



CROWE Graduate Scholar Series #2

How Do Cartels Affect Productivity and Survive in a Declining Industry?*

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** These research projects are currently in progress, and the findings presented here are preliminary. The results and conclusions may change as the analysis continues to develop and additional robustness checks are performed. Support from the Lynde and Harry Bradley Foundation via the Bradley Fellowship Program is gratefully acknowledged. The views expressed herein are those of the authors and not necessarily those of the Bradley Foundation, the Center for Research on the Wisconsin Economy, the Department of Economics, or the University of Wisconsin – Madison.*

Executive Summary

- We study what happens when competing businesses work together instead of competing with each other, using data from Japan's concrete industry where such cooperation is legally allowed and can be directly observed.
- When businesses stop cooperating and return to competition, they become more efficient and productive, suggesting that competition pushes firms to improve their operations and use resources better.
- Even in shrinking industries, business groups can maintain cooperation by promising payments to companies that leave the industry, but only if those companies followed the group's rules while they were members.
- These findings suggest that allowing businesses to cooperate may help small firms survive difficult times, but it can also make them less efficient, which is an important tradeoff for policymakers to consider.

Background

What happens to efficiency when firms work together rather than compete? How do businesses cooperate when their industry is shrinking? These questions matter for understanding how markets work, especially in industries facing structural challenges. My research examines these issues through the unique case of the Japanese ready-mixed concrete industry, where legal cooperative arrangements provide a rare opportunity to study collusion and its effects.

Most countries prohibit cartels because they harm consumers through higher prices. This makes cartels difficult to study since they operate in secret. Researchers usually learn about them only after authorities discover and prosecute them. However, the Japanese ready-mixed concrete industry offers an exceptional research setting. For historical reasons, firms in this industry can legally form cooperatives that coordinate sales within local markets. This legal framework allows us to observe how collusion works and measure its effects on both firm productivity and market outcomes.

Ready-mixed concrete is a vital construction material produced by mixing cement, water, sand, and gravel at specialized plants. The product must be delivered and used quickly before it hardens, which means plants serve only nearby construction sites. This creates many separate local markets across Japan, each with its own set of competing firms. Since the early 1990s, this industry has faced steady decline. Japan's construction boom ended, and building activity has fallen year after year. Total concrete production dropped significantly, and many plants closed.

The industry consists mainly of small- and medium-sized firms with limited bargaining power against large construction companies. To help these smaller firms survive, the government allows them to form regional cooperatives. Through these cooperatives, member firms can coordinate their sales activities. They set common prices and allocate orders among members, essentially acting as a single seller when dealing with construction companies. While this coordination is legal within each local market, coordination across different markets remains illegal. This creates variation in cooperative activity across markets and over time, which my research exploits to understand how collusion affects market outcomes.

The Impact of Cartels on Productivity

In my first research project, "The Impact of Cartels on Productivity" (with Satoshi Imahie, Kazuma Takakura, and Yasutora Watanabe), we investigate how cartels affect firm productivity and efficiency. While the effects of cartels on prices are well understood, their impact on productivity has received much less attention. Do firms become less efficient

when they face less competition? Or might cooperation allow firms to share knowledge and improve operations? These questions matter for understanding the full social costs of collusion beyond the immediate effects on consumer prices.

The scarcity of research on this topic stems from the difficulty of observing cartels in most settings. Since cartels typically operate illegally, researchers rarely have access to detailed production data from colluding firms. The Japanese ready-mixed concrete industry provides a unique opportunity to overcome this limitation, as the legal status of cooperatives allows us to observe both cartel participation and detailed production information.

This project uses comprehensive data covering the Hokkaido region from 1993 to 2004. The dataset includes annual plant level observations with detailed information on outputs and inputs including capital, labor, and raw materials. We also have market level information on construction demand and cement prices as well as cartel activeness. Importantly, cartel activeness varies both across markets and over time, with some markets experiencing transitions between competitive and collusive states during our study period.

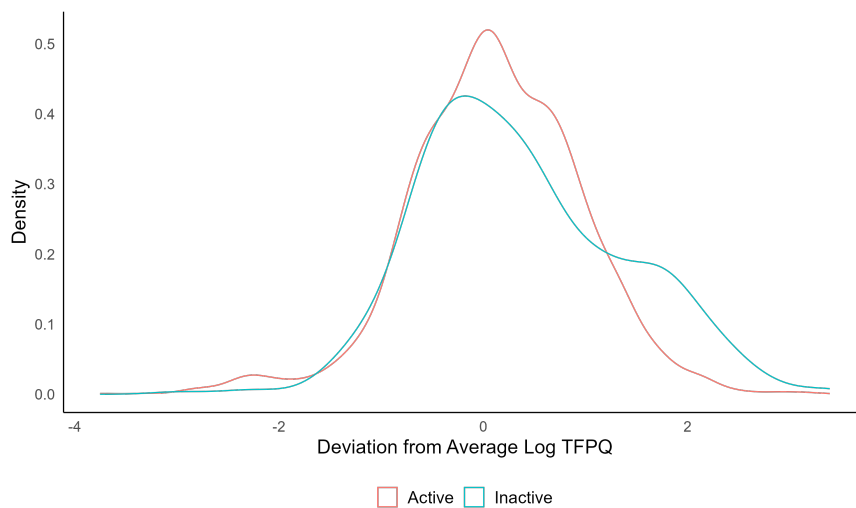


Figure 1: Distribution of Plant-level TFP

Our methodology involves two stages. First, we estimate a production function using advanced econometric techniques developed by Akerberg et al. (2015). This approach accounts for the fact that firms choose their input levels based on their productivity, which researchers cannot directly observe. From this production function, we calculate plant-level productivity. Figure 1 shows the distribution of total factor productivity at the plant level separately for markets where cartels are active and inactive. The distributions suggest that productivity tends to be lower in markets where cartels are actively functioning.

In the second stage, we use a staggered difference-in-differences design (Callaway and

Sant’Anna, 2021; de Chaisemartin and D’Haultfœuille, 2024; Sun and Abraham, 2021) to examine how productivity correlates with changes in cartel activity. This empirical strategy compares productivity changes in markets that experienced cartel collapse or formation with those that have not yet experienced these transitions and those that remain stable during the sample period.

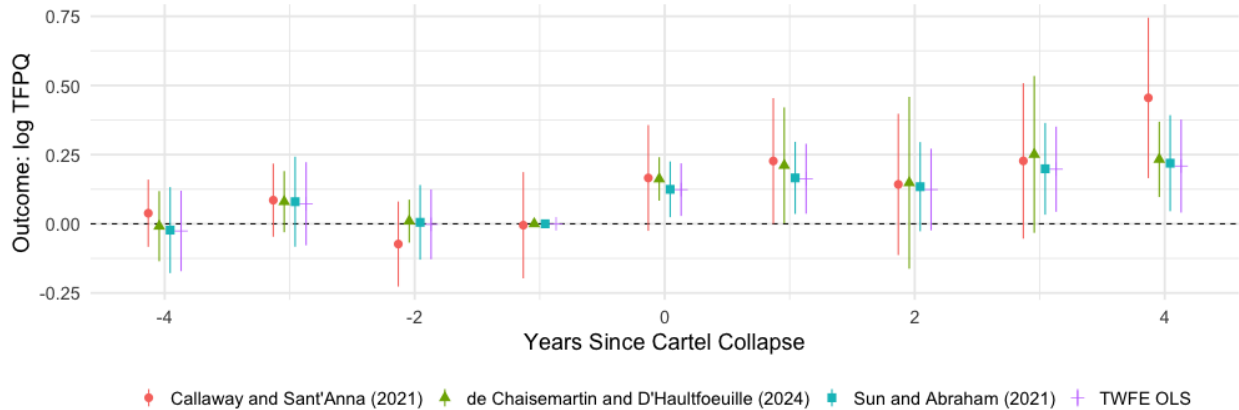


Figure 2: Changes in Plant-level TFP Following Cartel Collapses

Our findings reveal important patterns in the relationship between cartels and productivity. Figure 2 shows the estimated changes in productivity in years relative to cartel collapse, where year 0 represents the year of collapse. When cartels collapse and competition resumes, both plant level and market level productivity show significant improvements. Plants appear to become more efficient when they face competitive pressure. This suggests that the dissolution of collusive arrangements is associated with efficiency gains as firms optimize their operations in response to a more competitive environment. The productivity changes we observe likely operate through multiple channels, including firms adopting more efficient production techniques or improving management practices. At the market level, productivity gains may arise from the reallocation of resources from less efficient to more efficient producers. Conversely, when cartels are formed, we find no significant change in productivity levels. This asymmetry may reflect different adjustment processes firms undergo when transitioning between competitive and collusive market structures.

We are currently extending our analysis to decompose these market level productivity changes into distinct components: within-plant improvements, reallocation effects between existing plants, entry of new efficient plants, and exit of inefficient plants. Understanding which channels matter most will provide crucial insights into the mechanisms through which market structure affects industry efficiency.

Cartel Sustainability Under Declining Demand

In my second research project, "Cartel Sustainability Under Declining Demand" (with Ana Sofia Teles), we explore how cartels can persist even as demand declines and firms exit the market. Standard economic theory suggests cartels should collapse when industries decline. The logic is straightforward: if a firm plans to exit soon, it has strong incentives to cheat on the cartel agreement in its final period. It can increase output or cut prices to grab extra profit, knowing it will not face punishment later since it is leaving anyway. Other firms, anticipating this behavior, may also cheat preemptively. Through this reasoning, cooperation should unravel backwards from the future. However, we observe functioning cartels in the Japanese ready-mixed concrete industry, where demand has been declining for a few decades.

Our research proposes a simple mechanism that can sustain cooperation: exit transfers. The cooperative can promise a payment to firms when they leave the industry, conditional on their past cooperation. This creates a final reward for good behavior that maintains incentives to cooperate even in the last period of operation. Through interviews with industry participants, we learned that such exit support is common practice. Cooperatives help retiring firms wind down operations smoothly, sometimes purchasing their equipment or facilities.

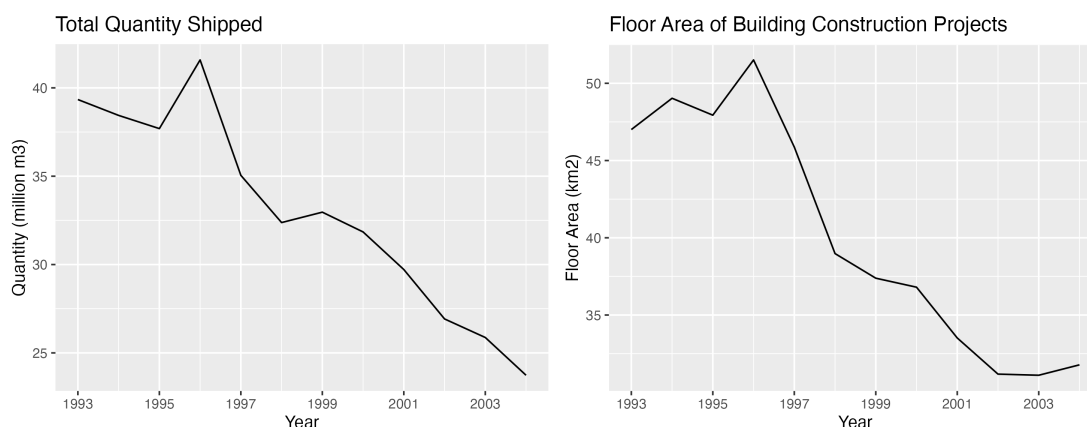


Figure 3: Total Output and Demand in Sample Markets

To test this theory, we assembled detailed data from 1993 to 2004 covering 111 local markets and about 1,300 plants across 15 prefectures in Japan. We combined plant-level production data from the Census of Manufacture with market level information on cooperative functioning from industry yearbooks. We also gathered construction statistics to measure local demand. As shown in Figure 3, both output and demand decreased substantially during the sample period. A crucial feature of our data is that cooperative status changes over time in many markets. About one third of markets in our sample

experience at least one transition during the study period, allowing us to separate the effects of cooperation from fixed market characteristics.

Our analysis reveals that cooperatives are more likely to break down when expected future demand is low, holding current demand constant. This matches our theoretical prediction: when the future value of cooperation is small, the temptation to cheat increases. We also find that prices are higher when cooperatives are active, confirming that coordination leads to less competitive pricing. While demand strongly predicts plant exit, we find limited evidence that cartel activeness directly affects exit rates once we control for demand conditions. These results support our theory that exit transfers can help sustain cooperation even in declining markets.

Conclusion

Together, these two research projects provide complementary insights into how cartels function and their economic effects. The first reveals that collusion affects productivity and efficiency, with important implications for how we understand the social costs of cartels. The second shows that even declining industries can sustain cooperation through mechanisms like exit transfers, explaining why we observe cartels in shrinking markets despite theoretical predictions of their collapse.

These findings have important implications for competition policy. Policymakers often focus on the immediate effects of cartels on consumer prices. Our research suggests they should also consider effects on industry efficiency. While allowing cooperation might help small firms survive in challenging market conditions, it may also affect their incentives to improve productivity. Understanding these tradeoffs is crucial for designing effective competition policy.

The Japanese ready-mixed concrete industry provides a unique window into cartel behavior that would be impossible to observe in most settings. By studying this industry, we gain insights relevant to competition policy and industrial organization more broadly. As many industries in developed countries face similar challenges of market maturity and structural change, understanding how firms respond through cooperation or competition becomes increasingly important for economic policy. Our research contributes to a growing body of work on how market structure affects firm behavior and economic outcomes, providing valuable evidence on fundamental questions in industrial organization.

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