Profitability, Uncertainty, and Firm Size

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ABSTRACT. This paper examines the connections between variations in profit and loss rates among firms in small-firm and large-firm size classes as reflections of uncertainty. We find that, within industries, such variations are particularly great for firms in small-firm size classes, leading to operating policies for small firms best characterized as entrepreneurial. Large firms, in contrast, faced with less uncertainty in earning profit, appear to adopt policies that manifest an emphasis on strategic planning.

I. Introduction

Largely missing in current explanations of the differences in profitability that arise among firms is concern for the entrepreneurial drives that early on were presumed to be the essence of the competitive dynamic. The reason for this lapse, this paper argues, is our failure to tie the behavior of firms in markets to the uncertainties that are inherent in economic change. These uncertainties are clearly manifest in the wide variations between profit rates and loss rates confronting managers of differently positioned firms.

Knight (1921) made adjustment to uncertainty a central factor in explaining the higher rates of return that some firms realized as compared to others. But Knight failed to take the next step, i.e., to examine how firms facing more or less risky prospects (profit opportunities) frame competitive strategies. With the presumed (and observed) depredations of large firms still a major concern, uncertainty has given way in recent times to market power as the analytical concept most relevant to explaining profit differences. Attention now focuses on the practices large firms in concentrated industries are in a position to impose in order to earn profit "excesses", as captured in the structure-conduct-performance paradigm. Under the sway of this forceful approach, the behavior of small firms has become a more or less easily assumed, and supposedly "neutral", benchmark.

It is the contention of this paper that omitting uncertainty from the analysis leads to an incomplete view of competitive behavior. For one thing, profit patterns are distorted: modestly higher average profit rates in favor of large firms are overemphasized; the much more substantial variations between the profit and loss rates experienced by all firms, and particularly small firms, are largely ignored. For another thing, strategic behavior is misrepresented: growth drives among large firms that lead to profit constraint are underemphasized; the difficulties involved in choosing innovative strategies for small firms in turbulent markets only loosely examined. Competitive behavior appears in a more revealing light, we propose, when the strategies small firms and large firms are developing to earn profit are related to the differing degrees of uncertainty faced by these two kinds of firms.[1]

Using information from the IRS *Corporate Source Book of the Statistics of Income* (CSB-SOI) for illustrative purposes, the paper develops this proposition in the following steps. Section II reviews some relevant current research into differences in profit rates. Section III details our analytical approach to uncertainty and defines the measures used to characterize firm strategies with CSB-SOI data. Section IV provides brief comments on the data source itself. Section V reports our empirical findings for the two years studied (one a recession year, the other a prosperous year). We conclude in Section VI that uncertainty in earning profit does indeed differentiate strategies for small firms, with their entrepreneurial characteristics, from those of large firms, where less uncertain operating conditions point toward strategic planning.

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II. Research review

Most research on differences in profitability has focused on profit rates earned by firms with varying market positions as manifest by market share, and has often been extended to include firm size. Contrary to expectations derived from neoclassical theory, many studies (often studies using CSB-SOI data) have found no positive relationship between profitability and firm size [e.g. Amato and Wilder (1985), Caves and Pugel (1980), Marcus (1969), Schmalensee (1987)].[2] Some studies have even found that small firms exhibit significantly higher profit rates than large firms [e.g. Osborn (1970), Stekler (1963), Ballantine, Cleveland, and Koeller (1985/86, 1988)], leading their authors to seek out a connection between profitability and uncertainty. Stonebraker (1976) associates high profitability in an industry, primarily for large firms, with high risk of entry faced by small firms and, by implication, with high earnings requirements for small firms that succeed.

It is a familiar axiom of finance, of course, that risks and returns are positively related. Yet largely because the structure-conduct-performance paradigm associates high profitability with large, relatively secure firms, it seems, only limited efforts have been made to extend this axiom to the analysis of the competitive behavior of firms. Research by Winn (1977), Hurdle (1974) and others does find that risk (measured as the variance of profit rates over time) is positively related to average profitability. But these studies exclude small firms, where much of the risk is likely to be.[3]

Among researchers using the CSB-SOI data base, Osborn (1951, 1970) is the one who first stressed the high rate of losses among small firms and its possible effect on average profit rates. Osborn argues, in fact, that comprehensive reporting on the distribution of profit rates by size class within an industry, made with CSB-SOI data, should present not just average profit rates over all firms, but also information on the dispersion of profit rates, as reflected in the average profit rates for firms with income and average loss rates for firms without income.

The intra-industry approach to the study of variations in profitability, which we consider appropriate for this study, was first developed by Marcus and later expanded by Caves and Pugel and Schmalensee (1985, 1989). In these studies, all of which used CSB-SOI data, profitability measures were regressed on firm size across asset-size classes within selected manufacturing industries. As noted by Marcus and Schmalensee (1985), an advantage of intra-industry analysis is that it does not require the addition of separate regressors to account for industry-level distinctions. The object of inquiry is to describe certain characteristics of firm behavior under particular industry conditions, not to estimate a structural model identifying the determinants of profitability as revealed by cross-industry experience.

III. Analytical approach

The basic propositions underlying this study are first, that ranges between profit and loss rates in small-firm and large-firm size classes reflect the differing degrees of uncertainty that managers of the firms involved face, and second, that differences in uncertainties so measured are related to the differing operating characteristics — as reflected in asset intensities, debt levels, and advertising intensities — manifested by the two types of firms. In exploring these propositions with CSB-SOI data, we start by examining differences in profitability and in operating characteristics by size class for all firms (those with and those without income combined). This analysis provides information on average performance by size class, typical of previous studies, and is a useful benchmark for extended analysis. However, given the diverse mix of firms within each size class, we reason that size-class averages are not likely to be indicative of the profit performance and operating policies of particular firms of a given size, and more generally, of the uncertainties that firms in the size class face as to prospects for earning profits and/or losses. To proxy the behavior of two distinctive types of firms (and managements), we therefore also examine performance patterns for firms *with* income and for firms *without* income.

Defined below are the measures of the key variables investigated in our research together with a brief statement of the logic tying each variable to uncertainty and to firm size.

i. *Measures of profitability*

Two conventional measures of profitability are examined: profit (loss)-on-assets defined as after-tax net income (loss) divided by total assets; and before-tax profit (loss)-on-sales, defined as income (loss) before interest and taxes divided by total sales.[4]

Because operating results are uncertain, we argue following Mills and Schumann (1985), managers of small firms are anxious to preserve flexibility. To this end they seek high returns-on-assets. Following Baumol (1959), we argue that managers of large firms, in contrast, somewhat better able to plan for the future, are likely to pursue strategies requiring relatively low returns-on-assets in order to encourage growth. Because small firms tend to have relatively high sales/assets ratios (see ii. below), profit-on-sales needed to attain these differing profit goals are likely to be comparable between small and large firms (i.e., profit-on-assets equals profit-on-sales multiplied by the sales/assets ratio).

Insofar as the losses occasioned by uncertainties are indeed great for small firms, we expect that the high profit rates on assets that small-firm managers are seeking will not be observed when profit rates are calculated using data for all firms in a size class. As already explained (and following Osborn), relatively high losses for small firms can be expected to reduce average profit rates in small-firm size classes. As a result, we expect that differences in profitability across size classes for all firms will be small.

However, when the performance of profitable firms is separated out from that of all firms combined, we think the profitability record will confirm our logic, i.e., profit-on-assets earned by small, "entrepreneurial" firms will exceed that earned by large, planning-oriented firms, with profit-on-sales for the two being more or less comparable. By the same token, we think that the record for unprofitable firms will show that small firms sustain substantially higher losses-on-assets than do their larger counterparts, and that, again, losses-on-sales are comparable.

ii. *Measures of asset intensity*

The measures of asset intensity examined in this study are the ratios of total receipts (or sales) to total assets and of total receipts (or sales) to depreciable assets.

In view of the uncertainties associated with operations, we reason, managers of small firms adopt relatively flexible production technologies, as reflected in relatively high sales/assets ratios, thus limiting associated fixed costs. This hypothesis is consistent with the recent findings by Mills and Schumann and Caves and Pugel. It is also consistent with the findings of Greenwald and Stiglitz (1990) that "entrepreneurial" firms facing considerable uncertainty and financing constraints are not likely to pursue substantial investment activities. Managers of large firms, in contrast, with somewhat more certain planning horizons and attracted by economies of scale and scope, are likely to pursue policies yielding relatively high asset intensity (and low sales/assets and sales/depreciable assets ratios), a proposition well documented in industrial economics research.

These projected differences in asset intensity between small firms and large firms are sufficiently general that we expect them to be confirmed by analysis of data including all firms. Among profitable firms, however, we anticipate that the sales/assets ratios and sales/depreciable assets ratios will be higher than for the all-firm data set, and especially so for small firms. Among unprofitable firms, we anticipate that these results will be reversed, i.e., that sales/assets and sales/depreciable assets ratios will be lower than for the all-firms data set, and especially for small firms.

iii. *Measures of debt*

Debt financing is measured by two standard ratios: short-term interest-bearing debt to total assets and long-term interest-bearing debt to total assets.

The connection between debt financing and uncertainty is well established. On the macroeconomic level, there is concern that increased reliance on debt may lead to periodic "liquidity" crises as the financial community loses the wherewithal needed to cope with change [see e.g., Friedman (1982), Minsky (1986), and Bernanke and Campbell (1988)]. At the microeconomic level, the concern is that through excessive reliance on debt, firms may be saddling themselves with financial structures that are inhibiting.

In line with this thinking, we reason that finance will be a particularly severe problem for small, "entrepreneurial" firms, where reliance on debt is great, a reasonably well-documented generalization. Following Stowe, Watson, and Robertson (1990), we argue that debt structure itself — short term vs. long-term — will reflect firms' asset structures. Short-term financing is thus expected to be greater for firms in industries where current-asset investments are substantial (e.g., Trade), and to vary with firm size on the same basis. Long-term debt ratios, reflecting relative difficulties in obtaining equity financing, are expected to be higher for small firms than for large firms. Following Stowe, Watson, and Robertson, we expect further that firms that can (firms with income) will use internal financing sources to keep long-term debt ratios low.

With the projected financial characteristics of firms as with the projected asset characteristics, we think that the policy differences between small firms and large firms are sufficiently well defined to be captured by data for all firms. Among profitable firms, however, we anticipate considerably less reliance on debt financing than on average, especially long-term debt, and particularly among small firms. As for unprofitable firms, following Scott and Pascoe (1985) we anticipate higher debt burdens than for all firms, or for profitable firms, especially among small firms.

iv. *Measures of advertising intensity*

Our measure of advertising intensity is advertising expenditures per dollar of total receipts, a conventional proxy for firm efforts to differentiate their products (see e.g., Caves and Pugel).

Since the 1930's product differentiation has been recognized as an important strategy for competing firms. For small firms, policies designed to attain market niches through specialized product features and/or services are relatively familiar routes to differentiation. For large firms, making products "different" via vigorous advertising efforts represents another approach.

In line with these observations, we reason that small firms, with customized marketing strategies, will exhibit relatively low advertising intensity: with high price elasticities, prospective sales gains are not expected to generate sufficient margins to justify the advertising expense, a proposition in accord with the Dorfman-Steiner (1954) theorem. For large firms, where market power is greater than for small firms and price elasticities less, the payoffs from advertising are likely to be greater. Following Caves and Pugel, we reason that in selected industries, e.g., Manufacturing and Retail Trade, advertising intensities for large firms will be relatively high.

Here too, as with asset intensity and debt burdens, we expect patterns of advertising intensity by industry and firm size to be sufficiently distinctive to be captured by analysis for all firms. For profitable firms, we further expect, strong performance will lower the realized ratio, i.e., payoffs in sales from given advertising expenses will be higher. For unprofitable firms, this effect is likely to be reversed.

IV. The data source

CSB-SOI data have been extensively used in profitability studies [e.g., Caves and Pugel, Marcus, Stekler, Stigler (1963), and Schalensee (1987, 1989)] because coverage is comprehensive, consistent, and inclusive of considerable financial detail. In this study, data on the key variables described above are derived directly from CSB-SOI tapes: first, for all corporations; second, for corporations with income. Data for corporations without income are then derived by careful differencing.

Previous studies with CSB-SOI data often omit firms with less than $500,000 in assets (the first three of eleven size classes reported) to avoid so-called "small-firm" bias [Kilpatrick (1968), Marcus]. The rationale behind this exclusion is that for tax purposes payments to owners may be overstated by some small firms, thus lowering reported profits. Following Osborn (1970), we believe that tax reports, despite possible and occasional biases in reporting profits, are the best source of data on profitability, and should be used to the fullest.[5] We therefore use data for all the size classes reported in the CSB-SOI.

This study covers all corporations reported in CSB-SOI with the exception of Finance, Insurance, and Real Estate (FIRE).[6] Most studies of

profitability focus only on Manufacturing, which includes fewer than half of the non-financial industries covered.

V. Empirical findings

Our results are presented: (1) as means for the several variables, designed to distinguish the composite performance of small firms in each industry division from that of large firms (Tables I, III, and V); (2) as the summations of within-industry regression analyses of each variable related to firm size for the several industries included in each industry division (Tables II, IV, and VI). These results are reported first using data for all firms combined (Tables I and II); then for firms with income only (Tables III and IV); and finally for firms without income only (Tables V and VI). Prevalence among industries in a division of significant regression slopes (or their absence) is interpreted as reflecting the intra-industry differences that exist within each industry division.

Findings are for two years: 1975, a year of slack economic performance; and 1979, a year of peak

TABLE I
Characteristics of small vs. large firms: all corporations

Industry Division	After-tax Return on Assets		Before-tax Return on Sales		Sales/ Assets		Sales/ Deprec. Assets		Short-term debt/ Assets		Long-term debt/ Assets		Advert. Intensity	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
						1975 Means								
Agriculture	0.02	0.01	0.05	0.05	1.63	1.44	2.18	3.31	0.17	0.23	0.35	0.34	0.004	0.002
Mining	0.02	0.06	0.04	0.13	1.76	0.94	2.19	1.59	0.17	0.09	0.31	0.21	0.002	0.001
Construction	−0.04	0.01	0.01	0.03	3.39	1.53	7.17	5.07	0.19	0.12	0.26	0.19	0.004	0.002
Manufacturing	0.00	0.05	0.02	0.07	2.72	1.73	4.57	3.70	0.12	0.11	0.26	0.17	0.005	0.009
Transp. Comm. Util.	0.00	0.02	0.02	0.08	2.59	0.96	2.62	1.01	0.15	0.08	0.35	0.36	0.006	0.003
Goods Sector	0.00	0.04	0.02	0.06	2.83	1.59	4.96	3.55	0.15	0.11	0.28	0.20	0.005	0.007
Wholesale	0.05	0.07	0.02	0.05	4.03	2.89	13.37	14.30	0.11	0.17	0.18	0.11	0.004	0.004
Retail	0.01	0.03	0.02	0.04	3.73	2.80	8.91	6.98	0.12	0.14	0.27	0.18	0.012	0.017
Services	0.03	0.01	0.02	0.08	4.02	0.93	5.17	1.55	0.13	0.15	0.33	0.37	0.011	0.012
Service Sector	0.03	0.05	0.02	0.05	3.89	2.55	8.64	9.85	0.12	0.16	0.27	0.17	0.010	0.009
Non Financial	0.02	0.04	0.02	0.06	3.59	2.02	7.59	6.39	0.13	0.13	0.27	0.19	0.008	0.008
						1979 Means								
Agriculture	0.04	0.01	0.06	0.05	1.71	1.52	2.10	4.01	0.16	0.23	0.39	0.00	0.005	0.002
Mining	−0.02	0.04	0.03	0.11	2.47	0.84	3.89	1.46	0.15	0.10	0.34	0.25	0.002	0.001
Construction	0.05	0.02	0.03	0.04	3.95	1.55	8.33	6.12	0.18	0.14	0.26	0.16	0.003	0.002
Manufacturing	0.04	0.06	0.03	0.07	2.95	1.89	4.84	4.10	0.11	0.10	0.28	0.17	0.005	0.008
Transp. Comm. Util.	0.00	0.03	0.02	0.08	3.40	1.21	4.00	1.46	0.12	0.08	0.40	0.33	0.005	0.002
Goods Sector	0.03	0.05	0.03	0.07	3.34	1.75	5.92	4.07	0.15	0.11	0.30	0.19	0.004	0.006
Wholesale	0.04	0.07	0.02	0.04	4.51	2.97	15.77	4.50	0.12	0.18	0.22	0.12	0.004	0.004
Retail	0.02	0.03	0.02	0.03	4.20	3.36	10.17	8.60	0.12	0.27	0.34	0.17	0.012	0.014
Services	0.07	0.03	0.03	0.08	4.22	1.20	5.57	1.97	0.12	0.14	0.31	0.33	0.009	0.013
Service Sector	0.04	0.05	0.02	0.05	4.24	2.77	9.39	10.57	0.12	0.19	0.31	0.17	0.009	0.008
Non-Financial	0.04	0.05	0.02	0.06	3.99	2.26	8.43	7.31	0.13	0.15	0.31	0.18	0.008	0.007

Source: *Corporate Source Book, Statistics of Income*, 1975 and 1979.
Goods Sector and Non-Financial averages are calculated without Mining to avoid distortion.

TABLE II

Regressions of financial ratios vs. firm size within industry divisions: All corporations. Number of SOI industries with regression coefficients positive (+) or negative (−) are reported.

	SOI Industries	After-tax Return on Assets		Before-tax Return on Sales		Sales/ Assets		Sales/ Deprec. Assets		Short-term debt/ Assets		Long-term debt/ Assets		Advert. Intensity	
		+	−	+	−	+	−	+	−	+	−	+	−	+	−
						1975 Results									
Agriculture	2	0	0	1	0	0	1	0	0	1	0	0	0	0	1
Mining	5	1	1	4	0	0	3	1	2	0	2	1	2	2	1
Construction	6	4	0	6	0	0	6	1	2	0	6	0	5	1	5
Manufacturing	67	35	3	57	1	0	53	1	38	4	22	4	30	27	10
Transp. Comm. Util	12	4	4	10	1	1	8	0	8	1	5	4	4	3	7
Goods Sector	92	44	8	78	2	1	71	3	50	6	35	9	41	33	24
Wholesale	15	7	0	15	0	0	15	3	1	11	0	0	15	2	6
Retail	13	11	0	13	0	0	12	0	9	3	3	0	11	8	1
Services	12	5	3	11	0	0	12	0	10	3	3	2	3	2	2
Service Sector	40	23	3	39	0	0	39	3	20	17	6	2	29	12	9
Non-Financial	132	67	11	118	2	1	110	6	70	23	41	11	70	45	33
						1979 Results									
Agriculture	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Mining	3	2	0	1	0	0	2	0	2	0	1	0	1	0	0
Construction	6	3	1	1	1	0	6	1	2	0	3	1	5	1	5
Manufacturing	43	29	2	15	9	0	26	0	15	6	6	3	19	15	3
Transp. Comm. Util	7	6	0	4	1	0	7	0	5	0	2	2	4	2	1
Goods Sector	60	40	3	21	11	0	40	2	24	6	12	6	29	18	10
Wholesale	17	11	1	8	7	0	14	1	6	5	1	1	13	3	4
Retail	10	9	0	7	0	0	8	0	7	3	2	0	9	5	0
Services	6	5	0	3	2	0	6	0	3	0	4	2	1	0	2
Service Sector	33	25	1	18	9	0	28	1	16	8	7	3	23	8	6
Non-Financial	93	65	4	39	20	0	68	3	40	14	19	9	52	26	16

Note: Regression coefficients are significant at the 15 percent level (two tails).

profitability. In calculating means, small firms are defined as firms with less than $5 million in assets, large firms as firms with $5 million in assets or more. We recognize that this break point introduces some ambiguity into means calculated for different industry divisions, i.e., some industries have more assets per employee than others. Employment is the preferred method for defining firm size, to wit, the published reports of the U.S. Small Business Administration. But this method is not available when working with CSB-SOI data. For our purposes — making broad distinctions between the behavior of small, "entrepreneurial" firms and large firms — we think that the $5 million break point, arbitrary as it may be, is a workable and relatively consistent division.[7]

To adjust for the large number of small firms in many industries, means are calculated weighting by the number of firms (returns) in the several size classes classified as small or large. Weighting by dollar amounts did not change the results. In estimating regressions, logarithmic transforms of asset size are used to make this firm-size variable linear. Following Amato and Wilder, we employ weighted least squares [see Maddala (1977), pp. 268—76] to adjust for the use of data aggregated by size class to test firm-level propositions.

TABLE III
Characteristics of small vs. large firms: profitable corporations

Industry Division	After-tax Return on Assets		Before-tax Return on Sales		Sales/ Assets		Sales/ Deprec. Assets		Short-term debt/ Assets		Long-term debt/ Assets		Advert. Intensity	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
							1975 Means							
Agriculture	0.14	0.07	0.09	0.06	1.77	1.59	2.38	3.13	0.13	0.21	0.23	0.28	0.003	0.002
Mining	0.21	0.12	0.11	0.15	2.14	1.27	2.38	1.79	0.09	0.08	0.19	0.15	0.001	0.001
Construction	0.13	0.06	0.04	0.04	3.55	2.09	7.53	5.74	0.14	0.11	0.18	0.14	0.004	0.001
Manufacturing	0.12	0.08	0.05	0.07	2.79	2.12	4.88	3.76	0.09	0.09	0.17	0.13	0.005	0.009
Transp. Comm. Util.	0.11	0.06	0.05	0.06	2.55	1.34	2.66	1.49	0.12	0.08	0.27	0.33	0.007	0.003
Goods Sector	0.13	0.07	0.05	0.07	2.91	1.66	5.22	3.60	0.11	0.09	0.20	0.17	0.005	0.007
Wholesale	0.12	0.09	0.04	0.04	4.05	3.17	14.15	15.34	0.09	0.13	0.14	0.10	0.004	0.004
Retail	0.10	0.06	0.03	0.03	3.75	2.92	9.25	7.21	0.10	0.24	0.20	0.13	0.012	0.016
Services	0.18	0.06	0.05	0.06	4.20	1.35	5.26	1.89	0.09	0.14	0.22	0.31	0.009	0.012
Service Sector	0.14	0.08	0.04	0.05	3.99	2.64	8.89	10.75	0.10	0.14	0.20	0.15	0.009	0.008
Non-Financial	0.13	0.06	0.04	0.05	3.64	1.76	7.68	5.31	0.10	0.10	0.20	0.16	0.007	0.008
							1979 Means							
Agriculture	0.15	0.07	0.09	0.05	1.75	1.78	2.23	4.94	0.14	0.19	0.28	0.30	0.002	0.002
Mining	0.22	0.10	0.11	0.12	2.12	1.00	3.48	1.79	0.12	0.07	0.22	0.18	0.002	0.001
Construction	0.18	0.05	0.05	0.04	3.99	1.73	8.22	5.17	0.13	0.12	0.19	0.15	0.003	0.002
Manufacturing	0.15	0.09	0.06	0.07	2.91	1.91	5.15	4.07	0.09	0.08	0.20	0.15	0.005	0.008
Transp. Comm. Util.	0.16	0.06	0.05	0.07	3.51	1.17	4.95	1.35	0.11	0.07	0.24	0.31	0.004	0.002
Goods Sector	0.16	0.08	0.06	0.07	3.23	1.61	5.89	3.54	0.11	0.08	0.21	0.17	0.004	0.007
Wholesale	0.14	0.09	0.03	0.04	4.66	2.98	16.88	14.42	0.10	0.16	0.14	0.11	0.003	0.003
Retail	0.13	0.06	0.03	0.03	4.26	3.26	10.17	8.21	0.09	0.20	0.24	0.17	0.011	0.014
Services	0.21	0.07	0.05	0.07	4.27	1.31	5.71	2.02	0.10	0.11	0.23	0.31	0.007	0.011
Service Sector	0.17	0.08	0.04	0.04	4.35	2.71	9.73	10.82	0.10	0.16	0.21	0.16	0.007	0.007
Non-Financial	0.16	0.08	0.05	0.06	3.97	1.92	8.47	6.19	0.10	0.10	0.21	0.17	0.006	0.007

Source: *Corporate Source Book, Statistics of Income*, 1975 and 1979.
Goods Sector and Non-Financial averages are calculated without Mining to avoid distortion.

i. *Variations in profitability*

Our research shows that mean profit rates on assets calculated for all large firms are higher than for all small firms (Table I). For firms with income, however, the situation is reversed (Table III), as it is for mean rates of loss-on-assets among unprofitable small firms (Table V). The range between profit and loss rates on assets is thus much greater among small firms than among large firms: higher rates of profit for successful small firms than for successful large firms, but higher rates of loss for unsuccessful small firms than for unsuccessful large firms. Differences in ranges found for small firms and for large firms, in turn, are much greater than differences in mean profit rates on assets for the two groups of firms.

These findings confirm our hypothesis that the relatively high degree of uncertainty, represented by wide ranges between profit and loss rates, faced by small, "entrepreneurial" firms leads to high profit rates required by managers of these firms. Also supported is the related hypothesis that the lesser uncertainties facing large firms, represented by narrow ranges between profit rates and loss rates, lead to lower required profit rates. Comparing the behavior of successful firms (Table III) and unsuccessful firms (Table V), with the impli-

TABLE IV

Regressions of financial ratios vs. firm size within industry divisions: profitable corporations. Number of SOI industries with regression coefficients positive (+) or negative (−) are reported.

	SOI Industries	After-tax Return on Assets +	−	Before-tax Return on Sales +	−	Sales/ Assets +	−	Sales/ Deprec. Assets +	−	Short-term debt/ Assets +	−	Long-term debt/ Assets +	−	Advert. Intensity +	−
						1975 Results									
Agriculture	2	0	2	0	1	0	1	1	0	1	0	1	0	0	1
Mining	5	0	3	1	1	0	3	1	2	0	2	0	2	2	0
Construction	6	0	6	0	3	0	6	1	2	0	5	0	5	0	5
Manufacturing	67	1	46	32	6	0	57	1	37	7	16	10	15	30	4
Transp. Comm. Utl.	12	0	8	2	0	0	11	0	9	2	4	4	2	2	6
Goods Sector	92	1	65	35	11	0	78	4	50	10	27	15	24	34	16
Wholesale	15	0	14	4	2	0	15	5	3	10	1	0	11	2	3
Retail	13	0	12	5	1	0	12	0	8	6	1	0	9	7	1
Services	12	0	11	3	0	0	12	0	10	3	1	4	1	2	2
Service Sector	40	0	37	12	3	0	39	5	21	19	3	4	21	11	6
Non-Financial	132	1	102	47	14	0	117	9	71	29	30	19	45	45	22
						1979 Results									
Agriculture	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1
Mining	3	0	3	0	0	0	2	0	2	1	1	1	1	1	0
Construction	6	0	6	1	5	0	6	1	2	0	2	1	5	1	2
Manufacturing	43	0	28	10	4	1	30	0	21	7	3	4	10	17	2
Transp. Comm. Utl.	7	0	6	0	0	0	6	0	4	0	2	2	1	2	1
Goods Sector	60	0	44	11	10	1	44	2	29	8	8	8	17	21	5
Wholesale	17	1	14	5	2	0	16	2	7	8	1	1	9	3	2
Retail	10	0	9	1	1	0	8	0	7	3	2	0	4	5	0
Services	6	0	6	1	1	0	5	0	3	0	1	2	0	1	2
Service Sector	33	1	29	7	4	0	29	2	17	11	4	3	5	9	4
Non-Financial	93	1	73	18	14	1	73	4	46	19	12	11	30	30	9

Note: Regression coefficients are significant at the 15 percent level (two tails).

cation provided concerning uncertainties faced, we believe, adds an important dimension to the analysis of profit-making, a dimension with substantial policy implications.

Like mean profit-on-assets, mean profit-on-sales rates calculated on an all-firm basis are relatively high for large firms as compared with small firms (Table I), both results reflecting the high losses found in small-firm size classes. For firms with income and without income, however, where mean profit rates are not affected by the inclusion of losses, profit- and loss-on-sales are comparable for large firms and for small firms (as shown in Tables III and V). These results confirm our hypothesis that small firms, with high sales/assets ratios, are leveraging their comparable rates of profit-on-sales into relatively high rates of profit, or loss, on assets.

The extent of the differences in ranges in profitability within size classes, as compared to differences in means between size classes, is striking. Mean profit-on-assets for large firms, calculated on an all-firm basis, is about 2 percent points higher than for small firms: mean profit rates of 4

TABLE V
Characteristics of small vs. large firms: unprofitable corporations

Industry Division	After-tax Return on Assets		Before-tax Return on Sales		Sales/ Assets		Sales/ Deprec. Assets		Short-term debt/ Assets		Long-term debt/ Assets		Advert. Intensity	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
							1975 Means							
Agriculture	−0.22	−0.08	−0.15	−0.10	1.35	0.88	1.78	2.77	0.24	0.32	0.57	0.45	0.006	0.002
Mining	−0.29	−0.13	−0.26	−0.61	1.10	0.68	1.38	1.11	0.26	0.21	0.50	0.36	0.003	0.004
Construction	−0.22	−0.07	−0.07	−0.06	3.11	1.37	5.40	4.36	0.26	0.21	0.37	0.25	0.006	0.003
Manufacturing	−0.24	−0.11	−0.09	−0.07	2.59	1.65	3.54	2.76	0.18	0.17	0.44	0.26	0.006	0.008
Transp. Comm. Util.	−0.18	−0.07	−0.07	−0.06	2.63	1.12	2.50	1.34	0.21	0.14	0.49	0.47	0.005	0.004
Goods Sector	−0.22	−0.08	−0.09	−0.06	2.67	1.35	3.90	2.68	0.22	0.18	0.44	0.32	0.006	0.006
Wholesale	−0.22	−0.08	−0.05	−0.03	3.94	2.46	11.78	9.25	0.16	0.28	0.29	0.20	0.006	0.005
Retail	−0.18	−0.07	−0.05	−0.03	3.63	2.72	6.89	5.35	0.17	0.33	0.42	0.25	0.014	0.019
Services	−0.24	−0.07	−0.07	−0.10	3.40	0.72	4.10	1.02	0.19	0.24	0.53	0.51	0.014	0.013
Service Sector	−0.21	−0.07	−0.06	−0.07	3.58	1.59	6.39	5.38	0.18	0.26	0.45	0.34	0.013	0.011
Non-Financial	−0.22	−0.07	−0.07	−0.08	3.25	1.47	5.50	4.31	0.19	0.19	0.44	0.33	0.010	0.008
							1979 Means							
Agriculture	−0.15	−0.10	−0.10	−0.10	1.63	1.05	1.89	2.54	0.21	0.31	0.56	0.58	0.010	0.002
Mining	−0.33	−0.11	−0.13	−0.20	2.85	0.56	4.50	1.16	0.17	0.17	0.51	0.39	0.003	0.001
Construction	−0.25	−0.06	−0.07	−0.05	3.62	1.19	6.30	3.87	0.27	0.16	0.40	0.20	0.004	0.002
Manufacturing	−0.29	−0.09	−0.10	−0.05	2.68	1.78	3.69	3.69	0.18	0.19	0.54	0.27	0.008	0.008
Transp. Comm. Util.	−0.24	−0.07	−0.07	−0.06	3.19	1.27	3.08	1.74	0.14	0.12	0.65	0.41	0.005	0.003
Goods Sector	−0.25	−0.07	−0.08	−0.05	2.99	1.47	4.35	3.38	0.21	0.16	0.51	0.28	0.006	0.006
Wholesale	−0.24	−0.07	−0.07	−0.03	3.61	2.93	11.37	13.24	0.19	0.34	0.44	0.19	0.006	0.006
Retail	−0.21	−0.05	−0.06	−0.02	3.59	3.08	6.91	7.33	0.15	0.36	0.54	0.22	0.016	0.016
Services	−0.27	−0.06	−0.07	−0.07	3.68	0.85	4.15	1.25	0.17	0.20	0.54	0.44	0.013	0.020
Service Sector	−0.24	−0.06	−0.07	−0.04	3.64	2.25	6.29	7.86	0.17	0.29	0.53	0.28	0.013	0.013
Non-Financial	−0.24	−0.07	−0.07	−0.05	3.42	1.58	5.66	4.83	0.18	0.20	0.52	0.28	0.011	0.009

Source: *Corporate Source Book, Statistics of Income*, 1975 and 1979.
Goods Sector and Non-Financial averages are calculated without Mining to avoid distortion.

to 5 percent for large firms as compared with 2 to 4 percent for small firms in the two years, respectively. The range between profit- and loss-on-assets, in contrast, is about 35 percentage points for small firms in 1975 versus 13 percentage points for large firms. For small firms, the profit rate is 13 percent for firms with income versus a loss rate of 22 percent for firms without income. For large firms, profit-on-assets is 6 percent for profitable firms versus loss-on-assets of 7 percent for unprofitable firms. In both cases the ranges are slightly higher in 1979 than in 1975.

Industry-specific regressions of profit (loss) rates on assets against firm size confirm these results. The slightly higher mean rate of profit-on-assets for all large firms is reflected in positive regression slopes in over half of the industries (Table II). For firms with income, however, regression slopes are negative (higher profit-on-assets for small firms) in 80 percent of the industries (Table IV). For firms without income, regression slopes are positive (higher rates of loss-on-assets for small firms) to the same extent (Tables VI). We believe that the positive relationship between profit-on-assets and firm size for the all-firms data set (Table II), somewhat unexpected in light of

TABLE VI

Regressions of financial ratios vs. firm size within industry divisions: unprofitable corporations. Number of SOI industries with regression coefficients positive (+) or negative (−) are reported.

	SOI Industries	After-tax Return on Assets		Before-tax Return on Sales		Sales/ Assets		Sales/ Deprec. Assets		Short-term debt/ Assets		Long-term debt/ Assets		Advert. Intensity	
		+	−	+	−	+	−	+	−	+	−	+	−	+	−
						1975 Results									
Agriculture	2	2	0	1	0	0	2	0	0	0	0	0	1	0	1
Mining	5	4	0	2	0	0	2	0	1	0	1	1	2	1	1
Construction	6	6	0	2	0	0	6	1	3	0	3	0	5	1	2
Manufacturing	67	41	0	28	0	1	36	7	19	8	14	1	23	22	11
Transp. Comm. Util.	12	10	1	3	2	1	7	1	5	1	3	2	2	2	3
Goods Sector	92	63	1	36	2	2	53	9	28	9	21	4	33	26	18
Wholesale	15	15	0	7	0	0	12	0	2	9	1	0	9	2	5
Retail	13	12	0	8	0	0	12	0	8	2	0	1	7	5	0
Services	12	12	0	1	0	0	12	0	8	3	2	2	6	2	4
Service Sector	40	39	0	16	0	0	36	0	18	14	3	3	22	9	9
Non-Financial	132	102	1	52	2	2	89	9	46	23	24	7	55	35	27
						1979 Results									
Agriculture	1	1	0	0	0	0	1	0	0	0	0	0	1	0	1
Mining	3	1	0	1	0	0	1	0	2	2	0	0	1	0	2
Construction	6	5	0	3	0	0	5	2	1	0	1	0	4	0	3
Manufacturing	43	21	0	17	3	5	16	5	9	10	4	5	13	14	8
Transp. Comm. Util	7	5	0	3	0	0	5	1	2	1	1	2	4	1	0
Goods Sector	60	33	0	24	3	5	28	8	14	13	6	7	23	15	14
Wholesale	17	9	1	8	0	1	5	4	2	5	2	1	8	1	4
Retail	10	10	0	10	0	0	8	0	4	4	0	0	8	3	2
Services	6	6	0	1	2	0	6	0	5	1	2	3	1	1	2
Service Sector	33	25	1	19	2	1	19	4	11	10	4	4	17	5	8
Non-Financial	93	58	1	43	5	6	47	12	25	23	10	11	40	20	22

Note: Regression coefficients are significant at the 15 percent level (two tails).

recent research, is a consequence of the inclusion of firms with less than $500,000 in assets, a high proportion of whom have substantial losses.

The contrasts between the profit rates on assets achieved by small and large firms found using regression analysis are not found when profit rates on sales are compared. As noted above, on an all-firm basis mean profit-on-sales is higher for large firms than for small firms, but for profitable and unprofitable firms mean profit- (and loss-) on sales are comparable between small firms and large firms. The results of the intra-industry regressions of profit-on-sales against firm size, reported in Tables II, IV and VI, confirm these observations.

ii. *Differences in asset intensity*

Confirming expectations, our research shows that for all firms combined, small firms are less asset intensive than large firms; i.e., have higher sales/assets ratios (Table I). But there are some interesting wrinkles. For one thing, ratios of sales to total assets are substantially higher for small firms as compared to large firms (3.6 versus 1.8 for all non-financial firms in 1975) than are ratios of sales to depreciable assets (7.6 versus 6.4 in 1975), and similarly for 1979. These relationships hold for firms with income only (Table III) and, as explained below, for unprofitable firms (Table V).[8]

In the Service sector, in fact, the ratio of sales to depreciable assets is slightly higher for large firms than for small firms; but due to substantial investments in inventories, mostly among large trading firms, ratios of sales to total assets are considerably lower. The implication of these findings is that small firms are economizing on current assets (particularly in trade) and not in fixed assets; the latter is the type of assets that determines flexibility.[9]

For another thing, comparison of differences in total and depreciable asset intensities between unprofitable and profitable firms (Table V compared to Table III) shows that flexibility attained by small firms is less than expected. Sales to total assets ratios are about 20 percent lower for both small and large firms without income than they are for small and large firms with income. However, the ratios of sales to depreciable assets are about 30 percent lower for unprofitable small firms than for profitable small firms (5.5 vs. 7.7 in 1975) but only about 15 percent lower for unprofitable as compared with profitable large firms (4.3 vs. 5.3 in 1975). These results suggest that unprofitable small firms with relatively "lean" technologies may have more difficulty holding sales, and in adjusting fixed costs to loss of sales revenues, than do large firms.[10]

Our observations concerning the sales/assets and the sales/depreciable assets ratios of small and large firms are supported by the intra-industry regression results reported in Tables II, IV, and VI. Regression slopes for sales/assets ratios are negative for about 80 percent of the industries using data for all firms (Table II), for a slightly higher percentage of industries for firms with income (Table IV), and for a considerably lower percentage of industries (around 50 percent) for firms without income (Table VI). Regression slopes for sales/depreciable assets ratios, in contrast, are negative for half of the industries or less using data for all firms (Table II) and for firms with income (Table IV), and for only about one-third of the industries for firms without income (Table VI).

iii. *Differences in debt ratios*

Confirming expectations, our research shows that small firms are more dependent on borrowed funds than large firms, often with negative consequences. Differences are most pronounced for long-term debt ratios. On an all-firm basis, long-term debt is about 27 percent of total assets for small firms as compared to 18 percent for large firms in 1975, with similar values in 1979 (Table I), and is higher for small firms in all industry divisions except Services. Short-term debt ratios are about 13 percent for both large firms and small for the two years, and differ greatly between industries depending on asset structures: relatively high for small firms in the Goods sector, where CSB-SOI detail shows that inventories for small firms are relatively high; relatively low for small firms in the Service sector, where inventories shown for small firms are comparatively low.

For profitable firms only, debt ratios are substantially lower than when calculated on an all-firm basis. For small firms, long-term debt ratios are 7 to 8 percentage points lower; for large firms, 1 to 3 percentage points lower (Table III compared to Table I). For both small and large profitable firms, short-term debt ratios are 3 to 5 percentage points lower than all-firm averages. For unprofitable firms, however, the situation reverses itself. Long-term and short-term debt ratios reported in Table V are double those reported for profitable firms in Table III. The biggest increases are found for long-term debt: for small firms this ratio increases from about 20 percent of total assets to over 50 percent; for large firms, from about 16 percent to over 30 percent.

The regression results reported in Table II, IV, and VI generally confirm these findings. On an all-firm basis (Table II), slopes for the long-term debt ratio are negative (more debt financing among small firms) in over half the industries in both 1975 and 1979, while the slopes for the short-term debt ratio are fairly evenly divided between negative and positive. For firms with income (Table IV), slopes for the long-term debt ratio are markedly less negative (i.e., less use of debt among small firms), and for the short-term debt ratio slopes are positive as often as they are negative. For firms without income (Table VI), negative slopes for the long-term debt ratio become dominant again (heavy use of debt financing by small firms), but no consistent relationship to firm size is found for the short-term debt ratio.[11]

iv. *Differences in advertising intensity*

Our research shows that, on an all-firm basis, advertising is an often-used strategy in selected industry divisions, i.e., Manufacturing, Retail and Services (Table I), and generally for large firms. In other industry divisions, advertising expenditures are less than one-half of one percent of sales, and advertising policy presumably is not that crucial. For firms with income (Table III), particularly in industries where advertising is important, advertising intensity ratios are somewhat lower, presumably reflecting increases in sales. For firms without income (Table V), just the reverse is found. It is interesting to note that in those industry divisions where advertising intensities are low, advertising ratios rise the most among unprofitable firms.

In general these observations are supported by the regression results reported in Tables II, IV, and VI. Among Manufacturing industries, slopes are positive (high advertising intensities among large firms) in about 40 percent of the industries (predominantly consumer goods industries), as shown in Table II. Among firms with income, there are slightly more Manufacturing industries with positive slopes (Table IV), and slightly less among firms without income (Table VI). In Retail industries, regression slopes are positive in half of the industries (Tables II and IV), again with slightly fewer positive slopes among firms without income (Table VI). Only in Services industries are advertising intensities high for both small firms and large firms.[12]

VI. Conclusion

Viewed as a whole, these findings confirm our basic propositions. Ranges between profit rates earned by firms with income and loss rates suffered by firms without income are much greater in small-firm size classes than in large-firm size classes, indicating the substantial uncertainties facing the managers of small firms. Operating characteristics for the two types of firms are also sharply different: small firms exhibit less asset intensity, higher debt ratios, and less advertising intensity as compared to large firms, indicating sharp distinctions in strategic approaches.

Crucial to understanding firm behavior, we believe, are the variations in profit prospects that our analysis brings out. Small firms may earn slightly lower rates of profit than large firms on average, but those small firms that do earn income are highly profitable, while those that do not earn income suffer high loss rates. Confronted with these prospects, the strategic response of small firms appears to be to advance products likely to have "unique" appeal in the entrepreneurial tradition. Large firms, the record shows, are marked less by modest advantages earned in average profit rates than by the limited extent of the variations between rates of profit and rates of loss faced within their size classes. Confronted with more manageable market environments, the strategic response of large firms is toward planning for growth, as Baumol has suggested.

In need of careful analysis are the specific policies that implement these strategies. Our research indicates that small firms compete with products made from "lean" technologies, yielding relatively high sales/assets ratios, but less high ratios of sales to depreciable assets. On the record, such products and technologies work well for successful small firms, but do not provide the flexibility sought for the unsuccessful. Considerable debt supports these uncertain operations, which is reduced by the successful, but which imposes a heavy burden for firms with slack sales. In their highly competitive markets, advertising is an expensive tool for the small, used with caution. Large firms, in contrast, compete with products generated from asset-intensive technologies which, it appears, promote growth for modest rates of profit. Less uncertainty as to profit prospects makes cautious use of long-term debt a viable policy (for these years at least). And advertising, as predicted, is a policy often used to advantage in markets where competition among the few makes price elasticities relatively low.

Tying the uncertainties of earning profit to the strategies firms are pursuing, in the way we have done in this paper, stresses the organizational aspects of profit-making. For large and small firms, our analysis suggests, finding varied strategies to earn profit is the critical concern. Such strategies are not that easy to find for small firms; but high variations in rates of profit and loss indicate how vigorously these firms are searching. Large firms have established their market positions more securely, the past record shows; but in

these days of international awakening, their need for entrepreneurial vigor is still very much to the forefront.

Overly facile assumptions as to firm objectives, characteristic of the structure-conduct approach, we would argue, obscure the organizational possibilities that profit-seeking behavior open up. These possibilities are in urgent need of continued systematic investigation.

Notes

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[1] Research on strategic groups, as reported by Porter (1979), has also considered the strategies and related performance of small and large firms.

[2] Exceptions are the study by Hall and Weiss (1967) and a later study by Schmalensee (1989), both of which find higher profitability for large firms.

[3] Winn and others who have considered the effect of profit variability on profit rates have generally used the Compustat tapes as their data source.

[4] We also analyzed the rate of profit before interest and taxes on assets; the results were essentially the same as those for the after-tax profit rate.

[5] In many industries, the omission of small firms excludes data for substantial numbers of firms, which data are highly informative as to differences in financial characteristics. Furthermore, such bias in reported profit as may arise from tax avoidance is likely to be small, works against high profits reported for profitable small firms, and has only a small effect on reducing the ranges between profit rates and loss rates.

[6] FIRE is excluded because the balance sheets of financial firms are heavily asset-intensive in relation to sales as compared to those of non-financial corporations. FIRE accounts for over half of the total assets reported in the CSB-SOI data source, but less than 10 percent of the total business receipts.

[7] Furthermore, this dividing point is roughly equivalent to sales-based size break points (generally $3—$10 million) as reported in the literature on strategic management [see, e.g., Robinson and Pearce (1984)].

[8] As noted by Caves and Pugel, use of data on depreciable assets and total assets net of accumulated depreciation can introduce a bias into firm-size comparisons if small firms have accumulated proportionately less depreciation on their fixed assets than have large firms. To check this point, we reestimated the means for the sales/assets and sales/depreciable assets ratios after redefining the total assets and depreciable assets variables to be gross of accumulated depreciation. These estimates, not presented here, are consistent with the results reported.

[9] Our findings on asset intensity also reflect the substantial long-term investments in securities of other corporations often made by large firms.

[10] This inference is also supported by the proportion of total assets (less long-term investments) that are depreciable assets: among profitable firms in 1979, about 40 percent for small firms and 50 percent for large firms; among unprofitable firms, about 46 percent for small firms and 50 percent for large firms.

[11] An additional perspective on these findings is afforded by examining firm-size differences in debt ratios for the "small business" sector of the economy, defined as Construction, Wholesale and Retail Trade, and Services, where small firms represent the dominant share of all corporations. In this sector, long-term debt ratios are significantly higher for small firms than for large firms, both profitable and unprofitable; i.e., in over 50 percent of the "small business" industries, as revealed by the regression slopes reported in Tables II, IV, and VI.

[12] In Tables I, III, and V, note that average advertising intensities for large firms in the Service sector are substantially influenced by the relative weighting (the number of firms) applied to the Wholesale industry division.

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