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Source: *The Journal of Political Economy*, Vol. 84, No. 5 (Oct., 1976), pp. 1109-1122
Published by: The University of Chicago Press
Stable URL: http://www.jstor.org/stable/1830445
Accessed: 30/03/2011 04:55

Advertising, Concentration, and Price-Cost Margins

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The industrial organization literature contains many empirical tests of hypothesized relationships among elements of industry structure and performance. Most of these studies used ordinary least-squares regression to estimate single-equation relationships. This approach is incorrect if the relationship being estimated is part of a simultaneous-equations system. This paper treats three important relationships in industrial organization as a single simultaneous-equations system. The results are consistent with those obtained from single-equation models and suggest that simultaneous-equations bias is not an important factor in the estimation of structure-performance relationships.

The Model

The Need for a Simultaneous-Equations Model

Our original purpose was to estimate the concentration-advertising relationship. In a previous article one of us (Weiss 1971) proposed that this relationship be examined on a simultaneous-equations basis. The Dorfman-Steiner model (Dorfman and Steiner 1954) indicated that the optimal level of advertising expenditure for a firm would be where the marginal revenue product of advertising equaled the absolute value of the elasticity of demand for the firm's product. Since the price elasticity of the demand curve faced by a firm is lower in more concentrated industries, advertising intensity might be expected to increase with concentration. This effect might be reenforced to the extent that there are externalities in advertising. That is, if advertising affects industry as well as firm demand, firms with large market shares would internalize a larger proportion of those industry effects.

At the same time, there is likely to be feedback from advertising to concentration through the probable economies of scale in advertising—at least for heavily advertised national brands. This suggests that a correct

[*Journal of Political Economy*, 1976, vol. 84, no. 5]

specification of the relationship would be a pair of simultaneous equations of the form

$$\frac{Ad}{S} = f\left(C, \frac{CD}{S}\right),$$
$$C = g\left(\frac{Ad}{S}, \frac{MES}{S}\right), \tag{1}$$

where Ad is advertising expense, S is value of shipments, C is concentration, CD is consumer demand, and MES is minimum efficient scale.

A number of more recent analyses have also called for simultaneous-equations models. Greer (1971) estimated a three-equation model where Ad/S, C, and growth were endogenous. Three others (Cable 1972; Schmalensee 1972; Commanor and Wilson 1974) argue for a two-equation model where Ad/S and the price-cost margin are endogenous. The argument is best expressed by Schmalensee, who concludes that optimal advertising intensity is

$$\frac{Ad}{S} = \frac{P - MC}{P}(a + \eta\bar{a}),$$

where P is price, MC is marginal production costs, a and $\bar{a}$ are elasticities of a firm's sales with respect to its own advertising and that of its rivals, respectively, and η is the elasticity of its rivals' advertising with respect to its own. It follows that advertising will be more intense the higher the margin: firms will advertise more the more that an additional unit sold adds to profits.

Accepting this argument leads us to a three-equation model where Ad/S, C, and margin are endogenous, since there is ample theoretical basis for expecting both concentration and advertising to affect margins. Our model will therefore take the form

$$\frac{Ad}{S} = f\left(C, M, \frac{CD}{S}\right),$$
$$C = f\left(\frac{Ad}{S}, \frac{MES}{S}\right), \tag{2}$$
$$M = f\left(C, \frac{Ad}{S}, X\right),$$

where M is the price-cost margin and X is one or more exogenous variables that affect M but not Ad/S or C. Good candidates for X are growth and capital intensity.

The Determinants of Advertising Intensity

Following Greer (1971) and Cable (1972), we expect the effect of concentration on advertising to take the form of an inverted U. Advertising is expected to increase with concentration at first for the reasons given above but to decrease at very high levels of concentration because collusion to avoid mutually offsetting advertising becomes easier (Greer 1971) or merely because a pure monopolist would avoid all such mutually offsetting advertising (Cable 1972). This argument implies that the advertising equation should contain both C and C^2, with a positive sign expected for the coefficient of C and a negative sign for that of C^2.

Following the arguments of Cable (1972), Schmalensee (1972), and Commanor and Wilson (1974), we also include price-cost margin (M) in the advertising equation, expecting its coefficient to bear a positive sign.

Finally, we include a number of variables intended to reflect advertising effectiveness. The most important is surely the share of total sales going to consumers (CD/S). We expect it to have a positive effect because consumer goods appear to be more differentiable than producer goods and because advertising is probably the more effective way of reaching millions of consumers while salesmen may be a more effective way to reach the typically far fewer industrial buyers. To control further for product differentiability, we will introduce growth (following Cable, Greer, and Commanor and Wilson) and a durability dummy (following Commanor and Wilson).

This leaves an advertising intensity equation of

$$\frac{Ad}{S} = a_0 + a_1 M + a_2 \frac{CD}{S} + a_3 C + a_4 C^2 + a_5 Gr + a_6 Dur, \qquad (3)$$

where Ad is advertising expense, S is value of shipments, CD is consumer demand, C is the four-firm concentration ratio, M is the price-cost margin (value added less payroll, divided by value of shipments), Gr is the average annual rate of growth in industrial production from 1954 to 1963, and Dur is a dummy variable equal to one for durable-goods industries and to zero for nondurable-goods industries. We expect the signs of a_1, a_2, a_3, and a_5 to be positive and that of a_4 to be negative. Following Commanor and Wilson, we give no a priori judgment about the sign of a_6.

The Determinants of Concentration

Conventional price theory predicts that an important determinant of concentration will be optimal firm scale as a percentage of market size. If the long-run average cost curve is flat at sizes above the minimum efficient scale, then the four-firm concentration ratio may exceed four times minimum efficient scale. This implies that the correlation between concentration and estimated minimum efficient scale will not be perfect even in long-run equilibrium.

Since most of the economies of scale in production appear to be attained at the plant level, an estimate of plant minimum efficient scale will be used as a determinant of concentration. Direct estimates of minimum efficient scale are available for only a minority of industries, so some proxy is needed. The two most common proxies are the average plant size among the largest plants accounting for half of industry shipments or employment (Commanor and Wilson 1967), and the "midpoint plant size"—the size of the plant that is at the midpoint of the shipments size distribution. Half of total shipments come from plants larger than the midpoint plant size. Of the two, the midpoint plant size correlates more closely with available engineering estimates of minimum efficient scale.[1] We will therefore use that variable divided by industry shipments (*MES/S*) as our economies-of-scale proxy.

The original impetus for this study arose from the expectation that advertising intensity would increase concentration due to economies of scale in advertising. Such economies of scale are conceptually slippery, but Commanor and Wilson (1974, chap. 10) provide evidence suggesting that they may be large in industries where advertising intensity is high.

In addition to probable economies of scale in advertising, strong product differentiation in and of itself might well be associated with high concentration. Firms that are successful in differentiating their products are also apt to be successful in attaining large market shares. There appears to have been a consistent postwar trend toward increasing concentration in highly differentiated products, although average concentration in manufacturing as a whole hardly changed during this period (Mueller and Hamm 1974). This trend is most likely attributable to the increase in advertising intensity that came with the television revolution. The effect of advertising on concentration is only likely to be important in industries where advertising intensity is great. In sum, there seems to be ample justification for including *Ad/S* as an independent explanatory variable in the concentration equation.

[1] In an as yet unpublished paper, one of us (Weiss 1975) correlates the two measures with direct estimates of *MES* made by Pratten (1971), Scherer (1973), and unpublished estimates of his own. The $\bar{R}^2$s relating the two measures with the three sets of direct estimates are given below.

	Scherer	Pratten	Weiss
Number of industries	12	19	16
Midpoint plant size	.9033	.4338	.4414
Average size of plants in top half of shipments	.7671	.3808	.3974

Altogether, then, our concentration equation will be

$$C = b_0 + b_1 \frac{Ad}{S} + b_2 \frac{MES}{S}. \tag{4}$$

We expect both b_1 and b_2 to have positive coefficients.

The Determinants of Price-Cost Margins

The literature contains a large number of statistical studies in which profit rates or price-cost margins are explained by concentration, advertising, and certain other variables (see Weiss 1974). Our margin variable will be the widely used "price-cost margin" based on census totals. It can be precisely measured at the four-digit level, and it avoids most of the accounting difficulties of corporate profit margins. Since the cost of capital is included in this margin, an essential independent variable is a measure of capital intensity, K/S. In our study, this variable is the gross fixed value of assets divided by value of shipments. Similarly, output growth due either to unanticipated increases in demand or to unanticipated decreases in costs can be expected to result in high margins. Our measure of growth is average annual growth rates in output from 1954 to 1963 based on the census index of industrial production.

There are strong theoretical grounds for believing that market structure will affect price-cost margins. Concentration is probably the most important element of market structure in this regard. Although there are many oligopoly theories, virtually all of them predict an increase in the effectiveness of collusion (a decrease in the cost of collusion) as concentration rises. The area of disagreement concerns the implied functional form of the concentration-margin relationship rather than the direction of its effect.

The concentration ratios used refer to national industries. These clearly do not characterize market concentration correctly where markets are local or regional in character. To allow for this, we follow Collins and Preston (1969) in introducing a measure of the geographic dispersion of output (GD) as well.

Finally, the attainable margins of effectively colluding firms can be expected to rise with the barriers to entry. The classic barriers to entry are those associated with product differentiation and scale requirements. As in many other studies, advertising intensity will serve as our proxy for the product differentiation barrier. Since advertising is included in the margin, its coefficient should equal 1.0 even if there is no product differentiation effect. It should significantly exceed 1.0 if the product differentiation barrier has its expected effect. The scale barrier is MES/S once more.

Altogether, then, our price-cost margin equation will be

$$M = c_0 + c_1 \frac{K}{S} + c_2 Gr + c_3 C + c_4 GD + c_5 \frac{Ad}{S} + c_6 \frac{MES}{S}. \quad (5)$$

We expect all of the coefficients to have positive signs, except for c_4, which should be negative.

The Structure and Estimation of the Simultaneous-Equations Model

In our three structural equations, the price-cost margin appears as a determinant of advertising intensity, both concentration and advertising intensity appear as determinants of price-cost margins, and advertising intensity is one of the determinants of concentration. We feel that there is good theoretical justification for inclusion of these variables as shown. Since the same variables also appear as dependent variables in our three equations, we must treat advertising intensity, concentration, and price-cost margins as endogenous variables whose values are *jointly* determined in a simultaneous-equations system consisting of equations (3), (4), and (5). The order conditions for identifiability indicate that equation (4) is overidentified while equations (3) and (5) are exactly identified.

Our three-equation system is linear in parameters but nonlinear in endogenous variables because of the squared concentration term in equation (3). As a result, the reduced-form equations are functions of the square root of linear relations among the endogenous variables. The reduced-form equations can, however, be approximated by a polynomial function of the exogenous variables (Kelejian 1971). This will lead to consistent estimates of the system's parameters using two-stage least-squares estimation. We used second-degree polynomials to approximate the reduced-form equations.

Empirical Analysis

The Data

All of the variables used in these equations are derived from the 1963 Census of Manufactures, except for *Ad/S*, *CD/S*, and *Dur*, the durability dummy. Values for *Ad/S* and *CD/S* are taken from the 1963 input-output tables for "detailed industries." *Ad/S* is just the direct requirements coefficient of each manufacturing sector for inputs from the sector labeled "advertising." *CD/S* is "personal consumption expenditures" divided by "total output," where figures for both are taken from the transactions matrix of those tables. The durability dummy was assigned on the basis of judgment.

All of the census variables are for four-digit industries. Input-output sectors correspond exactly to four-digit industries in 230 cases. In the remaining cases,[2] sectors and census industries do not match perfectly. In all but one case, two or more census industries are assigned to a single sector. As a result, our advertising and consumer demand variables for industries that are combined in the input-output sectors are more aggregated than the other variables.

The year 1963 was chosen because all the variables used in this study are available for that year and because most of the conventional relationships hold up well when estimated as single-equation models in that year. It was a year of moderate prosperity with little inflation—a decade after the last bout of serious inflation and price controls—so price-cost margins had the opportunity to adjust toward equilibrium levels. Similarly, the television revolution in advertising was more than a decade old, so that Ad/S had probably come close to equilibrium levels.

The sample consists of 408 of the 417 four-digit Standard Industrial Classification (SIC) manufacturing industries from the 1963 Census of Manufactures. Of the nine industries deleted from the sample, two (2819, 3943) were dropped for lack of advertising data. The seven remaining industries (2814, 3332, 3334, 3492, 3636, 3723, 3942) could not be used, since the census's disclosure requirement prevented the construction of four firm concentration ratios.

OLS Results

Table 1 shows ordinary least-squares estimates of the three structural equations. Most of the coefficients of conventional variables in the OLS regressions bear the expected signs and are significantly different from zero. Advertising rises with margins, as predicted by Cable, Schmalensee, and Commanor and Wilson. And, as expected by Cable and Greer, the relation between concentration and advertising intensity is of an inverted-U form. Advertising intensity reaches its peak at $C = 0.49$. As expected, the variable CD/S has a very strong effect on advertising. Advertising also increases with growth, though the effect is weak. Durability has a nonsignificant negative effect.

The results for equation (4) are also as expected. Both advertising intensity and MES/S have significant positive effects on concentration.

In equation (5), margins rise with both concentration and advertising intensity. The advertising coefficient exceeds 1.0 by a significant amount (by 4.35 standard errors), suggesting that there is a substantial product differentiation barrier to entry associated with advertising. Growth, MES/S, capital intensity, and geographic dispersion all have the expected

[2] Industry 2819 (inorganic chemicals, not elsewhere classified) was excluded because it was split into two sectors in the input-output tables. Industry 3934 (baby carriages) was excluded because it does not appear in the input-output table for some reason. Except for these two cases, our sample corresponds exactly to that of Collins and Preston (1969).

TABLE 1

OLS ESTIMATES OF OUR THREE EQUATIONS (t-RATIOS IN PARENTHESES)

	DEPENDENT VARIABLE		
	Ad/S Eq. (3)	C Eq. (4)	M Eq. (5)
Constant	−0.0314 (−7.45)	0.2638 (25.93)	0.1682 (17.15)
C	0.0554 (3.56)	...	0.0629 (2.89)
C^2	−0.0568 (−3.38)	...	...
M	0.1123 (9.84)	...	...
CD/S	0.0257 (8.94)	...	...
Gr	0.0387 (1.64)	...	0.2255 (2.61)
Dur	−0.0021 (−1.11)	...	...
Ad/S	...	1.1613 (3.33)	1.6536 (11.00)
MES/S	...	4.1852 (18.99)	0.0686 (0.54)
K/S	...	...	0.1123 (8.03)
GD	...	...	−0.0003 (−2.90)
R^2	.374	.485	.402
df	401	405	401

effects, though the coefficient of MES/S could easily differ this much from zero by chance.

Two-Stage Least-Squares Results

The results in table 1 may be biased because of the simultaneous character of our model. Two-stage least-squares estimates which avoid this bias appear in table 2.

The effect of concentration on advertising found in the OLS estimates remains in the 2SLS estimate of equation (3), but advertising now reaches its maximum at a concentration ratio of 0.57. The effect of margins on advertising is greatly reduced, though it is still significant. The effects of CD/S, growth, and durability are little altered.

Equation (4) is little changed in the two-stage least-squares estimates. The effect of advertising on concentration is somewhat enhanced and remains statistically significant.[3]

[3] At the suggestion of a referee, we also tried a different form of the concentration equation (eq. [4]) where CD/S was included among the independent variables. All three independent variables were highly significant in both the OLS and the 2SLQ regressions. The coefficient of advertising had a positive sign and that of CD/S had a negative sign. We do not know how to interpret this result.

TABLE 2

Two-Stage Least-Squares Estimates of Our Three Equations
(t-Ratios in Parentheses)

	Dependent Variable		
	Ad/S Eq. (3)	*C* Eq. (4)	*M* Eq. (5)
Constant	−0.0245 (−3.86)	0.2591 (21.30)	0.1736 (14.66)
C	0.0737 (2.84)	...	0.0377 (0.93)
C^2	−0.0643 (−2.64)	...	...
M	0.0544 (2.01)	...	...
CD/S	0.0269 (8.96)	...	...
Gr	0.0539 (2.09)	...	0.2336 (2.61)
Dur	−0.0018 (−0.93)	...	...
Ad/S	...	1.5347 (2.42)	1.6256 (5.52)
MES/S	...	4.169 (18.84)	0.1720 (0.92)
K/S	...	...	0.1165 (7.30)
GD	...	...	−0.0003 (−2.79)

The last equation does change in an important way, however. The effect of concentration on the price-cost margin remains positive but could easily be due to chance. In addition, the coefficient of advertising intensity now exceeds 1.0 by an amount that is barely significant using a one-tailed test (by 1.91 standard errors), thus raising some question about the product differentiation barrier. The coefficients of growth, *MES/S*, *K/S*, and geographic dispersion remain close to their values and significance levels found in the OLS regressions.

The reason for the weak relation between concentration and margins in the third equation is probably collinearity. Observed concentration and the other independent variables in the OLS estimate of equation (5) are related by an R^2 of .532, but this rises to .794 when $\hat{C}$ is regressed on $\widehat{Ad/S}$ and the other independent variables in the second-stage least-squares estimate of equation (5). This is because the estimated value of $\hat{C}$ is primarily determined by *MES/S* and, to a lesser extent, *K/S* and *GD*. In effect, equation (5) is not fully identified, since the exogenous variables excluded from equation (4) are not importantly correlated with concentration. We conclude that the effect of concentration on margins cannot be distinguished from the effect of optimal plant scale.

The same does not explain the weakened effect of advertising on margins. It is related to the other independent variables in the OLS estimate of equation (5) by an R^2 of only .06639 and to $\hat{C}$ and the other independent variables in the two-stage least-squares estimate by an R^2 of only .18118.

Consumer and Producer Goods Separately

The arguments for our model seem most relevant to consumer goods and much less so for producer goods. Specifically, one would not expect a strong effect of concentration on advertising, of advertising on concentration, or of advertising on margins in producer-goods industries where advertising is normally minor. In addition, the effect of concentration on margins has generally been found to be much greater in consumer- than in producer-goods industries (Collins and Preston 1969; Weiss 1974), presumably because of the difficulty of collusion where buyers are large and well informed.

For the purposes of this study, consumer-goods industries are defined as those where $CD/S \geq 0.5$. Breaking the sample in this way leaves 102 consumer-goods industries and 306 producer-goods industries.

Table 3 shows OLS and two-stage least-squares estimates for consumer goods. Table 4 shows the same for the producer-goods industries.

The consumer-goods regressions are similar to those for the overall sample except for the puzzling negative sign on CD/S in the advertising equation. We presume that this anomalous result is due to a lack of variation in the sample where $CD/S \geq 0.50$.

The effect of concentration on advertising is much stronger in the consumer-goods sample, but the coefficients retain their expected signs in the producer-goods sample. Advertising intensity reaches maximum at $C = 0.37$ in the OLS estimates and $C = 0.46$ in the 2SLS estimates for consumer goods and at concentration ratios of 0.47 and 0.72 for producer goods. Margins are also much less important in determining advertising in the consumer-goods sample. On the other hand, the effect of growth on advertising is significant in only the producer-goods sample, suggesting that producer-goods advertising is more concentrated on new products and new producers than in consumer-goods industries.

As expected, advertising has a greater effect on concentration in consumer-goods industries, but it remains significant in the producer-goods sample.

The effect of concentration on margin is significant in the OLS estimates and nonsignificant in the 2SLS estimates in both samples. The explanation suggested above seems applicable here also, since the R^2s relating $\hat{C}$ to Ad/S and the other independent variables are .799 in the consumer-goods sample and .779 in the producer-goods sample.

The coefficient of advertising in the margin equation significantly exceeds 1.0 in the OLS estimates but is not significantly greater than 1.0

TABLE 3

ESTIMATES FOR 102 CONSUMER-GOODS INDUSTRIES
(t-RATIOS IN PARENTHESES)

	DEPENDENT VARIABLE					
	OLS Estimates			2SLS Estimates		
	Ad/S Eq. (3)	C Eq. (4)	M Eq. (5)	Ad/S Eq. (3)	C Eq. (4)	M Eq. (5)
Constant....	−0.0005 (−0.02)	0.2165 (12.13)	0.1704 (8.66)	−0.0019 (−0.08)	0.1748 (6.77)	0.1783 (8.45)
C..........	0.1446 (3.29)	...	0.1376 (3.00)	0.1761 (3.18)	...	0.0953 (1.43)
C^2........	−0.1972 (−3.98)	...	...	−0.1918 (−3.62)	...	...
M.........	0.3159 (10.51)	...	...	0.2146 (3.34)	...	...
CD/S.......	−0.0864 (−3.45)	...	...	−0.0703 (−2.57)	...	...
Gr.........	0.0562 (0.97)	...	−0.0077 (−0.51)	0.0843 (1.36)	...	0.0385 (0.23)
Dur........	−0.0134 (−2.44)	...	...	−0.0152 (−2.65)	...	...
Ad/S.......	...	1.6740 (4.12)	1.6151 (8.73)	...	3.3710 (4.18)	1.3959 (2.90)
MES/S.....	...	3.7373 (11.17)	0.3726 (1.67)	...	3.5922 (9.76)	0.5203 (1.89)
K/S........	...	...	−0.0466 (−0.83)	...	...	−0.0042 (−0.06)
GD........	...	...	−0.0002 (−1.23)	...	...	−0.0002 (−1.35)
R^2.........	.631	.611	.654	...	...	...
df..........	95	99	95	...	...	...

in the 2SLS estimate for the consumer-goods sample and is barely so by a one-tailed test in the producer-goods sample. Thus, more doubt is cast on the importance of the product differentiation barrier.

Surprisingly, capital intensity and geographic dispersion affect margins significantly in only the producer-goods industries.

Conclusions

It would appear that advertising increases with concentration over the range of C in which most observations fall and that advertising leads to greater concentration. The failure of earlier studies (Telser 1964) to obtain this result is presumably due to the crudeness of their data on advertising (roughly three digits in coverage), their failure to use a quadratic form, and their use of single-equation models. The effect of advertising on concentration suggests that the economies of scale in advertising are substantial.

On the other hand, the effect of advertising on margins is only mildly greater than what might be expected from the fact that advertising

TABLE 4

ESTIMATES FOR 306 PRODUCER-GOODS INDUSTRIES
(t-RATIOS IN PARENTHESES)

	DEPENDENT VARIABLE					
	OLS Estimates			2SLS Estimates		
	Ad/S Eq. (3)	*C* Eq. (4)	*M* Eq. (5)	*Ad/S* Eq. (3)	*C* Eq. (4)	*M* Eq. (5)
Constant....	−0.0062 (−2.20)	0.2707 (21.30)	0.1715 (15.11)	−0.0001 (−0.04)	0.2661 (19.02)	0.1723 (13.16)
C	0.0113 (1.14)	...	0.0572 (2.31)	0.0036 (0.23)	...	0.0601 (1.33)
C^2	−0.0121 (−1.159)	...	...	−0.0025 (−0.17)	...	...
M.........	0.0337 (4.38)	...	...	0.0110 (0.77)	...	...
CD/S.......	0.0538 (11.49)	...	...	0.0563 (11.40)	...	...
Gr	0.0361 (2.32)	...	0.2661 (2.60)	0.0446 (2.71)	...	0.2753 (2.67)
Dur	−0.0008 (−0.70)	...	...	−0.0006 (−0.53)	...	...
Ad/S	...	1.5442 (2.15)	1.9540 (6.45)	...	2.0644 (2.09)	1.7782 (4.15)
MES/S	...	4.3659 (15.91)	−0.1334 (−0.87)	...	4.3546 (15.88)	−0.1423 (−0.65)
K/S	...	...	0.1201 (7.82)	...	...	0.1188 (7.24)
GD	...	...	−0.0003 (−2.87)	...	...	−0.0003 (−2.87)
R^2	.408	.464	.330	...	...	...
df..........	299	303	299	...	...	...

expense is included in the price-cost margin and is not significantly so in consumer-goods industries. This suggests that the product differentiation barrier to entry is not very great.

Our finding with respect to the impact of concentration on margins seems equivocal. It cannot be distinguished from the effect of the plant scale variable in our second-stage regressions. The combined effect of C and MES/S is unequivocally positive and significant. The F-statistic for the two variables together is 36.14 with 2 and 401 degrees of freedom—easily significant at the .01 level. We have no basis for assigning their joint effect between concentration and the scale barrier. We presume that both are present.

References

Cable, J. "Market Structure, Advertising Policy, and Inter-Market Differences in Advertising Intensity." In *Market Structure and Corporate Behavior*, edited by K. Cowling. London: Grays Mills, 1972.

Collins, N. R., and Preston, L. E. "Price Cost Margins and Industry Structure." *Rev. Econ. and Statis.* 51 (August 1969): 271–86.

Commanor, W. S., and Wilson, T. A. "Advertising, Market Structure and Performance." *Rev. Econ. and Statis.* 49 (November 1967): 423–44.

———. *Advertising and Market Power.* Cambridge, Mass.: Harvard Univ. Press, 1974.

Dorfman, R., and Steiner, P. O. "Optimal Advertising and Optimal Quality." *A.E.R.* 44 (December 1954): 826–36.

Greer, D. "Advertising and Market Concentration." *Southern Econ. J.* 38 (July 1971): 19–32.

Kelejian, H. H. "Two Stage Least Squares and Econometric Systems Linear in Parameters but Non-linear in the Endogenous Variables." *J. American Statis. Assoc.* 69 (June 1971): 373–74.

Mueller, W. F., and Hamm, L. G. "Trends in Industrial Market Concentration, 1947–1970." *Rev. Econ. and Statis.* 56 (November 1974): 511–20.

Pratten, C. F. *Economies of Scale in Manufacturing Industry.* Cambridge: Cambridge Univ. Press, 1971.

Scherer, F. M. "The Determinants of Industrial Plant Sizes in Six Nations." *Rev. Econ. and Statis.* 55 (May 1973): 135–45.

Schmalensee, R. *The Economics of Advertising.* Amsterdam: North-Holland, 1972.

Telser, L. "Advertising and Competition." *J.P.E.* 72 (December 1964): 537–62.

Weiss, L. W. "Quantitative Studies in Industrial Organization." In *Frontiers of Quantitative Economics,* edited by M. Intriligator. Amsterdam: North-Holland, 1971.

———. "The Concentration-Profits Relationship and Anti-Trust." In *Industrial Concentration: The New Learning,* edited by H. J. Goldschmid, H. M. Mann, and J. F. Weston. Boston: Little, Brown, 1974.

———. "Optimal Plant Size and the Extent of Sub-optimal Capacity." Unpublished, 1975.