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TRADE LIBERALIZATION AND PRICE-COST MARGIN IN INDIAN INDUSTRIES

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Content

Foreword

This paper gives a quantitative explanation of the effect of trade liberalization on Price-Cost Margins (PCM hereafter) in Indian industries. Cross-country studies reveal that import competition causes markups in profit margins to fall. This can be explained by two econometric approaches-one using PCM and the other using Output Growth Rate. Both the approaches yield similar econometric evidence leading us to believe that import competition leads to a fall in PCM in imperfectly competitive industries. Theoretically under the static profit maximization principle as import barriers are removed \ reduced the elasticity of demand would increase due to increased availability of imported good leading to a fall in the PCM. At times, particularly in the short run import liberalization may lead to increased efficiency and competence, having a favourable effect on profitability.

This paper focuses, in particular, on the effect of post-1991 trade liberalization on the PCM in Indian industries and is a pioneering step in studying the effect through an econometric model. The author gives an industry wise comparison of the PCM, based on researches done by various researchers using dummy and explanatory variables which suggests that trade liberalization influenced the impact of exports, R & D et al. Studies also reveal the growth of industry output and industrial concentrations are significant determinants of profitability. However the studies have overlooked the influence of tariff and non-tariff barriers. The authors have used tariff and non-tariff barriers, labour productivity and growth rate of industry as explanatory variables to study PCM.

The econometric analysis uses two models of panel data-Fixed and Random effects models based on the Kmenta Model. Analysis of PCM at the aggregate level reveals that there was no fall after 1991, rather there has been an increase, which may be attributed to fall in labour's share in the value added.

The authors have constructed a quantitative model for estimating and explaining PCM from panel data keeping in view the tariff and non-tariff variables. This leads them to conclude that reduced tariffs have pro-competitive effects on Indian industries and that there was a significant reduction in labour share in value added. They also state that the trade unions have become weaker and are facing a slack in real product wage.

It is hoped that this illuminating piece of work will provide better understanding of the industry implications of the liberalization regime and will help the economy to strategically formulate its stand on tariff negotiations.

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Arvind Virmani
Director & Chief Executive
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Trade Liberalization and Price-cost Margin in Indian Industries

Bishwanath Goldar[*] *and Suresh Chand Aggarwal*[**]

Abstract

Using panel data for 137 three-digit industries for the period 1980-81 to 1997-98, the paper examines the effect of trade liberalization on price-cost margins in Indian industries. An econometric model is estimated to explain variations in price-cost margins, in which the tariff and non-tariff barriers are included among the explanatory variables. Thus, inter-industrial and inter-temporal variations in tariff and non-tariff barriers on manufactured imports are employed to assess the effect of trade liberalization on price-cost margins in domestic industries. The results of the analysis clearly indicate that the lowering of tariff and removal of quantitative restrictions on imports of manufactures in the 1990s had a significant pro-competitive effect on Indian industries, tending to reduce the markups or price-cost margins. The paper notes at the same time that in spite of the pro-competitive effects of trade liberalization reinforced by domestic industrial deregulation, the price-cost margins in manufacturing did not fall in the post-reform period. Rather, there was an increase in the margin in most industry groups as well as at the aggregate manufacturing level. An analysis of trends in labor income in industries brings out that in the post-reform period there has been a marked fall in the growth rate of real wages and a significant reduction in labor's income share in value added, reflecting perhaps a weakening of industrial labor's bargaining power. This seems to have neutralized to a large extent the depressing effect of trade liberalization on the price-cost margins in Indian industries.

Key words: trade liberalization, price-cost margin, Indian industry

JEL Classification: F 13

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Trade Liberalization and Price-cost Margin in Indian Industries

I Introduction

A number of studies for developing countries have found that increased exposure to import competition causes markups or profit margins in industries to fall, with the largest effect being in the highly concentrated industries and in large plants.[1] These include studies undertaken for Chile, Columbia, Mexico, Morocco, and Turkey. That import competition reduces markups has been found also in two recent cross-country studies, covering both developed and developing countries (Hoekman et al., 2001; Kee and Hoekman, 2003).

Two approaches have been taken to examine the effect of increased import competition on markups in industries. In one approach, the price-cost margin (PCM) (defined as the ratio of sales net of expenditure on labor and intermediate inputs over sales) is used as an indicator of the markup, and it is regressed on a set of explanatory variables including variables representing the level of import competition. In the other approach, the methodology developed by Hall (1988) is used. It involves regression of output growth rate on a share-weighted growth rate of inputs, the regression yielding the markup as the slope coefficient. By allowing the coefficient to vary over time, one can test whether import competition affects markup.[2] The empirical results that have been obtained by the two approaches largely point in the same direction, and a general conclusion that may be drawn from the econometric evidence is that increased exposure to import competition leads to a reduction in price-cost margin or markup in imperfectly competitive industries. In other words, import competition disciplines domestic firms in imperfectly competitive industries.

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1 See, for instance, Roberts and Tybout (1996), and Currie and Harrison (1997). For a review of literature, see Tybout (2001) and Epifani (2003).

2 Hoekman et al. (2001) apply the structural regression approach of Hall to estimate the average industry markup for different countries, which are then used in a regression analysis relating markup to import penetration and other explanatory variables. Currie and Harrison (1997) regress output growth on input growth, the tariff and non-tariff barriers and interaction terms involving input growth and the import barriers, thereby estimating jointly the markups, and the effect of trade barriers on productivity and markups.

A theoretical explanation for the observed phenomenon can be provided by linking the removal/reduction of import barriers to the elasticity of demand for products of domestic firms (Tybout, 2001). Under the assumption of static profit maximization, the price set by a firm operating in an imperfectly competitive market as a ratio to marginal cost is a decreasing function of the elasticity of demand. Let p denote price, c marginal cost and η elasticity of demand, then the relationship between markup and elasticity of demand may be written as (Tybout, 2001):

$$\frac{p}{c} = \left(\frac{\eta}{\eta - 1}\right) \quad ...(1)$$

As import barriers are removed/reduced, the elasticity of demand would increase because of increased availability of imported goods, fall in the tariff-inclusive price of such goods to domestic consumers and enlargement of product variety, and this would in turn lead to a fall in the markup.

If one considers instead a theoretical framework typified by a collusive equilibrium rather than static profit maximization, then a theoretical argument for expecting import liberalization to make markups fall is that cooperative behavior may become unsustainable in such an environment (Tybout, 2001). Maintaining collusive equilibrium may become difficult after imports are liberalized because import liberalization changes the pay-off to defecting, or changes firms' ability to punish defectors or makes defection hard to detect.

It should be pointed out here that even though import liberalization leads to greater competition, it need not always have an adverse effect on profitability (price-cost margin) of industrial firms (there is such a possibility at least in the short-run). The reasons are that the firms may increase efficiency (through introduction of advanced technology or restructuring into the areas of their core competence) or the firms may undertake more R&D and advertisement in the changed environment, all of which should have a favorable effect on profitability. Further, increase in import penetration may lead to mergers among the foreign and domestic firms in concentrated markets. Evidently, though there are strong theoretical arguments for expecting trade liberalization to lead to lower profit margins in concentrated industries, and the proposition also has good empirical support, this need not happen in all cases. For instance, in a study of the effect of trade liberalization on profitability in Turkish manufacturing industry, Yalcin (2000) finds that import penetration led to a decrease in the price-cost margin in private sector firms in general, but the price-cost margin in highly concentrated private sector industries *increased instead of going down*.

The object of this paper is to analyze the effect of post-1991 trade liberalization in India on price-cost margins in Indian industries.[3] India has undertaken a major reform of trade policies since 1991 with large reductions made in tariff and non-tariff barriers on imports of industrial products,[4] and accordingly a study of the pro-competitive effects of these reforms would be useful and interesting. There is a growing body of empirical economic literature on the effects of post-1991 industrial and trade reforms in India on the performance of industrial firms, especially on industrial productivity.[5] By comparison, there has been relatively much less research on the effect of the reforms on markups or price-cost margins in Indian industries. The present paper makes an attempt to fill this gap in the literature. To this end, an econometric analysis of the effect of trade liberalization on price-cost margin in Indian industries is undertaken using panel data for 137 three-digit industries covering the period 1980-81 to 1997-98.

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3 The analysis is confined to the organized industrial sector comprising industrial units that employ 10 or more workers with power or 20 or more workers without power.

4 For a discussion on India's economic reforms since 1991, see Joshi and Little (1996), among others.

5 Balakrishnan et al. (2000) and Topalova (2003) have studied the effect of trade liberalization on industrial productivity using firm-level data for Indian manufacturing. Epifani (2003) has recently reviewed the studies on the effect of economic reforms on the performance of Indian industries based on firm-level data. Apart from these, there have been a number of studies which have used industry-level data to examine the effects of industrial and trade reforms on industrial performance in India (for example, Das, 1998, 2001, 2003b; Aghion et al., 2003; Goldar and Kumari, 2003; Pattnayak and Thangavelu, 2003).

The rest of the paper is organized as follows. Section 2 discusses briefly the findings of some recent studies on markups or profitability in Indian industries. Section 3 discusses the model applied for the analysis, the estimation technique, the data sources and the construction of variables used for this study. The empirical results are presented in Section 4, which begins with an analysis of trends in price-cost margin and labor income in Indian industries in the 1980s and 1990s, followed by the estimates of the model. Section 5 summarizes the main findings of the study and concludes.

II Findings of Earlier Studies

Krishna and Mitra (1998) in their study covering four Indian industries find that in the post-reform period markup declined significantly in three out of four industries. The decrease was to such a level as the markup parameter for firms dropped to a value less than one, i.e. the firms would incur losses. They rationalize this finding on the grounds that 'in the presence of adjustment and sunk costs a firm may lose money while it adapts to a new trading environment'.[6]

In contrast, the study undertaken by Srivastava et al. (2001), based on company-level data for the period 1980 to 1997, finds that the markup increased in the post-reform period in publishing and printing, leather products, food products, rubber and plastic products, motor vehicles, and electrical machinery. The explanation given is that these are generally consumer goods and consumer durables producing sectors with very limited foreign competition during the period studied. The markup declined in non-metallic mineral products, basic metals and paper products. The squeeze in the markup for metals and non-metallic mineral products is attributed to increased domestic and foreign competition. For textiles, machinery and fabricated metal products, no change in markup is found. Thus, the results of the study indicate that despite large reductions in tariff and non-tariff barriers on imports of industrial products, a reduction in markups did not take place in the post-reform period in most Indian industries (Annex A presents the estimates

[6] In industries marked by large sunk entry cost, unexpected foreign competition may cut into the revenues that firms had expected to earn to cover their entry cost (rather than merely squeezing monopoly profits), making them sorry ex-post that they had entered (Tybout, 2001).

of mark-up obtained in the study). However, in certain industries, import liberalization did have a significant adverse effect on profitability of Indian firms.

While Krishna and Mitra (1998) and Srivastava et al. (2001) have used the structural regression approach of Hall for studying of the effect of economic reforms on markups in Indian industries, Kambhampati and Parikh (2003) have taken the other approach, i.e. estimating a regression equation in which price-cost margin is taken as the dependent variable. They use data for 281 firms for the period 1980 to 1998. Analyzing trends in profit (price-cost) margins, they find that in firms with above average export intensity (exports to sales ratio over 4.5 percent), the profit margin increased during 1992-98 as compared to 1980-90, but in relatively less export-oriented firms the profit margin went down. The fall was from 20 percent during 1980-90 to 9 percent during 1992-98.

For the regression analysis, Kambhampati and Parikh have used a dummy variable to capture the effect of trade reforms (the dummy variable being based on time-periods, pre and post-reform, captures the effects of industrial and other policy reforms as well). Export intensity, import intensity, R&D intensity, capital-output ratio, and market share are among the explanatory variables used. The dummy variable enters the regression equation separately as well as in interaction with other explanatory variables. The results indicate that the effect of liberalization on profitability was mainly through its impact on other firm variables, particularly market share, advertising, R&D and exports. While exports had a pro-competitive effect, advertising and R&D caused profitability to increase. The results of the analysis thus suggest that while trade liberalization *per se* had a pro-competitive effect, it changed the impact of exports, R&D and advertisement on profitability and thus the overall effect on price-cost margins may have been positive for certain sections of the domestic industry.

In comparison with the above three studies, the study of profitability of Indian industries undertaken by Rao (2001) is more detailed. The work of Rao, like Srivastava et al. (2001), is based on company-level data taken from the Prowess database of the CMIE

(Center for Monitoring Indian Economy, Mumbai). In her analysis of profitability of industrial companies, she includes variables like concentration ratio, market share, advertising-sales ratio, growth rate of industry, export-sales ratio, import-sales ratio, etc. Panel data for a total of 1458 companies belonging to six industries (three producer goods industries and three consumer goods industries) for the period 1990-91 to 1998-99 are used for the analysis. For the selected industries, she finds dismal profitability performance by firms in post-reform period. Her econometric results show that growth of industry output and industrial concentration are statistically significant determinants of firm profitability in India. External trade is found to be playing a significant role only in producer's goods industries where reduction in import duties has been relatively higher.

One limitation common to the four studies spoken of above is that the tariff and non-tariff barriers have not been directly included in the analysis as variables affecting markups or profitability. In this paper, we use tariff rates and non-tariff barriers as explanatory variables in the regression equations estimated to explain price-cost margin, thereby employing inter-temporal and across-industry variation in trade protection measures to identify the effect of trade policies. This is, needless to say, far more satisfactory than employing a post-reform dummy variable as Krishna-Mitra, Kambhampati-Parikh and Srivastava et al. have done. [7]

III Model, Data and Variables

III.1 The Model

As mentioned earlier, we use an industry-level panel data set for the econometric analysis (discussed further in Section 3.3). The variable of interest is price-cost margin, and the aim of the analysis is to find out whether trade liberalization had a significant pro-competitive effect, reducing price-cost margins in Indian industries.

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[7] The advantage of including tariff and not-tariff barriers in the analysis, rather than using a dummy of post- reform period, has been noted by Goldar and Kumari (2003) and Topalova (2003).

If it is assumed that unit expenditures on labor and intermediate inputs are constant with respect to output, then the price-cost margin is a monotonic transformation of the markup. It can also be shown that the price-cost margin is current economic profit over sales plus the competitive return to capital over revenue (Tybout, 2001). Thus, the price-cost margin of j'th industry in period t, denoted by PCM_{jt}, may be written as:

$$PCM_{jt} = \frac{\pi_{jt}}{p_{jt} q_{jt}} + \frac{(r_t + \delta) K_{jt}}{p_{jt} q_{jt}} \quad ...(2)$$

where π denotes profits, r market return on capital, δ depreciation rate, K capital, p price and q quantity produced. In industries where competition drives economic profits to zero, the variables representing import competition should contribute nothing to the explanation of variations in PCM after controlling for the ratio of capital stock to output. On the other hand, if economic profits are present, then increased import competition should lower PCM by increasing price elasticity or by destroying collusive equilibria (Tybout, 2001). Accordingly, the basic model used in studies on the effect of import competition on PCM based on industry-level data typically takes the following form (Epifani, 2003):

$$PCM_{jt} = f(H_{jt}, IMP_{jt}, H_{jt} \cdot IMP_{jt}, K_{jt} / q_{jt}, I_j, T_t) \quad ...(3)$$

Here, H_{jt} is the Herfindahl index (an index of industry structure that is inversely related to the degree of competition) and IMP_{jt} is the import penetration ratio (reflecting import competition). The pro-competitive effect of trade liberalization should show up in a negative coefficient of the import penetration variable. The interaction term $H_{jt} \cdot IMP_{jt}$ allows one to test the hypothesis that if highly concentrated industries enjoy above normal profits because of market power, the adverse effect of import competition on profitability should be greater for such industries. Thus, the coefficient of the interaction term should be negative. The capital-output ratio controls for inter-industry differences in capital intensity, while I_j and T_t are industry and time dummies, capturing industry-specific and time-specific effects.

The model we use for our analysis is somewhat different from the one in equation (3) above though the underlying relationships between variables are the same. The model may be written as:

$$PCM_{jt} = f(DCON_j, MB_{jt}, DCON_j \cdot MB_{jt}, LP_{jt}, X_{jt}) \quad ...(4)$$

where MB denotes import barriers, LP denotes labor productivity and DCON is a dummy variable representing industrial concentration (taking value one for highly concentrated industries, zero otherwise). X is the vector of other variables used in the estimated model, which are expected to influence price-cost margin in industries.

Since the analysis is undertaken at three-digit industry level and no estimates of industrial concentration (e.g., Herfindahl index) are readily available at that level of industrial disaggregation, we have used a dummy variable, DCON, in the model to capture the effect of market power on profitability. We use for this purpose the estimates of industrial concentration in India made by Kambhampati (1996). DCON is assigned value one for industries for which Kambhampati's estimates indicate relatively high level of concentration, otherwise it is assigned value zero.

To capture the effect of import competition, tariff rates and non-tariff barriers (import coverage ratio) have been used. Since we did not get good results when capital-output ratio was included in the regression as an explanatory variable, we have replaced it by labor productivity (measured by real value added per employee). Labor productivity should bear a strong positive correlation with capital intensity and would therefore be a good proxy. Another advantage of using labor productivity is that the effect of productivity advances on profitability would be captured by this variable.

Besides the three variables mentioned above, we have used two other explanatory variables. These are growth rate of the industry (in terms of real output) and the deviation of income share of labor from estimated elasticity of real value added with respect to labor (based on an estimated production function).

Following Ghose (1975), Kambhampati (1996) and Rao (2001), we have included growth rate of the industry as an explanatory variable in the model. Similar to the arguments given by Kambhampati (1996), who included lagged growth rate as an explanatory variable, Rao (2001) has argued that higher growth rate might result in increased efficiency leading to increased profit margins for the firm. She has found a strong positive relationship between output growth and profitability for Indian industries in the 1990s. However, Ghose (1975) found strong empirical support for the Baumol (1962) assertion that fast growth of an industry attracts new entrants because barriers to entry are less in an expanding market, which reduces the level of concentration and thus the profitability of firms. Higher growth rate of industry may also depress profitability either through fall in product prices or through rise in input prices.

As regards the deviation of income share of labor from estimated elasticity of real value added with respect to labor, this variable, in our opinion, reflects how inter-temporal changes in labor's income share in value added may influence price-cost margins. In his study of the effect of trade liberalization on price-cost margin in Turkish manufacturing industry, Yalcin (2000) points out that the effect of import competition on the price-cost margin may be clouded by the influence of several other factors. In particular, he notes that a fall in labor's income share may cause the price-cost margin to go up. Indeed, the econometric results of the study show that a decline in labor's income share caused price-cost margin in Turkish manufacturing to increase. In this study, instead of taking wage share as an explanatory variable, the deviation of labor's income share from estimated elasticity is used. The rationale for constructing the explanatory variable in this manner is that capital-labor substitution may lead to changes in the income share of labor and this effect needs to be netted out since capital intensity (represented by labor productivity) is already included in the model.

It may be mentioned in this context that there is a complex relationship between protection to domestic industry and the income of labor employed in the industry. An important issue is how the rents associated with the protected trade/industrial regime are distributed between laborers and producers. Needless to say that trade union strength should be an important determinant of the portion of the rent accruing to labor.[8] Inasmuch as trade liberalization reduces or eliminates the rent accruing to labor, it would have a depressing effect on the wage rate. [9] A reduction in labor's share in the rent (shift of rent from laborers to producers), say caused by weakening of bargaining power of trade unions, would have a favorable effect on profitability of firms in concentrated industries.[10]

III.2 Model Estimation

Having discussed the model, we turn to the estimation. As mentioned earlier, for the econometric analysis, we use panel data for 137 industries for 18 years. Two commonly used 'panel data' models are the Fixed-effects model and the Random-effects model. For this study, we have used the Kmenta model[11] which is based on Generalized Least Squares (GLS) and corrects for heteroscedasticity and autocorrelation, a feature of panel data sets (the details of the model are provided in Annex B). We have carried out the necessary tests and found that the application of the Kmenta model is justified (test results reported in Annex B).[12] Since the final panel data set used is unbalanced, we have applied unbalanced panel data estimation method.

III.3 Data and Variables

The basic source of data for this study is the *Annual Survey of Industry* (ASI) published by the Central Statistical Organization, Government of India. Data for three-

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8 See Abowd and Lemieux (1993) and Borjas and Ramey (1995), among others.

9 A number of studies have examined how trade liberalization affects wages in industries of developing countries through elimination/reduction in rents accruing to labor. See, for instance, Revenga (1997). Goldar (2003) has examined this issue in the context of Indian manufacturing industries.

10 There have been several studies on the effect of union power on profitability (see, for instance, Freeman, 1983; and Dobbelaere, 2003) and how trade liberalization may affect union power (see, for instance, Dumont, et al., 2003).

11 See Kmenta (1986).

12 Note further that since industrial concentration is captured by a dummy variable (DCON) which does not vary over time, the fixed-effects model cannot be applied.

digit industries for the period 1980-81 to 1997-98 have been taken.[13] Though the data are available for 152 three-digit industrial groups, the study includes only 137 groups. The remaining groups have been excluded because in these the value of products is reported to be zero or very low in comparison with value added. Since these are service-oriented industries, their profitability might not have been affected by removal of import barriers on manufactured products. Accordingly, it was felt that such industries should be excluded from the analysis. Thus, we had 2466 observations on 137 industries for 18 years. But, subsequently we dropped six observations where the ratio of emoluments to value added is abnormally high (greater than 5) leaving us with 2460 observations. One observation is also lost for each industry when we use the variable output growth rate for econometric analysis.

The variable PCM is computed as gross value added minus emoluments, divided by the value of gross output. Labor productivity (LP) is computed as gross value added at constant prices divided by number of employees. Growth rate of industry (GRI) is the annual growth rate in deflated value of gross output. For value added and gross output, the same deflator has been used. For each industry, we have used as deflator the best available wholesale price index series we could obtain from the official series on Index Number of Wholesale Prices.

The main data source on tariff rates and non-tariff barriers (percentage import coverage by quantitative restrictions) is a research project undertaken at the ICRIER, the result of which are reported in Das (2003a). For a majority of three-digit industries, data on import barriers could be obtained from this source. Since Das has not covered all three-digit industries, it has been necessary to use other sources. Tariff rates and non-tariff barriers at the level of industrial groups (66 sectors of Input-Output table) have been taken form Goldar and Saleem (1992), NCAER (2000) and Nouroz (2001). In a number of cases, the estimate available for an input-output sector has been applied to all three-

[13] The Economic and Political Weekly has created a systematic, electronic database using ASI results for the period 1973-74 to 1997-98. Concordance has been worked out between the industrial classifications used till 1988-89 and that used thereafter (NIC-1970 and NIC-1987), and comparable series for various three- and two-digit industries have been prepared. We have used this database for our study.

digit industries belonging to that sector. It has also been necessary to interpolate the tariff rates or import coverage ratios, as these are not available for all the years of the period under study. For some industries, the import coverage ratio is not available for years prior to 1988-89. For such industries, the figure for 1988-89 has been applied for all earlier years of the 1980s. This should not introduce any serious error in the data on non-tariff barriers, as quantitative restrictions covered a very high proportion of imports of manufactures throughout the decade.[14]

To obtain deviation of labor income share from the elasticity of value added with respect to labor, a Translog production function has been estimated. The estimated production function is given in Annex C. Real gross value added is taken as the measure of output, number of employees as the measure of labor input and gross fixed capital stock at constant price as the measure of capital input.[15] Given the estimated production function, the logarithmic derivative of value added with respect to labor yields the required elasticity, which varies across observations. The income share of labor in gross value added is compared with this elasticity and the deviation is computed.

As mentioned earlier, we use a dummy variable, DCON, in the model to capture the effect of market power on profitability. DCON is assigned value one for the 23 industries for which Kambhampati's estimates indicate high level of concentration, otherwise it is assigned value zero.

[14] For aggregate manufacturing, the proportion of imports covered by quantitative restrictions was about 90 per cent in 1988-89.

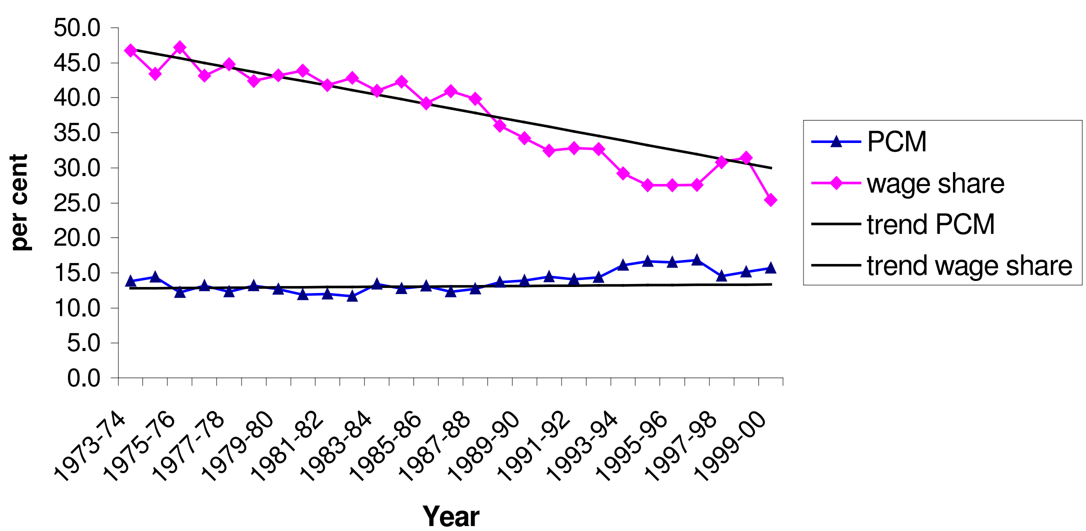
[15] Construction of real fixed capital stock series for each of the 137 industries would be an enormous task. For a research project undertaken at the ICRIER, real fixed capital series were constructed for 41 major industrial groups using the perpetual inventory method. We have taken the estimated capital stock series for each group and proportionately allocated the capital stock estimates among the constituent three-digit industries according to book-value of fixed assets reported in the ASI.

IV Empirical Results

IV.1 Analysis of trends in price-cost margin and labor income

Analysis of price-cost margin at the aggregate level reveals that there was no fall in the price-cost margin after 1991 when the process of trade and industrial reforms began. Rather, the margin seems to have increased in the post-reform period. This is broadly in agreement with the findings of Srivastava et al. (2001). It may also be noted that the price-cost margin in the post-reform period exceeded the level predicted by a simple trend line fitted to the series on the margin for the period 1973-74 to 1990-91 (see Figure 1). On the other hand, there has been a significant fall in the income share of labor in value added.[16] The labor share in the 1990s was much lower than the expected level indicated by the previous trend (Figure 1). This suggests the possibility that the fall in labor's share in value added may have helped prevent a slide in the average profit margin in Indian industries in the post-reform period.

Fig. 1: Price cost margin and wage share in gross value added, Indian Manufactuirng, 1973-74 to 1999-00



[16] The fact that the income share of labor in Indian industries has fallen sharply in the 1990s has drawn attention of researchers. See, for instance, Unel (2003).

A comparison of price-cost margin between the pre- and post-reform period at the level of two-digit industries is presented in Table 1. The table brings out that the price-cost margin in the post-reform period exceeded the average margin in the period 1973-74 to 1990-91 in most industries. Also, in most cases, it exceeded the level predicted by the past trend. The increase in price-cost margin in the 1990s as compared to the 1970s and 1980s was particularly marked in the following industries: Beverages and tobacco products (industry code 22), Textile products including readymade garments (26), Leather and leather products (29), Chemicals and chemical products (30), and Rubber, plastic, petroleum and coal products (31).

Table 1: Price cost margin in Indian manufacturing, two-digit industries,
1973-74 to 1997-98

Industry code	Description	Price-cost margin (%)			
		1973-74 to 1990-91 (average)	1991-92 to 1997-98 (average)	1995-96 to 1997-98 (average)	1991-92 to 1997-98 (estimate based on past trend)
20-21	Food products	7.7	9.0	9.4	9.8
22	Beverage & tobacco	15.5	21.0	22.3	16.1
23	Cotton textiles	9.8	9.9	9.9	8.7
24	Wool, silk and manmade fibre textiles	13.8	15.6	14.9	13.5
25	Jute textiles	5.0	3.9	4.0	-0.9
26	Textile products	11.2	18.3	16.6	15.3
27	Wood, wood products, furniture	13.5	15.6	16.5	12.4
28	Paper, paper products, printing and publishing	16.6	16.8	16.0	12.6
29	Leather, leather products	7.8	12.9	11.6	10.2
30	Chemicals, chemical products	17.3	21.4	22.4	14.9
31	Rubber, plastic, petroleum and coal products	10.5	14.6	14.0	11.3
32	Non-metallic mineral products	18.2	21.6	22.1	23.0
33	Basic metals and alloys	13.1	15.8	18.3	11.9
34	Metal products	14.2	14.1	14.4	14.3
35	Machinery	16.4	16.9	17.5	14.9
36	Machinery	16.3	18.3	17.3	17.1
37	Transport equipment	13.8	15.0	16.5	13.6
38	Other manufacturing	18.3	18.0	16.9	20.3

Source: based on ASI data.
Note: Price-cost margin = (gross value added minus total emoluments)/value of output

Table 2 gives the profile of industries according to price-cost margin (PCM), in respect of the 137 three-digit industrial groups covered in the study. We find that among the industries which had less than 15 percent PCM in 1980s, 19.54 percent (17 out of 87) recorded a fall in PCM in 1990s. The relevant proportion is 32.5 percent for industries which had PCM between 15 to 20 percent, and 50 percent for industries which had PCM above 20 percent. It is evident therefore that the decline in PCM in 1990s was relatively more common in industries which had higher PCM in 1980s. By contrast, among the industries that had very low PCM in 1980s (i.e. below 5 percent), no industry recorded a decline, perhaps because there was hardly any potential for further decline.

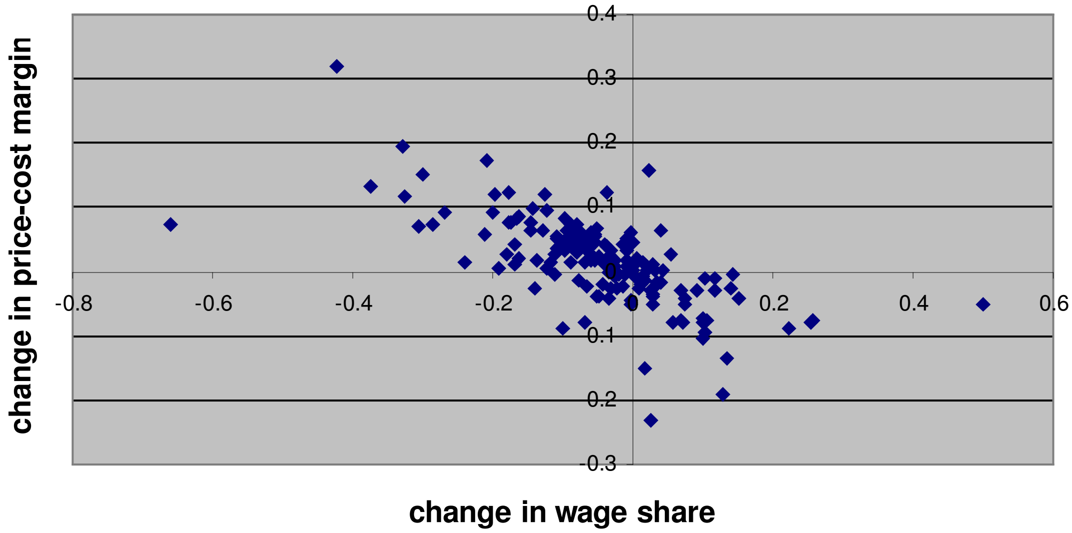
Table 2: Profile of industries according to price-cost margin

PCM range in the 1980s	Total no. of industries (three-digit)	No. of industries in which PCM declined in the 1990s	No. of industries in which growth rate of production declined in the 1990s
Less than 5%	3	-	2 (66.6%)
5 to 10 %	31	6 (19.35%)	14 (45.16%)
10 to 15%	53	11(20.75%)	22 (41.51%)
Below15 %	**87**	**17 (19.54%)**	**38 (43.68%)**
15 to 20%	40	13 (32.5%)	19 (47.5%)
Above 20%	10	5 (50%)	4(40%)
Above 15%	**50**	**18 (36%)**	**23 (46%)**
Total	**137**	**35 (25.54%)**	**61 (44.52%)**

Out of the 137 industries studied, 61 (or 44.5 percent) experienced a fall in the growth rate of output (real) in the 1990s as compared to the 1980s. The proportion was 43.7 percent (38 industries out of 87) among the industries with relatively low PCM in 1980s (below 15 percent). The proportion was marginally higher at 46 percent for industries that had a relatively higher price-cost margin in the 1980s (above 15 percent).

Figure 2 shows a plot of change in labor share in gross value added against change in price-cost margin between 1989-90 and 1997-98 for three-digit industries. The correlation coefficient is –0.67. It would be noticed that in a large number of industries there was an increase in the price-cost margin between 1989-90 and 1997-98. In most cases, this was associated with a fall in the income share of labor in value added. Thus, we find evidence that provides some support to our conjecture that the observed increase in the price-cost margin in Indian industries at the aggregate level in the 1990s is mainly due to a fall in labor’s income share.

Figure 2: changes in wage share and price-cost margin, Indian manufacturing industries (3-digit), 1989-90 to 1997-98



In a recent paper, Balakrishnan and Suresh Babu (2003) have noted that in the post-reform period there has been an almost across-the-board increase in the price-cost margin in Indian industries at the two-digit level (see Table 3 which reproduces the ratios computed by them). They also note that the share of wages in value added has declined in the post-reform period in all the two-digit industries and hence at the aggregate level. Accordingly, they conclude that there has been a relative shift of income away from workers towards profit earners. This is consistent with the trends in price-cost margin and labor share observed in Table 1 and Figure 1.

It is worth noting in this context that there has been a deceleration in the growth of real product wage of industrial workers in the post reform period.[17] The growth rate in product wage at the aggregate manufacturing level was 3.52 per cent per annum during the period 1973-74 to 1990-91 which declined to 2.91 per cent per annum during the period 1991-92 to 1999-00 (Balakrishnan and Suresh Babu, 2003:4002). The deceleration in the growth of real wages (money wages deflated by the consumer price index for industrial workers) has been sharper. The growth rate in real wages at the aggregate manufacturing level was 2.99 per cent per annum during the period 1973-74 to 1990-91, and it declined to 0.37 per cent per annum during the period 1991-92 to 1999-00 (Balakrishnan and Suresh Babu, 2003:4003). In nearly half of the two-digit industries, there was a fall in real wages in the 1990s. These trends in real product wage and real wages are consistent with the observed decline in the income share of labor in the post-reform period.

[17] Goldar (2003) has examined the causes of the fall in the growth rate of real product wage in Indian industries in the 1990s.

Table 3: Price-cost margin and wage share in Indian manufacturing, two-digit industries, 1973-74 to 1999-00

Industry code	Description	Price-cost margin (%)		Wage share (%)	
		1973-74 to 1990-91 (average)	1991-92 to 1999-00 (average)	1973-74 to 1990-91 (average)	1991-92 to 1999-00 (average)
20-21	Food products	7.66	8.89	23.46	18.88
22	Beverage & tobacco	15.51	21.32	26.98	19.52
23 to 25	Textiles	10.58	11.45	46.04	32.52
26	Textile products	11.15	17.61	26.86	17.07
27	Wood, wood products, furniture	13.55	15.54	29.96	23.62
28	Paper, paper products, printing and publishing	16.57	16.31	29.01	21.50
29	Leather, leather products	7.71	12.47	34.76	21.20
30	Chemicals, chemical products	17.27	21.62	14.80	9.78
31	Rubber, plastic, petroleum and coal products	10.48	14.19	13.68	9.87
32	Non-metallic mineral products	18.16	21.60	25.32	15.49
33	Basic metals and alloys	13.09	16.15	26.61	15.88
34	Metal products	14.21	13.82	27.94	21.62
35+36	Machinery	16.41	16.84	22.37	16.52
37	Transport equipment	13.81	14.71	34.14	23.24
38	Other manufacturing	18.38	17.23	26.33	16.99
	All manufacturing	12.99	15.50	26.59	17.20

Source: Balakrishnan and Suresh Babu (2003)

Notes:

Price-cost margin = (output minus total emoluments and intermediate inputs)/value of output
Wage share = wages/ value added. Note that labor income share shown in Figure 1 is based on total emoluments which includes income of 'persons other than workers'.

IV.2 Estimates of the Kmenta Model

The estimates of the model are presented in Tables 4 and 5. Since both tariff and non-tariff barriers were reduced in the process of trade reforms, and the inter-temporal changes in tariff and non-tariff barriers are highly correlated (see Annex D), separate estimation of the model has been done using tariff and non-tariff barriers as alternate variables representing import competition (or lack of it).[18] The results obtained by using tariff rates are reported in Table 4 and those using non-tariff barriers are reported in Table 5.

In addition to the variables listed earlier, a dummy variable D for the post-reform period has been included in the model. This is expected to capture the influences of reforms, other than trade reforms.

The results presented in Tables 4 and 5 indicate clearly a positive relationship of price-cost margin with tariff and non-tariff barriers. The coefficient of tariff rate (TRF) is statistically significant at one percent level in all the seven estimates of the model presented in Table 4. The coefficient of quantitative restrictions variable (QR) is also statistically significant at one percent level in all estimates of the model presented in Table 5. The inference that may be drawn from these results is that lowering of tariff and non-tariff barriers on imports of manufactures in India in the 1990s had a significant pro-competitive effect on Indian industries, tending to reduce the profit margins.

[18] In this regard, our analysis is similar to that of Currie and Harrison (1997).

Table 4: Estimates of the Model Explaining Price-cost Margin in Indian Industries (using tariff rates)

Dependent variable = PCM

Explanatory Variables	Model						
	I	II	III	IV	V	VI	VII
TRF	0.0119*	0.0105*	0.0113*	0.0133*	0.0113*	0.0122*	0.0142*
(t)	(4.408)	(3.893)	(3.939)	(4.333)	(4.159)	(4.243)	(4.628)
DWSE	-11.176*	-11.121*	-11.138*	-11.211*	-10.903*	-10.909*	-11.003*
(t)	(-27.5)	(-27.27)	(-27.28)	(-27.38)	(-26.29)	(-26.26)	(-26.42)
LP	0.075*	0.0073*	0.0074*	0.072*	0.0076*	0.0078*	0.0075*
(t)	(17.85)	(17.64)	(17.89)	(17.53)	(17.85)	(18.19)	(17.69)
GRI					-0.0095*	-0.0095*	-0.00946*
(t)					(-7.07)	(-7.098)	(-7.056)
DCON		0.3684		1.7524*	0.4585		2.04*
(t)		(1.153)		(2.557)	(1.412)		(2.967)
TRF*DCON			-0.00078	-0.0127*		-0.00067	-0.0144*
(t)			(-0.277)	(-2.104)		(-0.2338)	(-2.38)
D	-0.5667*	-0.5564*	-0.5570*	-0. 5649*	-0.5461*	-0.5431*	-0.5595*
(t)	(-3.180)	(-3.116)	(-3.12)	(-3.165)	(-3.051)	(-3.034)	(-3.123)
CONSTANT	7.6909*	7.7139	7.7087	7.4744*	7.6569	7.6354	7.4141
(t)	(22.89)	(23.09)	(22.87)	(20.78)	(22.38)	(22.16)	(20.22)
R^2_{OE}	0.7560	0.7563	0.7584	0.7595	0.7607	0.7627	0.7650
DW	1.9972	1.9883	1.9886	1.9904	1.9817	1.9828	1.9843
No. of observations	2460	2460	2460	2460	2323	2323	2323

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%,
*** = statistically significant at 10%

TRF= tariff rate, DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post reform period.

Table 5: Estimates of the Model Explaining Price-cost Margin in Indian Industries (using non-tariff barriers)

Dependent variable = PCM

Explanatory Variables	Model					
	I	II	III	IV	V	VI
QR	0.0107*	0.00936*	0.00767*	0.00929*	0.00739**	0.00748**
(t)	(3.755)	(3.262)	(2.604)	(3.233)	(2.508)	(2.432)
DWSE	-11.223*	-11.14*	-11.114*	-10.938*	-10.92*	-10.918*
(t)	(-27.56)	(-27.27)	(-27.21)	(-26.21)	(-26.19)	(-26.19)
LP	0.074*	0.072*	0.00725*	0.00747*	0.0075*	0.00753*
(t)	(17.74)	(17.43)	(17.48)	(17.50)	(17.55)	(17.57)
GRI				-0.00989*	-0.00989*	-0.0099*
(t)				(-7.265)	(-7.277)	(-7.289)
DCON		0.6434**		0.7754**		0.00346
(t)		(2.097)		(2.485)		(0.00535)
QR*DCON			0.0086**		0.0101*	0.00989
(t)			(2.48)		(2.849)	(1.345)
D	-0.5834*	-0.5623*	-0.5659*	-0.5857*	-0.5911*	-0.5984*
(t)	(-3.223)	(-3.108)	(-3.129)	(-3.248)	(-3.279)	(-3.317)
CONSTANT	8.0066*	7.9584	8.0792	8.0332	8.1656	8.1644
(t)	(25.3)	(24.78)	(25.44)	(24.88)	(25.57)	(24.63)
R^2_{OE}	0.7643	0.7635	0.7621	0.7689	0.7665	0.7659
DW	1.9826	1.9731	1.9743	1.9675	1.9696	1.9702
No. of observations	2460	2460	2460	2323	2323	2323

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%, *** = statistically significant at 10%

QR= quantitative restrictions (import coverage), DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post reform period.

The coefficient of the dummy variable representing highly concentrated industries (DCON) is consistently positive and statistically significant at five percent level or better in some of the estimates of the model presented in Tables 4 and 5. The finding of a positive relationship between industrial concentration and price-cost margin or profitability is consistent with theoretical expectations and in agreement with the results of Kambhampati (1996) and Rao (2001). The interaction term between tariff rate and concentration dummy has a negative coefficient (contrary to what is expected) while the interaction term between QR and concentration dummy has a positive and statistically significant coefficient. It may be inferred accordingly that the removal of quantitative restrictions on imports had a much stronger effect on the profitability of highly concentrated industries than the lowering of tariff rates. Another inference that may be drawn from the results is that the trade liberalization had a relatively stronger effect on profitability of highly concentrated industries than on profitability of other industries.

A significant positive relationship is found between labor productivity (LP) and price-cost margin. Such a relationship is obviously expected. On the other hand, a significant negative relationship is found between growth rate of industry (GRI) and price-cost margin. The results in respect of GRI are at variance with the results of Rao (2001) but are in line with the results obtained by Ghose (1975).

The post-reform dummy (D) has a negative and statistically significant coefficient. This is perhaps a reflection of pro-competitive effects of reforms other than trade reforms (e.g., industrial reforms, and easing of restrictions on entry of foreign direct investment).

As mentioned earlier, the deviation of labor income share in value added from the elasticity of output with respect to labor has been included in the model to capture the effect of inter-temporal changes in labor's income share on profitability of industrial firms. The coefficient of this variable is negative and statistically significant at one percent level in all the estimates of the model presented in Tables 4 and 5. The mean value of DWSE for the post-reform period is about 17 percentage points lower than that of the pre-reform period. It seems therefore that a fall in labor's income share in the post-reform period neutralized to a large extent the pro-competitive effects of trade reforms and other reforms.

To check the robustness of the model estimates, the model has been estimated separately for consumer goods industries and intermediate and capital goods industries. The 137 industries covered in the study have been divided into two groups: Consumer goods (84 industries) and intermediate and capital goods (53 industries). The estimates of the Kmenta model for intermediate and capital goods are shown in Tables 6 and 7, and those for consumer goods are shown in Tables 8 and 9. The model estimates for the two groups of industries are found to be quite similar to the results reported in Tables 4 and 5 based on the entire sample and thus raise our confidence in the results.

While the model results for the consumer goods industries are by and large similar to those for the intermediate and capital goods industries, there are some indications from the results that the effect of tariff reduction on the price-cost margin was relatively less for consumer goods industries than for intermediate and capital goods industries. The same applies to the effect of 'other reforms' captured by the post-reform dummy variable, D. It would be noticed that the coefficients of tariff rate are relatively lower for the estimates for consumer goods industries. Given that a high level of QR was maintained for the consumer goods long after the reforms began in 1991, the relatively low impact of tariff changes is expected. A simple comparison of average PCM shows that in intermediate and capital goods industries the average PCM increased from 16 percent in the pre-reform period to 17.6 percent in the post-reform period. In consumer goods industries, by contrast, the average PCM increased from 13.4 percent in the pre-reform period to 16.6 percent in the post-reform period. This is consistent with the finding of a lower impact of tariff reform on PCM for consumer goods industries.

Table 6: Estimates of the Model Explaining Price-cost Margin in Intermediate and Capital Goods Industries (using tariff rates)

Dependent variable = PCM

Explanatory Variables	Model					
	I	II	III	IV	V	VI
TRF	0.0197*	0.0202*	0.0204*	0.02268*	0.02084*	0.02099*
(t)	((4.108)	(4.124)	(4.048)	(4.364)	(4.357)	(4.297)
DWSE	-15.84*	-15.784*	-15.798*	-15.862*	-15.295*	-15.297*
(t)	(-21.25)	(-20.92)	(-21.02)	(-21.03)	(-20.76)	(-20.83)
LP	0.00818*	0.00786*	0.00819*	0.00762*	0.00847*	0.00882*
(t)	(11.41)	(10.54)	(11.03)	(10.20)	(11.35)	(11.86)
GRI					-0.00762*	-0.00771*
(t)					(-4.346)	(-4.432)
DCON		2.9270*		4.8051*	3.4099*	
(t)		(3.747)		(3.219)	(4.671)	
TRF*DCON			0.00158	-0.0172		0.004248
(t)			(0.1833)	(-1.154)		(0.4966)
D	-1.1806*	-1.1207*	-1.1399*	-1.135*	-0.9817*	-0.9997*
(t)	(-4.145)	(-3.891)	(-3.954)	(-3.945)	(-3.490)	(-3.555)
CONSTANT	6.5735	6.5553	6.5512	6.4273	6.3347	6.3555
(t)	(12.47)	(12.22)	(12.12)	(11.66)	(11.91)	(11.89)
R^2_{OE}	0.8248	0.8081	0.8076	0.8119	0.8171	0.8161
DW	2.01	1.997	1.998	2.0	1.9765	1.9749
No. of observations	953	953	953	953	900	900

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%, *** = statistically significant at 10% , TRF= tariff rate,
DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry,
DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post-reform period.

Table 7: Estimates of the Model Explaining Price-cost Margin in Intermediate and Capital Goods Industries (using non-tariff barriers)

Dependent variable = PCM

Explanatory Variables	Model					
	I	II	III	IV	V	VI
QR	0.0136*	0.01303*	0.0134*	0.01468*	0.0118*	0.0118*
(t)	(3.763)	(3.509)	(3.508)	(3.751)	(3.272)	(3.175)
DWSE	-15.946*	-15.887*	-15.946*	-15.868*	-15.393*	-15.426*
(t)	(-21.1)	(-20.80)	(-21.00)	(-20.74)	(-20.54)	(-20.64)
LP	0.0077*	0.00756*	0.00785*	0.00762*	0.00813*	0.008385*
(t)	(10.82)	(10.06)	(10.57)	(10.07)	(10.80)	(11.24)
GRI					-0.00826*	-0.00832*
(t)					(-4.665)	(-4.743)
DCON		3.1081*		4.1303*	3.6823*	
(t)		(4.387)		(3.318)	(5.664)	
QR*DCON			-0.0020	-0.00893		0.00193
(t)			(-0.2659)	(-0.7175)		(0.2510)
D	-1.1323	-1.0731*	-1.0801*	-1.0817*	-0.970*	-0.9873*
(t)	(-3.826)	(-3.566)	(-3.595)	(-3.561)	(-3.323)	(-3.378)
CONSTANT	7.2623	7.2886	7.2715	7.1680	7.2047	7.267
(t)	(16.98)	(16.60)	(16.49)	(15.84)	(16.75)	(16.86)
R^2_{OE}	0.8513	0.8254	0.8260	0.8325	0.8296	0.8258
DW	1.99	1.985	1.986	1.9852	1.9606	1.9565
No. of observations	953	953	953	953	900	900

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%, *** = statistically significant at 10%,
QR= quantitative restrictions (import coverage), DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post reform period.

Table 8: Estimates of the Model Explaining Price-cost Margin in
consumer goods industries (using tariff rates)

Dependent variable = PCM

Explanatory Variables	Model					
	I	II	III	IV	V	VI
TRF	0.0128*	0.0126*	0.01*	0.0113*	0.0129*	0.0102*
(t)	(3.576)	(3.518)	(2.686)	(2.768)	(3.511)	(2.644)
DWSE	-8.6008*	-8.6523*	-8.5988*	-8.5592	-8.5766*	-8.5194*
(t)	(-17.15)	(-17.25)	(-17.15)	(-17.04)	(-16.51)	(-16.42)
LP	0.0077*	0.0077*	0.0077*	0.00775*	0.0080*	0.008*
(t)	(15.32)	(15.43)	(15.40)	(15.42)	(15.18)	(15.13)
GRI					-0.0114*	-0.0114*
(t)					(-6.223)	(-6.21)
DCON		1.0782**		0.7524	1.1037**	
(t)		(2.481)		(0.8235)	(2.516)	
TRF*DCON			0.00989*	0.0035		0.00954**
(t)			(2.582)	(0.4385)		(2.489)
D	-0.2068	-0.21324	-0.232	-0.2178	-0.2857	-0.3076
(t)	(-0.8614)	(-0.8884)	(-0.9684)	(-0.9068)	(-1.153)	(-1.242)
CONSTANT	7.2937	6.9886	7.2890	7.1301	7.1342	7.4792
(t)	(15.58)	(14.54)	(15.61)	(13.71)	(14.15)	(15.27)
R^2_{OE}	0.6559	0.6557	0.6582	0.6575	0.6632	0.666
DW	2.00	2.02	2.01	2.01	2.00	2.00
No. of observations	1507	1507	1507	1507	1423	1423

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%,
*** = statistically significant at 10%

TRF= tariff rate, DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post reform period.

Table 9: Estimates of the Model Explaining Price-cost Margin in consumer goods industries (using non-tariff barriers)

Dependent variable = PCM

Explanatory Variables	Model				
	I	II	III	IV	V
QR	0.0113**	0.01358*	0.0079***	0.01413*	0.00779
(t)	(2.750)	(2.878)	(1.635)	(2.853)	(1.538)
DWSE	-8.2892*	-8.3438*	-8.3076*	-8.281*	-8.2468*
(t)	(-16.58)	(-16.67)	(-16.8)	(-15.95)	(-15.96)
LP	0.0077*	0.0077*	0.0077*	0.008*	0.0079*
(t)	(15.19)	(15.31)	(15.36)	(15.03)	(15.03)
GRI				-0.0114*	-0.011*
(t)				(-6.171)	(-6.211)
DCON		1.1324*		1.2535*	
(t)		(2.754)		(2.984)	
QR*DCON			0.0202*		0.0215*
(t)			(4.318)		(4.54)
D	-0.0287	-0.28252	-0.2709	-0.3665	-0.3533
(t)	(-1.219)	(-1.195)	(-1.150)	(-1.512)	(-1.462)
CONSTANT	7.5844	7.1658	7.5086	7.3243	7.7228
(t)	(15.51)	(13.97)	(15.32)	(13.62)	(15.01)
R^2_{OE}	0.6602	0.6636	0.6716	0.6688	0.6781
DW	1.984	1.9897	1.9942	1.9827	1.9847
No. of observations	1507	1507	1507	1423	1423

t-ratios in brackets, * = statistically significant at 1%, ** = statistically significant at 5%, *** = statistically significant at 10%

QR= quantitative restrictions (import coverage), DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, DCON= dummy variable for highly concentrated industries, D= a dummy variable for the post reform period.

V Conclusion

A number of studies for developing countries have found that import liberalization leads to a reduction in price-cost margins or markups in imperfectly competitive industries. While the Krishna-Mitra study for Indian industries did find this pro-competitive effect of trade liberalization, a later, more comprehensive study undertaken by Srivastava and associates, applying the same methodology, did not find a general fall in markups in Indian industries in the post-reform period. A more recent study on the same subject by Kambhampati and Parikh also does not find strong evidence of pro-competitive effects of trade reforms.

In this study, a model for explaining price-cost margin was estimated from panel data for 137 three-digit industries for the period 1980-81 to 1997-98. The analysis is different from the analysis in the three studies mentioned above in that the tariff and non-tariff barriers were included among the explanatory variables. The results of the analysis clearly indicate that the lowering of tariff rates and removal of quantitative restrictions on imports of manufactures had a significant pro-competitive effect on Indian industries, tending to reduce the markups or price-cost margins. This was, however, offset by some other influences. The results of the analysis suggest that there was a significant reduction in labor's share in value added in the post-reform period (beyond what can be explained by changes in capital intensity), and this helped prevent the slide in the price-cost margin in Indian industries.

What caused an accelerated fall in the income share of labor in manufacturing in the post-reform period is a moot question. It seems this may have an important connection with the bargaining power of unions. Goldar (2003) has presented empirical evidence to argue that the unions have become weaker in the post-reform period and this is one of the reasons for a slowdown in the growth rate of real product wage in organized manufacturing in the 1990s. Tendulkar (2004) points out that the organized labor market has been in a state of flux during the post-reform period. While the formal rules of the game incorporated in the protective labor legislation continue to persist, intensification of domestic and external competition is forcing the existing industrial units to seek out informal avenues of flexibility in labor allocation (including taking recourse to outsourcing of jobs and allowing flexi-time). He notes further that with the opening up of the economy and rising fiscal deficits of the states, public investment has been declining and so has been the central support for state capital expenditures. The state governments have thus been forced to look for private domestic and foreign investment for employment generation as well as revenues. This has probably made state governments take a softer stand in the matter of labor regulation. Certain state governments have started granting mandatory permissions for restructuring, retrenchment and closure more liberally than earlier.

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Annex A: Estimates of mark-up obtained by Srivastava et al. (2001)

The estimates of mark-up and change in mark-up between the pre- and post-reform periods obtained in the study undertaken by Srivastava et al. (2001) are shown in the table below.

Industry	Mark-up in the pre-reform period	Change in Mark-up in the post-reform period
Food products	0.89 (50.9)	0.23 (7.03)
Tobacco products	0.38 (6.4)	0.28 (0.9)
Textiles	1.00 (79.6)	-0.03 (-1.2)
Leather products	0.67 (9.3)	0.45 (5.5)
Wood products	1.30 (16.2)	0.22 (1.2)
Paper products	**1.15 (49.7)**	**-0.32 (-5.7)**
Publishing and printing	0.94 (13.5)	0.44 (4.3)
Chemical products	1.02 (82.5)	0.09 (3.6)
Rubber and plastic products	0.96 (33.7)	0.13 (2.4)
Non-metallic mineral products	**1.34 (34.0)**	**-0.33 (-5.2)**
Basic metal products	**1.19 (54.6)**	**-0.18 (-4.6)**
Fabricated metal products	1.10 (69.8)	0.03 (1.2)
Machinery and equipment	1.09 (74.0)	0.03 (1.2)
Electrical machinery	**1.28 (40.9)**	**-0.25 (-4.3)**
Motor vehicles	1.21 (58.1)	0.07 (1.7)
Other transport equipment	1.04 (24.1)	0.18 (1.0)
All industries	1.07 (200.8) 1.13 (120.0)#	-0.00(-0.23) -0.15 (-7.8)#

Note: The methodology proposed by Hall (1988, 1990) has bee applied in the study to estimate mark-ups. The estimates based on unbalanced panel obtained by the fixed-effects model are presented in the table. Company-level data for the period 1980 to 1997 are used. Total observations used are 24,463. The figures in parentheses are t-ratios.

Estimates for balanced panel using about 8,000 observations.

Source: Prepared from Srivastava et al. (2001).

Annex B: Estimation of Panel Data Models

A panel data model is written as:

$$Y_{it} = X_{it}'\beta + Z_i'\alpha + \varepsilon_{it}$$

Where Y is the dependent variable and the subscript i represents individuals or groups, while the subscript t denotes time. There are k regressors in $X_{it,}$ not including a constant term. The individual effect is $Z_i'\alpha$ where Z_i contains a constant term and a set of individual or group specific variables, which may be observed or unobserved but all of which are taken to be constant over time 't'. The model is basically a classical regression model. Based on the assumptions of the model one can apply different estimation techniques.

1. Pooled Regression: If Z_i contains only a constant term, then the OLS (Ordinary Least Squares) provides consistent and efficient estimates of the common intercept α and slope vector β.

2. Fixed Effects Model (FE or Least Squares Dummy Variable Model): This model assumes that differences across cross-sections can be captured in differences in the constant term.

$$Y_{it} = X_{it}'\beta + \alpha_i + \varepsilon_{it} \quad \text{where } \alpha_i = Z_i'\alpha$$

α_i differs across cross-section units. So Zi is unobserved but correlated with X_{it}. It follows that α_i is group specific constant term and does not vary over time. Group specific does not mean that it is non-stochastic. ε_{it} has the properties of the classical model and OLS is applied for estimation. The fixed effect estimator of β is generally viewed as an OLS regression of means-differenced variable and is therefore also known as a 'within group' estimator. That is, it uses only the variation within an individual's set of observations.

3. Random Effect Model (RE or Error Component Model): This approach assumes a single constant term, which is the mean of the unobserved heterogeneity E ($Z_i'\alpha$) and the model can be estimated by generalized least squares (GLS).

$$Y_{it} = X_{it}' \beta + \alpha + \mu_i + \varepsilon_{it}$$

So $Z_i'\alpha = \alpha + \mu_i$. μ_i is a group specific random element specific to observations relating to the ith individual or group and is constant through time. It is uncorrelated with X_{it}. ε_{it} has the properties of the classical model and GLS is applied for estimation. A few important assumptions about μ_i and ε_{it} are as follows:

$E(\varepsilon_{it}) = E(\mu_i) = 0$

$E(\varepsilon_{it}^2) = \sigma_{\varepsilon}^2$

$E(\mu_i^2) = \sigma_{\mu}^2$

The choice between fixed effect and random effect can be made with the help of the Hausman test, which is based on the premise that the FE and RE statistics should not differ systematically. It is a Chi-square test based on the Wald criterion. The choice also depends on whether one has to make inferences in respect of the population (RE) characteristics or only with respect to the effects that are there in the sample (FE). Fixed effect is costly in terms of degrees of freedom lost. Another problem with FE is that one cannot include in the model variables that vary across individuals or groups but take the same value over time. In such a model, estimates of α_i will be inconsistent.

4. The Time wise Autoregressive Cross–Sectional Heteroscedastic Disturbance Approach (Kmenta's Pooled Model):

This technique assumes the same slopes and same intercept across cross-section observations and it corrects for autoregression (time wise) and heteroscedasticity (cross-sectional).

$$Y_{it} = X_{it}' \beta + \varepsilon_{it} \qquad \text{for } i=1, 2, \ldots\ldots N \qquad t=1,2,\ldots\ldots\ldots T$$

The assumptions of the Kmenta model are:

$E(\varepsilon_{it}^2) = \sigma_i^2$ (heteroscedasticity)

$E(\varepsilon_{it}\,\varepsilon_{jt}) = 0$ for $i \neq j$ (cross-section independence)

$\varepsilon_{it} = \rho_i\,\varepsilon_{it-1} + v_{it}$ (autoregression)

and $E(v_{it}) = 0$; $E(v_{it}^2) = \pi_i^2$

$E(v_{it}, v_{js}) = 0$ for $i \neq j$ and $t \neq s$

$E(\varepsilon_{it-1}, v_{jt}) = 0$

The estimate for β is obtained by a generalized least square (GLS) procedure. The estimation procedure involves the following steps:

Step I : estimate β by OLS and obtain estimated residuals e_{it}.

Step II: the estimated residuals are used to compute $\hat{p}$ i as estimates of $\rho_{i.}$.

Step III: Use the $\hat{p}$ i's to transform the observations, including the first observation and apply OLS to the transformed variable.

Step IV: Obtain the GLS estimator.

For the non-autocorrelated models, the estimates may be two-step GLS or iterated GLS, which produces a maximum likelihood estimator (MLE). For the models with autocorrelation, the estimator may be three-step GLS or iterated GLS, which though convergent, does not produce the MLE.

The Durbin-Watson statistics is calculated as:

$$\square \sum_{i=1}^{N}\sum_{t=2}^{T} (v_{it-} v_{i,t-1})^2 / \sum_{i=1}^{N}\sum_{t=1}^{T} v_{it}^2$$

An advantage of this model is that no restrictive assumptions are made about $\varepsilon_{it.}$ Also, all the dummies, (especially the time invariant ones like DCON in our analysis) can be introduced which is not feasible in the FE models.

Choice among techniques

The choice of an appropriate estimation technique is made on the basis of Hsiao's (1986, pp. 15-17) homogeneity F-tests. The two null hypothesis that were proposed are:

H_3: both slope and intercept coefficients are identical; i.e.

$$\alpha_i = \alpha_j \text{ and } \beta_i = \beta_j \qquad \text{for } j \neq i$$

H_1: slope coefficients are identical but intercepts are not; i.e.

$$\alpha i \neq \alpha j \text{ but } \beta_i = \beta_j \qquad \text{for } j \neq i$$

H_3 is essentially a test of whether the model must be estimated with different slopes and different intercepts (i.e. OLS to each individual unit) or should we pool the data and estimate a single equation by the pool model. If slopes and intercepts are equal, i.e. H_3 is accepted, we pool the data and estimate a single equation by the pool models and no more testing is required. Hypothesis H_1 is a test of equality of slopes. If slopes are not identical among cross-sectional units (firms, industries or regions), i.e. H_1 is rejected, then FE and RE models are inappropriate (as these are based on the assumption of same slopes) and the model must be estimated at the level of individual units and the test sequence is naturally stopped [Hsiao (1986), pp.15]. The test statistics corresponding to H_3 and H_1 have been defined as:

$$F_3 = \frac{(S_3 - S_1) / [(n-1)(k+1)]}{S_1 / [nT - n(k+1)]}$$

and

$$F_1 = \frac{(S_2 - S_1) / (n-1)k}{S_1 / [nT - n(k+1)]}$$

where n = number of cross section groups, T = Time period

S_3=Residual sum of squares in a restricted model (Kmenta pooled model; it assumes same intercepts and same slopes)

S_1= Residual sum of squares in an unrestricted model (Least squares method to each individual unit)

S_2 = Residual sum of squares in a restricted model (fixed effect model, which assumes same slopes)

To conduct these tests, three sets of estimates have to be made: first, estimates of the fixed effects model, second, estimates of the (Kmenta) pooled model, and third, estimates of the least squares model (OLS) to each individual unit.

We have carried out the necessary tests and on the basis of the values of S_1, S_2 and S_3 found that the application of the Kmenta pooled model is justified. The tests for poolability resulted in insignificant value of F_3 (0.928) [and a significant value for F_1 (5.729)]. For this study, we have thus used the Kmenta model. The computations of F_3 and F_1 are shown below.

S_3=109834, S_1=81028, and S_2 = 223318

$$F_3 = \frac{(109834 - 81028) / [(136)(5)]}{81028 / [2460 - 137 (5)]} = 0.928$$

and

$$F_1 = \frac{(223318-81028) / (136)4}{81028 / [2460 - 137 (5)]} = 5.729$$

Annex C: Estimated Translog Production Function for Indian Manufacturing (Registered)

Dependent variable: ln(V)

Variable	Coefficient	Standard error	t-ratio
Ln(L)	0.8445	0.0137	61.47
Ln(K)	0.2452	0.0110	22.27
$Ln(L)^2$	-0.0601	0.0038	-15.79
$Ln(K)^2$	-0.0601	0.0038	-15.79
Ln(l)*ln(K)	0.1202	0.0076	15.79
T	0.0258	0.0111	2.32
T^2	0.0002	0.0005	0.39
Constant	-2.2103	0.0971	-22.75
F(5,2454)	3343.5		
No. of observations	2460		

V= real value added; L= labor; K= capital (real fixed capital stock): T= time (year)
Note: The production function is assumed to be homogeneous.

Annex D: Inter-correlation matrix among variables

	PCM	TRF	QR	GRI	LP	DWSE	DCON
PCM	1						
TRF	-0.0139	1					
QR	-0.04862	0.4839	1				
GRI	-0.02752	0.000133	-0.00895	1			
LP	0.2368	-0.11556	-0.23769	0.02458	1		
DWSE	-0.1018	0.11089	0.17024	-0.02477	-0.4392	1	
DCON	0.044	0.062354	-0.02669	-0.00674	0.04965	-0.1191	1

PCM= price-cost margin, TRF= tariff rate, DWSE= deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, LP= labor productivity, GRI= growth rate of industry, QR= quantitative restrictions (import coverage), DCON= dummy variable for highly concentrated industries.