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Concentration and Profit Rates: New Evidence on an Old Issue

ABSTRACT: In this paper, the relation of concentration to profit rates is examined with the help of new data for a sample of 507 manufacturing firms. Specifically, these data make it possible to distinguish between specialized and diversified firms. For the latter, measures of concentration relate to the entire range of a firm's activities rather than merely to its primary activity. ¶ Using several measures of the profit rate, the results obtained consistently show that there is no clear single-variate relation between concentration and the level of profits. Indeed, the industry in which the firm operates exerts only a weak influence on the differences in profit rates among firms. However, the profit rates of firms in the more concentrated industries show a substantially higher serial correlation. The latter result is attributed to high *exit* as well as *entry* barriers in the concentrated industries.

Economic theory offers a clear-cut solution for the relation of profits to monopoly power only for the polar cases of single-firm monopoly and

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perfect competition. But a continuous relation between profits and monopoly power has been widely assumed in economic literature, with indexes of concentration a commonly used proxy for monopoly power. There have now been well over thirty empirical studies that focus directly on that relation.[1] All but a few have been based on aggregative data for industries, that is, data that pertain only to industry averages (whether compiled from published aggregates or from individual firm records). Almost all support the conclusion, though with results that vary greatly in strength, that the association between profits and concentration is positive.[2]

A serious problem in the analysis of average profit rates for industries as distinct from information on profits for individual firms is the strong association of profit rates with firm size. While there is some uncertainty about the extent to which the relation stems from mere accounting peculiarities as distinct from real differences in profitability, there appears to be little doubt about the existence of a statistical association. Since small firms are, generally, far more numerous in the low-concentration industries, the net relation between profits and concentration becomes difficult to identify with such data. Moreover, there are serious aggregation problems. Thus, for example, average profit rates of surviving firms may be equal across industries. However, observed averages may vary considerably because of the effect on the averages of failing firms, particularly in industries with high rates of entry by new firms. For this and still other reasons, microdata are clearly superior in testing the relation of profits to concentration.

Since hardly a month passes in which some new study of profit rates does not emerge, any list is likely to be incomplete by publication time. However, there have been at least three important published studies containing analyses of microdata.[3] The most recent with which we are familiar relates only to the food industries and therefore yields conclusions of limited generality.[4] Hall and Weiss,[5] in one of the two other studies, found a weak but statistically significant relation between profits and concentration in the context of a multivariate model. The third is the early study of Bain,[6] which found for large firms in 1936–1940, a strong relation between profit rates and concentration, when firms were grouped into two categories: those classified in industries with eight-firm concentration ratios of 70 percent or more and those with ratios below 70 percent.

The relevance of Bain's study as a test of the equilibrium relation between the two variables may be questioned because of the choice of period. The interval 1936–1940 was strongly influenced by cyclical forces, and Bain's result may largely reflect the differing cyclical sensitivity of various industries. On the other hand, the strength of the relation may have been understated because Bain's data obliged him to classify firms exclusively by concentration in a firm's primary industry, regardless of level of specialization.

There are several versions of the hypothesis on the relation of profits to concentration. In its strong form, concentration is a dominant variable, and its effects should be observable in a single-variate relation, given suitable data. In its weak form, concentration merely contributes to explaining profit rates. The effects of concentration, in this version, need not be observable except in the context of either a multivariate additive model or, alternatively, a model that captures the interactions between concentration and other variables.

In this paper we test only the strong form of the hypothesis. The policy implications of the two forms are, of course, quite different. It is one thing to say that concentrated industries have higher profits than unconcentrated ones, and quite another to assert that concentrated industries, though no more profitable than other industries, would, in the absence of concentration, have been less profitable still. Or, alternatively, if the principal effects of concentration arise from interactions, it is particular configurations of variables that become relevant for policy rather than concentration by itself. Thus, though the way in which the scope of this paper has been delimited leaves many questions unanswered, the issue of what the simple relation is between profits and concentration is far from trivial and has broad implications for policy.

An examination of this basic question seems particularly appropriate at this time because new data recently developed permit the use of new techniques of analysis. These data, which are for 507 manufacturing companies and are described in detail in Appendix A, consist of company financial information, from Compustat, and information on the employment of establishments and the industries in which the establishments were classified.

The measures of profit rates all relate to accounting profits. This is consistent with the procedure followed in all other published studies of profit rates and, indeed, is probably the only feasible alternative at this juncture. Not only are price indexes for deflating assets[7] and depreciation unsatisfactory, but little is known about the effect of technological change on replacement costs. It is possible that even a random measurement error in the approximation of "true" profits through accounting data may obscure a weak relation of concentration to profits. But there is no basis for assuming a systematic bias such as would arise in inflationary times if firms in concentrated industries had, on the average, assets with a shorter economic life than firms in other industries. If the latter had been true, firms in concentrated industries would have had reported profits understated relative to those of other firms. But there is no evidence to support a conclusion that such a bias exists.

Since our data relate to the 1960s, they are less vulnerable than those of some earlier studies inasmuch as pre-World War II assets had a relatively small book value by the early 1960s. Hence, the denominators of our

rate-of-return ratios do not straddle periods of vastly differing price levels. Some distortion in the measure of profit rates is probably present because of the standard accounting practice of expensing investment in intangibles. While little is known about the magnitude of the resulting measurement error, expenditures on intangibles (e.g., advertising and research and development) are likely to be larger for firms in the concentrated industries. Hence, if there is a significant distortion, it is likely to bias the results in favor of a hypothesis that a significant relation exists between concentration and profit rates, since the effect of expensing intangibles is generally to overstate profit rates.

The forces generating differences in profit rates among firms may be decomposed into three sets. With y_{ij} defined as the profit rate of the ith firm in the jth industry, we have

$$(1)\quad y_{ij} = \mu + \sum_{k=1}^{J} \alpha_{kj} x_{kj} + \sum_{k=1}^{I_1} \beta_{ki} v_{ki} + \sum_{k=1}^{I_2} \gamma_{ki} w_{ki}$$

where the x's refer to the relevant attributes of industries and markets; the v's, to the relatively stable characteristics of firms (e.g., firm size or organizational structure); and the w's, to the transitory forces that affect the fortunes of individual firms and which, for lack of information, are usually lumped together as random disturbances (e.g., labor disputes, natural catastrophes, managerial errors, etc.). The analysis first focuses on the x attributes.

THE INDUSTRY AND THE MARKET AS EXPLANATIONS OF PROFIT RATES

Do the profit rates of firms cluster around industry means? The belief that they do derives from two assumptions. First, the structure of competition varies greatly among markets; hence, the firm's industry is an important variable in explaining relative profit rates. Second, adjustments to shifts in market demand or in industry production costs are slow enough to generate sustained disequilibriums in the profit rates of all firms in an industry. As a test of these assumptions, we proceeded to test the null hypothesis of equality of industry profit rates.

The basic model underlying the test of equality of industry profit rates (defined as the simple arithmetic means of the profit rates of firms classified in the industry) is a one-way analysis of variance. Symbolically, the model can be written as

$$(2)\quad y_{ij} = \mu + \beta_i + u_{ij} \qquad i = 1, \ldots, I; j = 1, \ldots, J_i$$

where y_{ij} is the profit rate of the jth firm in the ith industry, β_i is a constant associated with the ith industry, and u_{ij} is a random disturbance which can be attributed to, among other things, the omitted firm and industry variables. We assume that u_{ij} is normally and independently distributed with mean 0 and variance σ_i^2.

The conditional expectation of y for any industry is given by $\mu + \beta_i$; so a test of equality of industry profit rates (that is, of the irrelevance of industry classification) may be formulated as

$$(3) \quad \beta_1 = \beta_2 = \ldots = \beta_I = 0$$

It can easily be seen that analysis of variance is appropriate and that the F ratio gives us the relevant test of the null hypothesis in equation 3.

Table 1 shows the unadjusted coefficients of determination (R^2) expressed as percentage ratios of between-industry variance to total variance and the corresponding F values for various measures of profit rates, for three- and for five-year averages, at three-digit and four-digit levels of industry detail; the statistics are shown both for specialized firms in the sample, i.e., those with specialization ratios of 0.5 or more in the primary industry, and for all firms in the sample in the relevant industries. While the samples per industry were small, the method of analysis pools the data for all industries so that the coefficients of determination are all based on large samples (the smallest having 121 firms). Since sample sizes and numbers of industries varied, comparisons among statistics, levels of industry detail, and sample types require adjustment of the coefficients of determination for degrees of freedom. Following the usual notation,

$$R^2 = \frac{\sum_i n_i(\bar{y}_{i.} - \bar{y}_{..})^2}{\sum_i \sum_j (y_{ij} - \bar{y}_{..})^2}$$

and the adjusted coefficient

$$\bar{R}^2 = R^2 - \frac{I-1}{n-I}(1 - R^2)$$

$$= 1 - \frac{\sum_i \sum_j (y_{ij} - \bar{y}_{i.})^2/(n-I)}{\sum_i \sum_j (y_{ij} - \bar{y}_{..})^2/(n-1)}$$

Several conclusions emerge. First, the coefficients of determination clearly indicate that the industry of a firm is not a dominant variable in determining profit rate levels. Except for the profits-to-sales ratio, which is influenced by large interindustry differences in factor proportions, at least some of the F values for each statistic are nonsignificant.

Even more striking is the fact that the proportion of the total variance explained by industry means does not rise as the level of industry detail increases. The presumed greater homogeneity of four-digit as compared

TABLE 1 Percent of Variance among Firm Profit Rates Explained by Industry Means, 1968–1970 and 1966–1970

Profit Measure and Industry Classification	Firms with Specialization Ratio of 0.5 or More: Percent of Variance Explained, Unadj. (1)	Adj. (2)	F Value (3)	All Firms in Sample for Industries Included in Cols. 1 and 2: Percent of Variance Explained, Unadj. (4)	Adj. (5)	F Value (6)
(Net income + fixed charges)/total assets:						
3-digit SIC						
3-yr. average	34.34	10.34	$F_{51,151} = 1.55^{a}$	29.61	18.38	$F_{50,259} = 2.18^{b}$
5-yr. average	33.85	15.08	$F_{50,149} = 1.52^{a}$	28.43	12.32	$F_{50,259} = 2.06^{b}$
4-digit SIC						
3-yr. average	34.90	12.24	$F_{44,121} = 1.47$	27.07	11.73	$F_{44,186} = 1.57^{a}$
5-yr. average	30.68	9.59	$F_{44,121} = 1.22$	24.51	7.15	$F_{44,186} = 1.37$
Operating income/total assets:						
3-digit SIC						
3-yr. average	35.15	15.55	$F_{64,206} = 1.75^{b}$	29.55	15.83	$F_{64,335} = 2.20^{b}$
5-yr. average	32.09	11.52	$F_{64,206} = 1.52^{a}$	27.78	13.12	$F_{64,335} = 2.01^{b}$
4-digit SIC						
3-yr. average	40.17	17.00	$F_{55,139} = 1.70^{b}$	29.00	12.03	$F_{55,221} = 1.64^{b}$
5-yr. average	36.38	11.03	$F_{55,139} = 1.45$	28.46	10.95	$F_{55,221} = 1.60^{b}$

Profits available for common/common equity:			
3-digit SIC			
3-yr. average	33.66	12.70	$F_{62,188} = 1.54$[a]
5-yr. average	34.37	12.33	$F_{62,188} = 1.59$[a]
4-digit SIC			
3-yr. average	36.98	11.19	$F_{53,129} = 1.43$
5-yr. average	38.59	14.20	$F_{53,129} = 1.53$[a]
Operating income/sales:			
3-digit SIC			
3-yr. average	42.22	24.42	$F_{63,206} = 2.39$[b]
5-yr. average	46.92	30.68	$F_{63,206} = 2.89$[b]
4-digit SIC			
3-yr. average	43.02	21.05	$F_{54,139} = 1.94$[b]
5-yr. average	49.59	29.77	$F_{54,139} = 2.53$[b]

SOURCE: See accompanying text.
[a]Indicates significance at .05 level.
[b]Indicates significance at .01 level.

with three-digit industry groupings is not associated with higher coefficients of determination. Similarly, when data are limited to firms with specialization ratios of 0.5 or more in the primary industry, the results are, in general, no different from those based on the entire sample of firms. This was also true when data were limited to firms with specialization ratios of 0.7 and 0.9, though the latter results are not shown in Table 1. All these results reinforce the conclusion that the role of industry and market characteristics in determining the level of profit rates is relatively weak, on the average, as compared to the role of variables that pertain to individual firms.

Though, frankly, we found the results surprising, it might be argued that most of the industry categories probably did not differ greatly with respect to market structure. Moreover, the period chosen, 1966–1970, was generally one of high, that is, equilibrium, levels of output. Hence, variations in the sensitivity of industries to cyclical fluctuations had little influence on our results. What conclusions would emerge if industries were segregated so as to take account of basic differences in market structure? In the next section we examine this question.

CONCENTRATION AND PROFIT RATES

We are now ready to examine directly the single-variate relation between concentration and profit rates. Following Bain's approach, we examine several dichotomous relations, that is, the distinction between firms in high- and low-concentration industries is made on the basis of several alternative boundaries with respect to the concentration ratio. This procedure—as contrasted with testing of a continuous relation between the variables—is followed because Bain argued (with some merit) that a fairly high concentration ratio is required before a positive effect on profit rates can be expected. Both he and other authors[6] reported higher profit rates for concentrated industries only when concentration exceeded a high threshold.

Table 2 shows the relation of average profit rates to concentration in three ways. First, the average profit rates are shown for firms grouped, on the basis of primary activity, into industries with 1967 eight-firm concentration ratios of more and less than 70 percent (columns 1 and 2). Second, the results are shown with a grouping of firms based on whether concentration ratios were more or less than 50 percent (columns 3 and 4). Third, firms are divided into two groups (upper 20 percent and lower 80 percent) on the basis of weighted concentration ratios (columns 5 and 6), that is, the concentration ratio for each four-digit industry in which the firm is

active is weighted by the proportion of the firm's manufacturing employment located in that industry. The purpose of weighting is to correct for the error of attributing all the income of a firm to a single industry. Since product diversification is considerably greater for large than for small firms, the potential error for a given industry will depend, in part, on the size distribution of firms in that industry. Without correction, this introduces a serious problem for tests of hypotheses on market concentration because of the importance of large firms in many industries characterized by high concentration.

In brief, the differences in profit rates between firms with activities in more and less concentrated industries were small for all measures of concentration and profit rate,[9] and for both three-year and five-year intervals in the 1966–1970 period. The results were substantially the same when annual data were examined, though those are not shown in Table 2. For the classification of firms on the basis of primary industry, the high-concentration categories had the lower average profit rates in most cases, but the differences were very small, and none of the F values was significant at the 0.05 level. For the weighted concentration ratios, the high-concentration categories showed the higher profit rates in most cases; but, again, the F values were nonsignificant at the 0.05 level.

Turning once again to the classification of firms according to concentration on the basis of primary industry, we see the striking fact that relative profit rates for high- and low-concentration categories were substantially the same whether or not the sample was limited to the specialized firms (those with primary industry specialization ratios of 0.5 or more). This result reinforces our conclusion that the relation of profit rate level to concentration was not simply concealed by the phenomenon of product diversification.

The results lend themselves to several interpretations. One interpretation is that in a society in which explicit collusion is effectively blocked by antitrust laws, even high concentration is consistent with the existence of sufficient rivalry to force profit rates to competitive levels. In short, concentration is an inadequate index of monopoly power. An alternative interpretation is that the returns from noncompetitive prices are either dissipated through waste or appropriated by factor inputs other than capital (i.e., labor).

Still a third alternative is that comparisons of profit rates are misleading unless the profit rates are adjusted for differences in risk. While the introduction of variables that capture risk might help reveal some net relation between concentration and profitability, within the framework of the "strong" hypothesis (as stated earlier) the issue can be put more bluntly. Specifically, is there evidence of systematically lower risks for high-concentration industries, with the result that identical profit rates may

TABLE 2 Relation of Average Profit Rate to Concentration[a]

Profit Measure	Primary Industry Concentration of Firms[b]				Weighted Concentration[c]	
	≥70% (1)	<70% (2)	≥50% (3)	<50% (4)	Upper 20% of Firms (5)	Lower 80% of Firms (6)
(Net income + interest)/total assets:						
1. ≥0.5 specialization firms[d]						
3-yr. average	.0630 (24)	.0663 (141)	.0666 (70)	.0653 (95)		
5-yr. average	.0679 (24)	.0717 (141)	.0708 (70)	.0713 (95)		
2. All firms in sample for industries included in line 1						
3-yr. average	.0627 (32)	.0665 (199)	.0661 (78)	.0659 (153)		
5-yr. average	.0662 (32)	.0718 (199)	.0698 (78)	.0662 (153)		
3. All firms in sample						
3-yr. average					.0748 (73)	.0679 (293)
5-yr. average					.0776 (73)	.0730 (293)

Operating income/total assets:						
1. ≥0.5 specialization firms[e]						
3-yr. average	.1302	.1479	.1420	.1480		
	(24)	(171)	(72)	(123)		
5-yr. average	.1360	.1574	.1487	.1584		
	(24)	(171)	(72)	(123)		
2. All firms in sample for industries included in line 1						
3-yr. average	.1320	.1488	.1409	.1501		
	(32)	(245)	(98)	(179)		
5-yr. average	.1359	.1581	.1484	.1595		
	(32)	(245)	(98)	(179)		
3. All firms in sample						
3-yr. average					.1505	.1499
					(89)	(356)
5-yr. average					.1580	.1590
					(89)	(356)

SOURCE: See accompanying text.

[a]Figures in parentheses below average profit rates signify sample size.

[b]Based on eight-firm concentration ratio of primary industry as reported in *Census of Manufactures, 1967.*

[c]Based on eight-firm concentration ratio as reported in *Census of Manufactures, 1967.* However, the concentration ratio for each manufacturing industry in which the firm was active was weighted by the ratio of the firm's employment in that industry to the firm's total employment in manufacturing.

[d]Specialization in the firm's primary industry at the four-digit level of detail.

[e]Limited to firms with primary four-digit industries in manufacturing.

reflect higher rates of return per "unit of risk" in the high-concentration industries?

While several studies show a relation between the variance in profit rates and firm size or the firm's market share,[10] no firm evidence exists on the relation between measures of risk and market concentration. If risk is measured by the interfirm variance in profit rates, the firms in our sample that were in the top 20 percent based on weighted concentration ratios showed a somewhat higher standard deviation in profit rates than the rest of the sample. This was true for seven out of ten years in the 1961–1970 period if profit rates are measured by the ratio of net income plus fixed charges to total assets, though the differences in standard deviations were generally quite small.

THE STABILITY OF VARIATIONS IN PROFIT RATES

Let us turn once again to equation 1. If one groups companies by industry and the samples are sufficiently large, the w's should tend to yield zero sums, leaving the x's and the v's as sources of variation in profit rates (since there is no reason to assume that the v's also sum to zero when firms are grouped by industry). Since the w's are, by definition, transitory, greater serial correlation should be expected in profit rates for industry averages than for individual firms.

A key question is the rate at which serial correlation arising from the x and v variables declines over time. With respect to market forces, the issue is aptly stated by Stigler:

> Competitive industries will have a volatile pattern of rates of return, for the movements into high-profit industries and out of low-profit industries will—together with the flow of new disturbances of equilibrium—lead to a constantly changing hierarchy of rates of return. In the monopolistic industries, on the other hand, the unusually profitable industries will be able to preserve their preferential position for considerable periods of time.[11]

In short, do the x variables identify quasi-permanent differences among industries or merely disequilibriums? Indeed, are deviations from the norm of the competitive structure of markets themselves examples of disequilibriums?

Substantially the same issues arise when we look at the v variables. If some form of business organization, production technique, or set of labor skills leads to superior profit performance, will it be rapidly imitated and acquired by competing firms? Or are there specialized resources, human or physical, that cannot be readily acquired by other firms? Anecdotal evi-

dence can be cited for both types of phenomena, and the issue remains to be resolved empirically.

Table 3 shows the *regression* coefficients computed for each matrix of serial correlations for the relevant samples of firms or industries for profit rates in the 1961–1970 period. A matrix of serial correlations was computed for each of two measures of profits, for each of various samples of firms, and for both individual firm data and groupings of firms by primary industry. Thus, for each matrix (for example, the matrix for the ratio of operating income to total assets for all firms with a specialization ratio of more than 0.5), there are nine serial correlations between profit rates in two adjacent years, eight for profit rates two years apart, and so forth. Appendix Table B-1 shows, for illustrative purposes, the correlation of 1961 profit rates with those for each of the nine succeeding years and of 1970 profit rates with those for each of the nine preceding years. Table 3, then, measures the rate of decline in serial correlation as the time elapsed increases (thus providing answers to questions such as, How much lower is the correlation of 1960 and 1962 profit rates than of 1960 and 1961 or 1961 and 1962 profit rates?). The correlations for each set of intervals, for example, all correlations for profit rates two years apart, are not averaged. Each correlation coefficient is a separate observation for purposes of computing the regression coefficients.

Comparing first the serial correlation coefficients[12] with those obtained by Stigler[13] we find that (1) even for ungrouped data, that is, for the sample of individual firms, the coefficients we computed declined more slowly than Stigler's estimates for the unconcentrated industries; and (2) our estimates for three-digit industry groupings, without reference to concentration, showed a rate of decline in correlation coefficients roughly comparable to Stigler's for the high-concentration category of industries. In sum, Stigler found substantially less stability than we did, probably because the industry averages he used, particularly for the unconcentrated category, were strongly influenced by the instability in the profit rates of small firms.

We can next compare the regression coefficients in Table 3 as we shift from samples of firms limited to those with 0.5 specialization (columns 3 and 6) to the entire sample of firms but limited to the same industries (columns 4 and 7). For ungrouped data, the two types of samples yield roughly the same regression coefficients. As we shift to serial correlations for industry groupings, however, the reduction in random variance unveils a statistically significant difference in coefficients. The samples of more homogeneous companies in terms of product structure (those limited to firms with a specialization ratio of at least 0.5) yield a more stable pattern of profit rates with substantially lower rates of decline in serial correlation. This, in turn, reflects the role of the x variables in equation 1. That is, companies that are less diversified are associated with market characteris-

TABLE 3 Rates of Decline in the Serial Correlation of Profit Rates,[a] 1961–1970

Profit Measure	All Firms in Sample (1)	All Industries: 3-Digit Level (2)	Firms with ≥0.5 Specialization at 3-Digit Level (3)	All Firms in Sample in Industries Covered in Col. 3 (4)	All Industries: 4-Digit Level (5)	Firms with ≥0.5 Specialization at 4-Digit Level (6)	All Firms in Sample in Industries Covered in Col. 6 (7)
(Net income + interest)/total assets:							
Firm data	.05241		.05533	.05498		.05361	.05385
	(409–471)		(245–288)	(366–425)		(219–262)	(326–377)
Industry data		.05352	.03972	.05557	.05070	.03821	.04348
		(129–135)	(94–102)	(97–102)	(193–215)	(113–137)	(121–138)
Operating income/total assets:							
Firm data	.05369		.05794	.05481		.05808	.05461
	(471–507)		(290–310)	(422–457)		(261–281)	(375–405)
Industry data		.05983	.04656	.06001	.04693	.03706	.04070
		(136–137)	(101–103)	(101–102)	(213–222)	(130–139)	(133–139)

SOURCE: See accompanying text.

[a] Rates of decline over time are measured by regression coefficients computed for the matrix of serial correlation coefficients for the period 1961–1970. Range of sample size is indicated in parentheses below the regression coefficients. Sample size varies depending upon which two years were correlated.

tics that are more distinctive and consistent over time—hence the greater stability of cross-sectional differences in profit rates.

We are now ready to examine the relation of cross-sectional stability in relative profit rates to concentration (Table 4). In general, our results confirm Stigler's findings. The upper 20 percent of firms in terms of weighted concentration ratios yielded distinctly lower regression coefficients (that is, rates of decline in the r's) than the rest of the sample. In addition, and consistent with that result, the regression coefficient was reduced when the sample for the high-concentration category was limited to specialized firms. The effect of limiting the sample to specialized firms was opposite for the low-concentration category. In short, for the low-concentration category, product diversification, by reducing the random or cyclical variance in profit rates, increases the stability of relative profit rates. In contrast, for the high-concentration category, the loss in the distinctiveness of market characteristics that results from greater product diversification has a negative effect on cross-sectional stability. This negative effect is greater than the positive effect of the averaging of random and cyclical disturbances associated with particular markets.

TABLE 4 Rates of Decline in the Serial Correlation of Profit Rates for Firms in High-Concentration and in All Other Industries[a]

	Weighted Concentration Ratio			
	Upper 20 Percent of Firms		Lower 80 Percent of Firms	
Profit Measure	All Firms in Sample	Firms with ≥0.5 Specialization at 4-Digit Level	All Firms in Sample	Firms with ≥0.5 Specialization at 4-Digit Level
Income + interest/ total assets	.04891 (84–95)	.04256 (54–64)	.05354 (333–375)	.05759 (164–197)
Operating income/ total assets	.04407 (97–101)	.03997 (66–70)	.05701 (372–403)	.06295 (194–210)

SOURCE: See accompanying text.

[a] Rates of decline over time are measured by regression coefficients computed for the matrix of serial correlation coefficients for the period 1961–1970. Range of sample size is indicated in parentheses below the regression coefficients. Sample size varies depending upon which two years were correlated.

Each firm's concentration was computed by weighting the eight-firm concentration ratio for each manufacturing industry in which the firm had activities by the proportion of the firm's manufacturing employment located in establishments classified in the industry.

How can the strong effect of concentration on stability be reconciled with an apparent absence of observed effect of concentration on the level of profit rates? As indicated by Stigler, it is reasonable to expect that in high-concentration industries—that is, industries with presumably high entry barriers—when above-average profits are present they can persist for long periods of time. But if profits are below average in a particular high-concentration sector, will there not be a rapid shift of resources to competitive industries with higher profit rates? If so, the average for the concentrated sector should generally be above that for the more competitive industries.

The answer to the riddle lies in the proposition that high-concentration industries are associated not only with high entry barriers, but also with high exit barriers. Indeed, substantially the same factors contribute to both. Entry barriers arise largely from the possession by firms in concentrated industries of specialized human or physical capital that is difficult for others to acquire. But, conversely, the specialization of capital renders it difficult to shift such capital to new uses in more profitable sectors of the economy. If true, this would imply that while the risks of market erosion from competitive pressures are less in concentrated industries, such industries are more vulnerable than average to structural changes in the economy and in the composition of demand.

APPENDIX A: THE DATA BASE

The first element in our data base was the Dun and Bradstreet establishment record (hereafter referred to as DB data) for the 1,000 largest companies in the United States. That record shows the number of employees for each establishment for each of the 1,000 companies in 1970, and the primary industry of the establishment. Each of the companies was then matched with the identical firm in the Compustat tape for 1970. Limiting the list to companies that were successfully matched left us with a sample of 884 firms. For each of the companies, employment was aggregated for all the establishments, and the aggregate was expressed as a ratio to total employment for the company as shown in the Compustat record. That ratio was then used as a test of the completeness and reliability of information.

Our next step was to merge the DB record for the 884 firms with that obtained from Economic Information Systems, Inc. (EIS). The EIS and DB data we obtained are similar in that both show employment for each establishment of a company, and the establishments are classified by primary SIC (Standard Industrial Classification) four-digit activity. Both

also have common establishment and company codes and an indication of the geographic location of each plant. EIS data obtained by us were also for 1970 and encompassed 1,138 manufacturing companies, each matched with the identical company in the Compustat record (and comprising virtually all manufacturing firms in the latter source). A difference between DB and EIS information is that the latter excludes plants with fewer than fifty employees and those engaged in nonmanufacturing activities. Both DB and EIS data exclude central offices and foreign establishments of U.S. companies.

The DB and EIS lists of establishments for particular companies are not identical, each body of data containing some not listed in the other. An integrated tape was therefore developed subject to the following rules:

1. To the DB record for each company for which there was also EIS information, we added all establishments shown in the EIS but not in the DB record.[14]
2. Companies which were only in the EIS list but not in the DB record, and vice versa, were also included in the integrated tape. The resulting computer tape contains data for 1,381 companies. For each company, a ratio was computed of aggregate employment in all its establishments to the Compustat total for the company as a whole.

In selecting a test of adequacy of data, a primary objective was to assure that the scope of employment data for each company was consistent in terms of establishments and industry coverage with that implicit in financial statistics—in short, that both categories of information were based on a common definition of the company. Accordingly, we adopted the conservative rule that inclusion in the sample drawn from the larger list required a ratio of aggregate plant employment to company employment (the latter as shown in Compustat) of between 0.8 and 1.2. The rule was a stringent one since (1) our plant data excluded central office employment, and (2) there were substantial lags in reporting changes in plant employment, with the result that plant data and Compustat employment data did not necessarily refer to the identical point in time. The sample generated by our rule was doubtless significantly reduced by the absence from the plant record of information on foreign establishments and by the fact that data for nonmanufacturing activities were considerably less complete than those for manufacturing.

The analysis reported in our paper is based on a sample drawn as follows: Using the limits of 0.8 and 1.2 for the ratio discussed above, 283 companies were drawn from the original list of 884 in the DB record. Employment data for those companies were drawn exclusively from DB

information. An additional sample of 178 companies was drawn from the integrated tape, subject to the same selection rule. Finally, to broaden the sample, an additional 46 companies were included for which qualitative information contained in annual reports was sufficient to classify the firms as single-industry enterprises. The total sample, therefore, comprised 507 firms. Table A-1 contains a frequency distribution of the companies in the sample, excluding the above-mentioned 46, classified by the primary three-digit and four-digit specialization ratio.[15] A striking fact is that even at the fairly broad three-digit level, 197 of the 461 firms had a specialization ratio of less than 0.5.

TABLE A-1 Frequency Distribution of 461 Firms by Primary Three-Digit and Four-Digit Specialization Ratio[a]

Specialization Ratio	Number of Firms	
	Three-Digit Ratios	Four-Digit Ratios
0.10–0.19	19	32
0.20–0.29	50	67
0.30–0.39	68	66
0.40–0.49	60	60
0.50–0.59	50	51
0.60–0.69	50	50
0.70–0.79	44	40
0.80–0.89	39	33
0.90–0.99	53	39
1.00	28	23
Total	461	461

SOURCE: See accompanying text.

[a]The specialization ratio was defined as employment in the primary three-digit or four-digit industry divided by total company employment.

TABLE B-1 Serial Correlation Coefficients for Profit Rates, 1961 and Succeeding Years and 1970 and Preceding Years[a]

Category and Year	Years Elapsed 1	2	3	4	5	6	7	8	9
All firms									
1961	.751	.590	.543	.494	.437	.368	.355	.330	.252
1970	.761	.629	.472	.340	.345	.437	.369	.284	.252
3-digit industries[b]									
1961	.893	.761	.610	.692	.614	.630	.663	.523	.463
1970	.845	.731	.639	.500	.491	.594	.519	.482	.463

SOURCE: See section in text, "The Stability of Variations in Profit Rates."
[a]Profit rates measured by the ratio of net income plus fixed charges to total assets.
[b]Limited to firms with a primary three-digit specialization ratio of at least 0.5.

NOTES

1. For a detailed summary of studies prior to 1969, see Leonard Weiss, "Quantitative Studies of Industrial Organization," in Michael D. Intrilligator, ed., *Frontiers of Quantitative Economics* (Amsterdam: North-Holland, 1971).
2. One exception is George J. Stigler, *Capital and Rates of Return in Manufacturing Industries* (Princeton, N.J.: Princeton University Press, 1963). A second is a work by Brozen, in which he concludes that the association between concentration and profit rates found by Bain is attributable to the sample of industries chosen. Brozen further argues that the higher profit rates of concentrated industries as reported by Bain merely reflect transitory disequilibrium. See Yale Brozen, "The Antitrust Task Force Deconcentration Recommendation," *Journal of Law and Economics*, October 1970; and Brozen, "Bain's Concentration and Profit Rates Revisited," *Journal of Law and Economics*, October 1971.
3. A fourth study, that of W. G. Shepherd, "The Elements of Market Structure," *Review of Economics and Statistics*, February 1972, employs data on firms but does not offer a direct test of the role of market concentration in explaining profits.
4. U.S. Federal Trade Commission, *Economic Report on the Influence of Market Structure on Profit Performance of Food Manufacturing Firms*, 1969.
5. M. Hall and L. Weiss, "Firm Size and Profitability," *Review of Economics and Statistics*, August 1967.
6. J. S. Bain, "Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936–40," *Quarterly Journal of Economics*, August 1951. Bain's study contains tests based on industry aggregates as well as firm data.
7. Stigler, *Capital and Rates of Return*, p. 62, found that deflating assets had little effect on the measurement of rates of return for 1938–1947 and 1947–1954, at least at the two-digit level.
8. For example, George J. Stigler, "A Theory of Oligopoly," *Journal of Political Economy*, February 1964.
9. In principle, the ratio of operating income to assets should have excluded assets that do not contribute to operating income. The identification of such assets, however, is elusive both conceptually and empirically. Our analysis excluded the rate of return on common

equity since there is no solid theoretical or empirical basis for assuming a relation between concentration and leverage. The ratio of profits to sales was excluded because of its sensitivity to variations in factor proportions.

10. For example, Gloria Hurdle, "Leverage, Risk, Market Structure and Profitability," *Review of Economics and Statistics*, November 1974. Variance in profit rates may not be the relevant measure of risk where relevance depends upon how a manager assesses risk in making capital outlay decisions. A measure of risk widely used in the context of stockholder decision problems—the beta coefficient—does not seem appropriate for our problem.
11. Stigler, *Capital and Rates of Return*, p. 70.
12. The matrices of coefficients are not reproduced in this paper for lack of space. Table B-1, however, gives some illustrative examples.
13. Stigler, *Capital and Rates of Return*, p. 71.
14. This probably led to duplication for some companies because of inadvertent discrepancies in establishment codes.
15. Specialization ratio was defined as employment in the primary industry divided by total employment.