An Analytical Study of the Changing Structure in the Cement Industry of India

Jayanta Nath Mukhopadhyaya, Malabika Roy and Ajitava Raychaudhuri

Abstract

Unlike most sectors of the Indian economy, which are small players in the global arena, the Indian cement industry is second largest in the world. In this paper, we have attempted to evaluate the effect of deregulation on the performance and structure of the Indian cement industry. Concentration measures after liberalization fell indicating increased competitiveness. However, this trend was reversed later, primarily due to significant increase in capacity by larger firms. An analysis indicate that there sharper movement in the measure of inter-temporal mobility for the firms in the top two quartiles than in the total set of firms. The study found that there has been a structural break in the market share pattern for many companies. The four firm concentration is more than 50 percent and two dominant groups have emerged accounting for more than 40 percent market share. Some policy implications follow from this study.

Keywords: Deregulation, Cement industry, Concentration, Structural break, Competition.

1. Introduction

Few will dispute the statement that the economics of industry is an under researched area in India. There have not been many comprehensive studies of major individual industries. The cement industry of India is large; even by the global standards it is the second largest in the world, larger than that of USA and Japan. Also the existing published studies have not in general, focused on the post 1989 period, when the cement industry was fully decontrolled. The cement industry is considered an engine of domestic growth with its strong linkages to the infrastructure and housing sector.

In this paper, we study the structure of the cement industry focusing on how the concentration of market share has changed over the period. Though the cement industry in India is fragmented with large number of players, yet general reports[1] would mention that there is dominance of the top firms and the structure of industry is oligopolistic. In this paper, we propose to measure the changes in concetration in the cement industry in an attempt to address the vagueness in the existing understandings. We examine whether the cement industry has been an oligopoly and explore the direction in which it is moving.

In a study, Azzam and Rosenbaum (1996) found that past estimates of the critical concentration ratio supported the hypothesis of only two structural groupings: competitive versus non- competitive. In view of the spectrum of competitive conducts allowed by oligopoly theory, they felt the validity of the two groupings is restrictive and needs to be tested. Using data from the Portland cement industry, this paper conducted such a test, employing a non- linear switching regression technique based on the logistic function. In the paper, the hypothesis of two structural groupings is not rejected.

In a pioneering work in India, Gokarn and Vaidya (1993) made an attempt to evaluate the performance of the cement industry after decontrol and found that the structure of the industry had undergone a qualitative change. They found that the structural variables in the cement industry have been far from stable. The concentration ratio has been changing; the technology has undergone a sea change; the nature of government controls faced by the industry has also been changing.

In another study by Jha et al. (1991), analysis was conducted at the aggregate level and covered the period 1960-61 to 1982-83. They found that that this industry is characterized by allocative efficiency. Pradhan (1992) had raised doubts about the success of the decontrol of the cement industry because he found that the decrease in concentration has fallen after the decontrol.

1 Research reports on cement by ICRA 2006 and CRISIL 2009.

Mukhopadhyaya et al. (2007) had found in their study focusing on the period (1989- 2003) that the capacity addition per year in the cement industry had accelerated during the period of partial decontrol and increased further during the period of total decontrol. The four firm concentration which had started to go down initially, after the period of decontrol started going up again forming a U-shaped curve.

In this paper, we focus on the post 1989 period, when the cement industry was fully decontrolled. So far as the cement industry is concerned, there are only a few detailed studies of the industry in India in the post decontrol period. The capacity addition in 7 years after a period of total control (1982-89) was more than the capacity growth in nearly 70[2] years during the period of total control. The period of full decontrol commenced from 1989 and the capacity, which was 59 Million Metric Tonnne (MMT) in 1989 more than doubled to quickly reach 120 MMT by the year 2000 and reached 200 MMT by 2008. In the following sections, we first describe the structure of the industry and then calculate commonly used measures of concentration which, along with other indicators that are used by the USA Federal trade commission also.

The paper is organized as follows. Section 2 discussed the structure of the cement industry. Section 3 studies the changing pattern of market concentration in cement industry. Section 4 presents a detailed analysis after breaking up the dataset of companies into different quartiles based on their market share. In Section 5, we have studied the changes in the rankings of the cement companies from 1989 to 2006 and also analyze the index of rank concordance to understand the mobility of ranks. In Section 6 we have used the Chow test to structural breaks at the firm level.We Conclude with the implication of the study.

2. Structure of the Cement Industry

The cement industry had an installed capacity of around 171 million tonnes per annum[3] (mtpa) at end-March 2006 with large cement plants accounting for 93percent of the total installed capacity in India. The installed capacity is distributed over across approximately 130 large cement plants owned by around 52 companies. The structure of the industry is fragmented, and can broadly be classified into three categories namely companies with all India presence, regional presence and marginal presence.

The first category consists of two groups with all India presence viz., Holcim (the Swiss multinational) controlled ACC and Ambuja cements; Aditya Birla group controlled Grasim Industries, Century Textiles and UltraTech Cement. The second category consists of companies whose presence is restricted to one region but with a stronghold in markets of their respective operations. This segment includes firms like Lafarge (east), India Cement (south), Shree Cement (North), Birla Corp (north and east), Binani Cement (north and west) and Madras Cement (south) etc. The third category consists of small companies with marginal presence, constituting the balance capacity of the Indian cement industry. Companies like CCI, J&K Cement, Panyam Cement, Penna Cement etc fall in this category.

The trend emerging from table 1 is that regional companies and national level companies have gained significant share and the standalone companies have lost heavily. The regional players gained the lion's share at 14.2 percent during the period, followed by the large companies gaining 9.3 percent at the cost of stand alone companies which lost 23.5 percent capacity share. Cement being a high volume and low value commodity; transporting it beyond a distance makes it unremunerative, making it regional in nature. (Table-1)

The cement industry has witnessed significant mergers and acquisitions leading to reorganization of capacities. Multinational cement companies have also initiated the acquisition process in the Indian cement market. Swiss cement major Holcim picked up a strategic stake in Ambuja Cements Ltd (ACL). Earlier, Holcim had entered into a strategic alliance with ACL, and acquired a controlling stake in Ambuja Cement India. Through this

2 the first cement factory was set up in India in 1914]

3 The capacity includes Mini cement plant and white cement. Source: CMA.

Table 1: Size-wise Classification and their Trends in the Cement Industry

Classification	Number of companies			% share of total capacity		
	1997-98	2002-03	2008-09	1997-98	2002-03	2008-09
Large Companies	4	4	2	32.5	45.2	41.8
Regional companies	12	12	14	23.2	31.2	37.4
Standalone Companies	41	34	35	44.3	23.6	20.8
Total	57	50	51	100	100	100

Source: Research report on cement by CRISIL 2009

holding company, Holcim acquired a substantial stake in ACC. Lafarge, the French cement major, had acquired the cement plants of Raymond and Tisco. Italy based Italcementi has acquired a stake in Zuari Industries. Heidelberg Cement of Germany has entered into an equal joint-venture agreement with Indo-Rama Cement.

Consolidation of capacities has seen the emergence of two major groups in the Indian cement industry, the Holcim-ACC-Ambuja Cements combine and the Aditya Birla group through Grasim Industries and UltraTech Cement. We study the pattern of concentration in detail in the next section.

3. Changing pattern of Market Concentration in Cement Industry

In this section, we studied the impact of liberalization on growth and change in concentration of the cement industry. Concentration is an important aspect of the structure of any industry. Evidence suggests that an industry's conduct and performance is deeply influenced by the degree of concentration.

Hall and Tideman (1967) listed six properties or axioms for concentration measures. Curry and George (1983) mention that the oldest and most commonly used of all indices is the K- firm concentration ratio, defined as the cumulative share of the Kth firm. Using Si to denote the share of the ith firm, it may be defined as

$$CRK = \sum_{i=1}^{K} S_i$$

The index is simply one point on the cumulative concentration curve and so it may neglect important information. Recognizing this weakness, Miller (1967) introduced the concept of the marginal concentration ratio - the combined market shares of the fifth to eighth largest firms-which he included alongside four CR measures as an important element of market structure. However, Collins and Preston (1969) argued that little is gained by doing this because the two concentration measures are closely related. Support for the concentration ratio can be found in the work of Saving (1970), who shows that if K dominant firms collude to fix a price for the remaining firms, the value of the Learner index is directly related to their combined market share. Another popular index the Herfindahl or H index, defined as the sum of the squared values of all the firms' shares satisfies all of Hall - Tideman axioms. Theoretical support for H as an index of market concentration is provided by Cowling and Waterson (1976).

For our purpose we have chosen to focus on two alternative measures: four firm concentration ratio and Herfindahl index to get a comprehensive picture of the changing pattern of concentration in the cement industry.

3.1 Four firm Concentration Ratio

The four-firm concentration ratio is defined as the percent of total industry production (or sales) that is accounted for by the four large firms. We report the name of the top four firms with their market share in the beginning and terminal year of our study in table 2. It can be seen that not only has the four-firm concentration increased, the firms belonging to the top four firms has also changed from 1989 to 2006. Barring ACC which retained its position, we had new entrants like Ambuja Cements ltd (ACL), Grasim and Ultratech in the top four firms in 2006. (Table-2)

We report the movement of four firm concentration ratio in Table A.1, and figure 1 presents the results graphically. (Figure 1)

The concentration ratio initially declined over the period 1989 to 1997 to 33.8 percent, signifying reduced concentration. It then increased steadily and went up to 45 percent by 2003. The concentration ratio again declined in 2004, 2005 and 2006 to reach 41.4 percent by 2006 signifying increased competition. However, if we take ACL-ACC and Grasim - Ultratech strategic merger and combine them as one entity, then the 4 firm concentration ratio goes up to 51.7 percent. This pattern can be explained in the following way:

The extent of concentration in the industry seems to have increased over the years. It appears that with decontrol the cement industry became more profitable and to meet the latent demand, existing large companies went for expansion. Unfortunately, fresh investments were not forthcoming for the only dominant public sector company CCI and it lost market share rapidly. ACC, the top company also lost market share with the onslaught of competition. The entry of three new players who were not in the top four till 1993 viz., Ambuja Cements, Grasim Industries and L&T which started expanding its capacities aggressively led to a surge in the four firm ratio.

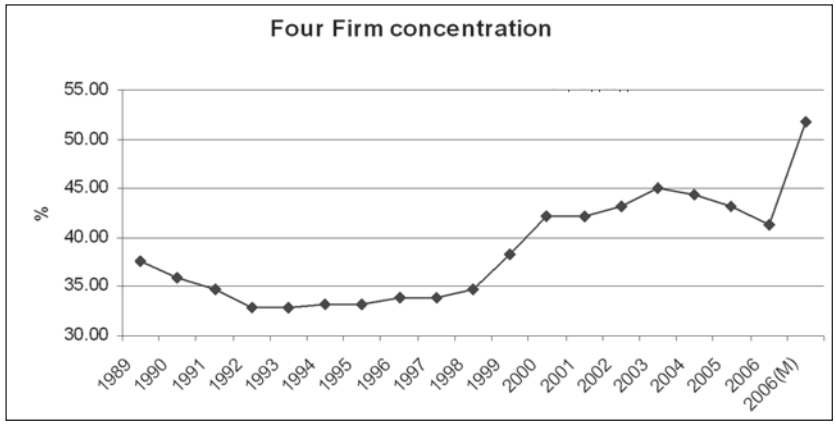
Table 2: Top Four firm in the Cement Industry

Company	Mkt Share 1989	Company	Mkt Share 2006	Company	Mkt Share
2006(M)					
A.C.C.	17.7	A.C.C.	12.7	A.C.C +ACL	22.6
J.K. Group	7.7	ACL	9.9	Grasim + Ultratech	18.7
C.C.I	6.5	Grasim	9.8	India Cements	5.8
Birla Corp	5.7	Ultratech	9.0	Century Textiles	4.6
Total	37.6	Total	41.4	Total	51.7

[Note: In 2005-06 (M) - we have modified the data to take into account the strategic merger of capacities of some cement companies like ACC -ACL and Grasim-Ultratech]

Source: Constructed using CMA data

Figure 1: Movement of Four firm Concentration Ratio



[Note : In 2005-06 (M) - we have modified the data to take into account the strategic merger of capacities of some cement companies like ACC -ACL and Grasim-Ultratech]

Source: Constructed using CMA data

3.2. Herfindahl Index

The four firm concentration ratio measured above is commonly used as a summary index of fewness. But concentration ratios contain information only about the market shares of the largest few firms in an industry. They therefore discard a considerable amount of information about the relative sizes of the smaller firms in the market and provide only a limited picture of the size distribution of firms in the market.

For this reason, an alternative measure of concentration, the Herfindahl index is studied here. It has the merit of combining information about the market shares of all firms in the market, not just the largest four.

If there are n firms and Si is the market share of firm i, the Herfindahl index H is measured as follows:

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

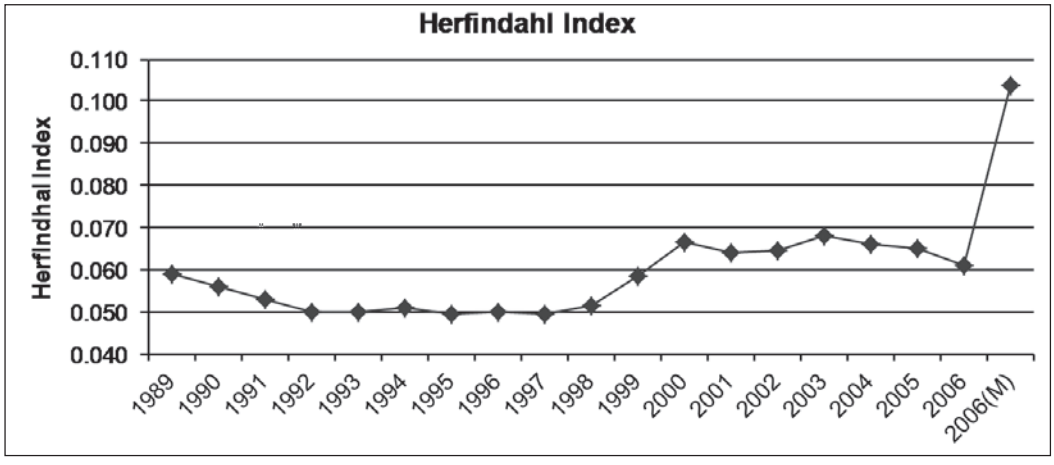
We have reported the calculations of Herfindahl index in table A.2, and presented it graphically in figure 2. It is a u-shaped curve. The index fell in the initial years from 1989 to 1998 and then started rising. There appears to have a slight declining trend from 2001 but to get a proper perspective, if we rearrange and modify the data to combine ACC with ACL and Grasim with Ultratech then the H Index has actually increased significantly as seen in the figure for 2006(M). (Figure 2)

Alternatively, the inverse of the Herfindahl index (1/H) is presented in table A.3 and graphically presented in figure 3. We know that 1/N equal sized firms in an industry produce an H Index of N, implying in this case that the cement industry is behaving as if 16 equal sized firms are dominating in 1989. This index went up to 20 in 1997 before declining to 14.7 by 2003. It started rising again and reached 16.4 by 2006. (Figure 3)

However, if we rearrange and modify the data to take (ACC and ACL) and (Grasim and L&T) as one group then the 1/H Index decreases to 9.6 in 2006. It indicates that though the cement industry is fragmented with a large number of firms operating, in effect the concentration has changed from more than 16 firms earlier dominating the industry in 1989, to nearly 10 equivalent firms in 2006.

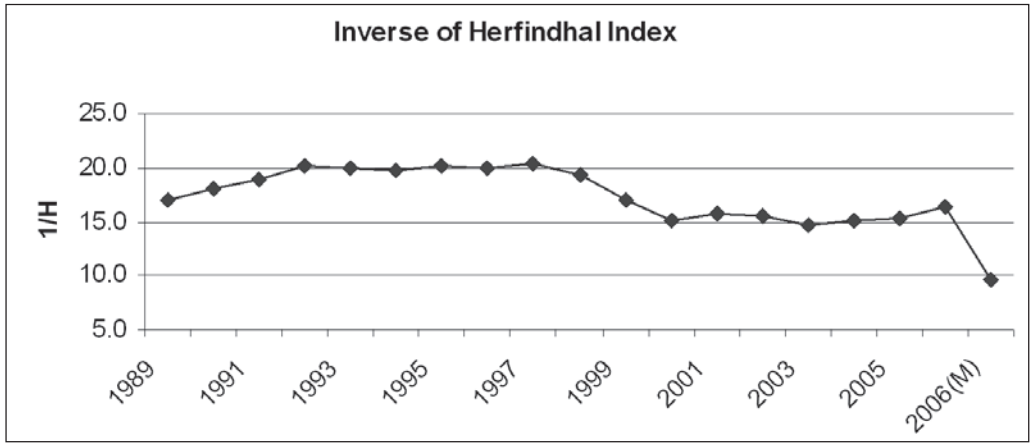
So Herfindahl index essentially follows the same pattern as four firm and eight firm concentration index. Large capital and extensive distribution network requirement, long gestation period and cyclical nature makes the cement industry unattractive. Though availability of technology is not difficult, the difficulty is in sourcing key raw materials like limestone; coal linkage deters new entrants and provides high entry barriers in the

Figure 2: Movement of Herfindahl Index



Source: Constructed using CMA data

Figure 3: Movement of Inverse of Herfindahl Index



Source: Constructed using CMA data

cement industry. One of the main reasons for the rise in concentration is the focus of the larger and the more efficient units to consolidate their operations by restructuring their business and taking over relatively weaker units. The entry of foreign multinationals who find the Indian market large and attractive and their penchant for consolidation and large scale operations is another significant reason for the rise of concentration. We expect this trend to continue.

4. Quartile-wise Analysis of Market Share

In this Section, we break the dataset of firms into quartiles. The Herfindahl index in the previous section gives an overall picture of the entire group of firms. To gain an insight into whether the patterns emerging from the analysis are same or different in each of the quartiles, we carry out a market share analysis for each of the quartiles separately.

We take the subset of companies, present both at the initial period of our study (1989) as well as at the terminal period (2006). This set consists of 32 companies. We divide the companies into four quartiles according to their average market shares during this period. We then calculate the total market share of the companies belonging to each quartile for both the periods 1989 and 2006 to study the nature of changes of the market share of each quartile during the period under consideration.

The result of our analysis is presented in Table A.4. It is found that the companies in the top 2 quartiles (i.e., companies having market shares more than the 2nd quartile) have gained significant market share in aggregate, whereas the companies in the lower two quartiles have lost market share. Our analysis shows that top most quartile gained maximum market share at 7.2 percent, whereas the second highest quartile gained 3.2 percent.

To take a closer look at the changes in aggregate market share we break up the total period i.e. from 1989 to 2006 from the median year 1997 into two intermediate periods,i.e. 1989 to 1997 and 1997 to 2006. Again we divided the total number of companies into four quartiles according to their market shares at each point of time (1989, 1997 and 2006). Then we calculated the aggregate market share of firms in each quartile. Further we checked how this aggregate market share of each quartile has changed during two time periods, which is from 1989 to 1997 and between 1997- 2006. We found that for the period 1989-97, the top quartile gained marginal share of 0.14 percent and the second largest quartile gained 0.5 percent. But the gain became much more pronounced during the 1997-2006 period. The top most quartile gained 7.1 percent and the second largest quartile gained 2.7 percent.

It appears that smaller firms were losing market shares whereas the larger ones were gaining from right after the liberalization of economy. Another interesting

feature that we found was that the gain was relatively marginal during the period 1989 -1997 at less than 0.5 percent for the top two quartiles. But the gain was more pronounced during the period 1997 -2006. It can be concluded that there has been redistribution of market shares in favour of larger companies, leading to higher concentration.

5. Ranking Test

In this section we studied the changes in the rankings of the cement companies from 1989 to 2006 based on the market share, and analyzed their significance. During this period many new companies entered the cement sector by putting up new plants, some of which got amalgamated with larger companies later. Some large multinational companies also entered India during this period. For the sake of consistency, only those companies, which existed during 1989 and were present throughout the entire period up to 2006 has been considered. In this study we have thirty two such companies, and for our analysis, the ranks of only these companies were considered.

We found that the relative market share of many players in the cement industry has changed significantly over the years. The large players have resorted to a combination of green field capacities as well as takeover of existing capacities for growth. It appears that there have been considerable changes in the rankings. To analyze how deep and significant are these changes, we take up rank concordance and correlation tests.

5.1 Index of Rank Concordance

Boyle and McCarthy (1997) had proposed a measure for assessing the inter-temporal mobility of countries in terms of the ranking of countries by income levels. The measure seeks to capture the change in the rankings as reflected by Kendall's index of rank concordance. They proposed a multi-annual version (RCt) and a binary version (RCat). We intend to use that concept for studying the change in inter-temporal mobility of ranks of the cement companies.

The multi-annual version may be defined as:

$$RC_t = \frac{\text{Variance} \quad {}^{T}_{t=0}AR(Y)_{it}}{\text{Variance}\{(T+1) * AR(Y)_{io}\}}$$

Where AR(Y)it is the actual rank of the firm i's market share in year t ; AR(Y)io is the actual rank of firm i's market share in the initial year 0 ; (T+1) is the number of years for which data were used in computing the index.

The binary measure is obtained from the ranks in year's t and 0 and is defined as:

$$RC_t = \frac{\text{Variance}\{AR(Y)_{it} + AR(Y)_{io}\}}{\text{Variance}\{2 * AR(Y)_{io}\}}$$

The multi-period measure can be calculated for every value of t i.e., T=0, 1,....The numerator measures the inter-firm variation of the sum of actual rankings of the firms over the period from 0 to T. The denominator is obtained by multiplying the base period ranking by (T+1) and then calculating the variance across the firms.

The multi-annual measure, extending over the whole period, contains all possible pairs of years for which the binary measure could be computed. The value of this rank concordance will lie between zero and unity. A value of unity for this measure will imply no mobility and closer the value of the measure to zero will imply greater is the extent of mobility within the distribution.

The results of the binary measure and multi-annual measure are reported in Table 3. Though both the values are very high, there is a downward trend in both the series, indicating some mobility of ranks within the firms. (Table-3)

Since the changes in market share has been taking place more in the top two quartiles, we particularly look at the inter - temporal movement of the firms measured by RCat in the top two quartiles.

The results reported in Table 4 indicate that there is much more sharp movement in the measure of RCat for the firms in the top two quartiles than in the total set of firms. (Table-4)

6. Testing for Structural Stability

In the present section we concentrate on how the market share has behaved for each individual company during the period under study and test for structural breaks. In order to study structural breaks we carry out the Chow test.

It was seen in the earlier section on rank correlation test that there has been considerable churning among the companies, when ranked according to their market share. The Chow Test confirms that there indeed has been a structural change, for many companies. The summary of the Chow test results are reported in Table A.5.

In the earlier analysis we have found that ACC retained the top slot and led the market share table, though it lost market share during this period. ACC's market share came down from 17.7 percent in 1989 to12.7 percent by 2006. However, we find no structural breaks in the Chow Test for ACC. This could be because it had lost market share gradually. Grasim is a company which gained significant market share from under 3 percent in 1989 to more than 6 percent by 1997 and going up to 11 percent by 2003 before losing some share and being at 9.8 percent by 2006. Grasim moved up from eighth position in 1989 to fourth position by 1997 and ultimately to third position by 2006. The Chow test gives break for Grasim in 1999. There were breaks in several years for the Ultratech which has the second slot as per average market share. Ultratech increased its market share from 4.3 percent in 1989 to 8 percent by 1997. It further increased its market share to 11.6 percent by 2000 before slipping to 9 percent by 2006. Ultratech's rank had moved up from the 6th position to 2nd position in 1997 and then again slipped to fourth position by 2006. We find the Chow test gives breaks from 1996-1999 for Ultratech. Grasim and Ultratech are two companies, who aggressively expanded their production capacities and increased their market shares to move up the rank tables significantly.

Ambuja cements and India cements were two companies which did not even figure in the top eight companies in 1989, but became leading cement companies by 2006. Ambuja Cements had a market share of less than 2

Table 3 : Inter-temporal Movement for the Full Set of Firms

Year	RCt	RCat	Year	RCt	RCat
1989	1.000	1.000	1998	0.942	0.936
1990	0.987	0.987	1999	0.933	0.910
1991	0.978	0.978	2000	0.922	0.898
1992	0.972	0.970	2001	0.917	0.906
1993	0.965	0.961	2002	0.895	0.856
1994	0.959	0.953	2003	0.891	0.891
1995	0.956	0.950	2004	0.892	0.912
1996	0.952	0.953	2005	0.890	0.892
1997	0.946	0.946	2006	0.890	0.896

Table 4: Inter-temporal Movement of RC_{at} for the Firms in the Top Quartiles

Year	Top Quartile	2nd largest Quartile	Year	Top Quartile	2nd largest Quartile
1989	1.00	1.00	1998	0.63	0.79
1990	1.00	0.96	1999	0.57	0.76
1991	1.00	0.98	2000	0.50	0.79
1992	0.98	0.93	2001	0.52	0.79
1993	0.95	0.92	2002	0.58	0.52
1994	0.86	0.81	2003	0.50	0.73
1995	0.82	0.83	2004	0.50	0.79
1996	0.73	0.79	2005	0.50	0.73
1997	0.63	0.79	2006	0.50	0.73

percent in 1989 and increased its market share to 5.6 percent by 1997 and further to nearly 10 percent to occupy the second position in 2006. Chow test gives structural breaks in the year 1995, 1996 and 1997 for Ambuja Cements. India Cements had only 2.5 percent market share in 1989 but by 1997 it had captured a market share of 4 percent and by 2006 it had nearly 6 percent market share and occupied the fifth position. The Chow Test gives structural breaks from 1997-2001.

JK group has moved down from second position in 1989 to eighth position by 2006. It was initially able to hold its position as it moved to third position by 1997 but slid sharply thereafter. The Chow test gives break for JK group in 1998, 1999 and 2000.

In the companies between the 2nd and 3rd quartile there was a significant break for CCI. CCI a public sector company gives multiple breaks in the Chow test from 1996 to 2002. Perhaps this was, as CCI held a commanding position during the pre decontrol period, but continuously lost market share, as it could not withstand the onslaught of competition from the new entrants after the period of decontrol. Other companies like Jaypee and Shree cement which recorded breaks had increased their market share significantly. Jaypee recorded break in 1995 and Zuari recorded breaks in 1997, 1998 and 1999. In the last group i.e., companies in the first quartile, companies like Kalyanpur, Malabar, KCP, Panyam, Shriram, Kanoria, Mawluh and J&K, remained in the fringes throughout the period with less than 1percentshare. All these companies except Panyam recorded no structural break.

An interesting observation that most of the companies recorded structural breaks during the 1996-1999 period. This coincides with the year 1998, when the direction of the all the concentration ratio i.e., four firm, eight firm and Herfindahl index changed. We may in conclusion that this was the period when the cement industry experienced a structural change.

7. Conclusion

This paper gives an insight into how the process of deregulation has impacted the structure of the cement industry, which has faced regulation for a large periods of time. The four-firm concentration ratio which stood at 37.6 percent in 1989, declined to 33.8 percent by 1997 signifying reduced concentration. It then started rising steadily and crossed the 40 percent landmark first time in the year 2000 and went on to reach 45 percent by 2003. There has been a slight reduction thereafter till 2006 but if we take Grasim-Ultratech and Ambuja-ACC as one entity, then the concentration ratio goes up to 51.7 percent in 2006 signifying increased concentration. The Herfindahl index also nicely captures this effect. We can conclude that immediately after decontrol, increase in competitiveness lead to reduced concentration for few years. However, this trend was reversed mainly due to expansion and acquisition of capacities by the larger Indian firms to consolidate their position and entry of multinationals. Regional and smaller players have had to sell out to these larger Indian players and multinationals leading to increased concentration.

There has been a considerable change in the market shares and ranks of the companies during this period. An analysis reveals that the top most two quartiles made significant gains in market share and the companies below the second quartile lost market share during this period. In other words, redistribution of market shares has taken place in favour of larger companies.

We have used Boyle and McCarthy's (1997) concept for assessing the inter-temporal mobility of firms in terms of the ranking of firms by market shares. The measure seeks to capture the change in the rankings as reflected by Kendall's index of rank concordance. The results of the binary measure and multi-annual measure shows that in both the values there is a downward trend in both the series, indicating some mobility of ranks within the firms.

The Chow Test confirms that there indeed has been a structural break, for many companies. The companies which rose to leadership position and gained significant market shares were Ambuja Cements, India Cements, Ultratech, and Grasim. The other companies which gained significant market shares were Jaypee, Shree Cement, Zuari etc. All these companies recorded structural breaks. ACC maintained its leadership

position and experienced no structural breaks. However, CCI, the dominant public sector cement company in 1989 lost its preeminent position and lost significant market share and had structural breaks. In the lowest quartile, companies remained in the fringes throughout the period with less than 1 percent share with most of the companies not recording any structural breaks.

An interesting observation that most of the companies recorded structural breaks during the 1996-1999 period which coincides with the year 1998, when the direction of the concentration ratios i.e., four firm and Herfindahl index changed. We may in conclusion that this was the period when the cement industry experienced a structural change. The cement industry has an increasing market concentration over period of time and the redistribution is happening in favour of the largest firms in the industry.

The present study is primarily exploratory rather than normative. However, some policy implications follow: The concentration of four firms is more than 50 percent. Two dominant groups viz., the Holcim group and the Aditya Birla group have emerged in the cement industry which now account for more than 40 percent market share. It indicates that the other companies in the industry are much smaller. Moreover, there is a rising trend in the market share of the larger companies both through organic growth and acquisitions. It is to be seen that in the cement industry also the spirit of the Competition Act, 2002 (as amended by the Competition (Amendment) Act, 2007), is ensured so that the larger companies do not get into anti-competitive agreements or abuse their dominant position which can cause an appreciable adverse effect on competition within India.

Table A.1: Movement of Four firm Concentration Ratio

Year	Four firm concentration ratio	Year	Four firm concentration ratio
1989	37.61	1999	38.30
1990	35.97	2000	42.09
1991	34.72	2001	42.18
1992	32.95	2002	43.23
1993	32.79	2003	45.01
1994	33.13	2004	44.33
1995	33.13	2005	43.20
1996	33.84	2006	41.35
1997	33.81	2006(M)	51.74
1998	34.80		

[Note : In 2005-06 (M) - we have modified the data to take into account the strategic merger of capacities of some cement companies like ACC -ACL and Grasim-Ultratech]

Source: Calculated using CMA data

Table A.2 - Movement of Herfindahl Index

Year	Herfindahl Index	Year	Herfindahl Index
1989	0.059	1999	0.059
1990	0.056	2000	0.066
1991	0.053	2001	0.064
1992	0.050	2002	0.064
1993	0.050	2003	0.068
1994	0.051	2004	0.066
1995	0.049	2005	0.065
1996	0.050	2006	0.061
1997	0.049	2006(M)	0.104
1998	0.052		

[Note : In 2005-06 (M) - we have modified the data to take into account the strategic merger of capacities of some cement companies like ACC -ACL and Grasim-Ultratech]

Source : Calculated using CMA data

Table A.3
Movement of Inverse of Herfindahl Index

Year	1/ H	Year	1/ H	Year	1/ H
1989	16.9	1996	20.0	2003	14.7
1990	18.0	1997	20.3	2004	15.1
1991	19.0	1998	19.4	2005	15.4
1992	20.1	1999	17.1	2006	16.4
1993	20.0	2000	15.1	2006(M)	9.6
1994	19.7	2001	15.7		
1995	20.2	2002	15.5		

[Note : In 2005-06 (M) - we have modified the data to take into account the strategic merger of capacities of some cement companies like ACC -ACL and Grasim-Ultratech]

Source : Calculated using CMA data

Table A.4: Quartile wise Analysis of Market Share

Mkt share (1989-2006)	Mkt share '89	Mkt Share '06	Gain / loss
Top (Mkt. Share > 3rd quartile)	53.11	60.32	7.21
Between 2nd and 3rd quartile)	16.7	19.89	3.19
Between 1st and 2nd quartile)	8.76	6.94	-1.82
< 1st quartile)	3.73	1.64	-2.09
Mkt sh (1989-1997)	Mkt share '89	Mkt share '97	Gain / loss
		1997	
Top (Mkt. Share > 3rd quartile)	53.11	53.25	0.14
Between 2nd and 3rd quartile)	16.7	17.19	0.49
Between 1st and 2nd quartile)	8.76	8.62	-0.14
< 1st quartile)	3.73	3.61	-0.12
Mkt sh (1997-2006)	Mkt share '97	Mkt share '06	Gain / loss
Top (Mkt. Share > 3rd quartile)	53.25	60.32	7.07
Between 2nd and 3rd quartile)	17.19	19.89	2.7
Between 1st and 2nd quartile)	8.62	6.94	-1.68
< 1st quartile)	3.61	1.64	-1.97

Source : Calculated using CMA data

Table A.5: Structural Breaks in Chow Test Results

Sl.No.	Name	Structural Breaks	Sl.No.	Name	Structural Breaks
1	ACC	None	17	Kesoram Industries	None
2 1996 1997	Ambuja Cement Ltd.	1995			
18		Madras Cement	None		
3	Andhra Cement	1998	19	Malabar Cement	None
4	Birla Corp. Ltd.	1996	20	Mangalam Cement	None
5	Cement Corp. India	1996 1997 1998 1999 2000 2001 2002	21	Mawluh Cherra	None
6	Century Textiles	None	22	Mysore Cement	1995 1996
7	Chettinad Cement	1999 2000	23	OCL	1999
8	Dalmia Cement	None	24	Orient Paper	None
9	Grasim Industries	1999	25	Panyam Cement	1997 1998
10	India Cements	1997 1998 1999	26	Rain Industries	None
11	J K Group	1998 1999	27	Saurashtra Cement	None
12	Jaypee	1995	28	Shriram Cement	None
13	J & K	None	29	Shree Cement	1998
14	Kalyanpur Cement	None	30	TNCC	None
15	Kanoria Group	None	31	Ultratech Cement	1996 1997 1998 1999
16	KCP	None	32	Zuari Cement	1997 1998 1999

Source : Calculated using CMA data

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Jayanta Nath Mukhopadhyay is a PGDM from IIM Calcutta and did his PhD from Jadavpur University. He is presently the Dean and Professor of Finance at Globsyn Business School. He has been a visiting faculty at IIM Calcutta and IIM Rohtak. His research papers have been published in leading journals.

Malabika Roy is an Associate Professor in the Department of Economics at Jadavpur University. She did her PhD from ISI Kolkata. Her articles have been published in several leading national and international journals.

Ajitava Raychaudhuri is Professor of Economics at Jadavpur University. He was ranked first both in the graduation and post graduation examinations before completing his PhD in Economics from American University, USA. He was also a Fulbright Fellow. He has written several books and his articles has been published in several leading national and international journals.