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Volume 16 | Issue 4

Article 5

5-15-1989

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### Recommended Citation

R. Preston McAfee and Michael A. Williams *The Department of Justice Merger Guidelines: A Critique and a Proposed Improvement*, 16 Pepp. L. Rev. Iss. 4 (1989)

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# The Department Of Justice Merger Guidelines: A Critique and A Proposed Improvement

R. Preston McAfee\*  
and Michael A. Williams\*\*

## I. INTRODUCTION

Antitrust policy toward mergers has a significant impact on the United States economy. Under the Hart-Scott-Rodino Act,<sup>1</sup> any proposed merger or buyout involving assets in excess of \$15,000,000 must be reviewed by the federal government. This involves hundreds of mergers every year (2533 in fiscal year 1987). Moreover, the very existence of an antitrust policy probably deters many profitable mergers that would likely be challenged. Antitrust policy affects billions of dollars worth of corporate assets and the organization of production in many markets.<sup>2</sup>

Current United States antitrust policy towards mergers is based largely on the Department of Justice Merger Guidelines (Guide-

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1. Hart-Scott-Rodino Antitrust Improvements Act of 1976, Pub. L. No. 94-435, 90 Stat. 1383 (1976). See generally Eckbo & Wier, *Antimerger Policy under the Hart-Scott-Rodino Act: A Re-examination of the Market Power Hypothesis*, 28 J. L. & ECON. 119 (Apr. 1985).

2. Mergers considered by the government have included some interesting products. These include condoms (delicately known as "rubber products not elsewhere classified"), zero gravity plumbing, Harlequin romances, temporary dental crowns, space stations, synthetic sausage casings, aerosol nozzles, jet tire recapping, and Long Island urologists. Conversations between Messrs. McAfee and Williams and various Department of Justice economists (1988).

lines).<sup>3</sup> A critical examination of both the rationale and the standard used by the Guidelines is appropriate in evaluating the welfare effects of horizontal mergers. After concluding that both the rationale and the standard used by the Guidelines are flawed, this article proposes an alternative rationale and standard. The proposed rationale and standard are superior on both theoretical and empirical grounds. Furthermore, the proposal satisfies the most stringent criterion of all—practicality. Implementation of the proposed rationale and standard requires the same information required by the Guidelines.

The primary rationale in the Guidelines for challenging horizontal mergers is that increases in market concentration make cartel formation and other forms of collusion more likely.<sup>4</sup> For example, in discussing the ability of small or fringe firms to expand output in response to a price increase, the Guidelines state: “[C]ollusion is less likely to occur if small or fringe sellers in the market are able profitably to increase output substantially in response to a ‘small but significant and nontransitory’ increase in price and thus to undermine a cartel.”<sup>5</sup> The Guidelines contain many more references to “cartels” and “collusion.”

The standard in the Guidelines for challenging horizontal mergers is based on an evaluation of how a merger will likely affect market concentration. The Guidelines measure market concentration by the “Herfindahl index,” which is simply the sum of the squared market shares of all the firms in the market. The Guidelines state that a horizontal merger is likely to be challenged if: (1) the post-merger Herfindahl is between 1000 and 1800 and the change in the Herfindahl caused by the merger is more than 100 or (2) the post-merger Herfindahl is above 1800 and the change in the Herfindahl caused by the merger is more than 50.<sup>6</sup>

This article demonstrates that both the Guidelines’ primary rationale (the increased likelihood of cartel formation) and standard (an increase of sufficient size in the Herfindahl index) for challenging horizontal mergers lack empirical and theoretical support. In their place, this article suggests a rationale and an associated standard that have some empirical support and rigorous theoretical support. The

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3. U.S. DEP’T OF JUSTICE, 1984 MERGER GUIDELINES, *reprinted in* 4 Trade Reg. Rep. (CCH) ¶ 13,103, at 20,551 (1988) [hereinafter GUIDELINES].

4. GUIDELINES, *supra* note 3, ¶ 13,103, at 20,560-61. The other rationale mentioned in the Guidelines for challenging horizontal mergers is the “leading firm proviso.” This proviso states that if the largest firm in the market has a market share of at least 35%, then any merger involving the largest firm and a firm with at least a 1% market share is likely to be challenged. *See id.* at 20,561.

5. *Id.* at 20,563.

6. *Id.* at 20,560-61. The Guidelines state, however, that even if a horizontal merger meets this standard, the merger is unlikely to be challenged if, for example, entry is easy. *See id.* at 20,562.

first question, though, is whether any rationale and standard are necessary, or whether all horizontal mergers should be allowed.<sup>7</sup>

## II. WELFARE-REDUCING HORIZONTAL MERGERS

In general terms, the determinants of optimal antitrust policy toward mergers are well understood. In markets where potential entrants are not disadvantaged relative to existing producers, mergers generally have insignificant welfare effects. Indeed, with no sunk costs and speedy entry, even a monopolist is forced to price at cost.<sup>8</sup> Even with an entry lag, the welfare effects of mergers in markets where entry is easy are probably negligible. Currently, the Guidelines reflect this observation in that mergers are not likely to be challenged when significant price rises would lead to entry within two years.

In many markets, however, entrants are severely disadvantaged relative to incumbents. For example, all of the world's bauxite is owned by existing aluminum producers so that entry requires the consent of existing firms.<sup>9</sup> Similarly, an entrant into wallboard production in the United States would either have to buy a low-grade gypsum site, since the high-grade sites are owned by existing firms, or produce at a distant location (e.g., Mexico) and suffer prohibitive transportation costs.<sup>10</sup> Patents may also serve to disadvantage entrants. Without the consent of the patent holder, an entrant's product may be inferior to the product of existing firms. In addition, there may be first-mover advantages, spatial location preemption, and effective commitment by sunk capital investment.<sup>11</sup>

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7. See Thurow, *Let's Abolish the Antitrust Laws*, N.Y. Times, Oct. 9, 1980, § F, at 2.

8. See generally W. BAUMOL, J. PANZAR, & R. WILLIG, CONTESTABLE MARKETS & THE THEORY OF INDUSTRY STRUCTURE (1982).

9. See Pindyck, *Gains to Producers from the Cartelization of Exhaustible Resources*, 60 REV. ECON. & STATISTICS 238, 239 (1978).

10. See, e.g., 1987-1 Trade Cas. (CCH) ¶ 67,639, at 60,832 (1987).

11. A convincing example of an anticompetitive horizontal merger is the 1979 merger of Xidex Corporation with Kalvar Corporation. See [1979-1983 Transfer Binder] Trade Reg. Rep. (CCH) ¶ 21,982, at 22,434-35 (1983). Xidex and Kalvar both produced non-silver duplicate microfilm. Three months after the merger, in June 1979, Xidex closed Kalvar's only plant and fired all production personnel. As documented by the Federal Trade Commission [hereinafter FTC], Xidex and Kalvar were active rivals prior to their merger. Xidex's 1969 entry into the production of non-silver duplicate microfilm was met with a patent infringement lawsuit by Kalvar. The FTC documented numerous instances where buyers used one of the two firm's prices to ob-

### III. ANTITRUST ENFORCEMENT IN THE UNITED STATES

Antitrust enforcement in the United States has displayed extreme variability. Twenty years ago, the Supreme Court found that the merger of Von's Grocery Company and Shopping Bag Food Stores, which resulted in a 7.5% market share, violated section 7 of the Clayton Act.<sup>12</sup> Recently, approval was given for a bank merger resulting in a sixty percent market share. From 1968 to 1982, the four-firm concentration ratio (the share of the market held by the four largest firms) was the primary standard with which the welfare effects of mergers were evaluated.<sup>13</sup> Due to its obvious flaws (a market with four equal-sized firms can be expected to perform differently than a market with only one firm), this measure was dropped in favor of the Herfindahl index.

#### A. *Market Definition*

The evaluation of a proposed merger occurs in two stages. First, relevant markets must be defined so that the merged firms' competitors can be identified and the merger's effect on concentration assessed. The Guidelines define a market as:

a product or group of products and a geographic area in which it is sold such that a hypothetical, profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products in that area would impose a "small but significant and nontransitory" increase in price above prevailing or likely future levels.<sup>14</sup>

Thus, the Guidelines ask whether a monopoly over a particular product in a particular area would maximize profits by raising the price significantly. (Five percent is usually considered significant.) If the answer is affirmative, then the product and geographic area constitute a market.<sup>15</sup>

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tain a lower price from the rival. *See id.*; *see also* Complaint Counsel's Trial Brief, FTC Doc. No. 9146 (1981).

The competitive effects of the Xidex/Kalvar merger have been extensively studied. *See* Barton & Sherman, *The Price & Profit Effects of Horizontal Merger: A Case Study*, 33 J. INDUS. ECON. 165 (1984). Barton and Sherman estimate that Xidex's supra-competitive profits in fiscal years 1980 and 1981 from its purchase of Kalvar were \$7,869,000. *Id.* at 174, 176. Given that the purchase price of Kalvar was \$6,029,892, Xidex's decision to purchase Kalvar and then close its only plant and fire all production personnel was clearly profitable. *See id.* at 170 n.12. Xidex's decision to close Kalvar's only plant is also evidence that the merger did not lead to any efficiency gains. Thus, no Williamsonian efficiency trade-off appears present in the merger. *See generally* Williamson, *Economies as an Antitrust Defense: The Welfare Tradeoffs*, 68 AM. ECON. REV. 18 (1968).

12. 15 U.S.C. § 18 (1982) (acquisition by one corporation of stock of another); *see* United States v. Von's Grocery Co., 384 U.S. 270 (1966).

13. U.S. DEPT OF JUSTICE, 1968 MERGER GUIDELINES, *reprinted in* 4 Trade Reg. Rep. (CCH) ¶ 13,101, at 20,523 (1988).

14. GUIDELINES, *supra* note 3, at 20,556.

15. Antitrust enforcement distinguishes between the economic notion of a market and the antitrust notion of a market. *E.g.*, A. MARSHALL, PRINCIPLES OF ECONOMICS:

This market definition has the interesting characteristic of relating the elasticity of demand to what constitutes a market: products with very elastic demand cannot constitute a market. In many instances, this is quite sensible, since the price of close substitutes serves as a limit on price increases arising out of a merger. However, the elasticity of demand matters more generally than is expressed through market definition. The demand elasticity, of course, affects the size of the welfare loss for a given quantity decrease.<sup>16</sup> Therefore, any coherent antitrust standard for evaluating horizontal mergers must take into account the effects of the elasticity of demand on welfare.

#### *B. The Guidelines' Evaluation of the Welfare Effects of Horizontal Mergers*

The second stage of a merger evaluation involves estimating the effect of the increased concentration on market performance. The Guidelines measure market concentration by the Herfindahl index. As described above in part I, the Guidelines state that a horizontal merger is likely to be challenged if: (1) the post-merger Herfindahl is between 1000 and 1800 and the change in the Herfindahl caused by the merger is more than 100 or (2) the post-merger Herfindahl is above 1800 and the change in the Herfindahl caused by the merger is more than 50.<sup>17</sup>

The Guidelines then ask whether there are market factors that cause the estimated concentration to understate or overstate the merger's likely competitive significance. The factors include (1) changing market conditions, e.g., new technologies, (2) the financial condition of the merging firms, and (3) entry. Next, the Guidelines examine a host of other factors "as they relate to the ease and profitability of collusion."<sup>18</sup> An example of an "other factor" considered by the Guidelines is the homogeneity of the relevant product: "In a market with a homogeneous and undifferentiated product, a cartel need only establish a single price—a circumstance that facil-

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AN INTRODUCTORY VOLUME (Porcupine Phil. Press ed. 1982). The economic notion concerns uniformity of prices, allowing for transportation costs for a commodity. With such a notion, market structure is irrelevant; thus, the economic notion is inappropriate for antitrust purposes. The antitrust definition is motivated by the desire to discern anticompetitive mergers. See Werden, *Market Delineation & the Justice Department's Merger Guidelines*, 1983 DUKE L.J. 514 (1983).

16. See, e.g., F. SCHERER, INDUSTRIAL MARKET STRUCTURE & ECONOMIC PERFORMANCE 459-64 (2d ed. 1980).

17. GUIDELINES, *supra* note 3, at 20,560-61.

18. *Id.* at 20,562.

tates reaching consensus and detecting deviation."<sup>19</sup>

#### IV. PROBLEMS WITH THE GUIDELINES' RATIONALE FOR CHALLENGING HORIZONTAL MERGERS

The rationale under which the Guidelines challenge horizontal mergers lacks both empirical and theoretical support. The rationale in the Guidelines for challenging horizontal mergers is founded on a mistaken notion of what constitutes the primary competitive problem caused by horizontal mergers. The Guidelines view the primary competitive problem of horizontal mergers as arising from an increased likelihood of collusion. The empirical evidence suggests, however, that the large, publicly traded firms whose mergers are reviewed by antitrust authorities rarely collude.<sup>20</sup>

Rather, the empirical evidence demonstrates that collusion occurs primarily among small, privately held firms in a small number of industries.<sup>21</sup> For example, the Department of Justice filed 279 criminal price-fixing cases involving 423 firms in the period October 1983 to August 1987.<sup>22</sup> Less than one percent of these firms had ever filed notice with the Securities and Exchange Commission to make a public stock offering, and fully three-fourths of the price-fixing cases occurred in just six SIC industries.<sup>23</sup> Furthermore, in ninety-three percent of the SIC industries in which the Department of Justice conducted an investigation of a merger in the period 1982-1987, there were no criminal price-fixing cases in that same period.

These facts are not surprising. As discussed by Joyce, economic theory demonstrates that managers in large, publicly traded firms have little to gain and much to lose from engaging in price-fixing agreements.<sup>24</sup> Conversely, the owners of small, privately held firms often have much to gain and little to lose from engaging in price-fixing agreements:

Two important criteria distinguish large corporations, where currently the incidence of overt price-fixing and bid-rigging is low, from the smaller firms that are typical defendants in an antitrust criminal violation. First, the gain to the decision maker in the smaller firm who decides to collude with rivals is usually more direct and amounts to a larger fraction of the profits from the collusion than the gain to the counterpart decision maker in the large corpo-

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19. *Id.*

20. See Joyce, *The Effect of Firm Organizational Structure on Price-Fixing Deterrence*, in ECONOMIC ANALYSIS GROUP, U.S. DEP'T OF JUSTICE, NO. 87-9, DISCUSSION PAPER (1987).

21. *See id.*

22. *See id.* at 19-20 & Table 1.

23. The six SIC industries and their percent of the 279 total criminal price-fixing cases are: (1) highway and street construction (33%); (2) electrical contracting (24%); (3) furniture wholesaling (5%); (4) water and sewer construction (5%); (5) motion picture theaters (5%); and (6) refuse systems (3%). *Id.* at 19-20.

24. *Id.* at 13.

ration. In general, compensation is related to but not strictly dependent upon the profits the individual earns for the firm, and while the individual price-fixer and bid-rigger in the smaller firm frequently owns a substantial share of the firm, the decision maker in large corporations is likely to be a minor shareholder at best. Second, and importantly, small firms that are guilty of price-fixing often have few assets available for recovery by victims of the collusion. Where assets available to victims are small in value, the price-fixer can be nearly immune to treble damage actions which constitute a major deterrent to large corporations (footnote omitted).<sup>25</sup>

Many antitrust authorities mistakenly believe that the primary concern caused by horizontal mergers is an increased likelihood of cartel formation.<sup>26</sup> For example, Jonathan Rose, in his critique of the National Association of Attorneys General (NAAG) Guidelines, stated:

At a philosophical or theoretical level, the NAAG guidelines represent a curious mixture of new learning—cartel theory, old learning—structural oligopoly theory—and nonlearning—antitrust law as a mechanism to prevent wealth transfers. At several points, the NAAG Guidelines reflect the Chicago School theory that the prime concern with concentration is its contribution to increasing the likelihood of horizontal merger collusive activity [citations omitted]. This economic rationale underlies both the 1982 and 1984 Department of Justice Merger Guidelines. This approach to horizontal mergers replaces the underlying rationale of the 1968 Department of Justice Merger Guidelines, which reflected the traditional structural approach to oligopoly [citations omitted]. Although the NAAG Guidelines reflect modern cartel theory, they also from time to time seem to incorporate structural oligopoly theory [citations omitted].<sup>27</sup>

## V. PROBLEMS WITH THE GUIDELINES' STANDARD FOR CHALLENGING HORIZONTAL MERGERS

The standard under which the Guidelines challenge horizontal mergers lacks both empirical and theoretical support, which is not surprising given the totally ad hoc use of the Herfindahl numbers in the Guidelines. There does not exist any empirical evidence that supports these Herfindahl numbers. A recent test of the numbers in the Guidelines found no evidence that firms' profits increase significantly when the Herfindahl index crosses either the 1000 level or the 1800 level.<sup>28</sup> The study concluded that "there is nothing magical about the values chosen by the Department of Justice in establishing its merger

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25. See *id.* at 8.

26. See, e.g., R. POSNER & F. EASTERBROOK, ANTITRUST 440-41 (2d ed. 1981).

27. Rose, *State Enforcement Under the New NAAG Guidelines: A Two Level Approach*, in PLI COURSE HANDBOOK SERIES, NO. 581, 27TH ANNUAL ADVANCED ANTITRUST SEMINAR: MERGERS, MARKETS, & JOINT VENTURES 562-63 (Dec. 1987-Jan. 1988).

28. See Uri & Coate, *The Department of Justice Merger Guidelines: The Search for Empirical Support*, 7 INT'L REV. L. & ECON. 113 (1987).

guidelines. The decision is purely subjective.”<sup>29</sup>

In addition to their lack of empirical support, the Herfindahl numbers in the Guidelines suffer from a singular lack of theoretical support. As a recent study of horizontal mergers and antitrust policy concluded:

The Merger Guidelines, while surely more sophisticated than what they replaced, are *ad hoc* in their use of the level and predicted change in the concentration index to judge the likely anticompetitive effects of a merger.

In particular, the rule used to compute a merger’s effect on the Herfindahl index is logically flawed. This rule takes the initial market shares of the merging firms,  $s_1$  and  $s_2$ , and assumes that the new entity’s [post-merger] market share will be  $s_1 + s_2$ , so that [the Herfindahl index] will rise by . . .  $2s_1s_2$ . This calculation has no basis in either the positive or the normative theory of oligopoly. If indeed all firms maintain their outputs at the pre-merger level, then the merger will have no effect on either consumers or non-participant firms in the industry, so will be socially desirable if and only if it is privately profitable. If, as is more likely, there are output responses to the merger, then the assumptions behind the  $2s_1s_2$  formula are invalid.<sup>30</sup>

Another problem with the theoretical basis of the Guidelines’ standard for challenging horizontal mergers is that the standard does not even take into account the demand elasticity in the relevant market. But, as is well known, the size of any welfare losses caused by horizontal mergers is a direct function of the demand elasticity.<sup>31</sup>

## VI. CHALLENGING HORIZONTAL MERGERS WITH A RATIONALE BASED ON NONCOOPERATIVE FIRM BEHAVIOR

Recent empirical work has shown the existence in several industries of a statistically significant relationship between the price in a market and either the number of sellers or the concentration of sellers. For example, studies of the airline industry have consistently found that the lower the number of competing carriers (or the higher their concentration), the higher are airline prices.<sup>32</sup> Importantly, however, there has been no evidence that collusion has affected prices in any airline market. The empirical finding that the lower the number of carriers, the higher are airline prices is simply the equilibrium nature of competition in airline markets. Such equilibria are called “noncooperative” equilibria because the competitors did not make binding cooperative, that is, collusive, agreements.

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29. *Id.* at 119.

30. Farrell & Shapiro, *Horizontal Mergers: An Equilibrium Analysis* (Preliminary Draft) 1-2 (1988) (unpublished manuscript). See generally McAfee & Williams, *Horizontal Mergers & Antitrust Policy*, in ECONOMIC ANALYSIS GROUP, U.S. DEP’T OF JUSTICE, NO. 88-7, DISCUSSION PAPER (1988).

31. See, e.g., F. SCHERER, *supra* note 16.

32. See, e.g., Williams, Joskow, Johnson, & Hurdle, *Explaining & Predicting Airline Yields With Non-parametric Regression Trees*, 24 ECON. LETTERS 99 (1987); see also Graham, Kaplan, & Sibley, *Efficiency & Competition in the Airline Industry*, 14 BELL J. ECON. 118 (1983).

Airline markets and other large, commercial markets are usually highly complex. An empirical test of oligopoly theory that uses data from such markets faces the daunting task of trying to hold constant the many variables affecting the observed market prices. Because of the difficulty of obtaining accurate data that can be used to hold constant these variables, economists have begun to test oligopoly theory with data taken from experiments with human subjects who compete in controlled markets.<sup>33</sup>

Experimental tests of oligopolistic markets provide support for noncooperative equilibria. For example, one group of commentators has found that as the number of firms (each firm represented by one player) increased from two to four, the market price fell from somewhat above the noncooperative level (but below the collusive level) to almost exactly the noncooperative level.<sup>34</sup> Fouraker and Siegel found that in markets with either two or three firms (again, each firm represented by one player) the best predictor of the market price was the noncooperative equilibrium known as the "Cournot" equilibrium.<sup>35</sup> Friedman and Hoggatt found that when (1) the firms do not have perfect knowledge of each others' costs functions or (2) the firms are not all the same size, then "[i]n the duopoly markets, significant (but less than perfect) cooperation occurs but, with an increase in the number of firms, it vanishes almost completely and the Cournot model is very accurate by comparison."<sup>36</sup>

## VII. EVALUATING THE WELFARE EFFECTS OF HORIZONTAL MERGERS WITH A STANDARD BASED ON NONCOOPERATIVE FIRM BEHAVIOR

The fundamental model of noncooperative firm behavior is the Cournot model. In the Cournot model, each firm chooses the rate of output that maximizes its profits given the rates of output chosen by rival firms in the market. The Cournot model predicts that as the

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33. See F. Dolbear, L. Lave, G. Bowman, A. Lieberman, E. Prescott, F. Rueter, & R. Shearman, *Collusion in Oligopoly: An Experiment on the Effect of Numbers & Information*, 82 Q.J. ECON. 240 (1968) [hereinafter Dolbear]; J. Friedman, *An Experimental Study of Cooperative Duopoly*, 35 ECONOMETRICA 379 (1967); Friedman & Hoggatt, *An Experiment in Noncooperative Oligopoly*, in RESEARCH IN EXPERIMENTAL ECONOMICS 1 (1980); Hoggatt, Friedman, & Gill, *Price Signaling in Experimental Oligopoly*, 66 AM. ECON. REV. 261 (1976); Plott, *Industrial Organization Theory & Experimental Economics*, 20 J. ECON. LITERATURE 1485 (1982).

34. See Dolbear, *supra* note 33, at 254-55.

35. See generally Plott, *supra* note 33, at 1513-15.

36. See Plott, *supra* note 33, at 1516-17.

number of sellers in a market decreases, the market price increases. A decrease in the number of sellers causes the market price to increase because each firm acting independently or "noncooperatively" maximizes its profits by decreasing output. The Cournot model is "consistent" in the sense that each firm's conjecture about how its rivals will respond to a change in its output is verified in equilibrium.<sup>37</sup> Cournot behavior represents a compromise between (1) the static Bertrand model in which firms compete on the basis of price, and generally set price equal to marginal costs regardless of the number of firms, and (2) dynamic oligopoly models.<sup>38</sup> Cournot behavior also arises out of a Bertrand model in which firms first choose their plan capacities and then compete on the basis of price.<sup>39</sup>

As described in detail elsewhere,<sup>40</sup> a standard can be derived based on the Cournot model to evaluate the welfare effects of horizontal mergers. This model has (1) a fixed level of cost-reducing capital in the industry, and (2) asymmetric firm sizes that arise out of firms holding different levels of this capital. The more capital a firm owns, the lower are its marginal costs. A merger combines two firms' capital in much the same way as a multiplant firm combines the operations of its plants. That is, the merged firm operates the two firms as "plants" and equates their marginal costs. Marginal costs are a linear function of the quantity produced.

In this model, mergers have two opposing effects on welfare. First, firms with different levels of capital will, in equilibrium, produce at different levels of marginal cost. Consequently, a merger results in coordination of production, which reduces costs. Second, the increase in concentration increases price, which reduces consumer surplus. In welfare-enhancing mergers, the former effect outweighs the latter.

The equation characterizing welfare-enhancing mergers can be reduced to an equation involving (1) the elasticity of demand [E], (2) the percentage market shares  $s_1$  and  $s_2$  of the merging firms, and (3) the Herfindahl of the non-merging firms, where the percentage

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37. See Daughety, *Reconsidering Cournot: The Cournot Equilibrium is Consistent*, 16 RAND J. ECON. 368 (1985).

38. See generally Abreu, Pearce, & Stachetti, *Optimal Cartel Equilibria with Imperfect Monitoring*, 39 J. ECON. THEORY 251 (1986); Porter, *Optimal Cartel Trigger Price Strategies*, 29 J. ECON. THEORY 313 (1983). A problem with dynamic oligopoly models is that they predict more collusion than is observed. In full-information Bertrand models, with a five percent real discount rate and a three-day lag before punishment, the threat of zero profits in perpetuity supports the monopoly price with 2493 firms.

39. See Kreps & Scheinkman, *Quantity Precommitment & Bertrand Competition Yield Cournot Outcomes*, 14 BELL J. ECON. 326, 327 (1983).

40. See generally McAfee & Williams, *supra* note 30.

market shares are denoted  $s_3, s_4, \dots$ . The Herfindahl of the non-merging firms is referred to as the "conditional Herfindahl" [HC]:

$$HC = 10,000 (s_3^2 + s_4^2 + \dots) / (100 - s_1 - s_2)^2.$$

The basic results of the model are given in Figure 1. The vertical axis shows the conditional Herfindahl, and the horizontal axis shows the elasticity of demand. The numbers at the top and right margins represent the maximum post-merger market shares that the merged firm can have without reducing welfare. (In the small area labeled "all," every merger should be allowed.)

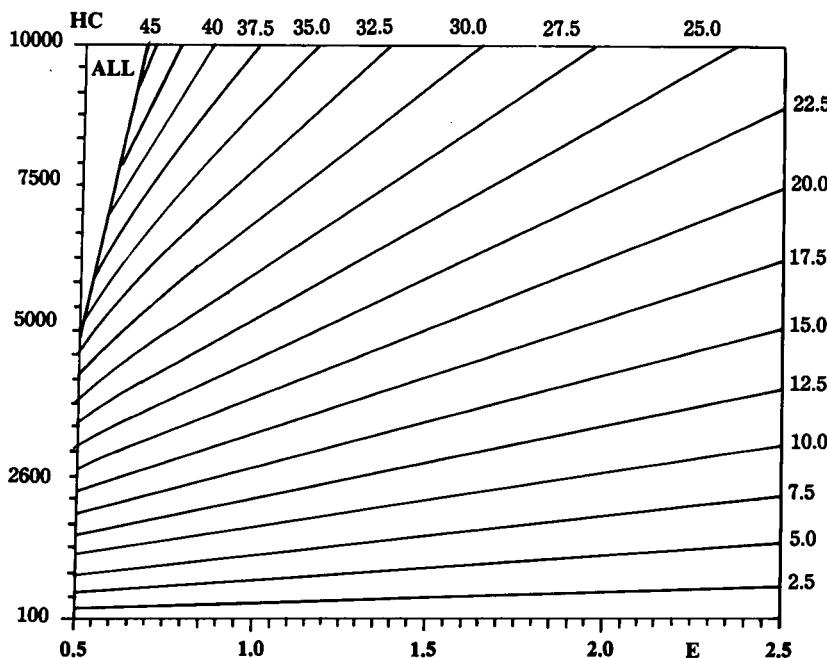


Figure 1. The conditional Herfindahl (HC) is shown on the vertical axis. The demand elasticity (E) is shown on the horizontal axis. The numbers at the top and right margins represent the maximum post-merger market shares that the merged firm can have and still increase welfare.

To illustrate the use of Figure 1 in evaluating the welfare effects of a horizontal merger, consider the following example using a pre-merger Herfindahl index of 1916: Firm 1—market share, 30%; Firm 2—market share, 20%; Firm 3—market share, 17%; Firm 4—market share, 13%; Firm 5—market share, 10%; Firm 6—market share, 7%; Firm 7—market share, 3%.

Suppose Firm 5 proposes to merge with Firm 6. The resulting change in the Herfindahl index according to the Guidelines would be 140. In this case, the conditional Herfindahl is 2565, i.e.,  $[10,000 (.30^2 + .20^2 + .17^2 + .13^2 + 3^2) / (100 - .10 - 7)^2]$ , and the sum of the market shares of the merging firms is 17%. Start in Figure 1 by drawing a horizontal line where the conditional Herfindahl equals 2565, i.e., just below the value of 2600 on the vertical axis. Suppose, first, that the demand elasticity is 1.0, and draw a vertical line at that point. These two lines intersect a little below the upward sloping line that has a value of 15% (as shown on the right margin) for the maximum post-merger market share that the merged firm can have without reducing welfare. In this case, the merger should be challenged because the sum of the market shares of the merging firms exceeds 15%. On the other hand, if the demand elasticity were 0.5, then the merger should be allowed because the relevant upward sloping line corresponds to a maximum post-merger market share of 17.5% that the merged firm can have without reducing welfare.

There are a total of twenty-one possible mergers in this example. They all violate the Guidelines except for the merger of Firms 6 and 7. Of the twenty-one possible mergers, seventeen violate the standard in Figure 1. The remaining four mergers may or may not violate the standard in Figure 1 depending on the demand elasticity:

- (1) The merger of Firms 4 and 7 violates the standard in Figure 1 if the demand elasticity is greater than or equal to 0.8. Thus, if the demand elasticity is less than 0.8, the Guidelines' standard prevents a profitable, welfare-enhancing merger.
- (2) The merger of Firms 5 and 6 violates the standard in Figure 1 if the demand elasticity is greater than or equal to 0.7.
- (3) The merger of Firms 5 and 7 violates the standard in Figure 1 if the demand elasticity is greater than or equal to 1.1.
- (4) The merger of Firms 6 and 7 violates the standard in Figure 1 if the demand elasticity is greater than or equal to 1.7. Thus, if the demand elasticity is greater than or equal to 1.7, the Guidelines' standard allows a profitable, welfare-reducing merger.

In general, the Guidelines tend to allow profitable, welfare-reducing mergers when a firm whose market share is greater than average acquires a small firm. The Guidelines tend to disallow profitable, welfare-enhancing mergers when two roughly equal-sized firms merge, and the sum of their pre-merger market shares is less than average.

If pre-merger demand is sufficiently elastic ( $E \geq 2/3$ ), then an upper bound on the merging firms' sum of shares for welfare-enhancing mergers is  $HC / (1 + HC)$ . Therefore, all mergers involving the largest firm in the industry reduce welfare, as do mergers that involve at

least half the industry's capacity. Similarly, a merger that creates a new largest firm reduces welfare.

### VIII. CONCLUSION

The proposed model shows that the elasticity of demand and market concentration should not be separated in a merger evaluation, as they are under the current Guidelines. Since both factors are currently used in merger evaluations, the proposed standard is not substantially more complex.<sup>41</sup> Indeed, the notions of Herfindahl indices and elasticities of demand are familiar to antitrust attorneys, so the proposed policy represents merely an alteration of the standard—not a change in the information necessary to make the evaluations.

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41. The standard should not be used to evaluate the welfare effects of horizontal mergers in *all* markets. If firms in a market have a history of forming successful cartels, the noncooperative standard would not apply. Also, if an increase in the market price would cause entry to occur in a short time (e.g., less than a year), then the model would not apply since it assumes no entry. One shortcoming of the noncooperative merger guidelines is that no "safe harbor" exists. That is, there is no Herfindahl level below which all mergers are allowed. In the model, a merger of two firms in an industry with 10,000 equal-sized firms reduces welfare. Obviously, some "safe harbor" is required for the noncooperative merger guidelines.

