

Relationship of Concentration and performance Indicators: A Data Based Study of Indian Electronics Industry

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Abstract:

Keeping the forgoing discussion in mind, an attempt has been made in this paper to study the level of market concentration in Indian electronics industry. Subsequently a relation has been established with the performance of industry. Besides, an endeavor has been made to link such relationship with the performance of electronics firms in the stock market.

Keywords: Electronics Industry, Market Concentration, Price-Cost Margin, Book Value and Market Value of stocks, Market Performance Indicator

Introduction

Electronics industry represents the emerging segment of Indian manufacturing sector. It has shown remarkable growth in recent years under the liberal policy environment. Unlike under the earlier policy framework, firms were given freedom to expand capacity, diversify their businesses and so on. In this process, existing electronic firms started growing speedily and new firms emerged on the scene. Hence, it is expected that the electronics industry must have witnessed some structural changes during the era of liberalization. There is coexistence of small, medium and large firms in the electronics industry. So in the era of competition some firms may not be in the position to face the onslaught of large firms and might have quit the market. Therefore market concentration must have changed after the new policy environment. As the market concentration is related to many other structural, conduct and performance variables. The questions for which the study will try to find answers are whether electronics industry has experienced increased market concentration overtime, whether Market concentration in both the industries under study is positively linked to performance, does positive relationship between market concentration and performance leads to better performance of firms in stock market or not, does increase in market valuation augments market concentration over a period of time. So this paper is devoted to study such relationships.

Methodology, Data Base and Variables Defined:

To study the aforementioned objectives various statistical and econometric techniques are used. Market concentration will be measured through concentration ratios, Harfindhal-Harishman index, coefficient of variation and Entropy index. Profitability, price-cost margin and net-worth will be the performance indicators of the firms. Performance

in stock market will be measured by market value of assets over book value and capital asset pricing model will be used to find the index of performance in stock market.

The study is based on the industry level and firm level secondary data available from various sources such as RBI, CMIE, Bombay stock exchange official directory and various on-line data providing agencies for the period of 2017-2018. The websites of the selected firms are also be used to corroborate.

Variables defined:

Concentration Ratio (CR): A ratio that indicates the relative size of firms in relation to their industry as a whole.

Herfindahl-Hirschman Index (HHI): A measure of market concentration calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. The HHI is expressed as:

$$H = \sum_{i=1}^n s_i^2$$

Coefficient of Variation (CV): A statistical measure of the dispersion of data points in a data series around the mean. It is calculated as follows:

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Expected Return}}$$

Profitability ratios: A class of financial metrics that are used to assess a business's ability to generate earnings as compared to its expenses and other relevant costs incurred during a specific period of time.

Price-Cost Margin (PCM): The difference between price (p) and marginal cost (mc) as a fraction of price, that is $[p-mc]/p$.

Net worth: For a company, total assets minus total liabilities.

Net Worth Ratio: the ratio of net profit to share holder's investment.

Market value of assets: The current quoted price at which investors buy or sell a share of common stock or a bond at a given time.

Book Value: The value at which an asset is carried on a balance sheet. To calculate, take the cost of an asset minus the accumulated depreciation.

Capital assets pricing model: A model that describes the relationship between risk and expected return and that is used in the pricing of risky securities.

P E Ratio: A valuation ratio of a company's current share price compared to its per-share earnings. Calculated as:

$$\frac{\text{Market Value per Share}}{\text{Earnings per Share (EPS)}}$$

EPS: The portion of a company's profit allocated to each outstanding share of common stock. Earnings per share serves as an indicator of a company's profitability. Calculated as:

$$= \frac{\text{Net Income} - \text{Dividends on Preferred Stock}}{\text{Average Outstanding Shares}}$$

Beta: A measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole.

Discussion and Results:

Market Concentration:

Though electronics industry contributes less than 3 percent of total manufacturing output but its dramatic growth, electronics revolution and being a facilitative industry for other areas of production compelled us to study this industry. During the study period (2016-2018) the industry recorded dramatic growth. The trend growth rate during this period was 11.3 percent per annum.

Table 2: Levels Market Concentration in Electronics Industry (2006-2018)

Year	CR ₄	CR ₈	CR ₂₀	HHI
2006	44.96	62.94	80.06	0.0647
2007	42.92	61.27	76.55	0.0613
2008	44.27	62.52	78.04	0.0683
2009	40.96	60.28	75.54	0.0623
2010	37.75	55.72	78.7	0.0538
2011	32.17	50.32	77.46	0.0476
2012	32.23	53.71	77.6	0.0493
2013	39.82	54.52	83.6	0.0667
2014	41.78	59.53	84.35	0.0602
2015	45.73	62.41	81.93	0.0736
2016	43.42	59.37	75.25	0.0703
2017	49.5	65.89	83.49	0.0913
2018	60.77	74.82	82.28	0.1099

TGR				
2006-2012	-6.4	-3.6	-0.2	-5.7
2012-2018	7.6	5.4	0.7	11.0
2006-2018	1.7	0.8	0.6	3.5

- CR₄, CR₈ and CR₂₀ stands for 4-firm, 8-firm and 20- firm concentration ratios
- TGR stand for trend growth rate

Does the market concentration registered increase during this period? To study such behavior, 4-firm concentration ratio, 8-firm concentration ratio, 20-firm concentration ratio and Hirschman Harfindahl Index (HHI) have been calculated and the results are presented in table-2. The figures shown in this table gave mixed results. 4-firm concentration ratio was to the level of 44.96 in 2006. It has recorded a declining trend till 2012. After that this ratio has started increasing and recorded the level of 60.77 in 2018. In terms of trend growth rate, this concentration ratio increased at the rate of 1.7 percent between 2006 and 2018. However, it was negative (-6.4 percent per annum) during 2006 and 2012 and highly significant (7.6 percent per annum) between 2012 and 2018. Similar trends were also recorded when 8-firm concentration ratio and 20-firm concentration ratios were calculated. When all the firms were taken into consideration i.e. HHI was calculated it has further vindicated the trends observed in concentration ratio.

Why did this happen in electronics industry of India? Initially when the liberal policy environment was introduced new firms along with the existing firms tried their hand in electronics industry. There was large scope for growth and opportunities in the export market and 'dotcom' type bubble in the market. Since electronics industry is a footloose and sunrise industry, it is not location specific and when the market provided opportunities many new firms, units of existing firms and subsidiaries of big firms made their entry in the industry. Hence it has recorded decline in market concentration till 2012. But the new and small firms could not stay for longer in the market. Large domestic and foreign firms which had innovative capability, strong R&D bases and healthy professional support consolidated their position and enjoyed the fruits of economies of scale. While the small firms which were lacking in such strengths could not survive in competition, consequently quit the market and lead to higher market concentration. So the benefits of bigger markets were gradually cornered by large firms. As this industry is highly technology oriented more

vigorous trends regarding concentration can be seen in the future.

Table-3: Coefficient of Variation in Output Values Levels

Year	C.V. for CR ₄	C.V. for CR ₂₀	C.V. for HHI
2006	0.203	1.015	2.472
2007	0.148	1.033	2.455
2008	0.199	1.071	2.58
2009	0.267	1.082	2.603
2010	0.317	0.991	2.421
2011	0.392	0.991	2.25
2012	0.211	0.909	2.281
2013	0.56	1.273	2.699
2014	0.508	1.09	2.574
2015	0.567	1.142	2.809
2016	0.707	1.299	2.678
2017	0.852	1.284	2.959
2018	0.891	1.589	3.061

One more dramatic feature regarding concentration appeared during the study period. The difference among the firms which were representing CR-4 and CR-20 also recorded increase i.e. the level of production gap between the larger and smaller firms in these groups increased tremendously. This has been represented by coefficient of variation in CR-4 firms and CR-20 firms overtime (table-3). The value of coefficient of variation was 0.203 in CR-4 group in 2006 and stayed almost on similar lines till 2012. After that such variation increased to the level of 0.56 in 2013 and increased to the level of 0.891 in 2018. Similar trends regarding coefficient of variation in CR-20 group were also recorded. It can be inferred from here that firms were able to maintain their position till 2012 and subsequently they lost their production levels in favor of bigger firms in the same group. Even the many public sector firms which were in the dominating position during initial years of the study period could not stay in competition with more sophisticated technology oriented private sector firms. This trend has further been corroborated by the coefficient of variation in production level of all firms considered (table-3, col.4). Therefore it can be concluded that big firms have become bigger and small firms have either shed the marked share or quit the market. So we can say that electronics industry as a whole followed the trends of high market concentration overtime.

Performance and its relations with stock market:

When the industry experiences market concentration, large share firms have some edges over smaller firms. They have more monopoly power, more control over output policy, they can earmark more funds for advertisement and R&D, can

charge little higher price in the market, and can develop brand loyalty. Ultimately they are able to develop better market demand for themselves and able to reduce the cost of production. Hence more price cost margin, higher level of profitability. Data regarding this behavior has been presented in the table-4.

So for the performance of electronics industry in terms of price-cost margin (PCM) is concerned it has followed increasing but fluctuating trend. All the firms under consideration had earned 49.647 crore rupees in 2006 and increased to the level of 122.82 in 2012. During this period the trend was of absolute increase. However, during the successive period in spite of following increasing trend, level of PCM was more fluctuating, though the level of trend growth rate between 2013 and 2018 was more vigorous than the previous period. To corroborate this fact, profitability levels for different levels of concentration (4-firm, 20-firm and all) have been calculated. The comparison of such columns highlighted that top four firms recorded highest level of profitability in almost all the years. However top twenty firms also registered higher profitability than the entire industry. So we can conclude here that concentration and profitability are positively associated. In addition trends of profitability overtime were almost same in comparison to PCM. The periods of 2014 and 2015 afflicted with a low level of profitability for all the levels of concentration, the values of entire industry has recorded even negative profitability and these levels were considerably higher in 20-firm and 4-firm concentration. Why the performance in terms of terms of profitability performed in this way during 2014 and 2015? To some extent it can be explained from the behavior of concentration ratio. When the industry witnessed higher level of concentration

Table 4: Levels of Price-Cost Margin and Profitability in Electronics Industry

Year	PCM (In Crores)	Profit/Output			Profit/Net worth		
		4-Firms	20-Firms	Total	4-Firms	20-Firms	Total
2006	49.647	3.281	0.65	1.304	15.438	2.759	4.733
2007	62.451	3.373	1.485	1.872	13.215	5.308	5.713
2008	60.957	3.309	1.997	1.81	11.114	6.237	5.079
2009	78.369	2.291	1.572	1.138	7.513	5.667	3.320
2010	97.477	3.104	3.355	3.099	10.132	13.951	11.480
2011	113.25	2.185	3.218	2.661	6.275	13.776	9.254
2012	122.82	3.021	2.628	2.048	4.987	8.413	7.348
2013	202.94	4.124	2.552	1.781	17.023	8.955	6.115
2014	176.87	2.948	0.649	-0.419	9.971	1.999	-1.316
2015	166.79	2.627	0.016	-0.829	10.834	0.055	-2.792
2016	235.74	8.544	3.286	-0.809	19.855	5.913	-1.933
2017	369.17	10.839	7.915	6.853	32.582	17.203	16.964
2018	472.21	7.779	4.014	3.581	46.595	13.554	11.482

after 2012, high competition in the market led to smaller firms to quit. Hence larger firms were able to corner bigger share in the market. To cater this market share they had to create additional capacity, more R&D facilities and better market management. It increased their cost of production and it took some time for such firms to consolidate their position in market. Consequently, the levels of profits jumped after that. Almost similar trends of profitability with respect to net worth have been seen. Therefore, it can be inferred that there is positive relationship between market concentration and profitability. To further elaborate such relationship following regression equations have been estimated:

$$\begin{aligned} \text{PCM} &= a + b \text{ CR} & (1) \\ \text{PCM} &= a + b \text{ CR} + c \text{ CR}^2 & (2) \end{aligned}$$

Here CR and PCM stand for concentration ratio and price-cost margin

PCM is a variable which is determined by market and cost factors. Market concentration increases monopoly power and help the firms to charge higher price in the market. So CR is a facilitative variable in enhancing the PCM. And this has been established in the estimation of equation-I as coefficient of CR is positive and highly significant. When CR² as additional variable has been added to equation-I, the explanatory value (R²) has increased significantly and the coefficient of this variable turned out to be significant and rendering CR insignificant i.e. rate of change in market concentration is more important to explain the PCM rather than CR itself.

$$\begin{aligned} \text{PCM} &= 9.85 + 0.8364 \text{ CR} \\ R^2 &= 0.35 & (0.084) \\ DW &= 0.6275 & t = 9.85 \\ \text{PCM} &= 9.44 + 0.127 \text{ CR} + 0.0394 \text{ CR}^2 \\ (0.596) & (0.019) \\ t &= -0.213 & t = 2.03 \\ R^2 &= 0.477 & DW = 0.90 \end{aligned}$$

The results recorded in these two equations did not register any change when PCM was regressed on HHI i.e. the relationship between PCM and concentration ratio has been further justified

$$\begin{aligned} \text{PCM}_t &= 8.8 + 0.836 \text{ HHI} \\ (0.0848) & \\ t &= 9.85 \\ R^2 &= 0.35 & DW = 0.62 \\ \text{PCM} &= 9.2 - 0.127 \text{ HHI}_t + 0.039 \text{ HHI}_t^2 \\ (0.596) & (0.019) \\ t &= 0.213 & t = 2.05 \\ R^2 &= 0.48 & DW = 0.90 \end{aligned}$$

Profits earned in one period helps the firm to generate funds for additional investments in next round. Therefore, profitability may support the firm to have bigger share in the market in the subsequent round. To verify this relationship market concentration is regressed on PCM and the following results have been obtained:

$$\begin{aligned} \text{CR}_{4t+1} &= 8.7 + 0.836 \text{ PCM}_t \\ (0.084) & \\ t &= 9.85 \\ R^2 &= 0.35 & DW = 0.62 \end{aligned}$$

Positive and significant coefficient of PCM highlights that concentration ratio is positively affected by the earnings of profit. As we know that that large firms have more potential to become bigger overtime i.e. higher concentration leads to further higher concentration in the subsequent period. To find such relationship concentration of current period is regressed on the concentration of previous period, and the positive and significant relationship had been established in the value and lagged value.

$$\begin{aligned} \text{CR}_t &= 4.2 + 0.583 \text{ CR}_{t-1} \\ (0.39) & \\ t &= 18.51 \\ R^2 &= 0.583 & DW = 1.31 \end{aligned}$$

Do the market concentration and profitability bear any relationship with stock market? In this

context an effort has been made to establish such relationship.

Earning per share is a variable that indicates the performance of firms in terms of earnings. The market concentration has considerable influence on EPS. For instance the table-7 shows that the average EPS is highest in top four firms followed by top twenty firms and least in the firms of entire industry. The earning per share has increased continuously for top four firms from average EPS 7.95 in 2016 to 73.35 in 2018. But such trends were not visible in top twenty firms and firms of entire industry. Overtime the variation in terms of EPS had increased in all three groups of market concentration which is indicator of variation in performance of the firm in the same group.

Table 7: Earning Per Share in Electronics Industry

Year	EPS		
	4-Firm	20-Firm	Total
2006	7.95(7.92)	6.79(13.33)	5.97(14.22)
2007	8.96(5.01)	5.75(06.81)	4.92(15.90)
2008	9.86(5.22)	6.62(09.68)	4.36(13.65)
2009	11.48(5.52)	5.54(14.71)	1.94(08.45)
2010	30.47(31.89)	16.7(23.07)	2.74(21.40)
2011	34.22(32.87)	15.43(22.26)	3.52(21.56)
2012	18.37(07.07)	10.56(21.47)	2.08(13.60)
2013	39.92(37.01)	16.85(33.86)	3.39(17.85)
2014	36.56(16.16)	04.44(36.96)	-0.33(21.89)
2015	47.70(22.16)	10.45(34.01)	3.57(19.40)
2016	43.10(21.40)	06.53(40.96)	4.65(21.57)
2017	58.88(24.47)	14.19(32.84)	8.57(22.15)
2018	73.35(25.75)	20.81(34.77)	8.42(23.02)

Note: Values in parentheses are standard deviations.

Over or Under Performance of Electronics Industry in Stock Market:

To capture the relative performance of electronics industry in comparison to entire stock market, β (beta) has been calculated, which is essentially a measure of strength of relationship between value of a portfolio and the stock market as a whole. A positive β means that the portfolio returns generally follow the market returns. However a negative β means that portfolio returns generally move opposite the market returns. Statistically:

$$\beta = \frac{\text{COV}_{s,m}}{\text{VAR}_m}$$

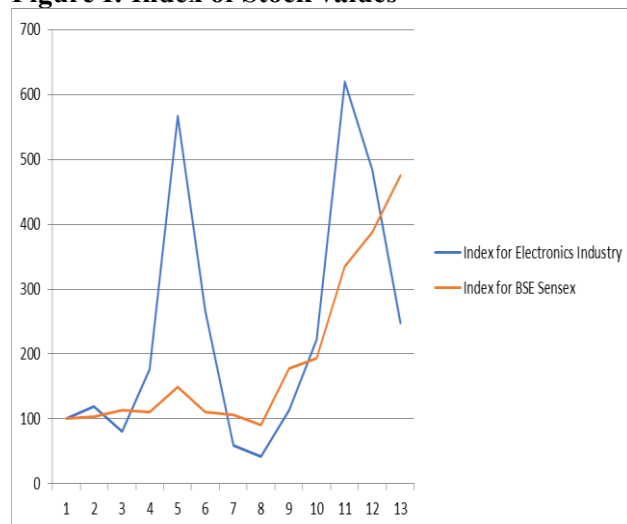
Where $\text{COV}_{s,m}$ is the covariance of the returns of the portfolio with the market return and VAR_m is the variance of the market returns.

The value of β equal to one indicates that the portfolio value will move with the market, β less than one means the returns from the portfolio (electronics industry) are less than the market. However positive β greater than one indicates that the portfolio over perform the market.

What is the behavior of electronics industry during the study period so for the value of β is concerned? For this purpose stock index for electronics industry has been constructed and compared with overall stock market (BSE Sensex). Value on both the indices i.e. electronics industry and Sensex are presented in table 8 and figure I. **The performance of electronics industry in stock market in comparison to sensitivity index relatively more volatile.** Starting from 2006 to 2011 when electronics industry was passing through its boom period and recognized as sunrise industry, it had outperformed the market except the year 2018 and its calculated β value was 8.04. However this performance could not be maintained in the successive period of study from 2012 to 2018. Out of seven years its performance was considerably below the stock market in four years. Consequently β tumbled down to 0.879 i.e. it underperformed the market. Now why did this happen? During the first period segment of the study, electronics technology started getting popular and was large entry of new

Table 8: Index of Stock values

Year	Index for Electronics Industry	Index for BSE Sensex
2006	100.00	100.00
2007	119.71	103.46
2008	81.02	114.07
2009	176.71	111.08
2010	567.04	148.55
2011	265.73	110.31
2012	58.67	106.37
2013	42.08	90.55
2014	112.82	178.01
2015	222.56	192.85
2016	619.31	335.04
2017	483.01	388.27
2018	247.95	475.69

Figure I: Index of Stock values


Firms in the market. The performance of the industry and the psychology of the investors and dotcom bubble contributed largely to performance of this industry in stock market. Hence the result (beta performance). During the subsequent period when the dotcom crisis occurred throughout the world industry failed to maintain its performance and its index value was around half the value of the Sensex from first two years. So after 2014 the industry again consolidated its position and outperformed the market till 2018.

Table 9: Beta value for share index of electronics industry

Period	Beta Value (β)
2006-2011	8.0449
2011-2018	0.8793
2006-2018	0.7884

Concluding Remarks:

It can be concluded here that under the liberal policy environment, Electronics industry has experienced decline in market concentration till 2012. However, this variable has increased with faster pace after that. With the growth in markets, benefits of the larger markets were cornered by relatively bigger firms. Moreover, the levels of production gaps between larger and smaller firms have increased overtime within the groups also. Large firms have become larger and small firms either shed the market share in favour of larger firms or quit the market. The industry experienced increasing trends in the price-cost margin with more fluctuations after 2012. Moreover, positive correlation has been established between market concentration and profitability. Rate of change in market concentration is more important variable to explain the change in PCM than market concentration itself. Profits earned in one period

helped the firms to generate funds for additional investments in next round. Hence, concentration is also affected by the profits earned by the firms in previous periods. Besides, book value per share bears positive relationship with market concentration ratio. The hypothesis of higher PE ratio for the larger firms has been established in this industry. So the discussion highlights the larger gains for the top firms in the industry in terms of profitability and the stock market performance.

References

- Athrey, S. and Sandeep K. (2006): "Industrial Concentration in Liberalizing Economy: A Study of Indian Manufacturing", *The Journal of Development Studies*, Vol-42 (6), pp 981-999.
- Apte, P.G. & Vidyathan R. (1982): "Concentration, Controls and Performance in 29 Manufacturing Industries in India", *Indian Economic Review*, Vol-17, pp. 241-64.
- Bain, J.S. (1951) "Relationship of Profit Rate to Manufacturing Industry Concentration: American Manufacturing 1936-40", *Quarterly Journal of Economics*, 1951, Vol-61, pp. 293-324.
- (1956), "Barriers to New Competition", Cambridge: Harvard University Press.
- Bresnahan, T. (1984) "Competition and Collusion in the American Automobile Industry: the 1955 Price War" *Journal of Industrial Economics*, Vol. 32, pp. 457-82.
- Brozen, Y. (1971) "The Persistence of High Rates of Return in High Stable Concentration Industries" *Journal of Law and economics*, Vol-14, pp. 501-12.
- Cowling, K. and Waterson M. (1976) "Price-cost Margin and Market Structure", *Economica*, Vol. 43, pp. 267-74.
- Demstz, H. (1973) "Industry Structure, Market rivalry, and Public Policy", *Journal of Law and economics*, pp. 1-9.
- Desai, P. (1969-70), "Growth and structure Change in Indian Manufacturing Industries", *Indian Economic Journal*, Vol-17, pp. 205-33.
- Fama, E. F. (1990) "Stock Returns, Expected Returns, and Real Activity", *Journal of Finance*, Vol-45(4), pp. 1089-1108.
- Fama, E. F., and French K. R. (1995) "Size and Book-to-Market Factors in Earnings and Returns", *Journal of Finance*, Vol. 50, pp. 131-155.

- Fama, E. F., and French K. R. (2005), "Profitability, Investment and Average Returns", *Journal of Finance*, Vol. 50, pp. 232-255.
- Gupta, V. (1968) "Cost Functions Concentration and Barriers to Entry in 29 Manufacturing Industries in India", *Journal of Industrial Economics*, Vol. 17, pp. 57-72.
- Kambhampati, Uma S. (1996) "Industrial Concentration and Performance", Oxford University Press: Delhi.
- Kewei Hou and David T. Robinson, (2006) "Industry Concentration and Average Stock Returns". *Journal of Finance*, volume 61(4).
- Meier, G. M. and Rauch J. E. (2003) "Leading Issues in Economic Development", Oxford University Press: New York.
- Ross Steven and Clifford (1996) "Intra-Industry and Inter-Industry Factors in the Cross-section of Expected Stock Returns", *Working Paper, Goldman Sachs Asset Management*.
- Schmalensee, R. (1989) "Inter-Industry Studies of Structure and Performance", in *Handbook of Industrial Organization*, Amsterdam: North-Holland.
- Shepherd, W.G. (1972) "The Elements of Market Structure", *Review of Economics and Statistics*, Vol. 54, pp. 25-37.
- Weiss, L.W. (1963) "Factors in Changing Concentration", *Review of Economics and Statistics*, Vol. 45(1), pp. 70-77.

