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Merger in the Round:

Anticompetitive Effects of Mergers in Markets with Localized Competition

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Abstract: We examine the incentives for merger and collusion in a market characterized by differentiated consumers. Firms offer differentiated products and serve specific customer segments. The nature of interaction among firms largely determines the choice of a partner for merger, and Bertrand, Stackelberg, and collusive cases are investigated. In comparison to other types of markets (i.e., those characterized by homogeneous products or homogeneous consumers), we find that collusion may be relatively easier to achieve in markets with spatial competition. We relate our findings to the approach recommended in the Merger Guidelines of the Department of Justice.

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## 1. Introduction

Discussions of current antitrust policy toward mergers generally begin with the 1984 Department of Justice Merger Guidelines, which provide a framework for economic analysis [see e.g., Salop (1987)]. The approach of the Guidelines is to first define the relevant geographic and product market. The relevant market then provides the arena for examining market concentration and other conditions affecting a merger's anticompetitive impact (e.g., ease of entry and factors encouraging collusion). According to this basic approach, firms are either in the market or not.

This basic approach appears unsuited to dealing with producers of heterogeneous products. By definition, a producer of a distinct good possesses potential market power. In section 3.4, the Guidelines consider the problems of product differentiation:

> Where products in a relevant market are differentiated or sellers are spatially dispersed, individual sellers usually compete more directly with some rivals than with others. In markets with highly differentiated products, the Department will consider the extent to which consumers perceive the products of the merging firms to be relatively better or worse substitutes for one another than other products in the market. In markets with spatially dispersed sellers and significant transportation costs, the Department will consider the relative proximity of the merging firms.

While this section suggests an evaluation of the "closeness" of competition between the merging parties, it does not indicate either a methodology for making this determination or a weight to assign to this factor. Moreover, this evaluation appears supplemental to the basic task of identifying a market and measuring the appropriate post-merger change in the Herfindahl index of market concentration. Hence, the importance of the "competitive stance" of the merging parties can and, in our experience, often does get lost in the shuffle.[1]

Ample evidence exists that the degree of product diversity is an important consideration in mergers. A sample of mergers challenged by the Federal Trade Commission indicates that 72 percent involved differentiated products.[2] Further, the prominence of market-segmenting strategies in discussions of corporate strategy [see Porter (1980)], and of submarkets in the legal literature on antitrust [see Blumenthal et al. (1986, pp. 128-131)], indicates a real concern about localized competition. Yet, the economic literature has not explicitly considered the effects from merger in markets where the influence of rivals differs.[3]

We employ a spatial model to examine the anticompetitive aspects of

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[1] Indeed, the role of product differentiation is unclear. The only other mention of differentiated products is in section 3.411 of the Guidelines, where it is suggested that differentiation generally reduces the likelihood of collusion by making pricing agreements more difficult to reach. The effect of spatial product differentiation on the likelihood of collusion is discussed later in this paper.

[2] This estimate was derived from a data set compiled by the FTC, and described in Coate, Higgins, and McChesney (1990). Of a sample of 70 cases involving second requests for information, economic staff discussed the extent of product diversity in 46 cases. Within this group, the staff considered the market as consisting of heterogeneous goods in 33 cases. This statistical information is released pursuant to FTC Commission Rule 5.12(c) (16 C.F.R., Sect. 5.12(c)).

[3] Recent economic literature has examined merger in oligopolistic markets [see e.g., Salant, Switzer and Reynolds (1983), Perry and Porter (1985), Deneckere and Davidson (1985), McAfee and Williams (1988), and Farrell and Shapiro (1990)]. With the exception of Deneckere and Davidson, the aforementioned models assume that firms produce homogeneous products. In the Chamberlinian model of Deneckere and Davidson, each firm competes symmetrically with all other firms in the market.

Some previous work has touched on the possibility of incentives for merger in spatial models. For instance, Baker and Bresnahan (1985) acknowledge that price effects would result from merger in a spatially differentiated market, but they do not develop an explicit model. The legal literature has also discussed the potential impact of mergers in spatial markets [see Davidson (1983) and Campbell (1987)]. None of these papers develop an equilibrium model.

merging in markets with localized competition. This type of model is useful because, by allowing consumers to differ, firms necessarily must choose to serve a particular segment of customers. Each firm faces a symmetric profit-maximizing problem based only on the reactions of its direct competitors, but its price is ultimately influenced by other "indirect" competitors. A merger may alter the profit-maximizing behavior of the merging parties, causing reactions by both direct and indirect competitors. The motivations for merger contrast sharply with those derived from homogeneous-product models, or from Chamberlinian models of heterogeneous products where identical consumers purchase multiple product varieties.[4]

The paper is organized in the following manner. Section 2 presents the basic spatial model. Sections 3 through 5 examine different types of firm behavior: Bertrand, Stackelberg, and collusive types, respectively. The analysis in these sections suggests that the incentives for merger vary depending on the type of interaction among firms. The likely targets for merger, and the extent and magnitude of price effects may change accordingly. In the last section of this group, we also dispel common notions concerning the difficulty of collusion in markets with differentiated products. Section 6 examines factors that determine long-term effects from merger; and, section 7 develops policy implications and offers suggestions concerning a proper methodology for evaluating merger in market with localized competition.

## 2. The Model

[4] Unlike our model, previous studies have found little reason to merge in the absence of efficiency gains. See the references in footnote 3 and our working paper (1989) for further discussion.

We adopt a spatial model similar to Salop (1979), where consumers are uniformly distributed along a circle of unit circumference. Firms are located at various points around the circle. All consumers receive the marginal value, $\alpha$, from the purchase of any firm's product. A given consumer potentially buys from a firm offering the lowest "delivered" price.

Consider the "delivered" price from firm i to consumer w. We define this price as $p^i + tx^i(w)$, where $p^i$ is the mill price, t is the unit cost of travel, and $x^i(w)$ is the distance from the firm to the consumer.[5,6] Distance may represent physical distance or, alternatively, a measure of the implicit cost to the consumer from purchasing a good deviating from the consumer's "ideal" product.

Each consumer buys at most one unit of the differentiated product, and we assume that all consumers participate in the market. In equilibrium, each active firm serves a portion of the market. Thus, the market segments served by neighboring firms must be adjoining.

To show that firms only compete directly with their neighbors, consider the six firms illustrated in Figure I. Next assume that $p^i = p^*$ for all firms; each customer would then purchase from the closest firm. Consider a point w*, which lies midway between firms B and C. Those consumers between w* and C(B), purchase from firm C(B). By lowering its price below p*, Firm C would attract some customers that formerly purchased

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[5] **Distance** is measured along the circle. The use of quadratic transportation costs will not affect the characterization of the results [see Tirole (1988, pp. 279-282) or Reitzes and Levy (1989)].

[6] It is assumed that firms cannot distinguish among consumers based on their location. Either firms cannot directly observe location, or they are legally restrained from price discrimination. Where relevant, we will discuss the impact of price discrimination on our analysis.

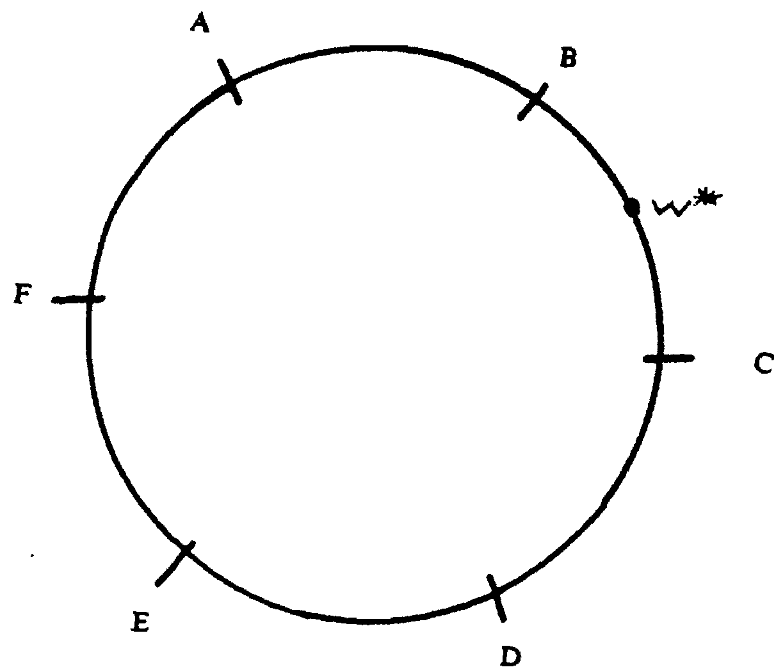


Figure I.

from firm B. Analogously, firm C would also attract some former customers of firm D. While competition is localized to B and D, firm C is indirectly affected by other firms in the industry, such as A(or E), since the price offered by firm A(E) affects the price set by firm B(D).

We are now ready to solve each firm's profit-maximization problem, assuming that marginal cost equals c (a constant), and fixed costs equal f. The profits of firm i can then be described as follows:

$$\max_{p^i} \pi^i = (p^i - c)(x^i_r + x^i_l) - f \qquad (1)$$

where $x^i_r(x^i_l)$ = the number of consumers served by a firm in a (counter)clockwise direction.

In general, we let the subscript r(l) denote (counter)clockwise. Assuming that N firms are evenly spaced around the circle, each firm is at a distance, 1/N, from its neighbor. By simple manipulation [see Salop (1979)], the market of a given firm can be represented as:

$$x^i_r = (p^i_r - p^i + t/N)/2t \qquad (2)$$

$$x^i_l = (p^i_l - p^i + t/N)/2t, \qquad (3)$$

Equation (1) can now be rewritten as:

$$\max_{p^i} \pi^i = (p^i - c)(p^i_r + p^i_l - 2p^i + 2t/N)/2t - f \qquad (1a)$$

With a Bertrand-Nash equilibrium concept, firm i assumes that it cannot directly influence rival prices. By differentiating equation (1a) with respect to $p^i$, the following first-order condition is obtained:

$$d\pi^i/dp^i = \partial\pi^i/\partial p^i = [p^i_r + p^i_l - 4p^i + 2Z]/2t = 0$$

or, $p^i = (1/4)(p^i_r + p^i_l) + (1/2)Z,$ (4)

where $Z = c + t/N$.

Since each firm faces the same cost function, the first-order condition is symmetric for all firms. Consequently, the equilibrium is symmetric, where $p^i = p^*$ for all i. Thus, $p^i_r = p^i_l = p^i$. Substituting this result into the above equation, we derive the premerger equilibrium price, $p^* = Z$. In an initial free-entry equilibrium, the number of firms, N, endogenously adjusts until profits become negative in a symmetric equilibrium with N+1 firms.[7] Further, our assumption that firms locate symmetrically around the circle conforms to a Nash locational equilibrium under proper conditions.[8]

We consider a merger of two firms. For the purposes of exposition, we confine our analysis to the 6-firm case illustrated in Figure 1. The characterization of the results can be generalized to the N-firm case [see e.g., Reitzes and Levy (1989)]. We also assume that no efficiency gains result from merger; marginal cost remains at c and the fixed costs of the merged firm equal 2f.[9] In addition, the analysis focuses on the economic

[7] Due to the integer constraint on the number of firms, profits may be positive when fixed costs limit the number of market participants [see Salop (1979) and Eaton and Wooders (1985)]. A positive-profit equilibrium may also arise in a game of sequential entry with substantial costs sunk to location [see Prescott and Visscher (1977) and Eaton and Lipsey (1978)].

[8] Specifically, Economides (1984) has shown that this configuration represents an equilibrium in the case of quadratic transportation costs. With linear transportation costs, this result would depend on the nature of equilibrium price behavior when a firm hypothetically locates nearer to one neighbor.

[9] However, the merger combines the firm-specific capital of two entities. The merged firm can consequently offer two brands (or operate from two locations) without experiencing the diseconomies that necessitate

effects prior to relocation, assuming that the merged firm continues to operate from two locations. Thus, fixed costs involve a substantial location-specific component.[10] Moreover, entry is not considered initially. These latter two assumptions are discussed in Section 6.

## 3. Merger in a Bertrand-Nash Equilibrium

In a Bertrand-Nash equilibrium, each independent firm takes the prices of its rivals as given. We begin by considering the merger of neighboring firms A and B in Figure 1. The maximization problem for the merger firm is:

$$\begin{aligned}\max_{p^A, p^B} \pi_M &= \pi^A + \pi^B = (p^A - c)(x^A{}_r + x^A{}_l) + (p^B - c)(x^B{}_r + x^B{}_l) \\ &= (p^A - c)[(p^B + p^F - 2p^A + 2(t/N))/2t] \\ &\quad + (p^B - c)[(p^A + p^C - 2p^B + 2(t/N))/2t] - 2f \qquad (5)\end{aligned}$$

The first-order condition for $p^A$ in the post-merger stage is then

$$\begin{aligned}d\pi^M/dp^A &= \partial\pi^A/\partial p^A + \partial\pi^B/\partial p^A = 0 \\ &= [2p^B + p^F - 4p^A + 2t/N + c]/2t = 0. \qquad (6)\end{aligned}$$

Similarly, the first-order condition for $p^B$ is:

$$d\pi^M/dp^B = \partial\pi^A/\partial p^B + \partial\pi^B/\partial p^B = 0$$

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single-brand (or single-plant) production for the other firms.

[10] Location-specific sunk costs may arise in two ways. These costs may represent either the expenses incurred in advertising a brand location, or the overhead associated with establishing or maintaining a physical location. When costs are sunk to location, the merging parties would typically obtain the largest possible market by announcing the merger after locational decisions are made. Further, once costs are sunk, the merger would more profitably operate from both locations in a sequential equilibrium.

$$= [2p^A + p^C - 4p^B + 2t/N + c]/2t = 0. \qquad (7)$$

From the above equations, it is apparent that the merged firm sets the same prices at A and B whenever $p^F = p^C$. We can thus demonstrate that a symmetric equilibrium exists if $p^F = p^C$ whenever $p^A = p^B$. Under a symmetric equilibrium, firms equidistant from the merger set identical prices.

Assume that $p^A = p^B$. Using equation (4), we can substitute the first-order condition for firm C(F) into the first-order condition for firm D(E). It is apparent from this result that firms D and E face symmetric first-order conditions. Hence, $p^D = p^E$ when $p^A = p^B$. Since the first-order conditions of firms C and F are identical with respect to the prices set by neighboring firms, we have now established that $p^C = p^F$. Given that profit functions are concave where defined, a symmetric equilibrium is therefore possible.[11]

We now compare the post-merger price of each firm to its premerger price, $p^i = p^* = Z$. Letting $p^C = p^F$, equations (6) and (7) can be solved simultaneously to yield:

$$p^A = p^B = 1/2(p^C + Z + (t/N)). \qquad (8)$$

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[11] Regarding a merger of two firms, a more formal proof of a symmetric equilibrium is presented in Reitzes and Levy (1989). Notice that profit functions may only be locally continuous in this type of spatial model. If transportation costs are linear (instead of quadratic), a discrete jump in demand would occur whenever a firm lowers its price sufficiently to obtain its neighbor's entire market. This behavior creates the possibility of two discrete optimal responses, and thus reaction functions may not satisfy Kakutani's fixed-point theorem.

In the case of linear transportation costs, consider a fixed-point price vector that satisfies equation (4) for all outside firms and equations (6) and (7) for the merger. This vector represents a Bertrand-Nash equilibrium only if firms prefer to share the market with their neighbors. Reitzes and Levy (1989) show that all firms prefer market-sharing strategies when a coalition consists of only two firms. However, a Bertrand-Nash equilibrium does not exist when coalitions exceed two firms.

If $p^A = p^B$, and if firms C and F satisfy their first-order conditions, then firms D and E would react in the following manner:

$$p^D = p^E = (1/11)p^B + (10/11)Z \qquad (9)$$

Substituting this result into the reaction functions for firms C and F, we obtain the following:

$$p^C = p^F = (3/11)p^B + (8/11)Z \qquad (10)$$

Equations (8) and (10) can now be solved simultaneously and substituted into equation (9) to obtain the following equilibrium prices:

$$p^A = p^B = Z + (11/19)t/N$$

$$p^C = p^F = Z + (3/19)t/N$$

$$p^D = p^E = Z + (1/19)t/N \qquad (11)$$

Clearly, $p^B > p^C > p^D > p\star = Z$. All firms raise their price from the premerger level. The merged parties experience the largest price increase, and prices decline as firms become more distant from the merger. By substituting prices into each firm's profit function, it can be shown that merger increases the profits of all firms in the industry.

Prior to merger, each of the merging parties maximized its profits independently. In the post-merger stage, the merged parties realize that by raising price at one location, profits increase at the other location. The merged firm consequently raises its prices, and that action induces other firms to raise their prices. As might be expected, these results hold only when the merging firms are neighbors. In Appendix A, we prove that a merger of non-neighboring firms causes no price (or profit) effects in a Bertrand-Nash equilibrium.[12]

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[12] Reitzes and Levy (1989) demonstrate that, in the case of price discrimination in a Bertrand-Nash equilibrium, only neighboring firms have incentives to merge. This result also holds for price discrimination in

The question arises: "When would mergers occur among non-neighboring firms?" We examine two possibilities: when firms are acting strategically in a dynamic noncooperative setting and when cooperative behavior can be achieved with proper inducement and enforcement.

## 4. Merger Among Non-neighboring Firms--Noncooperative Case

In a multiperiod (sequential) setting, firms may gain from strategic behavior.[13] A prominent example is a Stackelberg leader-follower game with a leader setting price first. Even in the absence of a merger, firms experience higher profits than in the Bertrand case where prices are simultaneously determined. However, each firm typically prefers to follow, since higher profits accrue to a follower than a leader. Hence, each firm may act as a free rider and the Stackelberg game may never begin.

The free-rider problem may be overcome when there are a limited number of candidates for the leadership role, due to disparities in market share or reputation of the firms. Specifically, a merger may facilitate the adoption of a leader-follower game by increasing the gains from leading relative to following. In a spatial model, merger produces gains from coordination for price leaders, but not for followers (unless neighboring firms merge).

The gains to coordination arise regardless of whether the merging

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spatial models with leader-follower behavior and other strategic interaction. Under many types of price discrimination, there are no free-rider benefits from merger. However, mergers among non-neighboring firms would not be expected to produce anticompetitive outcomes under price discrimination, unless they facilitate cooperative behavior.

[13] The endogenous determination of pricing policy and other aspects of competition within a noncooperative setting are discussed by Singh and Vives (1985), Thisse and Vives (1988), and Tirole (1988).

firms are neighbors. To illustrate, consider a merger between two non-neighboring firms, A and C in Figure I. As a leader, these firms face the following profit-maximization problem:

$$\max_{p^A, p^C} \pi^M = \pi^A + \pi^C$$
$$= (p^A - c)[(p^B + p^F - 2p^A + 2t/N)/2t]$$
$$+ (p^C - c)[(p^B + p^D - 2p^C + 2t/N)/2t] - 2f. \qquad (12)$$

The first-order conditions are:

$$d\pi^M/dp^A = (\partial\pi^A/\partial p^A) + (\partial\pi^A/\partial p^B)(dp^B/dp^A) + (\partial\pi^A/\partial p^F)(dp^F/dp^A)$$
$$+ (\partial\pi^C/\partial p^B)(dp^B/dp^A) + (\partial\pi^C/\partial p^D)(dp^D/dp^A) = 0$$
$$d\pi^M/dp^C = (\partial\pi^C/\partial p^C) + (\partial\pi^C/\partial p^B)(dp^B/dp^C) + (\partial\pi^C/\partial p^F)(dp^F/dp^C)$$
$$+ (\partial\pi^A/\partial p^B)(dp^B/dp^C) + (\partial\pi^A/\partial p^F)(dp^F/dp^C) = 0 \qquad (13)$$

Firm A maximizes the merger's profits by considering the effect of its price on the prices of rivals; in turn, the prices of rivals affect the profits of firm C. This interaction is captured by the term, $(\partial\pi^C/\partial p^B)(dp^B/dp^A) + (\partial\pi^C/\partial p^D)(dp^D/dp^A)$, which is necessarily positive. From equation (4), the reaction function for firm B is:

$$p^B = (1/4)(p^A + p^C) + (1/2)Z.$$

Therefore, $(dp^B/dp^A) = 1/4$ and $(\partial\pi^C/\partial p^B)(dp^B/dp^A) = (p^C - c)(1/8t) > 0$. It can also be demonstrated that, when the other firms satisfy their first-order conditions, $(dp^D/dp^A) = 1/56$, and $(\partial\pi^C/\partial p^D)(dp^D/dp^A) = (p^C-c)(1/112t)$. Thus, by increasing $p^A$ from its premerger level, profits would increase at location C. Firm C faces a comparable situation regarding the profits at location A.

The additional profits from merger may facilitate adoption of a leader-follower game by making the merged firms more likely to assume the role of a price leader. Since the potential payoffs from price leadership have changed for the relevant parties, the merger might "announce" the commencement of a sequential pricing game when there are limited candidates for leadership.

The above analysis indicates that firms gain from a merger that induces a leader-follower game. It can be easily shown that the benefits decrease as the distance increases between the merging firms. Further, the gains to followers decrease with their distance from the merger. Consequently, distant firms may also merge and assume a leadership role.[14]

## 5. Merger Among Non-neighboring Firms--Inducement to Cooperation

As is well known, the perfectly collusive outcome maximizes the combined profits of existing firms in the industry.[15] However, while firms benefit collectively from collusion, each firm can individually increase its profits still further by either "holding out" from the cartel or by "cheating" on the cartel price to expand market share. This tendency causes

[14] Gains to coordination among non-neighboring firms may also arise when there are other strategic variables besides price, which create an additional stage of decision making. Consider the addition of a stage where, after choosing location but prior to setting price, firms invest in a cost-reducing asset [see e.g., Brander and Spencer (1983)]. If a firm decreases its investment in the asset, marginal costs are higher and prices rise for all firms in the ensuing Bertrand-Nash equilibrium. Two non-neighboring firms could thus benefit from coordinated behavior. If one of the merging parties reduces investment subsequent to merger, then prices increase and the other party benefits.

[15] The optimal price under perfect collusion in our spatial model is $p^i = p^{*col} = \alpha - (t/2N)$. Each firm effectively monopolizes a market that covers half the distance between itself and each neighbor. Any further attempt to increase the market share of a given firm would necessarily reduce the combined profits of the cartel, since a price below $\alpha - (t/2N)$ would just lure customers away from a firm charging a higher price.

instability in cartel arrangements.[16]

A collusive agreement may be relatively easier to maintain in a spatial setting because of the localized nature of competition. In a spatial market, the gains to cheating (or holding out) are more limited than in a market with homogeneous products. Unless a firm reduces price sufficiently to undercut its neighbor, the increase in sales from cheating is limited to customers of neighboring firms. Consequently, large price reductions are necessary to substantially increase market share.

In markets with homogeneous products, or in differentiated-product markets where a "representative" consumer purchases multiple brands, (i.e., a Dixit-Stiglitz Chamberlinian model), cheating will draw consumers from all other firms. Thus, cheating may be a relatively more profitable strategy in these types of markets, and also difficult to detect. When a firm notices a reduction in its market share, <u>any</u> of its rivals may be responsible. In contrast, each firm in a spatial market can more easily identify the source of cheating since only a direct competitor can influence price. When spatial differentiation occurs on a relatively small number of dimensions, the cheater must come from a limited group of firms.[17]

Merger in a spatial setting may inhibit firms from chiselling on price, and facilitate identification and punishment of cheaters. When two neighboring firms merge, the gain in market share from price cutting is consequently reduced. The merger already controls the market between the

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[16] See Stigler (1964) for a discussion of factors affecting cartel stability.

[17] With a large number of product dimensions, cheating can still be readily detected when each firm can obtain sales information for various "regions" of its overall market, or for various groups of consumers.

neighboring firms, so there is no longer any incentive to engage in price cutting to obtain a larger share of that market.

Among non-neighboring firms, a merger may facilitate collusion by improving the ability to monitor and punish cheaters. Referring to the market described in Figure I, let firms A and C merge. Since they surround firm B, the merger can monitor price-cutting activities from two vantage points. The act of merging also increases the incentives for firms A and C to share market information that is useful in policing a collusive arrangement. Further, larger firms may realize scale advantages in regard to the monitoring of a market.

Punishment may also become more credible after merger in a spatial market. If a given firm cheats in a spatial setting, only the firms surrounding the cheater can inflict punishment.[18] However, without merger, one neighbor has an incentive to free ride on the other to avoid the short-term costs of punishment. When firm B cheats in Figure I, firm A might attempt to free ride off of firm C, or vice versa. If firms A and C merge, then only a single entity must decide to punish. Thus, punishment can be more credibly administered. Merger would be particularly effective when

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[18] Notice that, in the absence of price discrimination, a retaliating firm must communicate to other firms that it is engaged in punishment. Otherwise, their price decrease may cause other noncheating firms to lower prices. Since they lose market share, the noncheating firms bear some of the costs of retaliation, as is common to many models of punishment by colluding firms. With price discrimination, the retaliating firm can isolate the customers of the cheating firm and, thereby, avoid any conflict with noncheating neighbors. A punishing firm cannot isolate the cheating firm in this fashion in homogeneous-product models, or in differentiated-product models with a "representative" consumer.

surrounding a "maverick" firm with a reputation for cheating.[19]

Finally, merger in a spatial setting may facilitate the formation of a coalition among a subset of firms in the market. When two nonadjoining but nearby firms (e.g., firms A and C) merge, the value of collusion to internal firms (e.g., firm B) substantially increases. When prices are determined simultaneously, all market power is derived from the control of a contiguous market area. Firms internal to the merger face no direct (i.e, neighboring) competitors. Small coalitions among neighboring firms can thus wield significant market power over localized markets. The gain in profits from the formation of these coalitions could prove substantial for the participants.[20,21] If the probability of detection or the cost of

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[19] When the noncooperative equilibrium would be defined by Bertrand-Nash behavior (or a lack of strategic interaction), a merger of non-neighboring firms does not affect profits in a spatial model. As noted by Deneckere and Davidson (1984), a merger increases the profits associated with a noncooperative equilibrium in other models. Thus, a merger may impede the ability to collude through the use of trigger strategies in those models. This does not occur in our model when non-neighboring firms merge.

[20] Reitzes and Levy (1989) show that with linear transportation costs and evenly-spaced firms, no Bertrand-Nash equilibrium exists when a coalition consists of more than two firms. Equilibrium can be attained when prices are chosen sequentially. If the coalition acts as a price leader, it sets a "limit price" that is just low enough to prevent market appropriation by outside firms. Also, as the coalition becomes large, the equilibrium price chosen by the "border" firms of the coalition approaches the premerger price. As a consequence, outside firms have strong incentives to join a preexisting coalition and the profits of individual coalition members increase with the size of the coalition. This occurs because firms internal to the coalition charge progressively higher prices as the distance from an outside firm increases.

[21] The benefits from forming coalitions in spatial models are enhanced if firms can price discriminate. The coalition can then raise its price to those consumers that are "internal" to the coalition; further, the coalition's price increases as a consumer becomes more isolated from outside firms (see Reitzes and Levy (1989)). It is difficult to isolate customers in this manner in homogeneous-product markets or in differentiated-product markets with a representative consumer. Notice that the ability to price discriminate would produce similar benefits to coalitions in vertically-

punishment increases with the size of the coalition, small coalitions may arise in spatial models. In models with homogeneous products (or in Chamberlinian models), the formation of small coalitions is unlikely due to the limited gain in profits.

## 6. Long-term Effects from Merger

The above analysis is subject to qualification when considering the long-term effects from merger. In particular, the effects depend upon the extent of entry and the ability of existing firms to relocate. Relocation would typically reduce the benefits from merger over the long run, but not eliminate them. Entry, however, may result in the elimination of these benefits.

To preserve the free-rider benefits from the merger, firms (entrants and existing firms) generally will not try to position themselves between the merged firms.[22] Otherwise, the merged firms will have less (or no) incentive to maintain anticompetitive prices. Firms may attempt to

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differentiated markets, where consumers are distinguished by their valuation of quality.

[22] An exception may occur when the merged party exits from one location in response to entry. Judd (1985) shows that a potential producer can successfully enter by choosing a location identical to that of one plant belonging to a multiplant firm. Once the entrant has committed to that location, the multiplant firm closes its plant in order to avoid excessive competition that would lower profits earned by its other plants. Similarly, in our model, a merged firm with neighboring locations loses more than the entrant by continuing to operate, and would thus close one location in the absence of substantial exit costs. However, the merged firm could forestall entry by reducing the distance to its neighbors (and reducing the distance between its locations), thereby lowering post-entry profits for the potential newcomer. Alternatively, the merger could operate from two non-neighboring locations.

reposition themselves nearer the merged parties,[23] and entry may arise just outside the merged parties, where prices in the market are highest. In this fashion, profits from merger would be eroded over the long run.[24]

Notwithstanding these long-run effects, merger would remain a viable strategy due to the increased profits prior to entry. The Merger Guidelines suggest that, if entry takes longer than two years, the ability to raise price is still a policy concern. Furthermore, a merger may reduce free rider problems associated with undertaking costly strategic investments. As firms merge, they may be more willing to share in sunk cost investments that deter entry.

## 7. Conclusion and Policy Implications

We analyze a spatial model in which firms compete asymmetrically with rivals. This relationship provides insight into the considerations involved in choosing a firm for acquisition. The localized nature of competition in a spatial model implies that the ability to exercise market power is largely concentrated among nearby firms. For instance, only neighboring firms gain from merger in a noncooperative, Bertrand-Nash setting. In a cooperative or a leader-follower setting, non-neighboring firms may also gain from merger.

[23] With costless relocation, outside firms may wish to reposition themselves closer to the merged firms in order to benefit from the merger's higher prices. To avoid this problem, firms closer to the merger may cede some market area to firms farther from the merger. In this fashion, an equal-profit location equilibrium could occur (because firms distant from the merger would be relatively more separated from their neighbors). However, the presence of location-specific investments dampens the tendency of firms to move.

[24] When firms can engage in price discrimination, there may be no free-rider benefits from merger. Hence, merger does not encourage either relocation or entry (see Reitzes and Levy (1989)).

Still, the gains from acquisition are larger when the target lies in closer proximity. Further, the price effects from merger decline as the distance increases from the merging parties.

Mergers among direct competitors thus pose an antitrust concern in any behavioral setting. However, mergers among non-neighboring firms are likely to be motivated by efficiency, unless strategic or collusive behavior is likely to occur. A merger of firms surrounding a "disruptive influence" is a strong candidate for antitrust scrutiny while a merger of distant firms is not an apparent problem. These conclusions extend to many markets with localized competition. They readily apply to both horizontal (brand-based) and vertical (quality-based) product differentiation.[25]

Our results help to identify a proper empirical methodology for assessing the near-term effects from merger. Since each firm possesses some market power, elasticity information pertaining to a collection of firms larger than the merging parties is not particularly useful in analyzing the price effects from merger. As shown in Appendix B, the price impact of a merger can be determined from the following information: (1) the own-price elasticity of demand for each merging party, (2) the cross-price elasticity of demand for each merging party with respect to its partner's price, and (3) the sales of each merging party. To consider Bertrand competition, the above elasticities would be estimated while holding rival prices constant.

[25] When considering multiple product characteristics, the essence of these results remains intact. Further, the dimensionality of a spatial model is determined by the number of characteristics that consumers use to evaluate a product, and not necessarily the number of characteristics that distinguish brands. For instance, spatial competition may exist on a relatively small number of dimensions when consumers combine a number of product characteristics into an index, or when consumers rank characteristics in a specified order. Caplin and Nalebuff (1989) consider spatial models involving multiple product characteristics.

To consider strategic interaction, these elasticities would be estimated while allowing rival prices to adjust.[26] The set of estimates can then be used to form a range for assessing post-merger price effects.

In the absence of suitable data to estimate elasticities, antitrust authorities may gather other information concerning the "closeness" of the merging parties. Alternative methods include consumer surveys that evaluate brand preferences and an econometric technique suggested by Schmalensee (1984).

Our model suggests that "submarkets" in the traditional economic sense are potentially relevant to antitrust analysis. If each firm in Figure I is a close enough competitor with its neighbors, then they would generally all be considered part of the "market". However, anticompetitive price increases may be largely confined to a segment of the market near the merging parties. This approach does not necessarily conflict with the definition of "antitrust markets" in the Merger Guidelines.[27]

The Guidelines define an antitrust market in terms of "the smallest group of products" over which "a hypothetical monopolist could profitably impose a 'small but significant and nontransitory' increase in price" (section 2.11). Our analysis of spatial markets suggests that a merger

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[26] This method is similar to that used by Baker and Bresnahan (1985). We extend their methodology to incorporate Bertrand conjectures in setting optimal prices. Thereby, a "range" of price effects can be considered.

In analyzing potential mergers in the beer industry, Baker and Bresnahan find that both Coors and Pabst act as a restraining influence on the price of Anheuser Busch beer (and vice versa), but that Pabst and Coors exert no significant restraining influence on each other's prices. These results are consistent with the predictions of our spatial model, since they imply that Anheuser Busch beers lie "between" those of Coors and Pabst.

[27] The Guidelines also appear to have a different view of submarkets, they seem to view submarkets in terms of an area or product group where firms can price discriminate (see sections 2.13 and 2.33).

among close competitors may lead to considerable local price increases to specific customer groups, and, thus, a narrow "antitrust market" would exist.[28] However, contrary to the thrust of the Guidelines, industry concentration becomes almost totally irrelevant, since a merger among closely related firms necessarily involves a highly concentrated antitrust market. Analysis of a merger's anticompetitive impact should instead focus principally on the magnitude and extent of likely price effects, and the possibility of entry and relocation.

The Merger Guidelines do not explicitly consider entry in a market with localized competition. The prospective location of the entrant becomes critical. Entry at distant locations may produce only a small impact on the merger's long-term ability to raise price, but entry that occurs near the merged parties may substantially dampen the anticompetitive effects from the merger.

The analysis here also suggests that the Guidelines' discussion of collusion in differentiated-product markets is severely limited.[29] The Guidelines suggest that product differentiation will generally reduce the likelihood of collusion by requiring that firms agree upon a complex set of prices. While this may indeed be true in some markets (e.g., with

[28] Reitzes and Levy (1989) demonstrate that in a Bertrand-Nash spatial model, two neighboring firms will raise their mark-up (over marginal cost) by at least 57 percent after merger. From that level, the price increases of outside firms are descending in accordance with a given firm's distance from the merger.

[29] Section 3.411 states "As the products which constitute the relevant product market become more numerous, heterogeneous, or differentiated, however, the problems facing a cartel become more complex. Instead of a single price, it may be necessary to establish and enforce a complex schedule of prices corresponding to gradations in actual or perceived quality attributes among the competing products." This view is common in the economic literature (see e.g., Scherer (1980, pp. 200-205)).

Chamberlinian product differentiation), our analysis suggests that cheaters may be relatively easier to detect and punish if competition is localized. Moreover, there may be substantial gains from forming small coalitions in a spatial context, because it is easier to isolate specific customer groups.

In conclusion, while the Guidelines mention increased cause for concern when a merger involves "close competitors", the competitive stance of the firms is still viewed as a supplementary concern. Our analysis suggests that "closeness of competition" is the primary concern in spatial markets. The Guidelines' focus on a simple market definition and market concentration ignores the complexity of markets with localized competition. The tendency for uneven price increases, the significance of entrants' locations, and the effect of localized competition on collusion are not even considered. As Fisher (1987) has noted, reliance upon a single market definition may not be sufficiently comprehensive. This observation applies especially to markets characterized by differentiated consumers, where the relevant antitrust market depends upon the type of behavior that firms adopt.

**Appendix A. Merger of Nonadjoining Firms in the Noncooperative Case**

Referring to Figure I, assume that a merger occurs between firms A and i, where i $\neq$ B,F (or A). Letting r(l) denote (counter)clockwise, this assumption implies that A $\neq$ $i_r$ or $i_l$. With this in mind, consider the post-merger maximization problem.

$$\max_{p^A, p^i} \pi^M = \pi^A + \pi^i$$

$$= (p^A - c)[(p^B + p^F - 2p^A + 2(t/N))/2t]+$$

$$(p^i - c)[(p^i{}_r + p^i{}_l - 2p^i + 2(t/N))/2t] - 2f$$

The first-order conditions are then:

$$d\pi^M/dp^A = \partial\pi^A/\partial p^A = [p^B + p^F - 4p^A + 2Z]/2t = 0$$

$$d\pi^M/dp^i = \partial\pi^i/\partial p^i = [p^i{}_r + p^i{}_l - 4p^i + 2Z]/2t = 0$$

or,

$$p^A = 1/4(p^B + p^F) + (1/2)Z \tag{A.1}$$

$$p^i = 1/4(p^i{}_r + p^i{}_l) + (1/2)Z. \tag{A.2}$$

Equations (A.1) and (A.2) are independent. Thus, the reaction function for each of the merged parties is identical to equation (4), which expresses each firm's reaction function in a premerger noncooperative equilibrium. Since all outside firms continue to face reaction functions expressed by equation (4), prices must be unchanged from the premerger equilibrium.

## Appendix B. A Methodology for Evaluating Merger in Markets with Heterogeneous Products

Let Bertrand behavior occur in any type of product-differentiated market. Firms i and j have asked the antitrust authorities to approve a merger. Before merger, firm i solves the following first-order condition:

$$p^i = c^i\epsilon^i/(\epsilon^i - 1)], \qquad \text{(B.1)}$$

where $c^i$ = marginal cost facing firm i <u>before</u> the merger

$\epsilon^i$ = the own-price elasticity of demand for firm i (with rival prices constant).

In the post-merger period, firm i must consider the direct effect of a change in its price on the demand for firm j's product. Hence, the following first-order condition represents profit-maximizing behavior [assuming that marginal costs are constant and that demand relationships are log linear]:

$$p^i = c^{iM}(\epsilon^i\epsilon^j - \epsilon^{ij}\epsilon^{ji})/[(\epsilon^i\epsilon^j - \epsilon^{ij}\epsilon^{ji}) - \epsilon^j - s\epsilon^{ji}] \qquad \text{(B.2)}$$

where $c^{iM}$ = marginal cost facing firm i <u>after</u> the merger

$\epsilon^{ji}(\epsilon^{ij})$ = the cross-price elasticity of demand for firm j(i) with respect to firm i's(j's) price (holding rival prices constant)

s = (firm j's nominal sales)/(firm i's nominal sales)

Comparing equations (B.1) and (B.2), the post-merger price increase for firm i becomes more severe as either $\epsilon^{ij}$ or $\epsilon^{ji}$ rises, and as $\epsilon_j$ falls. An increase in either cross-price elasticity of demand makes the merger more anticompetitive. This effect is heightened as the own-price elasticity for the other merging party declines.

Next, assume that firms act strategically by explicitly allowing for rival price adjustment in setting their own prices. Let $\epsilon^{i\prime}$ represent the residual demand elasticity facing firm i, when all rivals respond optimally to a price change by firm i. Under strategic behavior, the premerger price of firm i would still be expressed by equation (B.1), with $\epsilon^{i\prime}$ replacing $\epsilon^{i}$. The post-merger price is still described by equation (B.2). However, $\epsilon^{i\prime\prime}(\epsilon^{j\prime\prime})$ replaces $\epsilon^{i}(\epsilon^{j})$, where $\epsilon^{i\prime\prime}(e^{j\prime\prime})$ denotes firm i's(j's) residual demand elasticity when all rivals except firm j(i) adjust their prices. Further, $\epsilon^{ij\prime\prime}(\epsilon^{ji\prime\prime})$ replaces $\epsilon^{ij}(\epsilon^{ji})$, where $\epsilon^{ij\prime\prime}(\epsilon^{ji\prime\prime})$ represents a cross-price elasticity when all outside rivals are allowed to adjust their prices optimally.

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