Merger in the Round:

Anticompetitive Effects of Mergers in Markets with Localized Competition

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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 wemity

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

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, ex, 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 pi + txi(w), where pi is the mill price, t is the unit cost of travel, and xi(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"

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from firm B. Analogously, firm C would also attract some former customers of firm D. While competition is localized to Band 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 i 1fi - (pi - c) (Xi r+x\) - f
P

where xir(xil) - the number of consumers served by a firm in a
(counter)clockwise direction.

(1)

In general, we let the subscript r(l) denote (counter)c10ckwise. Assuming
that N firms are evenly spaced around the circle, each firm is at a
distance, liN, from its neighbor. By simple manip3 0 0 59m57 0 0 10 1.89 381.13 i

(4)
where Z - c + tIN.

Since each firm faces the same cost function, the first-order condition is symmetric for all firms. Consequently, the equilibrium is symmetric, where pi _ p* for all i. Thus, pir - pil - pi. 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+l firms. 7
Further, our assumption that firms locate symmetrically around the circle
conforms to a Nash locational equilibrium under proper conditions. s
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. Thj 10.764757.94 499

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

- [2pA + pC - 4pB + 2t/N + c]/2t - O. (7)

From the above equations, it is apparent that the merged firm sets the same

prices at A and B whenever pF _ pC. We can thus demonstrate that a

symmetric equilibrium exists if pF - pc whenever pA - pB. Under a symmetric

equilibrium, firms equidistant from the merger set identical prices.

Assume that pA _ pB. 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, pD - pE when pA _ pB. 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 pc - pF. 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, pi _ p* _ Z. Letting pc - pF, equations (6) and (7) can be solved

simultaneously to yield:

pA _ pB _ l/2(pc + Z + (tiN». (8)

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.

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pB, and if firms C and F satisfy their first-order conditions, then
firms D and E would react in the following manner:
pO _ pI _ (l/ll)pB + (lO/ll)Z (9)
Substituting this result into the reaction functions for firms C and F, we obtain the following:
pC _ pF _ (3/ll)pB + (8/ll)Z (10)
Equations (8) and (10) can now be solved simultaneously and substituted into equation (9) to obtain the following equilibrium prices:
pA pB Z + (1l/19)t/N
pc pF Z + (3/l9)t/N
pD pE Z + (1/19)t/N (11)
Clearly, pB > pc > pD > p* - 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 substi-tuting 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

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

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The question arises: "T,.fuen 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

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, any 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

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 a

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-

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

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

punishment increases with the size of the coalition, small coalitions may arise in spatial models. In qiodels 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

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.
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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

among close competitors may lead to considerable local price increases to specific customer groups, and, thus, a

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

Appendix A. Herger of Nonadjoining. Firms in the Noncooperative Case Referring to Figure I, assume that a merger occurs between firms A
and i, where i ~ B,F (or A). Letting r(l) denote (counter) clockwise , this assumption

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:

marginal cost facing firm i before the merger
the own-price elasticity of demand for firm i
(with rival prices constant).

(B.l)

Next, assume that firms act strategically by explicitly allowing for
rival price adjustment in setting. their own prices. Let ei, 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.l), with eil replacing ei.

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