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IS PERFORMANCE DRIVEN BY INDUSTRY- OR FIRM-SPECIFIC FACTORS? A NEW LOOK AT THE EVIDENCE

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Abstract

In this study we revisit the question of whether firms' performance (usually measured as return on assets or ROA) is driven primarily by industry- or firm-specific factors by extending past studies in two major ways. First, we examine if the findings of past research can be generalized across all firms in an industry or whether it depends on a *particular class* of firms within the same industry. Second, in a departure from past research, we use value-based measures of performance (economic profit or residual income and market-to-book value) instead of accounting ratios. We also use a new data set and a different statistical approach for testing the significance of the independent effects. Our study uncovers an important phenomenon that may in large part be responsible for the strong firm-effect reported in past studies. We show that a significant proportion of the absolute estimates of the variance of firm-specific factors in our study is due to the presence of a few exceptional firms in an industry: the *two* firms that outperform their industry and the *two* that under-perform in comparison to the rest. In other words, only for a few dominant value creators (leaders) and destroyers (losers) do firm-specific assets matter more than industry factors. *For most firms, i.e. for those that are not notable leaders or losers in their industry, the industry effect turns out to be more important for performance than firm-specific factors.* A possible explanation of this phenomenon is that superior (or poor) management leads to superior (or poor) firm performance irrespective of industry structure, which matters only for firms "stuck in the middle", i.e. for firms with average managerial capabilities and performance. We also show that this phenomenon does not depend on the metrics used to measure performance.

INTRODUCTION

In many industries, from wireless communications to aluminum, a few and sometimes a single firm often outperform the rest. Firms in the top 20 percent of *Fortune*'s rankings in terms market value added (market value less book value of capital) enjoy double the shareholder returns of the other firms in their industries.[1] A hundred US dollars invested in Nokia stock in 1996 was worth over $15,000 in 1999 compared to an average of around $800 for its competitors. Over the same period, one hundred US dollars invested in Alcoa was worth over $400, compared to an average of approximately $150 for its competitors.

Can industry factors fully explain this phenomenon? Nokia, the telecommunications firm, is a typical 'new economy' company, while Alcoa is a typical 'old economy' firm. It seems that while industries vary in their environment and structural characteristics, there are also significant differences in performance among firms within the *same* industry. This phenomenon was reported in a number of studies which showed that differential profit rates persist under similar external contexts (Jacobsen, 1988). Recently, researchers in strategic management have shown increasing interest in the relative importance of firm and industry factors for firm performance - as data availability, statistical techniques and computing power have improved. Past research finds that firm-specific factors are relatively more important than industry effects. This finding is often generalized to all firms in an industry. However, there is an increasing awareness among management researchers of the possibility that one or a few firms may dominate value creation within their industries.[2] Innovative firms have been able to invent new markets and reinvent old ones and in this process able to capture a large part of the industry's profits (Kim and Mauborgne, 1996; Gadiesh and Gilbert, 1998). The present study seeks to explore whether the presence of these few exceptional firms within an industry may cause the firm-specific effect found in past studies, a phenomenon that may not necessarily apply to the vast majority of firms that make up an industry.

[1] See Jonash and Sommerlatte, (1999).
[2] For a discussion on how companies can dominate their industry's value creation, see Kim and Mauborgne, (1996); Gadiesh and Gilbert, (1998); Jonash and Sommerlatte, (1999).

This paper also extends past research in a second major way by choosing market-based measures of performance that differ from the traditional accounting ratios used by the previous studies. If the purpose of firm strategy is to deliver sustainable value creation, then the performance measures used to study the impact of strategy have to correspondingly reflect economic performance. Past research on the relative importance of firm and industry effects has traditionally relied on return on assets (ROA) as the performance measure. But accounting measures such as ROA suffer from certain disadvantages as they can be influenced by factors that have no real effect on the economic health of the firm. The more important disadvantage arises from the inability of accounting measures, and in particular ROA, to conceptually reflect economic performance.

In the current environment, characterized by the emphasis on shareholder value and economic profits, it is indeed a surprise that much of management research is still based on accounting-based measures of performance. Recent years have witnessed a rapid adoption of measures of economic profit or 'residual income' in the field of corporate finance. Their appeal to management researchers is even more pronounced given the pressure that financial markets have been exerting on managers to deliver shareholder value and the consequential orientation of firm strategies focused on this objective.

Based on these recent developments, we use alternative measures of performance such as economic profit per dollar of capital employed and market-to-book value to test the effect of industry- and firm-specific factors. We also use a new data set and implement a different statistical approach for testing the significance of the independent effects.

The rest of the paper is organized as follows. In the next section we provide a brief review of the relevant literature. In section 3 we look at the problem of industry definition and its possible impact on the research findings. In section 4 we discuss performance measures. The data set and methodology are discussed in sections 5 and 6 respectively. In section 7 we define and identify value leaders and value losers, and in sections 8 and 9 we report and interpret our empirical results. Concluding remarks are found in section 10.

REVIEW OF THE LITERATURE

In the early days, studies in the economics of industrial organization dominated the strategic management field. Most argued that the structural characteristics of particular industries were a central determinant of profitability.[3] Several studies investigated factors explaining the consistent differences in performance between industries.[4] The industrial organization economists' favored theoretical framework was the structure-conduct-performance (SCP) model, which proposes the existence of a deterministic relationship between market structure and profitability. The structural characteristics of an industry inevitably constrained the behavior (i.e. the conduct or strategies) of its component firms, which in turn led to industry-specific performance differentials between firms (Mason, 1939). In this framework, the industry structure in which a firm operates is the main reason offered to explain variations in firm profitability. Scherer (1980) points out that such a framework was simplistic and deterministic, concluding that the existence of interdependencies between the three elements of the SCP framework was a more realistic proposition.

An important line of research within this stream concerned the role of firm size as a factor explaining differences in profitability (Baumol, 1967; Hall and Weiss, 1967). Size was a source of competitive advantage because bigger firms are presumed to be relatively more efficient than smaller ones. However, the causal relationships between size and profitability have been widely tested, with ambiguous results.[5]

In the 1980s there were major shifts in the strategic management field regarding the unit of analysis. While industrial organization economics considers industry as the main unit of analysis, strategic management focuses increasingly on the firm itself to explain profitability differentials. The main reason for this shift is the inability of the industrial organization tradition to provide a rigorous

[3] Within strategic management, Oster (1990) and Porter (1980) are major contributors from industrial organization.
[4] For reviews, see Scherer (1980).
[5] For a review see Prescott, Kohli and Varadarajan (1986).

explanation for intra-industry heterogeneity in performance. If firms within an industry faced identical conditions of supply and demand and operated under the same market structure, then why did some firms within the same industry still perform better than others? Nelson (1991) argues that traditional microeconomic theory, with its focus on industry factors, ignores the fact that firms can make discretionary choices and such choices are not identical across all firms within an industry.

An important attempt to understand intra-industry heterogeneity came with the concept of strategic groups that classified firms based on dimensions of competition.[6] Profit differentials between groups were sustained due to the presence of conditions that created barriers to mobility between groups. Asymmetries among firms within industries act to limit the contraction of differentials and the equalization of profit rates (Caves and Porter, 1977).

Another significant attempt to understand intra-industry performance differences was the resource-based view of the firm, which proposes that firm-specific idiosyncrasies in the accumulation and leverage of unique and durable resources are the source of sustainable competitive advantage. Rent-producing resources determine the profit level of firms; for profits to be sustainable, the resources have to be scarce, difficult to copy or substitute, and difficult to trade in factor markets (Wernerfelt, 1984; Barney, 1986, 1991; Dierickx and Cool, 1989). Firms were not seen as identical "black boxes" in a given market structure, but as dynamic collections of specific capabilities, which were the sources of performance differences. Company strategies and organizational structures differ between firms within an industry, and organizations evolve in different ways. In the process, the bundle of capabilities that each organization possesses comes to differ (Nelson, 1991).

As a result, there has been much debate about the correct emphasis when analyzing a firm's strategy: Should strategy be examined in the context of an industry's structural characteristics, or an individual firm's resources and capabilities? Schmalensee's study (1985) was a first attempt to analyze

[6] For a review of the strategic group literature, see McGee, J. and H. Thomas (1986); Thomas, H. and N. Venkataraman (1988).

empirically the contribution of industry and firm-specific factors to overall profitability, taking market share as the measure of heterogeneity among firms, following the industrial organization assumption that intra-industry heterogeneity is uniquely due to differences in firms' size. Using 1975 FTC LB data and return on assets (ROA) as a performance measure, the study reported that industry membership accounted for around 20 percent of observed variance in business-unit returns while market share accounted for a negligible amount. The study concluded that industry effects played a central role in determining profitability, while, in comparison, firm-specific factors were insignificant.

But Schmalensee's 1985 study left 80 percent of the total variance in business-unit returns unexplained. Rumelt's study (1991) attempted to clarify this large degree of error. One reason was the use of market-share as a proxy for firm-specific factors, which probably left the research model under-specified. With a data set covering just one year, Schmalensee was constrained from specifying a composite firm factor that accounted for the effects of all firm-level factors. Rumelt's study used data from four years, allowing the inclusion of a composite term to measure firm effects. The study also extended Schmalensee's descriptive statistical model by including additional terms to measure the inter-temporal persistence in industry effects, year effects, corporate effects and effects arising from corporate/industry interaction.[7]

Rumelt (1991) reported that industry membership explained around 9 percent of the variance in business unit returns, of which only half of this proportion was stable from year to year. Firm-specific effects, on the other hand, accounted for more than 44 percent of business-unit variations in profits. The study also reported low year effects, and negligible corporate and corporate/industry interaction effects. The results were rich in interpretation. Not surprisingly, the study ignited a debate on the relevance of industry, firm-specific factors and diversification for profitability.

[7] Corporate effects are also known as conglomerate effects. They reflect the value added to the business due to its membership of a multi-business corporation.

The debate has been encouraged by further empirical studies along the lines of Rumelt's work:); Powell, (1996);Roquebert, Phillips and Westfall, (1996); McGahan and Porter, (1997); Mauri and Michaels, (1998 Brush, Bromiley and Hendrickx, (1999). These studies confirmed the dominance of firm-specific effects.[8] While using similar methodology, they differed from Schmalensee and Rumelt's work inasmuch as they used the Compustat database, which allowed service industries to be included in the analysis (the FTC data set contained only manufacturing industries).[9] Table 1 summarizes the results reported in three major studies.

With such robust support, it would be safe to conclude that industry membership does not matter *much* for a firm's performance. There would be little value in another study seeking to measure the impact of industry- and firm-specific effects if not for two reasons. These two issues form the key building blocks of this paper. First, are the results sensitive to the performance measure used or more importantly, is the performance measure used in past research a reliable indicator of economic value? Economic profits are nothing new, but somehow the research debate has been based on studies that have employed accounting measures such as ROA. Second, is the general conclusion (that firm-specific effects are relatively more important than industry effects) equally valid for *all* firms? Industry and firm effects may vary for different *classes* of firms within the same industry and this might arise, for instance, if the industry is made up of distinct strategic groups. Past studies argue that since there is more variation in profitability within industries than between industries, firm effects would implicitly matter more for competitive advantage. However, as pointed out earlier, there is some evidence that one or a few firms often outperform the rest of the industry and this phenomenon could be in large part responsible for the intra-industry variations. The obvious question is whether or not these few firms influence the reported strong firm-specific effect and consequently whether there

[8] Other studies provide some indirect evidence on the importance of firm and industry effects with no clear trend. Montgomery and Wernerfelt (1991) find that the success of market share building strategies depends on the industry conditions through their analysis of the brewing industry in the US. This study tries to proxy firm factors through market share and may underestimate firm effects as seen in Schmalensee (1985). On the other hand, Chatterjee and Wernerfelt (1991) find that the success of diversification strategies depends on the availability of surplus productive resources.

[9] Powell (1996) uses a survey methodology that uses executives' perceptions.

is anything to be said about the importance of industry and firm-specific factors for the other firms in the same industry.

INDUSTRY DEFINITION

The appropriate definition of an industry is a subject of some debate in strategic management. In the context of studies such as the present paper, a narrow definition would lead to a strong industry effect while a broad definition would demonstrate a relatively less substantial industry effect.

Past research has classified US industries according to the SIC system, a traditional taxonomy when assigning firms to particular industry groups. The SIC system classifies companies based on their production processes; however this supply-side orientation ignores other dimensions - such as different customer segments on the demand side - that may be relevant to the proper classification of industries. As a result, the SIC system in some cases does not identify strategically relevant industries (McGahan and Porter, 1997). Other problems include insufficient classification categories in the system.

The fact that industry definition is a subject of debate implies that the results and, importantly, the conclusion that firm-specific effects are dominant, are to be interpreted with some caution. If one cannot properly define industries then estimates of the degree of industry effects on performance, irrespective of how it is measured, will not be completely reliable. However, since few options are available that do not suffer from similar or other problems, researchers have to depend on the SIC system for industry classification. Our research objective here is to study the firm and industry effects with different data sets and measures, and examine the reasons for the strong firm-specific effect, within the framework suggested by past research.

PERFORMANCE MEASURES

Previous studies have used return on total assets (net income divided by total assets) as their exclusive performance measure. Accounting measures similar to ROA suffer from some well-known conceptual

disadvantages that arise from accounting conventions. Accounting ratios do not measure cash flows, and returns are not adjusted for risk. Often, asset values are quoted at historic cost and not at their true replacement values. As a result of such conceptual shortcomings, accounting ratios could not provide information either on past *economic* profitability or on the firm's future profitability.

Moreover, the existence of different accounting policies and conventions, and management's power to choose between them, means that accounting measures can be obtained by alternative but equally acceptable methods in the legal sense. Some authors such as Harcourt (1965) and Fisher and McGowan (1983) argue strongly against the use of accounting ratios as proxies for economic profitability.[10] It should be recognized, however, that data on value-based measures of performance for a large number of companies and over a long time period were not available until recently. This might explain why past research has traditionally relied on accounting measures of performance.

In this paper, we will test for two value-based measures of firm performance as an alternative to the accounting-based ROA: Economic profit per dollar of capital employed and total market value per dollar of capital employed, where capital employed is the sum of equity capital and debt capital. [11] Both these measures reflect the concept of residual income, i.e. income that is adjusted for capital costs and hence risk and the time-value of money. These two measures then reflect *economic*, in contrast to accounting, performance. A second feature of these measures is that they are usually not bound by accounting conventions that tend to distort performance measures such as ROA. They are also adopted increasingly by companies to examine whether their strategies create value for their shareholders.

[10] For instance, Harcourt (1965) concludes that 'the accountant's rate of profit is greatly influenced by irrelevant factors, even under ideal conditions'. Similarly, Fisher and McGowan (1983) view that 'there is no way in which one can look at accounting rates of return and infer anything about relative economic profitability...'.

[11] See for example Young and O'Byrne (2001). Others use different names for the same concept of residual income – Copeland, Koller and Murrin (1990) call the difference between cash returns on invested capital and the capital charge the economic profit model. Also, see Rappaport (1986) for a similar model. The consultancy Stern Stewart has coined the terms Economic Value Added (EVA) and Market Value Added (MVA) to reflect residual income.

Economic Profit (EP) is a version of the residual income method that measures operating performance. Unlike traditional accounting measures such as ROA, the principal feature of this measure is that it reduces income by a charge for the cost of capital that is employed to produce the income. It is expressed as follows:

$$\mathbf{EP = NOPAT - WACC \times CE} \qquad \mathbf{(1)}$$

where NOPAT is Net Operating Profit After Tax, WACC is Weighted Average Cost of Capital and CE is Capital Employed.

Equation (1) can be rewritten as,

$$\mathbf{EP = (ROIC - WACC) \times CE} \qquad \mathbf{(2)}$$

where ROIC is Return On Invested Capital (i.e. NOPAT/CE).

Strategy is about sustainable value creation, which occurs when the firm's activities deliver a return on invested capital (ROIC) over time that exceeds its weighted average cost of capital (WACC). This return spread (ROIC – WACC) measures the ability of the firm to create value per dollar of capital employed (CE):

$$\mathbf{EP/CE = ROIC - WACC} \qquad \mathbf{(3)}$$

If ROIC is greater than WACC, economic profit per dollar of capital employed is positive and the firm creates value. The opposite is true when ROIC is smaller than WACC. In this last equation, EP is scaled for size and implicitly shows that the ability of the firm to add value, irrespective of size, depends on its ability to earn a positive return spread.

The second measure of value-based performance used in this paper is the firm's total market value (TMV) per dollar of capital employed, where TMV is the sum of the firm's *market capitalization* (market value of equity) and the *market value* of its debt. This reflects the market's expectation of the firm's future economic profitability. To scale for size, we employ the ratio of TMV/CE. Note that the ratio TMV/CE is similar to Tobin's q ratio, which is expressed as the ratio of market capitalization to the book value of equity. The difference between Tobin's q and TMV/CE is that the latter includes debt capital in both the numerator and the denominator. The ratio TMV/CE also reflects residual performance in market terms and indicates how much the firm has been able to create value on the capital invested by shareholders and debtholders. If a firm's TMV/CE is greater than 1, then the firm increased the value of capital invested in the firm while the opposite is true if the value of TMV/CE is less than 1.

DATA AND SAMPLE

The source of data on EP and TMV are the data sets provided by the consultancy Stern Stewart. It makes adjustments to account for both capital costs and accounting conventions in calculating EP (otherwise known as EVA) and TMV (otherwise known as MVA).[12] Stewart (1991), Martin and Petty (2000) and Young and O'Byrne (2001) provides an overview of common adjustments that are made to financial statements to calculate these measures. Some common adjustments involve corrections for distortions caused by accounting policies that can understate the true level of invested capital (also referred as a correction for successful efforts accounting) and for those caused by the accounting for operating leases, mergers, goodwill, marketing expenses, and research and development expenses. EVA consultants have identified over 150 possible adjustments but most companies that adopt EVA restrict the number of adjustments to fewer than ten to make performance systems manageable.

The Stern Stewart data set ranks firms based on their annual MVA performance for firms in the US and several European countries and these rankings are published yearly in *Fortune* and in business

journals in Europe and Asia. In addition, the data is also published each year in the *Journal of Applied Corporate Finance*. While these data sets have been used in empirical research in the finance and accounting fields,[13] they have yet to find serious attention in strategic management research. In recent years, several companies have applied these metrics to measure performance both in the US and in other countries (Martin and Petty, 2000).

The US data set covers 1,000 listed companies for periods of up to 21 years. The firms are classified into industries following the SIC system at the 3-digit level, and the data retains many of the advantages of the Compustat data set (see Roquebert et al., 1996). It is recent, covers a relatively long period of time[14] and has a broad range of industries in both manufacturing and services.

One feature of the data set, however, is that it contains only the 1,000 best-performing companies and tends to be dominated by large companies. To a certain extent, this inherent size bias gets accounted for as we scale values of EP and TMV (such as in equation 3).[15] A second bias is the survivor bias that is inherent in this as well as past studies. The data set only contains firms that survived during the time period. However, the assumption of random industries within the economy, and random firms within the industries, means that the results, in principle, could be generalized if the effects were found to be significant.

A third aspect of the data set is that it does not provide business-level data at the four digit SIC code level, and provides performance data essentially for the primary business of the company. Balancing the advantages of measure validity of the data set against the disadvantages of corporate data, we proceed with the empirical analysis for the following reasons. Firstly, one well-known study by

[12] Stern Stewart measures market-based residual performance with Market Value Added (MVA) which is the difference between TMV and CE, i.e. MVA = TMV – CE. By dividing both sides of this equation by CE and rearranging the terms we have the expression TMV/CE = (MVA/CE) + 1.
[13] For instance, see Martin and Petty (2000).
[14] In comparison, Schmalensee's study was based on a single year of data, whereas Rumelt's was based on 4 years of data. Other recent studies have had more longer data periods, such as Roquebert et al. (1996) - 7 years, Brush et al. (1999) – 10 years, McGahan and Porter (1997) – 14 years.
[15] Since there are no a priori criteria in the selection of industries and years, sampling assumptions about industry and year are that they are random selections from their respective underlying populations.

Wernerfelt and Montgomery (1988) uses a similar approach in studying corporate diversification, where specificity is sacrificed for the sake of better value measures. Secondly, our interest is particularly in the relative importance of industry versus firm-specific effects, and any corporate level effect will add on to the firm-effect variable. In the next section on the empirical model, we discuss the corporate effect in more detail.[16]

The sample set covers the 10-year period from 1987 to 1996, representing a full economic cycle in the US: growth in the late 1980s followed by recession in the early 1990s and growth again in the later 1990s. The sample was screened in various ways. We dropped firms that did not contain a primary SIC designation, or were identified by SIC as 'not elsewhere classified'. Firms that reported results with missing values were also discarded. The data was also screened to identify firms that were not reported to be active in the same industry classification over the 10-year period. We also discarded firms that did not have a primary industry classification because they were conglomerates. The final sample contains 5,620 observations for 562 firms across 55 industry classifications with an average of over 10 firms per industry. Table 2 shows the number of firms in each industry on each of the performance measures used. Additional statistics describing the sample are reported in Table 3.

In addition, we also test the sample using ROA, so as to enable comparisons with previous studies. We use the Compustat database for data on ROA for the firms included in the EP/CE and TMV/CE sample.

Table 4 shows the correlation coefficients between EP/CE, TMV/CE and ROA. The correlation between the two measures of operating performance (EP/CE and ROA) is, on average, relatively high (0.80) while that between the measures of operating performance and market value is also strong on average (0.53). Whether this could mean that the level and the relative importance of firm and

[16] We also examine how much the results obtained by using this data are in line with those obtained by past studies.

industry effects would be similar across the three measures is one subject of investigation for this paper.[17]

MODEL AND METHODOLOGY

The model we use to examine the effects of industry, firm-specific and year factors largely follows the descriptive model used in past research (Schmalensee, 1985; Rumelt, 1991; McGahan and Porter, 1997). We have taken the variance components procedure used in past research as our statistical methodology. This methodology estimates the proportions explained by each independent variable in the variation of the dependent variable (performance measure). However, we use a different approach for testing the significance of the independent effects.

Our analysis is based on the following descriptive model, which is similar to Schmalensee (1985) and Rumelt (1991).

$$r_{ijt} = \mu_{...} + \alpha_i + \beta_j + \gamma_t + (\alpha\gamma)_{it} + \varepsilon_{ijt} \qquad (4)$$

where $\mu_{...}$ is a constant equal to the overall mean (the three dots indicate that it is an average over the i, j and t index); α_i is a random industry effect where i = 1...r denotes any one industry as i; β_j is a random firm effect where j = 1...n_i denotes any one firm as j; n_i is the number of firms within industry i where i denotes any one industry as i; γ_t is a random year effects where t denotes any one year as t; $(\alpha\gamma)_{it}$[18] is a random industry-year interaction effects; and ε_{ijt} is a random error term.

The main effects (α_i, β_j and γ_t) and the interaction effect $(\alpha\gamma)_{it}$ follow a normal random distribution with mean zero and variance σ^2_α, σ^2_β, σ^2_γ and $\sigma^2_{\alpha\gamma}$, i.e. ε (0, σ^2). The random independent effects specified in the above model are generated by random processes that are independent of each other,

[17] In our view, despite a high correlation, the important point is that measures reflecting economic performance and shareholder value creation should be used for research studies examining performance. The measures' conceptual appeal and as well as their increasing acceptance by firms to make their strategic decisions perhaps should take precedence over the extent of correlation with accounting measures.

i.e. each of the main effects is an independent random solution from an underlying population that is normally-distributed.

The model specifies for five sources of variation in business returns: stable and transient industry factors, stable firm-specific effects, the effects of yearly macroeconomic fluctuations, and random error. Firm effects comprise all firm-specific factors such as heterogeneity among firms in tangible and intangible assets due to differences in reputation, operational effectiveness, organizational processes and managerial skills. Stable industry effects reflect the influence of structural characteristics of industries on the performance of firms while the transient component of industry effects measures the sensitivity of profitability to the impact of business cycles on the industry. The impact of factors with broader economic significance is captured by the year effect.

The differences between our model and those of Rumelt (1991) and others are that the notion of 'corporate effect' has been discarded. Schmalensee (1985), Rumelt (1991) and McGahan and Porter (1997) all reported low corporate effects, hence we assume that the exclusion of corporate effects would not have a significant impact the model's specification. Some recent studies report non-negligible corporate effects (Roquebert et al (1996), Brush and Bromiley (1997)). However, there is some debate as to the size and the significance of the corporate effects. From an empirical perspective, some of the studies that show a non-negligible corporate effect are not directly comparable due to differences in data sets (Rumelt uses the FTC data base while Roquebert et al, 1996 and Brush and Bromiley, 1997 use Compustat) as well as differences in methodology (variance components versus regression). Roquebert et al. (1996) use a similar data set and methodology as McGahan and Porter (1997) but report a much higher corporate effect (17.9% versus 4.3% for McGahan and Porter). A key factor is the difference in samples between the studies – Roquebert et al.

[18] $(\alpha\gamma)_{it}$ is not a product of two variables, α and γ. It simply indicates the interaction between two main effects α and γ.

(1996) exclude single business firms from their sample, which is likely to lead to higher corporate results.[19]

In discarding the corporate effects, we are motivated by three issues. Firstly, evidence from studies on corporate diversification and refocusing suggest that the value added by corporate management has been often questionable and even negative (frequently referred to as the conglomerate discount) according to many studies both in strategy and finance (Markides, 1993; Goold, Campbell and Alexander, 1994; Lang and Stulz, 1994; Berger and Ofek, 1995). Past studies that tend to justify a corporate effect imply that there is only a positive value added by corporate management. But since management practice indicates that there is often a negative role played by corporate strategies, and as variance-based procedures cannot identify negative effects, the present study's model will exclude corporate effects. Secondly, we follow Wernerfelt and Montgomery's (1988) approach: when using Tobin's q as a performance measure, specificity is sacrificed for the sake of better value measures. Finally, our interest is particularly in the relative importance of industry versus firm-specific effects and not in general corporate effects. In our model specification, any corporate effect is likely to show up in the firm effect.[20]

Past studies use two methods to estimate the variances: analysis of variance and variance components.[21] The analysis of variance is a hierarchical procedure, where the researcher begins by estimating a null regression model with no independent effects, with the dependent variable a function

[19] In a recent study, Bowman and Helfat (2001) also suggest discarding single-business firms. However, this approach is likely to lead to overestimation of corporate effects and would not say if the businesses within the corporation would have performed better as single business or whether the multi-business structure is adding to the competitive advantage of the business. The exclusion of single business firms will also bias industry effects and finally, the results will not be applicable to the economy as a whole.

[20] The inclusion of corporate effect poses other empirical problems. For instance, McGahan and Porter (1997) and Roquebert et al. (1996) provide evidence that the corporate effect decreases as the average number of businesses within the multi-business corporation increases. This implies that in companies that diversify beyond what is justified by their core capabilities, corporate management has less and less value to add. To account for this, corporate effects have to be controlled for relatedness among business, which poses research problems (under the current research design) that are not readily overcome.

[21] As is generally with variance procedures, both these methods are based on averages – averages of returns to firms, industries and years. These independent variable averages are first subtracted from the overall mean, then this difference is summed across the levels of the variable, which is then finally multiplied with appropriate weights (see Searle, 1971).

of only a constant (typically, the mean of all observations). Adding the independent effects one after another then expands this initial null model and the researcher tests the parsimony of the expanding model by calculating the increment to the adjusted R^2 of the regression as an indicator of the fraction of the variance explained by each independent variable. By design, the order of entry of the independent variable can have large impact on which variable explains the most variance in the dependent variable. Typically, the first entries explain a large proportion of the variance, while the later variables explain progressively less variance. This is generally the fixed-effects version of analysis of variance. The other popular method is the variance components procedure, which is sometimes termed as random–effects analysis of variance.[22] In this study, we use the variance components procedure used here is similar to the one employed in past research.[23] The equation for the estimation of variance components is developed based on the descriptive statistical model of equation (4), by decomposing the total variance in the dependent variable (profitability measure) into its components as follows:

$$\sigma^2_r = \sigma^2_\alpha + \sigma^2_\beta + \sigma^2_\gamma + \sigma^2_{\alpha\gamma} + \sigma^2_\varepsilon \qquad \textbf{(5)}$$

The dependent variable r_{ijt} in the above model has constant variance and is normally distributed because they are linear combinations of independent normal random variables. We use the VARCOMP procedure in SAS software to estimate the different variance components. The variance components estimation is particularly suited to studies such as the present paper since it does not require a data set covering the whole population, while at the same time allowing the results to be generalized. This is useful since it is impossible to construct a data set that covers all industries and all firms in each industry.

One inherent disadvantage of the variance components estimation is that the procedure does not provide reliable tests for the significance of the independent effects. Since the independent effects are

[22] Variance component models are a special type of ANOVA models – the random effects ANOVA where the independent variables are assumed to be random in nature. See Neter, Kutner, Nachtsheim and Wasserman (1996), Chapter 24.

assumed to be generated by an independent random draw from an underlying population of the class of the effects, the null hypothesis that some of the variance parameters are zero lies on the boundary of the parameter space. This characteristic presents a non-standard problem for producing significance statistics.[24] Roquebert et al. (1996) produce the standard errors along with variance components estimates. While acknowledging the limitations, they argue that the magnitude of the parameter, expressed as a percentage of the total variance explained, can be used as an indicator of the likelihood that the underlying value of the parameter is nonzero.

Schmalensee (1985), Rumelt (1991) and McGahan and Porter (1997) solve this situation by using nested ANOVA techniques that consider the effects to be fixed. The ANOVA approach generates F-statistics for the presence of the independent effects. While the fixed effects transformation resolves the significance testing problem of the variance components procedure, it restricts the critical assumption of randomness of the independent effects. An important characteristic of the assumption of randomness is that results regarding both the presence and the importance of the various independent effects can be generalized over the population as a whole. In choosing the fixed effects ANOVA approach for significance testing, Schmalensee (1985), Rumelt (1991) and McGahan and Porter (1997) argue that an ANOVA test for significance is not a pre-requisite to variance components estimation, since their main interest lies in estimating the relative magnitudes of the different effects, and significance results are only of secondary importance.

We approach this problem by using a random effects ANOVA model. The random effects ANOVA model assumes that all the independent effects specified in the model are generated by random processes, consistent with the variance components assumptions. The random ANOVA model departs from its fixed effect version only in the expected mean squares and the consequent test statistic. Since

[23] In SAS packages, it is possible to control the biases that arise from the order of entry of independent effects by rotating the entry and adjusting the estimate of the variances.

[24] The MIXED procedure in SAS can also be used to specify a pure random effects model. The MIXED procedure can generate Wald Z-test of significance statistics, but their usefulness is doubtful due to the non-standard nature of testing for significance of random effects. See Verbeke and Molenberghs (1997) for a discussion on the issue of testing for significance in random effects models.

this procedure has not been employed in the past research, we provide a simple illustration of the design of such models and the calculation of F-statistics.

Let us assume that our model consists of two exogenous factors A (say, industry) and B (say, year). In a random-effects version of ANOVA for a two-factor study, we assume that both factor-A main effects $\alpha_{i,}$ and factor-B main effects $\beta_{j,}$ are independent random variables. Further, we assume that the interaction effects $(\alpha\beta)_{ij}$ are independent random variables. The random-effects version of ANOVA for a two-factor study with equal sample sizes n is:

$$\mathbf{Y}_{ij} = \mu_{..} + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ij}\,, \qquad \textbf{(6)}$$

where $\mu_{..}$ is a constant (the two dots indicate that it is an average over the i and j index); α_i, β_j, $(\alpha\beta)_{ij}$ are independent random variables with expectations zero and variances σ^2_α, σ^2_β, $\sigma^2_{\alpha\beta}$; i equals 1, …, a; j = 1, …, b.

Such a two-factor random model differs from its fixed-version counterpart in the expected mean squares. These expected mean squares are shown in Table 5 where the expressions for the expected mean squares can be derived using the usual expectation theorems (Neter, Kutner, Nachtsheim and Wasserman (1996)).

To test, for instance, for the presence of factor A effects in the random ANOVA model, we make the following hypothesis:

$$H_0: \sigma^2_\alpha = 0;\ H_a: \sigma^2_\alpha > 0$$

If we examine the expressions for MSA and MSAB, we see that if σ^2_α equals zero, then MSA equals MSAB. This means that MSA will be greater than MSAB, if and only if factor-A effects are present. We use this characteristic to generate a test statistic.

$$F^* = MSA / MSAB$$

By using the usual significance levels, one can determine whether the result provided by F^* is statistically significant. The difference between the above illustration and the present study is that there is a third factor (firm) which is nested within another factor (industry). However, the basic intuition remains the same in testing for the presence of the different effects.

VALUE LEADERS, LOSERS AND AVERAGE PERFORMERS

In many industries, it has been observed that a few firms tend to outperform the rest. Canon's market capitalization in the period 1996-1999 increased by a factor of over 2.5 while the increase for its competitors is around 1.7. During the same period, Chrysler increased its market capitalization more than tenfold, compared to a doubling (on average) for other automobile manufacturers.[25] When we look at our data set, we observe a similar trend. In industries such as discount retailing, software and beverages, one firm's performance (respectively, Wal-Mart, Microsoft and Coke) substantially and persistently differs from that of the others in its industry.[26]

It has also been observed that industries feature 'abnormal' value losers as well as value leaders. In terms of shareholder value, firms in the bottom 20 percent report returns that amount to less than one third of those gleaned by their average competitors (Jonash and Sommerlatte, 1999). If sustainable competitive advantage is taken as the basis for sustained superior performance then, by analogy, firms at the bottom of the industry are at a significant competitive disadvantage. The few firms that deviate strongly from the rest of their industry could influence the general result, which itself may or may not apply to the rest of the industry. Firm-specific factors drive superior or inferior performance (relative to the industry) but this does not help determine the performance drivers of firms that are 'stuck in the middle'. In other words, we are interested in two issues. Does the performance of a few firms

[25] See Jonash and Sommerlatte, 1999.

[26] It is possible that these value leaders also have high market shares in their respective industries. This raises the question whether high market shares are necessary for high value creation. Research shows that it is difficult to make unambiguous conclusions about the nature of this relationship (see Prescott et al., 1986; Schwalbach, 1991).

influence the relative importance of firm-specific and industry effects? And what is the relative magnitude of these effects for firms that are 'stuck in the middle'?

We make a rough attempt to identify an industry's value leaders and losers. Exact definitions of a value leader or loser are debatable, but our purpose here is to give some preliminary attention to the influence of such 'outliers' on firm-specific and industry effects, and to the importance of these effects on firms in the middle. The following procedure is used to identify value leaders and losers in an industry. To be identified as a value leader in its industry a firm must meet two criteria. First, its performance must be the highest in its industry for the maximum number of years within its industry. Second, the firm must have the biggest cumulative value over the ten-year period. The second criteria resolves situations when there is more than one firm has outperformed the industry for an equal number of years that is the highest. The same logic is applied to the identification of an industry's value loser. A firm with the consistently worst performance vis-à-vis the industry average, i.e. for at the maximum number of years which also has the lowest cumulative value over the same period is identified as an industry's value loser. We apply the descriptive statistical model (equation (4)) and the varcomp procedure firstly to the full sample that includes all the firms, and secondly to a reduced sample that excludes the *top two* value leaders and *bottom two* value losers in the industry. The reduced sample contains 3420 observations for 342 firms across the 55 industry classifications.

EMPIRICAL RESULTS

Prior to examining the impact of leading and losing firms on the level of firm and industry effects, we first test whether the magnitude of firm and industry effects are sensitive to the performance measure. Table 6 gives the variance components estimates of the independent variables that add up to the variation in the dependent variable (EVA/CE, TMV/CE and ROA). Table 7 gives the percentages of the total variance of the dependent variable explained by the independent effects of the model. All estimates were evaluated at 5 percent level by the random ANOVA procedure for statistical significance.

From the results, it is evident that firm effects dominate long-term performance irrespective of whether performance is measured by EP/CE, TMV/CE or ROA. Stable firm effects explain considerably more variance in the dependent variable than total industry effects, which are the sum of the stable and transient components. Total industry effects for EP/CE, TMV/CE and ROA are 10.7 percent, 14.3 percent and 11.2 percent, respectively (the sum of industry and industry-year effects in Table 7). In comparison, the corresponding figures for stable firm effects are 27.1 percent, 32.5 percent and 35.8 percent.

The dominance of firm-specific effects is even more pronounced when we compare stable firm-specific effects with stable industry effects. In the case of EP/CE and ROA, stable firm-specific effects dominate stable industry effects by a factor of more than four, while in the case of TMV/CE the amount of variance explained by stable firm effects is approximately three times more than that of stable industry effects. Year effects are smaller than firm-specific and industry effects, ranging from 1.0 percent for ROA to 1.9 percent for EP/CE. Table 8 contains the comparable figures from Schmalensee (1985), Rumelt (1991) and McGahan and Porter (1997) on the various effects.

The present paper's use of alternative measures of performance and a different data set does not alter the principal conclusion of recent studies, i.e. firm-specific effects dominate industry effects when seeking to explain performance. Furthermore, the random effects ANOVA approach indicates that the hypothesized independent effects are significant – the same conclusion was reached by past studies using the fixed-effects ANOVA approach.

One reason for the consistency of the results across the three measures could be that, in large cross-sectional and longitudinal studies of the present type, discrepancies resulting from different accounting measurements might even out over a period of time (Kay, 1976).[27] A second reason could be that while the results are similar, the processes that lead to the results might vary. The results

[27] 'The accountant's rate of profit, measured over a period of years, will be an acceptable indicator of the true rate of return: it is over a single year that it may prove seriously misleading' (Kay, 1976).

indicate only that firm-level factors are relatively more important across the three performance measures. We cannot say what these firm-level factors are, or whether the firm-level factors that drive performance in terms of ROA, EP/CE and TMV/CE are the same.

Even though the current sample is smaller than some of those employed in similar comparative studies, it is nevertheless homogeneous in terms of firm size, it has estimates that are statistically significant, and its results are in line with those reported in past studies. However, these results apply to all firms within the industry in the same way as the results of past research. Given the increasing awareness that a few firms in many industries dominate the industry's value pie, in the next section we examine the impact of outlying firms have on the firm and industry effects (see previous section for identification of value leaders and value losers).

VALUE LEADERS AND LOSERS AND THE INDUSTRY EFFECT

We now examine the impact of value 'leaders' and 'losers' on the levels of firm and industry effects. The modified sample, which excludes the two industry leaders and losers, is subjected to the same variance components estimation model and procedure as the full sample that we analyzed earlier. The independent effects are tested for statistical significance at the 5 percent level through the random ANOVA procedure.

Table 9 reports the estimated variance-covariance components for the modified sample and Table 10 shows the proportion of variance in performance explained by firm, industry and year effects, as well as by the effects of industry/year interaction.

The results shown in Tables 9 and 10 provide evidence on the impact of the outliers on the level of firm effect. In terms of variance component estimates, the firm factor contributes less across all three measures of performance, while industry factors increase for ROA and TMV/CE, and remaining almost the same for EP/CE. Table 10 indicates that in terms of relative proportions of variation explained industry factors are more important than firm-level factors in explaining firm performance.

When performance is measured with TMV/CE, overall industry effects (the sum of stable and transient industry effects) explain 35.2 percent in variation compared to only 17.0 percent for firm-specific effects. In the case of EP/CE it is 18.2 percent for industry effects versus 17.6 percent for firm-specific effects and for ROA it is 20.1 percent against 16.7 percent. In general, for a majority of the industry's firms, industry effects seem to dominate firm effects in explaining the variation in performance.

The findings indicate that a significant proportion of the absolute estimates of the variance of firm-specific factors in our study is due to the presence of a few firms that consistently deviate from the rest of their industry. The implication is that for value leaders and losers, firm factors matter more than industry effects. In other words, only for the few dominant value creators/leaders and destroyers/losers do firm-specific assets matter more than industry factors. To the vast majority of firms, i.e. for firms that are neither industry leaders nor losers, the industry effect turns out to be more important for performance than firm-specific factors. A possible explanation of this phenomenon is that superior (or poor) management leads to superior (or poor) firm performance irrespective of industry structure, which matters only for firms 'stuck in the middle', i.e. for firms with average managerial capabilities and performance.

We mentioned earlier that this study makes only a rough attempt to examine whether firm factors are equally important for all firms, and whether industry effects really matter to firms that are 'stuck in the middle', i.e. firms that do not possess unique competencies that can be leveraged successfully in product market competition. Our approach, discarding only the two best- and the two worst-performing firms per industry, provides a rather extreme test of our proposition. Had we decided to discard, say, the top and bottom quartile of each industry in terms of performance, the results would have been even more pronounced.

OUTLYING INDUSTRIES AND THE INDUSTRY EFFECT

One related question is the impact of outlying industries on both firm and industry effects. Some readers may be worried that while we discard outperforming firms, we do not do conduct tests with outlying industries. A key empirical basis for the high firm effects observed in the previous studies is that intra-industry variance in performance was observed to be greater than the inter-industry performance variance (Stigler, 1963; Fisher and Hall, 1969). This study builds on this empirical basis by arguing that most of the intra-industry variance may be due to the performance of a few firms. The implication of high intra-industry dispersion in performance means that removing some outlying industries should not imply a significant change in the level of firm and industry effects. Conceptually, if firm's can influence industry structure (Kim and Mauborgne, 1996), and the difference between value leaders and the rest is pervasive across the economy, then removing relatively attractive and unattractive industries and re-estimating firm and industry effects do not make sense. We test whether this is indeed the case and if removing outlying firms has a substantial effect on the previously estimated impacts of firm and industry factors.

In the identification of industry outliers, we first measure industry performance as the average performance of the firms in the industry in a year. Outlying industries are identified based on similar criteria as those applied with outlying firms in the paper. The tests were run by removing initially 3 from the top and 3 from the bottom (approximately 11% of the number of industries), which was later increased it to 4 and then 5 in both top and bottom (approximately 19% of the number of industries).

The results, exhibited in tables 11, 12 and 13, indicate that the relative levels of industry and firm effects remain stable and independent of the number of outlying industries removed. The variance in performance among firms and industries is still driven by the intra-industry component than the inter-industry component. In the view of the present study, even if we remove the outlying industries, value leaders in the remaining industries in the sample influence firm effects.

The results suggest once again that we have to think in terms of outperforming and under-performing firms rather than attractive and unattractive industries. In this view, whether an industry is attractive or not depends on the firm's resources and competencies that embody its competitive advantage and sustain its performance difference over its rivals.

CONCLUDING REMARKS

A major objective of this study was to examine whether a few firms may in fact drive the strong firm-specific effects reported in earlier studies. In corollary, we also examined the impact of firm-specific and industry factors on those firms that do not outperform or under-perform in relation to the rest of their industry. Our objective was to provide a first indication on the impact of outliers on the relative importance of industry and firm effects. The results suggest that industry-specific factors may have different meaning for different types of firms within an industry. Industry factors may have a large impact on the performance of the 'also-ran' firms, while for the industry leaders and losers that firm-factors dominate. This result is robust across all the three measures of performance used in this study.

However, we could argue that even if industry factors are not statistically important for leaders and losers, it is unlikely that these firms could ignore their industry's economics. Indeed, value leaders tend to build their success on their deep understanding of their industry, and use this knowledge to create and capture most of the industry value.

We would note here the relatively large amount of error reported in the present research as well as in past studies (from 45 percent (Rumelt, 1991) to 80 percent (Schmalensee, 1985). Firm-specific effects only dominate the *explained* variations in performance. In fact, a significant proportion of the performance variations observed is due to as yet completely *unexplained* factors. Here, we risk some speculation as to the additional effects that could be included in the model in order to add to its explanatory power. We consider in particular two additional concepts, namely the firm/year interaction effect and the industry/firm interaction effect. Rumelt suggests that some of the error might reflect the transient effects of firm-level factors. Even though this can be easily modeled, the

calculation seems difficult because of computing power limitations, even with current standards of computing power. The industry/firm interaction is more interesting, however. It reflects the importance of the interdependency between firm capabilities and the industry environment. However, with the current model we cannot estimate this interaction because the firm factor is nested within the industry. Interaction between a main factor (i.e. industry) and a factor nested within it cannot be estimated.

Our study is no exception and it contains some potential problems. Since the results are based on a sample that was taken from a data set containing the 1,000 largest and publicly-listed firms, we should be cautious when seeking to generalize the results. We address the problem by scaling the variables for size and assuming the randomness of industries and firms. To improve generalization, such studies could be replicated for other countries, wherever large longitudinal and cross-sectional data are available. This could reveal country effects that drive performance, and might allow for the testing of assertions regarding the competitive advantage of nations. The study implies that significant performance difference persist between different classes of firms in the same industry. Further research is justified into whether this also implies the presence of strategic groups composed of such firms. The question of exactly what constitutes industry- and firm-level factors also merits further investigation.

Table 1

Firm, industry and other effects on performance identified in past research
Percentage of variance explained of the dependent variable (ROA)

	Schmalensee (1985)	Rumelt* (1991)		McGahan and Porter (1997)
		Sample A	Sample B	
Firm Effects	0.6 %	46.4 %	44.2 %	31.7 %
Industry Effects	19.6 %	8.3 %	4.0 %	18.7 %
Year Effects	N/A	N/A	N/A	2.4 %
Industry/Year Effects	N/A	7.8 %	5.4 %	N/A
Corporate Effects	N/A	0.8 %	1.6 %	4.3 %
Error	80.4 %	36.9 %	44.8 %	48.4 %

*Rumelt uses two samples, naming them Sample A and Sample B. Sample A is similar to Schmalensee and Sample B covers a larger set of firms than sample A.

Table 4

Correlation between EP/CE, TMV/CE and ROA

(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

	EP/CE	TMV/CE	ROA
EP/CE	1.00	0.57	0.80
TMV/CE		1.00	0.48
ROA			1.00

Table 5

Expected mean squares for two-factor ANOVA models

Mean Square	Degrees of Freedom	Expected Mean Squares
MSA	a-1	$\sigma_e^2 + nb\sigma^2_\alpha + n\sigma^2_{\alpha\beta}$
MSB	b-1	$\sigma_e^2 + na\sigma^2_\beta + n\sigma^2_{\alpha\beta}$
MSAB	(a-1)(b-1)	$\sigma_e^2 + n\sigma^2_{\alpha\beta}$
MSE	(n-1)ab	σ_e^2

Table 2

Number of firms by industry and performance measure

(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Industry Name	EP/CE	TMV/CE	ROA
Aerospace & Defence	14	14	11
Cars & Trucks	5	5	4
Car Parts & Equipment	13	13	10
Chemicals	24	24	23
Plastics and Products	4	4	3
Apparel	9	9	6
Appliances & Home Furnishing	15	15	12
Beverages	8	8	8
Personal Care	9	9	7
Tobacco	4	4	4
Paper & Products	20	20	20
Discount Retailing	14	14	11
Fashion Retailing	11	11	8
Electrical Products	6	6	6
Electronics	9	9	5
Instruments	7	7	7
Semiconductors & Components	20	20	18
Food Processing	24	24	20
Food Distribution	3	3	-
Food Retailing	9	9	9
Oil & Gas	30	30	26
Petroleum Services	12	12	10
Drugs & Research	23	23	21
Drug Distribution	8	8	8
Medical Products	15	15	11
Healthcare Services	7	7	5
Building Materials	11	11	10
Construction & Engineering	3	3	-
Eating Places	6	6	6
Entertainment	7	7	7
Hotel & Motel	5	5	-
Games & Toys	4	4	-
General Engineering	21	21	7
Machine & Hand Tools	5	5	5
Machinery	6	6	-
Packaging	3	3	3
Textiles	3	3	3
Aluminium	5	5	-
Steel	9	9	9
Metals	7	7	-
Business Machine & Services	8	8	7
Computers & Peripherals	24	24	19
Computer Software & Services	15	15	14
IT Consulting Services	8	8	6
Broadcasting & Publishing	19	19	16
Printing & Advertising	5	5	4
Industrial Distribution	7	7	4
Pollution Control	3	3	-
Personnel Supply Services	3	3	-
Telephone Equipment & Services	6	6	5
Telephone Companies	16	16	16
Cable Television	6	6	5
Airlines	9	9	8
Railroads	5	5	5
Transportation Services	10	10	9
Total	**562**	**562**	**441**

Table 3

Mean EP/CE, TMV/CE and ROA by industry for the period 1987-1996

(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Industry Name	EP/CE	TMV/CE	ROA
Aerospace & Defence	-0.0331	1.3982	4.8390
Cars & Trucks	-0.0150	0.9473	2.1660
Car Parts & Equipment	-0.0003	1.5767	4.5989
Chemicals	0.0029	1.8195	7.9589
Plastics & Products	-0.0261	1.8394	5.3089
Apparel	0.0106	2.0114	10.6866
Appliances & Home Furnishing	-0.0191	1.5416	5.8016
Beverages	0.0018	2.1688	5.5960
Personal Care	0.0281	2.8700	8.005
Tobacco	0.0936	3.2314	14.3979
Paper & Products	-0.0149	1.2902	5.2342
Discount Retailing	-0.0126	1.7803	6.3501
Fashion Retailing	-0.0039	1.9829	9.2833
Electrical Products	-0.0327	1.3056	4.6276
Electronics	-0.0921	1.6542	3.4505
Instruments	-0.0415	1.5443	5.1271
Semiconductors & Components	-0.0126	2.0560	5.9906
Food Processing	0.0251	1.7090	8.5306
Food Distribution	-0.0056	2.3515	-
Food Retailing	0.0248	1.9880	6.5234
Oil & Gas	-0.0461	1.3604	2.5455
Petroleum Services	-0.0980	1.7189	-0.5861
Drugs & Research	0.0065	3.3807	7.6439
Drug Distribution	-0.0067	1.6614	5.5325
Medical Products	0.0276	3.0987	9.5384
Healthcare Services	-0.0169	2.4681	3.2672
Building Materials	-0.0056	1.5521	5.6250
Construction & Engineering	-0.0458	1.6749	-
Eating Places	0.0014	2.3246	6.8867
Entertainment	0.0442	2.8240	8.4403
Hotel & Motel	-0.0362	0.5391	-
Games & Toys	0.0083	2.3755	-
General Engineering	-0.0303	1.7353	5.1617
Machine & Hand Tools	-0.0174	1.4356	6.0154
Machinery	-0.0406	1.0974	-
Packaging	0.0075	1.7197	4.9736
Textiles	-0.0012	1.9392	7.4093
Aluminium	-0.0128	1.4844	-
Steel	-0.0647	1.2967	2.2646
Metals	-0.0101	1.7447	-
Business Machine & Services	0.0149	2.0492	8.2812
Computers & Peripherals	-0.0306	1.7332	3.1143
Computer Software & Services	0.0590	4.0331	10.3530
IT Consulting Services	0.0206	2.7136	6.5260
Broadcasting & Publishing	-0.0149	1.8042	6.0059
Printing & Advertising	-0.0196	1.5565	2.3386
Industrial Distribution	0.0012	2.5401	5.3783
Pollution Control	-0.0140	1.7691	-
Personnel-Supply Services	0.0402	2.8095	-
Telephone Equipment & Services	-0.0206	2.0647	7.0432
Telephone Companies	-0.0124	1.3680	4.6181
Cable Television	-0.0720	1.6966	-3.2513
Airlines	-0.0416	1.1676	0.9866
Railroads	-0.0340	1.0257	3.7780
Transportation Services	-0.0195	1.5836	3.1847
Mean	-0.0110	1.8930	5.5989
Standard deviation	0.0335	0.6550	3.0364

Table 6

Absolute values of the variance contributed by independent variables for years 1986-1997
(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Variance Component	Variance Estimate for Variable		
	EP/CE	TMV/CE	ROA
Firm	0.002650	1.095386	20.643661
Industry	0.000633	0.382606	4.700882
Year	0.000184	0.043188	0.555360
Industry-Year	0.000411	0.097929	1.810961
Error	0.005916	1.751753	30.036681

Table 7

Firm and industry effects in percentage of total variance of the dependent variable for years 1986-1997 based on the data reported in Table 6
(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Variance Component	EP/CE	TMV/CE	ROA
Firm effect	27.1 %	32.5 %	35.8 %
Industry effect	6.5 %	11.4 %	8.1 %
Year effect	1.9 %	1.3 %	1.0 %
Industry-Year effect	4.2 %	2.9 %	3.1 %
Error	60.3 %	51.9 %	52.0 %

Table 8

Comparison of results in percentage of total variance of the dependent variable
(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Variance Component	Schmalensee (1985)	Rumelt* (1991)	McGahan & Porter (1997)	This study (see Table 7)		
				EP/CE	TMV/CE	ROA
Firm effect	0.6 %	44.2 %	31.7 %	27.1 %	32.5 %	35.8 %
Industry effect	19.6 %	4.0 %	18.7 %	6.5 %	11.4 %	8.1 %
Year effect	N/A	N/A	2.4 %	1.9 %	1.3 %	1.0 %
Industry-Year	N/A	5.4 %	N/A	4.2 %	2.9 %	3.1 %
Corporate effect	N/A	1.6 %	4.3 %	N/A	N/A	N/A
Error	80.4 %	44.8 %	48.4 %	60.3 %	51.9 %	52.0 %

*Only the results of sample B of Rumelt's (1991) study are reproduced here.

Table 9

Absolute values of the variance contributed by the independent variables
for the modified* sample for years 1986-1997
(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Variance Component	Variance Estimate for Variable		
	EP/CE	TMV/CE	ROA
Firm effect	0.000820	0.232559	5.697587
Industry effect	0.000578	0.412727	5.413565
Year effect	0.000148	0.033736	0.384852
Industry-Year effect	0.000271	0.067775	1.409289
Error	0.002839	0.619511	21.149261

*The modified sample is smaller than the full sample and *excludes* each industry's top *two* leaders and bottom *two* losers according to the performance measure used (EP/CE, TMV/CE and ROA). See section 7 in text for details.

Table 10

Firm and industry effects for the modified* and full samples
in percentage of total variance for years 1986-1997, based on Tables 9 and 7
(EP = Economic Profit; CE = Capital Employed; TMV = Total Market Value - See section 4)

Variance Component	EP/CE		TMV/CE		ROA	
	Modified*	Full	Modified*	Full	Modified*	Full
Firm effect	17.6 %	27.1 %	17.0%	32.5 %	16.7 %	35.8 %
Industry effect	12.4 %	6.5 %	30.2 %	11.4 %	16.0 %	8.1 %
Year effect	3.2 %	1.9 %	2.5 %	1.3 %	1.1 %	1.0 %
Industry-Year effect	5.8 %	4.2 %	5.0 %	2.9 %	4.1 %	3.1 %
Error	61.0 %	60.3 %	45.3 %	51.9 %	62.1 %	52.0 %

*The modified sample is smaller than the full sample and *excludes* each industry's top *two* leaders and bottom *two* losers according to the performance measure used (EP/CE, TMV/CE and ROA). See section 7 in text for details.

Table 11

Firm and industry effects in percentage of total variance of the dependent variable for years 1987-1996 (number of outlying industries removed – 3 leaders and 3 losers for EP/CE and TMV/CE; 2 leaders and 2 losers for ROA)

Variance Component	EP/CE	TMV/CE	ROA
Firm effect	28.0 %	38.3 %	34.0 %
Industry effect	4.8 %	4.3 %	8.6 %
Year effect	2.5 %	1.2 %	1.5 %
Industry-Year effect	4.0 %	2.3 %	2.4 %
Error	60.7 %	53.9 %	53.5 %

Table 12

Firm and industry effects in percentage of total variance of the dependent variable for years 1987-1996 (number of outlying industries removed – 4 leaders and 4 losers for EP/CE and TMV/CE; 3 leaders and 3 losers for ROA)

Variance Component	EP/CE	TMV/CE	ROA
Firm effect	27.2 %	36.8 %	33.9 %
Industry effect	4.1 %	4.4 %	7.5 %
Year effect	2.5 %	1.2 %	1.5 %
Industry-Year effect	3.9 %	2.5 %	2.7 %
Error	62.3 %	55.1 %	54.4 %

Table 13

Firm and industry effects in percentage of total variance of the dependent variable for years 1987-1996 (number of outlying industries removed – 5 leaders and 5 losers for EP/CE and TMV/CE; 4 leaders and 4 losers for ROA)

Variance Component	EP/CE	TMV/CE	ROA
Firm effect	26.8 %	37.9 %	32.8 %
Industry effect	3.9 %	2.5 %	6.9 %
Year effect	2.5 %	1.4 %	1.4 %
Industry-Year effect	3.9 %	1.1 %	2.7 %
Error	62.8 %	57.1 %	56.2 %

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