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DOMINANT FIRM MARKET SHARE AND ECONOMIC PERFORMANCE

by

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Introduction

The relationship between industry structure and performance has been a major focus in the field of industrial organization. Empirical studies have utilized four firm concentration ratios (and other more "theoretically valid" measures such as the Lerner and Herfindahl indexes) as measures of structure and industry rates of return as a measure of performance. Where the four firm concentration ratio has been large (implying a greater likelihood of collusion or significant economies of scale), these more concentrated markets have consistently been associated with higher rates of return.

Past studies by Shepherd (1972, 1973), Dalton and Penn (1971), Gale (1972), and Dalton and Levine (1977), have used market share to imply horizontal dominance by a firm in an industry. Using many industries as cases, these studies have also found good statistical fits between market share and rates of return. Bradley Gale (1967, p. 412) has argued that the firm's market share merely proxies the presence of past and present "rent-yielding intangible assets". These share-based intangible assets may include: (1) a product differentiation advantage by risk averse buyers favoring a large share firm, (2) a membership in a group tight enough to recognize their interdependence and coordinate behavior, (3) a bargaining power advantage among rival oligopolists, and (4) the ability to take advantge of economies of scale. Gale has argued that these advantages represent a direct causal influence of share on profits. These factors yield hypotheses which have been supported empirically in numerous studies. However, no direct theoretical link between market share and rates of return has been demonstrated.

Market Share and Competitive Injury

The price leadership model can be used to show a continuous, direct relationship between market share and competitive injury exists. The model as formulated by T.R. Saving (1970, pp. 139-140) assumes an n firm market demand function for a homogeneous product:

(1) $Q^d_m = f(P)$.

The dominant firm (or largest k firms) behaves as a monopolist and tries to maximize profits, the remaining small firms act as price takers. The quantity supplied (or marginal cost function) by the n-k smaller firms may be expressed as a single-valued function of price p:

(2) $Q^s_k = g(p)$.

Assuming that the market is cleared at all times, the derived demand function for the k largest firm(s) is the difference between (1) and (2),

(3) $Q^d_k = f(p) - g(p)$.

Finally, the quantity supplied (or marginal cost function) by the k largest firm(s) must be given:

(4) $Q^s_k = h(p)$.

From these functions it is possible to derive a marginal revenue function for the dominant firm(s) and determine the price and output level which will maximize his (their) economic profits. The n-k small firms will simply accept the price and sell according to their supply function.

For a comparison between competitive and price-leadership price behavior, the price-leadership price and output can be compared against the competitively determined supply-demand price. Thus market quantity demanded (1) can be set equal to market quantity supplied (5), where

(5) $Q^s_m = g(p) + h(p)$.

Implicit in the model formulation and in the structure of a particular industry are various elasticities. Assuming that $\underline{f}$ and $\underline{g}$ in equation (3) are continuously differentiable the change in Q^d_k per unit change in p is:

$$(6)\quad \frac{dQ^d_k}{dp} = f'(p) - g'(p),$$

and the elasticity of demand facing the k largest firms is:

$$(7)\quad E_k = \frac{f(p)}{Q^d_k} \cdot E_m - \frac{g(p)}{Q^d_k} \cdot E_r,$$

where E_k and E_m are the demand elasticities for the k largest firms and for the market, an E_r is the supply elasticity for the n-k remaining firms.

An expanded version of (7) can be found in Stigler (1947 p. 301) and is shown below:

$$(8)\quad \frac{dQ^d_k}{dp} \cdot \frac{P}{Q^d_k} = \frac{p \cdot f'(p)}{Q^d_m} \cdot \frac{Q^d_m}{Q^d_k} - \frac{p \cdot g'(p)}{Q^s_r} \cdot \frac{Q^s_r}{Q^d_k}.$$

It should be noted that market share appears in its inverse form in the first term, right hand side and also in a slightly different form [small firms output relative to large firm(s') output] in the second term, right hand side. Thus inherent in the model's formulation of elasticities can be found the market share. This facet of the model suggests that a general mathematical proof does not appear promising because as the market share of the dominant firm increases the difference in competitive versus price leadership price rise, but elasticities of demand and supply will also change.

In the simulation exercise which follows, it can be shown that as dominant firm('s) market share increase, competitive injury will also increase. Competitive injury is here defined as the divergence between price leadership price-quanity decisions and competitive price-quantity levels. In Table 1, p. 4, a linear formulation of the dominant firm('s) supply, small firms' supply, and market demand functions are chosen. Convenient parameters were chosen so that

Table 1

"k" Dominant Firm(s') (percent) (1)	"n-k" Small Firms Market (percent) (2)	Market Demand Elasticity (3)	Market Price (dollars) (4)	Dominant Firm(s') Quanity (5)	Small Firm Quantity (6)	Market Quantity (7)	Percentage Increase in Prices (8)	Percentage Reduction in Quantities (9)
0	100	1.00	100.00	0	100.00	100.00	0	0
05	95	1.00	100.06	4.87	95.05	99.93	.6	.1
10	90	1.01	100.25	9.52	90.22	99.74	.3	.3
15	85	1.01	100.57	13.95	85.48	99.43	.6	.6
20	80	1.02	101.01	18.18	80.80	98.98	1.0	1.0
25	75	1.03	101.59	22.22	76.19	98.41	1.6	1.6
30	70	1.05	102.30	26.08	71.61	97.69	2.3	2.3
35	65	1.07	103.15	29.78	67.05	96.84	3.2	3.2
40	60	1.09	104.16	33.33	62.50	95.83	4.2	4.2
45	55	1.11	105.33	36.73	57.93	94.66	5.3	5.3
50	50	1.14	106.66	40.00	53.33	93.33	6.7	6.7
55	45	1.18	108.18	43.13	48.68	91.81	8.2	8.2
60	40	1.22	109.89	46.15	43.95	90.10	9.9	9.9
65	35	1.27	111.80	49.05	39.13	88.19	11.8	11.8
70	30	1.32	113.96	51.85	34.18	86.03	14.0	14.0
75	25	1.39	116.36	54.54	29.09	83.63	15.4	16.4
80	20	1.47	119.04	57.14	23.89	80.95	19.0	19.0
85	15	1.57	122.04	59.64	18.30	77.95	22.0	22.0
90	10	1.68	125.39	62.06	12.53	74.60	25.4	25.4
95	5	1.82	129.13	64.40	6.45	70.86	29.1	29.1
100	0	2.00	133.33	66.66	0	66.66	33.3	33.3

competitive equilibrium output and price were 100 units and $100, respectively, and the market demand elasticity in competitive equilibrium was unitary. This competitive case is illustrated in the first row of Table 1, where dominant firm has no share of the market (1), the n small firms are price takers filling out all of the market (2), price elasticity of market demand is unitary (3), market price is $100 (4), the dominant firm(s') sell nothing (5), the small firms sell 100 units (6); the total amount sold in the market is also 100 units (7), and their is no competitive injury in terms of the percentage difference between competitive and price-leadership price (8) or quantitites sold (9).

Pure monopoly is also depicted on the last row of Table 1. Here the dominant firm (1) chooses a short run price and output which maximizes his profits (or the k firms act in concert to jointly maximize profits), without any influence by the competitive fringe (2). Market price elasticity of demand has risen to 2.00 (3), market price has risen from $100 to $133.33 (4) while the effect of monopolization in the market has been to raise price above the competitive level by 33.3% (8) and the quantity sold in the market has been restricted to 66.7 units (5) or reduced by 33.3% (9). As market shares of the dominant firm(s) increase between the extremes of pure competition and monopoly, competitive injury is shown to rise as well.

Table 2 and 3 are based upon parameters which yield higher market demand elasticities in competitive equilibrium than Table 1. It can be seen in comparing the three tables, subsequently, that competitive injury in terms of large percentage differences in competitive versus price-leadership prices take place when larger values of market price elasticity are used.

Conclusions

The purpose of this comparison is to show the importance of market share, as a fundamental structural variable in describing the competitive structure of a

Table 2

"k" Dominant Firm(s') (percent) (1)	"n-k" Small Firms Market (percent) (2)	Market Demand Elasticity (3)	Market Price (dollars) (4)	Dominant Firm(s') Quanity (5)	Small Firm Quantity (6)	Market Quantity (7)	Percentage Increase in Prices (8)	Percentage Reduction in Quantities (9)
0	100	1.33	114.24	0	114.28	114.28	0	0
05	95	1.34	114.36	5.55	108.65	114.21	.1	.2
10	90	1.34	114.66	10.81	103.19	114.00	.3	.2
15	85	1.35	115.13	15.78	97.86	113.65	.7	.6
20	80	1.36	115.79	20.51	92.63	113.15	1.3	1.0
25	75	1.38	116.66	25.00	87.50	112.50	2.1	1.6
30	70	1.41	117.74	29.26	82.42	111.69	3.0	2.3
35	65	1.43	119.04	33.33	77.38	110.71	4.2	3.1
40	60	1.47	120.58	37.20	72.35	109.56	5.5	4.1
45	55	1.51	122.37	40.90	67.30	108.21	7.1	5.3
50	50	1.56	124.44	44.44	62.22	106.66	8.9	6.7
55	45	1.61	126.81	47.82	57.06	104.89	10.9	8.2
60	40	1.68	129.50	51.06	51.80	102.86	13.3	10.0
65	35	1.76	132.57	54.16	46.40	100.56	16.0	12.0
70	30	1.85	136.05	57.14	40.81	97.95	19.1	14.3
75	25	1.96	140.00	60.00	35.00	95.00	22.5	16.9
80	20	2.10	144.47	62.74	28.89	91.64	26.4	19.8
85	15	2.27	149.57	65.38	22.43	87.82	30.9	23.2
90	10	2.48	155.38	67.92	15.53	83.46	36.0	26.9
95	5	2.75	162.03	70.37	8.10	78.47	41.8	31.3
100	0	3.11	169.69	72.72	0	72.72	48.5	36.4

Table 3

"k" Dominant Firm(s') (percent) (1)	"n-k" Small Firms Market (percent) (2)	Market Demand Elasticity (3)	Market Price (dollars) (4)	Dominant Firm(s') Quanity (5)	Small Firm Quantity (6)	Market Quantity (7)	Percentage Increase in Prices (8)	Percentage Reduction in Quantities (9)
0	100	2.00	133.33	0	133.33	133.33	0	0
05	95	2.00	133.48	6.45	126.80	133.25	.1	.1
10	90	2.01	133.92	12.50	120.53	133.03	.5	.2
15	85	2.03	134.68	18.18	114.47	132.65	1.0	.5
20	80	2.05	135.74	23.52	108.59	132.12	1.8	.9
25	75	2.09	137.14	28.57	102.65	131.42	2.9	1.4
30	70	2.13	138.88	33.33	97.22	130.55	4.2	2.1
35	65	2.18	141.01	37.83	91.65	129.49	5.8	2.9
40	60	2.24	143.54	42.16	86.12	128.22	7.7	3.9
45	55	2.31	146.52	46.15	80.58	126.73	9.9	5.0
50	50	2.40	150.00	50.00	75.00	125.00	12.5	6.2
55	45	2.51	154.04	53.65	69.31	122.97	15.5	7.8
60	40	2.63	158.73	57.14	63.49	120.63	19.1	9.5
65	35	2.78	164.15	60.46	57.45	117.92	23.1	11.6
70	30	2.97	170.45	63.63	51.13	114.77	27.8	14.0
75	25	3.20	177.77	66.66	44.44	111.11	33.3	16.7
80	20	3.49	186.33	69.56	37.26	106.83	39.8	19.9
85	15	3.86	196.39	72.34	29.45	101.80	47.3	23.6
90	10	4.35	208.33	75.00	20.83	95.83	56.3	28.1
95	5	5.02	222.63	77.55	11.13	88.68	67.0	33.5
100	0	6.00	240.00	80.00	0	80.00	125.0	40.0

industry. This model suggests that cross-section, intra-industry studies should yield better market structure and rate of return associations. Moreover, the development of reliable market share data by Economic Information Systems of New York and by PIMS data set have lead to a new emphasis on market share studies, many of which are still in manuscript form, pending publication.

The structure of the model also suggest that careful scrutiny should be given to the calculation of market share in appropriate relevant markets. A particularly difficult problem arises in specifying which is (are) the "k" largest firm('s) and "n-k" price takers. Kwoka's inter-industry comparison (1979, p. 108) supports a view that industry returns are unaffected until output control by one or two firms reaches 25% to 35%, and that if the third largest firm's share is significant, it will have a depressing affect upon industry returns. Whether, as Kwoka suggests, that k should equal two, it seems appropriate to examine using inter-firm comparisons within an industry. Only Sultan (1975) and Gabel (1979) have examined intra-industry relationships, and these have not addressed this particular problem. On the basis of the market share data that is now becoming available, new intra-industry studies will shed light upon this important issue.

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