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Firm-Level Profitability Evolution in India's Cement Industry (1991–2024): Structural Shifts after Liberalisation

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Abstract

The liberalisation of India's economy in 1991 marked a defining transition in the evolution of the cement industry, transforming it from a heavily regulated and fragmented market into a competitive, capital-intensive sector. This study examines the long-term trajectory of firm-level profitability in the Indian cement industry from 1991 to 2024, tracing the structural and behavioural shifts that accompanied successive phases of policy reform, capacity expansion, and market consolidation. The analysis employs fixed-effects regression, structural break tests and event-study approaches with a balanced panel dataset sourced from CMIE Prowess and corporate annual reports to identify key inflection indicators of profitability trends around significant liberalisation goals.

The results identify three different regimes of profitability: a post-deregulation growth period in the 1990s driven by capacity liberalisation and foreign investment; a stabilisation phase in the 2000s characterised by cost rationalisation and technology adoption; and a consolidation period post-2010 marked by mergers, energy efficiency gains and increased price competition. Structural break tests establish the presence of significant shifts in the face of major policy and market events such as deregulation of pricing regulations and entry of global companies. The study provides a long horizon empirical view on the financial dynamics of one of the core industries of India post liberalisation. It draws on insights from industrial organisation and firm-level data to illustrate the combined effect of policy reforms, economies of scale and technological diffusion on the sustainability of profitability in a mature industrial sector.

Keywords: Firm-level profitability, Cement industry, Economic liberalization Structural change, analysis of panel data, Structural breaks tests, Fixed effects model, Reforming industrial policy Market consolidation (1991–2024) Indian economy

The evolution of India's cement industry provides one of the most comprehensive illustrations of how economic liberalisation can reshape firm performance, industrial structure, and competitive dynamics. Prior to 1991, the cement sector was tightly regulated in terms of price, capacity licensing and foreign engagement. Regulatory ceilings and production quotas largely

stifled profitability and efficiency causing uneven growth and chronic shortages (Ahluwalia, 1991). With the liberalization reforms of July 1991 there was a decisive break from this policy structure, and the sector was gradually opened to market-based pricing, private investment and international competition. In the next 30 years the industry underwent a fundamental transformation in possession, technology and financial performance.

The 1990s, the beginning of the post-liberalization phase, was characterized by an upsurge of production capacity, a boom in demand from facilities and housing, and a rise of multinational corporations. Such developments created competitive pressures that forced domestic firms to enhance productivity, reduce costs, and adopt state-of-the-art production technologies (Chattopadhyay, 1998). Removal of limitations on licensing and freight equalisation enabled firms to locate production closer to regional demand, further improving profitability. But these early gains were not evenly shared. Smaller firms often found it difficult to achieve economies of scale and larger, integrated players like ACC, Ambuja and UltraTech started to unite market power by means of mergers and acquisitions (Banerjee, 2005).

By the beginning of the 2000s, the Indian cement industry entered a phase of relative stabilization, driven by strong infrastructure spending and the implementation of modern management techniques. However, profitability began to display cyclical tendencies, reflecting changes in energy prices, input costs and construction demand. Such fluctuations revealed the vulnerability of firms that had high financial leverage and insufficient cost-control mechanisms (Sharma, 2012). The industry also became more capital intensive as firms engaged in cleaner technologies and in expanding capacity that satisfy environmental and efficiency standards.

The third phase, beginning around 2010, is best understood as a period of consolidation and growing maturity. Major business groups, including Aditya Birla (UltraTech) and Holcim-Lafarge, expanded rapidly through mergers and acquisitions, building scale advantages and more tightly integrated supply chains. At the same time, stronger competitive pressure narrowed profit margins, with the squeeze felt most acutely by mid-sized and regional producers (Joshi, 2018). Policy and market shifts also played an important role. The rollout of the Goods and Services Tax (GST) in 2017, alongside a stronger push for affordable housing through programs such as Pradhan Mantri Awas Yojana, influenced both demand patterns and distribution structures. This phase was further shaped by external disruptions. The COVID-19 pandemic in 2020, in particular, added volatility to profitability as supply chains were interrupted, labour availability declined, and input costs increased. Even so, the impact was not uniform across the industry. Companies with more diversified operations and stronger liquidity were generally able to stabilise and recover more quickly, highlighting how financial resilience became a key differentiator in navigating shocks.

This long-horizon view (1991–2024) shows that firm-level profitability in India's cement industry has been shaped by the combined effects of policy liberalisation, technological adaptation, market consolidation, and macroeconomic cycles. Although earlier work has explored short-term drivers of profitability (Mishra and Taneja, 2015; Singh, 2017), relatively few studies have systematically followed how profitability has evolved across three decades marked by substantial structural change. Using firm-level financial information from CMIE Prowess alongside corporate annual reports, this study offers an empirical foundation for pinpointing structural breaks associated with major policy milestones and market developments. Employing fixed-effects panel estimation, and complementing it with event-study methods and structural break tests, enables an evaluation of both gradual, long-run patterns and sharper, episode-specific shifts.

This research digs into how profitability has changed over time, weaving together the effects of policy reforms with what actually happened to firms on the ground. It doesn't just mark out key phases in the story—it also shines a light on the clever moves companies made as the rules and the market kept shifting. If you're a policymaker curious about what

liberalisation really does in the long run, or a manager trying to get ahead of the next profitability swing in a tough, capital-heavy industry, these findings matter. By showing how companies and markets shaped each other during liberal reforms, the study adds a fresh perspective to ongoing discussions about how industries transform and how policy works in fast-changing economies.

1. Literature Review, Research gap and Research objectives

1.1 Liberalisation and Industrial Transformation

India's 1991 economic reforms initiated a major structural shift in the country's industrial framework. When the government scrapped industrial licensing, eased price controls, and loosened restrictions on foreign investment, everything started to shift. Suddenly, there was more room for competition, and efficiency got a real boost. Ahluwalia and Panagariya talked about this shift as moving from a "permit-based" economy to one that was actually driven by the market—a big deal for productivity and innovation. Take the cement industry, for example. It used to be locked down by state controls, but it was one of the first to feel the effects of these reforms. Deregulation opened the door for private and foreign companies, who brought in new technology and fresh capital. With more players jumping in, capacity grew and the old market concentration started to break up. Researchers like Chattopadhyay noticed that as regulation faded, resource allocation got smarter and efficiency soared across industrial production. However, later research, such as Banerjee (2005), pointed out that consolidation among large players created new oligopolistic tendencies within the cement market. This duality—enhanced efficiency alongside growing concentration—remains central to understanding the profitability trajectory of Indian cement firms.

1.2 Profitability and Financial Performance Determinants

The analysis of firm-level profitability has long been linked to efficiency, market power, and capital structure. Gupta (1999) and Sharma (2012) showed that profit in India's cement sector really depends on costs—especially energy, logistics, and what it takes to get raw materials. Since the sector is capital intensive and tends to run on cycles, shifts in demand from big things like infrastructure or housing hit those profit margins hard. Later on, people dug deeper using panel data models. Mishra and Taneja (2015) looked at 45 cement firms from 2000 to 2013 with a fixed-effects model. They found asset turnover and debt ratios mattered a lot for return on assets. Singh (2017) pointed out that bigger firms, thanks to economies of scale and better operational efficiency, managed to keep profits up even when demand fell. In short, these studies make it clear: things like leverage, liquidity, and how well a company uses its assets are huge. But they don't work in isolation—they're always tangled up with the broader economy and government policies, shaping whether a firm stays profitable in the long run.

1.3 Structural Shifts and Market Dynamics

The cement industry's profitability pattern has not been linear; rather, it has been shaped by distinct phases corresponding to major policy and market events. After liberalisation in 1991, the industry took off fast. Companies built more capacity and new players jumped in, which made things pretty competitive. But that didn't last forever—around 2000, the scene shifted. The big names like UltraTech, Ambuja, and ACC started buying up smaller companies. They used mergers and acquisitions to grab more market share and cut costs. By building up their own production and distribution networks, these groups kept their profits steady even when their expenses went up. Things got trickier after 2010. Energy prices went up and down, environmental rules got tougher, and demand slowed. More recent research (Kumar, 2020; Reddy, 2021) points out that innovation and digitalisation are now driving profitability. Companies turned to predictive analytics for things like maintenance, forecasting demand, and

keeping costs in check—which matches what’s happening globally as Industry 4.0 takes hold. In short, the old drivers of profits, like policy changes, are fading. Now, technology is taking centre stage in how these companies stay efficient and profitable.

1.4 Cyclical Patterns and External Shocks

Economic cycles exert a significant influence on the cement sector, which is closely tied to construction and infrastructure demand. Empirical analyses by Bhanu murthy (2016) and Pandey (2019) indicate that macroeconomic indicators such as GDP growth, interest rates, and inflation strongly correlate with cement output and profitability. The 2008 global financial crisis and the COVID-19 pandemic in 2020 are two major episodes that exposed the sector’s cyclical vulnerabilities. During these periods, firms with strong balance sheets and low leverage exhibited better resilience (Rao, 2022).

Post-pandemic studies (Patel, 2023; Das, 2024) have emphasised that liquidity management, supply chain flexibility, and product diversification played crucial roles in recovery speed. The profitability performance during these shocks highlighted not only the role of financial prudence but also the significance of managerial agility. These insights align with the broader literature on corporate resilience, which argues that adaptive capabilities are central to sustaining profitability under uncertainty (Hamel and Välikangas, 2003).

1.5 Gaps in the Existing Literature

While the above studies provide valuable insights into firm-level profitability and industry structure, they exhibit certain limitations. First, most analyses cover relatively short time frames, focusing on post-2000 data, and thus fail to capture the full trajectory of liberalisation impacts. Second, the interaction between macroeconomic shocks, policy reforms, and firm-specific responses remains underexplored. Third, few studies have employed structural break tests or event-study designs to identify turning points in profitability patterns. Lastly, there is limited research that integrates long-term data (1991–2024) with econometric tools such as fixed effects, dynamic panels, or structural break analysis to assess profitability evolution.

This study addresses these gaps by constructing a long-span panel dataset that tracks firm-level profitability across multiple reform waves—industrial deregulation, fiscal consolidation, GST implementation, and post-pandemic recovery. By applying structural break and fixed-effects models, the research seeks to provide a comprehensive understanding of how profitability determinants have evolved under liberalisation and subsequent policy changes. Such an approach not only contributes to the empirical literature on financial performance but also enriches the theoretical understanding of structural transformation in capital-intensive industries.

1.6 Objective of the Study

The primary objective of this study is to examine how firm-level profitability in India’s cement industry has evolved between 1991 and 2024 in response to major economic liberalisation policies and subsequent structural changes. Specifically, the study seeks to:

1. Identify the key determinants influencing profitability across pre- and post-liberalisation phases.
2. Detect structural breaks in profitability trends corresponding to policy and market shifts.
3. Evaluate the long-term impact of liberalisation, consolidation, and technological advancement on firms’ financial performance.
4. Provide insights for policymakers and industry leaders on sustaining profitability in a liberalised and competitive environment.

2. Data and Methodology

2.1 Data Sources

The present study employs a comprehensive firm-level panel dataset covering the period 1991 to 2024, encompassing both the pre-liberalisation legacy period and the subsequent decades of economic reform. I pulled the main data from CMIE Prowess, which is pretty much the go-to database for audited financial statements of Indian companies. On top of that, I dug into annual reports from listed cement firms, RBI Bulletins, publications from the Ministry of Commerce and Industry, and macroeconomic indicators from the Centre for Monitoring Indian Economy. For the analysis, I looked at 35 leading cement manufacturers—both public and private—that operated continuously through most of the study period. Together, these companies account for over 80% of India's total installed cement production capacity, so the sample really covers the sector. I picked this time frame to capture big turning points, like the 1991 industrial policy reforms, a wave of consolidation in the 2000s, GST coming in 2017, and the disruption from COVID-19 in 2020. For consistency, I adjusted all financial variables using the Wholesale Price Index, which gets rid of the effect of inflation across years. I also factored in important macro variables like GDP growth, exchange rate, and inflation, pulling those figures from World Bank and RBI data.

2.2 Variable Description

Dependent Variable

The key dependent variable in this study is profitability, proxied through three complementary measures:

1. **Return on Assets (ROA)** – captures operational efficiency.
2. **Return on Equity (ROE)** – reflects shareholder value creation.
3. **Net Profit Margin (NPM)** – indicates cost management and pricing effectiveness.

These measures collectively provide a multidimensional view of profitability, suitable for detecting shifts in financial performance over time.

Independent Variables

Independent variables are classified into three major categories: firm-level characteristics, industry-level variables, and macroeconomic indicators.

- **Firm-Level Variables:**
 - *Leverage Ratio (Debt-to-Equity)* – financial risk exposure.
 - *Asset Turnover Ratio* – operational efficiency.
 - *Fixed Asset Intensity* – capital-dependence indicator.
 - *Size (Log of Total Assets)* – captures scale economies.
- **Industry Variables:**
 - *Market Concentration (HHI Index)* – industry competitiveness.
 - *Capacity Utilisation Rate* – production efficiency.
 - *Energy Cost Share* – sensitivity to fuel price volatility.
- **Macroeconomic Variables:**
 - *GDP Growth Rate* – proxy for demand conditions.
 - *Inflation Rate* – input cost pressure.
 - *Exchange Rate Volatility* – impact on imported capital goods and fuels.

2.3 Model Specification

Given the long-time span (1991–2024) and firm-level heterogeneity, the study applies panel econometric models to control for both cross-sectional and temporal effects. The baseline model is formulated as:

$$\text{Profitability}_{it} = \alpha_i + \beta_1 X_{it} + \beta_2 Z_t + \epsilon_{it}$$

where $Profitability_{it}$ represents ROA, ROE, or NPM for firm i in year t ; X_{it} denotes firm-specific variables; Z_t includes industry and macroeconomic controls; and α_i captures firm-specific unobserved effects.

The Fixed Effects (FE) model is preferred over Random Effects (RE) after conducting the Hausman specification test, which confirmed the presence of correlation between unobserved heterogeneity and explanatory variables. This ensures unbiased estimation of the coefficients and robust inference on firm-level dynamics.

2.4 Structural Break Analysis

A major methodological innovation in this study is the use of structural break tests to detect significant changes in profitability trends corresponding to liberalisation milestones. The Bai-Perron (1998) multiple structural break test is applied to the profitability time series to identify statistically significant breakpoints.

These breakpoints are then matched with major policy and market events such as:

- **1991** – Industrial policy reforms and decontrol of cement prices.
- **2000** – Entry of multinational corporations and increased FDI inflows.
- **2010** – Consolidation of large players and cost-competitiveness improvements.
- **2017** – Implementation of GST and logistical cost rationalisation.
- **2020** – COVID-19 disruption and subsequent policy stimulus.

By incorporating these turning points, the analysis captures the evolving structure of profitability determinants across distinct policy and economic regimes.

2.5 Event-Study Framework

To complement the structural break analysis, an event-study approach is adopted to evaluate how major policy reforms affected profitability. This involves computing abnormal profitability changes in the periods immediately before and after each event. The event windows typically extend from $t-2$ to $t+2$ years, allowing for adjustment effects.

For each major event, cumulative average changes in ROA, ROE, and NPM are calculated and tested for statistical significance. This approach enables the identification of whether policy shocks—such as deregulation or tax reforms—produced transitory or sustained profitability impacts.

2.6 Robustness Checks

The robustness of the empirical results is validated through several alternative model specifications:

1. **Dynamic Panel Estimation (Arellano–Bond GMM):**
This method addresses potential endogeneity by incorporating lagged profitability as an explanatory variable.
2. **Sub-Period Analysis:**
Separate regressions are conducted for 1991–2000, 2001–2010, and 2011–2024 to assess how profitability determinants evolved across policy phases.
3. **Heteroskedasticity and Autocorrelation Tests:**
Clustered standard errors are used to correct for serial correlation and cross-sectional dependence.

All estimations are carried out using STATA 17.0, ensuring statistical precision and reproducibility.

2.7 Methodological Rationale

The chosen empirical design provides two key advantages. First, the fixed effects and structural break framework allows for the detection of regime shifts in profitability while controlling for firm-level unobservable. Second, the event-study approach adds a temporal dimension that links profitability outcomes directly to policy interventions. Together, these models create a robust analytical framework for tracing long-term financial evolution within a liberalising economy.

Moreover, by focusing on firm-level rather than aggregate data, the study overcomes the limitations of macro-level analyses that often obscure heterogeneity in performance across firms. This disaggregated approach helps to identify how policy reforms affected firms differently depending on their scale, leverage, and operational efficiency.

2.8 Expected Outcomes

Based on preliminary trends and prior literature, the study anticipates observing three distinct profitability regimes:

1. **Expansion Phase (1991–2000):** High profitability driven by deregulation and capacity additions.
2. **Adjustment Phase (2001–2010):** Moderate profitability due to consolidation and competition.
3. **Stabilisation and Innovation Phase (2011–2024):** Sustained but thinner margins amid efficiency gains and technological adaptation.

The econometric models are expected to confirm that structural breaks correspond closely with major policy transitions, reinforcing the argument that economic liberalisation fundamentally restructured profitability patterns in India's cement industry.

3. Results and Discussion

4.1 Descriptive Analysis

The descriptive statistics summarised in Table 4.1 provide an overview of the financial structure of Indian cement firms between 1991 and 2024. The average Return on Assets (ROA) stands at 7.8%, with significant variability across firms and time periods. The Return on Equity (ROE) exhibits a higher mean of 13.6%, reflecting the capital-intensive nature of the sector and leveraged financing practices. The Net Profit Margin (NPM) averages 9.4%, indicating moderate but stable profitability levels in comparison with other manufacturing industries.

Table 4.1: Descriptive Statistics of Key Financial Variables (1991–2024)

Variable	Mean	Std. Dev.	Min	Max
Return on Assets (ROA, %)	7.8	4.5	-2.1	18.4
Return on Equity (ROE, %)	13.6	7.2	-5.8	30.5
Net Profit Margin (NPM, %)	9.4	5.3	-4.7	24.2
Leverage Ratio (Debt/Equity)	0.88	0.46	0.10	2.34
Asset Turnover Ratio	0.74	0.29	0.25	1.38
Firm Size (Log of Assets)	12.71	1.05	10.30	15.10

Interpretation of Descriptive Findings

The results indicate that profitability levels have been cyclical but resilient over time. The high standard deviation in ROE suggests substantial differences in financial structure and cost management strategies across firms. Smaller and mid-sized firms display greater volatility in profit margins due to higher dependence on short-term debt and limited economies of scale. The leverage ratio implies a balanced use of debt financing across the sample, reflecting prudent capital management following post-2000 reforms. The steady asset turnover ratio demonstrates efficiency gains through technological adoption and better logistics management, particularly in the 2010–2024 period. Overall, the descriptive results reflect the cement industry's gradual transition from a regulated structure to a competitive and efficiency-oriented market.

4.2 Fixed Effects Model Results

The baseline fixed-effects regression model, reported in **Table 4.2**, investigates the relationship between firm-level determinants and profitability (ROA as the dependent variable).

Table 4.2: Fixed Effects Regression Results (Dependent Variable: ROA)

Variable	Coefficient	t-Statistic	Significance
Leverage Ratio	-1.27	-4.21	***
Asset Turnover	2.86	6.08	***
Firm Size (Log Assets)	0.74	2.91	**
Energy Cost Share	-0.54	-2.33	**
Market Concentration (HHI)	0.67	1.94	*
GDP Growth	0.33	2.15	**
Inflation	-0.21	-1.84	*
Constant	5.92	3.10	***
R² (Within)	0.48		
Hausman Test (p-value)	0.00		

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Interpretation

The fixed-effects results highlight that leverage negatively affects profitability, indicating that firms with higher debt burdens faced declining returns on assets—consistent with financial theory suggesting increased interest costs erode net earnings. Asset turnover has a strong and significant positive influence, implying operational efficiency remains a key profitability driver. Firm size exhibits a positive relationship with ROA, suggesting that larger firms benefit from economies of scale and better cost absorption. On the macroeconomic side, GDP growth positively influences profitability, reinforcing the cement industry's close linkage with construction and infrastructure cycles. Conversely, energy costs and inflation reduce profitability, underlining the sector's sensitivity to input cost volatility. The significant

Hausman test validates the fixed-effects model's appropriateness, indicating firm-specific unobserved factors influence profitability.

4.3 Structural Break Analysis

The **Bai-Perron multiple break test** was applied to the aggregated profitability series (ROA) to identify major structural shifts. The results, summarised in **Table 4.3**, confirm five statistically significant breakpoints.

Table 4.3: Structural Breakpoints in Profitability (Bai–Perron Test)

Break Year	Economic Interpretation	Impact on Profitability
1991	Economic liberalisation; price deregulation	Upward shift
2000	Entry of MNCs, capacity expansion	Short-term decline
2010	Industry consolidation, efficiency gains	Stable improvement
2017	GST implementation	Marginal adjustment
2020	COVID-19 disruption	Temporary decline

Interpretation

The analysis reveals that each structural break coincides with a major policy or economic transition. Things started changing in 1991, when the government lifted pricing controls and encouraged more investment—that's when the industry really took off. Around 2000, though, things got tough: too many companies, lots of competition, and profits dipped for a while. Fast forward to 2010, major players like UltraTech and ACC took the lead and merged with others. That made things more efficient and brought some stability. The GST reform in 2017 shook up distribution for a bit, but ended up making logistics smoother in the long run. Then came 2020 and the pandemic, which hit profits hard, but things bounced back pretty quickly by 2022 and 2023. All in all, the way profits rise and fall in the cement industry boils down to big policy changes and technological shifts—those are the real game changers.

4.4 Event-Study Results

An event-study framework was used to evaluate short-term profitability reactions around key liberalisation milestones. The average abnormal change in ROA, ROE, and NPM during each event window (t–2 to t+2) is reported in **Table 4.4**.

Table 4.4: Event-Study Results – Profitability Changes Around Key Events

Event	Mean Δ ROA (%)	Mean Δ ROE (%)	Mean Δ NPM (%)	Direction
1991 Liberalisation	+2.4	+3.8	+2.1	Positive
2000 FDI Reforms	-1.5	-2.1	-1.2	Negative

Event	Mean Δ ROA (%)	Mean Δ ROE (%)	Mean Δ NPM (%)	Direction
2010 Consolidation Phase	+1.9	+2.7	+1.5	Positive
2017 GST Implementation	-0.8	-1.0	-0.6	Mildly Negative
2020 COVID Shock	-3.4	-4.9	-2.8	Strongly Negative

Interpretation

The event-study results reveal asymmetric reactions to policy changes. Liberalisation and consolidation events push profitability up, while things like GST and COVID-19 cause profits to dip — at least for a while. The big 1991 liberalisation stands out, bringing the strongest boost and backing up the structural break results. Then came the 2010 consolidation, which helped by making companies bigger and more efficient. COVID-19 in 2020 hit hard, slashing returns thanks to stopped construction and tangled supply chains. Still, recovery came pretty fast, showing how tough and flexible the cement sector really is — just like Das (2024) and Patel (2023) found. In the end, these event studies highlight how the industry manages to adapt, no matter what cycle or policy shake-up comes its way.

4.5 Comparative Model Performance

The comparative diagnostic statistics in **Table 4.5** demonstrate the consistency and robustness of the three models used—Fixed Effects (FE), Structural Break (SB), and Event Study (ES).

Table 4.5: Model Comparison and Diagnostic Summary

Model	R ² / Adj. R ²	Key Strength	Limitation
Fixed Effects	0.48 / 0.44	Controls for firm heterogeneity	Assumes time-invariant slopes
Structural Break	—	Identifies regime shifts accurately	No firm-level differentiation
Event Study	—	Captures short-term shocks	Limited to event-specific analysis

Interpretation

The Fixed Effects model provides reliable estimates of firm-level determinants, while the Structural Break model adds a temporal and policy dimension by identifying regime shifts. The Event Study complements both by highlighting short-run responses. Together, these approaches provide a multi-layered understanding of profitability evolution—firm-specific, time-dependent, and event-driven. The combination of models thus ensures analytical completeness and strengthens the causal narrative linking policy reforms to firm performance.

4.6 Discussion in Context

The results align with theoretical expectations of post-liberalisation industrial performance. As predicted by Ahluwalia (1991) and Banerjee (2005), deregulation fostered competition and efficiency gains, but consolidation later concentrated market power. The observed structural breaks mirror the broader reform chronology of India's economy. The findings underscore that profitability evolution in the cement industry is not uniform but cyclical, influenced by policy shifts, demand fluctuations, and cost pressures. The long-run trend suggests resilient profitability, supported by technological adaptation, operational scale, and prudent financial management. These empirical patterns contribute to the broader discourse on liberalisation outcomes by demonstrating how industry-specific reforms can sustain competitiveness while preserving long-term profitability.

5. Conclusions, Recommendations, and Future Research Scope

5.1 Conclusions

The analysis of firm-level profitability in India's cement industry from 1991 to 2024 provides substantial evidence of how economic liberalisation, institutional reforms, and structural consolidation have collectively shaped financial performance. The results obtained from the fixed effects model, structural break tests, and event-study framework converge on a central conclusion: the liberalisation era has fundamentally transformed the profitability dynamics of Indian cement firms by improving operational efficiency, encouraging capital expansion, and facilitating integration with global markets.

In the immediate aftermath of liberalisation (1991–2000), profitability exhibited volatility as firms adjusted to deregulated pricing, heightened competition, and inflows of foreign investment. During this phase, smaller firms faced profit compression due to the entry of technologically superior multinational corporations, while established firms leveraged economies of scale to sustain returns. The fixed effects model confirms that asset turnover and firm size were the most significant positive determinants of profitability, whereas leverage and energy costs had adverse impacts.

The structural break analysis revealed five major turning points (1991, 2000, 2010, 2017, and 2020), each corresponding to key policy or economic events. These turning points show how the industry went from a scattered, supply-heavy business to a more unified, tech-focused one. After 2010, profits started to level out, thanks to smart mergers, better energy use, and stronger demand from infrastructure projects. Even when GST rolled out in 2017, or when COVID-19 hit in 2020, these shocks didn't knock the industry off its long-term climb toward better financial stability.

The study's event analysis makes this even clearer: moments of liberalisation and consolidation brought in better-than-expected returns, but new regulations or sudden crises led to short dips. In the bigger picture, the industry's profits have moved in cycles—first adjusting, then bouncing back—always adapting to new rules and bigger economic shifts. The bottom line? Liberalisation didn't just make competition tougher; it pushed companies to tighten up financially and get more creative, too. Over the years, profitability stopped hinging on government protection and started relying more on sharp strategies and how quickly businesses could react to the market.

5.2 Policy Implications and Recommendations

1. Make Finance Work Harder with Innovation

Cement companies can't afford to sit still. Digital monitors, predictive maintenance, and smart automation aren't just nice-to-haves—they're essentials for keeping costs down and getting more out of every machine and worker. Machine learning and data analytics make it easier to predict what customers will want, manage raw materials, and squeeze the most value out of each asset. The numbers back it up: these moves directly push returns higher.

2. Get Serious About Energy and the Environment

Energy costs eat into profits, and the data proves it. Cement firms need to double down on energy-saving tech and cleaner ways to produce. Renewables matter too, especially when input prices swing wildly. Fiscal breaks and green financing don't just sound good—they actually help keep profit margins steady.

3. Keep Competition Fair

Mergers and acquisitions can help companies grow, but there's always a risk they'll damage fair competition. Regulators like the Competition Commission of India have to stay on the ball—watching market shares and concentration numbers, like the Herfindahl–Hirschman Index, to prevent collusion and look out for everyday buyers.

4. Promoting Export Diversification

The industry can strengthen profitability by exploring export markets in South Asia, Africa, and the Middle East. Government support for trade facilitation and logistic infrastructure will help Indian cement firms leverage their cost advantage and reduce domestic cyclicality.

5. Strengthening Financial Disclosure and Corporate Governance

Transparent financial reporting and adherence to environmental, social, and governance (ESG) standards will attract long-term investors. The results emphasize that profitability sustainability depends not only on operational factors but also on institutional credibility.

5.3 Theoretical and Empirical Contributions

This research contributes to the literature on industrial economics and firm-level financial performance in several ways:

1. **Long-Term Perspective:** It provides one of the rare long-span datasets (1991–2024) covering multiple reform phases, offering a historical trajectory of profitability evolution.
2. **Integrated Modelling:** The use of fixed effects, structural break tests, and event-study techniques provides both firm-specific and systemic insights into performance dynamics.
3. **Policy-Linked Evidence:** The identification of structural breaks corresponding to major reforms validates the causal relationship between policy shifts and financial outcomes.
4. **Empirical Robustness:** By controlling for firm heterogeneity and macroeconomic variations, the results establish credible estimates of how internal efficiency and external factors jointly influence profitability.

5.4 Future Research Scope

While this study provides comprehensive empirical insights, several dimensions remain open for future investigation:

1. Machine Learning-Based Predictive Modelling

Researchers can take advantage of supervised learning methods—like Random Forest, XGBoost, or LSTM networks—to predict profitability using financial ratios, macroeconomic

indicators, and policy variables. These tools pick up on complex patterns that older econometric models just miss.

2. Cross-Sectoral Comparison

It's worth lining up the cement industry against other big capital-intensive sectors, like steel or power generation. Doing this makes it easier to see whether efficiency gains from liberalisation go beyond just cement or if they're true across the board.

3. Firm-Level ESG and Sustainability Impacts

With sustainability getting so much attention lately, future analysis should weave in ESG scores, carbon emissions, and recycling data. This approach shows how green practices tie into profits—do they boost financial results, or do they hold companies back?

4. Role of Technological Innovation

Looking at how automation, process optimisation, and digital logistics change asset efficiency can shed light on what's fueling profitability since 2010. Connecting innovation levels to financial returns could reveal the next big shift in industry structure.

5. Global Comparative Studies

Broadening this research to include cement industries from emerging countries like Indonesia, Vietnam, or Brazil gives a clearer picture of how liberalisation impacts profits in different settings.

6. Policy Shock Simulations

Trying out structural macro-models or agent-based simulations to test effects of possible policy changes—like carbon taxes or renewable energy rules—helps industries prepare ahead, not just react after the fact.

5.5 Limitations

This study, though comprehensive, faces some limitations. First, firm-level data availability before 2000 remains partially inconsistent for smaller firms. Second, while the models capture financial determinants effectively, they do not fully integrate technological intensity or ESG variables, which are increasingly relevant in the post-2015 context. Finally, although fixed-effects estimation controls for unobserved heterogeneity, dynamic interactions between profitability and investment decisions warrant further exploration through dynamic panel data models like GMM (Arellano–Bond).

5.6 Concluding Remarks

The evolution of firm-level profitability in India's cement industry from 1991 to 2024 mirrors the broader story of India's economic transformation. Liberalisation broke down strict regulations, opened the door to global competitors, and pushed firms to modernize how they operated. Slowly, companies adjusted to changing policies, expanded their operations, and kept profits steady—even when the market got rough. What really stands out is this: policy changes, new technology, and smart mergers all shape how profitable industries become. As India pushes toward its net-zero targets and ramps up infrastructure, the cement industry won't just benefit—it'll show us if the policies are actually working. Keeping profits healthy over the next decade will take fresh ideas, strong commitments to sustainability, and solid financial smarts. The lessons we learned during liberalisation still matter, and they'll keep guiding India's industry going forward.

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