

Detecting Cartels in the Indian cement industry: An Analytical Framework
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Abstract

The boom in the real estate and construction industry in India saw a sudden and sharp increase in the price of cement, to the extent of a price increment as high as 17 per cent in a single month. This paper is an attempt to use the theories of collusive behaviour to explain this sudden increase. Collusive behaviour of cartel formation refers to the illegal behavior of firms within an industry to explicitly or tacitly collude to regulate their market behavior so as to restrict competition. There is a very thin blurred line of distinction between legitimate cooperation and illegitimate collusion. Cartel members agree on fixing prices, total industry output, market shares, rigging bids, setting common sale agencies, allocating territories, or a combination of these measures to gain supernormal profits.

In the process of assessing the cement industry behaviour, the paper analyses characteristics of an ideal cartel detection policy and structural and behavioral cartel detection methods. Parameters studied include the firm concentration index, region-wise production & consumption, capacity utilization, cost to sales ratio, etc. Our analysis clearly demonstrates that the sudden surge in the price of the cement is neither due to the demand-supply mismatch of the cement nor a sudden increment in the cost of producing cement. The contention that the cement industry engaged in illegitimate collusion is further strengthened by observing the recent decline in cement price after the Government announcement to import cement.

1. Introduction

“The country's anti-monopoly watchdog MRTPC has issued notices to 14 cement firms including Grasim, ACC and Ultratech, after its investigative arm Director General of Investigations and Registration (DGIR) pointed toward cartelisation and slammed Cement Manufacturers' Association for the "exorbitant" increase in prices”. (source: Economic Times, 25 July, 2007)

Following this announcement, a lot has been written in print media about the probability of an ongoing collusive behaviour among the major cement players in India. In spite of various notices & warnings to cement firms by Government officials and the competition commission, the price of cement in the country has breached all limits. With so much investment required in the construction and infrastructure industry, such a high price of cement could seriously impact the economy's growth trajectory.

The present research paper is an attempt to analyse the reason behind such a rapid rise in cement price and to predict if there is actually a cartel among the major players in the country. Given that it took 17 years for the MRTPC to come to a decision on an old case of the pernicious cement cartel in India of 1990s (source: comments by Mr. Pradeep S. Mehta, editor, COMPETITION & REGULATION IN INDIA, 2007, The Hindu Business Line, 26 December, 2007), this paper is an attempt to develop elements of a cartel detection policy and highlight through those elements, possible cartelization in the Indian cement industry.

To start with, the paper discusses theoretical issues about cartels and collusion. To contextualize our paper, this is followed by a brief overview of the competition law in India. Some cartel detection frameworks are presented and then applied to the recent price behavior of the Indian cement industry. The paper concludes that based on a preliminary analysis of the available data, the cement industry has behaved in a collusive manner.

2. Cartels and Collusion

Cartels are productive structures involving multiple producers acting in unison that allow producers to exercise monopoly power (Khemani and Shapiro, 1993). It refers to the illegal behavior of competitors in which they coordinate explicitly or tacitly to regulate their market behavior so as to restrict competition. These agreements are frequently verbal and although they can be harmful to competition they are difficult to detect (Xin, 2004). It is actually difficult to decide when a cartel is a cartel, what cartel success means, let alone if it acts inefficiently or destructively.

Cartels are an attractive option when actions/operations of different firms are strategic complements rather than strategic substitutes¹. Cartels often establish committees or secretariats to collect and share market sales intelligence of the participating members. In periods of high demand, with capacity constraints, bigger firms have incentives to join

¹ *The decisions of two or more players are called strategic complements if they mutually reinforce one another, and they are called strategic substitutes if they mutually offset one another* (http://en.wikipedia.org/wiki/Strategic_complements)

the cartel as they can cut their production and maximize profits through price increase. However, in periods of low demand, smaller firms have greater incentive to remain outside the cartel, as they would be in an advantageous position to sell their product without the burden of price fixation. Cartels can deter entry for new firms through price wars. They can also use price wars to force outsiders to join the cartel or to punish existing defectors for non-compliance.

Cartels can be classified as explicit or tacit, with explicit cartels referring to a situation where firms directly interact to establish the cartel, as in the case of OPEC². Tacit Cartels in contrast describes a situation where the firms can establish super competitive prices without any direct interaction. The incentive to defect exists in both tacit and explicit cartels, unless there is a written enforceable contract. Thus, sustainability of a cartel is an important area of study. A Cartel which is stable satisfies the property of “Internal stability” i.e. no cooperating firms find it desirable to become independent or break out of the cartel and “External Stability” i.e. no independent firm finds it desirable to join the cartel. Cartels persist among firms with similar cost functions. If the cost functions are similar, all participating firms have similar incentive to remain in the cartel. Entry of new participants into a cartel is disruptive because it destabilizes the collusive agreement, often leading to the breakdown of the cartel or results in the cartel being discovered. Transparency in the market makes it easier for the cartel members to have access to their sales and market share data of the participating cartel members. Persistent demand instability puts a strain on the management and coherence of any collusion. High concentration of buyers, makes it difficult for monitoring the cartel, as with high buying power, buyers would buy only from a single supplier i.e. one of the cartel members creating the impression that the member has defected. Table 2.1 summarizes factors affecting the sustainability of cartels.

Table 2.1 – Factors and their corresponding impact on cartel sustainability

Factors	Impact on sustainability
Small Number of Firms	Positive
High Concentration Index (C3)	Positive
Similar Cost Functions of Firms	Positive
High entry and exit barriers	Positive
Low Price elasticity of Demand	Positive
Discontent with existing performance	Positive
Trade Associations	Positive
Mutual Trust	Positive
Homogenous goods	Positive
Market Transparency	Positive
Threat of Legal Sanctions	Negative
Large Powerful Buyers	Negative
Demand fluctuations	Negative

² **OPEC:** *The Organization of the Petroleum Exporting Countries is a permanent intergovernmental organization created on September 10–14, 1960. The OPEC Members coordinate their oil production policies and thus influence the price of oil in the international market.*

Source: Adapted from Doree (2004)

Cartel Members agree on price fixing, total industry output, market shares, allocation of customers, bid-rigging, setting common sale agencies, and allocating territories, division of profits or combination of these to gain supernormal profits. Table 2.2 provides a typology of cartels (Fear, 2006). Past economic studies indicates the median price increase attributed to cartels is around 25% (Connor and Lande, 2005). Private international cartels (those with participants from two or more nations) had an average price increase of 28%, whereas domestic cartels averaged 18%. Less than 10% of all cartels in the sample failed to raise market prices (ibid).

Table 2.2 – Categories of Cartels

Customer Cartels	Customer cartels allocate customers or suppliers to certain producers
Specialization Cartels	Specialization cartels divided the market differentially. In Specialization cartels, members of the cartel assign lines of commerce/product or production techniques among themselves. This is basically a non-price oriented strategy involving division of labor.
Territorial Cartels	Territorial cartels divide market share by allocating the area geographically
Quota Cartels	Quota Cartels limit the production output of participating members and thus artificially creating supply constraint. This leads to price fluctuations and also excess capacity is left with the firm. However in these cartels, there is greater probability of defection as monitoring is difficult.
Price Cartels	In Price Cartels, price is agreed upon among the members and usually an independent agency is created to monitor the compliance of members and hold them accountable.
Syndicates	Syndicates usually pose a more united front against firms entering the market and also punish wayward firms.

Source: Adapted from Fear (2006)

Cartels are perceived to be productive structures which exploit consumers and reduce the consumer welfare surplus. However, Cartel formation does have some positive externalities which are beneficial to the industry and society (Salin, 2004). Cartels generate positive externalities for the firms that remain independent of the cartel. Moreover, facilities with high cost of production tends to close under cartels because of future market growth is restricted owing to higher prices leading to a reduction in operating margin. Variability in prices of cartelized products is reduced and demand for substitutes boosted as a result of cartel formation. Cartels also encourage

standardization of products and the industry as a whole benefits from economies of scale.

3. Competition Policy and Regulatory Framework in India

Competition Law & Policy throughout the globe result in equity among producers and reduce profit maximization behavior. The number of countries having a competition law has risen from 35 in 1995 to around 100 as on date (source: www.competition-commission-india.nic.in). India has well defined and clearly laid out policies and regulations which discourage the formation of unscrupulous associations or cartels, articulated through two acts, the Consumer Protection Act and the Competition Act. The rule and regulations have provisions to sustain and encourage fair competition and protect consumers against unethical and exploitative trade practices. Parties found violating the provisions/norms of these acts faces severe punitive actions or consumer is adequately compensated. Major provisions and implications of the Act are summarized next.

Consumer Protection Act: The main objective of the act is to provide for the protection of consumers. It applies to all goods and services, covers all the sectors whether private, public or cooperative. This act is compensatory in nature and is intended to provide fast and cost effective redressal to the consumers' grievances. It provides for the damage or loss incurred to the consumer as a result of the unethical and unfair trade practice of the industry or the company.

Under the provisions of this act, the consumer is protected against the marketing of goods and services which are hazardous to his/her life and property and is properly informed about the quality, quantity, potency, purity, standard and price of goods/services. He has access to a variety of good/services at competitive prices as well as information. He can seek redressal for exploitation by unethical and unfair trade practices.

Competition Act, 2002: Under this Act, a competition commission has been set up to prevent practices having adverse effect on competition and to promote and sustain competition in markets. The Act protects interests of consumers and ensures freedom of trade for all participants in competitive markets. Under this act, any firm or association of firms cannot engage in any association or Cartel which directly or indirectly

- determines purchase or sale prices
- limits production, supply, markets, technical development, investment or provision of services,
- limits market share or source of production or provision of services by allocating of geographical area of market, or type of goods or services, or number of customers in the market etc.
- results in bid rigging or collusive bidding,
- has an appreciable adverse effect on competition

However, Joint Ventures, Mergers or Strategic alliances forged to enhance the efficiency and productivity does not fall under category of cartel. The act further specifies that no firm can abuse its dominant position and adversely impact competition through

“predatory pricing”³ or conditional sale of goods. Further, no firm can use its dominant position to prevent entry of other firms.

3.1 Competition Commission of India

The Central Government has established the Competition Commission of India (CCI) with effect from 14.10.2003. The CCI is formed to prohibit and eliminate the formation of anti-competitive agreements, abuse of dominant position by an enterprise and to regulate certain “combinations” which include acquisition of shares, acquiring of control and mergers/amalgamation between and amongst enterprises. CCI ensures that no single firm shall create of barriers to new entrants in the market or drive existing competitors out of the market. It is also ensured that consumer surplus does not diminish and benefits must accrue to the consumer.

CCI provides judicial opinion and advice to the Government on the possible effect on competition emanating from its policy, statute, rules and regulations. The commission can conduct an enquiry and is entitled to impose penalty; award compensation to aggrieved party, modification of agreement, issues order regarding payment of costs, or division of enterprise enjoying dominant position.

Though the Competition Act 2002 seeks to repeal the MRTP Act and dissolve the MRTP commission, a notification to that effect is yet to be issued by the Central Government. The CCI is expected to be fully operation by the second half of the year 2008. As per Mr. P.C. Gupta (Union Minister for Corporate Affairs), *“The day the Competition Commission is fully operationalised, it would commence its constitutional work of regulating fraudulent practices in the corporate sector and the MRTP Act would stop looking into corporate affairs.”* (source: The Hindu, Jan 30, 2008 <http://www.hindu.com/2008/01/30/stories/2008013055091500.htm>)

4 A Framework for Detecting Cartels in industry

Cartels are self-enforcing agreements between firms to reduce the competition among themselves and thus promoting profits. Past evidence of cartel in an industry do provide some indication where a cartel may exist but not convincingly. In this section, we start with some normative characteristics of a cartel detection policy, and this is followed by two methodological approaches to cartel detection. The two methodologies are classified as “Structural Methodology” and “Behavioral Methodology”. Some comments as to how the methodology is applied to the Indian Cement Industry have also been made at appropriate places in these sections.

4.1 Desirable Traits in a Detection Methodology

Detecting cartels in industry is a challenging task when there is only a thin line of distinction between the cartel and competitive behavior. Past evidence of cartel detection provides some indication in which industry cartels may exist, with the probability of detecting a cartel increasing with deployment of more resources. Any

³ “Predatory price” means the sale of goods or provision of services, at a price which is below the cost with a view to reduce competition or eliminate the competitors.

methodology which is adopted should have the potential to detect and thereby deter cartels (Friederiszick and Rigaud, 2007). A methodology based purely on random selection – like investigating a random sample of industries each year – would not be an efficient mechanism despite some power in cartel detection. The policy must also aim to have low probability of type 1 and type 2 errors i.e. rejecting the positives and accepting the negatives. Triggering inspection with these errors would increase the legal burden and transaction cost.

Moreover the methodology must have a strong deterrence effect and should not be easy to circumvent. For instance, a methodology that depends on a single indicator, e.g. some measure of price variation at industry level, is more vulnerable than a methodology relying on several indicators. Furthermore, an automated methodology produces a more predictable outcome, compared to a methodology that leaves some room for discretion in interpreting individual indicators (Friederiszick and Rigaud, 2007). There is a need to keep exact methodology secret.

Also, the methodology has to take into account the capabilities and resources of a competition authority. It should not be too resource intensive such as complex economic analysis, which binds resources and requires large case teams both with economic and industry know-how. A methodology that requires permanent market monitoring and in-depth industry knowledge may simply overstretch a competition authority's capacities.

Finally, a methodology has to take into account the limitations of publicly available information. In other words, the marginal information provided by an additional individual indicator has to be balanced with the cost of information gathering necessary to apply the indicator. Another trade-off exists between secrecy and detection power of a methodology. A secret methodology may limit its circumvention by cartelist, but on the other hand it may have negative effects on the deterrence effect of the methodology, which is the central objective of any cartel policy.

4.2 Structural Methodology

The structural methodology relies on the principles of demand-supply and other economic indicators like price, cost analysis, capacity utilisation, number of firms, firm size and concentration of firms in an industry. Analysing the data for all these parameters provide empirical evidence indicating if firms collude or not. The various parameters are discussed further below.

Number of Firms: Number of firms in an industry is inversely related to the probability of cartel in that industry (Grout and Sonderegger, 2005), as difficulty in monitoring individual firm behaviour increases with number of firms. Also, greater numbers of firms imply each firm getting lesser share of the pie of the profits to be accrued by joining the cartel. Finally, large numbers of firms imply that firms with cost-asymmetries can coexist which contradict cartel sustainability.

Entry Barriers: Cartel member create entry barriers so as to hinder the entrance of the new private firms in the market. These entry barriers include like increased capital investment on technology, R&D innovation to gain competitive edge. Cartel members often indulge in “price wars” to cut into the profitability of the new participating firms. In our empirical study of the Indian cement industry that follows, data analysis has been

done to find the instance if firms have indulged in price wars or there are some other indication to prevent the entry of new firms.

Concentration and Firms Size: Large firm size with high concentration index makes collusion easier (Grout and Sonderegger, 2005). With economies of scale, firms can indulge in price wars to deter the entry of new firms. In the present study, “Concentration index” for top three large firms, denoting the market share of top three firms by market size, has been taken into account (C3).

Demand Variability: A stable demand encourages the formation of a cartel and its persistence over a period of time. If the demand is variable and changing over the years, cartels are unlikely (Grout and Sonderegger, 2005). Under conditions of low demand, members would like to deviate from the cartel, while high demand gave more incentives to the cartel members to capture a larger pie with a secret reduction in price.

Capacity Utilisation: Indication of cartel in an industry is also supported by the evidence of low capacity utilisation or availability of excess capacity with a firm even when demand is high. The “Oil Cartel” operated by OPEC is a prime example. In the present study, evidence of the excess capacity is analysed from available secondary data.

Cost/Expense to Sales Ratio: Increase in the price of a commodity or service provided by the firm which is not correlated with the corresponding increase in the expense or cost, provides evidence of cartelisation. In the present study, Cost to Sales ratio has been analysed on an annual basis. If there is a decrease in this ratio which cannot be explained, it is indicative of cartelisation.

4.3 Behavioral Methods

Members under a collusive agreement have defined rules and limits to operate. This determines their collusive behavior. This behavior can be manipulated with an antitrust policy. By influencing factors leading to cartel stability, competition policy can render the formation of cartels unattractive (deterrence) or can trigger the break-up of existing cartels (desistence) (Friederiszick and Rigaud, 2007)

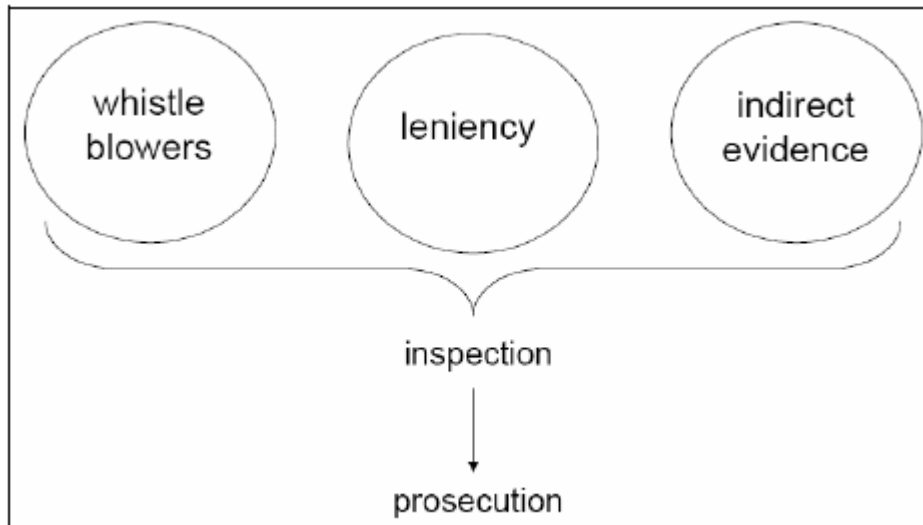
From this perspective, the cartel detection methodology modifies the incentive structure of individual firms in such a way that collusion is no longer sustainable. Such a policy suppresses the existence of cartels immediately in the wake of its implementation. Due to its immediate effect on market cartelization, harm to consumers is reduced to a minimum. In addition, it minimizes the resource requirements of a competition authority. Figure 4.3 summarises the behavioral approach to cartel detection.

Leniency, Whistle Blowers and Indirect evidence forms the three major behavioral methods for Cartel detection (ibid). Most of the cartels detected till now are due to leniency and to a limited extent on whistle blowers and complainants. Structural Methods based on indirect evidence generated by an economic methodology are still underdeveloped.

Whistle Blowers may be former employees of the firm or even existing ones. Whistleblowers offer a direct insight to the competition commission regarding the existence of cartel or may even provide documentary evidence. Under indirect

evidence, complainants, such as competitors or customers of the alleged cartel, provide more indirect evidence on the existence of a cartel (Apesteguia, Dufwenberg, Selten, 2007). For instance, customers may observe clear signs of collusive behaviour and report these to the Commission. Also indirect and circumstantial evidence based on a sector inquiry or a market screen, i.e. the active assessment of markets by a competition authority could be a potential source for suspicion of a specific cartel.

Fig 4.3. : Cartel Detection based on Behavioral Methods



Source: Friederiszick and Rigaud (2007)

Leniency based cartel detection method is an incentive constraint method that deters the cartel member with the imposition of high punishment. With a high probability of the cartel being detected, if the quantum of punishment is more than the profit to be accrued by being in a cartel, the cartel member has incentives to leave the cartel (Wils, 2006). As a result, many cartels have been detected through filing of the leniency applications by the cartel members. Leniency methods are the most prominent tool employed by the Competition Commission to deter the formation or break up of the cartel. However, if market conditions change in a way that renders some cartels unstable, there exists a motivation for firms to join the market competition by applying for leniency and guaranteeing a reduction in fine for themselves. In that sense, there is a risk that leniency is little more than terminal care for cartels.

5. Application: The Cement Industry in India

Over the past few years, the demand of cement has peaked. With the real estate and construction sector booming, demand for cement is bullish. The surge in demand is followed by a surge in the price of cement. This study attempts to examine whether this price increase is attributable to a (explicit or tacit) cartel in the cement industry. Some hints towards this are evident from:

“The MRTPC, after looking into complaints of price fixing and restrictive practices by cement companies, found that the cement companies adopted restrictive practices and a cartel existed. It sent notices to about 42 companies, including the Cement Manufacturers Association (CMA), in December 2007.” (source: The Hindu, Feb 21, 2008 <http://www.hindu.com/2008/02/21/stories/2008022154760400.htm>)

However, in the absence of concrete evidence, the present ongoing cartel existence is yet to be proved. This study makes use of structural methods to detect cartelization, as elaborated below.

5.1 Data & Methodology

The present study relies on secondary data provided by Centre for Monitoring Indian Economy Pvt. Ltd (CMIE). All the data pertaining to the Indian Cement Industry has been taken from the ‘Industry Analysis Service’ (IAS) while the firm specific data has been taken from ‘Prowess’. However this database has certain limitations like missed or no entries, time duration for which the data is available, number of cement firms covered by the database etc. No other database is accessed for cross-comparison and the present study derives its conclusion assuming that data provided by CMIE is reliable.

The study also makes use of the secondary literature: research papers, reports and official Government of India website of Competition Commission of India. The framework for Cartel detection proposed in the present study is very simple and can easily be applied to other industries.

5.2 Key Parameters of Indian Cement Industry

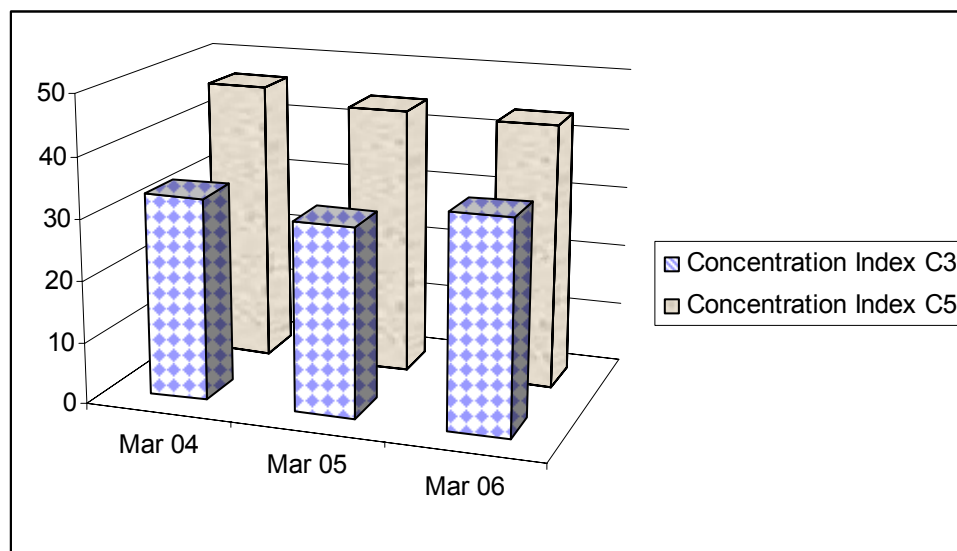
There are 127 firms present in the cement sector across the country, distributed into five geographic zones. The southern Zone has the maximum share in the All-India production of cement, followed by the Northern Zone for the years chosen for analysis (2004, 2005 and 2006). Firms are spread across various states in the country.

Concentration Index: C3

The Indian cement industry has three major players having a combined market share/size of 34.5 as on March 2006. Concentration Index, C5 is 43.31 as on March, 2006. The concentration index has remained more or less constant across the years 2004-2006 (for which the data is available), as indicated in Fig 5.2.1.

Such a high concentration index is a factor that strongly encourages collusion, as discussed in earlier sections. However, it is important to note that there are a significant number of small players in each zone.

Fig 5.2.1: Concentration Index: Indian Cement Industry

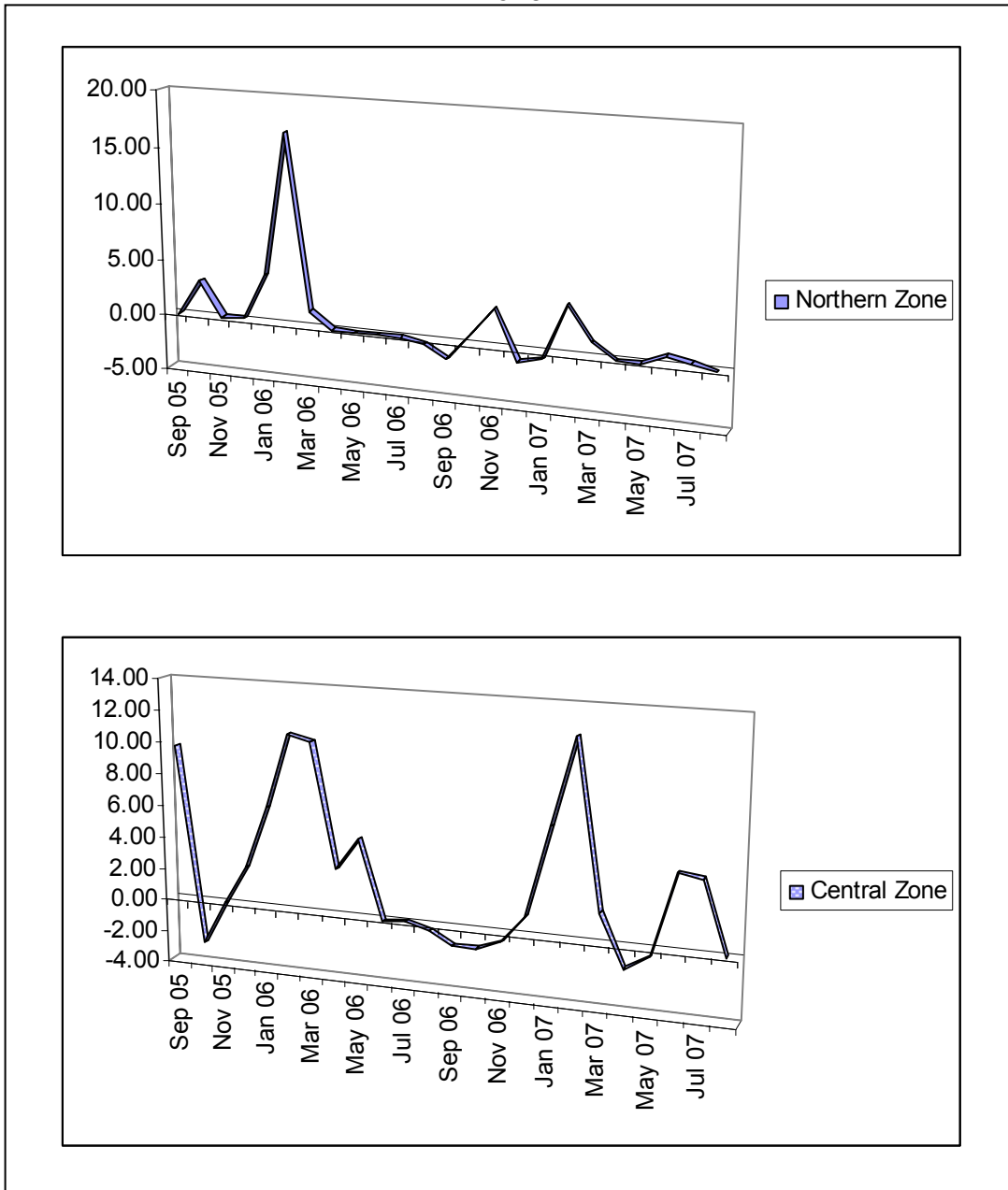


Price Variation discuss data trends for all zones

Retail prices of cement per 50 kg bag across the five zones identified by CMIE have been collated and compared spanning a time period of two years from Sep 2005 to Sep 2007. The five zones are represented by five metro cities in the respective regions: Mumbai (western), New Delhi (northern), Kolkata (eastern), Chennai (southern) and Hyderabad (central). Figure 5.2.2 summarizes the price variation observed over the time frame discussed. The y axes represent the percent change in cement prices. For efficiency and space considerations, data is reported only for two zones (northern zone and central zone). This approach of representing data from only the northern and southern zone has been followed for other parameters as well. Data for the remaining three zones follows similar trends and can be obtained from the authors.

In March 2006, a price surge of 16.95 per cent in the northern zone, 10.5 per cent in the eastern zone, 15.43 per cent in the western zone and 10.95 in central zone is observed. The central region had two consecutive increments of more than 10 per cent. Southern zone witnessed a per cent change of 16.97 per cent in the month of May-2006. The interesting observation is that this sudden surge in price has been observed simultaneously across four zones during March 2006.

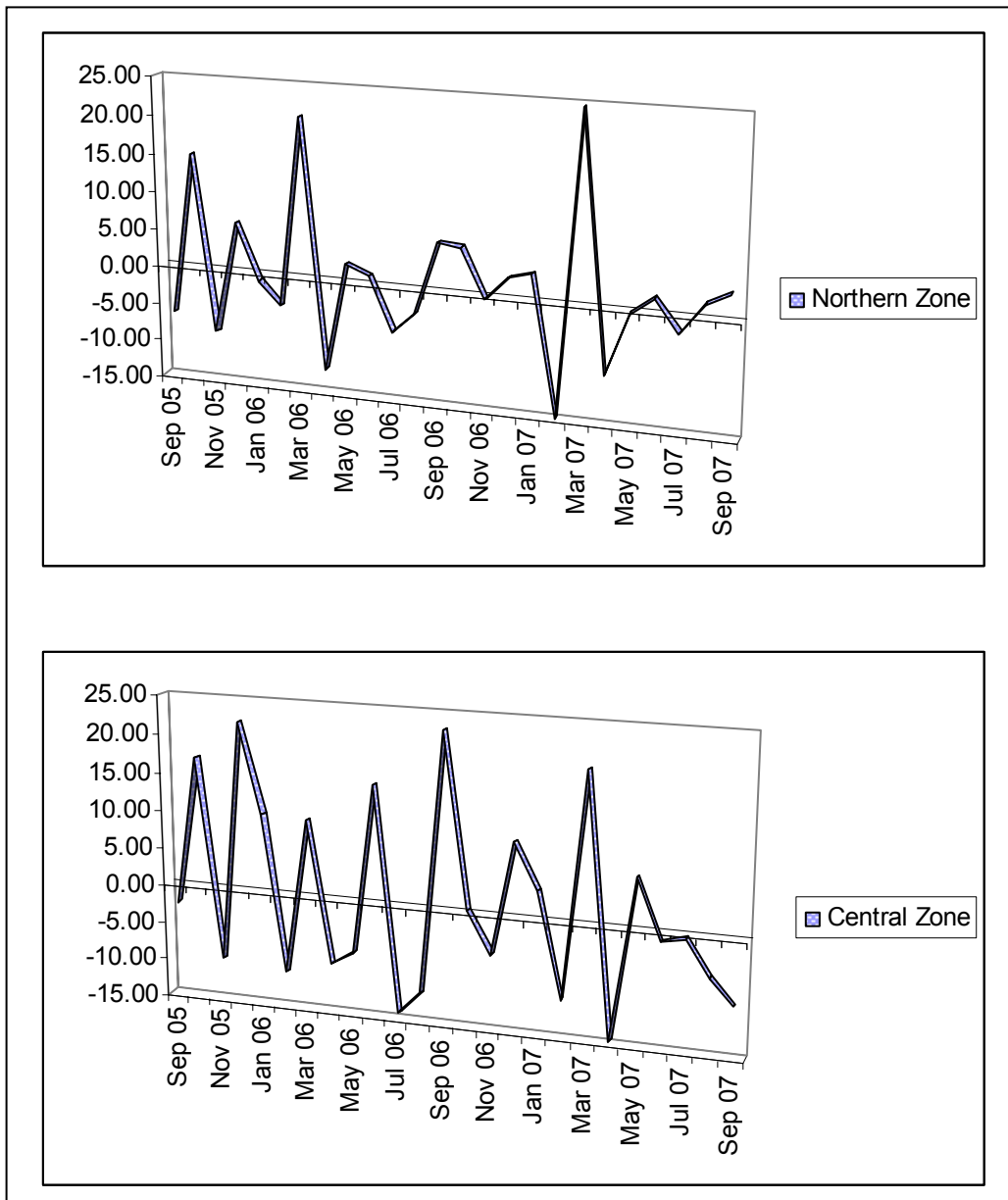
Fig 5.2.2: % change in retail cement price (per 50 Kg) across northern and central zone



Demand/Consumption

Demand or consumption of cement has been analyzed across the five respective regions, as done for the case of price. Results are summarized in Figure 5.2.3. From the graph, it is evident that, Dec 05, March 06 and Sep 06 witnessed sudden surge in demand after the previous months have faced demand shocks. Another apparent feature is that demand for cement is highly volatile across all zones. Shocks in demand are followed by sudden surges. Such high demand variability affects the formation and the sustenance of cartel in the long run. High prices in negative demand further impacts sales volume

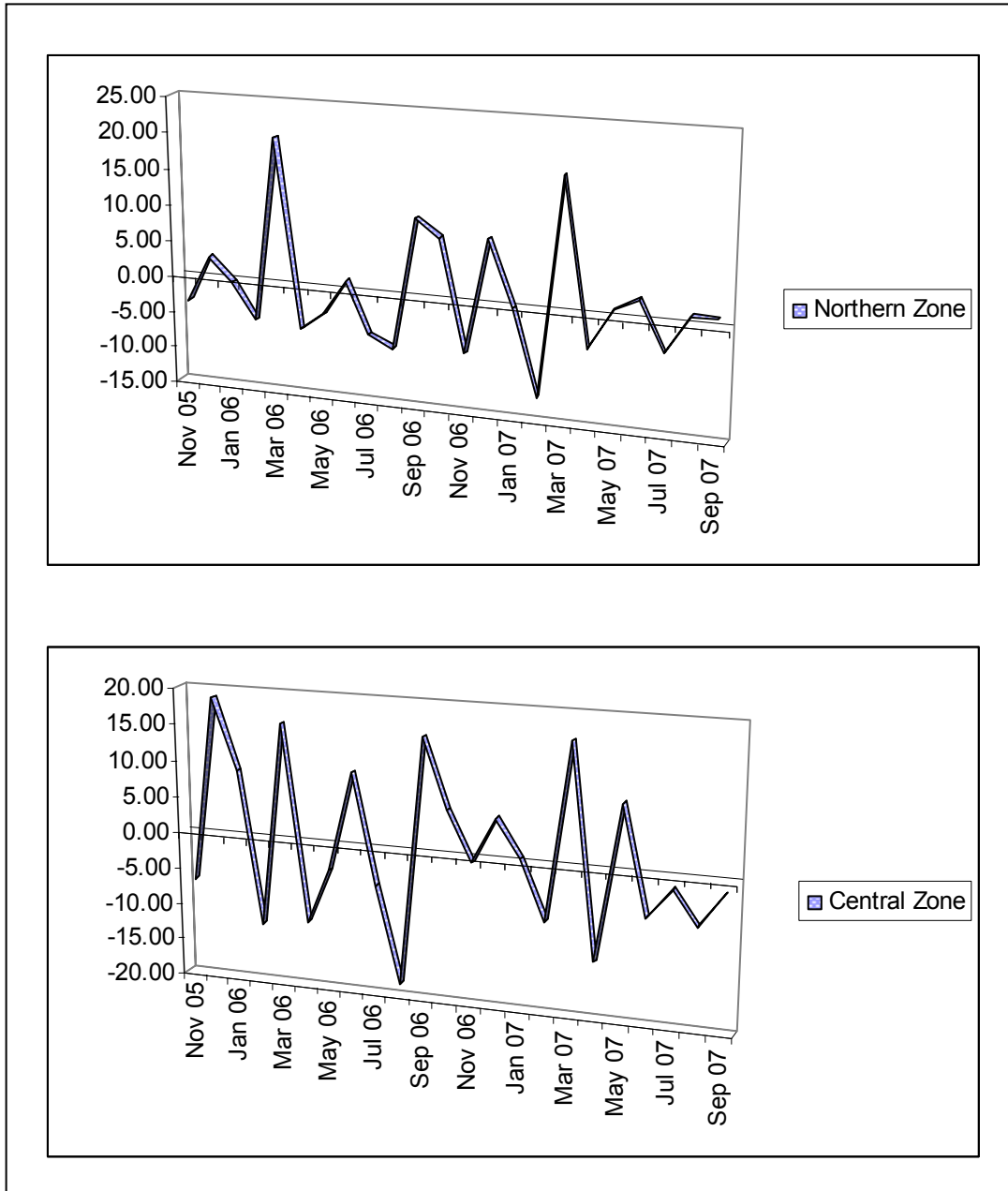
Fig 5.2.3: % change in demand of cement across northern and central zone



Production

Figure 5.2.4 summarizes the zone wise cement production figures. In Northern and Central zones, production was sufficient to cater to the entire demand. As such there was no shortfall. Even in the southern zone, the production was in excess to the demand and there was a surplus for all months in two years. In eastern and western zones, the production lags the demand slightly

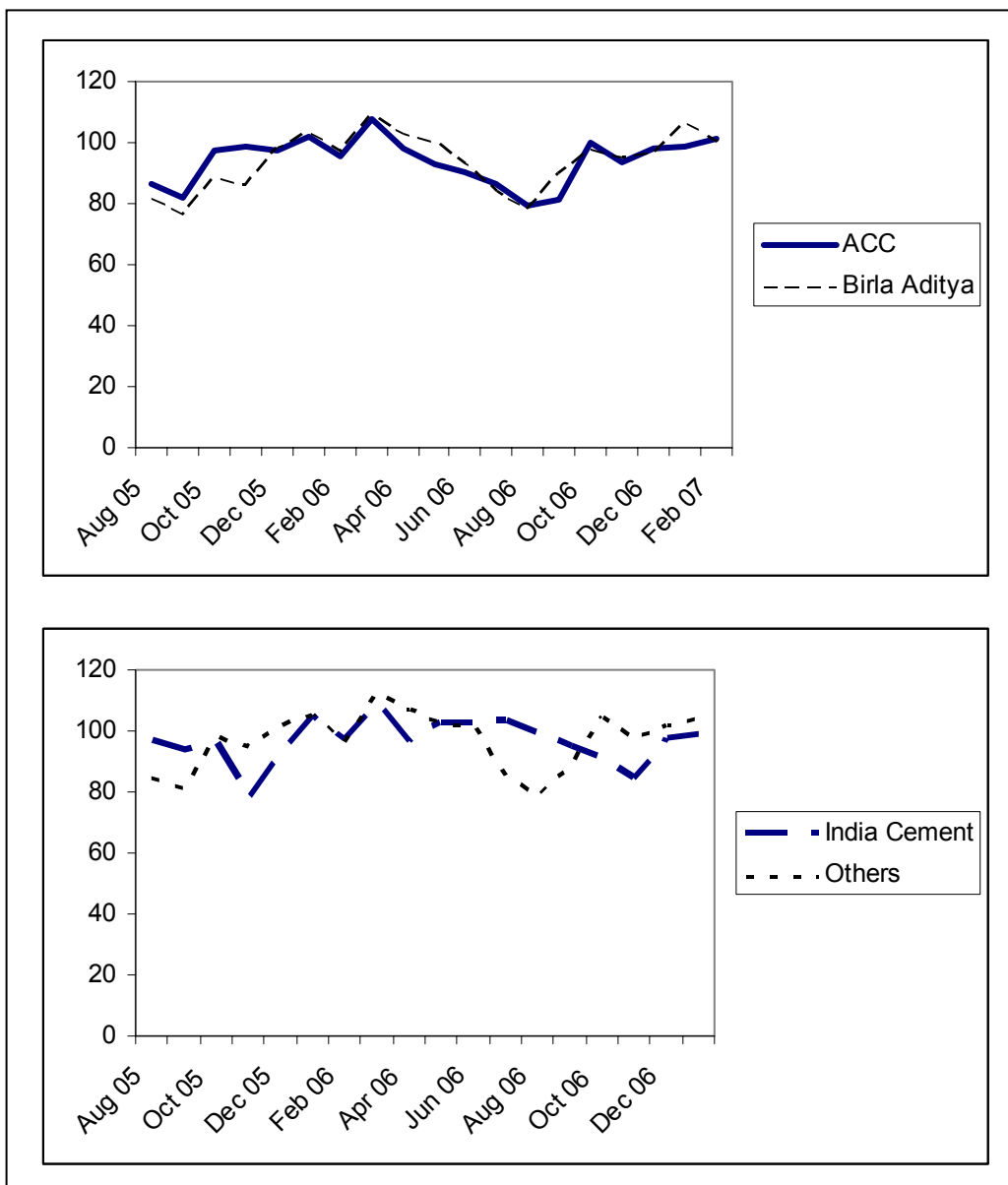
Fig 5.2.4: % change in the cement production across northern and central zone



Capacity Utilisation

Data over the past two years, as illustrated through Figure 5.2.5 reveals that the cement producing companies have utilized their capacity to the maximum to cater to the surging demand.

Fig 5.2.5: Trend in Capacity Utilization for various firms



The cement producing companies have utilized their capacity to the maximum to cater to the surging demand. There are no instances of extra ordinary excess capacity to create an artificial scarcity of supply. As clear for the above figure, the trend of capacity utilization is similar across the companies and closely follows the demand pattern.

Capacity Enhancement

Due to the strong demand as a result of increased real estate and construction activity in the country, all the major cement producing firms are ramping up their production capacity, as illustrated in Table 5.2.1. The table reveals the expansion plan of a few of the cement producing firms. The increased production capacity would translate into increased sales volume.

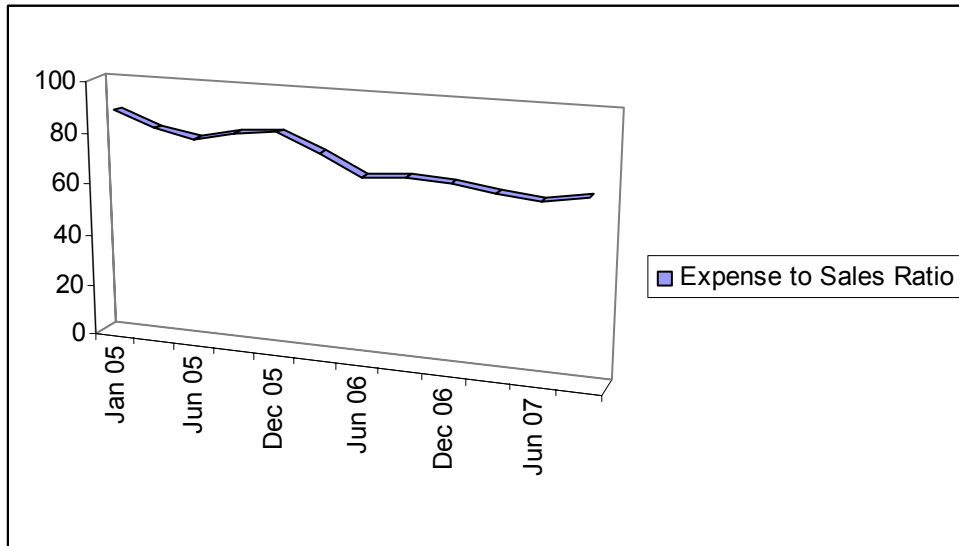
Table 5.2.1: Projected capacity enhancement for some Cement Firms (in MTPA)

Capacity Expansion				
	ACC	Gujarat Ambuja	India Cement	Binani Cement
Dec- 07 (projected)	23.1	16.3	8.53	2.25

Expense to Sales Ratio

Figure 5.2.6 indicates that expense (or cost to sales) ratio per annum of the cement companies has decreased over the years. Though the total sales have picked up, the cost of producing cement has not increased at the same pace. The sharp increase in sales without a corresponding increase in cost does indicate possibility of cartel behavior. A counter argument could be that the declining ratio is attributed to the economies of scale because of increased capacity utilization.

Fig 5.2.6: Trend in expense to sales Ratio (in per cent) for Indian Cement Industry



5.3 Is there Cartelisation in Indian cement industry?

Section 5.2 attempted to summarize key parameters observed in the Indian cement industry, using the structural framework developed to detect cartels in Section 4.2. Cement being a bulk commodity involving huge transportation and freight costs, arbitrage over physical distance is not possible. Hence, it was possible to analyze cement demand, production and other details independently across the five zones in the country.

Factors that point towards cartelization are the structure of Indian cement industry with few large firms dominating the industry (C3 index of 34.5) and the falling cost/expense to sales ratio in the last two years despite rising prices. The very high demand fluctuations, consistent capacity utilization rates of 80% or more and no evidence of price wars on the other hand leads one to believe that the players are not trying to restrict entry and are not stifling supply (as in the oil cartel) to get market power. Most large firms have also invested in capacity enhancement to the tune of 10% or more. Moreover, despite the existence of several large firms there are many small and nimble players in the cement industry who could disrupt the fine balance of the cartel by taking advantage of falling costs and fluctuating demand. This leads us to take a closer look at the cost of production, production quantity, demand and price relationship to determine whether the almost consistent price rise of cement in the last two years can be justified.

Table 6.1 lists the quarterly expense to sales ratio, monthly capacity utilization, price, production and sales data for three geographical zones. Using the figures 5.2.2, 5.2.3, 5.2.4, 5.2.5 and 5.2.6 from the last section and the comparative table, we can make the following observations. The increase in cement demand is matched with a corresponding increase in supply by increased capacity utilisation. As a result, the production has exceeded actual demand. Because of the match in supply and demand quantities, there should be no shortage in the market leading to the observed price rise. Also, the cost (expense) to sales ratio appears to have a clear declining trend over the years; the observed price increase cannot be attributed to this factor either.

However, in March 2006, with production still exceeding the demand and quarterly expense to sales ratio declining by 9% over the previous quarter, there is a sudden jump in the price (almost 11 % month on month, on average) of cement over almost all zones. This led to a very sharp (although not complete) convergence of price of cement across all zones in a matter of a few months. This sudden jump is not explained by any of the structural factors we have analysed, leading us to believe that the increase in price is the result of a tacit understanding among players of the cement industry to fix higher prices taking advantage of the boom in the cement sector. What is not clear, however, is why the smaller players in the industry have towed the line of larger firms, as this could have been a good way to gain market share. Perhaps capacity constraints have meant that they were not able to exploit this market opportunity.

6 Conclusions

In this paper we sought to develop a framework for cartel detection. Besides discussing some of the desirable features of a detection methodology, we discussed two approaches to developing the methodology. We then went on to apply one of the methodologies to the cement industry in India, using publicly available data. Our very preliminary analysis suggests definite evidence of cartel formation. Further refinement and testing of the methodology is desirable and could pave the path for future work. Our

results are vindicated by the recent Supreme court ruling (<http://www.thehindubusinessline.com/2008/03/04/stories/2008030452450200.htm>) as reported below. Interestingly, evidence in this case has been provided by a whistle blower (the behavioral approach).

Table 6.1: Figures for the demand, production and price of cement across three zones from Sep 2005 to Sep 2006

Time Period	Quarterly Expense to Sales Ratio	Average Capacity Utilisation	Northern Zone			Eastern Zone			Central Zone		
			Price (Rs per 50 Kg Bag)	Demand (in 00,000 tonnes)	Production (in 00,000 tonnes)	Price (Rs per 50 Kg Bag)	Demand (in 00,000 tonnes)	Production (in 00,000 tonnes)	Price (Rs per 50 Kg Bag)	Demand (in 00,000 tonnes)	Production (in 00,000 tonnes)
Sep 05	83	84.59	159.78	20.95		180.28	15.72		117.06	14.37	
Oct 05		99.58	159.78	24.10	25.56	180.10	17.16	15.50	128.50	16.83	18.07
Nov 05		93.51	164.83	22.10	24.69	179.73	17.79	15.53	125.00	15.24	16.89
Dec 05	84.7	103.00	165.00	23.53	25.43	173.69	20.14	18.62	125.00	18.62	20.06
Jan 06		104.70	165.33	23.31	25.36	177.06	19.46	18.41	128.11	20.57	21.88
Feb 06		96.76	172.54	22.42	24.03	179.80	19.12	18.16	136.23	18.45	19.27
Mar 06	77.7	112.54	201.78	27.10	28.88	198.51	23.19	20.69	151.15	20.32	22.32
Apr 06		101.17	204.67	23.88	27.19	201.74	20.84	19.45	167.25	18.57	19.86
May 06		99.37	204.67	24.49	26.27	201.21	20.70	18.74	172.13	17.32	19.18
Jun 06	70.5	96.63	204.67	24.80	26.66	201.16	20.48	19.04	180.58	19.97	21.12
Jul 06		95.12	204.67	23.34	25.16	201.50	17.37	15.88	180.50	17.16	20.05
Aug 06		83.17	204.67	22.59	23.34	201.06	14.98	13.41	180.60	15.25	16.39
Sep 06	71.8	92.87	204.00	24.04	25.89	203.00	16.82	16.01	180.00	18.73	18.92

"In yet another blow to cement producers, MRTPC on Monday found Cement Manufacturers Association (CMA) and nine others including ACC and Birla's Grasim Cement, guilty of having acted in concert to raise the price of cement bags in Jabalpur (Madhya Pradesh) during 2000 and 2001, and directed them to refrain from fixing prices of cement through such 'arrangements' with the apex association." (source: Business Line, March 04 2008)

7 References

Paul A Grout and Silvia Sonderegger (2005), "Structural Approaches to Cartel Detection", <[http://www.iue.it/RSCAS/research/Competition/2006\(pdf\)/200610-COMPed-Grout.pdf](http://www.iue.it/RSCAS/research/Competition/2006(pdf)/200610-COMPed-Grout.pdf)> , last accessed, Mar 05, 2008

Joseph E. Harrington Jr. (2005), "Detecting Cartels", John Hopkins University <www.econ.jhu.edu/pdf/papers/wp526harrington.pdf> , last accessed, March 05, 2008

Hans W. Friederiszick and Frank P. Maier-Rigaud (2007), "The Role of Economics in Cartel Detection in Europe", Working Paper. <www.esmt.org/fm/312/Role_of_Economics_in_Cartel_Detection_in_Europe.pdf>, last accessed, March 05, 2008

'Industry Analysis Service , Economic Intelligence Service and Prowess' Centre for monitoring Indian Economy Pvt. Ltd (CMIE) Database

Competition Commission of India Website, <www.competition-commission-india.nic.in>, last accessed March 05,2008

Competition Act 2002 <www.competition-commission-india.nic.in/Act> , last accessed March 05,2008

Khemani, R.S and D. M. Shapiro (1993), Glossary of Industrial Organisation Economics and Competition Law, commissioned by the Directorate for Financial, Fiscal and Enterprise Affairs, OECD <<http://stats.oecd.org/glossary/detail.asp?ID=3157>>, last accessed 9th Feb, 2008

Connor, John M. and Lande, Robert H. (2005), "How High do Cartel Raise Prices? Implications for Reform of the Antitrust Sentencing Guidelines." <http://www.agecon.purdue.edu/staff/connor/papers/HOW_HIGH_DO_CARTELS_4-20-05.pdf>, last accessed, March 05, 2008

Salin, Pascal (1996), "Cartels as Efficient Productive Structures". The Review of Austrian Economics Vol 9, No. 2 (1996) 29-42. <<http://www.springerlink.com/content/1027751667587v0n/fulltext.pdf>> , last accessed, March 05, 2008

Wouter P.J. Wills (2006), "Optimal Antitrust Fines: Theory and Practice" .World Competition 29(2):183-208, University of Amsterdam, <www.kernbureau.uva.nl/acle/object.cfm/objectid=E6B1A235-6C64-409E-B00CD1C2A3DE8915/download=true>, last accessed, March 05, 2008

Xin Frank He (2004), "The stickiness of legal collusion: a difficulty of legal enforcement", City University of Hong Kong, China, International Journal of the Sociology of Law, Volume 32, Issue 2, Pages 103-117, <http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WGX-4C47DHF-1&_user=489944&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000023778&_version=1&_urlVersion=0&_userid=489944&md5=696218b12282fd6e367dfad9bd13c4e2> last accessed, March 05, 2008

Jose Apesteguia, Martin Dufwenberg, Reinhard Selten (2007), "Blowing the Whistle", Research Article, Economic Theory (2007) 31:143-166, <<http://www.u.arizona.edu/~martind1/Papers-Documents/btw.pdf>>, last accessed, March 05, 2008.

Jeffery Fear (2006), "Cartels and Competition: Neither Markets nor Hierarchies", Working Paper, Harvard Business School. <www.hbs.edu/research/pdf/07-011.pdf>, last accessed, March 05, 2008