HYPERCOMPETITIVE PERFORMANCE:

ARE THE BEST OF TIMES GETTING SHORTER?

by

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ABSTRACT

"Hypercompetition" has been theorized to make competitive advantage increasingly more difficult to sustain in a wide range of industries. Further, sustained competitive advantage is now held to be less a matter of a single advantage maintained over time and more a matter of concatenating over time a sequence of advantages. This research examines 6772 firms in 40 industries over 25 years to discover which industries, if any, exhibit performance that is consonant with hypercompetitive behavior.

KEYWORDS: hypercompetition, performance, sustainability

INTRODUCTION

Even a casual perusal of the business and popular media over the last decade would reveal anecdotal evidence of a shift over time in the competitive environments of a number of industries (e.g. Aley, 1996; Ballmer & Gates, 1997; Colvin, 1997; Drucker, 1998; Ferguson, 1998; Green, 1998; Hutheesing, 1997; Hutheesing & Young, 1996; Karlgaard, 1998; Mandel, 1997; Mandel, 1998). According to these sources, for these industries, in contrast to prior decades, the last decade or two would show among other things: (1) an increase in firms cannibalizing their own products, (2) an increase in new product introductions, (3) shorter design and product life cycles, (4) an increasing pace in the commercialization of new technologies, (5) paradigm shifts that revised the way products and markets are defined, and (6) entirely new business models. Commentators have posited that these shifts in competitive environments have arisen from factors such as rapid technological change and increased globalization. Some have referred to it by a variety of terms, such as "coping with turbulence" (Chakravarthy, 1997) or "relentlessly shifting" (Brown & Eisenhardt, 1997). D'Aveni (1994) calls this phenomenon "hypercompetition" and because of his elaborate description of this state we will adopt his term here.

While the attention paid to hypercompetition in the academic literature has not been quite proportional to that in the business and popular presses, there have been some notable contributions. First, of course, is D'Aveni's seminal book (1994) and Christensen's (1997) book on the problems of entrenched companies facing competition from upstarts. Beyond that there have been two special issues of Organization Science (July & August 1996) devoted to hypercompetition, an edited book (Ilinitch, Lewin, & D'Aveni, 1998) that overlaps with the special issues, and a few articles in academic journals. Few of these research studies have been empirically based, but those that were will be reviewed below.

The purpose of our study is to add substantially to the base of empirical evidence concerning the nature and magnitude of the claimed shift in the U.S. economy. The underlying subject of our study will be a recognized hallmark of traditional firm and industry behavior: sustained competitive advantage. The reason for this is as D'Aveni (1994: 7) has noted: "The pursuit of sustainable advantage has long been the focus of strategy." However, the key predictions of hypercompetition for strategy researchers are: (1) that firms are increasingly less able to sustain a strategic advantage over their competition, (2) that hypercompetition is characteristic of a wide range of industries, and (3) that sustained competitive advantage has become less a matter of finding and sustaining a single competitive advantage and more a case of finding a series of competitive advantages over time and concatenating them into a sustained competitive advantage. "We have seen the giants of American industry, such as General Motors and IBM, shaken to their cores. Their competitive advantages, once considered unassailable, have been ripped and torn in the fierce winds of competition" (D'Aveni, 1994: 1). Taking things to their extremes D'Aveni (1994: xiv) concluded, "Under these conditions, it would seem that the most logical course for most American firms would be to liquidate or exit their industries because sustained advantage is impossible and low profitability would seem to be inevitable." Thus two of the three key hypercompetitive outcomes cited relate to sustained competitive advantage.

Our approach will be to develop a theoretical framework and hypotheses that relate hypercompetition and sustained competitive advantage. We then examine 6772 firms in forty industries over a 25-year period and identify in a rigorous way those firms that have been able to maintain, for a sustained period of time, a competitive advantage in a fashion that yielded superior economic performance. We will examine these periods of superior performance to determine if, in consonance with hypercompetition, the periods have become significantly shorter over time—and,

if so, for which groups of industries. We will also test the potential alternative explanations of industrial organization and evolutionary economics. Then we will examine these same firms for evidence that sustained competitive advantage is increasingly not singular, but is instead composed more and more often of multiple short advantages over time.

THEORETICAL FRAMEWORK AND ANTECEDENT LITERATURE

Though pessimistic about the future of capitalism, Schumpeter (1942) was quite prescient about the role innovation would play in the economy in general, and in competition among firms in particular. Traditional theories of strategic management eschewed the Schumpeterian theory of disequilibrium as a base framework and chose instead the equilibrium-oriented approach of industrial organization. In so doing they placed emphasis on what Schumpeter (1947: 153) called the "adaptive response" of managers and on creating a sustained competitive advantage for a firm. Thus, for decades, sustained competitive advantage has been a dominant concept in strategic management research. Emerging from the structure-conduct-performance paradigm of industrial organization economics (Bain, 1959; Mason, 1939, 1949) and popularized by the Harvard Business School and the work of Michael Porter (1985), sustained competitive advantage is the most influential mechanism for explaining the persistence of superior economic performance[1]. The increasingly popular resource-based view of the firm extends the influence of sustained competitive advantage and its result, above-normal returns, by making achieving sustained competitive advantage the very reason for firms' existence (Conner, 1991: 132).

A firm's ability to maintain superior economic performance has a long and varied history in economic and strategic management research. Neoclassical economics argues that persistent superior economic performance is an anomaly, a temporary condition that will vanish when

equilibrium is reached (Debreu, 1959). Industrial organization economics argues that any persistence is the result of industry structure, with mechanisms such as entry barriers preventing the equilibrium of neoclassical economics from being achieved (Bain, 1959). Evolutionary economics (Nelson & Winter, 1982) as well as the related Austrian school of economics (Jacobson, 1992; Schumpeter, 1934) both argued that persistent superior economic performance is the result of cycles of entrepreneurial innovation and imitation that create a continuing disequilibrium where some firms can achieve persistence of performance although it will be eventually eroded. Organizational and strategic management theories have incorporated most of these ideas and added the concept of sustained competitive advantage (Porter, 1985) that can lead directly to persistent superior economic performance.

There have been a number of empirical studies of the persistence of economic performance that examined average trends in loss of high profitability positions. Mueller (1986), in a time-series regression-based study of ROA of 600 large industrial firms over the period 1950-1972 utilizing COMPUSTAT and FTC databases, found that profit levels tended to converge toward the mean, but that the highest-performing firms converged the most slowly, and some of the high-performing firms' profitability even increased over time. Geroski and Jacquemin (1988), Schohl (1990), Droucopoulos and Lianos (1993), and Goddard and Wilson (1996), all using non-U.S. samples found similar results to Mueller (1986), as did Waring (1996) in a large-scale study of 68 U.S. industries. Jacobsen (1988), in a time-series regression-based study of ROI over the period 1970-1983 utilizing the PIMS SBU-level database, also found that profit levels converged over time but did not find persistence, and concluded that "the conditions under which market forces do not drive return back to its competitive rate seem remote, if present at all" (Jacobsen, 1988: 415). All of these

[1] Coff, (1999) points out that there may be cases in which firms have a competitive advantage in the market for outputs, but not for inputs—and thus may not realize superior economic performance. We shall explicitly assume that

studies were concerned with the pattern of loss of high profitability positions—but none focused on the length of time superior performance was maintained. McGahan and Porter (1999) examined shocks to profitability (both positive and negative) and estimate the effects of the factors of industry, firm and business unit level on the persistence of those shocks, but do not examine either the degree of persistence of abnormal profitability or its incidence across specific industries. Their methodology relied on an auto-regressive approach that makes assumptions (e.g., that abnormal profits will decay) that we avoid. Their results neither support nor conflict with results reported here.

None of these studies examined the effects of time, and all of them, by using autoregressive techniques, found it difficult to identify *which* firms achieve persistence or for how long they sustain it. All of these previous studies were all focused on examining the *assumed rate of decay* of persistence, rather than the timeframes of persistent superior performance—which is the focus of this study. By using a nonparametric methodology that is better suited to the identification of bot modal performers and outliers, this research avoids the problems of the autoregressive time-series methodologies. Further, the time frame of this research, 1972-1997, complements the time period (1950-1972) studied by Mueller (1986). Finally and importantly, the present research also supplements the accounting measures of performance used in these prior studies with a market-based performance measure. Barber & Lyon (1996) showed that the accounting performance data for all firms in the COMPUSTAT database is trending down over time. This calls into question any findings of autoregressive studies of decay of performance—since such decay could be confounded with the decline of the central tendency of all firms. However, this decline could also be indicative of precisely the effects of hypercompetition hypothesized here.

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competitive advantage obtains overall for a firm.

Even at the height of its influence, sustained competitive advantage was argued to not be equally applicable in all industries. Other concepts, such as "hyperturbulence" in industry environments (McCann & Selsky, 1984), or "high velocity" environments with rapid technological change (Eisenhardt, 1989), as well as increasing globalization (Bettis & Hitt, 1995; Hitt, Ricart I Coste, & Nixon, 1998a), began to be argued as working against the attainment of sustained competitive advantage. These arguments eventually led to a "new organizational paradigm that has been described as 'hypercompetition'" (Ilinitch, D'Aveni, & Lewin, 1996: 211), first articulated by D'Aveni (1994). In this paradigm, managers are "experiencing the strongest and most disruptive competitive forces of their careers" (Ilinitch et al., 1998: xxi), competition that is "brutal," "intense," "bitter," and "savage" (D'Aveni, 1995). These counter-arguments have led to an equally widely held belief that "all competitive advantage is temporary" (Fine, 1998: 30). But not everyone agrees. Michael Porter stated "in many industries, however, what some call *hypercompetition* is a self-inflicted wound, not the inevitable outcome of a changing paradigm of competition" (1996: 61) and that it is most likely to be limited to a subset of firms in high-technology industries (Porter, 1996). The question of which set of arguments should prevail is ultimately an empirical one, and that is the purpose of this research, to examine this question by examining over time the nature of the timing of the loss of sustained competitive advantage, the scope across industries, and the unitary or multiple nature of sustained competitive advantage. In short, we seek to respond to the call for "advocates of the hypercompetitive paradigm to back up their sweeping generalizations about the ubiquity of hypercompetition with rigorous large-sample empirical evidence" (Makadok, 1998).

While the above reviews the state of empirical research on persistent superior performance, there also exists one investigation into hypercompetition. In the most notable antecedent empirical

test of some of the aspects of hypercompetition, Thomas (1996) performed a large-scale study, examining over 200 manufacturing industries during the period from 1958 to 1991 and found that a "hypercompetitive shift" has indeed occurred in this sector of the U.S. economy. His models used growth rates in stock market value as the dependent variable, his results come from pooled cross-section time-series data analyzed using regression-based methodologies, and his sample was restricted to manufacturing firms. Our study will build on Thomas' approach, but will use alternate measures and methods to directly focus on the signature aspects of hypercompetition. Both accounting and market measures of performance will be employed to provide immediate comparisons with antecedent research. Longitudinal data will be employed to better enable the examination of possible effects of hypercompetition over time. We also use a unique stratification methodology applied industry by industry and then employ event history analysis, and thus can better discern over time which firms and which industries are involved in the possible effects of hypercompetition. Further, we include not only manufacturing firms but also mining, natural resource, transportation, utility, financial, and service firms, thus providing evidence about the scope of possible hypercompetitive effects.

Another empirical study that bears on hypercompetition is that of Young, Smith and Grimm (1999) who, in an examination of single business firms in the software industry obtained results that indicated that competitive moves, unless they were extreme, contributed more to increased performance than to industry rivalry. These results were extended and greatly expanded upon by Ferrier, Smith and Grimm (1999) who, in a paired sample empirical study of single or dominant business firms, examined the possible market share erosion and dethronement of market leaders when confronted by challengers. Their findings indicate that across a wide range of industries

market leaders which are faced with relatively more aggressive challengers are likely to be subject to market share erosion and dethronement as market leader.

THE RESEARCH QUESTIONS

Has persistent superior economic performance become more difficult to achieve over time, as the theories incorporating hypercompetition would suggest? In which industries? Are hypercompetitive effects related to industry concentration or market share, as the theories based on SCP IO economics argue? Have firms increasingly sought sustained competitive advantage through concatenation of a set of shorter-term competitive advantages? These are the chief reasearch questions that will be addressed through the formulation of hypotheses and via a novel empirical study.

HYPOTHESIS DEVELOPMENT

Hypercompetition and Loss of Persistent Superior Economic Performance

Conventional strategic management theory does not recognize hypercompetition as "the inevitable outcome of a changing paradigm of competition" (Porter, 1996: 61). "Porter (1980, 1985, 1996) has long argued that classic industrial organization solutions such as increasing barriers to entry and gaining market power over rivals, suppliers and buyers will reduce rivalry within an industry" (Ilinitch et al., 1998: xxvi). Indeed, such reasoning argues that we should see over time an increase in the length of time that competitive advantage can be maintained. On the other hand, D'Aveni (1996) clearly argues that hypercompetition is making it more and more difficult for firms to maintain a competitive advantage. Therefore, we should see the average period for which firms sustain a competitive advantage decrease over time. Following D'Aveni's line of reasoning, the hypothesis is proposed:

Hypothesis 1: Periods of persistent superior economic performance are decreasing in duration over time.

Hypercompetition across Multiple Industries

D'Aveni (1994: 4) originally argued for the near-ubiquity or hypercompetition: "There are few industries and companies that have escaped this shift in competitiveness." Porter (1996) argued that hypercompetitive effects are likely to be limited to high technology industries. D'Aveni, in a more recent publication (1999), proposed that there are four environments of varying turbulence ranging from "equilibrium" to "disequilibrium." The latter environment he identifies with hypercompetition, but he does not in this work specify the degree of prevalence of any of his environments in the economy. To formulate our next hypothesis we revert to D'Aveni's original position which leads directly to this formulation:

Hypothesis 2: Hypercompetition is not limited to high technology industries, but will occur throughout most industries.

Hypercompetition and Series of Temporary Competitive Advantages

D'Aveni specifically stated, "instead of seeking a sustainable advantage, strategy in hypercompetitive environments now focuses on developing a set of temporary advantages" (D'Aveni, 1994: 7). He reiterated this when he said, "If companies are not seeking a sustainable competitive advantage, what is the goal of strategy in hypercompetitive environments? The primary goal of this new approach to strategy is disruption of the status quo, to seize the initiative through creating a series of temporary advantages" (D'Aveni, 1994: 10). Brown and Eisenhardt (1998) also argued that success can only come from a continuous stream of temporary advantages when the environment is "relentlessly shifting" (Brown & Eisenhardt, 1997). These arguments lead directly to the following hypothesis:

Hypothesis 3: Over time firms increasingly have sought to sustain competitive advantage by concatenating a series of short-term competitive advantages.

Hypercompetition and Industry Concentration and Market Share

Both the SCP IO paradigm and evolutionary economics predict that sustained competitive advantage will be associated with industry concentration and firm market share, so that a few large firms will be the beneficiaries of sustained competitive advantage. The hypercompetitive model proposed by D'Aveni argues that smaller firms will be able to use tactics of disruption to overcome large incumbent firms' size and concentration advantages, similar to Schumpeter's entrepreneurial innovation cycles. The more established economic theories lead to the following hypotheses:

Hypothesis 4a: Industry concentration is negatively associated with chance of loss of persistent superior economic performance in an industry.

Hypothesis 4b: Large market share is negatively associated with chance of loss of persistent superior economic performance in an industry.

METHODS

Data

Data were collected from three primary sources: the COMPUSTAT PC-Plus database for the twenty years from 1978 to 1997 inclusive, the COMPUSTAT Back History database for the five-year period from 1972 to 1977, and the COMPUSTAT Segment Tapes for 1978-1996 provided additional data on lines of businesses (business segment data is unavailable prior to 1978). We included data from the COMPUSTAT Back History database to provide 20 overlapping five-year periods (1974-1997), as well as two additional years (1972-1973) to alleviate some of the left-censoring problem. SIC codes for firms that exited the database prior to 1978 are not included in the COMPUSTAT Back History database; therefore, the 1,145 firms that fall into this category were

classified employing the CRSP/COMPUSTAT Cross Reference database maintained by the Johnson Graduate School of Management at Cornell University, as well as an earlier version of the COMPUSTAT PC-Plus database (1973-1992), and also the Moody's Industrial, OTC, Transportation, Financial, and Utilities Manuals. The forty industries defined at the three and four-digit SIC levels that were selected for study are described below.

Dependent Variables

Received economic theory tends to view superior economic performance as abnormal profits or rents, where rents are profits in excess of those predicted by equilibrium models (Bain, 1959; Klein, Crawford, & Alchian, 1978; Ricardo, 1817; Schumpeter, 1934). This definition, however, assumes the existence of "normal" profits, which in turn assumes that the equilibrium model is valid. Rather than make any such assumption, this research will start with the less restrictive definition of statistically significantly above-average performance relative to a reference set of comparable firms (in this research, an industry).

Of particular interest to strategy researchers is the notion that advantages can continue for long periods of time, and thus yield sustained superior performance. One of the more interesting aspects of conceptual discussions of this phenomenon is that theorists are fairly vague about what exactly is meant by "sustained." Porter is the least ambiguous, and uses the phrases "long-term profitability" (Porter, 1985: 1) and "above-average performance in the long run" (Porter, 1985: 11) when describing the consequences of sustained competitive advantage, clearly implying that "sustained" in his usage is a long-term concept. Barney (1991), on the other hand, argues against the use of calendar time as a referent, and instead defines a sustained competitive advantage as a competitive advantage that "continues to exist after efforts to duplicate that advantage have ceased"

(Barney, 1991: 102). While this latter definition is theoretically more precise, it is virtually impossible to meaningfully operationalize quantitatively.

For the purpose of this research, we will adopt Porter's approach, and use calendar time to determine if superior performance can be called "sustained." Thus, persistent superior economic performance is defined here as statistically significant above average performance relative to a reference set (such as an industry) that persists over a long-term period of calendar time (such as ten years or more). The time frame that determines the persistence of superior economic performance may vary from industry to industry depending on such exogenous variables as product life cycles, patent protections, copyrights, or other variables specific to an industry. For example, computer products generally have a product life cycle of only a few years, while auto parts and accessories tend to have much longer product life cycles.

Two measures were used to operationalize economic performance: an accounting measure, return on assets (ROA), and a market measure, Tobin's q (the ratio of firm market value to the replacement cost of its assets). ROA (net income divided by total assets) was selected because a substantial amount of earlier economic and strategic management research uses some measure of accounting returns, often ROA. Tobin's q was selected because, although he did not use it in his study, Mueller (1990: 8-14) suggested its potential, and because some studies have shown results that vary between accounting and market measures (Hoskisson, Hitt, Johnson, & Moesel, 1993). Tobin's *q* was operationalized as the ratio of market to book value. This ratio has been shown to be empirically equivalent, with a correlation greater than 0.92 with all alternative operationalizations (Perfect & Wiles, 1992), as well as theoretically equivalent to Tobin's *q* (Varaiya, Kerin, & Weeks, 1987), and has been used in previous management research (e.g. Nayyar, 1993). Annual data were employed to mitigate the effects of short-term reporting of performance.

Superior economic performance was operationalized as statistically significant above average economic performance (relative to industry) over a five-year period. This was determined using the Iterative Kolmogorov-Smirnov stratification technique [cite], which is described later in this section. A rolling five-year window (Cool & Schendel, 1988; Fiegenbaum & Thomas, 1988) was used to create up to 22 distributions of returns for each firm for each of the two performance measures. This basically created 44 subsamples in each of the 40 industry samples. Firms were excluded from the analysis of a particular period when there was not performance data for at least four out of five years in that period.

Persistent superior economic performance was operationalized as superior economic performance lasting for six or more consecutive windows (i.e., a ten-year period), inasmuch as there were two non-overlapping five-year windows in the period, which eliminated potential bias owing to the effect of a single year of outstanding performance. The first five-year window in the models is 1977-1981 since that is the first window in which an exit from the persistent superior economic performance stratum could occur. This establishes a very stringent test for the performance effects of hypercompetition, in that it is the significant shortening of the periods during which *only those firms with significant sustained competitive advantage* (i.e., periods of ten years or more) that will be accepted as evidence.

Control Variables

Control variables included firm size, diversification, market share, industry density, and dummy variables for each industry, which were operationalized as follows. For firm size the natural logarithm of total sales was employed. For diversification we used the Jacquemin-Berry entropy measure of diversification (Jacquemin & Berry, 1979; Palepu, 1985), which is defined as

$$E = \sum_{i=1}^{n} P_i \ln(1/P_i)$$

where P_i is the ith segment's share of the firm's total sales, which operates in n segments. For market share we used the ratio of each firm's total revenues to the total revenues of all firms in the industry. For density we used the total number of firms in each industry in each period. Because the dependent variables represent five-year windows, all of the control variables were five-year moving averages matched to the dependent variables' five-year windows. Finally, the industry dummy variables were coded using the deviation method, which compares the effect of each dummy variable to the overall effect. The descriptive statistics and correlations of the study variables are shown in Table 1.

Insert Table 1 about here

Industry Selection

We selected forty industries out of the 279 that were of adequate size (at least 20 firms in the industry). Ten industries were included because of their use in prior strategic management research (references are representative and not comprehensive): SIC 2834—Pharmaceuticals (Cool & Dierickx, 1993; Pisano, 1990), SIC 2851—Paints and Allied Products (Dess, 1987; Fredrickson, 1984), SIC 2911—Petroleum Refining (Murray, 1989; Ollinger, 1994), SIC 357—Office Equipment and Computing Machinery (Chakravarthy, 1986; Eisenhardt & Bourgeois, 1988), SIC 4512—Airlines (Hambrick, Cho, & Chen, 1996; Tushman & Anderson, 1986), SIC 481—Telephone Communications (Barnett, 1997; Kashlak & Joshi, 1994), SIC 5311—Department Stores (Harrigan, 1985), SIC 602—Commercial Banks (Fox-Wolfgramm, Boal, & Hunt, 1998; Reger, Duhaime, & Simpert, 1992), SIC 6311—Life Insurance (Fiegenbaum & Thomas, 1990), and SIC 7812—Motion Picture Production (Miller & Shamsie, 1996).

The remaining 30 industries were chosen randomly, weighted by industry size. While the overall sample represents 9% of the available industries and 14% of the industries with 20 firms or

more, it also includes 64% of the 25 largest industries and 38% of the 100 largest. This weighting resulted in a sample of 6772 firms, 33% of the firms in the COMPUSTAT database. Ten of the industries selected were consolidated to the three-digit SIC level because they met one or more of the following criteria: (1) in six of the ten industries, some firms were classified only at the three-digit-level (xxx0), (2) in seven of the ten, the adjacent four-digit SIC industries were competitors in the same product-markets, (3) two of the ten had been studied in prior research at the three-digit SIC level. The ten three-digit industries are Advertising Agencies (SIC 731x), Commercial Banks (SIC 602x), Converted Paper (SIC 267x), Gold and Silver Mining (SIC 104x), Household Audio and Video Equipment (SIC 365x), Office Equipment and Computing Machinery (SIC 357x), Special Industry Machinery (SIC 355x), Steel Works (SIC 331x), Telephone Communications (SIC 481x), and Trucking (SIC 421x). Consequently, the final sample incorporates 10 three-digit SIC level industries and 30 four-digit SIC level industries (McGahan & Porter (1997) similarly compressed some industries to the 3-digit level). The industries in the sample represent 7 out of 10 one-digit SIC level categories, including (1) Mining and Construction, (2) Natural Resource Products, (3) Manufacturing, (4) Transportation and Public Utilities, (5) Wholesale and Retail Trade, (6) Finance, Insurance, and Real Estate, and (7) Services. Not represented are (0) Agriculture, Forestry, and Fishing, (8) Health, Legal, and Social Services, and (9) Public Administration. The sample thus includes an overlap with Thomas' (1996) sample, but most of the industries considered are outside the manufacturing sector. Table 2 shows the complete sample, along with some descriptive statistics.

Insert Table 2 about here

Identification of Superior Performance

In essence, our research concentrates on an outlier or frontier phenomenon (Starbuck, 1993), i.e., the loss of superior economic performance. However, to identify firms that have lost superior economic performance, we must first identify firms that obtained superior economic performance. Most statistical techniques, however, are based on measures of central tendency, and consequently their focus is on means and averages. In his study referenced earlier, Waring (1996) went so far as to remove outliers as a means of improving his autoregressive models of decay (Waring, 1996: 1262). Our argument, on the other hand, holds that these very outliers, those firms that gained, then lost superior performance, are of primary interest, which is the chief reason why we eschew autoregressive models. A non-parametric methodology, based on an iterative application of the Kolmogorov-Smirnov two-sample test and described in Appendix 1, was used to identify superior performers over time.

After the data were classified into three performance strata (superior, modal, and inferior) as described in Appendix 1, the modal and inferior strata were discarded, and the rest of the analysis concentrated solely on those firms in the superior stratum. Further, for the hazard models, we only include those firms that remain in the superior stratum for ten years—the firms that achieved *persistent* superior economic performance. In other words, our analyses were driven by the *significant differences* between firms that maintain persistent superior economic performance and those that attained it but lost it, as opposed to the very large differences between superior performers and average and below-average performers used by previous studies.

Event History Analysis

We tested the hypotheses by estimating models of the rates at which firms exit the superior performance stratum using discrete time event history analysis techniques (Allison, 1984; Tuma & Hannah, 1984). In the study of discrete state change processes, event history methods are

considered preferable to linear regression models, as the major problem with linear regression models is their failure to account for the timing of state changes — which may (or may not) be relevant (Allison, 1995). Moreover, we were interested in the dependence of the hazard rate on time, which cannot be readily accomplished with linear regression models (Allison, 1995).

Event history analysis estimates a hazard function that allows the calculation of the instantaneous rate of change for a firm at time *t*. In the case of persistent superior economic performance (PSP), the hazard function was defined as follows:

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr[\sim PSP\, t, t + \Delta t \mid PSP\ at\ t]}{\Delta t}$$

where $\Pr[\sim PSP\, t, t + \Delta t \mid PSP\ at\ t]$ is the probability of a firm exiting the superior performance stratum between time *t* and time $t + \Delta t$, if and only if the firm is *in* the superior performance stratum at time *t*. Firm transition rates were estimated using discrete time maximum likelihood models (Allison, 1984; 1995), which apply logistic regression to the analysis of time-series data.

Pattern Analysis

To test hypothesis three it was necessary to examine the patterns of superior and not-superior performance over time. If firms were increasingly forced by hypercompetition to seek a series of short-term competitive advantages, it would be expected that correlated with this would be an increase in the number of instances over time in which firms obtained a short-term advantage and then were not able to follow it with another short-term advantage. In the context of the methodology employed here, the fraction of firms that were at or below modal performance levels then rose to a superior performance level for one five-year period and then fell back into the modal or below performance strata should increase over the study period. To test hypothesis three therefore, for both performance measures the incidence of the pattern: modal or below performance, then superior performance, then modal or below performance, was noted in each three-period

window as the window was rolled through the 24 periods in the study. These numbers were then subjected to a 2×2 contingency analysis that compared the incidence and non-incidence of the pattern in the first and last ten three-period windows of the study. The likelihood ratio chi-square test of association was then employed for the patterns produced by the ROA and by Tobin's q.

RESULTS

As the first step toward testing the hypotheses, the two sets of forty industry samples were individually stratified with the iterative Kolmogorov-Smirnov method as previously described. For each sample this method formed multiple strata of statistically significantly different performance levels. Table 2 shows the modal strata means and standard deviations for both samples for all 40 industries in columns 3 and 4 (ROA) and columns 13 and 14 (Tobin's *q*), and the above-average or superior performance (SP) strata means and standard deviations in columns 10 and 11 (ROA) and 20 and 21 (Tobin's q). The strata sizes were consistent between the two measures of performance.

Hypothesis One: Hypercompetition and Persistence

Hypothesis 1 was represented in the model by the time variable Period. For both performance measures, the hazard of exiting the persistent superior performance stratum did indeed significantly increase over time, as shown in Tables 3 and 4. Hypothesis one was thus supported. (Note: hazard models were also estimated with non-linear time axes, but the effect proved to be linear, so only the linear models are reported here.)

Hypothesis Two: Hypercompetition across Multiple Industries

Because none of the three and four-digit industries contained enough spells of persistent superior economic performance to yield adequate statistical power, Hypothesis Two was examined in two ways. First, the overall samples were divided into "high tech" industries (SIC codes 357x, 365x, 3661, 3674, 481x, and 7372) and "low tech" industries (all other SIC codes). Second, the

forty industry samples were aggregated to the one-digit SIC level yielding seven one-digit industries. The "low tech" models shown in Tables 3 and 4 show that for both performance measures, the hazard of exit is statistically significantly increasing for the non-high-technology industries over time, although the magnitude of the hazard is lower than for the high-tech industries. This supports Hypothesis Two. The industry models (which contain significantly fewer spells than the total sample and are therefore less powerful) show more mixed results by performance measure. Table 3 shows that for only two of the six industries with sufficient data was the Tobin's *q* Period variable significant (in part because these sub-samples contain few spells), providing little additional support for Hypothesis Two. However, Table 4 shows that for six of the seven industries the ROA Period variable is statistically significant at the 0.05 level or better, providing additional support for Hypothesis Two. The phenomenon is not limited to high technology industries.

Insert Tables 3 and 4 about here

Hypothesis Three: Hypercompetition and Series of Temporary Competitive Advantages

The results for the likelihood ratio chi-square test of association for the patterns produced by the ROA and for Tobin's *q* are given in Table 5. Here it can be seen that the chi-squares are significant in both cases at the $\alpha = 0.000$ level, indicating that the pattern of one-period superior performance is relatively more prevalent in the last half of the study. Thus hypothesis three is supported.

Insert Table 5 about here

Hypothesis Four: Hypercompetition and Industry Concentration and Market Share

Hypothesis 4a proposed that loss of extended superior economic performance was negatively associated with industry concentration and Hypothesis 4b that it was negatively associated with market share. The four-firm concentration ratio was used to test hypothesis 4a. As

can be seen from Tables 3 and 4, which show the results of the event history analysis models of persistent superior economic performance exits, the four-firm concentration ratio coefficient is only significant in the model for SIC 4 (Transportation and Public Utilities), where it has the predicted negative effect on exit from the Tobin's *q* persistent superior economic performance stratum. Models were also estimated using the two-firm concentration ratio and the results were similar, with no significant effect of concentration. Given these results, there is very little support for the industry concentration hypothesis 4a. These results are consonant with the regression-based work of Jacobsen (1988), who found no effect of concentration on the persistence of abnormal profits measured using ROI, as well as with the regression-based work of Mueller (1986), who found the effect of concentration in only a few industries, and also with the seminal work of Lindenberg & Ross (1981), who found that industry concentration was not correlated with Tobin's *q*.

The results of the tests of hypothesis 4b are similar. As shown in Tables 3 and 4, there is no significant relationship between market share and exit in any model. Note also that the coefficient for size, which is not significant in the ROA models, significantly *positively* affects the log-odds of exiting the PSEP stratum in the overall Tobin's *q* sample as well as in the non-high-tech subsample, SIC 3 (Manufacturing) and SIC 5 (Wholesale and Retail Trade), which implies that larger firms have more trouble maintaining persistent performance when measured with market measures.

DISCUSSION AND IMPLICATIONS

The results presented above provide strong evidence that periods of sustained competitive advantage, as evidenced by its consequence, superior economic performance, are growing shorter over time. These results hold across a wide range of sectors of the economy. These results provide strong and direct support for the occurrence of hypercompetition. Coupled with the findings of Thomas (1998) of a hypercompetitive shift in the behavior of the manufacturing sector, results here

provide significant support for the contention that a substantial portion of the US economy is characterized increasingly by hypercompetitive behavior. Further, there is evidence to support the notion that managers have responded to this hypercompetitive environment by seeking in relatively more situations, not a single sustained competitive advantage, but rather a series of short advantages that can be concatenated into competitive advantage over time.

In the absence of the innovative dynamic change that characterizes hypercompetition, one possible explanation for this might be deregulation. The most formerly regulated sub-sample, Transportation and Utilities, shows evidence of this in terms of Tobin's *q* (but not in terms of ROA), however, the rest of the sample included many non-regulated industries—and these show strongly diminishing duration of superior economic performance in terms of ROA. Another alternative explanation for the results reported above might be largely due to increased levels of static competition. But, as in Thomas' (1998) study of manufacturing, there is no clear mechanism for such an increase in static competition alone—especially across such a wide range of industries. Yet another alternative explanation for the decrease in duration of competitive advantage might be turbulence in the macroenvironment. Such turbulence would, however, not be likely to have a more significant effect on only those firms with a sustained competitive advantage—at least not in the absence of substantial dynamic competitive effects. Thus the logical explanation for the reduced duration of sustained competitive advantage across a variety of different industries appears to be attributable to a shift to hypercompetition. The independent empirical evidence presented by Thomas (1998) and the anecdotal evidence in D'Aveni (1994) strongly reinforce this conclusion.

The finding that hypercompetition characterizes a wider number of firms than just a limited number in high technology industries (Porter, 1996), and industries even beyond those manufacturing industries studied by Thomas (1998) is important. The mechanisms for the spread of

hypercompetition beyond those industries with a rapidly changing technology base cannot be determined by this research. We can however speculate that those industries with stable traditional technology bases are increasingly subject to the effects of changes in information technology. Further, even in these stable industries, managers who have learned how to successfully employ hypercompetitive strategies in more dynamic industries may import such strategies and innovatively destabilize them. The wide appearance of hypercompetitive effects has significant implications for both practice and research.

Since the findings of this research are that hypercompetition appears to be affecting almost all industries, although some more than others, managers need to heed the call to "develop new managerial mindsets" (Hitt, Ricart I Coste, & Nixon, 1998b). The advice to adopt a new mindset should also be extended to investors, regulators, consumers, and researchers.

Limitations of the Research

The primary limitation of this research is its reliance on the corporate level data available in the COMPUSTAT database, which is further exacerbated by potential industry identification problems caused by using SIC codes. However, the problem of diversified firms has been shown empirically to be not significant.

Another limitation of this research is in the minimum time frame, ten years, selected to represent persistent superior economic performance. It may be that the appropriate time frames are shorter, varying by industry or by competitive arena, and future research to examine this would be of interest. An associated limitation is that the data employed are both right and left-censored. However, they do cover almost three decades, and precisely the three decades in which the concept of sustained competitive advantage rose to prominence in strategic management research. The use of additional data (1972-1973) to ameliorate the left-censoring problem was also of benefit.

Directions for Future Research

Although research by the authors has examined a number of other industries with results very similar to those reported here, the most obvious direction for future research is to extend the methods used in this research to other industries, more samples, and other time periods. Further examination of regulated industries would also be of interest. For example, a more comprehensive longitudinal study of the airline industry or the trucking industry (both of which are included in this research) that spanned the periods before and after deregulation might be revealing. Also, replication over a longer time frame such as 40 or 50 years would be of great interest, particularly since this time frame would encompass the periods most heavily studied by the early empirical work in strategic management research and would enhance the comparability of this research with prior investigations.

In conclusion, by examining the topography of economic performance via a new data-driven technique that identifies statistically significant superior economic performance, this research offers some important insights into the temporal dynamics of sustained competitive advantage. The avoidance of measures of central tendency allowed relationships that might have been obscured by averages to be highlighted, and the stratification technique employed resolved the problem of distinguishing superior economic performance.

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Table 1

Means, Standard Deviations, Minimums, Maximums, and Bivariate Correlations for All Study Variables*

	Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9
1	ROA PSP	0.0542	0.2300	0	1	1.000								
2	q PSP	0.0801	0.2700	0	1	.192•••	1.000							
3	Density	81.3800	66.1800	5	336	.040••	.024	1.000						
4	Entropy	0.2464	0.4228	0	2.1818	.014	-.007	-.184•••	1.000					
5	Market Share	0.0404	0.0933	0	0.6925	.018	-.003	-.211•••	.428•••	1.000				
6	Size	5.0841	2.6080	-10	10.9256	.030•	.045	-.178•••	.341•••	.446•••	1.000			
7	4-Firm Conc.	0.5702	0.1761	0.1301	0.9751	.006	.006	-.264•••	.082•••	.254•••	-.114•••	1.000		
8	Period	12.7000	5.8700	1	22	.107•••	.106•••	.126•••	-.137•••	-.025	.069•••	-.080•••	1.000	
9	Period**2	195.6842	144.1698	1	484	.103•••	.103•••	.101•••	-.130•••	-.020	.082•••	-.091•••	.974•••	1.000
10	SIC1000	0.0104	0.1017	0	1	.010	-.021	-.090•••	.011	.083•••	-.003	.173•••	.061•••	.067•••
11	SIC104X	0.0308	0.1727	0	1	.014	.023	-.047•••	-.067•••	-.010	-.094•••	-.092•••	.033•	.034•
12	SIC1311	0.0924	0.2897	0	1	.030•	-.026	.655•••	-.040•••	-.090•••	-.241•••	.103•••	-.035•	-.051•••
13	SIC1531	0.0101	0.0998	0	1	.026	.020	-.062•••	-.025	.012	-.035•	-.049•••	-.077•••	-.069•••
14	SIC2621	0.0192	0.1370	0	1	.012	-.025	-.125•••	.005	-.009	.077•••	-.103•••	-.026	-.024
15	SIC267X	0.0201	0.1404	0	1	-.015	-.017	-.123•••	.166•••	.352•••	.111•••	.192•••	-.028•	-.020
16	SIC2711	0.0093	0.0960	0	1	.019	-.007	-.097•••	.083•••	.018	.022	.012	-.043••	-.035•
17	SIC2721	0.0170	0.1294	0	1	-.008	-.004	-.142•••	.086•••	.149•••	-.010	.195•••	-.021	-.030•
18	SIC2731	0.0114	0.1062	0	1	.007	.012	-.098•••	.112•••	.067•••	-.001	.010	-.095•••	-.093•••
19	SIC2834	0.0969	0.2958	0	1	-.043••	.025	.047•••	.150•••	-.032•	.096•••	-.390•••	.083•••	.088•••
20	SIC2835	0.0211	0.1437	0	1	-.037•	.012	-.070•••	-.035•	.023	-.106•••	.077•••	.123•••	.127•••
21	SIC2851	0.0087	0.0929	0	1	.011	-.022	-.100•••	-.037••	-.011	.012•••	.160•••	-.008	-.009
22	SIC2911	0.0097	0.0979	0	1	-.010	.025	-.068•••	.047•••	-.034•	.029•	-.089•••	.022	.017
23	SIC3089	0.0311	0.1737	0	1	.003	-.029	-.129•••	.068•••	.056•••	.010	.121•••	.016	.021
24	SIC331X	0.0335	0.1798	0	1	.025	-.005	-.103•••	.148•••	-.052•••	.069•••	-.083•••	-.097•••	-.084•••
25	SIC355X	0.0116	0.1071	0	1	.010	-.006	-.058•••	-.031•	-.036•	-.072•••	-.045•••	.039••	.043••
26	SIC357X	0.0592	0.2360	0	1	.013	.012	.313•••	-.109•••	-.048•••	-.074•••	.116•••	.041••	.026
27	SIC365X	0.0099	0.0988	0	1	.000	-.013	-.087•••	-.010	-.023	-.012	.169•••	.072•••	.081•••
28	SIC3661	0.0145	0.1196	0	1	.023	.000	-.058•••	-.057•••	-.010	-.017	.208•••	-.003	-.013
29	SIC3674	0.0151	0.1219	0	1	.022	-.017	-.047•••	-.072•••	-.008	.011	.120•••	.056•••	.068•••
30	SIC3714	0.0259	0.1589	0	1	-.027	.014	-.094•••	.013	-.066•••	.050•••	.079•••	-.033•	-.027•
31	SIC3812	0.0124	0.1106	0	1	.019	.020	-.084•••	.040••	.017	-.026	.108•••	-.059•••	-.055•••
32	SIC3841	0.0234	0.1512	0	1	.004	.030	-.100•••	-.028•	-.046•••	-.104•••	.238•••	.006	.000
33	SIC3845	0.0193	0.1377	0	1	.000	-.020	-.031•••	-.073•••	.040••	-.061•••	-.015	.082•••	.076•••
34	SIC3861	0.0073	0.0854	0	1	.004	.016	-.076•••	.001	.082•••	.043•	.157•••	-.014	-.016
35	SIC421X	0.0253	0.1572	0	1	.005	.009	-.098•••	-.094•••	.045•••	.040•	.047•••	-.021	-.021
36	SIC4512	0.0093	0.0959	0	1	.025	.012	-.071•••	-.055•••	-.032•	.003	-.064•••	-.100•••	-.096•••
37	SIC481X	0.0547	0.2275	0	1	-.009	.018	.072•••	-.036••	-.102•••	-.113•••	-.221•••	.062•••	.053•••
38	SIC4833	0.0054	0.0734	0	1	.006	.000	-.073•••	.012	-.030•	-.047•••	.149•••	-.072•••	-.069•••
39	SIC4911	0.0128	0.1123	0	1	-.013	.006	-.017	-.026	-.040••	.035•	-.235•••	.023	.027
40	SIC5311	0.0205	0.1417	0	1	-.001	-.013	-.113•••	.042••	-.003	.147•••	.069•••	-.026	-.022
41	SIC5411	0.0599	0.2374	0	1	-.037•	-.006	-.143•••	-.083•••	-.034•	.238•••	-.195•••	-.047•••	-.031•
42	SIC5812	0.0567	0.2312	0	1	-.024	.005	.024	-.063•••	-.057•••	.034•	-.081•••	.007	.000
43	SIC602X	0.0422	0.2010	0	1	.039••	.013	.308•••	-.122•••	-.079•••	.044••	-.344•••	-.105•••	-.106•••
44	SIC6211	0.0193	0.1377	0	1	-.008	-.015	-.093•••	.019	.092•••	.011	.166•••	-.004	-.005
45	SIC6311	0.0151	0.1219	0	1	.004	-.015	-.089•••	.151•••	.062•••	.112•••	.014	.039••	.041••
46	SIC7011	0.0315	0.1747	0	1	-.014	.002	-.130•••	.100•••	.077•••	-.008	.269•••	-.049•••	-.052•••
47	SIC731X	0.0015	0.0393	0	1	.013	.000	-.041•••	-.023	.019	-.001	.015	-.042••	-.040••
48	SIC7372	0.0236	0.1518	0	1	-.001	-.007	.051•••	-.091•••	-.019	-.011	-.072•••	.097•••	.088•••
49	SIC7812	0.0019	0.0439	0	1	-.011	.000	-.034••	.075•••	.141•••	.061•••	.050•••	.036••	.036••

* Note: Bivariate correlations for industry dummy variables omitted. The ROA sample contained 4376 total spells and the Tobin's *q* sample contained 1436 total spells.

••• is significant at the 0.001 level.

•• is significant at the 0.01 level.

• is significant at the 0.05 level.

Table 2

Descriptive Statistics for All Industries including Modal and Superior Strata Statistics for ROA and Tobin's q 1974-1997

SIC	Industry Name	1 N	2 Avg n (ROA)	3 Total Spells ROA	4 PSP Spells ROA	5 % PSP Spells ROA	6 #PSP Firms ROA	7 PSP Ratio ROA	8 Modal Mean ROA	9 Modal StDev ROA	10 SP Mean ROA	11 SP StDev ROA	12 Avg n (q)	13 Total Spells q	14 PSP Spells q	15 % PSP Spells q	16 #PSP Firms q	17 PSP Ratio q	18 Modal Mean q	19 Modal StDev q	20 SP Mean q	21 SP StDev q
1000	Metal Mining	66	21.45	429	37	8.62%	5	7.58%	-12.87	73.71	13.54	32.74	14.70	294	7	2.38%	1	1.52%	2.10	8.44	12.25	22.45
104x	Gold and Silver Ores	180	57.35	1147	106	9.24%	14	7.78%	-32.08	705.76	8.25	19.74	45.70	914	23	2.52%	3	1.67%	-5.02	243.21	6.45	10.05
1311	Crude Petroleum and Natural Gas	739	234.25	4685	327	6.98%	39	5.28%	-9.07	257.15	8.26	18.02	171.30	3426	157	4.58%	18	2.44%	1.84	101.26	10.42	65.92
1531	Operative Builders	107	43.60	872	25	2.87%	3	2.80%	0.54	16.08	9.10	8.03	33.55	671	0	0.00%	0	0.00%	0.93	4.01	2.41	1.68
2621	Paper Mills	39	23.15	463	55	11.88%	5	12.82%	4.23	7.27	11.03	3.24	19.95	399	27	6.77%	3	7.69%	1.22	0.57	2.49	0.99
267x	Paper and Paperboard	70	27.10	542	39	7.20%	2	4.29%	3.79	10.90	12.89	6.13	22.40	448	41	9.15%	3	4.29%	1.55	3.89	5.63	12.98
2711	Newspaper Publishing and Printing	44	17.90	358	17	4.75%	2	4.55%	8.25	5.30	12.23	2.66	14.75	295	19	6.44%	2	4.55%	2.38	4.74	4.28	2.00
2721	Periodical Publishing	38	11.55	231	45	19.48%	4	10.53%	-1.72	23.02	9.65	6.81	8.20	164	36	21.95%	3	7.89%	2.21	8.06	3.85	2.40
2731	Book Publishing	47	18.10	362	42	11.60%	5	10.64%	4.09	8.12	11.02	5.74	13.65	273	7	2.56%	1	2.13%	1.56	1.01	3.78	2.14
2834	Pharmaceuticals	258	82.60	1652	319	19.31%	32	12.40%	-16.61	45.89	10.89	9.00	69.45	1389	104	7.49%	13	5.04%	4.13	11.76	12.94	21.00
2835	In Vitro In Vivo Diagnostics	112	32.80	656	101	15.40%	11	9.82%	-59.54	481.25	-2.82	45.76	24.70	494	7	1.42%	1	0.89%	3.49	24.56	13.87	34.87
2851	Paints and Allied Products	22	11.10	222	27	12.16%	2	9.09%	5.59	10.52	10.91	3.69	8.85	177	8	4.52%	1	4.55%	1.64	0.88	8.92	25.20
2911	Petroleum Refining	85	43.35	867	8	0.92%	1	1.18%	4.32	4.84	9.04	4.56	35.85	717	37	5.16%	5	5.88%	1.11	12.45	11.49	66.96
3089	Misc. Plastic Products	107	37.75	755	77	10.20%	7	6.54%	2.36	7.33	9.75	3.40	30.00	600	49	8.17%	6	5.61%	1.33	1.99	6.32	14.13
331x	Steel Works and Blast Furnaces	118	49.30	986	41	4.16%	4	3.39%	1.74	10.14	9.55	4.80	39.60	792	68	8.59%	6	5.08%	0.76	5.20	2.11	1.24
355x	Special Industrial Machinery	160	48.15	963	26	2.70%	4	2.50%	0.39	15.79	11.01	8.03	39.60	792	28	3.54%	4	2.50%	1.16	12.95	5.88	18.26
357x	Office Equipment and Elec. Computing	557	161.30	3226	183	5.67%	22	3.95%	-3.96	43.78	11.97	7.34	131.30	2626	96	3.66%	12	2.15%	1.38	49.62	7.73	62.91
365x	Household Audio and Video Equipment	87	23.95	479	29	6.05%	4	4.60%	0.61	11.27	9.61	4.67	18.85	377	19	5.04%	3	3.45%	1.55	3.41	6.79	15.26
3661	Telephone and Telegraph Equipment	164	48.95	979	62	6.33%	8	4.88%	-2.65	20.75	11.07	8.62	39.30	786	0	0.00%	0	0.00%	0.41	47.46	9.52	20.47
3674	Semiconductors and Related Devices	159	50.25	1005	44	4.38%	7	4.40%	1.53	17.03	12.27	4.86	42.50	850	16	1.88%	2	1.26%	2.24	4.31	4.33	6.28
3714	Auto Parts and Accessories	133	44.40	888	89	10.02%	7	5.26%	2.55	20.65	59.25	1041.64	35.95	719	23	3.20%	3	2.26%	1.43	3.38	3.27	2.21
3812	Navigation and Guidance Systems	69	30.45	609	36	5.91%	4	5.80%	3.69	10.71	11.65	5.29	25.80	516	12	2.33%	2	2.90%	2.05	5.03	7.21	11.87
3841	Surgical and Medical Equipment	159	40.85	817	74	9.06%	8	5.03%	-3.19	45.85	12.25	7.08	30.30	606	22	3.63%	3	1.89%	4.48	33.04	19.86	61.18
3845	Electromedical Apparatus	185	50.75	1015	71	7.00%	7	3.78%	-8.20	30.12	10.80	6.93	39.30	786	24	3.05%	3	1.62%	6.62	91.74	43.84	255.41
3861	Photographic Equipment and Supplies	66	24.40	488	27	5.53%	3	4.55%	-0.37	29.36	10.37	4.63	18.05	361	6	1.66%	1	1.52%	2.23	7.02	6.17	10.81
421x	Trucking (except local)	148	42.15	843	91	10.79%	9	6.08%	1.62	12.50	9.76	3.85	30.05	601	23	3.83%	3	2.03%	1.50	12.60	4.59	30.16
4512	Airlines	110	33.80	676	28	4.14%	4	3.64%	-1.56	20.00	6.38	9.41	25.20	504	0	0.00%	0	0.00%	1.60	6.41	4.58	9.53
481x	Telephone Communications	305	117.00	2340	240	10.26%	27	8.85%	5.05	6.56	9.93	4.61	45.60	912	75	8.22%	9	2.95%	2.13	23.21	11.63	46.89
4833	Television Broadcast Stations	75	20.15	403	23	5.71%	3	4.00%	2.97	15.09	11.03	6.35	15.55	311	0	0.00%	0	0.00%	2.31	8.38	6.09	7.04
4911	Electrical Services	168	71.55	1431	48	3.35%	5	2.98%	4.18	1.41	5.71	1.67	63.55	1271	8	0.63%	1	0.60%	1.14	0.95	1.64	2.93
5311	Department Stores	78	29.75	595	71	11.93%	7	8.97%	2.86	7.05	7.43	3.21	22.45	449	19	4.23%	2	2.56%	0.92	8.65	2.90	15.69
5411	Grocery Stores	133	45.05	901	178	19.76%	14	10.53%	3.26	4.49	9.24	3.45	35.70	714	98	13.73%	10	7.52%	2.35	38.93	3.01	1.95
5812	Eating Places	316	91.75	1835	227	12.37%	20	6.33%	0.23	13.82	10.78	6.62	68.80	1376	28	2.98%	5	1.58%	2.11	4.71	6.23	36.07
602x	Commercial Banks	678	203.35	4067	120	2.95%	13	1.92%	0.73	1.37	1.26	2.99	190.35	3807	45	1.18%	6	0.88%	1.12	0.65	1.81	0.89
6211	Securities Brokers and Dealers	107	37.95	759	68	8.96%	7	6.54%	-0.68	34.88	5.85	8.14	30.95	619	14	2.26%	1	0.93%	1.20	1.15	3.68	2.74
6311	Life Insurance	103	33.40	668	48	7.19%	5	4.85%	1.68	2.51	3.83	2.35	31.35	627	20	3.19%	3	2.91%	1.00	0.60	2.22	1.29
7011	Hotels and Motels	102	35.20	704	117	16.62%	10	9.80%	-1.07	30.81	7.65	7.95	21.55	431	22	5.10%	2	1.96%	1.40	3.01	4.14	5.31
731x	Advertising Agencies	64	14.25	285	7	2.46%	1	1.56%	1.11	15.33	8.76	3.30	11.50	230	0	0.00%	0	0.00%	1.97	9.26	13.20	25.71
7372	Prepackaged Software	512	75.00	1500	99	6.60%	13	2.54%	-4.89	43.10	15.91	8.75	54.90	1098	31	2.82%	4	0.78%	4.83	32.67	14.04	105.53
7812	Motion Picture Production	102	24.90	498	10	2.01%	1	0.98%	-15.27	394.81	4.94	15.34	20.00	400	7	1.75%	1	0.98%	2.53	13.85	5.72	17.27
	Totals/Averages	**6772**		**42201**	**3282**	**7.78%**	**350**	**5.17%**			**10.48**	**166.38**		**32822**	**1239**	**3.77%**	**139**	**2.16%**			**8.65**	**62.27**

Table 3

Maximum Likelihood Estimates of Persistent Superior Performance Exit (Tobin's q), 1977-1997

	Model								
Variable	All*	HiTech	LoTech	SIC 1	SIC 2	SIC 3	SIC 4	SIC 5	SIC 6
Period	.1056●●●	.164	.083●●	.0929	.1294●●	.0559	.4670●	.0149	-.0193
	(.0267)	(.170)	(.028)	(.0704)	(.0496)	(.0338)	(.1857)	(.0549)	(.0958)
Density	.0024	-.022	.005	-.0077	.0069	.0036	-.1835●	.1057●●	.0120
	(.0057)	(.023)	(.006)	(.0077)	(.0088)	(.0037)	(.0933)	(.0382)	(.0124)
Size	.1364●●	.200	.140●	.1070	.0648	.2121●	.0674	1.8823●	.5805
	(.0029)	(.111)	(.057)	(.0874)	(.0883)	(.0853)	(.2505)	(.7596)	(.4027)
Entropy	-.2013	-.401	-.206	-.0712	.2028	-.0544	-.6151	.6349	-1.2539
	(.3319)	(1.441)	(.352)	(1.5334)	(.5256)	(.5479)	(1.4927)	(1.1327)	(2.3288)
4-Firm	-3.0668	-10.888	-2.705	-8.1127	-.6766	1.8730	-25.9281●	10.7668	3.5486
Conc. Ratio	(2.8403)	(12.667)	(3.100)	(4.0253)	(1.7509)	(1.4900)	(12.2061)	(6.1061)	(7.6483)
Market	.3339	-11.229	.571	-1.7927	.5061	-10.6449	141.0405	-51.8844	-1.6021
Share	(1.6170)	(13.784)	(1.619)	(11.0903)	(1.8993)	(6.5968)	(116.7311)	(27.0414)	(5.7924)
SIC3812	2.1056●								
	(.9809)								
SIC3841	2.5042●		2.411●						
	(1.0077)		(1.130)						
Log-likelihood	-369.06	-53.84	-304.33	-51.14	-91.48	-117.09	-28.21	-40.07	-25.24
Spells	1436	234	1129	221	348	443	107	173	104

* Notes: Non-significant industry dummy variables omitted. SIC 7 model had too few events to be estimated.

●● is significant at the 0.01 level.

● is significant at the 0.05 level.

Table 4

Maximum Likelihood Estimates of Persistent Superior Performance Exit (ROA), 1977-1997

	Model									
Variable	All*	HiTech	LoTech	SIC 1	SIC 2	SIC 3	SIC 4	SIC 5	SIC 6	SIC 7
Period	.1563●●●	.152●●	.122●●●	.2337●●●	.1312●●	.0831●●	.0745	.1412●●	.1531●	.2566●
	(.0189)	(.061)	(.018)	(.0478)	(.0425)	(.0273)	(.0449)	(.0548)	(.0724)	(.1121)
Density	-.0078	-.016	-.001	.0037	-.0479●●●	-.0001	-.0101	.0125	.0266●	-.0342
	(.0043)	(.011)	(.004)	(.0022)	(.0111)	(.0026)	(.0075)	(.0121)	(.0104)	(.0210)
Size	.0099	.180	-.008	-.0317	.1358	.0971	.2032	.4019	.0213	.1389
	(.0540)	(.103)	(.055)	(.1030)	(.1789)	(.0951)	(.1886)	(.3583)	(.2203)	(.2439)
Entropy	.5441●	.561	.160	.4797	.9483	.2342	.8936	1.1201	.8982	-2.2531
	(.2290)	(.562)	(.231)	(.5546)	(.5354)	(.4013)	(.5820)	(.6466)	(.7505)	(1.6678)
4-Firm	-.4001	-5.255	.367	.9339	-2.3239	-.3455	.6542	2.6870	5.0832	-6.4580
Conc. Ratio	(1.8570)	(4.839)	(1.931)	(1.1356)	(1.8382)	(1.1441)	(1.3748)	(2.6019)	(3.9076)	(4.9201)
Market	.4192	-2.174	.304	-2.5558	-2.0569	-.9033	-9.7181	-8.4810	3.9099	3.3328
Share	(1.2727)	(3.337)	1.284	(3.5270)	(2.3705)	(2.3306)	(8.2464)	(11.3193)	(3.1217)	(4.8130)
SIC3714	2.6850●									
	(1.1286)									
SIC3812	2.1411●									
	(.9648)									
SIC3841	2.3901●									
	(1.0848)									
SIC4512			1.800●							
			(.853)							
Log-likelihood	-723.81	-172.95	-663.32	-131.57	-92.49	-217.14	-87.73	-79.44	-65.62	-42.33
Spells	3735	662	2897	522	755	918	449	536	292	263

* Note: Non-significant industry dummy variables omitted.

●●● is significant at the 0.001 level.

●● is significant at the 0.01 level.

● is significant at the 0.05 level.

Table 5

Maximum Likelihood Estimates of Persistent Superior Performance Exit (ROA), 1977-1997

Measure	ROA		Tobin's q	
	First half	Second half	First half	Second half
Incidence of pattern	133	188	72	140
Incidence of non-pattern	12087	15366	15562	19571
N =	27774		35345	
Likelihood chi-square	100132.04•••		150484.29•••	

••• is significant at the 0.001 level.

APPENDIX 1

To initialize the Iterative Kolmogorov-Smirnov stratification (IKS) technique, we assumed that no firm's performance was statistically significantly different from any other firm's performance and that therefore the entire industry or reference set had a single distribution of performance. We then use the nonparametric Kolmogorov-Smirnov two-sample test and iteratively test each firm's distribution of performance for a specific period against the group distribution of performance levels for the same period.

Firms with performance distributions that were different from the group distribution in a statistically significant ($\alpha = 0.05$) manner were set aside. The process was repeated until the stabilization of the stratum of firms sharing the main distribution was achieved. Firms that were eliminated from the principal performance stratum were then used as the foundation of a second stratum, and the process was repeated until no additional strata could be formed. After all strata were formed, any single-firm strata were retested against all other strata, and then the entire process was repeated until no further firms could be excluded or included.

Unlike cluster analysis, the IKS method does not predetermine the number of performance strata for an industry; the strata emerge based the significance level that is used to discriminate between distributions and on the data's characteristics. The IKS methodology is a polythetic divisive multiple-pass technique that mitigates against both the incompleteness of the single-pass algorithms that are characteristic of traditional clustering techniques and the researcher's subjective involvement (Ketchen & Shook, 1996).

The IKS analysis produces performance strata that form naturally ordered categories (Argresti, 1984) from superior to poor performance that are statistically significantly different from each other. However, IKS analysis can generate varying numbers of performance strata

over time, which makes longitudinal comparisons difficult. We are interested only in the firms with performance above the industry or reference set modal stratum. Therefore, as a form of a fortiori analysis (because it is conservative in regard to the hypotheses being tested), the number of performance strata were compressed in each time period to three by creating two supersets of strata: those above the modal stratum and those below the modal stratum. To validate the stratification supersets, discriminant function analysis was employed in a confirmatory mode on the industries studied. For these industries, all of the discriminant functions were significant ($p<0.05$) for both variables, demonstrating the validity of the superset performance strata.

The Effects of Diversification

Because the industry samples were based upon primary SIC codes, some diversified firms that also conducted business in other SIC codes were included in these samples. To determine if the inclusion of the diversified firms materially affected the results for the non-diversified firms, the latter[2] were subsampled from the computing industry (SIC 357) ROA sample and the entire analysis described above was repeated on just those firms. Once again, all of the discriminant functions were statistically significant at least at the $p<0.05$ level, and the average classification rate of over 60% was over two and one half times that expected by chance. To compare the classifications of the non-diversified subsample with those from the complete sample, each set of the observations was pooled and Cohen's kappa for interrater agreement was calculated. The two sets of analyses agreed on over 88% of the classifications with a value of kappa of 0.756 (with a standard error of 0.023 for an approximate z-score of 31.972, significant at the $p < 0.001$ level). Cohen's kappa was also computed for each 5-year window. In one period

[2]To remain consistent with prior diversification research, the coding was done strictly on SIC code classifications, even though this meant that many firms that would not be considered diversified by industry experts were in fact coded as diversified. For example, PC clone computer manufacturers such as Dell, Gateway 2000, Zeos, and others

out of 44, the number of groups was unbalanced and kappa could not be computed, but in all the other periods kappa was significant at the $p<0.001$ level, and in two periods the two analyses agreed on 100% of the classifications. With such high levels of agreement between the two sets of analyses, the inclusion of the diversified firms did not appear to materially affect the outcomes of the analyses, which is consistent with the conclusions of Hoskisson & Hitt (1990).

all report SIC codes for software, communications devices, and other add-ons which are ancillary to their main business.