



## Multi-market contact and competition: evidence from the Depression-era portland cement industry<sup>☆</sup>

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### ABSTRACT

Theoretical work has suggested that contact between firms in different markets can facilitate tacit collusion. Empirical work on this link has been limited. We address the paucity of empirical evidence with a novel plant-level dataset for the cement industry during the Great Depression. We find that multi-market contact fosters tacit collusion and higher prices based on a new measure of contact that accounts for capacity utilization. A one standard deviation increase in our measure of contact increases prices by around 4.3%. We then examine the effect of the National Industrial Recovery Act's "Codes of Fair Conduct," introduced in 1933 to stem deflation through cooperative behavior within industries. We find that the effects of the codes were most strongly felt in markets with the highest level of multi-market contact. This suggests that multi-market contact can be a useful 'tool' for firms to support collusive outcomes, tacit or otherwise.

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### 1. Introduction

How do firms in an industry support tacit collusion? This question has a venerable tradition stretching back to Stigler (1964), who emphasized the importance of punishing defectors in sustaining collusive regimes. One answer stressed by recent literature is the interaction of firms in a number of different markets, so-called multi-market contact (MMC). When firms compete in multiple markets, this gives 'victims' of defection the potential to punish cheaters in *all* of the markets where they meet. If all the markets are identical,

this does not amount to much. However, if markets differ, then it is possible to use this punishment in all other markets to sustain collusion when it might not otherwise be possible. The implication is that in industries with extensive multi-market contact, collusion can be easier to sustain.

While sensible on a theoretical level, this conjecture has proven difficult to test empirically because of the lack of well-defined markets for most industries. We address this problem by studying the portland cement industry, which features geographically segmented markets. In fact, the product rarely moves more than 200 miles from the plant. To test whether multi-market contact affects pricing, we construct a novel plant-level dataset from the Census of Manufactures in 1929, 1931, 1933, and 1935. The data include information on prices, quantities, and plant inputs. We augment this source with information on plant capacities to develop a rich micro-level dataset that allows us to address the effects of multi-market contact on prices and output.

Another difficulty in testing the link between collusion and multi-market contact is in constructing a theoretically grounded measure of contact. Other work such as Jans and Rosenbaum (1997) (JR) has developed measures of multi-market contact related to the theory. Part of our contribution is to offer a new measure that we argue is more closely tied to the characteristics of the cement industry, and

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uses data on a firm's capacity utilization across markets. Our measure is also more closely connected to the theoretical approach of [Bernheim and Whinston \(1990\)](#), who emphasize the role played by slack capacity in facilitating tacit collusion. Under Bertrand competition, firms may deviate from a collusive agreement by undercutting rivals' prices. The intuition of our approach is that the payoffs to deviation are constrained by the amount of excess capacity firms hold, since firms can only expand their output to the limit imposed by their capacity. This leads us to construct a measure of MMC based on capacity-utilization weighted contact between firms. Using our preferred MMC measure, we find a strong positive effect of contact on prices. A one standard deviation increase in our measure of contact leads to an increase in price of 4.3%. At the same time, we also estimate the effect on prices of the contact measures proposed by JR and find inconsistent results from measure to measure, some positive, some negative, and almost none statistically significant. This emphasizes the importance of tying together theoretical and empirical work.

We also examine how the effects of MMC were modulated by the National Recovery Administration's (NRA) "Codes of Fair Conduct." Introduced in the middle of 1933, the NRA created by the National Industrial Recovery Act was a response of the Roosevelt Administration to the major deflation, and encouraged cooperative behavior in broad swathes of the American economy. While these Codes were drawn up in consultation with the government, the exact enforcement mechanism was left unclear. This vagueness has led to much debate in the literature as to what effect they actually had. For example, [Alexander \(1997\)](#) emphasizes the limitations of even government-encouraged collusion in industries with large cost differences through a case study of the macaroni industry.<sup>1</sup> In separate work, we (along with a co-author) have shown that the cement code had major collusive effects ([Chicu et al., forthcoming](#)). In the present paper, we highlight that the effects of the NRA were most strongly felt in the markets with high MMC. It is not simply that collusion increased everywhere by an equal amount, but rather the code for the cement industry was most effective when conditions ripe for collusion were already in place.

The theoretical literature on multi-market contact and the possibility of collusion starts (and nearly ends) with [Bernheim and Whinston \(1990\)](#) (BW). They show that by pooling market-level incentive compatibility constraints, multi-market contact can foster collusion. This result relies on heterogeneity across markets whereby firms can transfer "slack" in one market-level incentive constraint to a market where the constraint binds. All empirical papers have taken BW as a launching point. While the theory generates clear predictions to test, identifying empirical settings with which to test these implications has proven difficult, mainly foundering on how markets should be defined.

In light of this difficulty, much of the empirical work on the effects of MMC studies the airline industry, where it is sensible to define markets as flights between two points. [Evans and Kessides \(1994\)](#) were the first to use this industry and found strong evidence of higher prices on routes served by firms that interacted in many different markets. In another study of the airline industry, [Ciliberto and Williams \(2012\)](#) use the number of gates a particular airline has at a particular airport as an instrument for multi-market contact. They find that instrumenting for multi-market contact has a major effect on the estimated impact. As in the present paper, [Arie et al. \(2012\)](#) place an emphasis on capacity constraints. They study the role of multi-market contact in the allocation of productive capacity across markets, with an application to airlines. They show that in their setting, increased multi-market contact may lead to higher prices not through collusion, but as a competitive outcome. Other markets that have been studied include Spanish hotels ([Fernandez and Marin, 1998](#)) and the cellular phone industry ([Busse, 2000](#)).

## 2. Background on the industry and the data source

### 2.1. Economic characteristics of cement production

We briefly summarize the key features that make the portland cement industry a popular object of study.<sup>2</sup> First, its product is essentially homogeneous, so that for a buyer the identity of the firm offering the product is of limited relevance. Second, there are numerous relatively isolated markets due to geographical segmentation in the industry, providing useful variation in the cross-section. The markets are relatively concentrated making them ideal settings to study strategic behavior. In addition, given the large scale of plants and the capital-intensive nature of production, fixed costs are high relative to variable costs. The large capital investments are also largely sunk with no alternative use and low scrap value. Thus, there is potential for ruinous price competition, particularly when firms have excess capacity relative to industry demand. Finally, on the demand side, cement is a key component of many construction activities though the cost of cement only accounts for on average 2 to 5% of construction costs ([Dumez and Jeunemaître, 2000](#)). Because of its essential nature, it has few substitutes making demand relatively insensitive to price fluctuations.

### 2.2. Historical background of the NRA

Along with many of his closest advisers, Franklin Roosevelt was convinced that the Great Depression was caused by "cut throat competition." They argued that ruthless price cutting drove out businesses and resulted in low wages that created a vicious cycle of underconsumption and further price and wage cuts. Their solution was greater national planning and coordination within industries. In May 1933, the National Industrial Recovery Act was drafted to promote cooperation through so-called "Codes of Fair Conduct." The codes were supposed to be formulated under the auspices of the National Recovery Administration (NRA) as a collaborative process between industry, labor, and consumer. The latter two had explicit representatives appointed by the government while a particular industry was usually represented by its trade association. In reality, the consumer advocate had little effect and the labor representative was usually satisfied by a collective bargaining provision ([Hawley, 1974](#)). By the end of 1933, a large portion of the American economy was operating under a code, including the cement industry. In addition, hundreds of other industries were clamoring for approval of codes they had submitted. The law was struck down on May 27, 1935, by the Supreme Court in a unanimous decision invalidating the major provisions of the NRA.

The Code of Fair Competition for the Cement Industry (Cement Code) was approved on November 27, 1933, after having first been submitted by the Cement Institute on July 19, 1933. Its first stated aim was to "stabilize the industry and prevent economic disturbances due to price wars." The code set out provisions to limit capacity investment and accordingly the excess capacity that might result (Article VII), limited predatory (below cost) pricing (Article VIII), created clear guidelines for price announcements and changes (Article IX), prohibited unfair competition by the way of, e.g., gifts to purchasers (Article X), standardized the methods of sale and marketing (Article XI), and stipulated acceptable terms and conditions of sale such as not allowing subsequent price cuts to an initial quote (Article XII). On the face of it, these provisions would have radically changed the competitive environment of the cement industry.

<sup>1</sup> [Vickers and Ziebarth \(2011\)](#) reexamine this industry using data from the Census of Manufactures and find evidence for collusion, contrary to [Alexander](#).

<sup>2</sup> [Dumez and Jeunemaître \(2000\)](#) provide a comprehensive overview of the economic characteristics of the Portland cement industry.

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