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

GABRIEL HAWAWINI,[1] VENKAT SUBRAMANIAN[2] and PAUL VERDIN[1,2]*
[1] *INSEAD, Fontainebleau, France*
[2] *Solvay Business School, Université Libre de Bruxelles, Brussels, Belgium*

In this study we revisit the question of whether firms' performance is driven primarily by industry or firm factors, extending past studies in two major ways. Firstly, 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 (such as return on assets). We also use a new data set and a different statistical approach for testing the significance of the independent effects. Secondly, we examine whether the findings of past research can be generalized across all firms in an industry or whether they apply to a particular class *of firms within the same industry. We find that a significant proportion of the absolute estimates of the variance of firm factors is due to the presence of a few exceptional firms in any given industry. In other words, only for a few dominant value creators (leaders) and destroyers (losers) do firm-specific assets seem to matter significantly more than industry factors.* For most other firms, i.e., for those that are not notable leaders or losers in their industry, however, the industry effect turns out to be more important for performance than firm-specific factors. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

Explaining the sources of performance differences among firms is a key theoretical and empirical issue in the field of strategic management. The industrial organization view argues that industry factors are the primary determinants of firm performance, while the resource-based view argues that the firm's internal environment drives competitive advantage. Since the initial works of Schmalensee (1985) and Rumelt (1991), a number of empirical studies have examined the relative importance of firm and industry factors over the last decade.

An important characteristic of past studies is the measure of performance used. Research on the relative importance of firm and industry effects has traditionally relied on raw accounting values of return on assets (ROA) as the performance measure. If the purpose of firm strategy, however, is to deliver sustainable value creation, which occurs only when firms earn returns greater than the cost of capital, then the measures used should proxy such economic performance. Raw accounting values of measures such as ROA account neither for the cost of capital nor for the accounting policies that may distort the true value of the underlying measures, for instance, the value of assets.

Examining what drives ROA is not equivalent to examining what drives value creation. Most accounting-based measures are not consistent with value maximization. Fortunately, recent developments in corporate finance have led to new metrics of performance, which have been adopted by several firms in order to track their performance and to design their reward systems.[1] The adoption of such

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*Correspondence to: Paul Verdin, Solvay Business School, Université Libre de Bruxelles, Avenue Franklin D. Roosevelt 21, CP 145, B-1050 Brussels, Belgium.

[1] For a review, see Martin and Petty (2000).

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measures and, in general, the practice of value-based management (Haspeslagh, Noda, and Boulos, 2001), has coincided with increasing pressures from capital markets and the markets for corporate control for managers to focus their strategies on value creation, i.e., economic performance.

In this paper, we investigate the importance of industry factors using alternative measures of performance such as economic profit and market-to-book values. The former reflects operating performance in a given year, while the latter reflects the market's expectations of the firm's future operating performances. We also use a new data set using measures such as economic profit and total market value and implement a different statistical approach using random ANOVA methods for testing the significance of the independent effects.

Our study also examines the influence of 'outliers' on firm and industry effects. As the number of firms that outperform the industry increases, the greater will be intra-industry dispersions and lower will be the importance of industry effects. An interesting case would be when all firms deviate 'considerably' from each other. But recent evidence suggests that such outliers are not numerous and are very few in most industries. Firms in the top 20 percent of *Fortune*'s rankings in terms of market value added (market value less book value of capital) enjoy double the shareholder returns of the other firms in their industries.[2] Management researchers have identified the possibility of one or a few firms dominating value creation within their industries. Innovative firms have been able to invent new markets and reinvent old ones and in the process have been able to capture a large part of the industry's profits (Kim and Mauborgne, 1997; Gadiesh and Gilbert, 1998). The present study seeks to explore to what extent the presence of these few exceptional firms within an industry may be responsible for the high level of firm effects found in past studies, and whether the structural effects of the industry have a different level of impact for the rest of the industry's firms.

Our paper is organized as follows. In the next section we provide a brief review of the relevant literature. We then discuss performance measures, the data set and methodology. This is followed by the identification of value leaders and value losers and the empirical results. We conclude with a discussion of the results and final remarks.

[2] See Jonash and Sommerlatte (1999).

REVIEW OF THE LITERATURE

Since the late 1970s, industrial organization (IO) economics has provided the main theoretical basis for strategic management research into the determinants of firm performance.[3] The central argument was that the structural characteristics of industries were the primary determinants of performance (Porter, 1980). 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 driver of performance variations. 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 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)

[3] Rumelt, Schendel, and Teece (1996) discuss the historical evolution of strategic management research from its initial case-based orientation to a more theoretical basis, developed by concepts from industrial organization and later the resource-based view.

[4] For reviews, see Scherer (1980).

[5] For a review see Prescott, Kohli, and Venkatraman (1986).

argues that traditional microeconomic theory, with its focus on industry factors, ignored 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; Dierickx and Cool, 1989; Barney, 1991). 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, a central empirical question for strategic management has been the relative roles of industry and firm effects on firm performance. Schmalensee's (1985) study was a first attempt to analyze empirically the contribution of industry and firm factors to overall profitability,[7] 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 Federal Trade Commission (FTC) Line of Business 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 factors were insignificant.

However, Schmalensee's (1985) study left 80 percent of the total variance in business unit returns unexplained. Rumelt's (1991) landmark study 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 underspecified. With a data set covering just 1 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 4 years, allowing the inclusion of a composite term to measure business unit effects. The study also extended Schmalensee's descriptive statistical model by including additional terms to measure the intertemporal persistence in industry effects, year effects, corporate effects, and effects arising from corporate/industry interaction.

As a result, Rumelt (1991) reported that industry membership explained around 9 percent of the variance in business unit returns, of which only half was stable from year to year. Business unit 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 reignited the debate on the relevance of industry, business unit factors, and diversification as determinants of profitability.

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). 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).[8] A second difference was

[6] For a review of the strategic group literature, see McGee and Thomas (1986).

[7] Firm effects include any effect that has a firm-specific component such as stable and transient business-level, stable and transient corporate effects.

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

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[b] (1991)		McGahan and Porter (1997)
		Sample A	Sample B	
Industry effects	19.6%	8.3%	4.0%	18.7%
Firm effects	0.6%	47.2%	45.8%	36.0%
of which				
Business-level effects[a]	0.6%	46.4%	44.2%	31.7%
Corporate effects	N/A	0.8%	1.6%	4.3%
Year effects	N/A	N/A	N/A	2.4%
Industry/year effects	N/A	7.8%	5.4%	N/A
Error	80.4%	36.9%	44.8%	48.4%

[a] In both Schmalensee and Rumelt the business-level effects are business unit effects as they use FTC data sets. In the other studies, the business-level effects are business segment effects, as they are based on Computstat data set.
[b] 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.

that Compustat reported the data at the level of the business segment, while the FTC data set used by Schmalensee and Rumelt reports data at the business unit level.[9] All the studies, whether they measured competitive advantage effects through either business unit or business segment effects, confirmed the dominance of firm-specific effects.[10] 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 effects, if not for two reasons, which form the basis for this paper. First, are the results sensitive to the specific performance measure used or, more specifically, is the performance measure used in past research a reliable indicator of economic value? Second, is the general conclusion (that firm 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. 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 intraindustry variations. The obvious question is whether or not these few firms influence the reported strong firm effects and consequently whether there is anything to be said about the importance of industry and firm factors for the other firms in the same industry.

PERFORMANCE MEASURES

Previous studies mostly relied on return on total assets (operating income, i.e., earnings before interest and taxes, divided by total assets) as a measure of performance. 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

[9] Since business segments tend to contain several business units, industry effects tend to be lower when the SIC classification is used instead of the FTC classification (see McGahan and Porter, 1997, for a discussion).

[10] 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 United States. 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.

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.[11] 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 traditionally had no alternative to accounting measures.

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.[12] Both these measures reflect the concept of residual income, i.e., income that is adjusted for capital costs and hence risk as well as 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 shareholders.

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:

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

where NOPAT is net operating profit after tax, WACC is weighted average cost of capital and CE is capital employed.

[11] 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 ... '.

[12] 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. The consultancy Stern Stewart has coined the terms Economic Value Added (EVA) and Market Value Added (MVA) to reflect residual income.

Equation 1 can be rewritten as

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

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):

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

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. 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 debt-holders. 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 economic profit (EP) and total market value (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 economic value added) and TMV

(otherwise known as market value added).[13] Stewart (1991), Martin and Petty (2000), and Young and O'Byrne (2001) provide 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 to 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 firms that adopt EVA restrict the number of adjustments to fewer than 10 to make performance systems manageable.

The Stern Stewart data set ranks firms based on their annual MVA performance for firms in the United States and several European countries and these rankings are published yearly in *Fortune* and in business journals in Europe and Asia. In addition, the data are 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, they have yet to find serious attention in strategic management research. In recent years, several firms have applied these metrics to measure performance both in the United States and in other countries (Martin and Petty, 2000).

The U.S. data set covers 1000 listed firms for periods of up to 21 years. It is recent and has a broad range of industries in both manufacturing and services. One feature of the data set, however, is that since it contains only 1000 listed firms by MVA performance it could be dominated by large firms, to the extent that large firms create more value. Research suggests that the relationship between market share and performance is ambiguous (Prescott *et al.*, 1986) and in the estimates of Schmalensee (1985) market share actually has a negligible impact on performance. To a certain extent, any size bias is accounted for as we scale values of EP and TMV (such as in Equation 3). 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.

Finally, the nature of the data set implies that it does not provide business-level data at the 4-digit SIC code level. The problem with market-level data (such as TMV) is that it is usually available only at the corporate level. The value of business units, unless otherwise quoted on the stock market, can be difficult to infer. Even though there are a variety of methods used by analysts to evaluate the value of a firm's parts, the lack of consensus and the credibility of the data used could lead to methodological and measurement errors. While the data set suffers from a lack of specificity, it has the advantage of better measures. We proceed along the lines of Wernerfelt and Montgomery (1988), who used a similar approach in studying corporate diversification, where specificity is sacrificed for the sake of better value measures.

The lack of specificity implies two consequences for this study. First, since we assign firms according to their primary industry classification, the analysis will underestimate industry effects to the extent that the firm is diversified beyond its primary industry. Second, the firm effects in this study are likely to reflect both corporate- and business-level effects and we will not be able to distinguish between the effects, i.e., firm effects in this study comprise both corporate- and business-level effects. Our interest is particularly in the relative importance of industry vs. firm effects, and any corporate-level effects will add on to the firm effect variable. In the next section on the empirical model, we discuss the corporate effect in more detail.

The sample set covers the 10-year period from 1987 to 1996, representing a full economic cycle in the United States: growth in the late 1980s followed by recession in the early 1990s and growth again in the later 1990s.[14] The firms are classified into industries based on the SIC system at the 3-digit level, and the data retain many of the advantages of the Compustat data set (see Roquebert *et al.*, 1996). The sample was screened in various ways. We excluded 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 were also screened to identify firms that

[13] 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.

[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 data periods, such as Roquebert *et al.* (1996), 7 years; Brush *et al.* (1999), 10 years; McGahan and Porter (1997), 14 years.

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 and were classified as conglomerates, such as General Electric. The final sample contains 5620 observations for 562 firms across 55 industry classifications, with an average of over 10 firms per industry. Descriptive statistics are reported in Table 2.

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 3 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 industry effects would be similar across the three measures is one subject of investigation for this paper.[15]

MODEL AND METHODOLOGY

The model we use to examine the effects of industry, firm, and year factors largely follows the descriptive model used in Schmalensee (1985), Rumelt (1991), and McGahan and Porter (1997). We have taken the variance components procedure used in past research as our statistical methodology. The 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 $i = 1 \ldots r$ denotes any one industry as i; β_j is a random firm effect where $j = 1 \ldots n_i$ 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 effect where t denotes any one year as t; $(\alpha\gamma)_{it}$ is a random industry–year interaction effect; 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_α^2, σ_β^2, σ_γ^2, and $\sigma_{\alpha\gamma}^2$, i.e., $\varepsilon(0, \sigma^2)$. The random independent effects specified in the above model are generated by random processes that are independent of each other, i.e., each of the main effects is an independent random solution from an underlying population that is normally distributed.

The model specifies five sources of variation in business returns: stable and transient industry factors, stable firm effects, the effects of yearly macroeconomic fluctuations, and random error. Firm effects include both corporate and business unit effects and reflect the influence of 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 difference between our model and those of Rumelt (1991) and others is that the notion of 'corporate effect' has been discarded. As suggested earlier, the data set does not allow for distinguishing corporate effects with other firm-specific effects such as business-level effects. A key question that has emerged is how important corporate effects are. The evidence is mixed, with the earlier studies suggesting low corporate effects (Schmalensee, 1985, Rumelt, 1991, and McGahan and Porter, 1997) and the latter studies (Roquebert *et al.*, 1996, Brush and Bromiley, 1997) non-negligible effects. However, there is some debate as to the size and the significance of the corporate effects. From an empirical perspective, some

[15] 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, 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.

Table 2. Mean EP/CE, TMV/CE, and ROA by industry for the period 1987–96

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	8.0050
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

EP, economic profit; CE, capital employed; TMV, total market value

Table 3. Correlation between EP/CE, TMV/CE and ROA

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

EP, economic profit; CE, capital employed; TMV, total market value.

of the studies that show a non-negligible corporate effect are not directly comparable, due to differences in data sets (Rumelt uses the FTC database, while Roquebert *et al.*, 1996, and Brush and Bromiley, 1997, use Compustat) as well as differences in methodology (variance components vs. 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% vs. 4.3% for McGahan and Porter). A key factor is the difference in samples between the studies—Roquebert *et al.* (1996) exclude single business firms from their sample, which is likely to lead to higher corporate results.[16]

Past studies use two methods to estimate the variances: analysis of variance and variance components.[17] The analysis of variance is a hierarchical procedure, where one begins by estimating a null regression model with no independent effects, with the dependent variable a function of only a constant (usually 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 a 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 random-effects analysis of variance.[18] The variance components procedure used here is similar to the one employed in past research.[19] 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 (performance measure) into its components as follows:

$$\sigma_r^2 = \sigma_\alpha^2 + \sigma_\beta^2 + \sigma_\gamma^2 + \sigma_{\alpha\gamma}^2 + \sigma_\varepsilon^2 \qquad (5)$$

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 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.[20] Roquebert *et al.* (1996)

[16] 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 a 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. See also McGahan and Porter (1997), who discuss this issue.

[17] As is generally the case 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 by appropriate weights (see Searle, 1971).

[18] Variance component models are a special type of ANOVA model: the random effects ANOVA, where the independent variables are assumed to be random in nature. See Neter *et al.* (1996: Chapter 24).

[19] 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.

[20] The MIXED procedure in SAS can also be used to specify a pure random effects model. The MIXED procedure can generate

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 prerequisite 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-effects version only in the expected mean squares and the consequent test statistic (Neter *et al.*, 1996).

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 1996–99 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 10-fold, compared to a doubling (on average) for other automobile manufacturers.[21] 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.

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 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 influence the relative importance of firm 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's performance must be the highest in its industry for the maximum number of years over the sample period. But this criterion can create situations where two or more firms have outperformed the industry for an equal number of years. Hence, *if* we cannot identify the value leader by the number of years, we look at how much value in total was created by the firm over the sample period, i.e., highest cumulative firm

the Wald Z-test of significance statistics, but its 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.

[21] See Jonash and Sommerlatte (1999).

performance over the sample period. The same logic is applied to the identification of an industry's value loser. A firm showing the consistently worst performance *vis-à-vis* the industry average, i.e., for the maximum number of years is considered as a value loser. In the situation when two or more firms are tied in terms of the number of years, the firm that has the lowest cumulative value over the sample 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 4 gives the variance components estimates of the independent variables that add up to the variation in the dependent variable (EP/CE, TMV/CE and ROA). Table 5 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 5). In comparison, the corresponding figures for stable firm effects are 27.1 percent, 32.5 percent, and 35.8 percent.

Table 4. Absolute values of the variance contributed by independent variables for years 1987–96

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

EP, economic profit; CE, capital employed; TMV, total market value

Table 5. Firm and industry effects in percentage of total variance of the dependent variable for years 1987–96 based on the data reported in Table 4

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

EP, economic profit; CE, capital employed; TMV, total market value

The dominance of firm 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 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 and industry effects, ranging from 1.0 percent for ROA to 1.9 percent for EP/CE. Table 6 contains the comparable figures from Schmalensee (1985), Rumelt (1991), and McGahan and Porter (1997) on the various effects.

The results suggest that on average industry factors have little impact on performance and the finding is robust across performance measures. Firm-related factors dominate industry effects when seeking to explain performance. Furthermore, the random effects ANOVA approach indicates that the hypothesized independent effects are significant, similar to the findings of past studies.

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

Table 6. Comparison of results in percentage of total variance of the dependent variable

Variance component	Schmalensee (1985)	Rumelt[b] (1991)	McGahan and Porter (1997)	This study (see Table 7)		
				EP/CE	TMV/CE	ROA
Firm effect[a]	0.6%	45.8%	36.0%	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%
Error	80.4%	44.8%	48.4%	60.3%	51.9%	52.0%

[a] Firm effects comprise both business-level and corporate effects as reported in Table 1.
[b] Only the results of sample B of Rumelt's (1991) study are reproduced here.
EP, economic profit; CE, capital employed; TMV, total market value

a period of time (Kay, 1976).[22] A second reason could be that while the results are similar, the processes that lead to the results might vary. The results indicate only that firm factors are relatively more important across the three performance measures. We cannot say what these firm factors are, or whether the firm 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 has estimates that are statistically significant, and the 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 in many industries a few firms are responsible for the industry's value pie, in the next section we examine the impact of outlying firms 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 as discussed above 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 7 reports the estimated variance–covariance components for the modified sample and Table 8 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 7 and 8 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 remain almost the same for EP/CE. Table 8 indicates that in terms of relative proportions of variation explained industry factors are more important than firm 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 effects. In the case of EP/CE it is 18.2 percent for industry effects vs. 17.6 percent for firm effects and for ROA it is 20.1 percent against 16.7 percent. In general, for a majority of the industry's firms, when the industry's outliers (leaders and losers) are discarded, industry effects seem to dominate firm effects in explaining the variation in performance.*

Is it necessary that industry factors have to increase if we remove a few outliers? The important issues that will influence whether industry factors are likely to be more dominant or not depends on how many are these outliers and how significant is the competitive advantage or disadvantage of these outliers. The greater is the difference between the value leaders and losers and the rest of the industry, the larger will be their influence on the observed firm effects for the industry as a

[22] '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).

Table 7. Absolute values of the variance contributed by the independent variables for the modified[a] sample for years 1987–96

Variance component	Variance estimate for variable		
	EP/CE	TMV/CE	ROA
Firm effects	0.000820	0.232559	5.697587
Industry effects	0.000578	0.412727	5.413565
Year effects	0.000148	0.033736	0.384852
Industry-year effects	0.000271	0.067775	1.409289
Error	0.002839	0.619511	21.149261

[a] 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).
EP, economic profit; CE, capital employed; TMV, total market value

Table 8. Firm and industry effects for the modified[a] and full samples in percentage of total variance for years 1987–96, based on Tables 5 and 7

Variance component	EP/CE		TMV/CE		ROA	
	Modified[a]	Full	Modified[a]	Full	Modified[a]	Full
Firm effects	17.6%	27.1%	17.0%	32.5%	16.7%	35.8%
Industry effects	12.4%	6.5%	30.2%	11.4%	16.0%	8.1%
Year effects	3.2%	1.9%	2.5%	1.3%	1.1%	1.0%
Industry-year effects	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%

[a] 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).
EP, economic profit; CE, capital employed; TMV, total market value

whole. Evidently, the results suggest that only a few firms that capture or destroy a large part of industry's value dominate intra-industry variance and firm effects.

The smaller the number of such outliers, and larger the number of firms that closely follow each other, the greater will be the importance of structural factors. Firms being heterogeneous, performance differences are likely to exist and may persist due to isolating mechanisms (Lippman and Rumelt, 1982), between firms even in a duopoly. A resource-based explanation would imply that firms even in industries with few players are likely to differ from factors other than size (Caves and Porter, 1977), and if such factors are immobile between firms because of specificity and causal ambiguity, then differential performance will result and persist.[23]

But do industry factors systematically have a larger impact on the average firms? As with past studies, this study performs a statistical decomposition and does not investigate the exact sources of these effects (Rumelt, 1991). But the fact that dispersion in performance narrows drastically suggests that firms that pursue largely identical strategies with similar bundles of assets and capabilities will likely achieve similar performance, as proposed by the SCP paradigm.

In short, 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 and substantially 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 other firms, i.e., for firms that are neither industry leaders nor losers,

[23] Such was the case in the aircraft industry, where the performance of McDonnell Douglas radically differed from its main competitors Boeing and Airbus over several years.

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. In other words, industry structure matters only for firms that do not manage to be the leader or the loser, i.e., for firms with average managerial capabilities and performance.

CONCLUDING REMARKS

This study revisited the relative importance of industry- and firm-level effects on performance in two ways. First, we tested for the effects using new measures of performance and, second, we considered the impact of outliers. Our results confirm previous findings that industry factors, on average, matter little to firm performance, whether performance is measured by operating values such as EP or ROA or market values such as MV. This is encouraging indeed, since the accounting nature of measures used in past research (ROA) could have been a limiting factor.

Second, we also examined the impact of firm-specific and industry factors on those firms that do not outperform or underperform in relation to the rest of their industry. 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 it is firm factors that dominate. This result is robust across all the three measures of performance used in this study.

Are there outlying industries, similar to outlying firms? In other words, are there attractive and unattractive 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. 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. Tests performed by us using similar criteria as firms to identify outliers indicate that the relative levels of industry and firm effects remain stable and independent of the number of outlying industries removed.[24] 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.

We would note here the relatively large amount of error reported in the present research as well as in past studies (from 45%—Rumelt, 1991—to 80%—Schmalensee, 1985). Firm 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.

Similar to past research, we use the SIC system—a traditional taxonomy that assigns 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 effects are dominant, are to be

[24] We acknowledge the suggestion by one referee for proposing the possibility of outlying industries. Full results of the tests can be sought from the authors.

interpreted with some caution. If one cannot properly define industries in an economically relevant manner, then estimates of the degree of industry effects on performance, irrespective of how it is measured, will not be completely reliable.

Our study is no exception and it contains some potential problems. Particularly, the data do not allow us to distinguish between corporate- and business-level effects and hence may underestimate industry effects. The results are also based on a sample that was taken from a data set containing only 1000 listed firms that may potentially be large, and hence we should be cautious when seeking to generalize the results. The question of exactly what constitutes industry- and firm-level factors therefore merits further investigation.

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