

## Comment

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Finkelstein and Friedberg point out some of the peculiar results one may reach in measuring the impact of mergers on concentration if concentration is measured by the share of output produced by a fixed number of firms. Their complaints are justified and could be enlarged. They then proceed to offer an “entropy” measure of concentration which summarizes the entire size distribution of firms, and lends itself to an estimate of the impact of a merger on concentration. I shall comment briefly upon their measure, but first some fundamentals.

A good measure of concentration has the property of increasing with the probability of possession of effective monopolistic power by the firms in the industry. I assume this purpose for the measure, but would be prepared to defend it if an alternative purpose were proposed.

There are innumerable possible measures of concentration: number of firms, “the” concentration ratio, slope of the Pareto curve, etc. There are only two persuasive bases for choosing any one measure:

- (1) A theory of economic behavior which tells us which factors govern the probability of monopolistic behavior by the industry.
- (2) A quantitative investigation which reveals that the proposed measure of concentration is well correlated with some acceptable measures of monopoly power (profit rates, extent of price discrimination, etc.)

Obviously the ideal measure of concentration will meet *both* tests; it will be derived from a theory which itself has been well tested.

By the standards of plausibility which support most measures of concentration, the Finkelstein and Friedberg measure of entropy is both stimulating and appealing. The main criticism I would make of their proposal is that it lacks any precise theoretical rationale.<sup>1</sup> Their first derivation is based upon the assumption that the “competitive pressure” on a firm depends only upon the total share of other firms. The concept of “competitive activities” does not exist in economics and they give no explicit definition. Their second and third derivations are based upon shifts of customers among firms. This is a more prom-

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1. I cannot refrain from dissenting from their sporadic use of court decisions in judging among concentration measures. Since the judges ignore economics, surely we economists should be allowed to ignore judges.

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ising approach, I believe, but they do not relate the shifts to price or other behavior of the firms. I do not doubt that eventually an economic rationale for their measure will be found. We shall then be better able to judge it. My colleague Henri Theil, I may add, is far advanced on a book on information theory in economics which uses an entropy measure of concentration.

I have sought to derive a measure of concentration from a theory of collusion which turns upon the difficulty of policing any collusive agreement.<sup>2</sup> This argument turns on the behavior of the sales of each firm over time and leads to a familiar index of concentration, the Herfindahl index. This index is defined as

$$H = \sum s_i^2$$

where  $s_i$  is the share of firm  $i$ . The index has a maximum value of 1 (monopoly) and a minimum value of  $1/n$  when there are  $n$  firms of equal size. A concentrated industry such as automobiles will have an index of say .4, an unconcentrated industry an index of say .05 or less. A few scraps of empirical evidence were offered in behalf of this measure.

The Herfindahl measure is well-suited to the measurement of the impact of a merger on concentration. If two firms with shares  $s_i$  and  $s_j$  join, the industry rises by

$$(s_i + s_j)^2 - s_i^2 - s_j^2 = 2 s_i s_j$$

Hence a merger of firms with .9 and .1 increases concentration by  $2 \times .9 \times .1 = .18$ , whereas with shares of .1 each, the contribution is  $2 \times .1 \times .1 = .02$ . If 1,000 firms merge into 100 firms (all equal in size), the index rises from  $1/1000$  to  $1/100$  or by .009; if 100 merge into 10, the index rises by .09; if ten merge into a monopoly, the index rises by .9. The role of mergers in seven large American and British industries is measured by this technique in a forthcoming article.<sup>3</sup>

A full theory of monopoly may well go beyond the size distribution of firms. The concentration of buyers ( $H_B$ ), on my theory, is equally important, and a better measure of concentration would perhaps be

$$\frac{H_S}{H_B} (H_B > H_S)$$

because the higher the concentration of buyers, at least if it is less than

2. See Stigler, *A Theory of Oligopoly*, 72 J. OF POL. ECON. 44-61 (1964).

3. *The Effects of the Antitrust Laws*, 9 J. OF LAW & ECON. (1966) (unpublished).

the concentration of sellers, the closer the market will be to competition.

The Herfindahl index would rank the various mergers discussed by Finkelstein and Friedberg in the same way as their entropy measure. Until we have a better theoretical and empirical basis for concentration measures, however, this agreement is no proof of the joint possession of virtue.