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A ROBUST TEST FOR CONSUMER WELFARE ENHANCING MERGERS AMONG SELLERS OF DIFFERENTIATED PRODUCTS*

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Recently developed tools are used to predict the effects of differentiated products mergers, but they require the assumption of a particular functional form for industry demand, and any assumption is vulnerable to attack. This paper demonstrates that marginal cost reductions necessary to restore premerger prices can be calculated without making any assumption about demand, and it provides a robust and practical method for determining whether a particular merger enhances consumer welfare.

I. INTRODUCTION

CONSIDER an industry in which the competitive interaction is Nash in prices (Bertrand) and products are differentiated substitutes. Assuming no entry, product repositioning, or efficiencies, Deneckere and Davidson [1985] demonstrated that any merger would cause the merging firms to increase the prices of their products and that would cause the remaining firms to increase the prices of their products. If a merger caused a reduction in marginal cost for the merging firms, the cost reduction would offset the anticompetitive effect of the merger on prices. Indeed, if the merger reduced the marginal costs of the merging firms by a sufficient amount, it would cause all prices in the industry to fall.

Following Williamson [1968], economists generally have favored total economic welfare as the touchstone for antitrust policy toward mergers, and differentiated product mergers that raise prices still may enhance total welfare (see Werden and Froeb [1994]). However, antitrust enforcement authorities have argued, and courts have agreed, that a merger should be deemed unlawful if its likely effect is to increase prices, i.e., to diminish consumer welfare.[1]

Recently developed tools are now used to predict the price effects of differentiated products mergers (see Hausman, Leonard, and Zona [1994], Shapiro [1996], Werden and Froeb [1994, 1996]), and marginal cost reductions are easily incorporated into such an analysis. Unfortunately,

*The views expressed herein are not purported to reflect those of the U.S. Department of Justice.

[1] See FTC v. University Health, Inc., 938 F.2d 1206, 1222–23 (11th Cir. 1991); United States v. United Tote, Inc., 768 F. Supp. 1064, 1084–85 (D. Del. 1991).

these tools require the assumption of a particular functional form for industry demand, and any assumption is vulnerable to attack. The purpose of this paper is to demonstrate that the marginal cost reductions necessary to restore precisely the premerger prices can be calculated relatively simply, without making any assumption about demand. This provides a robust and practical method for determining whether a particular merger enhances consumer welfare.

II. THE MODEL

Define

p_i = the price of product i
q_i = the quantity of product i
c_i = the constant marginal cost of producing and distributing product i
m_i = the margin of product i, $\frac{p_i - c_i}{p_i}$
ϵ_{ij} = the elasticity of demand for product i with respect to the price of product j
d_{ji} = the diversion ratio to product j from product i, $-\frac{\epsilon_{ji} q_j}{\epsilon_{ii} q_i}$

The diversion ratio is the share of the sales lost by one merging product that is recaptured by another when the price of the former increases. Shapiro [1996] presents it as a useful way in which to gauge the effects of differentiated products mergers on competition and consumers. Although estimating a diversion ratio requires estimating the underlying demand elasticities, it is easier to intuit likely diversion ratios from qualitative evidence than to intuit cross elasticities of demand. Moreover, in the analysis below, the diversion ratios play a central role, while the absolute magnitudes of the elasticities do not matter.

If a merger leaves price unchanged but reduces marginal cost, the proportionate reduction in marginal cost can be derived from definition of m_i. Denoting pre- and postmerger values of variables with the superscripts 0 and 1, that definition can be rearranged to yield

$$(1) \qquad \frac{c_i^0 - c_i^1}{c_i^0} \equiv \dot{c}_i = \frac{m_i^1 - m_i^0}{1 - m_i^0}.$$

Using this result, it is straightforward to derive expressions for the merger-induced cost reductions necessary to restore premerger prices.

Assuming for simplicity that each product is initially sold by a single firm, the premerger first-order conditions for profit maximization are

$$(2) \qquad m_i^0 = -\epsilon_{ii}^{-1}.$$

If two such firms merge, the merged firm maximizes the sum of the profits for the two products sold by the merging firms with respect to the prices

of both products. The two first-order conditions for profit maximization can be arranged to yield:

$$m_i^1 - m_j^1 d_{ji} p_j / p_i = -\epsilon_{ii}^{-1}, \tag{3}$$

where i denotes either merging firm and j denotes the other. As a general matter, the prices, elasticities, and diversion ratios in equation 3 differ from those in equation 2, but this is not the case if premerger and postmerger prices are equal. Thus, equations 2 and 3 can be solved for the postmerger margins in terms of the premerger margins and other quantities:

$$m_i^1 = \frac{m_i^0 + m_j^0 d_{ji} p_j / p_i}{1 - d_{ij} d_{ji}}. \tag{4}$$

And equations 2 and 4 can be substituted into equation 1 to yield the marginal cost reductions necessary to restore premerger prices. Using m_i to denote the premerger margin,

$$\dot{c}_i = \frac{m_i d_{ij} d_{ji} + m_j d_{ji} p_j / p_i}{(1 - m_i)(1 - d_{ij} d_{ji})}. \tag{5}$$

It is clear from equation 5 that $\dot{c}_i$ is an increasing function of the two margins and the two diversion ratios. Higher margins can be thought of as a consequence of greater differentiation, while higher diversion ratios can be thought of as a consequence of more intense competition between the merging products.

In the symmetric case, there is a single d and m, and equation 5 simplifies to

$$\dot{c} = \frac{m}{1 - m} \frac{d}{1 - d}. \tag{6}$$

The symmetric case is useful for gleaning the magnitude of the cost reductions necessary to restore premerger prices. Table I presents the necessary percentage cost reductions for plausible values of m and d. The values of m reflect the range observed in actual antitrust investigations involving differentiated products industries. Large—typically implausible—cost reductions are necessary to restore premerger prices if the product is highly differentiated and the merging firms compete intensely. With much less intense competition, as might be expected in an industry with a large number of brands, far more plausible marginal cost reductions would suffice.[2]

The assumption that each merging firm sells a single product premerger is not necessary. Equation 6 changes slightly if each merging firm sells n

[2] This finding is congruent with that of prior work relating to homogeneous product industries (e.g., Fisher, Johnson, and Lande [1983]).

TABLE I
NECESSARY PERCENTAGE COST REDUCTIONS FOR VARIOUS MARGINS AND DIVERSION RATIOS

d \ m	.4	.5	.6	.7
.05	3.5	5.3	7.9	12.3
.10	7.4	11.1	16.7	25.9
.15	11.7	17.7	26.5	41.2
.20	16.7	25.0	37.5	58.3
.25	22.2	33.3	50.0	77.8

products premerger and if prices, margins, and diversion ratios are the same for all products of both merging firms. What changes is that the d in the numerator gets multiplied by n, while the d in the denominator gets multiplied by $2n - 1$. The asymmetric case can be analyzed using the matrix version of the first-order conditions. Define

$\mathbf{m}$ = margins for the products of the merging firms
$\boldsymbol{\epsilon}$ = reciprocals of own elasticities of demand for the products of the merging firms
$\mathbf{B}$ = matrix of elements b_{st}, where

$$b_{st} = \begin{cases} 1, & s = t \\ -d_{st}p_s/p_t, & s \neq t,\ s \text{ and } t \text{ are commonly owned} \\ 0, & s \neq t,\ s \text{ and } t \text{ are not commonly owned} \end{cases}$$

The pre- and postmerger first-order conditions can both be written

$$\mathbf{m} = -\mathbf{B}^{-1}\boldsymbol{\epsilon}. \tag{7}$$

The difference between the two is the $\mathbf{B}$ has no elements equal to zero postmerger, since all of the included products are commonly owned at that point, while premerger those elements corresponding to pairs of products not yet commonly owned are zero. From these equations, the necessary cost decreases can be derived from equation 1.

III. CONCLUSION

The foregoing provides a practical way to compute in actual antitrust cases the precise marginal cost reductions that assure an enhancement of consumer welfare from a differentiated product merger. Diversion ratios are estimated in differentiated products merger cases today,[3] and margins are both estimated from accounting data and inferred from premerger

[3] Estimation is routine in cases for which commercial data vendors such as IRI and Nielsen provide high frequency, disaggregated price and quantity data derived from point-of-sale scanners. Such data is available for products sold in supermarkets and certain other retail outlets.

first-order conditions. Thus, it is possible to compute marginal cost reductions sufficient to assure that a merger enhances consumer welfare, and these can be compared to efficiency claims made by the merging parties. If the marginal cost of only one merging firm is reduced by more than the critical amount, it is necessary to assume a functional form for demand to compute the overall effect of the merger on consumer welfare. Total welfare calculations also require such an assumption.

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