected in the average price-cost margin trends, which has increased in a number of sectors during the post-liberalization period, as noted by various other studies as well (Srivastava et al., 2001; Kambhampati and Parikh, 2003; Goldar et al., 2004).

F. Welfare Evaluation:

A rise in the price-cost margin may be due to a number of reasons, e. g. - (1) changes in demand conditions, (2) changes in cost conditions or (3) changes in the equilibrium configuration of firms affecting the elasticity of demand. The price-cost margin is inversely related to the elasticity of demand and positively related to decline in marginal cost. Therefore, any inter-temporal analysis of this ratio makes no sense. But if it could be said that both profits and consumer's welfare have increased with the increase in price-cost margin then perhaps a rise in the price-cost margin need not necessarily be welfare reducing. We can use the monopolistic equilibrium model described above to calculate the profits and the consumer's welfare loss as follows.

Profits in the industry:

The firms' profit could be written as:

$$\Pi = \sum (P - c_i)\, q_i$$

$$= R \sum (P - c_i) / P.\ (q_i / Q_D), \text{ where } Q_D \text{ is the aggregate industry demand.}$$

$$= R \sum s_i / \varepsilon\ s_i, \text{ (using equation (5))}$$

$$= R/\varepsilon \sum s_i^2$$

$$= R/\varepsilon \, . \, H \qquad \ldots\ldots (13)$$

where H is the Herfindahl index of concentration.

Consumer Welfare Loss

The welfare loss to consumer for price being charged P rather than C* is measured by the area ABCD in the **Diagram 2**. In order to measure this area, we calculate the consumer welfare loss for a constant elasticity demand function as denoted by (6).

$$L = \int A.P^{-\varepsilon} \, dp$$

Integrating the function over C* to P, we obtain:

$$L = A. \left[P^{(1-\varepsilon)} / (1-\varepsilon) - C^{*(1-\varepsilon)} / (1-\varepsilon)\right]$$

$$= A/(1-\varepsilon) \, . \left[P^{(1-\varepsilon)} - C^{*(1-\varepsilon)}\right]$$

$$= A. P^{(1-\varepsilon)} / (1-\varepsilon) \, . \left[1 - (C^*/P)^{(1-\varepsilon)}\right]$$

$$= R / (1-\varepsilon) \, . \left[1 - (C^*/P)^{(1-\varepsilon)}\right]$$

$$= R / (1-\varepsilon) \, . \left[1 - \{(1 - (s_i / \varepsilon)\}^{(1-\varepsilon)}\right]$$

$$= R / (1-\varepsilon) \, . \left[1 - \{1 - (1-\varepsilon) \, . \, s_i / \varepsilon\}\right]$$

$$= R. \, s_i / \varepsilon \qquad \ldots (14)$$

We have not however attempted to calculate the profits and welfare losses because of the fact that the very low elasticity of demand generates uneconomic results in case of a few select sectors. One area of future research would be re-asses the elasticities by relaxing the assumption of uniform price faced by all firms.

Section III: Conclusion

The study considered the effects of increased market access due to reduction in tariffs and entry liberalization policies on India's exports and industrial performance. India's trade expansion during the post-reform period seems to be consistent with the standard HOS theory of trade, without any drastic reallocation of resources in the industrial sector. The shares of exports and imports remain more or less same in most cases even after liberalization and total trade as a percentage of the GDP has gone up significantly. 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 oligoopolistic market framework shows that liberalization has led to a lowering of the concentration ratio and a rise in the price-cost margins. Elasticity of demand however did not show any significant change although we observe an increasing trend in it in a few cases.

While a fall in industrial concentration is good for the consumers in the sense that it may increase consumer welfare, it may lead to a fall in producer's surpluses. Similarly, a rise in the price-cost margins while may be considered beneficial for the producers, it is certainly welfare-reducing from the view point of the consumers. The net effect on welfare is therefore not known unless we can evaluate profits and consumers' surpluses before as well as after the policies of liberalization, which should be an area of further research.

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Table 1: Horizontal and Vertical Specialisation trend[15]

HS-Digit	Both way Trade (Number of HS 6-digit lines)			Proportion of Both way Trade (% of all 6-digit lines)			Proportion of 6-digit lines with Vertical trade (15%)			Proportion of 6-digit lines with Vertical trade (25%)		
	1988-89	1999-00	2003-04	1988-89	1999-00	2003-04	1988-89	1999-00	2003-04	1988-89	1999-00	2003-04
28	44	61	153	70.97	95.31	85.00	88.64	86.89	90.20	77.27	80.33	85.62
29	76	129	287	77.55	98.47	91.69	85.53	91.47	86.41	77.63	70.07	76.31
30	-	16	26	-	100.00	89.66	-	81.25	100.00	-	75.00	100.00
39	39	47	119	92.86	100.00	94.44	79.49	93.62	91.60	69.23	80.85	79.83
40	20	24	70	86.96	100.00	95.89	100.00	91.67	85.71	100.00	87.5	78.57
42	-	12	10	-	92.31	100.00	-	91.67	70.00	-	91.67	50.00
71	6	14	39	46.15	77.78	79.59	83.33	85.71	92.31	83.33	64.29	82.05
72	61	63	155	63.54	94.03	91.18	88.52	90.48	77.42	78.69	80.95	67.10
73	33	50	111	67.35	96.15	92.50	96.97	94.00	96.40	87.88	88.00	91.89
84	167	198	471	90.76	98.02	92.90	97.6	97.47	95.75	96.40	95.96	93.84
85	78	99	275	93.98	99.00	94.18	96.15	92.93	89.82	93.59	87.88	83.27
87	19	27	65	65.52	96.43	89.04	94.74	96.30	93.85	89.47	81.48	86.15

[15] HS 28 - Inorganic chemicals, HS 29 - Organic chemicals, HS 30 - Pharmaceutical products, HS 39 - Plastics & articles thereof, HS 40 - Rubber & articles thereof, HS 42 - Articles of leather, saddliry harness and animal gut, HS 71 - Pearls, precious and semi-precious stones/ metals & articles thereof, HS 72 - Iron & steel, HS 73 - Articles of Iron & steel, HS 84 - Nuclear reactors, boilers, mechanery & mechanical appliances; parts thereof, HS 85 - Electrical machinery & equipment & parts thereof; sound & TV recorders & reproducers & parts thereof, HS 87 - Road vehicles and parts.

Table 2: Harfindahl index Trends in industries (Overall Sales)

Industry	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Automobile	0.108	0.089	0.096	0.106	0.102	0.104	0.121	0.130	0.139	0.134	0.107	0.095	0.090
Chemical	0.113	0.120	0.111	0.094	0.096	0.082	0.106	0.099	0.123	0.106	0.110	0.133	0.135
Electrical	0.042	0.036	0.033	0.029	0.027	0.026	0.024	0.025	0.029	0.025	0.025	0.023	0.021
Electronics	0.096	0.084	0.064	0.056	0.057	0.050	0.035	0.032	0.032	0.032	0.030	0.025	0.026
Gems	0.388	0.402	0.370	0.376	0.337	0.215	0.155	0.121	0.144	0.110	0.125	0.128	0.104
Leather	0.704	0.879	0.624	0.475	0.437	0.308	0.198	0.149	0.173	0.187	0.224	0.177	0.235
Machinery	0.044	0.037	0.031	0.026	0.023	0.019	0.016	0.015	0.016	0.017	0.016	0.013	0.013
Pharma	0.042	0.037	0.034	0.030	0.028	0.027	0.023	0.018	0.020	0.021	0.023	0.021	0.025
Plastic	0.070	0.058	0.047	0.049	0.039	0.029	0.029	0.026	0.027	0.026	0.023	0.024	0.027
Rubber	0.271	0.292	0.218	0.199	0.184	0.151	0.151	0.114	0.113	0.135	0.097	0.106	0.094
Steel	0.383	0.354	0.309	0.277	0.257	0.235	0.216	0.173	0.149	0.156	0.160	0.147	0.136
Textile	0.015	0.014	0.012	0.011	0.010	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.010
Transport	0.079	0.057	0.063	0.065	0.062	0.063	0.072	0.077	0.083	0.079	0.063	0.056	0.052

Table 3: Harfindahl index Trends in industries (Domestic Sales)

Industry	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Automobile	0.105	0.087	0.094	0.102	0.098	0.101	0.117	0.127	0.136	0.133	0.107	0.094	0.090
Chemical	0.111	0.118	0.109	0.093	0.095	0.082	0.110	0.104	0.129	0.112	0.117	0.141	0.144
Electrical	0.043	0.036	0.032	0.028	0.027	0.025	0.023	0.025	0.028	0.024	0.025	0.023	0.021
Electronics	0.102	0.089	0.068	0.062	0.062	0.054	0.038	0.034	0.036	0.037	0.038	0.032	0.033
Gems	0.752	0.786	0.429	-	0.367	0.365	0.240	0.397	0.402	0.286	0.118	0.488	0.287
Leather	0.712	0.937	0.659	0.648	0.596	0.544	0.457	0.379	0.390	0.363	0.430	0.310	0.451
Machinery	0.047	0.039	0.033	0.027	0.023	0.019	0.016	0.015	0.018	0.019	0.019	0.015	0.015
Pharma	0.041	0.037	0.034	0.031	0.028	0.027	0.023	0.018	0.018	0.019	0.020	0.019	0.022
Plastic	0.068	0.058	0.047	0.049	0.038	0.029	0.028	0.025	0.025	0.025	0.022	0.023	0.026
Rubber	0.271	0.296	0.225	0.202	0.195	0.156	0.162	0.133	0.124	0.135	0.102	0.111	0.093
Steel	0.390	0.360	0.313	0.285	0.271	0.251	0.226	0.186	0.155	0.160	0.167	0.155	0.147
Textile	0.015	0.015	0.012	0.012	0.011	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.011
Transport	0.079	0.057	0.062	0.063	0.060	0.061	0.070	0.076	0.082	0.080	0.063	0.057	0.053

Table 4: Harfindahl index Trends in industries (Export)

Industry	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Automobile	0.246	0.164	0.181	0.231	0.188	0.167	0.203	0.185	0.197	0.176	0.127	0.139	0.135
Chemical	0.201	0.182	0.193	0.181	0.158	0.115	0.049	0.049	0.059	0.038	0.025	0.021	0.062
Electrical	0.082	0.077	0.071	0.067	0.101	0.078	0.061	0.058	0.063	0.064	0.068	0.053	0.059
Electronics	0.210	0.198	0.115	0.137	0.094	0.040	0.036	0.040	0.064	0.079	0.069	0.059	0.067
Gems	0.656	0.633	0.378	0.405	0.376	0.248	0.260	0.163	0.153	0.149	0.146	0.167	0.119
Leather	0.574	0.391	0.301	0.252	0.290	0.157	0.100	0.093	0.077	0.099	0.095	0.101	0.106
Machinery	0.034	0.031	0.027	0.033	0.032	0.026	0.017	0.016	0.024	0.031	0.036	0.036	0.043
Pharma	0.111	0.065	0.061	0.049	0.064	0.067	0.055	0.048	0.05	0.069	0.061	0.054	0.068
Plastic	0.236	0.154	0.141	0.105	0.084	0.081	0.073	0.062	0.075	0.064	0.060	0.049	0.057
Rubber	0.564	0.573	0.709	0.241	0.162	0.268	0.178	0.134	0.176	0.274	0.155	0.146	0.213
Steel	0.268	0.278	0.327	0.386	0.251	0.199	0.165	0.120	0.141	0.133	0.124	0.110	0.094
Textile	0.040	0.029	0.023	0.022	0.020	0.018	0.013	0.012	0.012	0.010	0.011	0.012	0.015
Transport	0.138	0.093	0.094	0.132	0.106	0.099	0.117	0.106	0.107	0.089	0.065	0.065	0.061

Table 5: Elasticity Trends in industries[16]

Industry	1989	1991	1995	2001
Automobile	0.1671 (31)	0.0983 (38)	0.0835 (47)	0.1127 (51)
Chemical	0.0211 (261)	0.0143 (366)	0.0060 (825)	0.0067 (869)
Electrical	0.0617 (67)	0.0464 (92)	0.0231 (173)	0.0288 (190)
Electronics	0.1249 (45)	0.0620 (77)	0.0214 (228)	0.0122 (383)
Gems	- 	- 	0.2105 (34)	0.2624 (35)
Leather	- 	- 	0.3683 (29)	0.4610 (35)
Machinery	0.0248 (194)	0.0171 (282)	0.0082 (582)	0.0072 (775)
Pharma	0.1104 (48)	0.0707 (73)	0.0228 (200)	0.0394 (212)
Plastic	0.1394 (33)	0.0639 (52)	0.0208 (158)	0.0358 (158)
Rubber	- 	- 	0.2131 (31)	0.1742 (43)
Steel	0.1359 (49)	0.1244 (68)	0.0346 (128)	0.0376 (138)
Textile	0.0484 (160)	0.0236 (242)	0.0090 (498)	0.0184 (506)
Transport	0.0579 (73)	0.0343 (117)	0.0219 (172)	0.0312 (219)

[16] For the first two periods, the number of firms in gems, leather and rubber sector obtained from PROWESS database is too small.

Table 6: The Price Cost Margin Trends in the Industries

Industry	1989	1995	2001
Automobile			
Automobile 1 (Top 10)	0.4949	0.9912	0.7001
Automobile 3 (Bottom 10)	0.0330	0.0023	0.0008
Foreign Firms	0.4024	1.1332	0.5415
Average Price Cost Margin	**0.2008**	**0.3563**	**0.2536**
Chemical			
Chemical 1 (Top 50)	0.8373	2.6322	2.5754
Chemical 10 (Bottom 10)	0.0022	Negligible	Negligible
Foreign Firms	0.0782	0.1919	0.0876
Average Price Cost Margin	**0.1528**	**0.3675**	**0.3307**
Electrical			
Electric 1 (Top 10)	0.8483	1.7466	1.3490
Electric 5 (Bottom 10)	0.0217	0.0021	0.0008
Foreign Firms	0.2012	0.4731	0.4192
Average Price Cost Margin	**0.2684**	**0.4526**	**0.3456**
Electronics			
Electronics 1 (Top 10)	0.6176	2.4389	3.5714
Electronics 5 (Bottom 10)	0.0130	Negligible	0.0001
Foreign Firms	0.3202	0.3776	0.3930
Average Price Cost Margin	**0.2067**	**0.6895**	**0.9845**
Gems			
Gems 1 (Top 10)	-	0.4228	0.3438
Gems 3 (Bottom 10)	-	0.0022	0.0014
Foreign Firms	-	-	-
Average Price Cost Margin		**0.1514**	**0.1225**
Leather			
Leather 1 (Top 10)	-	0.2233	0.1884
Leather 3 (Bottom 10)	-	0.0131	0.0041
Foreign Firms	-	1.1324	0.9967
Average Price Cost Margin		**0.0917**	**0.0704**
Machinery			
Machine 1 (Top 25)	1.0333	2.2578	2.4187
Machine 10 (Bottom 10)	0.0048	Negligible	Negligible
Foreign Firms	0.1511	0.3130	0.2983
Average Price Cost Margin	**0.2209**	**0.3880**	**0.3881**
Pharmaceuticals			
Pharmaceuticals 1 (Top 10)	0.4968	1.6124	1.0240
Pharmaceuticals 5 (Bottom 10)	0.0369	0.0007	0.0002
Foreign Firms	0.3252	0.7884	0.2405
Average Price Cost Margin	**0.1879**	**0.4148**	**0.2521**
Plastic			
Plastic 1 (Top 10)	0.5100	1.8855	1.2284
Plastic 4 (Bottom 10)	0.0485	0.0022	0.0013
Foreign Firms	0.2082	0.3784	0.2574
Average Price Cost Margin	**0.1996**	**0.5547**	**0.3634**
Rubber			
Rubber 1 (Top 10)	-	0.4049	0.4350
Rubber 3 (Bottom 10)	-	0.0095	0.0049
Foreign Firms	-	0.0446	0.1152
Average Price Cost Margin	**-**	**0.1547**	**0.1660**

Steel			
Steel 1 (Top 10)	0.6582	2.2913	2.0185
Steel 5 (Bottom 10)	0.0061	0.0001	Negligible
Foreign Firms	-	0.1758	0.1124
Average Price Cost Margin	**0.1826**	**0.6134**	**0.5447**
Textile			
Textile 1 (Top 25)	0.4250	1.6511	0.8615
Textile 7 (Bottom 10)	0.0137	Negligible	Negligible
Foreign Firms	0.2117	0.8409	0.1882
Average Price Cost Margin	**0.1556**	**0.4240**	**0.2148**
Transport			
Transport 1 (Top 25)	0.6320	1.5144	1.0154
Transport 7 (Bottom 10)	0.0099	0.0020	0.0003
Foreign Firms	0.3657	1.0459	0.5691
Average Price Cost Margin	**0.1488**	**0.2938**	**0.1914**