NATURE AND SALIENT FEATURES OF PAKISTAN'S MANUFACTURING SECTOR: A COMPREHENSIVE INSIGHT

[1]Asad Abbas, [2*]Muhammad Ramzan Sheikh

[1] Lecturer in Economics, COMSATS University Islamabad, Vehari Campus
PhD Student, School of Economics, Bahauddin Zakariya University Multan
Email: asad@ciitvehari.edu.pk
[2]Associate Professor, School of Economics, Bahauddin Zakariya University Multan
[*]Corresponding Email: ramzansheikh@bzu.edu.pk   s

A R T I C L E I N F O	A B S T R A C T
	The study investigates the nature and salient features of Pakistan's manufacturing sector by focusing on the structure, conduct and performance aspects for 2004-2018. In structural analysis, Pakistan State Oil Company Ltd has turned out to be the largest firm according to gross sales criterion while Oil & Gas Development. Co. Ltd is classified as the largest firm according to the total assets criterion. Six industries are categorized as most heavily concentrated industries, five industries are in moderately concentrated industries while four industries are placed in the least heavily concentrated industries according to four-firm concentration criterion while according to Herfindahl-Hirschman Index principle, six industries are characterized as highly concentrated industries, two industries are in moderately concentrated industries while seven industries are placed in low concentrated industries. Demand and market conditions point out the disparity between the own-price elasticity of market demand and the own-price elasticity of a firm's product. In conduct analysis, Learner's index shows that there is imperfect competition in Pakistan's manufacturing sector. The chemicals & Pharmaceuticals industry has come out with high advertising while the Petroleum Products industry has the lowest advisement intensity. In performance analysis, Spinning, Weaving has more gross profit to sales ratio while Electrical Machinery & Apparatus has the lowest gross profit to sales ratio. The Motor Vehicles industry is at the top for Charnes-Cooper-Rhodes (CCR), Banker-Charnes-Cooper (BCC) criteria while for scale efficiency, the cement industry stands at the apex.

1. INTRODUCTION

There are numerous factors which the managers or policymakers of the firms have to take into account for making decisions regarding output, pricing, research and development and advertisement etc. For this purpose, one has to comprehend the nature of the particular industry, its state of the economy and, the World financial and economic position because there is no single holistic theory and methodology which gives the solution to a specific issue of the industry. Price, output, research and development and advertisement strategies for various industries are diverse so in these states of affairs, it is imperative to draw attention to understand the nature and salient features of industries belonging to Pakistan's manufacturing sector. The structure, conduct and performance indicators will enable the effective manager to devise the optimal decisions and strategies relevant to his/her industry[1].

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[1] This paper has been extracted from Asad Abbas PhD dissertation entitled " Structure, Conduct and Performance Nexus in Pakistan's Manufacturing Sector: Testing of Models and Empirical Analysis"

In this study, we are focusing on the industry-wide differences in the manufacturing sector of Pakistan for structure, conduct and performance factors. The rest of the paper is structured as: Section 2 shows a conceptual review of the structure, conduct and performance. Section 3 gives a review of the literature. Section 4 is based on methodological issues. Section 5 presents the preliminary analysis of the structural aspect of Pakistan's manufacturing sector, section 6 highlights the prelude of conduct related factors while section 7 elucidates the performance analysis of Pakistan's manufacturing sector. Finally, section 8 concludes the paper.

2.   STRUCTURE, CONDUCT AND PERFORMANCE: A CONCEPTUAL REVIEW

It is pertinent to understand the variables related to structure, conduct and performance to analyze the nature and salient features of Pakistan's manufacturing sector.

Firm Size

It is a major structural variable that represents the characteristics or environment of a particular market in which firms operate. The proxies mostly used for a firm size are gross sales and total assets of the firm. The sum of local sales and export sales[2] is called Gross sales revenue. Total assets are the aggregate of Current Assets and Non- Current Assets (SBP, 2018).

Concentration Ratios

Fraction of total industry sale produced by the top largest firms in the industry. Its measure how much of the total output in an industry is produced by the largest firms in that industry. The four-firm concentration ratio (C4) and Herfindahl-Hirschman Index (HHI) are general measures of concentration ratio. The four-firm concentration ratio is defined as the sum of the market share of the top four largest firms in the industry. If we sort the market share (MS) of firms in descending order i.e., $MS_1 \geq MS_2 \geq ...... \geq MS_i \geq ...... \geq MS_n$, the p-firm concentration ratio is the sum of the market shares of the largest p- firms:

$$C^P = \sum_{i=1}^{p} MS_i$$

(1)

Herfindahl-Hirschman Index (HHI) the sum of the square of the market share of all the firms in the industry:

$$HHI = \sum_{i=1}^{n} MS_i$$

(2)

Usually, HHI is multiplied by 10,000 to remove the effect of decimals. So,

$$HHI = 10,000 \left[\sum_{i=1}^{n} MS_i \right]$$

(3)

Demand and Market conditions

To measure demand and market conditions, we must know the concepts of elasticity of industry demand and the Rothschild index. The Rothschild index provides a measure of the sensitivity to the price of the product group as a whole relative to the sensitivity of the quantity demanded of a single firm to a change in its price:

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[2] Local sales is obtained by net of local revenues after adjusting sales tax, sales discounts, federal excise duties etc. and Export sales covers net of export sales after adjusting export rebates and excise duties etc.

$$Rothschild\ Index = \frac{PED}{IPED}$$

(4)

IPED is the elasticity of demand for the whole market while PED elasticity of demand for the product of a particular firm.

Pricing Behavior

Lerner index is used to measure the Pricing Behavior of a particular firm. It is the difference between price and marginal cost as a ratio of price.

$$L = \frac{P - MC}{P}$$

(5)

The Lerner index is related to the markup charged by a firm. In particular, we can rearrange the formula for the Lerner index to obtain:

$$P = \left(\frac{1}{1-L}\right)MC$$

(6)

(1/(1-L)) is the markup factor. It defines the factor by which marginal cost is multiplied to obtain the price of the good.

Advertising

These are non-production cost, but directly related to the revenue generation of saleable goods, i.e., cost incurred to mobilize goods from the factory outlet to the market palace. Advertisements and promotion cover the amount used by the company for product advertisements for both print and electronic media (SBP, 2018).

$$Adver = \frac{Advertisement\ Expenditure}{Gross\ Sales}$$

(7)

Gross Profits to Sales

Gross profit margin is the basic measure to assess a firm's financial health by revealing the proportion of money left over from sales after accounting for the cost of goods sold (SBP, 2018):

$$GPS = \frac{Gross\ Profit}{Gross\ Sales}$$

(8)

Dansby-Willig Performance (DWP) Index

"It measures how much social welfare (defined as the sum of consumer and producer surplus) would improve if firms in an industry expanded output in a socially efficient manner. If the Dansby-Willig Performance (DWP) index for the industry is zero, there are no gains to be obtained by inducing firms in the industry to alter their outputs; consumer and producer surplus are maximized given industry demand and cost conditions. When the index is greater than zero, social welfare would improve if industry output were expanded" (Baye, 2010).

DWP = Consumer Surplus + Producer Surplus

(9)

3.   REVIEW OF LITERATURE

The literature of industrial organization consists of many empirical studies to test the relationships among the elements of performance and the structure of the industry.

Ullah et al (2020) posited on the relationship among firm-specific factors, the structure of capital, financial performance and macroeconomic factors by taking into consideration the textile sector of Pakistan over the period 2008 to 2017. The authors used return on equity as a dependent variable to represent the financial performance proxy. Total debt to asset, sales growth, export growth, debt to equity, taxation and size of the firm has been taken as independent variables. By applying the random effect method authors find out that the debt-to-equity variable and capital structure has a significant and negative association with the financial performance while firm performance and asset turnover ratio indicated a significant and negative relation. The sales growth and the growth of exports have a remarkable positive relation with the financial performance, while the size of the firm has a significant and negative influence on the performance of the firm.

The manufacturing sector of South Africa shows the significance of the highly concentrated industries that has controlled by few powerful firms. Hence, Niekerk (2018) encapsulated the factors of concentration by taking data from the manufacturing industries of South Africa from the time period 2008-2011. Findings revealed that all the independent variables that have estimated in this research are the industry concentration determinants in the manufacturing sector of South Africa. Moreover, the value-added, as well as advertising, have a positive effect on the concentration of industry.

Turgutlu (2017) encapsulated the relationship between advertising and market concentration by taking into consideration the banking industry of the Turkish economy over the period 2006 to 2015. The authors used the generalized method of moments to estimate the relationships among the variables. Findings revealed a non-linear relation between market concentration and advertising intensity and the findings shows a U-shaped relation. The U-shaped relation indicates that the intensity of advertisement decreases with the market concentration in low levels of market concentration.

Donovan et al (2015) highlighted the determinants of advertising expenditures by taking evidence from aggregate and cross-media of New Zealand. Authors revealed that the advertising expenditures in all the media are pro-cyclical actively, that the allocation of the expenditure relies on the patterns of circulation as well as magazines and press are the integral media and are the replacements for the advertising of Television. Richter and Weiss (2013) investigated the public firm's factors of ownership concentration at firm, industry and country level. By applying hierarchical linear models on a sample of nine hundred firms from 9 countries in 2007, the authors find out that the firm, as well as country level determinants, affects the concentration of ownership more strongly than the determinants at the industry level can do.

Abbas et al (2012) have done a comparison of the financial performance in the banking sector by taking data from commercial banks of Pakistan. The period of this study was from 2007-2011. In this study, the authors have used Return on Operating Fixed Assets (ROFA) for the assessment of financial performance. The return on fixed assets shows that how banks are utilizing their assets of operation and what is the participation of operating fixed assets in banks performance. Findings show that the banks that have more total equity, total assets and total operating assets give a better financial performance. It does not mean that banks with higher total assets, higher equity and higher total operating assets always perform better.

Lee (2002) investigated the association between market structure and market industry of Korean manufacturing industries by taking the data of four hundred and twenty-six 5-digit industries for 1983. Results indicated that there is an inverted U-shaped relation between the intensity of advertising and the Herfindahl index. Similarly, by taking manufacturing industries of Brazil Resende (2006) highlighted the determinants of advertisement intensity by using cross-section data for 1996. The estimated results explored a massive degree of endogeneity among the variables of performance and structure. The estimation of instrumental variables has also considered instruments referring to organizational practices as well as information technology and explores suitable roles for barriers to entry, industrial concentration and prevalence of the durable goods in describing the intensity of advertisement. In the Brazilian case, the findings lend some support to an instructive role of advertisement.

Cowling and Waterson (1976) analyzed the relationship between market structure and price cost margin for the US economy over the period 1958, 1963 and 1968 and concluded that HHI works better as compared to concentration ratios. There is a significant relationship between changes in price-cost margin and changes in concentration. Findings are also consistent with durables exhibit higher flexibility in price through the change in quality than the non-durables, rather simply influencing the intercept term.

Strickland and Weiss (1976) estimated the relationship between price-cost margin, concentration and advertising by taking data from manufacturing industries of the US for the period 1963. This study tests three crucial relations in the industrial organization as a system of simultaneous equations. Findings suggested that the simultaneous equations bias is not a crucial determinant in measuring the relationship between structure and performance. Many researchers have considered that if the advertisement is a cause of monopoly power, then this association should be disclosed appropriately through a positive relation, as estimated by linear regression or correlation coefficient, between the intensity of advertisement and the concentration of seller. In this regards, Greer (1971) demonstrated the relationship between advertisement market concentration and advertisement. By applying the OLS estimation technique author find out a significant relationship between concentration and the intensity of advertisement.

A lot of pieces of research have been done on the determinants of performance, structure and conduct. Most of the analysis has proved a positive and significant relationship between Structure, Conduct, and Performance (SCP). It has also recommended that all the firms are required to boost their management system related to the expenditures and also need to raise the shareholders to enhance the performance of the firms. In Pakistan mostly studies had done on banking sectors in which researchers have recommended that the policy maker's focus would be on the improvement of the banking sector's efficiency of Pakistan. On the other side, a positive impact of advertisement on a firm's efficiency and performance has been found in almost all the countries. Further, to estimate the structure of a firm, concentration ratio and HHI have used by many economists as a dependent variable and found a significant impact of many factors i.e., advertisement, performance, profit ratio and market size etc.

4. DATA AND METHODOLOGY

The data for this study have been extracted from "Financial Statement Analysis of Companies (Non-Financial) listed at Karachi Stock Exchange" published by the State bank of Pakistan. We have taken the panel data from 2004-2018. Data of 283 firms (15 industries) related to the manufacturing sector have been taken. A structure, conduct and performance analysis has been executed by applying the various formulas and techniques.

5. A PRELIMINARY ANALYSIS OF STRUCTURAL ASPECTS OF PAKISTAN'S MANUFACTURING SECTOR

Different industries may have various market structures so omniscient managers opt for prudent decisions based on information of these structures. There may be many factors that explain the structural variables including the number of firms within an industry, cost conditions, demand conditions, technology, concentration and entry/exit conditions in the industry but we are focusing on three vital factors i.e. firm size, concentration, demand and market conditions to explain the structural aspects of Pakistan's manufacturing sector.

5.1 Firm Size

To measure firm size, we have taken two variables i.e. gross sales and total assets of the firm. Table 1 exhibits the snapshot of firm size in the manufacturing industries of Pakistan. Considering the gross sales and total assets, we may notice that sizeable and substantial differences exist among the largest firms in the different industries. For example, if we consider gross sales as a criterion of firm size, Pakistan State Oil Company Ltd has been the maximum largest firm in the Petroleum Products with gross sales of Rs345331 million while Pakistan Services Ltd has been the minimum largest company in Services Activities Industry with gross sales of only Rs6310 million. Similarly considering total assets as a criterion to determine the firm size, we may observe that Oil & Gas Development. Co. Ltd has been the maximum largest firm in the Fuel & Energy industry with total assets of Rs326524 million. In contrast, Baluchistan Glass Ltd has been the minimum largest maker of Mineral Products with total assets of only Rs11190 million.

So, if we change the criterion from gross sales to total assets, the largest firm and their related industries differ. It is pertinent to mention here that we have taken the average values of gross sales and total assets from the period 2004 to 2018. It would be very interesting to compare the values of gross sales and total assets on a year-to-year basis because over time the relative position of a firm within an industry may differ due to multiple factors such as market condition, competitive strategies and changes in the industry itself.

5.2 Industry Concentration

Table 1 points out wide-ranging differences in the largest firm size among assorted industries. The relative size of firms within an industry or the size distribution of firms within an industry[3] is another significant factor that can influence managerial decisions because the decisions of managers will vary according to the degree of competition within an industry.

Table 1. Firm Size in Manufacturing Industries in 2004-2018 (Million Rs)

Firm Size w.r.t. Gross Sales

Industry	Largest Firm	Number of Firms	Gross Sales
Services Activities	Pakistan Services Ltd	6	6310
Electrical Machinery & Apparatus	Pak Elektron Ltd	6	17371
Paper, Paperboard & Products	Packages Ltd	6	18735
Petroleum Products	Pakistan State Oil Company Ltd	9	345331
Information, Communication & Transport	Pakistan Telecommunication Co. Ltd	9	98395
Fuel & Energy	Southern Electric Power Co. Ltd	13	201764
Motor Vehicles, Trailers & Auto Parts	Indus Motor Company Ltd	18	67252
Cement	Lucky Cement Ltd	14	43631
Mineral Products	Baluchistan Glass Ltd	6	16891
Manufacturing	Tri-Pack Films Ltd	24	104284
Chemicals & Pharmaceuticals	Fauji Fertilizer Company Ltd	28	74237
Sugar	JDW Sugar Mills Ltd.	27	23711
Spinning, Weaving	Azgard Nine Ltd.	43	12442
Finishing	Nishat (Chunian) Ltd.	35	17117
Made-up and Other Textile Articles	Nishat Mills Ltd.	39	35902

Firm Size w.r.t. Total Assets

Industry	Largest Firm	Number of Firms	Total Assets
Services Activities	Pakistan Services Ltd	6	24966
Electrical Machinery & Apparatus	Pak Elektron Ltd	6	25041
Paper, Paperboard & Products	Packages Ltd	6	50413
Petroleum Products	Pakistan Petroleum Ltd.	9	165951
Information, Communication & Transport	Pakistan Telecommunication Co. Ltd	9	221355
Fuel & Energy	Oil & Gas Development. Co. Ltd	13	326524
Motor Vehicles, Trailers & Auto Parts	Atlas Honda Ltd	18	35187
Cement	Lucky Cement Ltd	14	64147
Mineral Products	Baluchistan Glass Ltd	6	11190
Manufacturing	Tri-Pack Films Ltd	24	64030
Chemicals & Pharmaceuticals	Fauji Fertilizer Company Ltd	28	81922
Sugar	JDW Sugar Mills Ltd.	27	22866
Spinning, Weaving	Azgard Nine Ltd.	43	27815
Finishing	Nishat (Chunian) Ltd.	35	18708

[3]It means that the planners of the firm while taking the optimal decisions should have the information about the competitive environment in the industry. In other words, it explains that how many small firms or how many large firms operate within an industry.

Made-up and Other Textile Articles	Nishat Mills Ltd.	39	62942

Source: Authors' calculations

Table 2 provides the results of two indexes of concentration i.e. Four-Firm Concentration Ratios (C4) and Herfindahl-Hirschman Indexes (HHI) for Pakistan's manufacturing industries. There is noticeable variation in the extent of competition or degree of concentration among industries. The values of the two indexes may or may not reveal the same pattern and results. In Pakistan's manufacturing sector, we can identify that eight industries out of fifteen industries have contradictory results for HHI and C4. These industries include information, communication & transport, fuel & energy, motor vehicles, trailers & auto parts, cement, mineral products, chemicals & pharmaceuticals, finishing and made-up and other textile articles. There are two important reasons for differences in the results of HHI and C4. First, HHI encapsulates the market share of all the firms while C4 is hinged on the market share of just the four largest firms in the industry. Second, HHI includes the square of market share of all the firms while C4 does not embrace the square of market share of the four largest firms. Thus, both indexes rank the firms differently for the degree or extent of concentration due to these two factors.

Table 2. Four-Firm Concentration Ratios (C$_4$) and Herfindahl-Hirschman Indexes (HHI) for Manufacturing Industries (2004-2018)

Industry	*C$_4$* *(Percentage)*	*HHI*
Services Activities	96	5720
Electrical Machinery & Apparatus	98	4152
Paper, Paperboard & Products	94	4130
Petroleum Products	41	2235
Information, Communication & Transport	49	3690
Fuel & Energy	30	1615
Motor Vehicles, Trailers & Auto Parts	69	1489
Cement	60	1299
Mineral Products	26	3061
Manufacturing	74	2813
Chemicals & Pharmaceuticals	61	1337
Sugar	34	778
Spinning, Weaving	31	498
Finishing	40	735
Made-up and Other Textile Articles	49	872

Source: Authors' calculations

Table 3 displays the results of C4 in the categories of most heavily, moderate and least heavily concentrated industries. We have reproduced the values of C4 from Table 2 in Table 3 to explore the type of market and level of competition in the manufacturing sector of Pakistan. In Table 3, the industries have been sorted out in three categories of concentration based on ranges of C4, defined by the Department of Justice, USA.[4] Table 3 shows considerable variation in the degree of concentration among industries in terms of C4. Six industries turn out to be the most heavily concentrated and it suggests the role of competition policy to intervene in these industries to restrict the abuse of market power by four leading firms in these industries. In contrast, four industries are emerged as the least heavily concentrated industries exhibiting effective competition in these industries. In the middle ground, five industries are appeared as moderately concentrated industries demonstrating the loose oligopoly market structure in these industries. Again Table 2 is replicated in Table 4 to categorize the industries in terms of the degree of concentration concerning high, moderate and low concentrated industries based on HHI. According to department of Justice, following

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[4]According to department of Justice, following ranges are defined to determine the degree of concentration in an industry. 0-39 is for low concentrated market, 40-60 is for moderately concentrated market and > 60 is for highly concentrated market..

ranges of HHI are defined to determine the degree of concentration in an industry. 1-1499 is for the low concentrated market, 1500-2500 is for moderately concentrated market and > 2500 is for the highly concentrated market.

Table 3. Most Heavily, Moderate and Least Heavily Concentrated Industries based on C_4 for Manufacturing Sector (2004-2018)

Industry	C_4 (Percentage)
Most Heavily Concentrated Industries	
Electrical Machinery & Apparatus	98
Services Activities	96
Paper, Paperboard & Products	94
Manufacturing	74
Motor Vehicles, Trailers & Auto Parts	69
Chemicals & Pharmaceuticals	61
Moderate Concentrated Industries	
Cement	60
Information, Communication & Transport	49
Made-up and Other Textile Articles	49
Petroleum Products	41
Finishing	40
Least Heavily Concentrated Industries	
Sugar	34
Spinning, Weaving	31
Fuel & Energy	30
Mineral Products	26

Source: Authors' calculations

Table 4 also reveals that there are substantial deviations in the degree of concentration among industries in terms of HHI. Six industries have appeared as the most heavily concentrated industries while seven industries have emerged as the least heavily concentrated industries. Betwixt and between, there are only two industries that are classified as moderately concentrated industries.

Table 4. High, Moderate and Low Concentrated Industries based on HHI for Manufacturing Sector (2004-2018)

Industry	HHI
Highly Concentrated Industries	
Services Activities	5720
Electrical Machinery & Apparatus	4152
Paper, Paperboard & Products	4130
Information, Communication & Transport	3690
Mineral Products	3061
Manufacturing	2813
Moderate Concentrated Industries	
Petroleum Products	2235
Fuel & Energy	1615
Low Concentrated Industries	
Motor Vehicles, Trailers & Auto Parts	1489
Chemicals & Pharmaceuticals	1337
Cement	1299
Made-up and Other Textile Articles	872
Sugar	778
Finishing	735
Spinning, Weaving	498

Source: Authors' calculations

5.3 Demand and Market Conditions

Demand and market conditions are also vital structural variables that vary in the industries. The degree of market demand differs in various industries and affect managers' decisions. Only a few firms are enough to meet low demand industries while many firms are required to fulfil high demand industries. There is also the asymmetry of information among consumers across the markets. So, managers form their policies based on the information in the market. Moreover, various industries have different elasticity of demand for products and the degree of elasticity of demand for an individual firm's commodity varies from the degree of market elasticity of demand for the commodity[5]. Table 5 displays the results of firm and market elasticities of demand along with Rothschild indexes for 15 Pakistani industries.

Table 5. Rothschild Indexes for Manufacturing Industries (2004-2018)

Industry	Own Price Elasticity of Market Demand (IPED)	Own Price Elasticity of Demand for Representative Firms' Product (PED)	Rothschild Index
Services Activities	-0.59	-5.8	0.10
Electrical Machinery & Apparatus	-0.99	-7.64	0.13
Paper, Paperboard & Products	-0.97	-8.97	0.10
Petroleum Products	-0.79	-8.62	0.09
Information, Communication & Transport	-0.37	-5.18	0.07
Fuel & Energy	-0.41	-7.50	0.05
Motor Vehicles, Trailers & Auto Parts	-0.37	-11.02	0.02
Cement	-0.30	-10.09	0.30
Mineral Products	-0.95	-8.00	0.12
Manufacturing	-0.17	-9.40	0.02
Chemicals & Pharmaceuticals	-0.12	-14.50	0.01
Sugar	-0.31	-15.00	0.02
Spinning, Weaving	-0.11	-22.3	0.00
Finishing	-0.23	-18.20	0.01
Made-up and Other Textile Articles	-0.17	-14.40	0.01

Source: Authors' calculations

The table indicates that in all industries there is a large disparity between the degree of own-price elasticity of market demand (IPED) and own-price elasticity of demand for representative firms' product (PED). Furthermore, in all industries, the own-price elasticity of demand for representative firms' product is elastic than the own-price elasticity of market demand and resultantly values of the Rothschild index is close to zero[6] suggesting that the industry is composed of many firms producing the similar products or close substitutes[7].

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[5]Generally, demand for individual firm's commodity is elastic than that for industry with the exception of monopoly.
[6]The range of Rothschild index is between 0 and 1. Since there is no monopoly in the manufacturing sector of Pakistan, so value of Rothschild index is not equal to one.
[7]When the value of Rothschild index is less than 1, it means that an x-percent decrease in one firm's product price will increase that firm's product quantity demanded by greater than the overall industry quantity demand would rise if all the firms in the industry decreased their prices by x-percent.

6. A PRELIMINARY ANALYSIS OF CONDUCT ASPECTS OF PAKISTAN'S MANUFACTURING SECTOR

Besides structural variables, the conduct or behavioral factors among the firms also vary across the industries. The conduct of the firm or industry can be trashed out by considering the pricing behavior, research and development, integration, and advertising activities. We are concentrating on two essential factors i.e., pricing behavior and advertising to elucidate the conduct aspects of Pakistan's manufacturing sector.

6.1 Pricing Behavior

Pricing strategies vary across the firms and industries as some firms have high markups than those of others. Economists use the Lerner index[8] to explain the markup factors or pricing behaviour of the firms. It is interesting to observe that what is the extent to which the firms mark up their product prices over marginal cost in the industry. Table 6 depicts the results of Lerner indexes[9] and markup factors for Pakistan's manufacturing sector industries[10]. It is noticeable that Lerner indexes and markup factors across industries exhibit substantial variation.

Table 6. Lerner Indexes, Mark-up Factors and Own Price Elasticity of Market Demand for Manufacturing Industries (2004-2018)

Industry	Non-Standardized Estimates			Standardized Estimates		
	Lerner Indexes (L=PCM)	Mark-up Factors $\dfrac{1}{1-L}$	Own Price Elasticity of Market Demand	Lerner Indexes (L=PCM)	Mark-up Factors $\dfrac{1}{1-L}$	Own Price Elasticity of Market Demand
Services Activities	1.90	-1.13	-0.53	0.23	1.30	-4.28
Electrical Machinery .& Apparatus	1.41	-2.85	-0.74	0.18	1.22	-5.39
Paper, Paperboard & Products	1.04	-20.28	-0.97	0.57	2.36	-1.73
Petroleum Products	1.41	-2.50	-0.79	0.58	2.41	-1.70
Information, Communication & Transport	2.70	-0.57	-0.37	0.44	1.79	-2.25
Fuel & Energy	2.78	-0.59	-0.37	0.37	1.60	-2.64
Motor Vehicles, Trailers & Auto Parts	3.73	-0.09	-0.26	0.13	1.15	-7.46
Cement	3.62	-0.38	-0.30	0.38	1.62	-2.60
Mineral Products	1.10	-8.64	-0.89	0.36	1.57	-2.72
Manufacturing	6.30	-0.18	-0.17	0.23	1.31	-4.20
Chemicals & Pharmaceuticals	8.82	-0.13	-0.12	0.29	1.40	-3.44
Sugar	3.43	-0.42	-0.31	0.30	1.42	-3.33
Spinning, Weaving	11.80	-0.09	-0.11	0.29	1.41	-3.43
Finishing	5.90	-0.20	-0.23	0.14	1.16	-7.14
Made-up and Other Textile Articles	6.71	-0.17	-0.17	0.26	1.35	-3.81

Source: Authors' calculations

[8] It explains the divergence between P and MC as a fraction of P of commodity.

[9] We have used gross profit to gross sales ratio as proxy to measure the Lerner's index.

[10] Since data on MC and prices are not available, so Lerner index gross profit to gross sales ratio is used as proxy to measure Lerner's index. In this case, we are unable to get the values of Lerner's index between 0 and 1 so we have standardized the estimates of Lerner's index through dimension index.

The values of estimated Lerner indexes are greater than zero which points out the imperfect competition in Pakistan's manufacturing sector[11]. We have found the values of Lerner indexes close to zero in Electrical Machinery & Apparatus, Finishing and Motor Vehicles, Trailers & Auto Parts industries suggesting that firms in these industries effectively compete by lowering their product prices to enhance the sales in the market. Moreover, the values of Lerner indexes are close to 1 in Petroleum Products, Paper, Paperboard & Products and Information, Communication & Transport industries indicating that the firms in these industries are not competing rigorously through price for consumers sales. Table 6 also exhibits the positive association between the Lerner index and the industry's markup.

The petroleum industry shows the highest value of the Lerner index and markup factor across the industries. The value of the Lerner index is 58 per cent while the markup factor is 2.41. The estimate of the Lerner index indicates that if consumers pay Re1 to the firms, Rs 0.58 is markup in the Petroleum industry. In other words, the price is 2.41 times marginal cost.[12]

For Motor Vehicles, Trailers & Auto Parts industry, we have found the lowest estimates of the Lerner index and markup factors. The value of the Lerner index is 13 per cent while the markup factor is 1.15. The estimate of the Lerner index indicates that if consumers pay Re1 to the firms, Rs 0.13 is markup in the Motor Vehicles, Trailers & Auto Parts industry. In other words, the price is 1.15 times the marginal cost. Table 6 also indicates the inverse relationship between the estimate of Lerner indexes and the own-price elasticity of market demand across the industries. The petroleum industry has an inelastic demand curve while Motor Vehicles, Trailers & Auto Parts industry has elastic demand curve having own-price elasticity -1.70 and -7.47 respectively.

6.2 Advertising

Table 7 provides the estimates of advertising as a percentage of gross sales. There is considerable variation across firms for advertisement intensities in the manufacturing sector.

Table 7. Advertising as Percentage of Gross Sales for Manufacturing Industries (2004-2018)

Industry	Advertising as Percentage of Gross Sales
Services Activities	0.8
Electrical Machinery & Apparatus	0.4
Paper, Paperboard & Products	0.2
Petroleum Products	0.1
Information, Communication & Transport	1.1
Fuel & Energy	0.6
Motor Vehicles, Trailers & Auto Parts	1.0
Cement	0.6
Mineral Products	0.6
Manufacturing	2.3
Chemicals & Pharmaceuticals	4.6
Sugar	0.8
Spinning, Weaving	1.8
Finishing	1.4
Made-up and Other Textile Articles	1.2

Source: Authors' calculations

The Chemicals & Pharmaceuticals industry turns out to be the largest industry which spends 4.6 per cent of their gross sales on advertising. In contrast, the Petroleum Products industry has the lowest advisement intensity in the manufacturing sector as it spends 0.1 per cent of its sales revenues on advertising.

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[11] If P and MC are the same, the value of Lerner index is zero suggesting perfect competition in the market.
[12] After rearranging the Lerner index, we get the expression P = (Markup Factor) (MC)

There are 8 industries out of 15 industries of Pakistan's manufacturing sector whose advertising expenditures are less than one per cent of their gross sales. These industries include Services Activities, Electrical Machinery & Apparatus, Paper, Paperboard & Products, Petroleum Products, Fuel & Energy, Cement, Mineral Products and Sugar. Seven industries relatively show high advertisement intensity as their advertising expenditures are more than one per cent of their gross sales. These industries include Information, Communication & Transport, Motor Vehicles, Trailers & Auto Parts, Manufacturing, Chemicals & Pharmaceuticals, Spinning, Weaving, Finishing and, Made-up and Other Textile Articles.

7. A PRELIMINARY ANALYSIS OF PERFORMANCE ASPECTS OF PAKISTAN'S MANUFACTURING SECTOR

Performance is the ultimate concern of any industry as every manager or planner in a firm is very much concerned with the elements of performance which are level, growth, sustainability of profits and above all social corporate responsibility in the form of provision of social welfare. So, it is the prime responsibility of the policymakers that they must recognize profits and social welfare.[13]

7.1 Gross Profits to Sales

Table 8 depicts the gross profit to sales for manufacturing industries. The three top industries concerning gross profit to sales are Spinning, Weaving, Chemicals & Pharmaceuticals, and Made-up and Other Textile Articles having the values of 11.80, 8.82 and 6.71 respectively. So for the three least gross profit to sales earners industries are concerned, these are Electrical Machinery & Apparatus, Mineral Products and Paper, Paperboard & Products having the values of 1.41, 1.10 and 1.04 respectively. On average gross profit to sale ratio of all industries has turned out with a value of 4.17.

Table 8. Gross Profits to Sales for Manufacturing Industries (2004-2018)

Industry	Gross Profits to Sales (Percentage)
Services Activities	1.90
Electrical Machinery & Apparatus	1.41
Paper, Paperboard & Products	1.04
Petroleum Products	1.42
Information, Communication & Transport	2.70
Fuel & Energy	2.78
Motor Vehicles, Trailers & Auto Parts	3.73
Cement	3.62
Mineral Products	1.10
Manufacturing	6.30
Chemicals & Pharmaceuticals	8.82
Sugar	3.43
Spinning, Weaving	11.80
Finishing	5.90
Made-up and Other Textile Articles	6.71

Source: Authors' calculations

It is interesting to note that the Petroleum Products industry has been at the top for gross sales (see Table 1), but when we examine gross profit to sale ratio, the Spinning, Weaving industry stands at the top position. Thus, it is an important message for the managers that they must recognize that it is not necessarily that the firms with high gross sales must have a high gross profit to sale ratio.

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[13]Traditional theories on firm behavior given by Walras, Marshall and Jevons suggest that profit is the main objective of firm but now a days, modern theories of firm such as other optimizing theories presented by Williamson, Marris managerial theories and Non-optimizing theories such as Simon satisficing theory and Cyert, March & Cohen behavioral theory have altered their view towards all stakeholders and social corporate responsibilities.

7.2 Social Welfare

Table 9 displays the Dansby-Willing Performance (DWP) index for Pakistan's manufacturing sector. DWP index measures social welfare which is the sum of consumer and producer surplus[14].

If we measure the efficiency scores based on CCR, the top three most efficient industries are Motor Vehicles, Trailers & Auto Parts, Mineral Products and Cement having efficiency scores of 0.29, 0.25 and 0.24 respectively. Similarly, the least three industries for efficiency are Sugar, Services Activities and Electrical Machinery & Apparatus having the efficiency scores of 0.08, 0.06 and 0.03 respectively. Now based on BCC criterion, the top three efficient industries are Motor Vehicles, Trailers & Auto Parts, Fuel & Energy and Mineral Products having efficiency scores of 0.44, 0.41 and 0.25 correspondingly. The least three efficient industries are Information, Communication & Transport, Sugar and Electrical Machinery & Apparatus having the values of 0.22, 0.17 and 0.12 respectively.

Table 9. Dansby-Willig Performance Indexes for Manufacturing Industries (2004-2018)

Industry	Dansby-Willig Performance Indexes		
	CCR	BCC	Scale Efficiency
Services Activities	0.06	0.32	0.19
Electrical Machinery & Apparatus	0.03	0.12	0.25
Paper, Paperboard & Products	0.15	0.26	0.58
Petroleum Products	0.16	0.24	0.67
Information, Communication & Transport	0.08	0.22	0.36
Fuel & Energy	0.14	0.41	0.34
Motor Vehicles, Trailers & Auto Parts	0.29	0.44	0.66
Cement	0.24	0.33	0.73
Mineral Products	0.25	0.38	0.66
Manufacturing	0.16	0.30	0.53
Chemicals & Pharmaceuticals	0.23	0.36	0.64
Sugar	0.08	0.17	0.47
Spinning, Weaving	0.17	0.28	0.61
Finishing	0.19	0.30	0.63
Made-up and Other Textile Articles	0.20	0.31	0.65

Source: Authors' calculations

Turning to the scale efficiency scores, the top three efficient industries are Cement, Petroleum Products and Motor Vehicles, Trailers & Auto Parts having the efficiency scores of 0.73, 0.67 and 0.66 respectively while the least three industries are Fuel & Energy, Electrical Machinery & Apparatus and Services Activities having the efficiency scores of 0.34, 0.25 and 0.19 respectively.

8. CONCLUSIONS AND POLICY IMPLICATIONS

This paper provides an insight into the nature and salient features of Pakistan's manufacturing sector. A preliminary analysis of the structure, conduct and performance of fifteen manufacturing industries for 2004-2018 has been performed. For structural analysis, firm size, concentration, demand and market conditions, for conduct analysis, pricing behavior and advertising and performance analysis, gross profit to sales ratio and social welfare have been analyzed. In structural analysis, for firm size, we have taken two variables i.e. gross sales and total assets. Pakistan State Oil Company Ltd has turned out to be the largest firm according to gross sales criterion while Oil & Gas Development. Co. Ltd is classified as the largest firm according to the total assets criterion. In industry concentration, eight industries out of fifteen industries have contradictory results for HHI and C4 criteria. Six industries are categorized as the most heavily concentrated industries, five industries are in moderately concentrated industries while

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[14] Efficiency exists when marginal benefits are equal to marginal costs and this phenomenon occurs where both demand and supply curves interests to each other and here consumer and producer surplus or total efficiency is maximized. So, alternative to measuring the consumer and producer surplus as suggested by DWP index, we have measured efficiency scores based on CCR, BCC showing the allocative efficiency along with scale efficiency.

four industries are placed in the least heavily concentrated industries according to the C4 criterion. Based on the HHI principle, six industries are characterized as highly concentrated industries, two industries are in moderately concentrated industries while seven industries are placed in low concentrated industries. Demand and market conditions reveal that there is much disparity between the own-price elasticity of market demand and the own-price elasticity of a firm's product. In conduct analysis, for pricing behavior, the values of Learner's index infer that there is imperfect competition in Pakistan's manufacturing sector. For advertising behavior, The chemicals & Pharmaceuticals industry has thrashed out to be the top advertising industry while the Petroleum Products industry has the lowest advisement intensity in the manufacturing sector. In performance analysis, concerning gross profit to sales ratio, Spinning, Weaving has more gross profit to sales ratio while Electrical Machinery & Apparatus has lowest gross profit to sales ratio. Finally, according to the social welfare criterion, the Motor Vehicles industry is at the top with respect to CCR and BCC criteria while for scale efficiency, the cement industry stands at the peak.

As we have done three types of preliminary analysis of Pakistan's manufacturing sector, we propose three types of policy recommendations with respect to structure, conduct and performance separately. For structure analysis, we have focused on three important variables firm size, concentration, demand and market conditions.

- From the structure analysis, we have pointed out that firms related to Petroleum Products and Fuel & Energy industries are the largest firms in Pakistan's manufacturing sector which suggest that Petroleum Products and Fuel & Energy industries need not expand more as these gross sales or total assets are already at the top in the manufacturing sector. In other words, the government may focus on or facilitate those industries of the manufacturing sector which have low gross sales or total assets.
- Government intervention is considered necessary when externalities exist in the market. One of the forms of externalities is the high concertation ratio in the industry. The analysis suggests to the policymakers that the industries of Services Activities, Electrical Machinery & Apparatus, Paper, Paperboard & Products, Information, Communication & Transport, Mineral Products and Manufacturing are highly concentrated. So, they may examine and do the needful if these heavily concentrated industries are exploiting the consumers.
- Demand and market conditions reveal that all the industries have high own price elasticity of demand so there is no chance of charging high price from the consumers, so the planers need not focus on the pricing strategies of the manufacturing sector.
- For the conduct aspect of Pakistan's manufacturing sector, two behaviors have been analyzed and the policies related to the conduct aspect of Pakistan's manufacturing sector are:
- From pricing behavior, we can infer that there is imperfect competition in the manufacturing sector. The petroleum industry has the largest monopoly power but unfortunately, the government is giving monopoly power to this sector. So, the government may revise its petroleum policy.
- From advertising behavior, it is concluded that Chemicals and Pharmaceuticals are spending more on advertisement so the government may impose taxes on these industries for more revenue collection.
- For performance analysis, we have taken two variables gross profit to sale ratio and social welfare and the policies related to the performance aspect of Pakistan's manufacturing sector are:
- From gross profit to sale ratio, we inferred that Spinning, Weaving, Chemicals & Pharmaceuticals, and Made-up and Other Textile Articles have more gross profit to sale ratio, so the government may impose more taxes on these industries.
- From a social welfare point of view, the most efficient industries are Motor Vehicles, Trailers & Auto Parts, Mineral Products and Cement. So, the government may subsidize these industries as these are generating positive externalities in the form of social welfare.

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