

## Spatial competition among multi-store firms

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### Abstract

The paper analyzes spatial Cournot competition among multi-store firms. It demonstrates that the complex problem of determining equilibrium store locations for competing multi-store firms can be approximated by a simple one, in which each firm behaves as a multi-store monopolist in choosing its store locations. A firm's equilibrium store locations often coincide with its monopoly locations, and in general, converge to its monopoly locations as the demand grows larger. When the firms have an equal number of stores, the stores belonging to competing firms agglomerate at discrete points that coincide with each firm's monopoly store locations. © 2002 Elsevier Science B.V. All rights reserved.

*JEL classification:* D43; L13

*Keywords:* Spatial competition; Multi-store firms; Cournot oligopoly

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### 1. Introduction

Spatial competition has a rich and diverse literature, with its origin dating back to the seminal work of Hotelling (1929). Despite its long history, it is surprising how little attention has been paid to study competition among firms who can set up multiple stores.<sup>1</sup> The literature on spatial competition that allows firms to choose

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<sup>1</sup>Note that *stores* can be interpreted as *plants*. In this paper we use the word *stores*, although *stores* and *plants* can be used interchangeably.

their locations typically assumes that each firm can set up only one store.<sup>2</sup> Presumably, this assumption is often made to avoid the analytical complexity that would arise otherwise.

It is important, however, to recognize that most firms actually set up multiple facilities. A casual look at a typical U.S. city reveals that diverse firms, such as Pizza Hut, J.C. Penney, Kroger and Circuit City, all have several stores.<sup>3</sup> In fact, retailers with four or more outlets account for more than half of the total retail business in the United States. In the context of manufacturing, a producer often manufactures a homogeneous product at several production facilities. For example, in the United States, Lafarge Corporation, a leading cement producer, has 15 cement plants. In the natural gas liquids (NGL) industry, the industry leaders GPM Gas Corporation (formerly Philips 66 Natural Gas) and Warren Petroleum Company (a subsidiary of Chevron Corporation) have 18 and 57 gas liquid plants, respectively. In the ready-mixed concrete industry, Florida Rock Industries has 82 ready-mixed concrete plants, Texas Industries Inc. has 29 ready-mixed concrete plants and the industry leader Lafarge Corporation has as many as 450 production facilities.<sup>4</sup>

It may be argued that the assumption of single-store firm is merely a technical simplification and the results should extend to multi-store firms. However, observe that when a firm has several stores, each store's behavior affects the decisions of all other stores, including those owned by the same firm. Consequently, each store cannot be treated independently as a single-store firm and the results obtained with multi-store firms are likely to differ from those obtained with single-store firms.<sup>5</sup> Naturally, the study of spatial competition among multi-store firms deserves special attention, which is the objective of this paper.

Although the literature on this topic is surprisingly brief, the study of location decisions by multi-store firms originates more than thirty years back. Teitz (1968) is the first to study spatial competition among multi-store firms. In the context of Hotelling's linear city model with linear transport cost, Teitz (1968) points out that a Nash location equilibrium does not exist if the firms have multiple stores. This non-existence of a location equilibrium may have contributed to the brevity of the literature during the next two decades. Subsequently, Martinez-Giralt and Neven (1988) assume quadratic transport cost together with mill pricing and demonstrate

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<sup>2</sup> Even in the context of a spatial monopolist, only a few papers analyze the location and pricing decisions of a multi-store monopolist. Katz (1980) and Chu and Lu (1998) are among the few studies in this area. See Chu and Lu (1998) for a related discussion.

<sup>3</sup> The telephone directory for the city of Cincinnati lists 25 stores for Pizza Hut, 7 stores for J.C. Penney, 53 stores for Kroger, and 6 stores for Circuit City.

<sup>4</sup> Source: Gale Business Resources. Internet address: [www.galenet.com/servlet/GBR/](http://www.galenet.com/servlet/GBR/).

<sup>5</sup> In the context of retailing, Ghosh and McLafferty (1987, Chapter 6) argue that the traditional methods of site selection with single-outlet firms are inadequate to analyze location decisions of multi-outlet retail firms. They claim that the analysis of multi-outlet retailers requires *systematic evaluation of the impact of each store on the entire network*.

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