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ABSTRACT

Using a panel of eight Pakistani manufacturing industries, we have examined the changes in price-cost margin (gross profitability) during 1998-2009. In this study the traditional industrial organization approach of Structure-Performance has been applied to analyse the effects of concentration and import intensity on price-cost margins. It has been found that market concentration measured by four-firm concentration leads to high price-cost margin. Imports have the tendency to make the domestic firms more competitive, but their effect on more-concentrated firms is smaller as compared to non-concentrated firms. The minimum efficient scale and assets of industry have positive effects on margins while capital intensity has been found to reduce gross profitability.

Keywords: Price-Cost Margin, Concentration, Manufacturing, Pakistan

1. INTRODUCTION

Every firm and industry strives for maximum profit. It is not bad when it is earned through efficient allocation of resources by minimising costs and charging the lowest possible price from the consumers (perfect competition). Firms growing in competitive markets charge low prices, practice allocative efficiency, develop new products, innovate techniques of distribution and production, and adapt to new technologies. For example a country-level finding by Sakakibara and Porter (2001) has shown that export competitiveness in Japan is credited to domestic competition rather to collusion or government intervention. But inspection of empirical evidence reveals that firms in LDCs are usually engaged in charging higher prices from consumers rather than improving their efficiency [Collins and Preston (1969), Gale (1972), Alokesh, Chakraborty, and Hariprasad (2010)]. As for as Pakistan is concerned, our Global Competitive Index ranking is not very impressive and according to Barki, *et al.* (2010) this depicts a dismal picture of local competition in the industrial sector of Pakistan. The Global Competitive Index which is developed on the parameter of intensity of local competition ranked Pakistan 83 out of 122 countries in 2008, and went further down to 101 out of 134 countries in 2010. If we lack competition, there will always be a chance for firms to charge mark-up pricing that provides them further opportunities to create barriers to competition, exploit consumers and become ever more strong monopolies. In such a state of affairs further analysis and explanation would be required and policy action needed to foster greater competition and reduce the scope for mark-up pricing.

This study investigates the part that is played by monopoly forces (market concentration) in influencing industrial performance (price-cost margins or profitability) in Pakistan. It also analyses the role that is played by imports in making domestic industry more competitive. The study analyses the industry price-cost margins (profitability) in the context of structure-performance framework by using a panel of manufacturing industries listed at Karachi stock exchange. The study covers the time period from 1998 to 2009 and considers a sample of eight manufacturing sectors covering 100 firms. Panel data econometric techniques have been applied on industry level data.

Earlier studies in this area in Pakistan, excluding White (1974) and Amjad (1977), have been carried out mostly by financial analysts, where the focus was basically on advising managers and entrepreneurs how to increase their profits. In these studies the main focus was on financial variables while market structure, the effect of imports, exports and business fluctuations on the performance were largely ignored [see for example, Hayat and Bhatti (2010)]. The present study would hopefully use present knowledge of industrial structure and its effects on performance in Pakistan, and help policy makers to devise such policies which could make domestic industry more competitive through better use of resources.

The study proceeds as follows. After the introduction, Section 2 reviews the findings from previous studies in the area. Section 3 gives the theoretical and econometric methodology. Section 4 consists of results and discussion. Section 5 gives conclusions and some policy recommendations. References and Appendix follow.

2. LITERATURE REVIEW

The studies on inter-industries profitability started with Mason (1939) and his PhD student Bain who formulated a framework for empirical analysis that aimed at describing how key aspects of market structure related to its performance (SCP). The literature reveals that most of the studies before 1980s focused on industry level analysis and cross-section data. In these studies, Bain (1951), Stigler (1963), Comanor and Wilson(1967), Collins and Preston (1968, 1969), Weiss (1969), Miller (1969), White (1974), Dalton and Penn(1976), Jenny and Weber (1976), the main focus was on empirical analysis, where the performance variables, excess profit to sale ratio, rate of return on equity, price-cost margins, Tobin's-q etc., were regressed on structural variables such as concentration, size and number of the constituent firms in the industry, advertisement, economies of scale, growth of demand, capital intensity, research and development expenditure. Weiss (1974) has documented 46 such industry level cross-section studies which have checked the correlation between market structure, particularly concentration, and profitability. He has noted that 42 of them have found a positive relation between concentration and profitability. Another detailed review of these studies originates in Schmalensee (1989). In these studies the point of general agreement was that the inter industry variations in profitability are explained to certain extent by structural variables, principally domestic concentration, and that the relation between concentration and profitability is positive. However, there were exceptions to this positive relationship: for example, Porter (1976a), Hart and Morgan (1977), Connolly and Hirschey (1984), Hirschey (1985). Moreover, a positive relationship was reported among profitability and scale economies, capital requirements, advertising, size and number of firms, research and development, with some exceptions. Then in the late 1970s and early1980s researchers focused increasingly on the theoretical aspects of the structure-performance relations. In this respect, the two studies which have contributed the most are that by Cowling and Waterson (1976) and Jacquemin (1982). These studies, on the basis of different behavioural assumptions, predicted theoretically a positive relationship between price-cost margins and domestic producer's concentration and a negative one between price-cost margins and domestic elasticities of demand and import intensities. In the 1980s, the industrial structure and performance studies were extended in three directions. The first was an important concern raised about the past single equations estimations. In this regard Comanor and Wilson (1974), Strickland and Martin (1979a, b), Marvel (1980), Caves, Porter and Spence (1980), Scherer (1980), Geroski (1982), Connolly and Hirschey (1984) and Caves (1985), have argued that it is possible that higher current profits lead to higher producers' concentration in the future so that the concentration may be endogenously determined within the model. These authors have focused on simultaneous equations techniques where different variables such as profitability, concentration, advertising, imports etc. are treated as endogenous. The second change is the introduction of business cycles effects on the pricing behaviour of firms: Rotemberg and Sloner (1984), Green and Porter (1984), Domowitz, Hubbard and Petersen (1986a, 1986b), Haltiwanger and Harrington (1991), Martins, Scarpetta and Pilat (1996), and Athey, Bagwell and Sanchirico (2002, 2004). These studies have given opposing theoretical prediction and empirical results about the pricing behaviour of industries over boom and busts and set ground for onward empirical studies on the effects of cycles on performance: Small (1997), Marchetti (2002), Boulhol (2004) and Culha and Yalcin (2005). The third change is the introduction of external sector and the focus on firm level analysis rather than industry level to allow for firm heterogeneity, Pugel (1980), Geroski (1982), Amjad (1977, 1982), Chou (1986, 1988), Domowitz, Hubbard and Petersen (1986), Nolle (1991), Levisohn (1991), McDonald (1999), Bhattacharya and Takehiro (2002), Li and Urmanbetova (2004), Culha and Yalcin (2005) Sabido and Mulato (2006). One very interesting study was conducted by Slade (2003), in which she has compared four competing models, namely the SCP model of the industrial organisation (Harvard tradition), Market Share model of industrial organisation (Chicago tradition)—which state that firm efficiency leads to high profit and high profits in turn lead to high market share rather than monopoly power; the Capital Assets Pricing Model of financial economics (CAPM model)—which says that an asset with higher systematic risk should command a higher return, and the Exhaustible-Resource model of natural resource economists—which predict that the profit on the marginal unit of exhaustible-resources should increase exponentially overtime and that there should be no systematic relationship between market structure and firm profitability. Using panel data from nonferrous mining and refining markets and component analysis econometric technique, she found a strong support for structure-conduct-performance model. For the different alternative specifications, the firm's profits (measured as the ratio of net real profit to revenue and alternatively the ratio of net real profit to the assets) are positively and significantly related to the structure of their markets (Hirschman-Herfindahl index of concentration and four-firm concentration ratio). A firm market share was found to have no relationship with profitability. A partial support was found for the financial model, while none was found for the Exhaustible-Resource model.

The main conclusions that can be derived from this review are that most of the study lead to the fact that industrial concentration is an important determinant of industry profitability. Most of the time concentration increases profitability rather than profitability, leading to higher concentrations. The external sector and business cycles are important for affecting the performance of domestic industries. Almost all the studies agree that imports make domestic industries more competitive, Amjad (1977, 1982), Pugel (1980), Geroski (1982), Domowitz, Hubbard and Petersen (1986), Levisohn (1991), Li and Urmanbetova (2004), Sabido and Mulato (2006). However, the effects of exports on domestic performance are not quite clear. Some studies have argued that prices at the international markets are higher than the domestic prices so that more exports will increase the margins of the domestic industries, Geroski (1982), Neumann, Bobel and Haid (1985), Nolle (1991) and Gorg and Warzynski (2003). But at the same time there are studies which have proved that more exports make domestic firms more competitive, particularly in small economies, and reduce their margins, Culha and Yalcin (2005), Hsu, Tsai and Yang (2008).

3. THEORETICAL MODEL, DATA AND EMPIRICAL SPECIFICATION

Theory plays a very important function in providing rational and logical ground for testing any relationship. It is the theoretical model which helps us to discover the important variables, establish relationship among the variables and guide us in formulating testable hypothesis.

3.1. Theoretical Framework

To theoretically analyse the effect of market structure and imports on performance, we have considered an oligopoly model with homogenous products. Following Alexis Jacquemin (1982) we have assumed Cournot behaviour. As an illustration, a static non-cooperative oligopoly model of N producers is considered. The cost conditions are the same for all firms and each firm expects that in the short-run no firm will change its supply. Thus each firm maximises its profit with respect to its own output, expecting that the rival firms will not change their output levels.

Another important factor that can affect industrial performance is imports. It has been shown that imports from abroad generally limit market power and reduce the profitability of domestic producers [Jacquemin (1982) and Levinsohn (1991)]. If the domestic producer has monopoly power as well as perfectly elastic supply of import, the effect of imports on profitability would depend on domestic cost conditions. With high domestic cost, the domestic monopolist has to behave as a competitor, while with lower cost he can exploit his monopoly power. To derive the relation between import and performance in our oligopoly model we simply incorporate the import sector and assume, for simplicity, that the import supply does not respond to domestic prices. To see the effects of market structure (market concentration) and imports on industrial performance we proceed as follow:

The N homogeneous firms face the inverse demand function

$$P = f(Y + M)$$

Where, $Y = \sum_{i=1}^{N} y_i$ is total industry output, M is total imports. The gross profit of the ith ologopolist is formulated as

$$\pi_i = f(Y + M)y_i - c_i(y_i) - F_i \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.1)$$

Where π_i is the profit of the ith firm, $P = f(Y + M)$ is the market price, y_i is the output of the ith firm, c_i (y_i) is the variable cost of the ith firm and F_i is the fixed cost. Maximising Equation (3.1) with respect to y_i give us the equilibrium conditions of the ith firm. After some manipulation (see Annex A) this gives us

$$L_i = \frac{P - c_i}{P} = \frac{1}{\varepsilon d}\frac{y_i}{Y}\frac{Y}{Y + M} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.2)$$

Where εd is the elasticity of domestic demand (Y+M) with respect to domestic price P. aggregating over N firms we get

$$L = \frac{PY - \sum_{i=1}^{N} y_i c_i}{PY} = \frac{1}{\varepsilon d} H_d (1 - rm) \qquad \ldots \quad \ldots \quad \ldots \quad (3.3)$$

$L = \dfrac{PY - \sum_{i=1}^{N} y_i c_i}{PY}$ = Lerner index of monopoly power of industry,

$H_d = \sum_{i=1}^{N} (\dfrac{y_i}{Y})^2$ = The Herfindhal measure of domestic producer's concentration,

$rm = \dfrac{M}{Y + M}$ = the rate of imports

Thus finally we get

$$L = \frac{1}{\varepsilon d} H_d (1 - rm) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.4)$$

If we assume that constant marginal costs are equal to average variable costs then the L.H.S. of Equation (3.4) become the industry rate of gross return on domestic sales. Thus Equation (3.4) tells us that the industry rate of return on sales or price-cost margins are positively related to concentration of producers and negatively related to the domestic elasticity of demand and imports. So the higher the producers' concentration and the lower the market elasticity of demand and imports, the higher will be the price-cost margins.

3.2. Data and Variables

The study is conducted on 100 manufacturing firms belonging to eight different sectors. The data on most of the variables is collected from "Balance Sheet Analysis of Joint Stock Companies Listed on Karachi Stock Exchange" published by the State Bank of Pakistan (SBP). The eight different sectors from which the firms are taken are: Cement, Sugar, Paper and Board, Textile Spinning, Textile Weaving, Chemical Engineering, and Food and Dairy Products. We have selected only those firms for which the data on all relevant variables are available for the whole period and whose products are similar or as close substitutes as possible to meet the theoretical definition of industry. Had the firms from the different sectors been selected according to State Bank classification, we may have deviated from it because the different firms classified under a specific industry still employ different production operations that though differentiate it from other industries, yet are so different they cannot be categorised as homogenous products under the model. For example, SBP has data on 37 firms under Sugar and Allied industries that are involved in more than one production operations as crushing, distillery, building materials and boards etc. Thus under SBP classification the products are not homogenous. To avoid that we have selected 15 such sugar industry firms which are involved simultaneously in sugarcane crushing and sugar production. Similarly under textiles and other textiles we have data on 181 firms which are involved in one or more than one operations as production of yarn, fabric, spinning, weaving, garments, sports garments, ginning, dyeing, knitting, stitching, finishing, bed sheets, polyester etc. From this we have chosen 24 firms under two different sector headings. In the first case we have taken 14 of those firms producing yarn only. This sector is given the name of Textile Spinning sector. In the second case we have selected 10 firms under the heading of Textile Weaving. In this sector we have considered only those firms which are involved in spinning and weaving. In the SBP book there is data on 77 firms under Miscellaneous. But these firms cannot be taken under a single industrial heading because they are involved in the production of very different products. To be more specific, we have considered 12 firms from this group under Food and Dairy Products that are involved in the production and processing of different foods and dairy products. From the available 36 firms in Chemical sector we have taken 14 of those firms which are involved in the production of either different chemicals or pharmacy products. Under Engineering we have taken 12 firms producing such items as light and heavy vehicles, motor cycles, automobile parts, tractors etc. The data on total imports, total exports and gross domestic product are taken from *Economic Surveys* published by the finance ministry, while the data on sectoral imports are taken from the *Statistical Year Books* published by the Pakistan Bureau of Statistics (PBS) and from *Handbook of Statistics* published by SBP. The Pakistan Bureau of Statistics publishes imports data in thousand of rupees on commodity basis rather than sector wise. To rectify this disparity, we have converted the figures into million rupees first. Then the commodities in each sector are matched with similar products of other firms in that sector. For example, to see the effect of imports on domestic sugar industry, the sugar import data are taken for total imports in that industry. Similarly for the Paper and Board sector, the imports of paper, paper board are taken as total imports for that industry, and so on for Textile and Chemical, Food and Dairy Products, Engineering sectors etc. There is no data on imports of Cement in the *Statistical Year Books*, so the total imports for cement industry are taken as zero. The SBP imports data are then converted into rupees by using the nominal exchange rate in each respective year.

In Table 3.1, the subscript '*jt*' shows those variables which vary over industry as well as over time. The variable C_{4jt} is constructed in two ways. In the first method we take the average of sales for the 12 years' period for each firm. Then the sales of those four firms are added which have the higher average sales in the respective sector. In the second method we compare the sales in individual years. We add the sales of those four firms each year which have the higher sales in that year in the corresponding sector. Thus in this method a firm is allowed to enter into the group of the four concentrated firms if it has managed to increase its sales in a given year, and go out of the group if it has failed to maintain its sales in the consequent years. For the variable MES_{jt} we have identified the largest firms with respect to their assets in each sector. We then find out how many firms are so large in each sector as to account for about 50 percent of the total assets in that sector. The average assets of such firms are then found out in each sector. The import intensity measure is constructed both at industry as well as at national level. The industry level measure is given in the above table (most reported results are based on this method). At the national level, the import ratio is constructed as the ratio of total imports to GDP plus total imports minus total exports, that is the ratio of imports to total domestic supply. The output gap at the sector level is found by using the HP filtering method [Hodrick and Prescott (1997)] where λ is set equal to 100.

The various variables, their definitions and sources are given in the table.

Table 3.1

Data Description

Variable	Definition	Source
PCM_{jt}	Defined as the ratio of gross profit to gross sales and is used as a measure of price-cost margin(Percent)	SBP (Balance S. analysis)
C_{4jt}	Defined as the ratio of the sales of the four largest firms to the total industry (sampled firms) sales and is used as a measure of market concentration(Percent)	SBP(Balance S. analysis)
MES_{jt}	Minimum efficient scale, defined as the average assets of the largest firms accounting for about 50% of the industry's (sampled firms) total assets and is used as measure of firm size or economies of scale	SBP(Balance S. analysis)
AST_{jt}	Total assets of industry and is used as alternative measure of firm size	SBP (Balance S.) analysis)
KOR_{jt}	Defined as the ratio of total capital employed to output and is used as compensating variable	SBP(Balance S. analysis)
$TTMP_{jt}$	Defined as ratio of imports to sectoral domestic consumption (exports were deducted from domestic supply)	FBS&SBP
GAP_{jt}	Defined as the difference between actual and potential output and is used to see the effect of business fluctuations on PCM	SBP(Balance S. analysis)
YY_{jt}	Industrial output (sampled firms) used as a control variable.	SBP(Balance S. analysis)
$GDPg_t$	The difference between actual GDP growth and potential GDP growth and is used to see the effect of GDP fluctuations on price-cost margins	Eco. Surveys

3.3. Empirical Specification

The theoretical framework highlighted in the previous section implies a log linear relationship between the price-cost margins and the market structure, elasticity and foreign sector. However we face two problems here. The first problem (faced by almost every study in this area) is that the data on the industrial elasticity of demand is not available for analysis. Cowling and Waterson (1976) have argued that if we ignore the market elasticity in cross-section study, the result can be highly misleading. But according to them the market elasticities remain fairly constant overtime, so that we can ignore them in studies in which time dimension is involved and our focus is on changes in structure effecting changes in performance. Thus we hope our result will not be affected by ignoring market elasticities. The second problem is that most of our variables are in form of ratios and some of the explanatory variables contain negative values. Thus we cannot proceed with the log linear form because in such a case we may encounter the missing values problem which can lead to selectivity bias. In this way by following Bain (1951), Collins and Preston

(1969), Weiss (1969), Miller (1969), White (1974), Cowling and Waterson (1976), Amjad (1977), Bhattacharya and Bloch (1997), Li, Patrick, and Urmanbetova (2004), Culha and Yalcin (2005), Sabido and David Mulato (2006) and Hsu, Tsai and Yang (2008) we have assumed a simple linear relationship. Going by the theoretical framework, and adding business cycles, we are able to express the price-cost margins as a function of market structure, imports and business fluctuations as follow

PCM = f (*domestic market structure, importer sector, business fluctuations*)

More specifically, in terms of the variables used in this study for measuring price-cost margin, market structure and import sector, our empirical structural performance model becomes as

$$PCM_{jt} = \alpha + \beta_1 C_{4jt} + \beta_2 KOR_{jt} + \beta_3 MINI_{jt} + \beta_4 YY_{jt} + \beta_5 TTMP_{jt}$$
$$+\beta_6 C_{4jt} * TTMP_{jt} + \beta_7 GAP_{jt} + \mu_{jt} \quad \ldots \quad \ldots. \quad \ldots \quad \ldots \quad (3.5)$$

Because price-cost margin is not directly observable, different authors have used different measures for price-cost margin. Following Bhattacharya and Bloch (1997), we have used the ratio of gross profit to gross sales as the measure of price-cost margins. The one possible problem with gross profit as a measure of price-cost margin is that it may overstate the true value of the latter. In this connection, the capital-output ratio is used as an additional explanatory variable to account for this problem [Bhattacharya and Bloch (1997)]. The variables C_4, *MINI* and *KOR* show the effects of market structure on profitability. The variable *TTMP* represents the effects of import intensity. The variable *GAP* represents the effects of business fluctuations, and C_4 * *IMP* is an interaction term used to check the notion that imports have stronger effects in more concentrated industries.

C_4 is the four firm's concentration and is used as a proxy for market structure. Our theoretical framework provides the rationale for expecting industry profitability to be positively correlated with the level of concentration. This is also evidenced by a large body of empirical research on the structure performance relations. Thus, the coefficient of C_4 is expected to be positive. We have used the firm's size (as measured by total assets) and alternatively, the economies of large scale (as measured by minimum efficient scale) as measures of entry barriers in our analysis, [Gan and Beng (1972), Porter (1979), Audretsch, Prince, and Thurik (1999), Feeny (2000), Culha and Yalcin (2005), Hayat and Bhatti (2010)]. The minimum efficient scale is the size of the firm at which long-run average costs are at a minimum. Many empirical studies show that *MINI* and *AST* have positive effect on the profitability of industry (large size makes a firm able to create barriers for new entrants, and can charge high prices). So we would expect a positive sign for the coefficients of minimum efficient scale and assets. The variable *KOR* is capital-output ratio and is introduced into the model to account for the degree to which the gross profit over-state the true price-cost margins as suggested by Bhattacharya and Bloch (1997). Some authors have used it to capture the differences in the capital intensities of the industries [see for example, Collins and Preston (1969) and Feeny (2000)]. Most of the empirical studies give positive sign for this variable, implying that more capital intensive industries charge high margins [Domowitz, Hubbard, and Petersen (1986) Audretsch, Prince and Thurik (1999)]. In developing countries like Pakistan nothing can be said about the sign of capital output ratio, because in LDCs the cost of capital is very high (for example in Amjad (1977) study capital output ratio has negative effect on industry price-cost margins in most of the estimations).

TTMP captures the effects of import intensity on performance. As is clear from our theoretical framework, imports are expected to make domestic firms more competitive and thus force them to reduce their margins. This theoretical rationale is supported by a large body of empirical research also [see for example, Amjad (1977, 1982), Levisohn (1991), Li, McCarthy, and Urmanbetova (2004) and Sabido and Mulato (2006)]. Thus the coefficient of import is expected to be negative.

GAP captures the effects of business fluctuations on a firm's performance. The research on this variable is relatively a new topic in structural performance models. Both theory and empirical treatment have failed to give exact answers regarding the effects of business fluctuations on firm performance (see for example, Stigler's (1964), Green and Porter (1984), Rotemberg and Sloner (1984), Domowitz, *et al.* (1986), Martins, *et al.* (1996), Small (1997), Marchetti (2002), Boulhol (2004) and Culha and Yalcin (2005)]. However Domowitz, *et al.* (1986) have noted that business fluctuation affect a firm's price setting behaviour over time and, they argue that, if we ignore the effects of business fluctuations and conduct only cross-section studies on structural performance model then the results can be highly misleading. Keeping this in view we have included this variable to capture the possible effects of business fluctuations on industry profitability. The sign of this variable is not clearly *a priori*.

We have applied panel data analysis techniques to check our structural performance model. Panel data techniques allow us to capture industry heterogeneity (if any) over time and across the industries; whereas industry specific effects are omitted under the pooled least square estimation. In such a case, if the unobservable individual specific effects are correlated with the explanatory variables, then PLS estimates will be biased [Hsiao (2003)]. Making our empirical model a more general panel data equation and using the vector X_{jt} to represent our explanatory variables (for ease of reference), we can write a more general unrestricted equation as

$$PCM_{jt} = \alpha_0 + \mu_j + \lambda_t + \beta_{jt} X_{jt} + \varepsilon_{jt} \qquad \ldots \qquad \ldots \qquad \ldots \quad (3.6)$$

The intercept has three parts, α_0 common to all industry and all time periods, μ_i are industry specific intercepts and λ_t are time specific intercepts, while ε_{jt} is the error term which shows all those unobservable effects which vary both over time and across industries. β_{jt} are the slope parameters which, according to this specification, vary over time and across industries. The above equation cannot be estimated in this fashion, but restrictions are to be imposed. Following the tradition we have assumed that the slope parameters are constant over time as well as over industries (later we have tried to relax this assumption). Thus Equation (3.6) becomes as

$$PCM_{jt} = \alpha_0 + \mu_j + \lambda_t + \beta X_{jt} + \varepsilon_{jt} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.7)$$

where β is now a vector of parameters, one for each of the explanatory variable. Rewriting Equation (3.5) and incorporating Equation (3.7) our final model for estimation assumes the following form

$$PCM_{jt} = \alpha_0 + \mu_j + \lambda_t + \beta_1 C_{4jt} + \beta_2 KOR_{jt} + \beta_3 LAST_{jt} + \beta_4 LYY_{jt} + \beta_5 TTMP_{jt} + \beta_6 C_{4jt} * TTMP_{jt} + \beta_7 GAP_{jt} + \varepsilon_{jt} \quad \ldots \quad \ldots \quad (3.8)$$

4. MODEL TEST, RESULTS AND DISCUSSION

4.1. Tests of the Data and Model

Before carrying out panel estimations, it is necessary to check the nature of the data and choose an appropriate estimation technique. The important issues that need to be addressed are: check whether individual effect exists or a pool equation be estimated with both common intercept and slopes; and that if individual effects exist, whether they are period or cross-section specific or both; and whether the unobserved individual effects are fixed, constant or randomly distributed, independent of the explanatory variables.

4.1.1. *Test for Individual Effects*

Industry specific effects are omitted under the pooled ordinary least square estimation. In such a case, bias will be introduced in the PLS estimates if the unobservable individual specific effects are correlated with the explanatory variables [Cheng Hsiao (2003)].

To test for the individual effects in E-views, the unrestricted specification of the model, with two-way fixed effects, is estimated first. When we perform the fixed effects test in E-views, they give us three restricted specifications: period specific effects only; cross-section specific effects only and estimation with common intercept. The results of the redundant fixed effects are presented in Table 4.1 above. Both of the F-test and the Likelihood function (Chi-Square test) favour the cross-section specific model as the correct specification.

Table 4.1

Individual Effects Test

Effects Test	Statistic	d.f.	Prob.	Conclusion
Cross-section F-Statistic	19.93	(7,72)	0.00	Reject H_0 of redundancy
Cross-section Chi-Square	103.46	7	0.00	Reject H_0 of redundancy
Period F-Statistic	1.27	(11,72)	0.26	Fail to reject H_0 of redundancy
Period Chi-Square	17.04	11	0.11	Fail to reject H_0 of redundancy
Cross-Section/PeriodF	9.36	(18,72)	0.00	Reject H_0 of redundancy
Cross-Section/Period Chi-square	115.80	18	0.00	Reject H_0 of redundancy

4.1.2. *Other Specification Tests*

Let us first discuss the results of different specification tests. We focus on the method which is suggested by the specification tests. As indicated in table 4.1, we will use the cross-section specific model as the correct specification. Therefore prior to estimation it needs to be checked if the industrial specific intercepts are fixed constant, correlated with the explanatory variables or randomly distributed, independent of the explanatory variables. The result of Hausman Specification Test in the bottom row of the Table 4.2 proposes the Random Effects Model (the industrial specific intercepts are randomly distributed independent of the explanatory variables). Also, many studies raise concerns about the single equation estimation approach [see for example, Comanor and Wilson (1974), Strickland and Martin (1979a, 1979b), Marvel (1980), Caves Porter and Spence (1980), Scherer (1980), Geroski (1982a), Caves (1985)]. According to these studies, the concentration variable may be endogenously determined in the model so that a single equation estimation approach may result in biased and inconsistent estimates. But some authors argue that the simultaneity problem is not so important and the results of the single equation estimation method are accurate: Weiss (1976), Martin (1979) and Bhattacharya and Bloch (1997). Since it is not clear whether a casual relationship exists between profitability and concentration or not, we also carried out instrumental variable estimations to check for the potential endogeneity problem. We have used two lag values of concentration ratio as instruments. To check for their validity two tests have been used. The over-identifying restrictions test indicates that the instruments are not correlated with the error term, while the week instrument test suggests that the instruments are strongly correlated with the suspected endogenous variable. To check whether the PLS and Ins-V methods give significantly different results i.e., whether concentration ratio is endogenous or not, we have used the modified Hausman test [see Woolridge (2002)]. As indicated in the bottom row, the test failed to reject the null hypothesis of exogenous concentration. Thus our final correct specification is the Random Effects Model.

4.2. Empirical Results and Discussion

We begin our analysis with the examination of the effects of structure, imports and cycles on profitability. The results are presented in table 4.2 below. As expected, the concentration ratio has a powerful positive impact on industry profitability in all the estimation methods. The result of the Random Effect Model indicates that a one unit increase in four-firm concentration ratio leads to 0.23 units increase in profitability. Thus these results lend support to the theoretical stand point that more concentrated industries tend to have higher profits. Our earlier finding of exogeneity of concentration also suggests that there is no two- way causality between profit and concentration. The results for capital-output ratio differ surprising from that of Collins and Preston (1969), Domowitz, Hubbard and Petersen (1986), Bhattacharya and Bloch (1997), Audretsch, Prince and Thurik (1999) and Feeny (2000). In all of these studies the coefficient of capital-output or capita-sale ratio is positive and significant. They argue that capital intensive industries charge high mark-up due as their capital investment is sunk and they need to recover the fixed costs. The results in Table 4.2 indicate that a one unit increase in capital-output ratio leads to a 0.09 units decrease in the profitability. The reasons for this negative relation can

Table 4.2

Structure Performance Estimation Results

Variable	I PLS	II Random Effects	III Ins-v
Constant Term	6.35	6.04	4.15
	(0.79)	(0.90)	(0.53)
Concentration Ratio	0.23**	0.23*	0.26*
	(1.97)	(2.66)	(2.55)
Capital Output Ratio	–0.09*	–0.09*	–0.09*
	(–3.79)	(–3.32)	(–2.73)
Mini Effi. Scale	0.0002*	0.0002*	0.0002*
	(5.68)	(5.84)	(4.41)
Output	–3.80E*	–3.90E*	–4.70E*
	(–4.10)	(–4.57)	(–4.43)
Imports	–0.05*	–0.05**	–0.04***
	(–2.50)	(–2.07)	(–1.84)
Gap	6.29E***	6.04E	8.47E**
	(1.68)	(1.66)	(2.47)
R-Square	0.76	0.25	0.22
F-statistic	20.47*	5.01*	3.42*
Observation	96	96	80
Hausman Test For Random Effects	$\lambda^2 = 5.65$	P-Value	0.34
Modified Hausman Test for Endogeniety	$T = 0.01$	P-Value	0.99
Over-identifying Restriction Test	$\chi^2 = 0.78$	*df* =1 Critical value=3.84	
Week Instrument Test	*F-Statistic* = 505		

*Significant at 1 percent; **Significant at 5 percent;***Significant at 10 percent.
Heteroskedasticity-robust t-statistics are in parentheses.
In Ins-v 2 lag values of C4 are used as instruments.

be two-fold. First, as we have used profitability and price-cost margins interchangeably. But Feeny (2000) has pointed out that if we use price-cost margin as a dependent variable, then the coefficient of capital-output ratio should be positive; but in case of profit as a dependent variable, the coefficient is uncertain. The second and important reason may be that like other LDCs, the cost of getting and maintaining capital (both physical and financial) are very high in Pakistan relative to the labour cost.

Firms in Pakistan pay high cost (interest) for getting financial capital and are dependent on expensive imported machinery, foreign skills and often raw materials as well, while the return for this capital is low as compared to developed countries. These higher costs may reduce the price-cost margins of manufacturing industries. This explanation is credible because in Amjad (1977) study the coefficient of capital output is negative in most estimation for Pakistan, even though he has used price-cost margin as a dependent variable. The coefficient of minimum efficient scale is 0.0002 and is significant. These results are in accordance with the traditional belief that large firms take cost advantage (economies of large scale), diversify their operation, create barriers for new entrants, have greater excess to financial markets and greater power to bear risk, which enable them to charge high margin and contradict the "strategic group" theorists who believe that size of the firm does not necessarily lead to high margins [Porter (1979) and Audretsch, Prince, and Thurik (1999)]. In Pakistan Nazir and Afza (2009) and Hayat and Bhatti (2010) have shown that firm size in Pakistan explains about 5 percent variation in profitability. The magnitude of minimum efficient scale is small due to the fact that our dependent variable is a ratio while the minimum efficient scale is in absolute term and is measured in million. When we have included minimum efficient scale in log form its coefficient has become 1.93, indicating that one unit change in minimum efficient scale brings about 2 percent changes in profitability (see Annex A). The negative coefficient of output may be due to the fact that part of the output goes to inventories which, although they increase the cost of the firm, do not lead to any revenues for the firm until it is sold. As the theory predicts, imports make domestic manufacturing more competitive and reduce their price-cost margins. As is clear from table 4.2, a one unit increase in imports reduces the margins by 0.05 units and is highly significant. These results match the results of Amjad (1977), Pugel (1980), Geroski (1982), Domowitz, Hubbard and Petersen (1986), Levisohn (1991), Li and Urmanbetova (2004), and Sabido and Mulato (2006). Moreover, we have included $C_4 * TTMP$ as an interaction term to check the notion that imports have strong effects in more concentrated industries. But we have failed to include both the terms $C_4 * TTMP$ and *TTMP* simultaneously in our estimated equation because of very high colinearity between them (the correlation between them is 0.92, causing all coefficients to become statistically insignificant when we included both of them simultaneously). To avoid this problem we have included this term separately.

The result for the estimations in which we have included the interaction term is given in Annex A. The interaction term shows that a one percentage point increase in imports reduces the margins by 0.0007 percentage points in more concentrated industries. The sign of this coefficient is according to the theoretical expectations but its magnitude is very small. Our result shows that for all sampled firms a one percentage point increase in imports reduces the margins by 0.05 percentage points, while in more concentrated industries it reduces the margin by 0.0007 percentage points. This result does not totally match the theoretical prediction that imports should have greater disciplining effects in more concentrated industries. The possible reason for the weaker coefficient of the interaction term, as Yalcin (2005) pointed out, is that for imports to discipline more concentrated industries a precondition is that there should be no implicit or explicit collusion between domestic and foreign firms in an oligopolistic market [Jacquemin (1982)]. If the degree of implicit collusion between domestic and foreign firms is more than that among domestic firms, then more imports may result in high price-cost margins [Urata (1984)]. The main reason for such a result in Pakistan may be the fact that most of the large firms in Pakistan have got license from different foreign multinationals, and they work as foreign affiliates of these multinationals. Moreover, as Amjad (1977) pointed out, most of the big industrialists in Pakistan are traders also and there is a very strong link between industrialists and traders in Pakistan. Thus if such a situation really exists, then it would be very difficult for imports to discipline the domestic industry. The coefficient of output gap is positive but insignificant in most of the estimations. Finally R-square indicates that these variables explain 25 percent of the variation in industry profitability.

All these results are based on the assumption that the slope coefficients does not change from industry to industry for all the explanatory variables. It would be better to check this assumption by including industries' dummies as interaction terms. But, unfortunately, industries' dummies cannot be included for all the explanatory variables as that would create degrees of freedom problem. To this end we have included industries' dummies for concentration and imports only. Our results (not reported) have indicated that the effects of imports do not change significantly from industry to industry. Then we have estimated our model with industries' dummies for concentration only. This result has indicated (see Annex A) that the effects of concentration on profitability change from industry to industry, with positive relation between concentration and profitability for all the industries with the most powerful effects seen in the Chemical industry and the least in Engineering industry. We have also included the growth of sales as an additional explanatory variable to investigate the effect of increase in demand on profitability. The coefficient of growth rate of sales was highly insignificant indicating that growth in sales has nothing to do with profitability. For this reason it was dropped from the analysis.

5. CONCLUSION AND POLICY RECOMMENDATIONS

In this study, we have analysed the profit-concentration relation with introduction of imports in Pakistani manufacturing during 1998–2009. We have found that on average when market concentration measured by four-firm concentration ratio increases by one percent, price-cost margin will increase by 0.25 to 0.30 percentage points. Concentration ratio was found exogenous, leading us to end that market power is not due to high current profits. Import competition has the tendency to reduce the ability of domestic industries to charge high margins and force them to behave more competitively. A one percent increase in import intensity reduces price-cost margin by some 0.05 percentage points on average. But imports from abroad failed to strongly affect the more concentrated firms. The reason for this may be any explicit or implicit collusion between the domestic oligopolists and the foreign multinationals or the fact that most of the big industrialists in Pakistan are importers also. Another reason may be that most of the big firms in Pakistan have got license from international firms and work as their foreign affiliates. The coefficient of national level import intensity measure is greater as compared to industry level import but the effects of the former are insignificant. Size of firm measured by minimum efficient scale and alternatively by total assets has positive effects on profit while capital intensity reduces profitability of domestic manufacturing.

Thus our analysis showed that market power on the part of firms leads to high profitability. The result that a main root of high price-cost margin is market concentration (monopoly power) cannot be justified on economic grounds. So the need is for strong competitive laws to be formulated and then properly implemented. One therapy for making domestic manufacturer to become competitive is to allow imports into the domestic economy. But at the same time these foreign multinationals should be properly checked so as to avoid any implicit collusive agreements between the large domestic firms and these foreign firms. Also imports licensing should not be monopolised in the hands of big traders and industrialists only. Most of the time in Pakistan import is undertaken by the individuals who are owner of the domestic factories producing the same products. In such a situation there is no reason to believe that imports will improve our domestic competition.

One serious limitation of the study is our small sample of firms. As our study consist of just 100 firms, and to make strong inferences about an economy consisting of hundreds of thousands manufacturing firms on the basis of such a small sample may be very risky. But the problem which forces us to reduce our sample to such a small number of firms was the construction of some of the very crucial variables of the study. The case on table is the concentration ratio and minimum efficient scale. For example, concentration index require that the ratio should be constructed in such a way that the denominator be consists of entities whose products are homogenous. But in the state bank data books there is not even a single industry where there are more than 15 firms producing homogenous are even products that can be considered close substitutes (for detail discussion see the data description section). Another limitation is that we have failed to include variables such as advertisement and R&D expenditure among our explanatory variables. The reason is that data on such variables is reported and available in annual reports only. For this data we require excess to 1200 annual reports released since 1998. But given the time, resources and limited excess to annual reports released some 13 to 14 years ago it was almost not possible for us to include this two variables.

ANNEX A.

A.1. Derivation of Equation (3.2)

The profit function is

$$\pi_i = f(Y+M)y_i - c_i(y_i) - F_i \quad \dots \quad \dots \quad \dots \quad \dots\text{(A1.1)}$$

$$\pi_i = py_i - c_i(y_i) - F_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots\text{(A1.2)}$$

Maximise Equation (A1.2) with respect to y_i give us the equilibrium condition of firm I.

$$\frac{d\pi_i}{dy_i} = p\frac{\partial y_i}{\partial y_i} + y_i\frac{\partial p}{\partial Q}\frac{\partial Q}{\partial y_i} - \frac{\partial c_i(y_i)}{\partial y_i} - \frac{\partial F_i}{\partial y_i} = 0 \quad \dots \quad \dots \quad \dots\text{(A1.3)}$$

Where, $Q = Y + M$, $\frac{\partial Q}{\partial y_i} = 1$ on the Cournot assumption

Now Equation A1.3 can be written as,

$$\frac{d\pi_i}{dy_i} = p + y_i\frac{\partial p}{\partial Q} - c_i = 0 \quad \text{Or} \quad \frac{d\pi_i}{dy_i} = p + y_i\frac{\partial p}{\partial(Y+M)} - c_i = 0 \quad \dots\text{(A.1.4)}$$

Divide both sides of equation (A1.4) by p and then multiply and divide the resultant right hand side by $Y + M$.

$$\frac{p-c_i}{p} = -y_i\frac{\partial p}{\partial(Y+M)}\frac{Y+M}{p}\frac{1}{Y+M} \quad \text{Or}$$

$$L_i = \frac{p-c_i}{p} = y_i\frac{1}{\varepsilon_d}\frac{1}{Y+M} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots\text{(A.1.5)}$$

Multiply and divide the right hand side of Equation (A1.5) by Y we get

$$L_i = \frac{p-c_i}{p} = \frac{1}{\varepsilon_i}\frac{y_i}{Y}\frac{Y}{Y+M}$$

A.2 Tables of Descriptive Statistics

Table 1

Behaviour of Different Variables Over Time for all the Sampled Firms

Years	Concentration Ratio (%)	Profit Sale Ratio (%)	Import Sale Ratio (%)	MiNi Effi. Scale	Output Gap
1998	63.5	13.12	122.17	9723.35	14471.88
1999	65.01	14.61	93.44	9884.9	5084.75
2000	65.59	16.09	87.15	10103.14	930.72
2001	66.06	14.05	103.3	10301.97	-3200.43
2002	66.48	15.02	71.08	11616.36	-9398.53
2003	68.49	13.55	56.47	12216.62	-7564.53
2004	68.15	15.28	62.31	13801.2	-16858.71
2005	68.7	15.41	75.39	17121.34	-9013.26
2006	71.65	16.35	153.91	22351.51	6600.82
2007	72.77	13.7	136.59	27871.81	534.81
2008	73.69	14.48	147.26	33547.6	17840.26
2009	71.9	15.73	139.09	39440.46	572.23
Mean	68.50	14.78	104.01	18165.02	0.00
SD	3.19	0.99	33.27	9857.57	9660.35
CV	4.66	6.73	31.98	54.27	1159241612

This statistics are based on sample data of 100 manufacturing firms. This does not mean that the above and what follows (the figures in the end) hold true for overall manufacturings. But what is important for us is the change in the respective variables over time rather than the exact level. Note, for example, that the sectoral imports are measured as the ratio of total imports of the respective industry to the total domestic sales (industrial imports are added and exports of the sampled firms are subtracted to arrive at total domestic consumption) of the sampled firms in that industry only (see figures below). Thus this measure overstates the true percentage of imports in our domestic consumption in each industry. But what is important for us is the change in import intensity over time rather than the exact level.

A.3. Estimations Results

Table 2

Estimation with Different Specifications

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	5.63	13.04**	7.38	6.00	6.72
	(0.88)	(2.05)	(1.04)	(0.89)	(0.63)
Concentration	0.24*	0.13***	0.23*	0.23*	0.25*
	(2.80)	(1.71)	(3.07)	(2.64)	(2.67)
Capital-Output Ratio	–0.09*	–0.11*	–0.09	–0.09*	–0.06**
	(–3.27)	(–3.82)	(–3.51)	(–3.30)	(–2.21)
Mini Effi.	0.0002*	–	0.0002	0.0003*	1.93
Scale	(5.51)		(4.72)	(5.07)	(1.09)
Total Assets	–	0.0001*	–	–	–
		(6.02)			
Output	–3.89E*	–7.02E*	–2.82E***	–4.06E *	–1.93
	(–4.51)	(–4.18)	(–1.70)	(–4.41)	(–1.05)
Import Intensity	–	–0.06**	–0.24	–0.04***	–0.05***
		(–2.36)	(–0.89)	(–1.82)	(–1.88)
Gap	5.94E	3.53E	7.28E***	–	6.85E ***
	(1.62)	(0.94)	(1.78)		(1.74)
GDP Gap	–	–	–	0.04	–
				(0.41)	
Import Inten*Concen	–0.0007***	–	–	–	–
	(–1.81)				
R-Square	0.25	0.35	0.24	0.25	0.20
F-State	5.05*	8.11*	4.71*	4.80*	3.74*

*Significant at 1 percent; **Significant at 5 percent;***Significant at 10 percent.
Heteroskedasticity-robust t-statistics are in parentheses.
Model 3 are based on total import to total domestic consumption as import intensity measure.

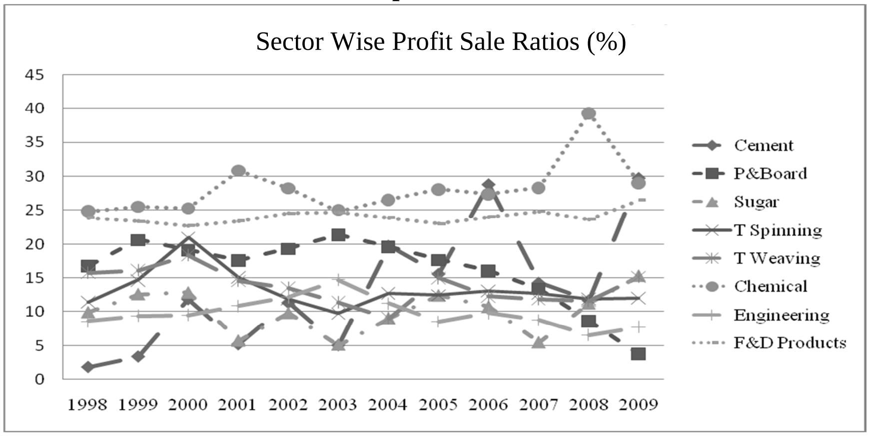
In Model 5 Mini Effi Scale and Output are in Log form

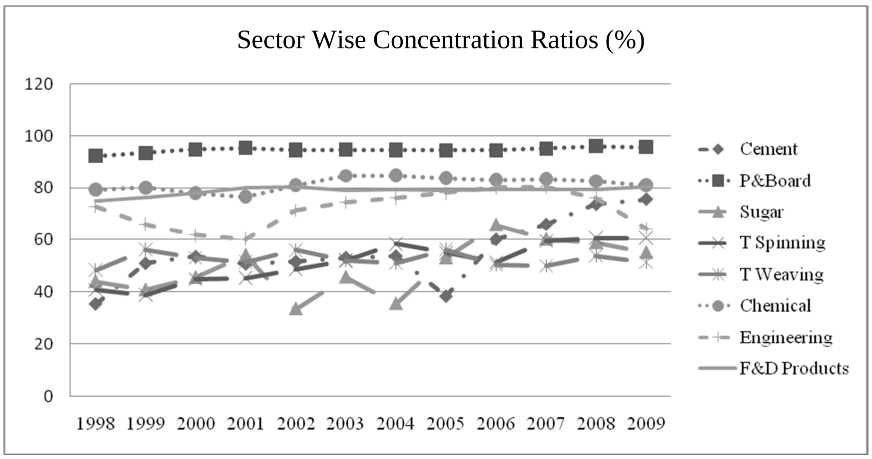
Table 3

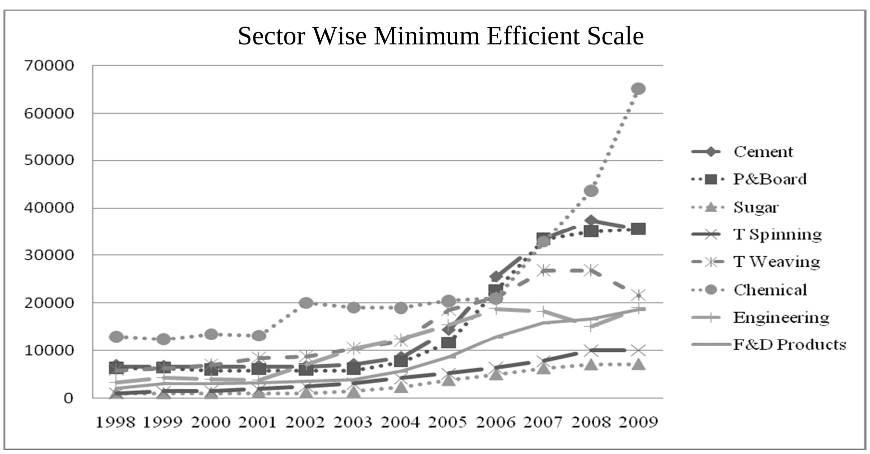
Estimation with Industrial Dummies

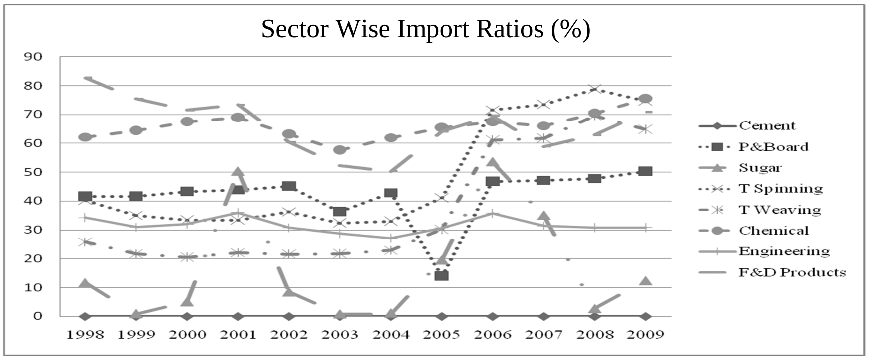
Variables	Model 1			Model 2
Constant	6.05			5.79
	(0.99)			(0.93)
Concentration	0.29*			0.30*
	(3.51)			(3.53)
Capital- Output Ratio	–0.10*			–0.10*
	(–4.01)			(–3.98)
Mini Efficient	0.0002*			0.0002*
Scale	(6.33)			(6.40)
Output	–3.75E*			–3.69E *
	(–4.21)			(–4.13)
Import Intensity	–0.04***			—
	(–1.76)			
Gap	6.42E ***			6.45E ***
	(1.72)			(1.69)
Import Intensity*Con-	–			–0.0006**
centration				(–2.14)
Concentration*Cement	0.02			0.004
dummy	(0.23)			(0.04)
Concentration*P&B	–0.09*			–0.09*
dummy	(–3.78)			(–3.82)
Concentration*Sugar	–0.12*			–0.13*
dummy	(–2.86)			(–3.11)
Concentration*T. Spinning	–0.03			–0.05
dummy	(–1.01)			(–1.44)
Concentration*T.	–0.10*			–0.106*
Weaving dummy	(–6.63)			(–6.86)
Concentration*Chemical	0.07*			0.07*
dummy	(3.76)			(3.73)
Concentration*Engineering	–0.17*			–0.18*
dummy	(–10.56)			(–10.64)
R-Square	0.77	0.24	0.25	0.77
F-State	21.04*	4.71*	4.80*	21.20*

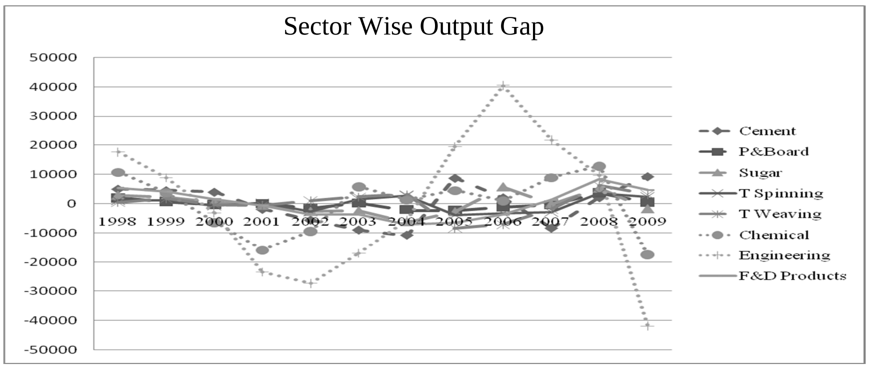
A.4. Sector Wise Comparison of Different Variables











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