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# TRADE LIBERALIZATION AND PRICE-COST MARGIN IN INDIAN INDUSTRIES

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Using panel data for 137 three-digit industries for 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, taking tariff and nontariff barriers among the explanatory variables. The results indicate that the lowering of tariffs and removal of quantitative restrictions on imports of manufactures in the 1990s had a significant pro-competitive effect on Indian industries, particularly concentrated industries, tending to reduce the price-cost margins. The paper notes that despite the pro-competitive effects of trade liberalization reinforced by domestic industrial deregulation, the price-cost margin increased in the post-reform period in most industries and aggregate manufacturing, which is attributed to a marked fall in the growth rate of real wages and a significant reduction in labor's income share in value added in the post-reform period, reflecting perhaps a weakening of industrial labor's bargaining power.

*Keywords:* Trade liberalization; Price-cost margin; Indian industry

## 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, Kee, and Olarreaga 2001; Kee and Hoekman 2003).

Two approaches have been taken to examine the effect of increased import com-

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

petition 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 PCM or markup in imperfectly competitive industries. In other words, import competition disciplines domestic firms in imperfectly competitive industries.

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 $\eta$ elasticity of demand, then the relationship between markup and elasticity of demand may be written as:

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

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.

[2] Hoekman, Kee, and Olarreaga (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 nontariff 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.

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 (PCM) 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 the Turkish manufacturing industry, Yalçin (2000) finds that import penetration led to a decrease in the PCM in private sector firms in general, but the PCM 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 PCMs in Indian industries.[3] India has undertaken a major reform of trade policies since 1991 with large reductions made in tariff and nontariff 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 PCMs 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 PCM in Indian industries is undertaken using panel data for 137 three-digit industries covering the period 1980/81 to 1997/98.

The rest of the paper is organized as follows. Section II discusses briefly the findings of some recent studies on markups or profitability in Indian industries. Section III discusses the model applied for the analysis, the estimation technique,

[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, Pushpangadan, and Suresh Babu (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 2001, 2003a; Aghion et al. 2003; Goldar and Kumari 2003; Pattnayak and Thangavelu 2003).

the data sources, and the construction of variables used for this study. The empirical results are presented in Section IV, which begins with an analysis of trends in PCM and labor income in Indian industries in the 1980s and 1990s, followed by the estimates of the model. Section V summarizes the main findings of the study and presents our conclusion.

## II. FINDINGS OF EARLIER STUDIES

Krishna and Mitra (1998) in their study covering four Indian industries found that in the post-reform period markup declined significantly in three of the four industries. The decrease was to such a level that the markup parameter for firms dropped to a value of less than one, i.e., 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, Gupta, and Datta (2001), based on company-level data for the period 1980 to 1997, found 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. Their explanation was that these are generally consumer goods and consumer durables producing sectors that faced very limited foreign competition during the period studied. The markup declined in nonmetallic mineral products, basic metals, and paper products. The squeeze in the markup for metals and nonmetallic mineral products was attributed to increased domestic and foreign competition. For textiles, machinery, and fabricated metal products, no change in markup was found. Thus, the results of the study indicate that despite large reductions in tariff and nontariff barriers on imports of industrial products, a reduction in markups did not take place in the post-reform period in most Indian industries. However, in certain industries, import liberalization did have a significant adverse effect on the profitability of Indian firms.

Balakrishnan, Pushpangadan, and Suresh Babu (2002) applied Hall's methodology to study the effect of economic reforms on markup and scale efficiency in Indian industries. They used the Prowess database of the CMIE (Centre for Monitoring Indian Economy, Mumbai). Data for 3,596 firms for the period 1988/89 to 1997/98 was used for their analysis. They found that the economic reforms reduced the markup in certain industries (e.g., rubber, plastic and petroleum products, machinery, and transport equipment), while it raised the markup in certain other industries (e.g., food products, chemicals, basic metals, metal products, and nonmetallic

[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).

metal products). The regression equation estimated of all manufacturing firms taken together suggested that in general economic reforms caused markup in Indian industries to increase.

While Krishna and Mitra (1998), Srivastava, Gupta, and Datta (2001), and Balakrishnan, Pushpangadan, and Suresh Babu (2002) used the structural regression approach of Hall to study the effect of economic reforms on markups in Indian industries, Kambhampati and Parikh (2003) took the other approach, i.e., estimating a regression equation in which PCM is taken as the dependent variable. They used data for 281 firms for the period 1980 to 1998. Analyzing trends in profit (price-cost) margins, they found 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 their regression analysis, Kambhampati and Parikh used a dummy variable to capture the effect of trade reforms (the dummy variable being based on time-periods, pre- and post-reform, captured the effects of industrial and other policy reforms as well). Export intensity, import intensity, R&D intensity, capital-output ratio, and market share were among the explanatory variables used. The dummy variable entered 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 PCMs may have been positive for certain sections of domestic industry.

Compared with the above three studies, the study of profitability of Indian industries undertaken by Rao (2001) is more detailed. Rao's work, like Srivastava, Gupta, and Datta (2001) and Balakrishnan, Pushpangadan, and Suresh Babu (2002), is based on company-level data taken from the Prowess database of the CMIE. In her analysis of profitability of industrial companies, she included 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 1,458 companies belonging to six industries (three producer goods industries and three consumer goods industries) for the period 1990/91 to 1998/99 were used for her analysis. For the selected industries, she found dismal profitability performance by firms in the 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 pro-

ducer goods industries where reduction in import duties has been relatively higher.

One limitation common to the five studies discussed above is that the tariff and nontariff barriers have not been directly included in the analysis as variables affecting markups or profitability. In this paper, we use tariff rates and nontariff barriers as explanatory variables in the regression equations estimated to explain PCM, 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, Srivastava et al., and Balakrishnan et al. have done.[7]

## III. MODEL, DATA, AND VARIABLES

### A. *The Model*

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

If it is assumed that unit expenditures on labor and intermediate inputs are constant with respect to output, then the PCM is a monotonic transformation of the markup. It can also be shown that the PCM is current economic profit over sales plus the competitive return to capital over revenue (Tybout 2001). Thus, the PCM of $j$th industry in period $t$, denoted by $PCM_{jt}$, may be written as:

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

where $\pi$ denotes profits, $r$ market return on capital, $\delta$ 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):

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

Here, $H_{jt}$ is the Herfindahl index (HI, an index of industry structure that is inversely related to the degree of competition) and $IMP_{jt}$ is the import penetration ratio

[7] The advantage of including tariff and nontariff barriers in the analysis, rather than using a dummy of the post-reform period, has been noted by Goldar and Kumari (2003) and Topalova (2003).

(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:

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

where *MB* denotes import barriers, *KQ* denotes capital-output ratio, 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 PCM in industries.

Since the analysis is undertaken at the three-digit industry level, and given that no estimates of industrial concentration (e.g., Herfindahl index) are readily available at that level of industrial disaggregation for the period considered in the study (1980/81 to 1997/98), we have used a dummy variable, *DCON*, in the model to capture the effect of market power on profitability. Based on the Prowess database for Indian firms, we have calculated the HI for 132 product categories for the early 1990s, i.e., from 1991 to 1995. The average value of HI has been used as the basis of classifying Indian industries into highly concentrated ones and other industries. After matching the 132 product categories into a *Annual Survey of Industries* (*ASI*) three-digit classification, we have identified highly concentrated industries as those whose value of HI is above 1,800 (as per the practice followed in the United States). A dummy variable has accordingly been formed. For 45 industries identified as highly concentrated, the dummy variable *DCON* has been assigned the value of one, and for the remaining it has been given the value of zero. It would have been better if we had used the HI directly as an explanatory variable in the estimated equation. However, we could not do that because the Prowess database we used did not have company balance-sheet data for the 1980s.

To capture the effect of import competition, tariff rates and nontariff barriers (import coverage ratio) have been used. This makes our study somewhat different from most earlier studies, which have used the import penetration ratio to represent import competition. Two studies that have used tariff and nontariff barriers to study the effect of import competition on markup are Grether (1996) and Currie and Harrison (1997).

Besides the three variables mentioned above, we have used two other explana-

tory variables. These are the 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 Ghosh (1975), Kambhampati (1996), and Rao (2001), we have included the 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, Ghosh (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 in an industry may also depress profitability either through a fall in product prices or through a rise in input prices. It seems to us that in the context of the industrial policy reforms undertaken in the 1990s, high growth rates for industries might reflect to some extent the easing of policy induced entry barrier prevailing in the pre-reform period. This is expected to increase competition and thus reduce profitability.

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 PCMs. In his study of the effect of trade liberalization on PCM in the Turkish manufacturing industry, Yalçin (2000) points out that the effect of import competition on the PCM 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 PCM to go up. Indeed, the econometric results of Yalçin's study show that a decline in labor's income share caused PCM in Turkish manufacturing to increase. In the present 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 capital-output ratio) is already included in the model.

To provide some further explanation, note that the deviation of labor's income share ($S_L$) from the elasticity of value added with respect to labor ($\alpha_L$) may be interpreted as the gap between wage rate ($w$) and marginal product of labor ($\partial V/\partial L$, where $V$ is real value added and $L$ denotes labor) normalized by the average product of labor ($V/L$).

$$\begin{aligned} S_L - \alpha_L &= (w \cdot L/V) - (\partial V/\partial L)\,(L/V) = (w)/(V/L) - (\partial V/\partial L)/(V/L) \\ &= (w - \partial V/\partial L)/(V/L). \end{aligned}$$

Under the assumption that production technology is characterized by a two-

input value added function and markets are competitive, the marginal product of labor will be equal to wage rate (as follows from the marginal productivity theory) and hence the income share of labor in value added will be equal to the elasticity of value added with respect to labor. Thus, the deviation of the income share of labor from the estimated elasticity may be treated as an indicator of market imperfection (since it is caused by the wage rate being not equal to the marginal productivity of labor). It is reasonable to assume that trade unions are a major source of market imperfection.[8] There is a view that in the post-reform period there has been a weakening of industrial trade union power in India (Goldar 2004; Tendulkar 2004). This probably was responsible for a marked fall in the income share of labor. By taking $(S_L - \alpha_L)$ as an explanatory variable, this aspect is incorporated into the regression analysis. Thus, this variable captures to a certain extent the effect of unionization on profitability.

One must hasten to add here that if labor demand is competitive in the sense that the firms have no market power in the labor market, wage rate will be equal to the value of marginal product even if labor unions have market power. A weakening of labor union strength under such circumstances may reduce wage rate, but it will not lead to any change in the difference between $S_L$ and $\alpha_L$, which remains at zero.[9] Thus, the use of the variable $(S_L - \alpha_L)$ as a proxy variable for trade union strength will be justified if labor demand is imperfectly competitive. To derive a positive relationship between $(S_L - \alpha_L)$ and strength of labor unions, some additional assumptions are needed. This aspect is discussed further in Appendix.

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.[10] Inasmuch as trade liberalization reduces or eliminates the rent accruing to labor, it would have a depressing effect on the wage rate.[11] A reduction in labor's share in the rent (shift of rent from laborers to producers), say caused by a weakening of the bargaining power of trade unions, would have a favorable effect on the profitability of firms in concentrated industries.[12]

[8] A number of studies model wages as being determined in a process of bargaining between trade union and firm management; see, for instance, Bande, Fernández, and Montuenga (2000).

[9] We are grateful to one of the reviewers of the paper for drawing our attention to this theoretical point.

[10] See Abowd and Lemieux (1993) and Borjas and Ramey (1995), among others.

[11] A number of studies have examined how trade liberalization affects wages in industries of developing countries through the elimination/reduction of rents accruing to labor. See, for instance, Revenga (1997). Goldar (2004) has examined this issue in the context of Indian manufacturing industries.

[12] There have been several studies on the effect of union power on profitability (see, for instance, Freeman 1983; Dobbelaere 2005) and how trade liberalization may affect union power (see, for instance, Dumont, Rayp, and Willemé 2004).

Attention needs to be drawn here to the fact that unionization need not always have an adverse effect on profitability. The negative influence may be offset or even more than offset by the productivity enhancing effects of unions, particularly the effects on R&D (see Dobbelaere [2005] for a discussion and review of the literature). Recent empirical evidence for the United States shows a positive relationship between unionization and profitability. Recent empirical studies for the United Kingdom find that by the end of the 1990s a negative relationship between unionization and profitability ceased to exist. Evidently, questions can be raised about the simple causal relationship between union power and PCM that we assume in our analysis. We feel, however, that in Indian industries the favorable effect of unionization on innovative activity is likely to be a less important phenomenon than the effect of unionization on sharing of rent by labor so that a weakening of trade unions in the 1990s should have caused the PCMs to go up.

### B. *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[13] which is based on generalized least squares (GLS) and corrects for heteroscedasticity and autocorrelation, a feature of panel data sets. We have carried out the necessary tests (Hsiao 1986) and found that the application of the Kmenta model is justified.[14] Since the final panel data set used is unbalanced, we have applied the unbalanced panel data estimation method.

### C. *Data and Variables*

The basic source of data for this study is the *Annual Survey of Industries* (*ASI*) published by the Central Statistical Organisation, Government of India. Data for three-digit industries for the period 1980/81 to 1997/98 have been taken.[15] 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

[13] See Kmenta (1986).

[14] 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.

[15] 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.

was felt that such industries should be excluded from the analysis. Thus, we had 2,466 observations on 137 industries for 18 years. But, subsequently we dropped 6 observations where the ratio of emoluments to value added is abnormally high (greater than 5) leaving us with 2,460 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. Capital-output ratio (*KQ*) is computed as total capital stock (fixed plus working) divided by value of gross output. Growth rate of industry (*GRI*) is the annual growth rate in deflated value of gross output. For each industry, we have used as the 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 nontariff barriers (percentage import coverage by quantitative restrictions) is a research project undertaken at the Indian Council for Research on International Economic Relations (ICRIER), the results of which are reported in Das (2003b). 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 nontariff barriers at the level of industrial groups (66 sectors of the input-output table) have been taken from Goldar and Saleem (1992), NCAER (1999), and Nouroz (2001). In a number of cases, the estimate available for an input-output sector has been applied to all three-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 nontariff barriers, as quantitative restrictions covered a very high proportion of imports of manufactures throughout the decade.[16]

To obtain the deviation of labor income share from the elasticity of value added with respect to labor, a translog production function has been estimated.[17] 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.[18] Given the estimated production function, the logarithmic

[16] For aggregate manufacturing, the proportion of imports covered by quantitative restrictions was about 90 percent in 1988/89.

[17] The function is assumed to be homogeneous.

[18] 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 the book-value of fixed assets reported in the *ASI*.

derivative of value added with respect to labor yields the required elasticity, which varies across observations (across industries and over time). 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 the value one for 45 industries out of the 137 for which the computed HI[19] for the period 1991 to 1995 indicates a high level of concentration (above 1,800 on average), otherwise it is assigned the value of zero.

## IV. EMPIRICAL RESULTS

### A. *Changes in Tariff and Nontariff Barriers*

How tariff and nontariff barriers for Indian industries have changed in the 1980s and 1990s has been described at length in the studies of Das (2003b) and Nouroz (2001), among others. A detailed discussion on liberalization of trade in industrial products is therefore unnecessary. Some indication of the changes in tariff and nontariff barriers that took place in the 1990s for the 137 industries covered in this study is given in Tables I and II.

Tables I and II clearly show that in the 1990s there was substantial decrease in both tariff and quantitative restrictions for the 137 industries considered in this study. The average tariff rate declined from 110.9 percent in the period 1981–91 (fiscal years) to 85.3 during 1992–95 and further to 41.3 percent during 1996–98. In 131 out of the 137 industries, the average tariff rate was 70 percent or higher during 1981–91. By contrast, in 132 industries out of the 137, the average tariff rate was in the range of 20 to 50 percent during 1996–98.

During 1981–91, the average import-coverage ratio (proportion of imports covered by quantitative restrictions) was 90 percent or more in 122 industries of the 137. By contrast, during 1996–98, the average import coverage ratio was less than 50 percent in 82 industries out of the 137. Taking all 137 industries together, the average import-coverage ratio declined from 97.3 percent during 1981–91 to 46.6 percent during 1996–98.

### B. *Analysis of Trends in Price-Cost Margin and Labor Income*

Analysis of PCM at the aggregate level reveals that there was no fall in the PCM 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

[19] Mr. Prabhu Prasad Mishra of ICRIER computed the HI from the Prowess database, for which we are thankful.

TABLE I

DISTRIBUTION OF INDUSTRIES BY TARIFF RATE

| Tariff Rate (Range, %) | Number of Industries in the Range | | |
|---|---|---|---|
| | 1981–91 | 1992–95 | 1996–98 |
| 20–30 | 0 | 0 | 26 |
| 30–40 | 0 | 0 | 31 |
| 40–50 | 0 | 0 | 75 |
| 50–70 | 6 | 34 | 1 |
| 70–90 | 16 | 55 | 0 |
| 90–110 | 52 | 43 | 4 |
| 110–130 | 36 | 0 | 0 |
| Above 130 | 27 | 5 | 0 |
| Total | 137 | 137 | 137 |
| Average tariff rate of all 137 industries | 110.9 | 85.3 | 41.3 |

Note: For each industry, the average tariff on products (for different years) was obtained first, and then the average tariff rate was computed for the periods: 1981–91, 1992–95, and 1996–98 (fiscal years).

TABLE II

DISTRIBUTION OF INDUSTRIES ACCORDING TO EXTENT OF QUANTITATIVE RESTRICTIONS ON IMPORTS

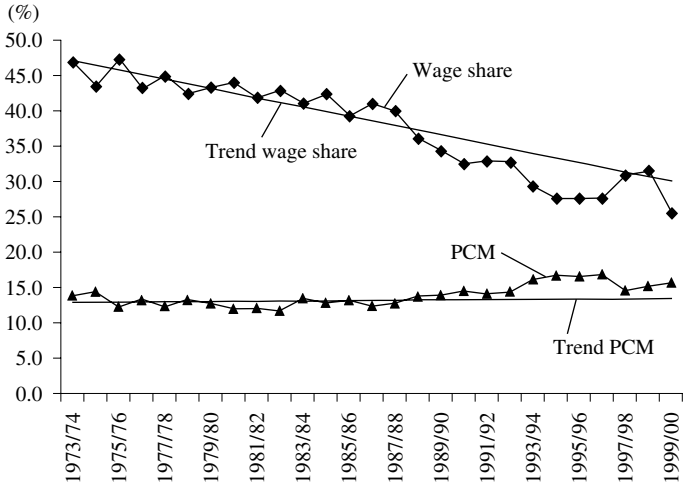
| Quantitative Restriction (Import Coverage Ratio,%) | Number of Industries in the Range | | |
|---|---|---|---|
| | 1981–91 | 1992–95 | 1996–98 |
| 0–25 | 1 | 31 | 45 |
| 25–50 | 0 | 30 | 37 |
| 50–75 | 0 | 33 | 19 |
| 75–90 | 14 | 19 | 17 |
| 90–100 | 122 | 24 | 19 |
| Total | 137 | 137 | 137 |
| Average of all 137 industries | 97.3 | 53.4 | 46.6 |

Note: For each industry, the average of the import coverage ratio was considered for the periods: 1981–91, 1992–95, and 1996–98 (fiscal years).

with the findings of Srivastava, Gupta, and Datta (2001) and Balakrishnan, Pushpangadan, and Suresh Babu (2002). It may also be noted that the PCM 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.[20] 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

[20] The sharp fall in the income share of labor in Indian industries during the 1990s has drawn the attention of researchers. See, for instance, Unel (2003).

Fig. 1. Price-Cost Margin and Wage Share in Gross Value Added, Indian Manufacturing, 1973/1974 to 1999/2000




in value added may have helped prevent a slide in the average profit margin in Indian industries in the post-reform period.

A comparison of PCM between the pre- and post-reform periods at the level of two-digit industries is presented in Table III. The table brings out that the PCM 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 PCM 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).

Tables IV and V give the profile of industries according to PCM, in respect of the 137 three-digit industrial groups covered in this study. Looking at the distribution of industries according to PCM shown in Table IV, it is seen that there has been no major change in the distribution, except that the number of industries with PCM above 20 percent have gone up somewhat in the 1990s. The average PCM across the 137 industries has increased in the post-reform period in comparison with the pre-reform period by over 2 percentage points.

Turning to Table V, we find that among the industries which had less than 15 percent PCM in the pre-reform period, 25.9 percent (21 out of 81) recorded a fall in PCM in the post-reform period. The relevant proportion is 34.4 percent for industries which had PCM between 15 and 20 percent, and 62.5 percent for industries which had PCM above 20 percent. It is evident therefore that the decline in PCM in

TABLE III

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 fiber 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 | Nonmetallic 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 IV

DISTRIBUTION OF INDUSTRIES ACCORDING TO PRICE-COST MARGIN

| PCM (Range, %) | Number of Industries in the Range | | |
|---|---|---|---|
| | 1981–91 | 1992–95 | 1996–98 |
| 0–10 | 47 | 35 | 41 |
| 10–15 | 34 | 34 | 35 |
| 15–20 | 32 | 37 | 26 |
| Above 20 | 24 | 31 | 35 |
| Total | 137 | 137 | 137 |
| Average PCM of all 137 industries | 14.5 | 17.5 | 16.9 |

TABLE V

PROFILE OF INDUSTRIES ACCORDING TO PRICE-COST MARGIN

| PCM Range in the Pre-reform Period | Total No. of Industries (Three-Digit) | No. of Industries in Which PCM Declined in the Post-reform Period | No. of Industries in Which Growth Rate of Production Declined in the Post-reform Period |
|---|---|---|---|
| Less than 10% | 47 | 12 (25.53) | 24 (51.06) |
| 10% to 15% | 34 | 9 (26.47) | 17 (50.00) |
| **Below15%** | **81** | **21 (25.92)** | **41 (50.60)** |
| 15% to 20% | 32 | 11 (34.37) | 11 (34.37) |
| Above 20% | 24 | 15 (62.50) | 12 (50.00) |
| **Above 15%** | **56** | **26 (46.42)** | **23 (41.07)** |
| Total | 137 | 47 (34.30) | 64 (46.70) |

Note: Figures in parentheses are percentages.

TABLE VI

DISTRIBUTION OF INDUSTRIES ACCORDING TO WAGE SHARE

| Wage Share (Range, %) | Number of Industries in the Range | | |
|---|---|---|---|
| | 1981–91 | 1992–95 | 1996–98 |
| 10–30 | 20 | 50 | 46 |
| 30–40 | 42 | 45 | 49 |
| 40–50 | 45 | 23 | 21 |
| 50–60 | 17 | 12 | 9 |
| Above 60 | 13 | 7 | 12 |
| Total | 137 | 137 | 137 |
| Average of all 137 industries | 44.0 | 36.8 | 36.7 |

the post-reform period was relatively more common in industries which had higher PCM in the pre-reform period.

Out of the 137 industries studied, 64 (or 46.7 percent) experienced a fall in the growth rate of output (real) in the post-reform period as compared to the pre-reform period. The proportion was 50.6 percent (41 industries out of 81) among the industries with relatively low PCM in the pre-reform period (below 15 percent). The proportion was relatively lower at 41 percent for industries that had a relatively higher PCM in the pre-reform period (above 15 percent).

Distribution of industries according to wage share (total emoluments divided by gross value added) is shown in Table VI. It is interesting to note that while wage share was less than 30 percent in only 20 industries out of the 137 during 1981–91, the relevant figure was 46 industries out of the 137 during 1996–98. On the other hand, the wage share was 40 percent or more in 75 industries during 1981–91,

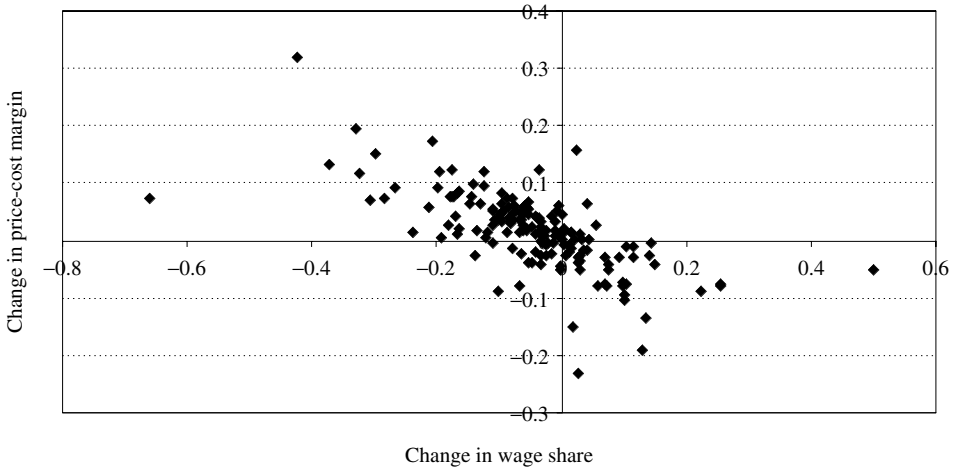
which declined to 42 industries during 1996–98. The average wage share across the 137 industries came down from 44.0 percent during 1981–90 to 36.7 percent during 1996–98.

Figure 2 plots the change in labor share in gross value added against the change in PCM between 1989/90 and 1997/98 for three-digit industries. The correlation coefficient is −0.67. It can be seen that in a large number of industries there was an increase in the PCM 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 PCM in Indian industries at the aggregate level in the 1990s is mainly due to a fall in labor's income share.

In a recent paper, Balakrishnan and Suresh Babu (2003) noted that in the post-reform period there has been an almost across-the-board increase in the PCM in Indian industries at the two-digit level (see Table VII 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 PCM and labor share observed in Table III and Figure 1 above.

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.[21] The growth rate in product wage at the aggregate manufacturing level was 3.52 percent per

Fig. 2. Changes in Wage Share and Price-Cost Margin, Indian Manufacturing Industries (3-digit), 1989/90 to 1997/98




[21] Goldar (2004) has examined the causes of the fall in the growth rate of real product wage in Indian industries in the 1990s.

TABLE VII

PRICE-COST MARGIN AND WAGE SHARE IN INDIAN MANUFACTURING, TWO-DIGIT INDUSTRIES, 1973/74 TO 1999/2000

| Industry Code | Description | Price-Cost Margin (Average,%) | | Wage Share (Average,%) | |
|---|---|---|---|---|---|
| | | 1973/74 to 1990/91 | 1991/92 to 1999/2000 | 1973/74 to 1990/91 | 1991/92 to 1999/2000 |
| 20–21 | Food products | 7.66 | 8.89 | 23.46 | 18.88 |
| 22 | Beverage & tobacco | 15.51 | 21.32 | 26.98 | 19.52 |
| 23–25 | 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 | Nonmetallic 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: 1. Price-cost margin = (output minus total emoluments and intermediate inputs) / value of output.

2. Wage share = wages / value added. Note that labor income share shown in Table VI (also Figure 1) is based on total emoluments which includes income of "persons other than workers" as well as the money value of benefits received by workers and other employees. This explains the difference between the two sets of figures.

annum during the period 1973/74 to 1990/91 which declined to 2.91 percent per annum during the period 1991/92 to 1999/2000 (Balakrishnan and Suresh Babu 2003, p. 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 percent per annum during the period 1973/74 to 1990/91, and it declined to 0.37 percent per annum during the period 1991/92 to 1999/2000 (Balakrishnan and Suresh Babu 2003, p. 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.

## C. *Estimates of the Kmenta Model*

The estimates of the model are presented in Tables VIII and IX. Since both tariff

and nontariff barriers were reduced in the process of trade reforms, and the intertemporal changes in tariff and nontariff barriers are highly correlated (see Appendix Table I), separate estimation of the model has been done using tariff and nontariff barriers as alternate variables representing import competition (or lack of it).[22] The results obtained by using tariff rates are reported in Table VIII and those using nontariff barriers are reported in Table IX.

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. However, being a dummy variable it would also capture the influence of other developments in the post-reform period except those

TABLE VIII

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 |
| *TRF* | 0.0117* | 0.0114* | 0.0097* | 0.0128* | 0.0128* | 0.0121* |
| | (4.179) | (3.974) | (3.211) | (4.466) | (4.418) | (3.975) |
| *DWSE* | −14.458* | −14.372* | −14.427* | −14.536* | −14.553* | −14.58* |
| | (−40.06) | (−39.76) | (−39.88) | (−39.19) | (−39.05) | (−39.11) |
| *KQ* | 0.5034** | 0.4975** | 0.49** | 0.3759 | 0.3657 | 0.3683 |
| | (2.179) | (2.148) | (2.112) | (1.582) | (1.532) | (1.541) |
| *GRI* | | | | –0.0072* | –0.00718* | –0.00715* |
| | | | | (−5.254) | (−5.27) | (−5.223) |
| *DCON* | | 1.026* | | | 0.6763*** | |
| | | (2.740) | | | (1.711) | |
| *TRF · DCON* | | | 0.00577*** | | | 0.00296 |
| | | | (1.900) | | | (0.9256) |
| *D* | 0.1633 | 0.1693* | 0.1406 | 0.1841 | 0.1885 | 0.1757 |
| | (0.8649) | (0.8921) | (0.741) | (0.9546) | (0.9727) | (0.9055) |
| Constant | 8.9076* | 8.597* | 8.9155* | 8.9137* | 8.6392* | 8.8357* |
| | (25.03) | (23.73) | (24.81) | (24.07) | (22.92) | (23.59) |
| $R^2_{OE}$ | 0.7537 | 0.7229 | 0.742 | 0.7585 | 0.7297 | 0.7434 |
| DW | 2.0075 | 2.0178 | 2.0132 | 2.0152 | 2.0240 | 2.0199 |
| No. of observations | 2,460 | 2,460 | 2,460 | 2,323 | 2,323 | 2,323 |

Notes: 1. Figures in parentheses are *t*-ratios.
2. *TRF* = tariff rate, *DWSE* = deviation of share of wages and salaries in value added from estimated elasticity of output with respect to labor, *KQ* = capital-output ratio, *GRI* = growth rate of industry, *DCON* = dummy variable for highly concentrated industries, and *D* = a dummy variable for the post-reform period.

***, **, and * represent statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[22] In this regard, our analysis is similar to that of Grether (1996) and Currie and Harrison (1997).

TABLE IX
ESTIMATES OF THE MODEL EXPLAINING PRICE-COST MARGIN IN INDIAN INDUSTRIES
(USING NONTARIFF BARRIERS)
Dependent Variable = *PCM*

| Explanatory Variables | Model | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI |
| *QR* | 0.0092** | 0.00919** | 0.00638*** | 0.0102* | 0.0103* | 0.00799** |
| | (2.474) | (2.473) | (1.620) | (2.803) | (2.848) | (2.026) |
| *DWSE* | −14.498* | −14.386* | −14.386* | −14.579* | −14.568* | −14.553* |
| | (−39.57) | (−39.29) | (−39.26) | (−38.66) | (−38.49) | (−38.42) |
| *KQ* | 0.3841*** | 0.4025*** | 0.38 | 0.251 | 0.2578 | 0.2299 |
| | (1.642) | (1.723) | (1.602) | (1.063) | (1.089) | (0.9509) |
| *GRI* | | | | −0.00783* | −0.00785* | −0.00769* |
| | | | | (−5.729) | (−5.765) | (−5.554) |
| *DCON* | | 1.268* | | | 0.9716** | |
| | | (3.526) | | | (2.544) | |
| *QR · DCON* | | | 0.014* | | | 0.0106* |
| | | | (3.687) | | | (2.668) |
| *D* | 0.2012 | 0.2296 | 0.2252 | 0.2593 | 0.2829 | 0.2692 |
| | (0.82) | (0.9323) | (0.8975) | (1.081) | (1.172) | (1.085) |
| Constant | 9.4025* | 8.9954* | 9.2459* | 9.4456* | 9.0826* | 9.2976* |
| | (23.02) | (21.66) | (22.01) | (23.39) | (22.02) | (22.09) |
| $R^2_{OE}$ | 0.7582 | 0.7333 | 0.7401 | 0.7625 | 0.7368 | 0.7421 |
| DW | 2.0242 | 2.0364 | 2.0324 | 2.0333 | 2.0453 | 2.0434 |
| No. of observations | 2,460 | 2,460 | 2,460 | 2,323 | 2,323 | 2,323 |

Notes: 1. Figures in parentheses are *t*-ratios.
2. *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, *KQ* = capital-output ratio, *GRI* = growth rate of industry, *DCON* = dummy variable for highly concentrated industries, and *D* = a dummy variable for the post-reform period.

***, **, and * represent statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

incorporated in the estimated model through the explanatory variables.

The results presented in Tables VIII and IX indicate clearly a positive relationship of PCM with tariff and nontariff barriers. The coefficient of tariff rate (*TRF*) is positive and statistically significant at 1 percent level in all the six estimates of the model presented in Table VIII. The coefficient of quantitative restrictions variable (*QR*) is also positive and statistically significant in all estimates of the model presented in Table IX (at the 1 percent level in some cases). The inference that may be drawn from these results is that lowering of tariff and nontariff 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.

The coefficient of the dummy variable representing highly concentrated indus-

tries (*DCON*) is consistently positive and statistically significant at the 10 percent level or better in the estimates of the model presented in Tables VIII and IX (in some cases statistically significant at the 1 percent level). The finding of a positive relationship between industrial concentration and PCM or profitability is consistent with theoretical expectations and in agreement with the results of Kambhampati (1996) and Rao (2001). The interaction term between *QR* and concentration dummy has a positive and statistically significant coefficient (at the 1 percent level). The interaction term between tariff rate and concentration dummy also has a positive coefficient. The coefficient is statistically significant at 10 percent level in one regression estimate and insignificant in another one. 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 trade liberalization had a relatively stronger effect on the profitability of highly concentrated industries than on the profitability of other industries.

The coefficient capital-output ratio is consistently positive. The coefficient is statistically significant when the growth rate of industries is not included in the regression equation, but the level of statistical significance of the coefficient goes down when growth rate of industries is included. On the whole, the results indicate a significant positive relationship between capital-output ratio (*KQ*) and PCM. Such a relationship is obviously expected. On the other hand, a significant negative relationship is found between growth rate of industry (*GRI*) and PCM. The results in respect of *GRI* are at variance with the results of Rao (2001) but are in line with the results obtained by Ghosh (1975).

The post-reform dummy (*D*) has a positive but statistically insignificant coefficient. We expected this variable to pick up the pro-competitive effects of reforms other than trade reforms (e.g., industrial reforms, and easing of restrictions on the entry of foreign direct investment). However, the variable may also reflect the influence of other developments in the post-reform period, thereby clouding the influence of industrial reforms. Also, the growth rate variable may be picking up to some extent the effect of industrial reforms.

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 the profitability of industrial firms. The coefficient of this variable is negative and statistically significant at the 1 percent level in all the estimates of the model presented in Tables VIII and IX. 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 model estimates for the two groups of industries are found to be quite similar to the results reported in Tables VIII and IX 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 PCM was relatively less for consumer goods industries than for intermediate and capital goods industries. The same applies to the effect of *QR*. Given that a high level of *QR* was maintained for 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 reduction in tariff and nontariff barriers on PCM for consumer goods industries.

## V. CONCLUSION

A number of studies for developing countries have found that import liberalization leads to a reduction in PCMs or markups in imperfectly competitive industries. While the Krishna-Mitra study for Indian industries did find this pro-competitive effect of trade liberalization, two subsequent, more comprehensive studies undertaken by Srivastava et al. and Balakrishnan et al., applying the same methodology, did not find any general decline 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 for pro-competitive effects of trade reforms.

In this study, a model for explaining PCM was estimated from panel data for 137 three-digit industries for the period 1980/81 to 1997/98. Our analysis differs from that in the four similar studies discussed above in that we included tariff and nontariff barriers among our explanatory variables. The results of our 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, particularly concentrated industries, tending to reduce the markups or PCMs. 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 a slide in the PCM 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 (2004) 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 incorporated into protective labor legislation remain in effect, the intensification of domestic and external competition is forcing the existing industrial units to seek out informal avenues of flexibility in labor allocation (including recourse to the outsourcing of jobs and allowing flexi-time). Tendulkar notes further that with the opening up of the economy and rising fiscal deficits of the states, public investment has been declining along with central support for state capital expenditures. The state governments have thus been forced to seek out 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 become more liberal in granting permission for the restructuring and retrenchment of labor and closure of factories.

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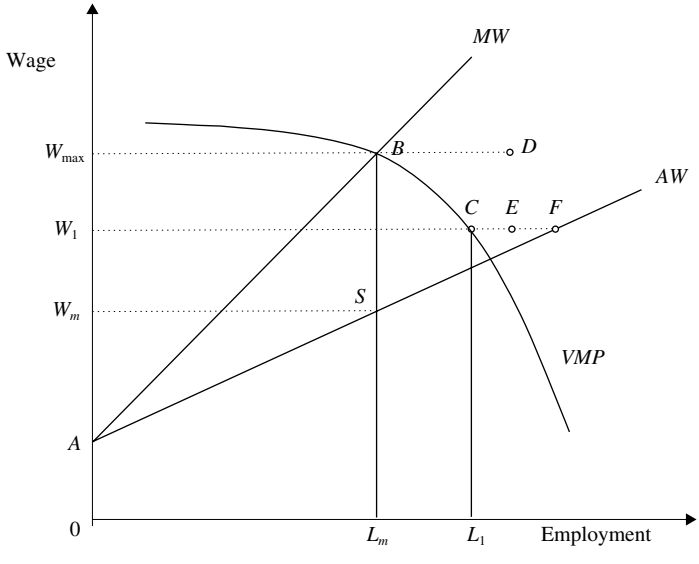
## APPENDIX

## LABOR MARKET EFFECT OF TRADE UNIONS

In the econometric analysis of PCM presented in this paper, the gap between income share of labor (denoted by $S_L$) and the elasticity of output with respect to labor (denoted by $\alpha_L$) has been taken as an explanatory variable, and treated as a proxy for trade union strength. Certain theoretical issues concerning the effect of unions on wages and employment are briefly discussed here to explain the justification for choosing the proxy variable.

The discussion is set in the framework of a monopsonistic labor market faced by an industrial firm. A diagrammatic presentation of the determination of wage and employment in such a labor market is provided below. Employment is measured along the x-axis and wage rate and value of marginal product along the y-axis. The firm faces a rising supply curve of labor which is given by the line *AW*. The marginal labor cost to the firm is higher than the average wage. This is given by the line *MW*. Curve *VMP* shows the value of marginal product at different levels of employment. The monopsony market equilibrium, in the absence of a union, is at $W_m$ and $L_m$ (Hoffman 1986, p. 266). At this point, the wage rate is less than the value of marginal product. Therefore, the income share of labor ($S_L$) is less than the elasticity of output with respect to employment ($\alpha_L$). Hence, $S_L - \alpha_L < 0$. This follows from the relationship, $(S_L - \alpha_L) = (w - \partial V/\partial L) / (V/L)$, where $V$ denotes value added and $L$ denotes labor.



Let us now consider the effect of unionization. This typically raises the wage above $W_m$, and it provides the firm with a new supply curve of labor which is perfectly elastic over most of its range (Hoffman 1986). Suppose the wage is set at $W_1$. The new supply curve is $W_1F$ in the segment up to $F$ and the line $AW$ thereafter. The equilibrium in this situation is given by $W_1$ and $L_1$. In the equilibrium, the wage rate is equal to the value of marginal product, and therefore $S_L - \alpha_L = 0$. Note further that the union may be able to push the wage rate to $W_{\max}$ without reducing employment below the original level $L_m$. At this point, again, $S_L - \alpha_L = 0$. It follows therefore that as compared to a situation of no union, the presence of a union raises $(S_L - \alpha_L)$.

The weakening of trade unions in their bargaining strength may render them incapable of enforcing on the firm the minimum wage set by the unions. This would lead to a shift in the equilibrium point from $B$ to $S$ or $C$ to $S$ in the diagram above, which would cause $(S_L - \alpha_L)$ to decrease from zero to a negative value, and hence there is some justification for taking $(S_L - \alpha_L)$ as a proxy variable for representing trade union strength in the econometric analysis.

APPENDIX TABLE I

INTERCORRELATION MATRIX AMONG VARIABLES

| | *PCM* | *TRF* | *QR* | *GRI* | *KQ* | *DWSE* | *DCON* |
|---|---|---|---|---|---|---|---|
| *PCM* | 1 | | | | | | |
| *TRF* | –0.0139 | 1 | | | | | |
| *QR* | –0.04862 | 0.4839 | 1 | | | | |
| *GRI* | –0.02752 | 0.000133 | –0.00895 | 1 | | | |
| *KQ* | 0.0649 | –0.1704 | –0.0738 | 0.0465 | 1 | | |
| *DWSE* | –0.1018 | 0.11089 | 0.17024 | –0.02477 | –0.0957 | 1 | |
| *DCON* | 0.0016 | 0.0564 | 0.00396 | –0.0187 | –0.0238 | –0.048 | 1 |

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

One must, however, allow for the possibility that the weakening of trade unions does not affect the shape of the supply curve but causes the height of the flat portion of the curve to go down. The interpretation is that a weak trade union is unable to push up the wage as much as a strong union can, but it still has the power to ensure that the firm pays the minimum wage rate negotiated by the union with the firm. The implication is that the equilibrium point will move along the *VMP* curve, the equilibrium shifting, for example, from $B$ to $C$. The wage rate is equal to the value of marginal productivity at both points, and therefore $(S_L - \alpha_L)$ will not fall.

At this stage, it would be useful to bring in the issue of labor market rigidities. Different labor market institutions such as: (a) collective bargaining agreements, (b) employment security regulations, (c) minimum wage legislations, and (d) hir-

ing and firing costs give rise to labor market rigidities and not only set the price of labor above the market clearing wage level but also make labor adjustment difficult. As a result of these regulations, a firm does not enjoy the flexibility of adjusting its labor demand to its output level and has to retain excess manpower, i.e., labor hoarding (Seth and Aggarwal [2004] examine the issue of labor hoarding in Indian industries and find evidence that such hoarding is significant). Consequently, the firm is not able to operate on its *VMP* curve. Rather it is often compelled to operate at a point to the right of the curve. It seems reasonable to argue that generally the extent of excess manpower in the firm will be higher in those cases where the union is very strong as compared to the cases where the union is weak.

We can compare points $D$ and $E$ in the diagram above. At $D$, the trade union forces the wage rate to rise to $W_{\max}$ and compels the firms to maintain an excess of manpower given by $BD$. A weakening of the trade union leads to a downward shift of the supply curve. The wage rate falls to $W_1$. The extent of excess manpower that the firm has to carry also goes down, from $BD$ to $CE$. At $D$, the wage rate is above the value of marginal product, and therefore $S_L - \alpha_L > 0$. The same applies to the point $E$, but the gap between wage rate and marginal productivity is higher at $D$ than at $E$. Thus, $(S_L - \alpha_L)$ should generally be higher at $D$ than at $E$, i.e., trade union strength being positively related with $(S_L - \alpha_L)$. This provides additional justification for taking $(S_L - \alpha_L)$ as a proxy variable for trade union strength.