The emergence and sustainability of abnormal profits

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Abstract

In this paper, we examine the emergence and the sustainability of abnormal profits among businesses that were part of US public corporations between 1981 and 1994 and that reported financial results for at least six years. Our results reveal strong asymmetries between high and low performers. Overall, high performance is more stable than low performance. High performers show profits above the average a decade earlier. In contrast, low performers show profits that are slightly *above* average a decade earlier. Industry and corporate-parent effects influence high performance to a far greater degree than low performance. Low performance is dominated by business-specific effects.

Key words • competition • entrepreneurship • industry • performance • sustainability

The fields of strategy and organization deal with fundamental questions about how company profits emerge and persist over time. Strategy researchers have generated extensive theory on the sources of profitability, including the industrial-organization, resource-based, property rights, organizational ecology, and transaction-cost views. For example, resource-based theorists tend to emphasize the importance of corporate and business-specific effects in the emergence of high performance, and organizational ecologists emphasize the persistence of both high and low performance due to inertia. While there is no shortage of theories to explain the sources of profitability, there is little empirical evidence about the trajectory of profitability over extended periods of time. Mueller (1986), Ghemawat (1991), and McGahan and Porter (1999) are exceptions.

In this paper, we report the results of a panel study that begins to fill this gap. Our purpose is to report empirical regularities in the different trajectories of profitability for those businesses that retained their identities and reported financial results for at least six years. The analysis distinguishes the influences on the emergence and sustainability of abnormal profitability of year, industry, corporate-parent, and business-specific effects. The approach reflects the idea that industry, corporate-parent, and business-specific levels are all important for

understanding the role of both strategy and organization. Data are drawn from the Compustat Business-Segment Reports for 1981 through 1994, which cover the activities of all corporations publicly traded on US equity markets.

Industry effects on the emergence of high and low profitability arise from structural impediments to competition that similarly affect incumbents. For example, after its initial public offering in 1986, the Lotus Development Corporation was a superior performer in the sense that its return on assets in each year was greater than average. Its performance largely reflected its participation in the profitable PC applications software industry. The structural impediments that generated industry effects in the software industry arose through both strategy and organization. In this case, the decisions and actions of particular individuals, such as those of Bill Gates, were instrumental in shaping the industry structure through strategic and organizational choices that gave rise to shared development tools, licensing policies, and barriers to entry. Broadly, this paper provides evidence that suggests relationships between various theoretical explanations for why industry effects arise.

Corporate-parent effects arise when a company's return in a specific business is uniquely affected by its pattern of diversification. A negative corporate-parent effect arises when a diversified firm's member businesses underperform their industries on average. For example, the tendency of corporate parents to deploy resources into related industries may partly explain why poor performance persists in some businesses. This explanation for a negative corporate-parent effect draws on both the industrial-organization and resource-based views. Like industry effects, corporate-parent effects can be explained theoretically by the industrial-organization, resource-based, and organizational views (among others). In general, we allow for the fact that different theoretical explanations may be relevant for understanding the sources and persistence of the effects. This paper identifies the effects but does not discriminate among the theoretical explanations.

A positive corporate-parent effect arises when a diversified firm's member businesses outperform their industries. For example, Taco Bell's profitability improved during the 1980s after it was acquired by Pepsico, a beverage and food company with operations in other fast-food businesses. In this case, membership in the corporate parent improved the profitability of the member business in ways that were not available to the average fast-food company, and in ways that supplemented the improvements in the business-specific effect associated with a 1984 restructuring.

Business-specific effects arise from differences in the competitive positions of an industry's incumbents, and also are rooted in both strategy and organization. Throughout this paper, the term 'competitive positioning' refers to the broad variety of factors that influence the relative performance of a specific firm within an industry compared to its direct rivals within the industry. Southwest Airlines' performance during the 1980s was largely due to business-specific effects based on its particular competitive strategy in the airline industry: it

offered low price and convenience to business travelers on short-haul flights between medium-sized cities; it achieved extremely low operating costs due to route selection, few on-board services, efficiencies in aircraft utilization, and highly motivated employees. Southwest substantially outperformed the industry as a whole, where limited barriers to entry and vigorous competition between incumbents depressed average profitability. Case studies on Southwest demonstrate that its no-frills approach, better segmentation, superior leadership, and extraordinary execution all contributed to the business-specific effect. In general, business-specific effects may arise from entrepreneurial insight, effective management of critical resources, superior organization design, effective leadership, and other factors that influence strategy and organization.

Industry, corporate-parent, and business-specific effects also influence the *sustainability* of profits, which we define as the tendency of abnormally high or low profits to continue in subsequent periods. Theory gives rise to several potential reasons why high profits may be sustained. Organizational ecology focuses on impediments to imitation. Resource-based theorists suggest that long-lived assets with appropriable value explain persistently high profitability. Recent work in industrial organization emphasizes institutional structure as a potential source of persistence. This paper presents evidence on actual patterns in the persistence of high performance to shed light on the causal mechanisms suggested by each of these theories.

Superior performance may deteriorate because of eroding industry structure, such as occurred with the deregulation of long-haul trucking during the 1980s. Profits also may decline because of the detrimental influence of a corporate parent. For example, during the 1980s, Ross Perot claimed that the company he founded, EDS, had suffered as a result of its acquisition by General Motors. Performance in a particular business also may decline because of damage to business-specific effects. The Heileman Brewing Company was bankrupt in 1987 because it could not sustain a profitable position after competitors cut prices in its markets.

To investigate these effects, we examine the profitability of businesses covered in the Compustat Business-Segment Reports for 1981 through 1994. We excluded data on subsequent years because of large distortions in reported performance during the late 1990s. The data report the profitability of publicly traded firms by 'business segment', i.e., by particular industries defined by 4-digit SIC codes. In our statistical analysis, we decompose the profitability of business segments into effects associated with the year, the industry, the corporate parent, and the segment itself. We include business segments in our estimates even if the Compustat Business-Segment Reports do not contain a complete data series for 1981 through 1994. In some previous studies, businesses were included only if a full time series was available. We believe that the prior approach may have introduced selection bias in the calculation of effects and hence in estimates of persistence. Our objective is to include all useful information to ensure better estimates.

By examining the historical influence of each effect on segments that become high and low performers, we explore patterns in the emergence of abnormal profits. We examine patterns in the sustainability of abnormal profits by studying the influence of each effect on the subsequent profitability of initially high and low performers. The results address the trajectory of performance for only those business segments that maintain their identity for at least six years. There could be systematic differences in the influence of industry, corporate parent and segment-specific characteristics for those segments that maintain their identity and those that are sold, acquired, closed, or redefined. Our analysis cannot address these differences due to the absence of data, and the findings should be interpreted accordingly. Although the analysis is fundamentally descriptive, it provides an empirical foundation for exploring the nature of the underlying strategic and organizational processes.

This study differs from prior research in a number of respects. First, it brings together research in two separate lines. In one line, authors have studied the influences of industry and firm-specific effects on profitability but have neither analyzed how the effects change over time nor examined high and low performance separately. Schmalensee (1985) found that industry effects account for about 20% of cross-sectional variation in the profits of the business units covered in the Federal Trade Commission's (FTC) 1975 Reports on American manufacturers. Rumelt (1991) showed that business-specific effects have an important influence on the profits of manufacturing firms covered in FTC Reports for 1974 to 1977. Using data on a broader variety of economic sectors, McGahan and Porter (1997) showed that year, industry, corporate-parent, and business-specific effects all influenced abnormal profits among Compustat firms over the period 1981 to 1994. The effects may differ for high and low performers, however, and thus endure at different rates.

In the second line of research, authors have studied the persistence of profits over time, measuring persistence in several particular ways. Such research either did not examine differences in the emergence and sustainability of profits, or did not study the influence of industry, corporate-parent, and business-specific effects on emergence and sustainability. Several of the studies in this line (Mueller, 1986; Waring, 1996; McGahan and Porter, 1999) employed a method that requires careful interpretation because it defines persistence as the endurance of the incremental components of effects. Mueller (1986) used FTC survey results that spanned a 23-year period to demonstrate significant persistence in the ranking and profitability of very high and very low performers. Using this method, Waring (1996) demonstrated persistence in the corporate profits of US firms. McGahan and Porter (1999) used the Compustat Business-Segment Reports to show that industry effects persist longer than corporate-parent effects, which in turn persist longer than business-specific effects. McGahan and Porter (1999) compared differences among industry, corporate-parent and business-specific effects in the persistence of their shocks – that is, of *incremental* changes that could be identified with a specifc year under study. This

paper differs in that it deals with persistence in the *entire* influence of the industry, the corporate parent, and the specific business, regardless of whether the influence arose from a fixed effect or from a shock. As a result, the analysis in this paper deals with a broader set of issues that arise in the development of strategy and in the effectiveness of organization.

Cubbin and Geroski (1987) used different methods to show endurance in the firm-specific effects of 217 British manufacturers. Ghemawat (1991) showed sustainability in the profits of firms covered in the PIMS database. Here, we separately examine how industry, corporate-parent, and business-specific effects emerge and how they are sustained. By bringing together research in the two lines, we aim to shed light on the underlying competitive processes that shape strategy and organization.

Our research also differs from previous studies because it is based on a dataset that covers a wide variety of economic sectors over a period that spans several business cycles. The screened Compustat reports contain information on agriculture and mining, construction, manufacturing, wholesale and retail trade, transportation, entertainment and lodging, and the service sector. Many prior studies, including Schmalensee (1985); Rumelt (1991); Mueller (1977, 1986), and Cubbin and Geroski (1987), covered only the manufacturing sector. As a result, our findings are more general than those of previous authors.

Finally, our research differs from previous studies in that it includes information on segments even if we do not have a series of data on them in every year from 1981 to 1994. Unlike Mueller (1986) and Waring (1996), we include businesses on which we do not have a complete series because they prove to account for a significant portion of activity in the economy. Entries and exits in the Compustat Business-Segment Reports include acquisitions, divestitures, and reclassifications. Thus, they often do not represent actual entries and exits by businesses and should not be interpreted as economic entry and exit. In McGahan and Porter (1999), we present the results of a number of tests on selection bias with regard to exits and entries in the Compustat data. Although we find no evidence of differences in rates of entry by high and low performers, we do find differences in rates of survivorship for high and low performers. This difference may be attributable to the viability of operating units or to reporting bias. Our findings apply only to publicly traded firms, not to all businesses in the economy. As a consequence of including businesses without a complete series, our dataset includes information on businesses that are more varied in age than those examined by previous authors. Our results are also less subject to survivorship bias than those of previous studies.

Methods

Our analysis involves several steps. First, we calculate the mean profitability and the year, industry, corporate-parent, and segment-specific effects for each

business segment in each year. Following McGahan and Porter (1999), we use sequential, weighted-least-squares techniques to partition profits according to the following model:

$$A_{i,k,t} = \mu + \gamma_t + \alpha_{i,t} + \beta_{k,t} + \phi_{i,k,t} \qquad (1)$$

In this equation, the dependent variable is the ratio in percent of operating income to identifiable assets of the business segment in industry i and corporation k at time t. The terms μ, γ_t, $\alpha_{i,t}$, $\beta_{k,t}$, and $\phi_{i,k,t}$ represent the mean, the year effect, the industry effect, the corporate-parent effect, and the segment-specific effect, respectively. Industry, corporate-parent, and segment-specific effects differ by year. There is no corporate-parent effect unless a corporation has more than one segment.

In the sequence of the estimation, we introduce effects in the following order: mean, year, industry, corporate-parent, and segment-specific. Thus, the segment-specific effects are defined as the residual after introduction of the year, industry, and corporate-parent effects. As a result, any reporting error that arises systematically at the year, industry and corporate-parent levels also affects the measured segment-specific effects. Measurement error in accounting profits and anomalies in accounting conventions may introduce bias in our assessment of any of the effects. For example, a change in statutory requirements on pension plans in a particular year may influence all businesses in the economy and create a year effect. Similarly, a change in the inventory method of a diversified firm in a specific year may generate a corporate-parent effect in the year. We have no hypothesis about the source or direction of bias, and therefore cannot assess its impact.

Observations are weighted by assets in the calculation of each effect to assure that effects are not skewed by the influence of small segments. Rather than report the thousands of estimates, we report a nested ANOVA on equation (1).[1] Abnormal profits are defined for each segment in each year as the difference between profit and the grand mean; that is, as $r_{i,k,t} = A_{i,k,t} - \mu = \gamma_t + \alpha_{i,t} + \beta_{k,t} + \phi_{i,k,t}$.

Second, we present a set of charts that show the path of average abnormal profits in the emergence and sustainability of high and low performance. The charts partition abnormal profits by type of effect for segments that eventually become high and low performers, and for segments that once were high and low performers. For the emergence analysis, a business segment is classified as a high performer if the sum of its industry, corporate-parent, and segment-specific effects (i.e., $\alpha_{i,t} + \beta_{k,t} + \phi_{i,k,t}$) is greater than the median for all segments in the last year for which we have data on the segment, and as a low performer if the sum (i.e., $\alpha_{i,t} + \beta_{k,t} + \phi_{i,k,t}$) is less than the median in the last year for which we have data. The partitioning is based on the median rather than the mean because the median identifies half of the segments as high performers, and half as low performers. If we were to break the sample by using the mean, then

skewness in the distribution of performance would lead to different numbers of business segments in the high and low cohorts.

For the sustainability analysis, a segment is classified as a high performer if the sum of the three effects is greater than the median in the first year for which we have a complete record on the segment, and as a low performer if the sum is less than the median in the first year for which we have a complete record. (A complete record contains lagged information; thus, the classification for the sustainability analysis is based on profits in the second calendar year for which we have data on the segment.)

Third, we examine statistically the importance of industry, corporate-parent, and business-specific effects over the period from 1982 to 1994 (i.e., over the same period covered in the charts). The importance of each type of effect is assessed from its average in the emergence and sustainability of abnormal profits. The statistical assessment is based on the mean rather than the median. This allows reports on whether differences are statistically significant.

Finally, we examine persistence as it has been defined in the literature using a statistical approach developed initially by Mueller (1986). The approach is based on the idea that estimates of persistence should not be overly influenced by abnormal profits in the first observation on a business segment. If persistence were estimated as the percentage of profits in a year that had arisen in the prior year, then the estimate would be unduly affected by the arbitrary initial starting point. Under Mueller's method, 'persistence' is defined as the tendency of *incremental components* of abnormal profit to endure rather than the total amount by which abnormal profits endure between periods. The incremental component is the portion of abnormal profit that is unique in a particular year. Because persistence applies only to incremental components, the statistical approach generates results that must be interpreted carefully. For example, a high persistence rate may be associated with a small average incremental component to profitability. Thus, the persistence of the incremental component may be largely irrelevant to the tendency of profits to last between periods. The results of some previous studies, especially Waring (1996), have been interpreted without sufficient attention to this definition of persistence. The consequence is a mistaken inference about the importance of a persistent effect to the continuing performance of a firm. We use this statistical approach because it has become the standard in the literature and because it makes our results comparable to those of previous authors. In our discussion of results, we attend to the idiosyncrasies of the persistence definition. Overall, we rely on the charts to convey information about the broader patterns by which abnormal profits last between periods.

Data

The complete Compustat Business-Segment Reports for 1981 to 1994 contain 151,929 records, each on a single business segment in a particular year. Since 15

December 1977 the Securities and Exchange Commission (SEC) has required publicly-traded firms to report operating income, identifiable assets, and sales by 4-digit SIC (i.e., by business segment). We exclude data prior to 1981 because of the high proportion of missing records in the reports for 1977–1980.

From the Compustat reports for 1981 through 1994, we eliminate records without a primary SIC designation, and segments in SICs that are not identified with actual industries (i.e., those described as 'not elsewhere classified', 'non-classifiable establishments', or 'government, excluding finance'). In addition, we eliminate financial businesses designated as 'depository institutions' with SICs in the 6000s, and segments that are the only organizations in their primary SIC classifications in a particular year. Following previous authors, we exclude small segments with sales less than $10 million or with assets less than $10 million because their financial results are volatile and because they are often created for the disposition of assets prior to exit, for example.

After screening and calculating lagged effects, our dataset contains 58,340 observations. These screens and characteristics of the dataset are the same as in McGahan and Porter (1999). The screened dataset covers a substantial portion of US economic activity, accounting for about half of non-financial corporate sales and nearly a quarter of non-financial corporate assets reported to the Internal Revenue Service (IRS) from 1985 to 1992. We have information on an average of 4,488 business segments in each year, with 5.7 years of information on average for each segment. The dataset covers 638 industries, 12,304 business segments, and 7,005 corporations, of which 1,886 are diversified (i.e., report information on more than one included segment). Diversified corporations in our dataset participate in 2.6 business segments on average. The mean ratio of operating income to identifiable assets among the business segments in the screened sample is 9.94% with a variance of 248%. The average business segment has $901.2 million in identifiable assets. There is no statistically significant difference in the average size or parent diversification level among businesses with performance above and below the norm.

Because the average reported business segment is large, and because there are just 2.6 measured segments per diversified parent, we believe that the average business segment is larger than a true operating business unit. There is evidence that firms may aggregate activity beyond the true 4-digit level in their reports on segments to limit disclosure and because a maximum of only 10 segments must be reported. The implied aggregation in reported business segments suggests the pooling of activity that would otherwise be categorized in more than one 4-digit SIC. Such pooling would tend to dampen industry effects and enhance business-specific effects because we infer industry profits from the overly diverse activities of segments categorized in the same 4-digit SIC and assess the business-specific effects as the residual. If the business units of diversified firms are related, the pooling also may dampen corporate-parent effects because we infer the influence of the corporate parent from the profits of

member segments. Segment-specific effects may be diminished if the effects of the different positions of a parent within true 4-digit industries are blurred through aggregation. We interpret our results with these tendencies in mind.

We have at least six years of data on a total of 4,046 business segments, which account for 65.2% of the total observations. McGahan and Porter (1999) shows that relationships between aggregate measures of persistence are not sensitive to the six-year exclusion rule. We confine our estimates of persistence to these segments to exclude segments for which persistence estimates may be spurious because of fluctuations in the business cycle, for example, and because our methods require at least three years on a segment for calculation of a full set of statistics. The average number of years per segment in our analysis of persistence is 9.4.

The analysis reported in this paper deals with mobility between high and low performance over time. Of the business segments, 36% are high performers (i.e., rank in the top half of segments by profitability) at both the beginning and the end of the period for which they are tracked; 14% begin as high performers and end as low performers, 10% begin as low performers and end as high performers, and 39% begin as low performers and end as low performers. The remainder of the analysis investigates this pattern in greater depth.

Empirical results

In this section, we first present the results of a nested ANOVA to verify the presence of year, industry, corporate-parent, and business-specific effects on high and low performance. We then introduce and discuss charts that show the emergence and sustainability of high and low performers. Finally, we present the results of statistical analyses to confirm and expand on the regularities identified in the ANOVA and in the charts.

The existence of effects

Table 1 shows the results of the nested ANOVA on equation (1), which we use to verify the existence of the various effects. The analysis for all segments shows that all types of effects are significant at the 1% level except corporate-parent effects. Industry effects, while significant, may be understated because of reporting error. We preserve corporate-parent effects in the analysis despite their lack of significance in the aggregate because of their theoretical importance and because McGahan and Porter (1997) and McGahan (1999) show a strong relationship between corporate-parent and industry effects. In a nested ANOVA, McGahan and Porter (1997) show that the time-invariant portions of year, industry, corporate-parent, and segment-specific effects add to incremental R^2 in nearly the same proportions as in Table 1.

Table 1: Sequential analysis of variance of equation (1)[a]

Source	All segments			High performers[b]			Low performers[b]		
	d.f.	Incr. R^2	F-Stat[c]	d.f.	Incr. R^2	F-Stat[c]	d.f.	Incr. R^2	F-Stat[c]
Year	12	0.0044	21.24	12	0.0170	41.50	12	0.0037	8.88
Industry-year	6402	0.2130	1.73	5783	0.2959	1.22	5403	0.2254	0.99
Corporate-parent-year	10847	0.1883	0.91	8796	0.2997	0.73	7714	0.2278	0.61
Segment-specific-year	41078	0.5944	inf	14657	0.3873	inf	15961	0.5431	inf
Model	58340	1.0000		29249	1.0000		29091	1.0000	

[a] Order of effects: year, industry-year, corporate-parent-year, segment-specific-year
[b] For this analysis, high performers and low performers are identified as segments with profits above and below the mean by year; segments with profits at the mean are identified as high performers
[c] All F-statistics are significant at the 1% level except for the corporate-parent-year effects

Charting the emergence and sustainability of abnormal profits

Figure 1 shows the emergence of high and low performance in the sample. The vertical axis represents the sizes of effects (as the contribution to the total ratio of operating income to identifiable assets). The horizontal axis represents the number of years prior to the final year for which we have data on the segment. For each segment, we lose the first observation in our statistical analysis of persistence. Thus, we have a maximum of 13 years of data on each segment. Segments are included in the calculations for the charts even if we do not have a complete series of data on them. Thus, the plotted averages at the right side of the figure (above year 0) represent the average of the effects in the last years for which data is available. The information above the horizontal axis at the year marked 10, for example, describes the averages for segments 10 years prior to the date (year 0) at which they are classified as high performers. As a result of this approach, the averages at the left side of the figure are calculated from fewer observations than the averages at the right side of the figure. This occurs because segments enter into the dataset continuously. At the bottom of the chart, we indicate the number of observations for each year.

   In the figure, the average abnormal profits among high and low performers at year 0 are 9.3% and −11.8%, respectively. These numbers differ from each
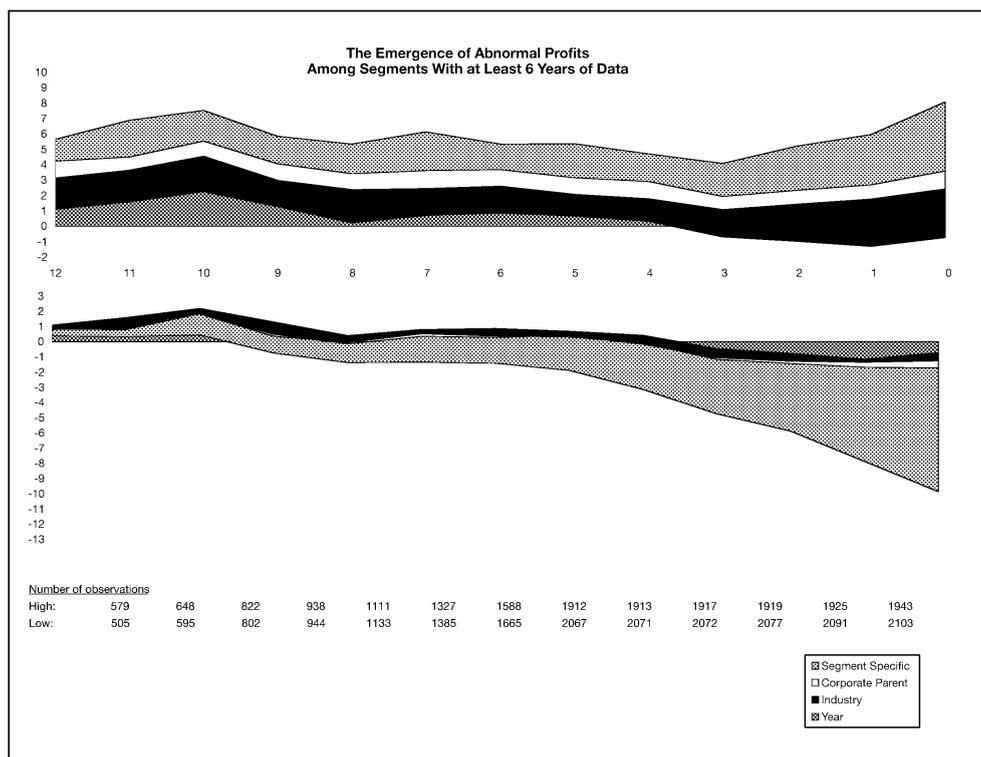

Figure 1   The emergence of abnormal profits

other in absolute value for three reasons. First, high and low performers are identified by reference to the median profitability, not to mean profitability. Second, various calendar years are represented in the calculation of averages at year 0. Third, differences in size by assets can generate differences in the average abnormal profits for high and low performers because the averages are weighted by assets. One notable feature of the results in Figure 1 is that there is as much net entry into the low-performing cohort as into the high-performing cohort during the period, which suggests no systematic distortion associated with entry. The total number of segments is about 4,000 in each of the final six years because we restrict the dataset to include only those segments for which we have six years of data. Most of the entry into the dataset occurs in years 6–12. The number varies across the last six years because some segments are not observed in the dataset for six continuous years. Entry can occur for a number of reasons, including acquisition, the formation of a new company, the entry by an established company into a new business, and changes in the conventions for reporting by an established company.

Figure 1 reveals several important empirical regularities. On average, a segment which is ultimately a high performer shows profits significantly greater than the norm over the entire period for which data are available. Highly profitable segments have a history of high performance. This suggests that the causes of high profit tend to endure and perhaps even accumulate. This result contradicts the theory that high accounting profits occur subsequent to a period of low or moderate accounting profits during which companies invest for later reward. Instead, high performance among Compustat segments appears to result from product- or factor-market imperfections that endure. The figure shows that the average low performer shows profit slightly above the norm 12 years earlier. Previously satisfactory performance is typical of segments that subsequently become low performers. The Appendix contains an analysis of segments for which we have a complete data series over the period from 1981 to 1994. Survivorship is associated with higher profits for both high and low performers.

Figure 1 also shows that the influence of industry, corporate-parent, and segment-specific effects differs markedly for high and low performers. The influence of year effects is modest and nearly the same for high and low performers, which suggests that the business cycle has little enduring effect on the emergence of abnormal profits.

For high performers, participation in an attractive industry strongly contributes to abnormal returns. This result supports theoretical explanations that emphasize the interaction between industry structure and firm positioning as crucial to the emergence of superior performance. Affiliation with a high-performing corporate parent is also associated with the emergence of abnormal returns, although to a somewhat lesser extent. This finding supports the idea that a corporation's ability to achieve superior performance through diversification may be related to the attractiveness of the other industries in which it competes. Empirically, industry effects are nearly as great as segment-specific

effects in the early development of high performance. Over time, segment-specific effects become somewhat more important, which is consistent with the idea that robust competitive positions build incrementally over time.

In contrast, low performance typically arises from business-specific effects rather than from participation in an unattractive industry or from ownership by a poorly performing corporate parent. Recall that the business-specific effects may arise from any condition that affects performance relative to direct rivals within a specific industry, and may be associated with superior insight, changing external institutions, deteriorating resources, poor leadership, or poor execution. This result means that the adverse effects on profitability associated with industry events such as the deregulation of long-haul trucking or with corporate events such as the acquisition of EDS by GM are not characteristic of the average surviving low performer. Heileman's experience in the brewing industry is typical of low performers in the sense that its emerging poor performance could be traced to its own loss of competitive position – hence a negative segment-specific effect. The importance of industry effects to high but not low performers raises a question about how low-performing industries affect profitability. The answer is that low performers tend to participate in both high-profit and low-profit industries, but high performers tend to participate in high-profit industries. Thus, the influence of the low-profit industries is offset by the influence of the high-profit industries in the reported industry effect for low performers. The strong influence of business-specific effects for low performers in Figure 1 suggests that low performance may result from commitment to untenable positions that are hard to reverse.

Figure 2 charts the subsequent sustainability of initially abnormal profits. For this analysis, segments are classified as high or low performers based on their profits in the earliest year for which we have data. Each successive point in the figure represents the average performance of the high and low cohorts in a subsequent year. Note that the averages represented at the left side of Figure 2 are developed from more observations than those at the right side of the figure. Thus, the sustainability chart is not symmetric to the emergence chart because Figure 2 groups segments at year 0 based on their performance in the earliest year, whereas Figure 1 groups segments at year 0 based on their performance in the latest year. As a result, some of the segments that are classified as low performers in the emergence analysis may be classified as high performers in the sustainability analysis, and vice versa.

The change in number of observations for each year arises because of attrition among segments in the dataset. Attrition may occur for a number of reasons: bankruptcy or corporate merger may occur, companies may combine segments in reporting, or a corporation may sell a business to another corporation that is represented in the dataset. The rates of attrition are greatest for years 6–12 because the data are constrained to include only those segments for which we have more than six years of data. Note that attrition is just as great for high performers as low performers, which may indicate that high performers are as
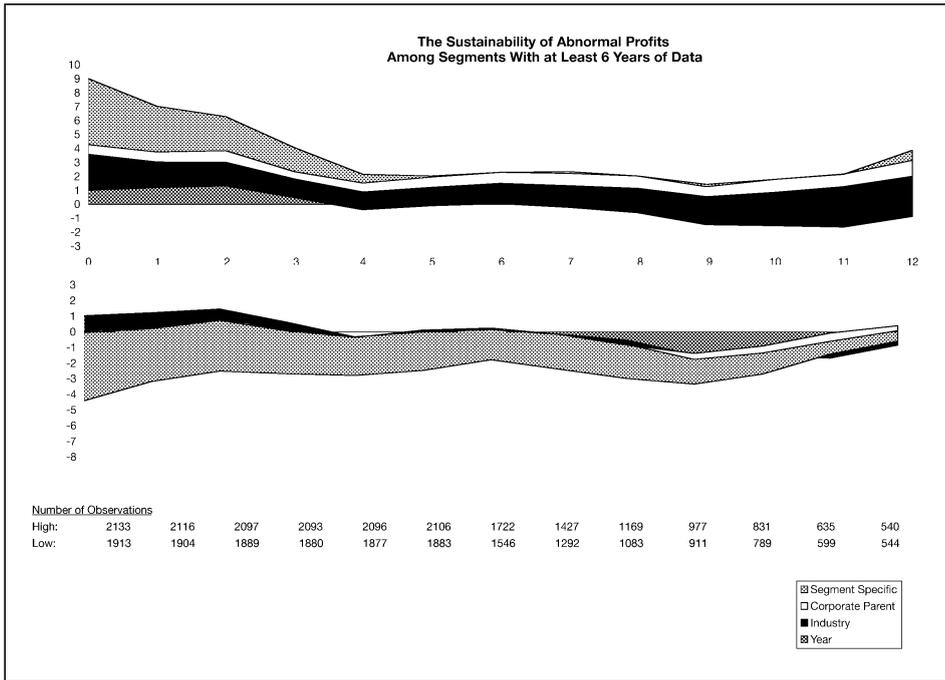
Figure 2   The sustainability of abnormal profits

likely to be sold as low performers. The results must be interpreted carefully to apply only to those segments with continuity in identity over the period.

Figure 2 reveals several important empirical regularities about sustainability. High performers show profits significantly greater than the norm 12 years later. A comparison of Figures 1 and 2 reveals that in both cases, high profits are relatively enduring. In the Compustat sample, segments that are initially high performers report profitability that erodes somewhat faster than profits emerge among segments that end up as high performers. This occurs both because of exit and entry into the Compustat dataset and because of changes in the profits of segments.

Figure 2 also indicates that initially low performing segments that continue to report for 12 years eventually show profits that are near the norm. A comparison with the emergence analysis indicates that the recovery from initial low performance occurs more slowly than low performance develops. On average, a business that is initially a low performer continues to post below-average returns. Thus, although low performers often start as average performers, low performance is difficult to reverse. Different causal mechanisms may be at work: low performance may emerge from commitments to specialized assets that do not create value for buyers, while low performance may endure because of organizational inertia that prevents the redeployment of resources to more productive uses.

In Figure 2, industry and corporate-parent effects are again significantly larger for high performers than for low performers. Thus, the influence of industry, corporate-parent, and segment-specific effects in Figure 2 is broadly consistent with Figure 1, with one exception. In Figure 2, segment-specific effects are initially large for high performers, but erode relative to industry and corporate-parent effects. By contrast, Figure 1 shows that segment-specific effects remain important to high performance in every year. On average, high performers regress toward the mean almost exclusively because of diminished segment-specific effects. Industry and corporate-parent effects are remarkably stable (see also McGahan and Porter, 1999). In other words, the erosion of an advantageous competitive position is the most significant threat to the sustainability of abnormally high profits.

On average, low performance is corrected as segment-specific effects diminish. Thus, low performers tend to reduce the disadvantages in their competitive positions over time, which is not surprising given that segment-specific effects account for nearly all of low performance. A comparison of the results for high and low performers indicates an asymmetry in how business-specific effects change. This suggests fruitful avenues for further research into theoretical explanations for why businesses can build competitive positions more easily than they can dismantle positions.

Statistical analysis on the importance of industry, corporate-parent, and segment-specific effects

We next use statistical methods to develop more precise findings. The analysis confirms our previous results, and reveals additional regularities. To assess relative importance, we examined the average and standard deviation by type of effect for high and low performers in the emergence and sustainability of abnormal profits. Table 2 shows the results. The table indicates that:

- *Large low performers show profitability closer to the norm than large high performers. As a result, abnormal profitability is greater for high performers than low performers*. The average abnormal profitability for high performers is greater in absolute value than for low performers. This asymmetry is possible because the effects are calculated by weighting each observation by the size of the segment.
- *Industry effects are especially important to high performance*. Industry effects are greater in size than any other type of effect in the sustainability of high performance, and are nearly as large as segment-specific effects in the emergence of high performance. Emerging high performers tend to participate in structurally attractive industries, and sustained high performers benefit from participation in attractive industries that remain attractive. Among low performers, industry effects are considerably smaller in absolute value than segment-specific effects in both cases.

Table 2 Importance of industry, corporate-parent, and segment-specific effects on abnormal profitability[a]

| | Emergence | | | | Sustainability | | | |
| | High Performers | | Low Performers | | High Performers | | Low Performers | |
Effect	Avg.[b]	Std.D.[b]	Avg.[b]	Std.D.[b]	Avg.[b]	Std.D.[b]	Avg.[b]	Std.D.[b]
Abnormal Profit[c]	5.733	14.153	−3.850	12.268	4.041	15.316	−2.727	11.538
Year	0.121	1.224	0.182	1.214	0.128	1.219	0.179	1.218
Industry	2.099	6.974	−0.486	5.947	1.767	7.108	−0.320	5.787
Corporate-parent[d]	1.032	6.538	−0.090	5.642	0.765	6.522	0.118	5.627
Segment-specific	2.481	12.546	−3.456	11.743	1.381	13.210	−2.704	11.283

[a] Includes only segments for which we have at least six years of data
[b] Average and standard deviation over all years for which we have data
[c] Sum of year, industry, corporate-parent, and segment-specific effects
[d] Corporate-parent effects are reported as averages over all corporations, not just diversified corporations

- *Although corporate-parent effects are consistently smaller in absolute value than segment-specific and industry effects, they contribute positively to high performance. Among low performers, corporate-parent effects slightly offset other effects.* Positive corporate-parent effects contribute to both the emergence and sustainability of high performance. High performers tend to belong to corporate parents that positively contribute to profitability. On average, low performance is slightly offset by positive corporate-parent effects, although corporate-parent effects on low performers are so small as to be negligible.

- *Segment-specific effects are important to both high and low performance, especially to low performance.* In the emergence and sustainability of high performance, segment-specific effects account for 43% and 34%, respectively, of abnormal profits on average. In the emergence and sustainability of low performance, segment-specific effects account for 90% and 99%, respectively, of abnormal profits on average. Thus, segment-specific effects are important to high performance, and dominate low performance.

- *The effects of the business cycle are not important in the emergence and sustainability of high and low performance.* High and low performance is not materially influenced by year effects. On average, year effects influence both high and low performers positively in our sample. (This result is possible because we have more observations for years at the peaks of business cycles than at the troughs of business cycles.)

See McGahan and Porter (1997) for an analysis that breaks down the contribution of industry, corporate-parent and business-specific effects for agriculture & mining, manufacturing, transportation, wholesale & retail trade, lodging & entertainment, and services. While the decomposition of variance in Table 2 confirms the results in Figures 1 and 2, it does not provide direct evidence on the rates at which abnormal profits emerge and are sustained. The next section provides a direct assessment of the relative rates of change in each type of effect.

Statistical analysis of the persistence in incremental components of effects

Figures 1 and 2 reveal that some types of effects appear to diminish over time while others appear to accumulate. To explore these regularities, we use a widely adopted statistical approach to measure the persistence in the incremental components of effects. Specifically, we stipulate that for each observation, the year, industry, corporate-parent, and segment-specific effects each consist of a fixed component and an incremental component. We also stipulate that the sum of these effects (which equals the abnormal profit) consists of a fixed component and an incremental component. For example, the segment-specific effect, $\phi_{i,k,t}$, is assumed to equal $f_{i,k} + s_{i,k,t}$. The fixed component, $f_{i,k}$, is the average amount by which an effect differs from zero in *every year* for which we have data on the segment. The incremental component, $s_{i,k,t}$, is the *additional amount* (above or below the fixed component) that arises in year t.

Following Mueller (1986), Waring (1996), and McGahan and Porter (1999), we allow the incremental component of each effect to follow the first-order autoregressive process $s_{i,k,t} = \rho_{SS,i,k} s_{i,k,t-1} + \kappa_{i,k,t}$ where $\kappa_{i,k,t}$ is a random shock at time t. McGahan and Porter (1999) use the same specification to study persistence without distinguishing the emergence of abnormal profits from the sustainability of abnormal profits. This expression defines $\rho_{SS,i,k}$, which is the rate of persistence in the incremental components for segment i,k. The rate of persistence may take on positive or negative values. Some algebraic substitution yields the following expression in $\phi_{i,k,t}$, $\phi_{i,k,t-1}$, and $\rho_{SS,i,k}$, which we use to estimate $\rho_{SS,i,k}$:

$$\phi_{i,k,t} = d_{i,k} + \rho_{SS,i,k} \phi_{,k,t-1} + \kappa_{i,k,t} \qquad (2)^{[2]}$$

Equation (2) stipulates that $\phi_{i,k,t}$ follows a first-order autoregressive process[3] with a drift captured by $d_{i,k}$. The fixed component of the segment-specific effect, denoted $f_{i,k}$, is equal to $d_{i,k}/(1-\rho_{SS,i,k})$. Equations (3) through (6) show similar relationships for the year, industry, and corporate-parent effects, and for the sum of effects. For each equation, we assume that the error is independently drawn from a distribution with mean zero and constant but unknown variance.

$$\gamma_t = a + \rho_{YR,i,k} \gamma_{t-1} + \lambda_{i,t} \qquad (3)$$

$$\alpha_{i,t} = b_i + \rho_{IN,i,k} \alpha_{i,t-1} + \vartheta_{i,t} \qquad (4)$$

$$\beta_{k,t} = c_k + \rho_{CP,i,k} \beta_{k,t-1} + \zeta_{k,t} \qquad (5)$$

$$r_{i,k,t} = \tau_{i,k} + \rho_{i,k} \; r_{i,k,t-1} + \varepsilon_{i,k,t} \qquad (6)$$

Ordinary least squares (OLS) estimation of equations (2) through (6) yields biased estimates of $\rho_{i,k}$, $\rho_{YR,i,k}$, $\rho_{IN,i,k}$, $\rho_{CP,i,k}$, and $\rho_{SS,i,k}$ because the errors associated with some years are correlated with dependent variables in other years.[4] We correct for this bias using a formula developed by Nickell (1981).[5] With Nickell's correction, the OLS procedure generates an estimate of persistence by type of effect for each of the business segments in our dataset. We obtain an average by weighting each estimate by the inverse of its variance.[6] The intuition is that the average should reflect the precision with which the constituent estimates are calculated. The inverse of the variance of each estimate accounts for both the number of observations on the segment and the degree of fluctuation in the incremental components for the segment. From the persistence estimates, we impute the fixed and incremental components of each effect. A summary measure of goodness-of-fit for each of the average persistence rates is obtained from a weighted sum of the variances of the residuals in each of the regressions, and from a weighted sum of the dependent variables in each of the regressions.[7]

In the statistical analysis, we eliminate spurious estimates by assessing persistence only when we have at least six years of data on a segment. McGahan and Porter (1999) contains a specification test to verify that estimates of persistence are not sensitive to this criterion. Changes in the corporate ownership of a seg-

ment are treated as exits and subsequent entries. We do not assess the persistence of profitability between years for any segment unless we have data on both the current and previous year for the segment; as a consequence, we omit information on a segment for the year of a change in corporate parent. Our results should be interpreted carefully as applying only to those segments that retain their identities for at least six years, and not to all segments in a particular year.

Table 3 shows the results. Panel (a) shows statistics on the emergence of abnormal profits, and panel (b) shows statistics on the sustainability of abnormal profits. The first section of each panel shows the average estimates of the fixed (i.e., $f_{i,k}$) and incremental components of each effect ($s_{i,k,t}$). The second section of each panel shows estimated rates of persistence in the incremental components and the third section shows goodness-of-fit of the persistence estimates.

In several instances, the estimated rate of persistence in the sum of effects is greater than the estimated rates for each of the constituent effects. For example, in panel (b), the estimated rate of persistence among high performers in the sum of effects is 80.6%, which is greater than each of the estimates for the year, industry, corporate-parent, and segment-specific effects of 65.8%, 76.6%, 71.5%, and 70.8%, respectively. This outcome is possible because the fixed and incremental components of effects vary asynchronously, so that aggregation across effects can yield greater stability than in each of the constituent effects. Mann–Whitney tests indicate that the means are significantly different at the 99% level for high and low performers in every case except for the following: the year effects, and the incremental component of the corporate-parent effects. Note that the fixed component of the corporate-parent effects is significantly different for high and low performers, and that the rates of persistence in the corporate-parent effects are significantly different for high and low performers. Thus, we draw our conclusions about the year, industry, corporate-parent, segment-specific and overall abnormal profits with confidence of their statistical robustness. In supplementary analyses on both the emergence and the sustainability of abnormal profits, we found no significant correlation between the fixed components, the persistence rates, the sizes of businesses, and the amount of diversification.

The results in panel (a) suggest the following regularities in the *emergence* of abnormal profits for businesses that maintain their identities for at least six years:

- *On average among businesses that retain their identities for six or more years, low performance accumulates faster than high performance.* Panel (a) shows a persistence rate in abnormal profits for low performers that is greater than for high performers (82.1% vs. 77.4%). This occurs because the incremental component of high performance is small on average; high performance is largely fixed. Persistence in the incremental component is not as relevant to the emergence of high performance as low performance. The incremental components of low performance accumulate over time on average.

Table 3 Estimates of persistence in the incremental components of effects

(a) The Emergence of Abnormal Profits[a]

	Year		Industry		Corp.-Par.[b]		Seg-Spec.		Ab. Profits	
	High	Low	High	Low	High	Low	High	Low	High	Low
Average effect [c]	0.121	0.182	2.099	−0.486	1.032	−0.090	2.481	−3.456	5.733	−3.850
Fixed component [d]	0.043	−2.249	8.180	0.128	7.673	−11.920	−18.365	−4.445	11.733	−8.794
Incr. component [d]	0.727	2.989	−5.724	−0.635	−6.735	12.573	20.136	0.487	−1.680	5.752
Estimated persistence rates										
Average [d]	0.642	0.658	0.784	0.744	0.638	0.787	0.717	0.592	0.774	0.821
Standard deviation [e]	0.005	0.009	0.002	0.006	0.002	0.058	0.020	0.021	0.000	0.000
Goodness of fit [f]	0.479	0.475	0.880	0.680	0.698	0.362	0.795	0.911	0.936	0.459

(b) The Sustainability of Abnormal Profits[a]

	Year		Industry		Corp.-Par.[b]		Seg-Spec.		Ab. Profits	
	High	Low	High	Low	High	Low	High	Low	High	Low
Average effect [c]	0.128	0.179	1.767	−0.320	0.765	0.118	1.381	−2.704	4.041	−2.727
Fixed component [d]	−0.644	−1.966	1.745	7.369	-0.460	−4.697	−2.730	−25.662	−0.742	10.792
Incr. component [d]	1.377	2.739	0.444	−7.436	1.535	5.232	1.916	24.146	4.926	−10.868
Estimated persistence rates										
Average [d]	0.661	0.643	0.760	0.771	0.643	0.781	0.620	0.712	0.808	0.753
Standard deviation [e]	0.004	0.006	0.002	0.003	0.028	0.024	0.029	0.015	0.000	0.000
Goodness of fit [f]	0.472	0.482	0.759	0.873	0.428	0.624	0.809	0.903	0.915	0.457

[a] Includes only segments for which we have at least six years of data

[b] Corporate-parent effects reported as averages over all corporations, but corporate-parent persistence rates are reported only for diversified corporations

[c] The averages of the fixed and incremental components do not sum to the average effect because the components are weighted to reflect the precision of persistence estimates

[d] Weighted by the inverse of the variance on each estimate

[e] Weighted by the inverse of the variance on the standard errors

[f] This measure is the weighted average of the R^2 in the OLS regression on each segment; the weights are the inverses of the standard errors

- *Industry effects accumulate over time for the average high performer but not for the average low performer*. In panel (a), the average incremental component of the industry effect is negative for both high and low performers. Persistence in the negative incremental component for high performers indicates that industry effects diverge from the economic mean on average. Persistence in the negative incremental component for low performers indicates that industry effects for these firms converge toward the economic mean on average. Thus, industry effects contribute to the emergence of high performance but not to the emergence of low performance. The incremental components of industry effects are also more persistent for high performers than low performers.

- *Corporate-parent effects accumulate and contribute to divergence from the mean for both high and low performers*. In panel (a), the incremental components of the corporate-parent effects take the same signs as the incremental components of the sum of effects. Thus, corporate-parent effects contribute to the divergence of abnormal profits from the mean. Corporate-parent effects on high performers are about half as large as industry effects on average, and persist at a lower rate than industry effects. Corporate-parent effects on low performers are smaller than any other type of effect (including year), although estimated rates of persistence in the corporate-parent effects on low performers show greater variability than any other type of effect.

- *The incremental components of the segment-specific effects persist at a greater rate for high performers than low performers on average*. In the emergence of high performance, segment-specific effects diminish over time on average (given the positive incremental component on average). Panel (a) also shows a positive incremental component of the segment-specific effect for low performers, which indicates that segment-specific effects diverge from the mean for the average low performer. In panel (a), incremental segment-specific effects persist at 71.7% for high performers and 59.2% for low performers.

Panel (b) shows persistence rates in the *sustainability* of high and low performance for businesses that maintain their identities for at least six years. The results indicate:

- *On average among segments that retain their identities for six or more years, the incremental components of abnormal profits deteriorate at about the same rate for high and low performers on average*. Panel (b) shows a persistence rate in the sum of effects for high performers that is about the same as for low performers (80.6% vs. 81.34%). In the sustainability of abnormal profits, the erosion of the incremental components of high performance occurs at about the same rate as the erosion of the incremental components of low performance. The competitive processes that cause regression to the mean in high performance appear to have similar effect to the corrective processes that cause regression to the mean in low performance.

- *In the sustainability of abnormal profits, industry effects contribute to convergence toward the mean for the average segment.* In panel (b), the average incremental component of the industry effect is positive for high performers and negative for low performers. Thus, industry effects on both high performers and low performers tend to diminish in absolute value over time, although the gross impact of industry effects is considerably less for low performers than for high performers. Average persistence in the incremental components of industry effects is similar for high and low performers.

- *Corporate-parent effects contribute to convergence toward the mean for high performers, but do not contribute to convergence for low performers on average.* In panel (b), the average incremental component of the corporate-parent effect is positive for both high and low performers. Thus, corporate-parent effects contribute to convergence for high performers, but not for low performers.

- *On average, segment-specific effects diminish over time for high performers. For the average low performer, segment-specific effects accumulate rather than diminish.* Panel (b) shows positive average incremental components of the segment-specific effect for both high and low performers. Thus, segment-specific effects diminish over time on average for high-performing segments. For the average low performer, however, the segment-specific effect accumulates over time on average.

A supplementary analysis on results by sector does not generate information on statistically significant differences in persistence rates because of high variance on the persistence estimates. The estimated persistence rates by sector have high variance both because there are small numbers of observations in some sectors and because we incorporate into the variance estimates a correction that accounts for the fact that the rates are themselves built from estimated parameters with non-zero variances. We did find significant differences in the effects for businesses belonging to single-segment and diversified companies, however. Significant differences for single-segment and multi-segment firms arise in the fixed components of the industry effects and in the persistence rates of the business-segment effects. Single-segment businesses tend to have higher fixed components of industry effects but somewhat lower persistence rates in business-specific effects. This may arise because single-segment businesses participate in more attractive industries while diversified firms have greater scope for enhancing favorable influences on positioning. These findings point to opportunities for further research on the structural and behavioral differences across focused and diversified firms that give rise to the emergence and sustainability of abnormal profits.

Conclusion

In this study, we examine the behavior of profitability among business segments covered in the Compustat Business-Segment Reports for 1981 to 1994 and that

retain their identities for at least six years. Our purpose is to report on empirical regularities in the influence of year, industry, corporate-parent and business-specific effects on high and low performance over time. This study differs from prior research by examining differences in the emergence and sustainability of abnormal profits, by examining changes in the influence of effects over time, and by distinguishing differences among high and low performers.

We chart the emergence and sustainability of high and low performance among a large group of firms engaged in the US economy, and corroborate the results using statistical methods. In analyzing changes over time, we distinguish between the incremental and fixed components of abnormal profit and note that the standard measure of persistence applies only to the incremental components. We are unable to explore the differences in industry, corporate parent, and business-specific factors between business segments that retain their identity for six years and those that are sold, acquired, closed, or redefined. The persistence rates reported in this paper apply only to the incremental component of the effects for business segments with at least six years of longevity. Some previous studies have reported persistence estimates that have been interpreted more generally. Because the incremental components of abnormal profit may be quite small, this misinterpretation can lead to incorrect inferences about the emergence and sustainability of abnormal profits. To best convey our results, we interpret the persistence estimates in context of the charts presented earlier.

The analysis reveals the following broad regularities about the process of competition:

1   Industry effects are more important than business-specific and corporate-parent effects in the sustainability of high performance. Business-specific effects are more important than industry and corporate-parent effects in the emergence and sustainability of low performance, and in the emergence of high performance.
2   Industry and corporate-parent effects are more important on average to high performance than to low performance. Business-specific effects are more important on average to low performance than to high performance.
3   On average, high performance is preceded by high performance, whereas low performance is preceded by average performance.
4   High and low performance erode at about the same rate.

While our analysis is descriptive, the results are consistent with fundamental principles of strategy and organization. The emergence of low performance is distinguished not by a history of poor performance but by the onset of an adverse competitive positioning in a situation where industry and corporate-parent effects are neutral on average. The absence of negative industry effects on low performance suggests that low performance is not triggered by competitive imitation. Instead, low performance apparently emerges when a competitor that initially generated an average return suffers from an eroding position relative to rivals.

On average, the emergence of high performance reflects a combination of several circumstances: creating a business-specific position with benefits that are preserved over time; participation in an attractive industry; and the beneficial influence of a corporate parent. High performance is not normally associated with mastering profit-dissipating rivalry in an unattractive industry.

On average, the industry and corporate-parent effects of high performers are more sustainable than their business-specific advantages. This may mean that positioning effects due to strategy and to organization are exposed to competitive threats. Given the enduring nature of the positive industry effect on the average high performer, it appears that high performers do not resort to profit-dissipating rivalry to fend off imitation, perhaps in the interest of preserving industry structure.

On average, low performance is sustained for over a decade. The longevity and importance of segment-specific effects suggests that low performers adopt losing strategies or adopt management practices that are hard to modify. Candidate explanations include organizational inertia and sunk-cost effects that lock a company into a losing strategy.

There is a stark contrast between sustaining high performance and the emergence of low performance. Emergent low performers appear to be locked into their adverse competitive positions and find it hard to recover their profitability. Sustained high performers appear to preserve industry and corporate benefits as their distinctiveness within a business erodes over time. When a high performer can preserve its distinctive business-specific effect without harming industry structure and without harming other corporate members, then the high performance appears to accumulate. In sum, a distinctive idiosyncratic business-specific effect appears to be necessary for the emergence of superior profitability. Overall, however, sustained high profitability apparently follows from the decision to preserve industry attractiveness and corporate structure rather than to obtain a fully distinctive business-specific advantage without regard for the industry and corporate consequences.

This paper also points to opportunities for further research. While the descriptive analyses in this paper do not test theoretical hypotheses, the results are broadly consistent with theory from a number of disciplines and perspectives. One major avenue for research lies in identifying the causal mechanisms that explain why superior performance tends to emerge quickly while inferior performance emerges slowly and tends to persist. Sophisticated studies of mobility are needed to identify structural features associated with the emergence and sustainability of high and low performance (see Furman and McGahan, 2002 as an example of one study that takes on the question of whether performance is predictable).

A second area for further research involves questions about strategic choice. How can a firm make strategic decisions that enhance superior performance and curtail inferior performance? Further research on these questions may require

enhanced methods that account for complex relationships between the estimated effects (for example, see Hambrick and D'Aveni, 1988).

The results also indicate important relationships in the causal explanations favored by theorists aligned with the industrial-organization view, the resource-based view, property rights explanations, transaction-cost economics, and organizational ecology. Each theoretical lens may be particularly powerful at a specific point in the evolution of a business. The greatest promise for further theoretical study may be in integrating the various explanations and in demonstrating how they can be related to a broader framework that links strategic and organizational choices to the industry, corporate, and business-specific context.

Appendix: the emergence and sustainability of abnormal profits among segments with a complete series

The central analyses in our paper raise several questions about patterns of emergence and sustainability for newly tracked segments and segments on which we have a complete series of data. In the emergence analysis, for example, the pattern of high performance suggests that newly tracked segments may enter at the same high rate of profitability as segments on which we have a complete series of data. In this Appendix, we report the analyses for segments on which we have complete series and indicate differences in the results. A principal finding is that the segments on which we have a complete series have higher profits on average than those on which we do not have a complete series. Otherwise, the broad patterns reported in the body of the paper for the entire sample also hold for the segments that are analyzed in this Appendix.

In Figure 1, high performers show profits significantly greater than the norm 12 years prior to the date on which they are classified as superior. This regularity raises a question about whether high performance is immediately evident among segments that enter the Compustat dataset during the period under study. Figure A1 shows the emergence of high and low performance for only those segments on which we have a complete series. The pattern for high performers is strikingly similar to the pattern for the full cross-section of high performers. For low performers, however, the pattern is somewhat different. The comparison suggests the following relationships for the average segment as abnormal profits emerge:

- At the time that a segment is first tracked by Compustat, its abnormal profits are about the same as the abnormal profits of mature performers in its cohort.
- The low performance that emerges among newly tracked businesses is considerably more severe than the low performance of mature businesses.

Figure 2, which shows the sustainability of high and low performance, raises the possibility that abnormal profits steadily erode for surviving segments. There is ambiguity in Figure 2 because surviving segments are grouped with those no longer tracked. (Recall that segments may be dropped from Compustat because of exit, privatization, merger of the corporate parent, sale of the division, or reclassification of the division to another
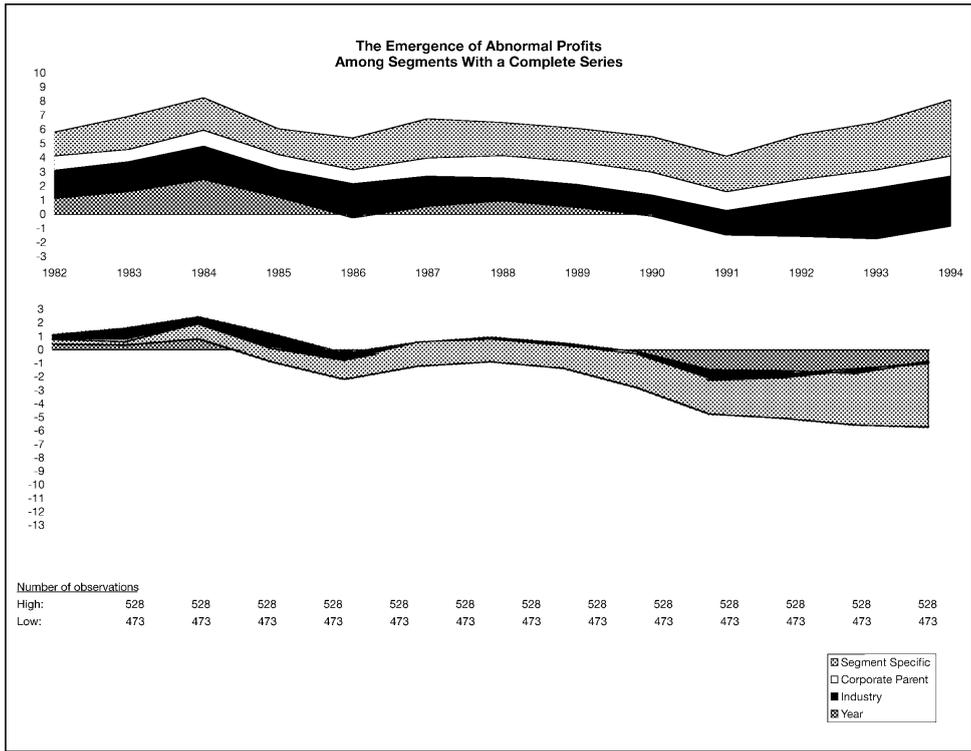
Figure A1 The emergence of abnormal profits among segments with a complete series

SIC.) Figure A2 shows the sustainability of high and low performance for only those segments on which we have a complete series. A comparison suggests the following relationships:

- 'Exit' among the high performers in the Compustat database occurs after a greater than average decrease in abnormal returns.
- The high performance of businesses that do not exit is initially better than the average for all high performers.
- The low performers in the Compustat database that eventually exit show worse profits than the average among low performers.
- The low performance of businesses that do not exit is initially better than the average for all low performers.

Survivorship is associated with higher than average profitability for both high and low performers. The longevity of low performance in both cases suggests that low performers are locked into their poor positions for several years, making exit difficult. Even long-tracked low performers recover only to average profitability during the 12-year period subsequent to their initial classification.

Among high performers, those that exit the Compustat database have seen a large portion of their abnormally high profits erode prior to their exit. Thus, there is an
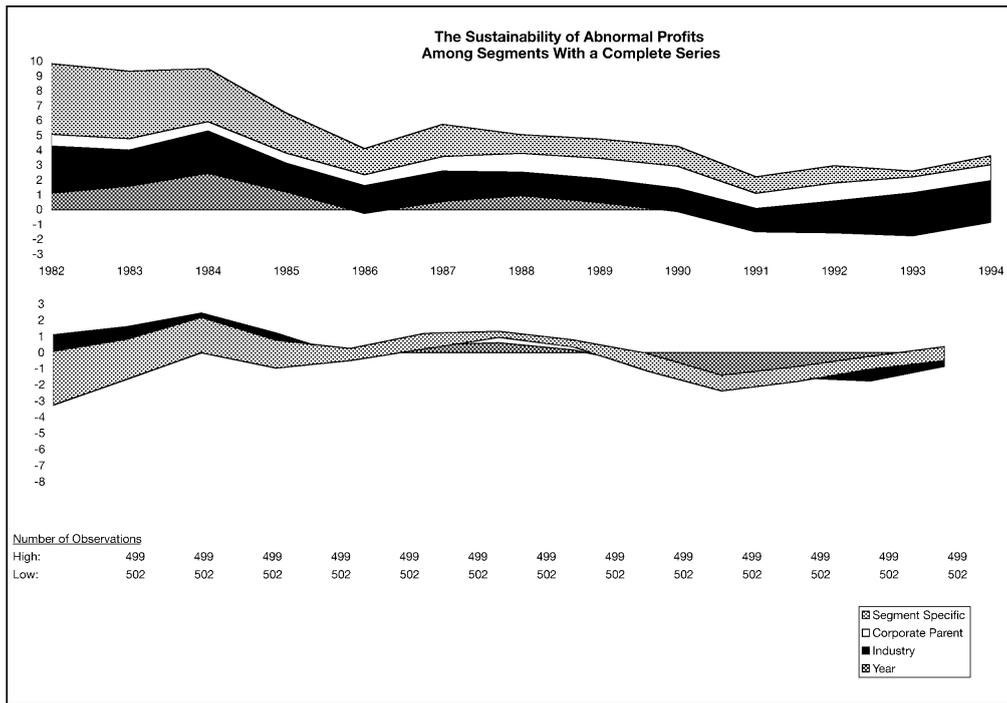
The Sustainability of Abnormal Profits Among Segments With a Complete Series

Figure A2   Sustainability of abnormal profits among segments with a complete series

asymmetry between patterns of entry and exit for high performers. Whereas newly tracked high performers show profits comparable to those of mature high performers, exiting high performers are less successful.

A comparison of Figures 2 and A2 reveals a higher segment-specific effect among long-tracked high performers compared to` the average high performer. The favorable segment-specific effects of exiting high performers diminish quicker than those of surviving high performers. By contrast, the adverse segment-specific effects of exiting low performers appear to be larger than those of surviving low performers. Figures 2 and A2 suggest the following hypotheses about the sustainability of abnormal profits for the average business:

- Surviving high performers are distinguished by particularly favorable segment-specific effects, suggesting an unusually distinctive position.
- Surviving low performers are distinguished by less adverse segment-specific effects compared to the average low performer.

One interpretation that is consistent with these patterns is that exit from Compustat occurs for high performers in attractive industries and attractive parents after their competitive positions erode. While exit is a viable option for such segments, it may not be viable for the typical low performer. Instead, low performers may be forced to reposition within their industries over a period of several years.

Notes

1. Equation (1) is not estimable through a sequential ANOVA because the model is fully specified. Full specification is necessary to capture intertemporal changes in effects. See McGahan and Porter (1997) for a nested ANOVA on a model in which year, corporate-parent, and business-specific effects do vary by year.

2. Note that equation (2) can be derived from the following expressions: $s_{i,k,t} = \rho_{SS,i,k} s_{i,k,t-1} + \kappa_{i,k,t}$ and $\phi_{i,k,t} = f_{i,k} + s_{i,k,t}$. The derivation requires substitution of $s_{i,k,t-1} = \phi_{i,k,t-1} - f_{i,k}$ into $s_{i,k,t} = \rho_{SS,i,k} s_{i,k,t-1} + \kappa_{i,k,t}$, and substitution of the resulting expression for $s_{i,k,t}$ into $\phi_{i,k,t} = f_{i,k} + s_{i,k,t}$.

3. We adopt the notation that an underlined subscript indicates the average over the observations denoted by the subscript. There is no information in either the ratio $(f_{i,k} + \rho_{SS,i,k} s_{i,k,\underline{t-1}})/(f_{i,k} + s_{i,k,\underline{t}})$ or $(d_{i,k} + \rho_{SS,i,k} \phi_{i,k,\underline{t-1}})/\phi_{i,k,\underline{t}}$ because $s_{i,k,\underline{t}} = \rho_{SS,i,k} s_{i,k,\underline{t-1}}$ and $\phi_{i,k,\underline{t}} = d_{i,k} + \rho_{SS,i,k} \phi_{i,k,\underline{t-1}}$; thus, $(f_{i,k} + \rho_{SS,i,k} s_{i,k,\underline{t-1}})/(f_{i,k} + s_{i,k,\underline{t}}) = (d_{i,k} + \rho_{SS,i,k} \phi_{i,k,\underline{t-1}})/\phi_{i,k,\underline{t}} = 100\%$.

4. Consider, for example, equation (2) for business segment i,k in 1989. The equation stipulates that $\phi_{i,k,89}$ is a function of $\kappa_{i,k,89}$. Now consider equation (2) for the same segment in 1990. This equation indicates that $\phi_{i,k,90}$ is a function of $\phi_{i,k,89}$, but we cannot claim that the two records are independent, because $\phi_{i,k,89}$ is correlated with $\kappa_{i,k,89}$ in the prior record. Thus, the estimate of the coefficient on $\phi_{i,k,t}$ is systematically biased.

5. See Waring (1996) and McGahan and Porter (1999) as well as Nickell (1981). We conducted several simulations to verify Nickell's approach, and found that it performed quite well except for extreme OLS estimates. We therefore limited the Nickell corrections to absolute values less than or equal to one. Thanks to Geoff Waring for discussions about this approach.

6. The variance of each of the OLS estimates of persistence, which we here denote $\rho_{x,i,k}$ (where x may signify year, industry, corporate-parent, segment-specific, or the sum of effects) is given by $\mathrm{var}(\rho_{x,i,k}) = [\mathrm{var}(x_{i,k,t}) - \mathrm{est}(\rho_{x,i,k})^2 \mathrm{var}(x_{i,k,t-1})]/[(n-2)\mathrm{var}(x_{i,k,t-1})]$ where n represents the number of years of data for the segment.

7. In the calculation of goodness-of-fit, the weights are the inverses of the variances of the sampling variances, which we obtain from $\mathrm{Var}(v_{x,i,k}) = 2 F_x^4/(n-1)$ and $\mathrm{est}(F_x^2) = (n\,\mathrm{Var}(x_{i,k,t}) - \mathrm{est}(\rho_{x,i,k})^2 n\,\mathrm{Var}(x_{i,k,t-1}))/(n-2)$, where F_x is the standard deviation of the population parameter $\rho_{x,i,k}$ and $v_{x,i,k}$ is the sampling variance of the estimate of $\rho_{x,i,k}$ (see Hald, 1952: 203 and Kendall, 1952: 229). Thanks to Arthur Schleifer for this derivation.

References

Cubbin, J. and Geroski, P. (1987) 'The Convergence of Profits in the Long Run: Inter-firm and Inter-industry Comparisons', *Journal of Industrial Economics* 35(4): 427–42.

Furman, Jeffrey L. and McGahan, Anita M. (2002) 'Turnarounds', *Managerial and Decision Economics* 23(4–5): 283–300.

Ghemawat, Pankaj (1991) *Commitment: The Dynamic of Strategy*. New York: Free Press.

Hald, A. (1952) *Statistical Theory with Engineering Applications*. New York: Wiley & Sons.

Hambrick, Donald C. and D'Aveni, Richard (1988) 'Corporate Failure as a Downward Spiral', *Administrative Science Quarterly* 33(April): 1–23.

Kendall, Maurice G. (1952) *The Advanced Theory of Statistics*, Vol. I, 5th edn. London: Charles Griffen & Co.

McGahan, Anita M. (1999) 'The Performance of US Corporations: 1981–1994', *Journal of Industrial Economics* 47(4): 373–98.

McGahan, Anita M. and Porter, Michael E. (1997) 'How Much Does Industry Matter, Really?', *Strategic Management Journal* 18(4): 15–30.

McGahan, Anita M. and Porter, Michael E. (1999) 'The Persistence of Shocks to Profitability: Comparing the Market-Structure and Chicago Views', *Review of Economics and Statistics* 81(1): 43–53.

Mueller, Dennis C. (1977) 'The Persistence of Profits Above the Norm', *Economica* 44 (November): 369–80.

Mueller, Dennis C. (1986) *Profits in the Long Run*. Cambridge: Cambridge University Press.

Nickell, Stephen (1981) 'Biases in Dynamic Models with Fixed Effects', *Econometrica* 49(6): 1417–26.

Rumelt, Richard (1991) 'How Much Does Industry Matter?', *Strategic Management Journal* 12(3): 167–85.

Schmalensee, Richard (1985) 'Do Markets Differ Much?', *American Economic Review* 75(3): 341–51.

Waring, Geoff (1996) 'Industry Differences in the Persistence of Firm-Specific Returns', *American Economic Review* 86(5): 1253–1265.

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