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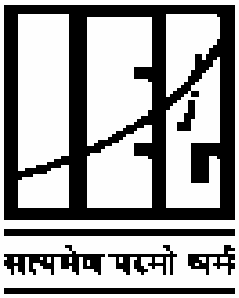

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Import Penetration and Price-Cost Margins in Indian Manufacturing Industries

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Abstract

An econometric analysis of the impact of import liberalization on price-cost margins in Indian industries in the post-reform period is carried out using firm-level data for eight manufacturing industries for the period 1991-92 through 2001-02. Price-cost margins are regressed on refined measures of import competition and some other explanatory variables. The results show a negative effect of import penetration on the profitability of Indian manufacturing firms in the 1990s. On the basis of the econometric results, together with the observed upward trends of import penetration ratios during the period, the paper concludes that the trade liberalization since 1991 in India has decreased the profitability of domestic firms. Moreover, we show that the profit reducing effect of import penetration is smaller for firms with larger market shares. This result is in contrast with earlier empirical studies, but in line with the recent theoretical work (e.g., Melitz, 2003).

JEL Classification Number: F13

Key Words: price-cost margin, import penetration ratio, market share, export intensity

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1. Introduction

Since 1991, Indian foreign trade regime has undergone a drastic change from a very restrictive to an almost free one. This change is expected to increase the intensity of import competition and hence lead to a reduction in the profitability of domestic firms.[1] A number of empirical studies for developing countries have found that increased exposure to import competition causes markups or profit margins in industries to fall (for instance, Roberts and Tybout, 1996; Currie and Harrison, 1997).[2] 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). Some of these studies have also shown that the decline of profitability caused by import competition tends to be higher in more concentrated markets or for firms with higher market shares.

The effects of trade liberalization on profitability of domestic firms in India have been examined in several studies. In some of these studies, to assess the effect of trade liberalization, a dummy variable has been used that differentiates between the pre- and post-reform period, and it is difficult to say that the estimation results precisely capture the effects of trade liberalization. Goldar and Aggrawal (2005) have gone a step further to use tariff and non-tariff barriers as explanatory variables and obtained evidence of a decline in profitability due to trade liberalization. It may be pointed out, however, that the extent to which the relaxation of tariffs and non-trade barriers causes an increase in imports depends on the characteristics of each product market. Accordingly, in this study, we investigate the direct effects of import penetration on the profitability of domestic firms.[3]

The methodology of empirical analysis used in this paper is basically similar to the one adopted by the studies in Roberts and Tybout (1996). Most previous studies have taken either of two approaches to study price-cost margins. The first approach is the one by Hall (1988), whereby output growth rate is regressed on a share-weighted aggregation of growth rates of inputs. The price-cost margin is obtained as a coefficient of the regression estimate. The second approach directly calculates the price-cost margin (for instance, Roberts and Tybout, 1996). In this study, we take the second

[1] Theoretical basis for such a relationship between import competition and the profitability of domestic firms is provided in Tybout (2001).
[2] For a review of literature, see Tybout (2001) and Epifani (2003).
[3] In this sense, this study complements the work of Goldar and Aggrawal (2005).

approach and regress the price-cost margin on a set of explanatory variables including import penetration to find out their effects on the price-cost margin.

One improvement made over previous studies is to obtain a more refined measure of the extent of import competition in this study. Usually, a firm produces more than two products. Not only does the extent of import competition differ across products, but also the degree of importance of each product for the firm varies from product to product. For instance, if a product that accounts for most of the revenue of the firm faces fierce import competition, its impact on the firm's profitability is larger than in the case where only an unimportant product comes under the threat of import competition. Thus, we calculate a weighted average of import penetration ratios of each product market, using as weights, the percentage of the product's sales in the firm's total sales. We use the same method to calculate an aggregate index of market share of each firm.

From our regression analysis, we find robust negative effects of import penetration on the profitability of Indian firms during the period from 1991-92 to 2001-02. This effect is more apparent in the sample of private firms in contrast to public sector firms, and that of domestic-market oriented firms compared to export-oriented firms. These results, together with the observed upward trend of our index of import penetration ratio, imply that trade liberalization in India since 1991 has on the whole reduced the profitability of domestic industrial firms.

Also, we obtain a robust result that as a firm's market share becomes higher, its profit margin tends to be higher, and its effect diminishes as market share increases. Furthermore, the estimation results indicate that pro-competitive effects of trade liberalization tends to be smaller as a firm's market share gets larger, i.e. bigger firms are less affected by import competition, which is at variance with the findings of earlier studies for developing countries (for instance, Roberts and Tybout, 1996). Previous studies have shown that the interactive term between import penetration ratio and market share (or concentration ratio) has a negative coefficient, that is, the profit reducing effect of import penetration becomes larger as the market share of a firm increases. Schmalensee (1989) also confirms that even earlier studies have shown the same results.

However, recent theoretical analyses (for instance, Melitz, 2003; Bernard, Eaton, Jensen and Kortum, 2000) assert that as the trade regime gets liberalized, more productive firms increase both profit and market share (or firm size). This theoretical prediction entails that as market share is higher, the decline of profits due to import penetration is lower. Our empirical results show some evidence conforming to the new theoretical work, but are in contrast with the earlier empirical work.

The rest of the paper is organized as follows. Section 2 gives a brief overview of the studies on the effect of Indian trade liberalization on price-cost margins of industrial firms. Section 3 explains our estimation method, and describes data and variable construction. For the key variables used in the analysis, descriptive statistics are provided in this section. Results of regression analysis are presented and discussed in Section 4. We present some more evidence that is consistent with the new theoretical studies in Section 5. Section 6 deals with the relationship between capital-output ratio and price-cost margin. Section 7 concludes the paper.

2. Earlier Studies

Several studies have been undertaken to examine the effect of trade liberalization since 1991 in India on the profitability of firms. To capture this effect in the regression analysis undertaken, a dummy variable that distinguishes between pre- and post- reform periods has been used in most of these studies. Krishna and Mitra (1998), using the method by Hall (1988), found a decrease in price-cost margin in the post-reform period for three out of the four industries they studied. Srivastava *et al*. (2001) obtained more mixed results. Based on Hall's method and a dummy variable approach, they found a decline in price-cost margin in three industries, an increase in six industries and no change in three industries. The results obtained by Balakrishnan *et al*. (2002) are similar: they found an increase in mark-up in some industries and a decline in some other industries. Kambhampati and Parikh (2003) also took the dummy variable approach but directly regressed price-cost margins on a set of explanatory variables. They showed that the effects of trade liberalization operate through the change in other variables including advertising, R&D, exports and market shares.

Goldar and Aggrawal (2005), criticizing these studies with dummy variables, used more direct measures of the extent of trade liberalization, namely, tariffs and non-tariff barriers, and examined the effect of the trade policy reform on price-cost margins for 137 three digit level industries during the period from 1980-81 to 1997-98. They found that reductions in both tariff rates and non-tariff barriers significantly reduced the price-cost margins of industries.

Goldar and Aggrawal's approach is methodologically superior to that used in previous studies in that variables representing trade liberalization are used in the regression analysis rather than the use of a dummy variable for the post-reform period. However, their approach also has some limitations. The impact of relaxation of tariffs and non-tariff barriers may differ from product to product. For instance, even if tariff on a product is lowered, foreign products may not gain competitive advantages inside India, probably due to the difference in tastes of the consumers or the availability of more desirable

domestic products. In this case, the reduction in tariff may not reduce the price-cost margin of domestic firms.

Another point worth noting in this context is that there was a great deal of tariff redundancy or "water in tariff" in the tariff structure prevailing in India at the time that reforms began (and some degree of tariff redundancy continued in later years). A reduction in tariff in that situation would have had little effect on the domestic industry.

In this study, we directly investigate the impact of the change in import penetration ratio (the sales of imported goods / the total domestic sales) on price-cost margins. Estimates of the impact of the import penetration ratio on price-cost margins obtained through regression analysis, along with the time trend of import penetration ratios throughout the 1990s, enable us to assess the effect of trade liberalization on the price-cost margin.

This approach is the same as the formulations in full-fledged studies on the effect of import penetration for Chile, Colombia, Mexico, Morocco and Turkey in Roberts and Tybout (1996). In these studies, profitability of either industries or firms was regressed on import penetration as well as other variables including concentration in industries or market shares of firms, whose interactive terms with import penetration ratios were also included. The interactive terms generally have negative coefficients, implying thereby that as concentration ratio increases or a firm's market share increases, the profit reducing effect of import penetration becomes larger. These effects had been confirmed by earlier studies referred to in Schmalensee (1989).

However, recent theoretical analyses (Melitz, 2003; Bernard, Eaton, Jensen and Kortum, 2000) show that as trade policy gets liberalized, more productive firms may raise both profits and market shares (or sizes). This may lead to the empirical prediction that as import penetration increases, the negative impact of import penetration are smaller for firms with higher market shares. Hence, their predictions are in contrast with the findings of earlier empirical works. Our estimation results are more in line with the new theoretical works.

One improvement made in this study is to construct more refined measures of import penetrations faced by firms and of market shares of the firms. In previous studies, those variables were constructed in a crude manner, such as computing the relevant ratio at industry level. However, in many cases, each firm produces multiple products, which are not substitutes and thus do not belong to the same market. The effect of import penetration and market share on price-cost margin should be examined in each product market, which includes only close substitutes. Since price-cost margins

are available for the firms and not for each individual product produced by the firms, it becomes necessary to construct measures of import penetration and market share at the firm-level using data on these variables at the product level. In this study, we start from the data of each product market and through a process of weighted aggregation of ratios representing import penetration and market share, work out the overall measures of import penetration and market share of each firm.

3. Models, Data and Variables

3.1 Model Specification

Following Roberts and Tybout (1996), we specify the regression equations as follows:

$$PCM_{it} = \alpha_i + \beta_1 * KQ_{it} + \beta_2 * IMP_{it} + \beta_3 * MS_{it} + \beta_4 * IMP_{it} * MS_{it} \quad \ldots(1)$$

and

$$PCM_{it} = \alpha_i + \beta_1 * KQ_{it} + \beta_2 * IMP_{it} + \beta_3 * MS_{it} + \beta_4 * IMP_{it} * MS_{it} + \beta_5 * (MS_{it})^2 \quad \ldots(2)$$

where i is an index for firms and t indicates year. PCM_{it} is price-cost margin, and KQ_{it} is capital-output ratio of firm i in year t. IMP_{it} is import penetration ratio and MS_{it} is market share. In the second equation, the square of market share has been included as an explanatory variable. This allows for a non-linear relationship between price-cost margin and market share. In all the regression equations estimated, year dummies have been included.

The above equations have been estimated from a panel data set for a sample of companies. The estimation of the models has been done using panel data estimation techniques. To get greater insight into the effect of import competition on profitability of domestic firms, we have also divided the sample into private and public sector firms, as well as export-oriented and domestic-market-oriented firms, and then made the estimates of the equations for each sub-sample group.

3.2 Data and Variables

For our study, we have focused on the following eight industries: chemicals, plastics and rubbers, non-metallic mineral products, base metals, non-electrical machinery, electrical machinery, electronics, and transport equipment.

Our data set covers the period from 1991-92 through 2001-02. Since drastic deregulation of trade policy began in 1991, this decade should be appropriate to analyze the effect of trade liberalization.

The data on import penetration and market share are obtained from *Industry: Market Size and Shares*, published annually by Center for Monitoring Indian Economy (CMIE). From this data source, we can obtain, for each main product: (1) import penetration ratios in product markets, and (2) market share of each firm in product markets. We use these variables to construct aggregate measures of import penetration and market share for each firm.

Each firm produces a variety of products, and the share of each product in total sales of the firm varies across firms. In each market, the import penetration ratio is different and the importance of each product in a firm's total sales is also different. Suppose, for instance, that a firm produces products A and B, with the shares of these two products in the total sales of the firm being 95% and 5%, respectively. If the import penetration ratio in product A market is 50% and that in product B market is 1%, the firm can be said to face serious import competition. On the other hand, if the import penetration ratio in product A market is 1% and that in product B market is 50%, the firm does not face as serious a competition as in the former case. Therefore, we must make adjustments for this difference. In this study, we calculate a *weighted sum* of import penetration ratios and market shares, respectively. We use the percentage of each product's sales in its total sales as weights, in order to calculate the variables. Note that these variables are firm specific.

To explain this further, let import penetration in product market j be donated by IMP_j. Then, the weighted sum of import penetration ratios of firm i in various product markets ($j= 1, \ldots n_i$) denoted by $WSIMP_i$ is:

$$WSIMP_i = \sum_{j=1}^{n_i} \{s_{ij} \times IMP_j\} \qquad \ldots(3)$$

where j is the index of product that firm i produces, s_{ij} is the product j's share in firm i's total sales and n_i is the number of products firm i produces. One problem is that the publication, *Industry:*

Market Size and Shares does not cover all the products in the economy. Therefore, we make the following normalization to calculate the aggregated import penetration ratio ($AIMP_i$).

$$AIMP_i = \frac{1}{\sum_j s_{ij}} WSIMP_i \qquad \ldots(4)$$

In a similar manner, an aggregate measure of market share (called AMS_i) is computed for each firm. In the following we omit "A" in *AIMP* and *AMS* and call them simply *IMP* and *MS*. Interactive terms between import penetration ratio and market share are also calculated in each market, and then aggregated in the same way as above.

The data for the sales of each product and a firm's gross sales are derived from *PROWESS*, constructed by CMIE. Financial data necessary for constructing the price-cost margin (value of output, salary and wages, expenditure on materials and power), and capital-output ratio (total assets, value of output) are also obtained from this data source.

We construct the data series for price-cost margin and capital-output ratio as below:

PCM: [Value of Output – {Salary and Wages + Expenditures on Materials + Expenditure on Power}]/Value of Output

KQ: Total Assets/Value of Output

The price-cost margin computed in the manner described above was found to be very high in certain cases, above 90%. This is obviously unreasonable, since it would imply that variable costs (labor, materials, energy, etc) constitute less than ten percent of the value of output while the return to capital accounted for more than 90%. For the econometric analysis, the observations with high price-cost margin were excluded. The cut-off level was taken as 50%. It may be mentioned, however, that the results remain by and large the same if a higher cut-off is used or if this issue is ignored altogether.

A similar problem was noted about the capital-output ratio. In certain cases, the ratio was unreasonably high. In this case, again, firms with a very high capital-output ratio (more than five) have been excluded from the econometric analysis.

3.3 Descriptive Statistics

The exact sample of firms vary from estimation to estimation. We present in Table 1, summary statistics for the sample firms which satisfy the following criteria: (a) the sum of sales of products included in the data set is more than 80% of the firm's total sales, (b) capital-output ratio is in the range between zero and five, and (c) price-cost margins are greater than zero but less than 50%. The correlations between these variables are shown in Table 2.

Figure 1 shows the time trends in PCM and KQ. From this figure we see that PCM almost remains the same or show a slight decline, if any, during the period under study, while KQ increases over the time period. Figure 2 shows the trends in PCM along with IMP and MS. IMP shows an upward trend except for small drops in 1998 and 1999, indicating that import penetration ratios have been gradually increasing in the markets in which sample firms operate. MS shows a downward trend, implying that the markets of sample firms are becoming less concentrated.

4. Estimation Results

4.1 All Firms in the Sample

The estimation results based on all sample firms are presented in columns 1 and 2 of Table 3. We restrict our estimation to firms which meet the following conditions: sum of sales of products covered in *Industry: Market Sizes and Shares* is more than 80% of the firm's total sales, and capital-output ratio is in the range between zero and five. Further, observations in which price-cost margins are less than zero or 50% or more are excluded. In columns 1 and 2 of Table 3 the coefficients of IMP are negative and statistically significant at the 1% level. The coefficient of MS is significantly positive in column 2 at the 1% level. If we include squared MS, the term has significant negative sign at the 1% level in column 2. This indicates that the effect of the rise in MS diminishes as MS reaches higher levels.

The interactive terms are significantly positive at the 1 % level in both columns 1 and 2. The results seem to indicate that as the MS of the firm gets higher, the downward pressure on PCM due to import penetration becomes lower. This result is contrary to the findings of some previous studies.

The coefficient of the capital-output ratio is negative and significant at the 1% level. This is in contradiction with theory. Actually, these negative coefficients of capital output ratios consistently appear throughout in this study.

4.2 Private vs. Public Sector Companies

Next we divide the sample into private and public sector firms, and we did the same estimations as in Section 4.1 separately. The criteria for selection of firms are also the same as in the estimates presented in Section 4.1. The results are shown in columns 3 to 6 of Table 3.

In columns 3 and 4, where the results for private firms are presented, we see that the results found in the all-firm sample estimations clearly stand out. Namely, the coefficients of IMP are negative and statistically significant. We can see that the coefficients of MS are positive and statistically significant in column 4. The squared term of MS are also negative and significant, reconfirming the declining effect of the increase of MS on profitability. With respect to the effect of the interaction of IMP and MS, the coefficients are positive and statistically significant in both columns 3 and 4.

As regards the estimation results on public sector firms, which are presented in columns 5 and 6, we have fewer statistically significant results. A negative and statistically significant coefficient of capital-output ratios is found as in the results in columns 1 and 2. The interaction term between MS and IMP has a positive and statistically significant coefficient in column 6.

It seems to us that when trade policy is liberalized, public sector firms should be the ones that would suffer most from import penetration. However, we cannot find any empirical support for this hypothesis. In general, statistical findings for public sector firms are weak.

4.3 Export-Oriented vs. Domestic-Market-Oriented Companies

In this subsection, we take up only private firms for analysis and divide them into export-oriented firms (hereafter E-firms) and domestic-market-oriented firms (hereafter D-firms). Firms whose export ratio is above 40 % are defined as E-firms, and those with a ratio below 40% are D-firms. Although a firm with a 40% export ratio still has 60% of its sales in domestic market and is quite exposed to the effect of import penetration, if we raise this criterion up further, the number of sample E-firms will be very small. Therefore, we adopt a 40% export ratio as our criterion. Again we take firms which meet the other criteria mentioned above, i.e. the sum of sales of products covered in our data set is more than 80% of the total sales, 0< PCMs <0.5, and 0<KQs<5.

The results of the estimations are presented in Table 4. As regards D-firms, the results are presented in columns 1 and 2. As expected, we find negative signs on the coefficients of IMP. These results are in line with the results of the estimation for all sample firms and all private firms. Higher market shares indicate a higher profitability in column 2. In the estimation including squared MS term, the coefficient of squared MS has a negative sign (and is statistically significant), implying its declining effect. The interaction terms are positive and statistically significant in columns 1 and 2, indicating that the profit reducing effect of import penetration is weaker for firms with high market shares.

Estimation results for E-firms are presented in columns 3 and 4. The effects of import penetration on the PCM of E-firms are weaker, as expected, relative to the results on D-firms and also relative to the results of all sample estimations. The coefficients of IMP are negative, but it is not statistically significant in either of the columns. Although one may wonder why export oriented firms are exposed to import penetration, the weak results of the negative signs of IMP are reasonable, because 40% is a fairly low criterion to define E-firms, and thus weak effect of import penetration would remain in the results.

Interestingly, positive and statistically significant coefficients are found for the market share variable, MS in column 4. Thus, even for E-firms, higher domestic shares seem to indicate a higher profitability. One possible interpretation is that E-firms have a higher productivity and thus attain both a higher market share and higher export ratio. In other words, higher domestic market shares also indicate higher competitive advantages in the international markets, thus only highly competitive firms can export (see, e.g., Clerides, Lach and Tybout, 1998).

We find negative coefficients of the interactive terms of MS and IMP in columns 3 and 4, though they are statistically weak. These results are in sharp contrast to those we obtained in the other estimations, where we had positive coefficients on the interactive terms. Although IMP affects profitability to a less extent in E-firms, the profit enhancing effects of MS are mitigated in the markets with higher import penetrations.

4.4 Summary of Findings[4]

From the estimation results presented in this section, we find robust negative effects of the import penetration ratio on the profitability of firms during the period, 1991-92 to 2001-02. This effect is more apparent in the sample taken of private firms and, within these, in domestic-market-oriented firms. Also we obtain a robust result that, as a firm's market share becomes higher, its profit tends to be higher, too. For domestically oriented firms, the observed positive relationship between market share and profitability can be explained in terms of firms using their market power to enhance their profits. However, this would not be a valid argument for export-oriented firms. For such firms, one possible interpretation of the finding of a positive relationship between market share and profitability may lie in productivity. Thus, the results for export-oriented firms seem to indicate that a firm with higher productivity tends to have both higher profitability and higher market share.

Two other findings need to be highlighted. First, while the results indicate a positive relationship between market share and profitability, there are indications from the estimation results that this effect becomes smaller as a firm's market share gets larger. Second, several earlier empirical studies have found that the disciplining effect of import competition (causing profitability to go down) tends to be greater for larger firms. One can give some theoretical arguments to justify such a relationship, as given in Tybout (2001). The results of this study, however, do not bear out such a relationship. Rather, the results give the impression that the firms which have a large market share are less affected by import competition.[5]

5. Does import penetration adversely affect small or large firms?

We pay special attention to the abovementioned issue of how import penetration impacts firms of different sizes. The studies in Tybout and Roberts (1996) and earlier studies referred to in Schmalensee (1989) have reported that the profitability of firms with larger markets shares (or industries with higher concentration) is more adversely affected by trade liberalization. This

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[4] We also tested the formulations that have two other dependent variables. The first one has price cost margins constructed by using gross sales as output variable, instead of value of output. The second one has above normal rents constructed by subtracting normal returns to capital from profits. In both formulations, the coefficients of import penetration are negative and statistically significant. The other results by and large remain the same, though the statistical significance is slightly weaker. The estimation results are available from the authors upon request.

[5] In a study undertaken for Turkey, Çulha,and Yalçýn (2005) come up with results that suggest that import penetration is ineffective in reducing the price-cost margins of large, high market share and foreign partner firms.

argument can be theoretically explained, as elucidated in Tybout (2001), by using the relationship between profitability and price elasticity of demand in a symmetric Cournot oligopoly. However, the real world situation is not symmetric. Rather, there coexist high and low productivity firms in the same industry. Melitz (2003) theoretically analyzes this situation and shows that as the trade regime is liberalized, more productive firms increase profits, as well as their market shares and exports. Here, we do not directly relate the productivity of firms to these performance variables. Rather we will see that firms that export and have larger market shares have higher profitability, and the time trends that obtain are better than those of domestic-market-oriented firms and smaller market share firms.

First, we ran regressions including export-sales ratio (denoted by EXP) as an additional explanatory variable. Table 5 summarizes our results. EXP has significant positive coefficients, while all the other coefficients keep the same sign and remain statistically significant. Note also that the coefficients of MS continue to be significantly positive as in the previous regressions. The results indicate that firms that export more and have higher market shares register higher profitability. Next we divide sample firms into an export-oriented group and a domestic-market-oriented group. To do so, we first calculate the average export-sales ratio over the time periods included in our data set for each firm. Then we define the firms with an average export-sales ratio of more than 0.2 as belonging to the export-oriented group. Because we make this classification at a firm level rather than at the observation level, we must compromise with a lower threshold than in the previous section, in order to keep the number of sample firms. Figure 3 shows the time trends of PCM for the two groups. The PCM of the export-oriented group has an upward trend, while the PCM of the domestic-market-oriented group shows a downward trend during trade liberalization.

Last, we divide sample firms into a large market share group and a small market share group by using the average MS of all samples (0.0862) as our threshold. As in the case of export-sales ratio, we calculate the average market share over the time periods included in the data set for each firm. Figure 4 shows the time trends of the PCM of the two groups. Although neither group shows clear trends, the PCM of the large market share group (denoted by PCM(L)) is seen to have a better performance than that of the small market share group (denoted by PCM(S)). Figure 5 shows the time trends of the ratio of PCM relative to the initial year value for the two groups. There we can see more clearly the superior performance of the large market share group.

In summary, the firms that export more have higher profitability, and its trend is more upward than that of the domestic-market-oriented group. The firms that have larger market shares have higher

profitability, and the time trend here looks better than that for the smaller market share group. These findings seem to be consistent with the new theoretical literature.

6. Relation between Price-cost Margin and Capital/Output Ratio

Some discussion on the relationship between capital-output ratio and price-cost margin would be in order here, since the results obtained in the study are counter-intuitive. It can 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 *i*'th firm in period *t*, denoted by PCM_{it}, may be written as:

$$PCM_{it} = \frac{\pi_{it}}{p_{it}q_{it}} + \frac{(r_t + \delta)K_{it}}{p_{it}q_{it}} \qquad \ldots(5)$$

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).

Consider now the relationship between PCM and capital-output ratio. From equation (5) above, one may derive:

$$PCM = \frac{\pi}{Q} + (r + \delta)\frac{K}{Q} = \left(\frac{\pi}{K}\right)\left(\frac{K}{Q}\right) + (r + \delta)\left(\frac{K}{Q}\right) \qquad \ldots(6)$$

where *K* denotes capital and *Q* denotes output. Since r, δ and *K* are non-negative, and π should be positive for many firms, as long as they stay in the market for a while, one would therefore expect the coefficient of *K*/*Q* in equations (1) and (2) above to be positive. But, in the results obtained, the coefficient is found to be negative and statistically significant. How do we explain such results?

We may point out here that the simple correlation coefficient between capital-output ratio and price-cost margin is positive (0.159) in our data set, as is expected theoretically. Further, as a check on these results, the relationship between *PCM* and *KQ* across industries has been studied using data

from *Annual Survey of Industries* (Central Statistical Organization) for 2002-03 (the latest year for which data are available). Data for three-digit industries belonging to the same set of eight industries as used in the firm level study have been taken. The correlation coefficient between *PCM* and *KQ* ratio is found to be 0.11, and if one of the industries, an outlier, is dropped (see Figure 6), the correlation coefficient is found to be 0.33 (n=34).

It may be pointed out next that a negative relationship between capital-output ratio and price-cost margin has been found in several earlier studies for developing countries in which models have been estimated to explain variation in price-cost margin at the industry level or at the firm level (see, for instance, Roberts and Tybout, 1996; especially the papers on Chile and Columbia).

The observed negative relationship between capital-output ratio and price-cost margin is partly attributable to the fact that the estimation method used controls for firm effects and this weakens the effect of capital-output ratio. Tybout writes: "the role of capital-output ratios (KQ) depends strongly on whether industry effects are included. If industry effects are left out, capital-output ratios have positive and statistically significant coefficients. If industry effects are controlled, temporal variation in capital intensity is not significantly related to fluctuations in price-cost margins within industries" (Roberts and Tybout, 1996, p.212). If so, firm effect should be explaining a part of this stable capital output ratio.

A related point is that temporal variation in output induces a strong negative association between price-cost margin and capital-output ratio because output appears in the numerator of the price-cost margin and the denominator of the capital-output ratio. To explain the point further, note that,

PCM = (Value of Output - Expenditures)/Value of Output

= 1 - (Expenditures/Value of Output) = 1- (Expenditure/capital)(Capital/Value of Output),

where Expenditures means the expenditures on salary and wages, materials and power. Let us now consider, a linear approximation to the above relationship. It may be written as:

$= \alpha + \beta$ (Capital/Value of output) + other terms.

In this equation, β may be interpreted as the ratio of expenditure to capital at the sample mean multiplied by minus one. Now, if the value of output decreases, other things remaining the same, Capital/Value of Output increases, while 1-(Expenditures/Value of Output) decreases. As a result, the coefficient β can be negative.

Of course, the increase in output will not take place without change in expenditure. Nonetheless, it may be argued that variations in expenditure will be less than proportionate to the changes in output, so that the argument given above will hold. To justify this point, it may be pointed out that the above argument essentially rests on the assumption of price-cost margin being pro-cyclical, and the study for Turkey (Chula and Yalchin, 2005) cited above does find that price-cost margin behaves pro-cyclically.

7. Conclusion

In this study we investigated the impact of trade liberalization since 1991 on the profitability of Indian manufacturing firms. We regress price-cost margins on a set of explanatory variables including import penetration ratios and market shares.

The trend of the index of import penetration ratio represents a gradual increase throughout the 1990s in our sample firms, which appear to have resulted from the trade liberalization. Furthermore, our estimation results show robust negative effects of import penetration on the profitability of firms during the period from 1991-92 to 2001-02. This effect is more apparent in the sample of private firms and that of domestic market oriented firms. On the basis of the econometric results, together with the observed upward trends of import penetration ratios during the period under study, we may conclude that the trade liberalization since 1991 in India has decreased the profitability of domestic firms.

Also we obtain a robust result that as a firm's market share becomes higher, its profit tends to be higher. Furthermore, the estimation results imply that the profit reducing effect becomes smaller as a firm's market share gets larger. This result is in contrast with many earlier empirical results, but consistent with the predictions of some recent theoretical studies.

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Table 1: Summary Statistics for Key Variables

	Mean	Std Dev	Minimum	Maximum
PCM	0.24	0.10	4.10500D-08	0.50
KQ	1.24	0.74	0.08	4.99
IMP	0.07	0.12	0.00	0.86
MS	0.09	0.13	0.00	0.93

PCM: Price cost margin; KQ: Capital output ratio;
IMP: Import penetration; MS: Market share.

Table 2: Correlation Coefficients among Variables

	PCM	KQ	IMP	MS
PCM	1			
KQ	0.159	1		
IMP	0.089	0.075	1	
MS	0.143	-0.067	-0.086	1

TABLE 3: Estimation Results for All Sample Firms, Private Firms and Public Sector Firms: Model explaining Price-cost Margins

	All Sample Firms						Private Firms						Public Sector Firms					
	Column 1			Column 2			Column 3			Column 4			Column 5			Column 6		
Dependent Variable	PCM			PCM			PCM			PCM			PCM			PCM		
KQ	-0.024	(-9.59)	***	-0.0229	(-8.91)	***	-0.024	(-9.37)	***	-0.022	(-8.69)	***	-0.066	(-2.00)	**	-0.048	(-2.62)	***
IMP	-0.175	(-5.92)	***	-0.168	(-5.68)	***	-0.172	(-5.65)	***	-0.165	(-5.42)	***	-0.178	(-1.04)		-0.15	(-1.06)	
MS	0.0227	(0.59)		0.216	(3.21)	***	0.023	(0.59)		0.217	(3.23)	***	0.217	(0.18)		-1.155	(-1.99)	**
IMP*MS	0.0125	(3.75)	***	0.0118	(3.55)	***	0.012	(3.66)	***	0.012	(3.46)	***	0.03	(0.51)		0.056	(1.99)	**
MS^2				-0.295	(-3.49)	***				-0.296	(-3.51)	***				-0.622	(-0.34)	
R^2	0.782			0.783			0.786			0.787			0.649			0.325		
Adjusted R^2	0.726			0.727			0.73			0.732			0.505			0.21		
FE or RE	FE			FE			FE			FE			FE			RE		
HAUSMAN(p-value)	134.45	[.0000]		133.91	[.0000]		131.67	[.0000]		130.46	[.0000]		21.685	[.0412]		22.26	[.0514]	
No. of Observations	3036			3036			2932			2932			104			104		

Notes: Values in the parentheses are t-values. *** indicates significance at 1% level, ** 5% level and * 10% level.

PCM: (Value of Output – Salary and Wages- Expenditures on Material-Expenditure on Power)/Value of Output

KQ: Total Assets/Value of Output;

IMP: The index of import penetration ratio faced by each firm, as defined in the main text

MS: The index of market share held by each firm, as defined in the main text; MS^2: The index of the squared value of MS, as defined in the main text.

TABLE 4 Estimation Results for Domestic-Market-Oriented Firms and Export-Oriented Firms: Model explaining Price-cost Margins

	Domestic-Market-Oriented Firms						Export-Oriented Firms					
	Column 1			Column 2			Column 3			Column 4		
Dependent Variable	PCM			PCM			PCM			PCM		
KQ	-0.022	(-8.32)	***	-0.02	(-7.66)	***	-0.02613	(-3.16391)	***	-0.025134	(-3.08548)	***
IMP	-0.17	(-5.61)	***	-0.163	(-5.39)	***	-0.18188	(-1.33014)		-0.160982	(-1.19022)	
MS	0.03	(0.77)		0.223	(3.34)	***	-0.02847	(-0.233641)		0.692999	(2.15228)	**
IMP*MS	0.016	(4.6)	***	0.015	(4.47)	***	-0.01282	(-1.01083)		-0.022348	(-1.72736)	*
MS^2				-0.293	(-3.54)	***				-1.59511	(-2.4409)	**
R^2	0.794			0.795			0.11409			0.126195		
Adjusted R^2	0.74			0.742			0.027358			0.033891		
FE or RE	FE			FE			RE			RE		
HAUSMAN(p-value)	123.54	[.0000]		123.72	[.0000]		14.205	[.2878]		16.274	[.2347]	
No. of Samples	2774			2774			158			158		

Notes: Values in the parentheses are t-values. *** indicates significance at 1% level, ** 5% level and * 10% level.

PCM: (Value of Output – Salary and Wages- Expenditures on Material-Expenditure on Power)/Value of Output

KQ: Total Assets/Value of Output;

IMP: The index of import penetration ratio faced by each firm, as defined in the main text

MS: The index of market share held by each firm, as defined in the main text; MS^2: The index of the squared value of MS, as defined in the main text.

TABLE 5: Estimation Results, including export intensity as an explanatory variable: Model explaining Price-cost Margins

	All Sample Firms						**Private Firms**						**Public Sector Firms**					
	Column 1			Column 2			Column 3			Column 4			Column 5			Column 6		
Dependent Variable	PCM			PCM			PCM			PCM			PCM			PCM		
KQ	-0.024647	(-9.71)	***	-0.023172	(-9.03)	***	-0.02411	(-9.49)	***	-0.022626	(-8.82)	***	-0.04731	(-2.63)	***	-0.04835	(-2.62)	***
IMP	-0.172481	(-5.83)	***	-0.165249	(-5.59)	***	-0.168917	(-5.56)	***	-0.161707	(-5.33)	***	-0.12779	(-0.99)		-0.14529	(-1.02)	
MS	0.023085	(0.60)		0.21967	(3.26)	***	0.022995	(0.60)		0.220144	(3.27)	***	-1.23859	(-2.49)	**	-1.14148	(-1.95)	*
IMP*MS	0.012319	(3.69)	***	0.011636	(3.49)	***	0.012052	(3.60)	***	0.011368	(3.40)	***	0.049383	(2.12)	**	0.054778	(1.94)	*
MS^2				-0.298954	(-3.54)	***				-0.299584	(-3.56)	***				-0.60972	(-0.33)	
EXP	0.035575	(2.35)	**	0.036582	(2.42)	**	0.036006	(2.39)	**	0.037029	(2.46)	**	-0.20883	(-0.32)		-0.19998	(-0.30)	
R^2	0.782415			0.783539			0.786179			0.787339			0.312819			0.322626		
Adjusted R^2	0.726555			0.727855			0.730796			0.73214			0.195686			0.198052		
FE or RE	FE			FE			FE			FE			RE			RE		
Hausman (p-value)	127.71	[.0000]		126.96	[.0000]		125.08	[.0000]		124.67	[.0000]		21.855	[.0576]		22.29	[.0728]	
No. of observations	3036			3036			2932			2932			104			104		

Notes: Values in the parentheses are t-values. *** indicates significance at 1% level, ** 5% level and * 10% level.

EXP: Exports/Sales. Other notation: as in the previous tables.

Figure 1:Trends of PCM and KQ

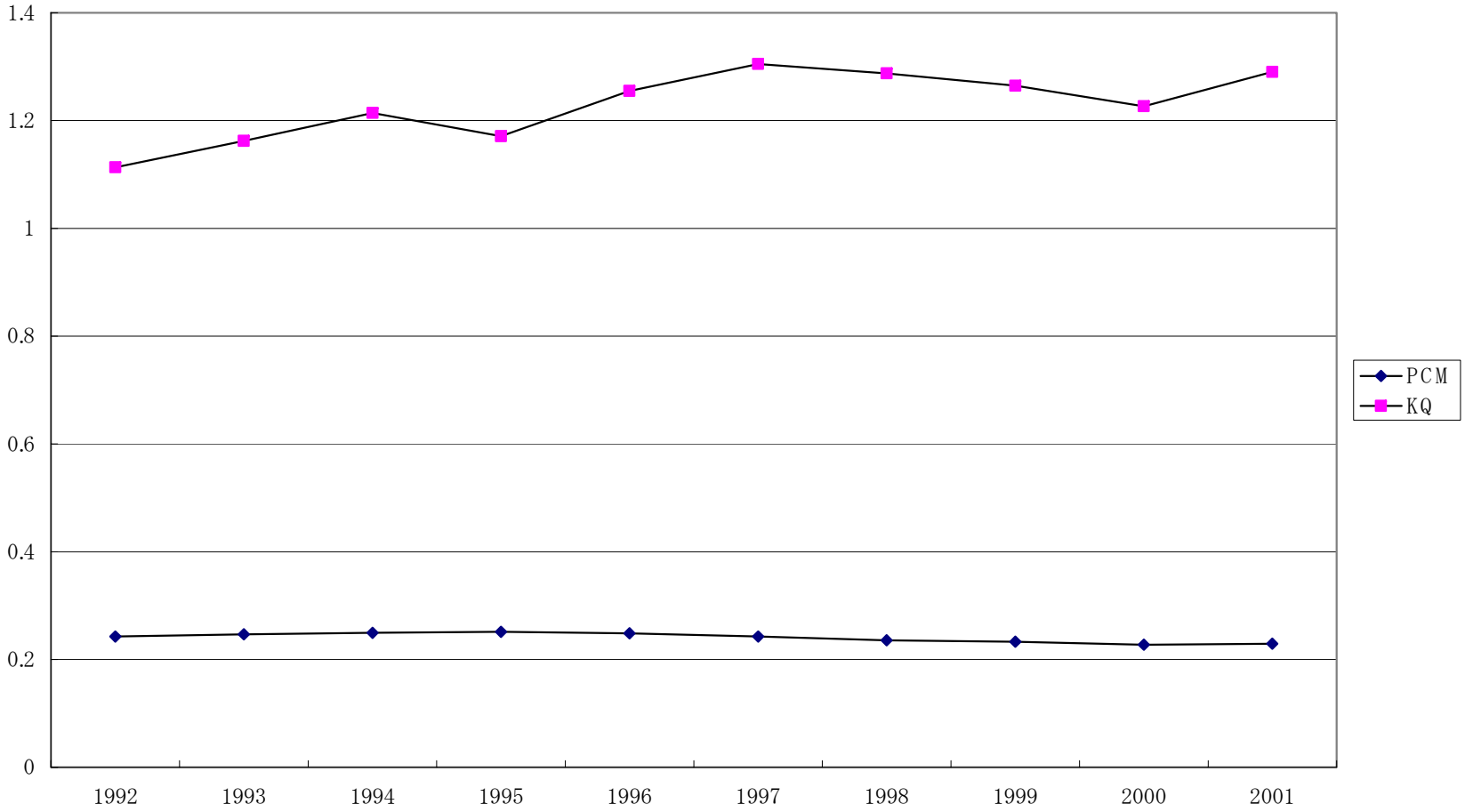


Figure 2: Trends in PCM, IMP and MS

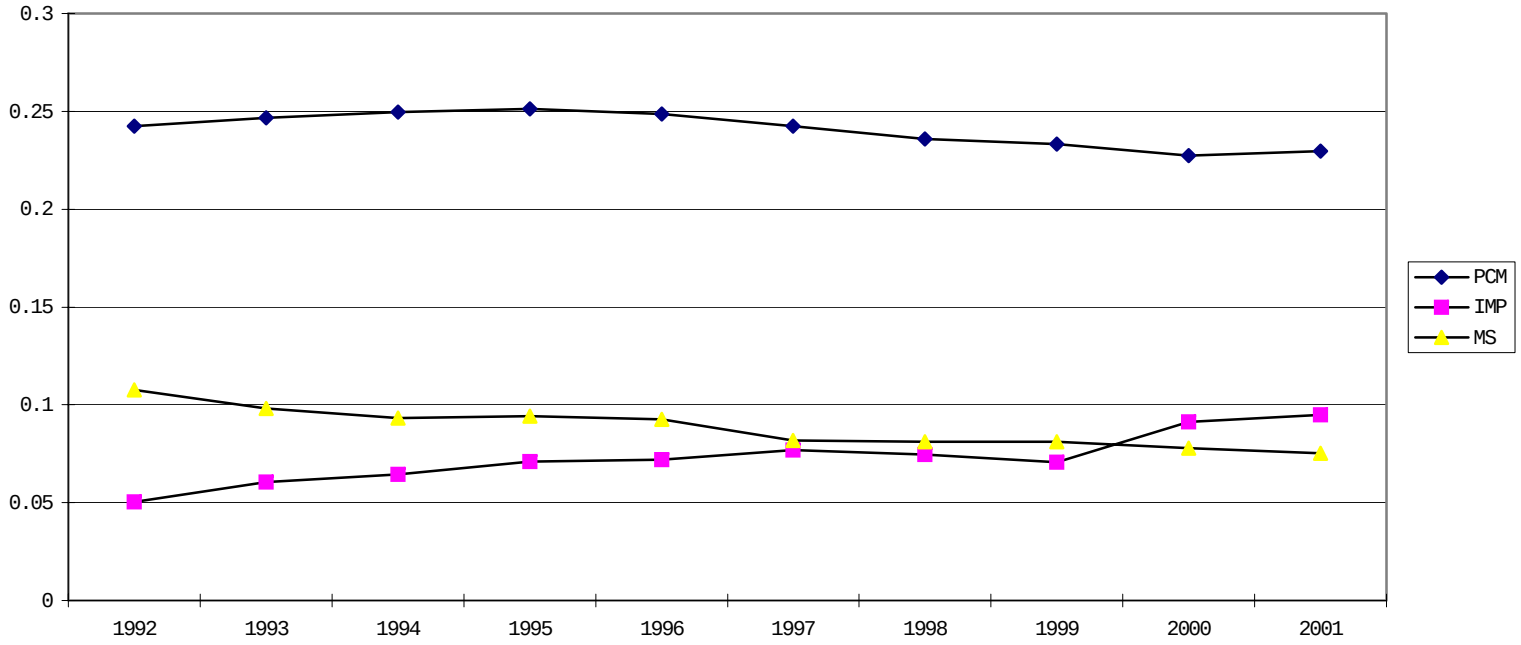


Figure 3: Trends of PCM

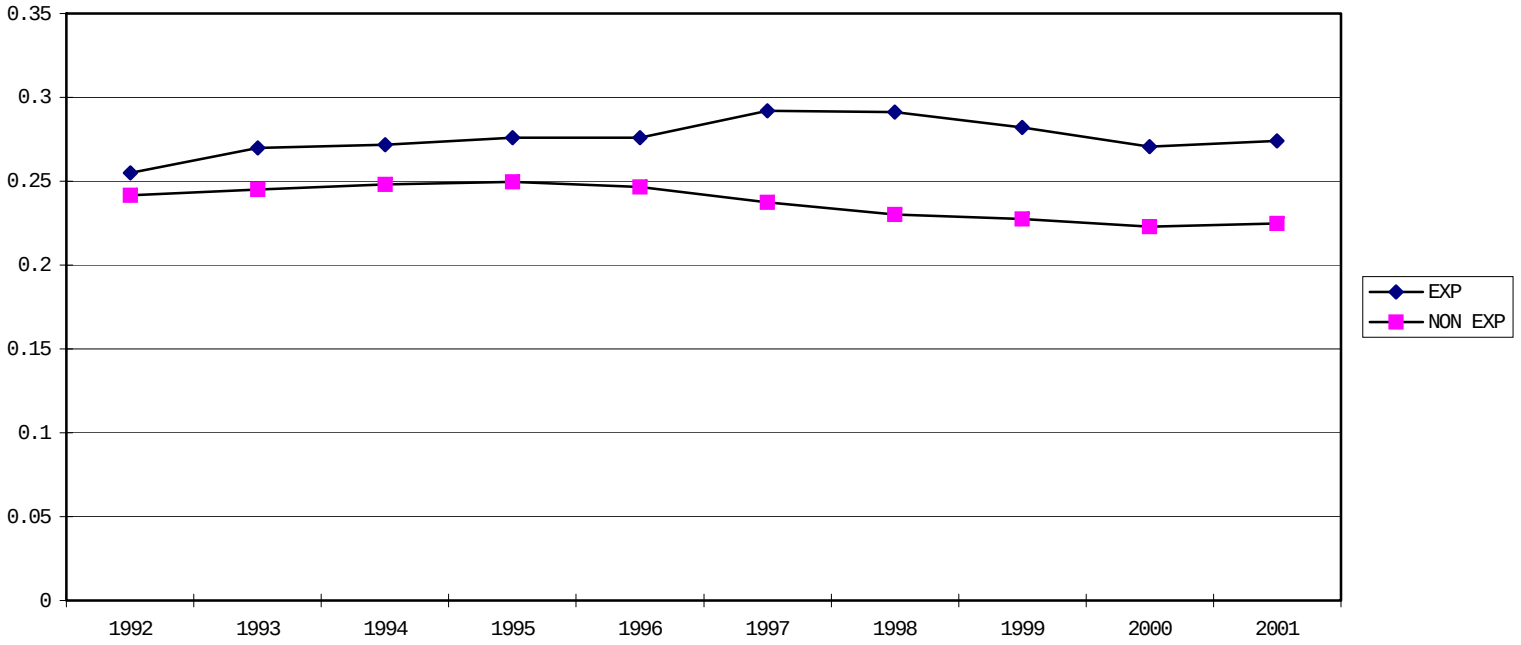


Figure 4: Trends of PCM for Large and Small Market Share Groups

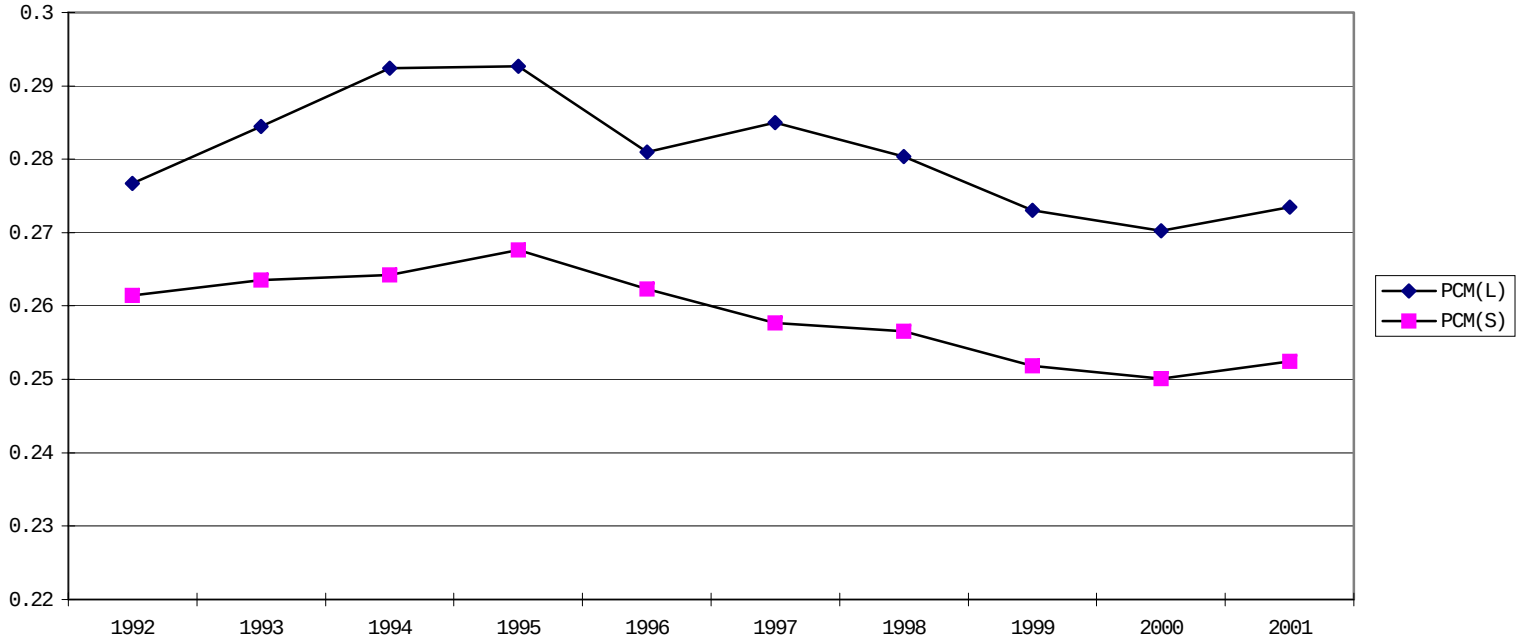
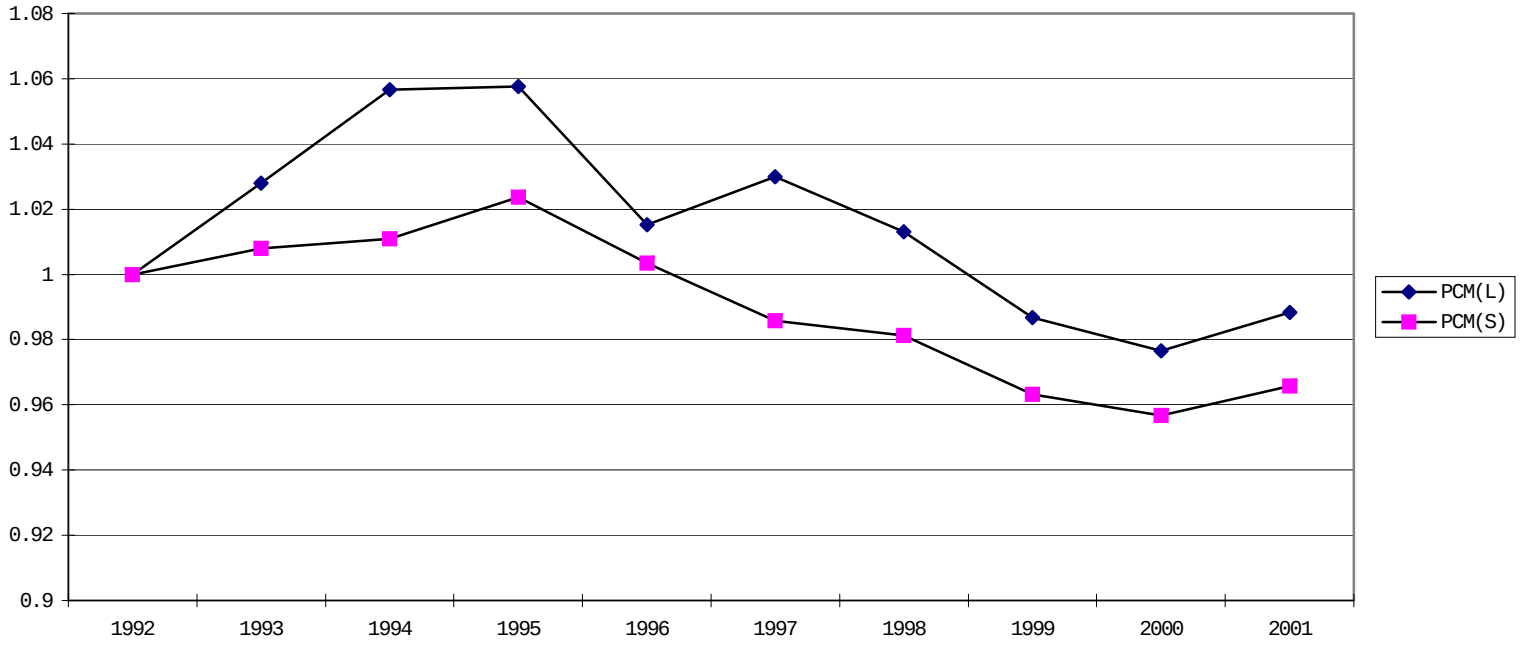
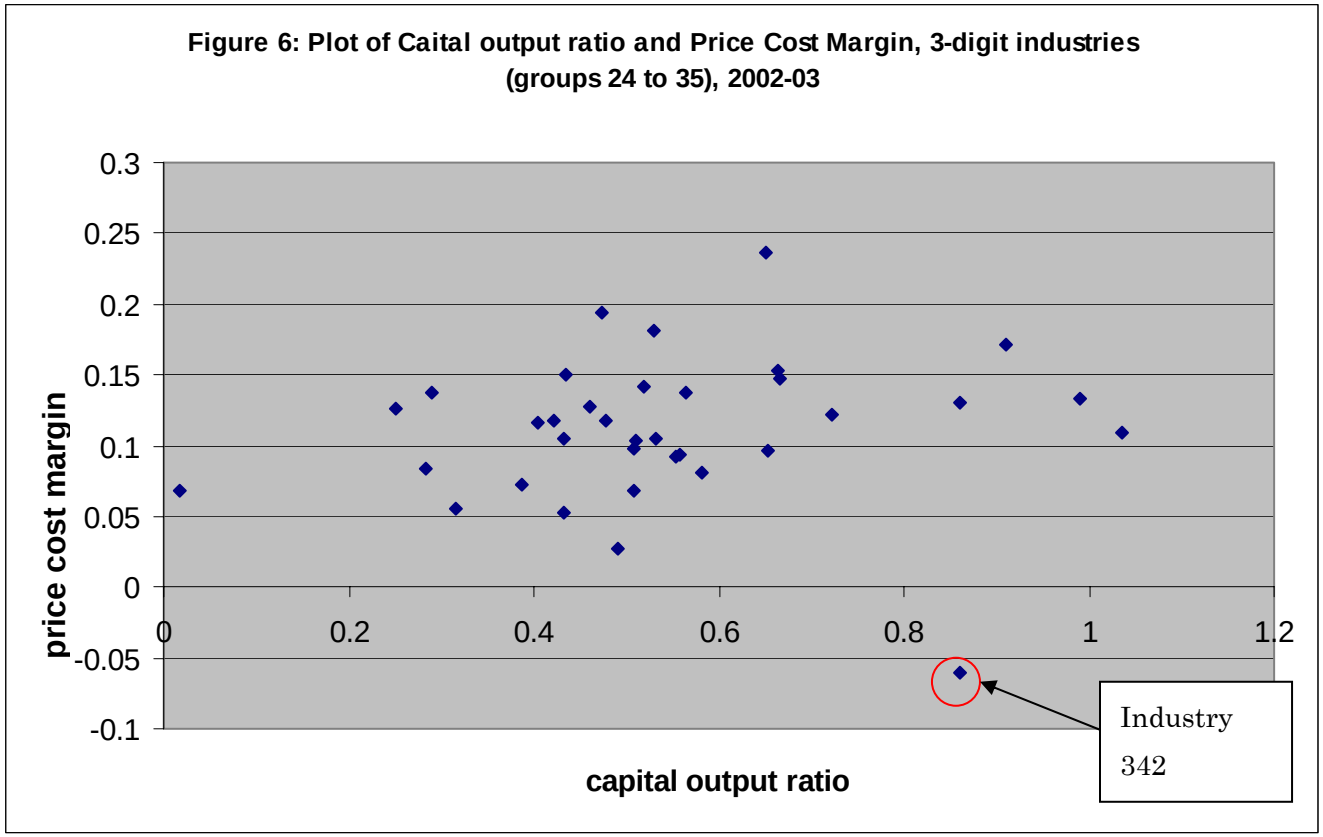


Figure 5: Trends of PCM Ratio Relative to 1992 for Large and Small Market Share Groups





Note: The graph is based on industry level data taken from Annual Survey of Industries (CSO)

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