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Portfolio Interrelationships and Financial Performance in the Context of European Firms

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The linkage between the interrelationships of a firm's lines of business and corporate financial performance has been the subject of extensive research in the strategy field. Yet very little research has examined this key relationship within firms operating in Continental Europe. This study investigates firm relatedness and its further relationship to accounting and market-based performance measures within a sample of European firms. The results confirm a positive and significant relationship between resource-based relatedness and firm performance for German, Swiss and Austrian multi-business firms. Thus, this study provides further evidence that resource-based relatedness of large diversified manufacturing companies can help explain variability in corporate financial performance across different institutional environments.

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Introduction

The impact of the interrelationship of a firm's lines of business on its performance has been the subject of extensive research in the strategy literature since the seminal works of Wrigley (1970) and Rumelt (1974). As the theory suggests, a related portfolio of

businesses should enhance the value of a company through the sharing and transfer of resources between related business lines (Collis and Montgomery, 1998; Goold *et al.*, 1994; Prahalad and Bettis, 1986, 1995; Prahalad and Hamel, 1990). While traditional empirical diversification research employs product-based operationalizations of diversification, more recent approaches have tried to capture different aspects of diversification, foremost interrelationships that are based on intangible resources (Farjoun, 1998; Markides and Williamson, 1996; Robins and Wiersema, 1995).

However, while the methodological approaches to examine what has often been referred to as the most researched link in the field of strategy develop further, the limited geographic scope of diversification studies remain. Although a great deal of research investigating the relatedness – performance linkage has been conducted for US and British firms, very little research has examined this key relationship in firms operating in Continental Europe.¹ In a review of the large body of diversification literature, we could not detect a single study that specifically deals with the relatedness – performance relationship in the institutional context of German-speaking countries. However, as we argue in this paper, differences in the institutional environments of different national settings may distort the relationship between relatedness and performance. Specifically, significant differences in the corporate governance and regulat-

ory systems between European countries and that of the US provide reasons to believe that this relationship may not hold in the same fashion in Europe. In light of these institutional differences and the scarcity of non-US based research, the impact of the interrelationship of a firm's lines of business on its financial performance for European firms remains uncertain. This study is an effort to narrow this research gap by investigating the relatedness – performance relationship within the institutional context of three European countries: Austria, Germany and Switzerland.² As diversification research has become increasingly focused on resource-based relatedness, this study analyzes the linkage between a firm's portfolio interrelationships and its financial performance by contrasting a resource-based relatedness measure with the traditional product-based measure of relatedness.

In addition, this study uses both accounting and market-based measures of firm performance to investigate the relatedness – performance relationship. Previous work using resource-based measures of relatedness has relied predominantly on accounting-based measures. The weaknesses of measuring firm performance with accounting data have been addressed frequently in the business literature (Chakravarthy, 1986; Dalton *et al.*, 1998; Datta *et al.*, 1991; Hoskisson *et al.*, 1993; Johnson *et al.*, 1985; Lubatkin and Shrieves, 1986; Ramanujam and Varadarajan, 1989; Rappaport, 1986). The major problems encountered by relying strictly on accounting data are that they can be easily manipulated by the firm, they are often not adjusted for a firm's risk, they are difficult to interpret when companies participate in various industries and finally, accounting standards differ from country to country. By utilizing both accounting and market-based measures of firm performance this study offers a more comprehensive investigation of the resource-based relatedness – performance linkage.

Finally, this study utilizes multiple time periods in which to examine the relatedness – performance relationship, whereas previous research has used mostly cross-sectional methods employing one time period. The main problem with relying on one point of observation in examining the relatedness – performance relationship is that the relationship may not be stable over time (Bergh, 1995a,b; Bowen and Wiersema, 1999; Lubatkin and Chatterjee, 1991). Reliance on one time period observation may limit the ability to detect the nature of the relationship (Ramanujam and Varadarajan, 1989). This study controls for such effects by examining the relatedness – performance relationship for three different time periods.

The study provides new empirical insights into the link between corporate strategy and financial performance in multi-business firms within Europe. Our key findings suggest that despite differences in the institutional environment, resource-based

relatedness has a positive influence on firm performance for European firms, while traditional SIC-based product relatedness has no significant impact on firm performance. These findings are consistent with those of prior research on US companies that have also shown statistically significant differences between the linkage of resource-based versus product-based relatedness and firm performance (Robins and Wiersema, 1995). Evidence of a positive relationship between resource-based portfolio relatedness and firm performance suggests that European corporate governance and regulatory systems are beginning to converge towards those in the US.

Institutional Context, Multi-business Strategy and Firm Performance

Institutional Context in the US and German-Speaking Countries

In this section we focus on differences in the institutional contexts of the US and Continental Europe that could influence the composition of the firm's business portfolio as well as the linkage between firm relatedness and performance. Basic differences in corporate governance mechanisms as well as culturally influenced differences in strategic goal-setting are frequently viewed as the main concerns that a relationship detected in one context might not be valid for another context (Bird and Wiersema, 1996; Charkham, 1994; Geringer *et al.*, 2000; Janesch, 1989). Some studies have already shown that national contexts have a major influence on corporate restructuring trends in the US and Europe (e.g. Bühner *et al.*, 1997). The differences in institutional environments, e.g. in the protection of intellectual property rights or in the cross-country tradability of goods and services (Teece, 1998), may also alter the characteristics or value of a firm's resources available for diversification and therefore have a fundamental influence on the concept of relatedness. The whole process of employing and redeploying resources of a diversifying company may differ internationally owing to different institutional environments (Capron *et al.*, 1998).

Corporate governance and regulatory systems were identified as two key factors of the European institutional environment that are significantly different from that in the US and that are likely to impact the relatedness of the firm's business portfolio as well as the linkage between relatedness and firm performance. Managerial strategic decision-making is subject to the constraints of the governmental regulatory system in which a firm conducts business. Governments can have radically different policies with regard to merger activity across industries, thus influencing the nature of the firm's business portfolio. Similarly, corporate governance factors such as executive compen-

sation systems, board oversight and shareholder activism, can all serve to influence the nature of strategic decision-making. There has been a well-established link between corporate governance and managerial strategic behavior and subsequent financial performance (see Short, 1994; Shleifer and Vishny, 1997, for a review of empirical studies). Specifically, portfolio composition and expansion decisions can be heavily influenced by the degree to which these governance factors serve to align manager's incentives with shareholder wealth maximization (Jensen, 1986).

Corporate governance for European firms is dramatically different than that of their US counterparts. These differences are due largely to significant changes in the underlying factors that serve to govern US firms during the past 15 years. Historically, it was well established that US public corporations did not provide strong incentives for managers to maximize firm value (Baumol, 1959; Berle and Means, 1932; Jensen, 1986, 1989). The lack of alignment between managers and shareholders was due to a variety of factors including: executive compensation systems that did not serve to align managerial incentives with shareholder interests; boards of directors that did not exercise their fiduciary responsibility to shareholders; and fragmented shareholders that were ineffective at influencing either management or the board to pursue shareholder wealth maximization. Within US firms, the compensation of senior management was determined on the basis of the size and diversity of the firm rather than its market value (stock price) (Jensen and Murphy, 1990; Murphy, 1985). The boards of public corporations tended to consist mostly of 'insider' managers appointed by and loyal to the CEO and the key committees of the board, e.g. the nominating, executive, and compensation committees were controlled by insider directors (Harrison, 1987). Finally, shareholder oversight was attenuated due to many small shareholders (Berle and Means, 1932; Demsetz, 1983). As a result of these factors, top management had the incentives and discretion to invest in projects, such as unrelated diversification, that enhanced their compensation and reduced their employment risk by increasing the size of the firm and reducing the firm's bankruptcy risk (Amihud and Lev, 1981; Baumol, 1959; Marris, 1964; Murphy, 1985). Theoretically and empirically, however, unrelated diversification has been shown to reduce firm value (Lubatkin and Rogers, 1989; Palepu, 1985; Rumelt, 1974). These three factors — executive compensation determination, board composition and structure, and the fragmented nature of shareholders — resulted in weak alignment between managerial incentives and shareholder wealth maximization (Jensen, 1986).

This corporate governance structure, however, changed considerably in the mid 1980s when the pressures for shareholder wealth maximization increased. Firms were forced to put the focus on

shareholder value due to several factors. First, institutional investor holdings now represent nearly 50 per cent of the US equity market (as of 1999) and hold over 57 per cent of the shares in the largest 1000 US corporations (Institutional Investment Report, 2000a). The power of concentrated buyers, along with a more active role on the part of institutional investors has led to significant pressures on the management of firms to enhance shareholder value (Shleifer and Vishny, 1997; Short, 1994). Second, as a result in part of these institutional investor pressures for performance, the composition, structure, and role of the board of directors has also significantly changed. Based on suggestions by the American Bar Association, the Security Exchange Committee, the NYSE, and the Amex, the boards for publicly traded companies are now composed predominantly of outside directors and the key committees on the board, the executive, nominating, and compensation committees, are no longer controlled by insiders. As a result, the board has become a more effective governance mechanism. Third, hostile takeovers became an increasing threat for inefficient management in the 1980s. Non-value maximizing firms had to face the possibility of being bought up by a corporate raider, which inspired many managers to focus on the shareholder value of their company (Jensen, 1993; Shleifer and Vishny, 1991; Bethel and Liebeskind, 1993). These changes in corporate governance mechanisms as well as tying management compensation to stock performance have significantly altered how US firms are managed and have had serious ramification for issues such as the portfolio composition of the firm (Shleifer and Vishny, 1997). Specifically, firm diversification that does not lead to enhancing firm value is less likely to be pursued. Instead, managers have increasingly focused their firm strategies by pruning unrelated businesses and focusing on leveraging core competencies to related sets of businesses (Bergh, 1995a,b; Liebeskind *et al.*, 1992; Markides, 1995; Prahalad and Hamel, 1990).

The increasing pressures for shareholder wealth maximization in the US were due to several changes in the factors that constitute the governance system. In Europe, pressures for maximizing shareholder wealth have been much less prevalent. Institutional investors and pension funds have much lower equity holding in European companies, while significant equity is closely held by institutions such as banks³ and major corporations (24.2 per cent of total market capitalization in Germany in 1998, Institutional Investment Report, 2000b), which also hold positions on the board of directors. Furthermore, the voting rights of small shareholders are commonly executed by banks, as for example through the *Depots-timmrecht* in Germany (Charkham, 1994). Governance is also determined through large cross-holdings of companies and is reflected in cross-participation in the boards. In European firms, non-institutional owners typically have other business relationships with the firm (Thomsen and Pedersen, 2000). In their

study of ownership effects, Thomsen and Pedersen found that corporate, family, and government ownership had a significant negative influence on firm performance as compared to institutional investors. Hence, ownership and control of European companies are relatively closely held by an identifiable group of 'insiders'. These insiders tend to pursue longer term, stable relationships with the companies and encourage strategic objectives rather than invest for profit maximization (Bühner *et al.*, 1997).

In addition to the differences in corporate governance, the US and Europe are characterized by different regulatory environments that influence corporate restructuring and diversification activity. Within Europe, the government plays a larger role in regulating the buying and selling of firms than in the US. The host governments of firms planning a merger become involved because of legal and trade ramifications, as well as concerns over employee welfare and the economic vitality of the communities in which the firm has activities. These factors have served to historically reduce the overall level of merger activity and thus the diversification profile of firms (Bühner, 1987; Bühner *et al.*, 1997).

These differences in corporate governance and the regulatory environment in Europe reflect an institutional context that might have significant consequences for the firm's strategy and performance. It is not at all clear that — given regulatory constraints and weaker corporate governance for European firms — the strategy–performance relationship detected in US firms might be valid for the European context. Yet, little research has examined the performance implication of relatedness for European firms. In this study, we focus on the relationship of relatedness and firm performance in large, multi-business firms in Germany, Switzerland and Austria, three countries with similar institutional environments and very interrelated economies. Given the extent of differences in national institutional environments, this study takes an important step towards testing the generalizability of one of the most researched relationships within US firms in the European context.

Diversification and Firm Performance

Ever since Chandler's (1962) seminal work on the strategy and structure of expanding US corporations, diversification — the entry of a firm into new lines of activity — has been a central topic in the strategy literature. At the same time, diversification has been researched in other fields of business administration, foremost in the finance and industrial economics literature. While the perspectives of the studies in these disciplines have differed, the empirical research methodology has been very similar. Typically, the diversity of a company — the spread of a company's activities at a point in time — was operationalized

using a variety of measures that relied on the SIC industry identification associated with a company's line of businesses. Researchers would then empirically investigate the relationship between the diversity of a firm's portfolio and the firm's performance.

Unfortunately, the overall empirical evidence of 30 years of research does not uniformly support either a positive or negative hypothesized linear relationship between diversity and firm performance (Datta *et al.*, 1991; Palich *et al.*, 2000; Ramanujam and Varadarajan, 1989). In a recent meta-analytic review of the diversification research of the past decades, Palich *et al.* (2000) found a curvilinear relationship between diversification and firm performance, an idea that has also been suggested by Markides (1992). Even though Palich *et al.* (2000) empirically detected an inverted-U relationship between diversification and firm performance, they did not find a theoretic grounding for this or any other linear or curvilinear relationship between diversification and firm performance. After reviewing the various motives for and against diversification, the authors state: 'As noted above, it is difficult to conclude whether moderate (i.e., related) or extensive (i.e., unrelated) diversification is superior for firm performance' (p. 161). The fact that motives for and against diversification may even out any positive or negative effect of the level of diversity on firm performance has been recognized by other authors (Markides, 1995; Ramanujam and Varadarajan, 1989) and argues for an isolated analysis of specific diversification motives and firm performance. In the field of strategy, the relatedness literature focuses on the synergy motive.

Relatedness and Firm Performance

It was Wrigley (1970) who first empirically examined firm relatedness — the logic and extent to which different business lines are connected. By employing a (subjective) measure that should capture the interrelationships between the various lines of business of a firm, he and later Rumelt (1974) found a positive impact of relatedness on firm performance. But the results of the authors could not be uniformly confirmed by later studies using the same methodology (Bettis and Hall, 1982; Christensen and Montgomery, 1981; Dubofsky and Varadarajan, 1987; Harrigan, 1986; Michel and Shaked, 1984; Montgomery, 1985). Overall, inconclusive results were also produced by a large research stream that used (objective) SIC code data to operationalize relatedness in terms of the distance between industries based on their SIC classification (Datta *et al.*, 1991; Hoskisson and Hitt, 1990; Ramanujam and Varadarajan, 1989).

With the elaboration of the resource-based theory in the 1990s, the issue of relatedness became central to the research on diversification (Peteraf, 1993; Teece, 1982). The resource-based theory of the firm argues that the relatedness of businesses provides the econ-

omic foundation of the multi-business firm (Peteraf, 1993; Teece, 1982). Resource-based theory defines relatedness on the basis of firm resources and not products. According to the resource-based theory, synergies out of portfolio interrelationships can arise in two ways: through the sharing of resources between two or more business units and through the transfer of resources from one business unit to one or several others (Collis and Montgomery, 1998). Resource sharing usually refers to operative processes such as the sharing of production processes or distribution channels. Value generation results from economies of scale and scope. The resources shared are typically tangible in nature. The transfer of resources, on the other side, usually involves resources that can be used in different business units simultaneously. The most prominent example of resource transfer was brought forward by Prahalad and Bettis (1986) who argue that the success of a company in a specific business is crucially dependent on whether the 'dominant management logic' of the company can be applied in this business. The application of technological know-how in different business lines is another important source of value creation through the transfer of resources. In contrast to shared resources, resources that are transferred within a firm are typically intangible in nature.

Resource-based theory argues that is fundamental to look at managerial or technical know-how that can be transferred between different business lines (Barney, 1986; Teece, 1986; Winter, 1987). Conceptualizing firm relatedness in terms of resources rather than products enriches the concept of synergy through the inclusion of intangible resource interrelationships. Because the product-based measures of relatedness are based on SIC codes, which primarily capture product-market similarities of different business lines, they are limited in capturing the underlying resource sharing that forms the basis for relatedness.

In addition, resource-based relatedness is only connected to the synergy motive for relatedness while the traditional product-based measures of relatedness may capture both risk diversification and internal capital market motives for diversification. The product-based measures of relatedness have been shown to be highly sensitive to dominant business focus and pure diversification, e.g. the number of different business units within the firm (Robins and Wiersema, 1999). As a result, the hypothesized link between relatedness and firm performance using these product-based measures can be influenced by other diversification motives such as risk diversification (Aron, 1988; Lewellen, 1971; Marshall *et al.*, 1984; Stulz, 1990) and internal capital market efficiencies (Stein, 1997; Weston, 1970; Williamson, 1975). In contrast, resource-based relatedness is only connected to the synergy motive because interrelationships of business units on the basis of their resources should not be systematically influenced by

any of the diversification motives other than the synergy motive.

Recently, some authors have developed relatedness measures, which capture resource-based interrelationships between the business units of a firm. These measures of resource-based relatedness include technology flows between business lines, skills of employees, the nature of interaction with customers and the importance of imperfectly tradable assets in different business lines (Farjoun, 1998; Markides and Williamson, 1996; Robins and Wiersema, 1995). These measures make it possible to empirically test the relatedness–performance relationship as proposed by resource-based theory.

Diversification and Firm Performance — A European Perspective

Despite significant differences in the institutional context of US and European firms and their implications for the linkage between firm relatedness and performance, there has been very little research on the diversification–performance linkage in Continental Europe. Empirical investigations of the linkage between firm diversification and performance have mostly focused on US, British and, more recently, Japanese companies (Geringer *et al.*, 2000). Research relying on resource-based measures of relatedness has exclusively focused on US firms. In this study, we examine the relatedness–performance linkage for multi-business firms in three German-speaking countries: Germany, Switzerland and Austria. These specific countries were chosen for this study, because their economic environment is similar and their economies are very interrelated, thus eliminating the need to control for other external influences. Figure 1 gives an overview of empirical diversification studies performed on samples of German companies over the past 20 years.

As highlighted in Figure 1, the existing research on diversification in German companies is scant and limited in its ability to analyze the linkage between firm resource-based relatedness and performance. Schwalbach (1985) and Lins and Servaes (1999) investigated the diversification–performance relationship and did not include variables to measure related diversification in their studies. Bühner (1983, 1987) and Spindler (1988) employed a continuous as well as a discrete diversification measure that combined product and international diversification. Both authors used the same sample and measures of diversification and firm performance. The discrete diversification measure Bühner and Spindler used differentiates between different levels of product relatedness (single, dominant, related, unrelated). A comparison with the US diversification literature is limited by the fact that Bühner and Spindler combined their product diversification measure with measures of international diversification. The authors themselves com-

Author(s)	Research Question	Data	Methodology	Results
Bühner (1983, 1987)	Effects of product and international diversification on firm performance and risk	40 German companies, 1966-1981	SIC-based measure: Herfindahl-type index Categorical measure: Rumelt-built categories with geographical extension Performance measures: Sharpe ratio, Jensen Alpha, return on assets, return on equity	Diversification reduces unsystematic risk Excessive diversification has a negative effect on firm performance Internationally diversified firms that start from a narrow diversified level outperform purely domestic firms and firms with highly foreign product diversity
Spindler (1988)	Similar to Bühner, but inclusion of influences from the business cycle	Same companies as Bühner	Same diversity measures as Bühner Performance measure: Jensen Alpha	Boom period: Diversification leads to a decrease in unsystematic risk and an increase in systematic risk; international diversification increases performance Depression period: Diversification leads to an increase in systematic risk and has a negative effect on firm performance.
Schwalbach (1985)	Motives for diversification	Several thousand German business units, 1980	Diversity measure: product count measure	Diversification is more likely to occur, if a company is active in small, low-growth industries and pursues a growth strategy
Lins and Servaes (1999)	Are diversified companies traded at a „discount“ at the stock market?	Around 200 German companies, 1992-1994	Diversity measure: classification into diversified and no diversified companies according to number of 2-digit SIC codes a company participates in Performance measure: Difference between market value and stand-alone value	German companies do not trade at a diversification discount (as opposed to the UK and Japan) Concentrated ownership in the hands of insiders enhances the valuation of diversified firms in Germany (as opposed to the UK and Japan)

Figure 1 German Diversification Research

pared their work primarily to the international diversification literature.

As indicated there has been limited research conducted on German firms while no research exists exploring diversification in Swiss and Austrian firms. Thus, the empirical issue remains as to the nature of the linkage between portfolio relatedness and performance within multi-business firms in German-speaking countries. This study is an attempt to close this research gap by empirically investigating the relationship between resource-based and product-based relatedness and firm performance within a sample of German, Swiss and Austrian multi-business companies.

Methods

The paper analyzes the impact of relatedness on corporate financial performance for a sample of large European manufacturing firms. The relationship was tested by employing two different measures of firm relatedness and four measures of firm performance as well as industry and firm-specific control variables. The model tested was as follows:

$$\text{Firm performance} = \alpha + \beta_1 (\text{Industry profitability}) + \beta_2 (\text{Firm size}) + \beta_3 (\text{Firm relatedness}) + \varepsilon$$

This model was analyzed cross-sectionally on a panel of companies for the years 1991, 1994 and 1997. The

Table 1 Companies Included in the Final Sample, n = 33

	Country		Country
Altana	Germany	Lenzing	Austria
BASF	Germany	Linde	Germany
Bayer	Germany	MAN	Germany
Beiersdorf	Germany	Mannesmann	Germany
BMW	Germany	Nestle	Switzerland
Daimler-Benz	Germany	Oerlikon-Buehrle	Switzerland
Degussa-Huels	Germany	OMV	Austria
Deutsche Babcock	Germany	Preussag	Germany
Deutz	Germany	Rheinmetall	Germany
DLW	Germany	Rieter Holding	Switzerland
Draegerwerk	Germany	Roche	Switzerland
Duerr Beton	Germany	Ruetgers	Germany
Forbo	Switzerland	Siemens	Germany
Henkel	Germany	Suedzucker	Germany
Hoechst	Germany	Sulzer	Switzerland
IWKA	Germany	Thyssen	Germany
Kloeckner-Werke	Germany		

data for all three periods was then combined in a pooled data analysis. The pooled sample allowed us to test the above model with increased degrees of freedom. At the same time, it provides an informal analysis of coefficient stability over time, as the pooled sample is compared to the cross-sectional samples (Bowen and Wiersema, 1999).

Sample and Data

A sample of 33 manufacturing companies were chosen from the 250 largest public companies in Germany, Switzerland and Austria as stated in the database DATASTREAM in the year 1997. The DATASTREAM database comprises only publicly-listed companies. The sample includes only firms participating in manufacturing industries since the technology flow data used to measure firm relatedness is available only for the manufacturing sector. For the analysis, this study uses a panel sample of 33 firms for all three time-periods. Table 1 lists the companies included in the final sample and Table 2 compares their sales to the population of 250 public companies.

All data for the variables defined below was taken from DATASTREAM. DATASTREAM consists of firm financial data and also reports a company's sales broken down by SIC codes. DATASTREAM uses the 1980 version of the UK SIC coding, as defined by the

UK Government Central Statistical Office. Annual reports are used to classify the sales of a company into different 3-digit SIC codes. Accounting standards applied by publicly traded German, Swiss and Austrian companies require companies to report lines of business data. This is similar to the line of business reporting requirement of US firms. Specifically they require companies to break down their sales revenue by industry. This information is the basis for the DATASTREAM lines of business breakdown by firm.

Variable Definitions

Firm Performance

This study utilizes both accounting-based and market-based measures of firm performance. The accounting-based measures used in this study were return on capital employed (ROCE) and return on sales (ROS) and they are calculated as follows:

$$\text{ROCE} = \frac{\text{income before interest and taxes}}{(\text{total assets} - \text{current liabilities})}$$

$$\text{ROS} = \frac{\text{net income}}{\text{total sales}}$$

The accounting measures of performance were calculated for the 'current firm performance' period as used by Robins and Wiersema (1995) in their original study. Current firm performance covers the years around the year firm relatedness is measured. For firm relatedness measured in 1991, ROCE and ROS were calculated as an average for the three-year period 1990 to 1992. For firm relatedness measured in 1994, ROCE and ROS were calculated as three-year averages for 1993 to 1995. And for firm relatedness measured in 1997, ROCE and ROS were calculated as three-year averages for 1996 to 1998 accordingly.

Table 2 Comparison between Original Sample and Final Sample

Euro 1997 (million)	Original Sample n = 250	Final sample n = 33
Average sales	5,125	15,718
Maximum sales	124,755	124,755
Minimum sales	475	522

The market-based measures used in this study were the Treynor ratio and the Sharpe ratio. The Treynor ratio and the Sharpe ratio are market-based performance measures, which have been employed frequently in strategy research (e.g. Bühner, 1983; Dubofsky and Varadarajan, 1987; Hoskisson *et al.*, 1993). Both measures are adjusted for firm risk. The Treynor ratio accounts for systematic, or firm-specific, risk and the Sharpe ratio accounts for total risk of a company. The ratios are calculated as follows (Sharpe, 1966; Treynor, 1965):

$$\text{Treynor ratio} = (R_i - R_f) / \beta_i$$

$$\text{Sharpe ratio} = (R_i - R_f) / \sigma_i$$

where R_i = return of stock i , R_f = risk-free rate of return, β_i = systematic risk of stock i , σ_i = total risk of stock i .

Choosing the correct time-periods for which the performance measures are calculated can be critical for the market-based measures. A firm's stock price reflects the expectations of future earnings, not current earnings. When examining the relationship of firm strategy to a market-based measure of performance, the appropriate time horizon for the performance measure would be in the years preceding and including the year firm strategy is measured.

Market-based performance was measured over a three year period immediately preceding and including the year firm relatedness was measured. For firm relatedness measured in 1991, Treynor and Sharpe ratios were calculated for the years 1989 to 1991. For firm relatedness measured in 1994, Treynor and Sharpe ratios were calculated for the years 1992–994. And for firm relatedness measured in 1997, Treynor and Sharpe ratios were calculated for the years 1995–1997, accordingly. The firms' stock returns (R_i) were adjusted for dividends and stock splits. The firms' betas (β_i) were calculated by regressing monthly stock market data of the sample companies on a national market index for the periods 1989–1991, 1992–1994 and 1995–1997. The market indices used to calculate the betas were the 'Deutscher Aktien Index' for Germany, the 'Swiss Performance Index' for Switzerland and the 'Austrian Traded Index' for Austria. The monthly returns of three-year government bonds from Germany, Switzerland and Austria were used as the risk-free rates of return (R_f).

Firm Relatedness

This study operationalized firm relatedness using two measures: resource-based relatedness and product-based relatedness. The firm relatedness measures were calculated for the years 1991, 1994, and 1997. Resource-based relatedness was measured by the technology-related measure developed by Robins and Wiersema (1995). For each industry combination i and j in a firm's portfolio, a sales-weighted measure of interrelationship R_{ij} was calculated as follows:

$$R_{ij} = P_i r_{ij} + P_j r_{ji},$$

where: P_i = percentage of sales in industry category i , P_j = percentage of sales in industry category j , and r_{ij} = relatedness based on technology flows between industries i and j .

These weighted measures of similarity between paired industries (R_{ij}) were summed over all combinations of two industries that could be formed from the business portfolio of a firm. This resulted in an aggregate measure of relatedness of a firm's portfolio $M_k = \sum R_{ij} = \sum r_{ij} (P_{ki} + P_{kj})$, where i and j represent any two different industries in which firm k is active. After an adjustment for the number of industries a firm is active in, the measure has a range from +1.0 to -1.0, with a positive score indicating that a firm has a positively interrelated portfolio of businesses and a negative score indicating a negatively inter-related portfolio.

Product-based relatedness was measured by the related component of the entropy index of diversification as defined by Jacquemin and Berry (1979), one of the commonly used SIC-based relatedness measures (Barker and Duhaime, 1997; Bergh, 1997). Product-based relatedness (related diversification, DR) is calculated by using the following formulas:

$$DR_j = \sum P_i / \ln(1 / P_i),$$

$$DR = \sum DR_j P_j,$$

where DR_j = a firm's related diversification in a specific industry group; P_i = a firm's sales in industry i as a percentage of a firm's total sales in industry group j (P^j).

Industry groups were defined on the 2-digit SIC code level, industries were defined on the 3-digit SIC code level.

Industry Profitability

When looking at the relationship between firm relatedness and performance, industry profitability should be included for two reasons. First, accounting-based measures can suffer from measurement problems caused by multi-industry participation (Nayyar, 1992; Rumelt, 1982). Second, when examining diversification, it is often argued that companies participating in below-average performing industries are more likely to seek more profitable industries and diversify. Therefore, diversified companies could be primarily those that have their core business in an unprofitable industry. If this is the case and if the low profitability of an industry is reflected by a lower profitability of a company participating in this industry, then diversified firms could be less profitable than focused ones only because they started off in an unprofitable industry (Ramanujam and Varadarajan, 1989). As this study examines firm relatedness rather than diversification, this latter concern might not

apply here. While the measure of resource-based relatedness might not be correlated with the diversity of a company, the related component of the entropy index, our measure of product-based relatedness, has been found to be highly sensitive to the level of total diversity in the firm's business portfolio (Robins and Wiersema, 1999). Therefore, industry profitability was used as a control variable in our examination of the firm relatedness–performance linkage.

Industry profitability was calculated in two steps. First, the average profitability of each 2-digit SIC industry was calculated. Second, using average industry profitability at the 2-digit SIC level and lines of business data for each firm, industry profitability for each company was calculated. Three-year average industry profitability was calculated for the same periods the firm performance measures were calculated for 1990–1992, 1993–1995 and 1996–1998 in the case of accounting-based measures and 1989–1991, 1992–1994 and 1995–1997 for market-based measures. Industry profitability was calculated using the accounting and market performance data of 250 publicly listed companies that were available for the period the measure was calculated for. All firms assigned to each 2-digit SIC code were identified and their performance was used to calculate the average profitability of each 2-digit SIC industry. The sales of each company in each industry were used as weights. As four different performance measures were used, four different measures of average profitability for each 2-digit SIC industry for each period were obtained: average industry ROCE, average industry ROS, the average industry Treynor ratio and the average industry Sharpe ratio. In a second step, the average profitability of each industry a company participated in was multiplied by the proportion of the firm's sales in each industry and aggregated for the firm as follows:

$$\text{Industry Profitability} = \sum \text{Prof}_i * P_{i,r}$$

where Prof_i = average profitability of 2 - digit SIC industry ij , P_i = proportion of a firm's sales in 2 - digit SIC industry i .

For each firm, four industry profitability measures were obtained for each time period: Industry ROCE, industry ROS, the industry Treynor ratio and the industry Sharpe ratio. Each of these four industry profitability measures was used as a control variable for the corresponding performance measure.

Firm Size

Firm size was measured as the log of a company's sales in the years 1991, 1994 and 1997 as reported by DATASTREAM. Large companies may achieve economies of scale and market power, which, in turn, can enhance performance (Grant *et al.*, 1988). Because large companies are usually more diversified than small companies, firm size could represent a system-

atic bias and therefore firm size was added as a control variable.

Results

Table 3 shows descriptive statistics and correlation matrices for the 1991, 1994, 1997 and pooled samples. As can be seen, there were significant correlations between the firm and industry accounting performance measures. Similarly, the market-based measures of industry and firm performance were highly correlated to each other. The accounting measures of firm and industry performance were much less correlated with the market-based measures of firm and industry performance. This indicates that the two groups of measures capture different aspects of firm and industry performance.

The correlation of the product-based relatedness measure and resource-based relatedness measure was positive for all samples and significant in the case of the pooled sample. Robins and Wiersema (1995) found a negative, but insignificant relationship between the entropy index of relatedness and the resource-based measure. The reason for this difference may lie in the usage of 3-digit SIC codes in this study to measure related entropy as opposed to 4-digit SIC codes in the study by Robins and Wiersema (1995). The 3-digit SIC codes are not as precise as the 4-digit SIC codes and therefore do not separate the aspect of resource-based relatedness as adequately from product relatedness as the 4-digit SIC codes do. This is also reflected in the fact that the mean of the resource-based relatedness measure (pooled sample mean of 0.24) was lower in this study than in the Robins and Wiersema (1995) study (mean of 0.72).

Table 4 presents the results of the regression analysis using the 1991, 1994, 1997 and pooled samples, respectively. For each sample, hierarchical regression analysis was used to examine the relative effect of firm relatedness on firm performance. First, the control variables — industry profitability and firm size — were entered. Then, the firm relatedness measure was added in the second step. Separate regression equations were tested for each of the relatedness measures. The first set of models labeled 1A–4A regressed firm performance on the product-based relatedness measure. The second set of models labeled 1B–4B regressed firm performance on the resource-based relatedness measure. Since we were examining two different accounting performance measures and two different market-based performance measures, each table has four models as follows: (1) ROCE, (2) ROS, (3) Treynor ratio, and (4) Sharpe ratio. This approach allows comparison of the effects of each of the relatedness measures on explaining variance in the four measures of firm performance.

In Table 4(a), models 1A–4A depict the regression of

Table 3 Means, Standard Deviations and Correlations^a

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
(a) 1991													
1 ROCE	9.94	4.57	1										
2 ROS	2.35	2.49	0.593***	1									
3 Treynor ratio	-0.09	0.53	0.285	0.417**	1								
4 Sharpe ratio	-0.21	1.33	0.287	0.492***	0.958***	1							
5 Industry profitability	10.03	2.41	0.617***	0.412**	0.263	0.315*	1						
6 ROCE	2.57	1.12	0.545***	0.563***	0.378*	0.395**	0.819***	1					
7 Industry profitability ROS	-0.08	0.14	0.198	0.137	0.482***	0.473***	0.356**	0.301*	1				
8 Treynor ratio	-0.17	0.35	0.258	0.148	0.456***	0.471***	0.555***	0.398**	0.944***	1			
9 Sharpe ratio	6.69	0.59	0.066	0.173	0.035	0.04	0.182	0.189	0.359**	0.281	1		
10 Product-based relatedness	0.35	0.36	0.392**	0.272	-0.014	-0.018	0.386**	0.513***	0.215	0.244	0.262	1	
11 Resource-based relatedness	0.22	0.27	0.186	0.395**	0.168	0.243	-0.075	0.005	-0.001	-0.139	0.204	0.174	1
(b) 1994													
1 ROCE	7.95	5.13	1										
2 ROS	1.77	5.59	0.716***	1									
3 Treynor ratio	0.11	0.31	0.285	0.418**	1								
4 Sharpe ratio	0.54	1.16	0.335*	0.448**	0.960***	1							
5 Industry profitability	8.12	2.75	0.671***	0.465***	0.129	0.188	1						
6 ROCE	2.29	1.79	0.670***	0.532***	0.156	0.23	0.895***	1					
7 Industry profitability ROS	0.14	0.09	0.521***	0.342*	0.509***	0.546***	0.594***	0.679***	1				
8 Treynor ratio	0.70	0.46	0.597***	0.383**	0.398**	0.467***	0.735***	0.803***	0.957***	1			
9 Sharpe ratio	6.71	0.60	0.122	0.183	0.355**	0.403**	0.053	0.115	0.096	0.098	1		
10 Product-based relatedness	0.33	0.33	0.393**	0.065	0.074	0.079	0.341*	0.477***	0.420**	0.427**	0.194	1	
11 Resource-based relatedness	0.22	0.28	0.199	0.277	0.249	0.288	-0.181	-0.052	-0.055	-0.119	0.267	0.245	1

^a P < 0.1, ** P < 0.05 *** P < 0.01, n = 33.

Table 3 Continued^a

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
(c) 1997													
1 ROCE	10.06	4.65	1										
2 ROS	3.47	2.94	0.526***	1									
3 Treynor ratio	0.21	0.44	0.650***	0.402**	1								
4 Sharpe ratio	0.99	1.37	0.691***	0.540***	0.914***	1							
5 Industry profitability	11.22	2.78	0.474***	0.313*	0.248	0.273	1						
6 ROCE	4.27	1.63	0.561***	0.466***	0.395**	0.424**	0.914***	1					
7 Industry profitability ROS	0.61	0.40	-0.040	-0.119	-0.121	-0.066	0.395**	0.323*	1				
8 Treynor ratio	1.90	0.65	0.584***	0.367**	0.570***	0.608***	0.789***	0.828***	0.297*	1			
9 Industry profitability	6.79	0.61	0.290	0.284	0.526***	0.663***	-0.083	0.016	-0.332*	0.218	1		
10 Firm size	0.36	0.36	0.278	0.202	0.228	0.172	0.309*	0.464***	0.018	0.253	0.063	1	
11 Product-based relatedness	0.27	0.32	0.138	0.234	0.357**	0.280	-0.039	0.169	0.072	0.114	0.060	0.226	1
(d) Pooled sample 1991-1997													
1 ROCE	9.32	4.89	1										
2 ROS	2.53	3.98	0.618***	1									
3 Treynor ratio	0.08	0.46	0.366***	0.356***	1								
4 Sharpe ratio	0.44	1.38	0.395***	0.440***	0.935***	1							
5 Industry profitability	9.79	2.95	0.599***	0.420***	0.212	0.256**	1						
6 ROCE	3.04	1.77	0.572***	0.517***	0.338***	0.398***	0.873***	1					
7 Industry profitability ROS	0.23	0.38	0.093	0.126	0.248**	0.327**	0.396***	0.520***	1				
8 Treynor ratio	0.81	0.99	0.273***	0.264***	0.455***	0.548***	0.498***	0.683***	0.793***	1			
9 Industry profitability	6.73	0.60	0.161	0.203**	0.285***	0.369***	0.060	0.117	-0.01	0.157	1		
10 Firm size	0.35	0.35	0.352***	0.144	0.089	0.077	0.323***	0.425***	0.083	0.166	0.173*	1	
11 Product-based relatedness	0.24	0.29	0.176*	0.278***	0.262***	0.278***	-0.060	0.083	0.089	0.067	0.176*	0.216**	1

a (for 1997 results) * $P < 0.1$, ** $P < 0.05$, *** $P < 0.01$, $n = 33$.a (for Pooled sample 1991-1997) * $P < 0.1$, ** $P < 0.05$, *** $P < 0.01$, $n = 99$.

Table 4 Regression of Accounting and Market-based Performance on Industry Profitability, Firm Size, Product-based Relatedness, and Resource-based Relatedness

	1A ROCE	2A ROS	3A Treynor ratio	4A Sharpe ratio	1B ROCE	2B ROS	3B Treynor ratio	4B Sharpe ratio
(a) 1991								
Constant	3.03 (0.39)	-2.95 (-0.67)	0.95 (0.9)	1.41 (0.54)	0.78 (0.28)	0.75 (-0.32)	0.24 (1.19)	0.27 (1.13)
Industry profitability	1.05*** (3.59)	1.26*** (3.19)	2.09*** (3.20)	2.00*** (3.06)	1.24*** (4.62)	1.25*** (4.00)	2.11*** (3.32)	2.21*** (3.63)
Firm size	-0.68 (-0.59)	0.32 (0.48)	-0.12 (-0.79)	-0.17 (-0.43)	-0.82 (-0.73)	-0.06 (-0.10)	-0.19 (-1.22)	-0.44 (-1.22)
Product-based relatedness	2.56 (1.27)	-0.28 (-0.22)	-0.14 (-0.58)	-0.47 (-0.74)				
Resource-based relatedness					4.28* (1.80)	3.60*** (2.86)	0.41 (1.32)	1.77** (2.33)
R ²	0.42	0.32	0.26	0.25	0.44	0.47	0.30	0.35
Adjusted R ²	0.35	0.25	0.19	0.17	0.39	0.42	0.22	0.29
Δ R ²					0.06***	0.15***		0.12***
F-statistic	6.86***	4.61***	3.44***	3.15***	7.74***	8.62***	4.07***	5.27***
(b) 1994								
Constant	-5.39 (-0.67)	-11.49 (-1.21)	-1.30** (-2.53)	-5.24** (-2.74)	0.58 (-0.56)	0.52 (-0.65)	-1.06* (-2.04)	-4.24** (-2.24)
Industry profitability	1.14*** (4.29)	2.01*** (3.79)	1.91*** (3.61)	1.30*** (3.25)	1.37*** (5.78)	1.7*** (3.67)	1.65*** (3.41)	1.18*** (3.26)
Firm size	0.48 (0.41)	1.52 (1.07)	0.18** (2.35)	0.76** (2.66)	-0.05 (-0.04)	0.40 (0.28)	0.13 (1.67)	0.55* (1.92)
Product-based relatedness	2.72 (1.21)	-4.64 (-1.59)	-0.22 (-1.45)	-0.78 (-1.35)				
Resource-based relatedness					6.11** (2.54)	5.88* (1.93)	0.23 (1.39)	1.11* (1.79)
R ²	0.48	0.35	0.40	0.39	0.56	0.38	0.39	0.41
Adjusted R ²	0.43	0.29	0.34	0.32	0.51	0.31	0.33	0.35
Δ R ²					0.10***	0.08***		0.07***
F-statistic	9.05***	5.31***	6.37***	6.08***	12.13***	5.88***	6.29***	6.78***

*P < 0.1, **P < 0.05 ***P < 0.01, n = 33, t-statistics reported in parentheses.

Table 4 Continued

	1A ROCE	2A ROS	3A Treynor ratio	4A Sharpe ratio	1B ROCE	2B ROS	3B Treynor ratio	4B Sharpe ratio
(c) 1997								
Constant	-15.99* (-1.85)	-9.26* (-1.75)	-2.56*** (-2.98)	-9.5*** (-5.74)	-9.08* (-1.75)	-9.37* (-1.76)	-2.50*** (-3.07)	-9.54*** (-6.10)
Industry profitability	0.78*** (2.93)	0.86*** (2.72)	0.06 (0.32)	1.01*** (4.26)	0.79*** (2.8)	0.76*** (2.53)	0.03 (0.17)	0.98*** (4.47)
Firm size	2.47** (2.12)	1.35* (1.78)	0.39*** (3.26)	1.26*** (5.06)	1.30* (1.74)	1.38* (1.77)	0.38*** (3.32)	1.24*** (5.30)
Product-based relatedness	1.48 (0.71)	-0.31 (-0.21)	0.24 (1.26)	0.05 (0.13)				
Resource-based relatedness					1.33 (0.92)	1.09 (0.7)	0.45** (2.21)	0.84* (1.90)
R ²	0.35	0.29	0.32	0.67	0.31	0.28	0.38	0.70
Adjusted R ²	0.28	0.22	0.25	0.63	0.24	0.21	0.32	0.67
F-statistic	5.10***	4.03***	4.50***	19.25***	4.41***	3.84***	6.02***	22.84***
(d) Pooled sample 1991-1997								
Constant	-5.82 (-1.27)	-7.85** (-2.02)	-1.45*** (-2.95)	-4.70*** (-3.73)	0.16 (-1.40)	-6.30* (-1.67)	-1.34*** (-2.80)	-4.32*** (-3.53)
Industry profitability	0.9*** (6.44)	1.23*** (5.76)	0.30** (2.62)	0.71*** (6.22)	1.00*** (7.66)	1.09*** (5.76)	0.28** (2.51)	0.69*** (6.26)
Firm size	0.82 (1.25)	1.05* (1.82)	0.22*** (2.95)	0.69*** (3.64)	0.74 (1.13)	0.71 (1.26)	0.19*** (2.68)	0.59*** (3.20)
Product-based relatedness	2.23* (1.87)	-1.33 (-1.21)	0.03 (0.2)	-0.24 (-0.72)				
Resource-based relatedness					3.28** (2.45)	2.98** (2.57)	0.31** (2.08)	0.94** (2.52)
R ²	0.40	0.30	0.14	0.39	0.41	0.33	0.18	0.42
Adjusted R ²	0.38	0.28	0.12	0.37	0.39	0.31	0.16	0.40
ΔR^2	0.02***				0.04***	0.05***	0.04***	0.04***
F-statistic	20.86***	13.48***	5.35***	19.94***	22.19***	15.88***	7.02***	23.08***

(for 1997) *P=0.1, **P < 0.05, ***P < 0.01, n = 33, t-statistics reported in parentheses.
(for Pooled sample 1991-1997) *P < 0.1, **P < 0.05, ***P < 0.01, n = 99, t-statistics reported in parentheses.

firm performance on industry profitability, firm size, and product-based relatedness for the sample of firms in 1991. Each of the models represents a different measure of firm performance. In model 1A, firm and industry profitability are measured using the ROCE measure. In model 2A, firm and industry profitability are measured using the ROS measure. In model 3A, firm and industry profitability are measured using the Treynor ratio. And in model 4A, firm and industry profitability are measured using the Sharpe ratio. The overall models are significant in explaining firm performance. However, as shown, firm relatedness as measured by the related entropy measure is not significantly related to firm performance. These results are consistent across the accounting (models 1A and 2A) and market-based (models 3A and 4A) measures of firm performance. The lack of a significant relationship between product-based relatedness and firm performance is consistent with prior studies and in particular with the findings by Robins and Wiersema (1995).

In Table 4(a), models 1B–4B depict the regression of firm performance on industry profitability, firm size, and resource-based relatedness for the sample of firms in 1991. Each of the models represents a different measure of firm performance. In model 1B, firm and industry profitability are measured using the ROCE measure. In model 2B, firm and industry profitability are measured using the ROS measure. In model 3B, firm and industry profitability are measured using the Treynor ratio. And in model 4B, firm and industry profitability are measured using the Sharpe ratio. The overall models are significant in explaining firm performance. As indicated, firm relatedness as measured by the resource-based relatedness measure is significant and positively related to three of the four measures of firm performance. For the accounting measures of firm performance, resource-based relatedness was positive and significantly related to both ROCE ($\Delta R^2 = 0.06$ and $F = 3.70$, $P < 0.01$) and ROS ($\Delta R^2 = 0.15$ and $F = 9.34$, $P < 0.01$). For the market-based measures of firm performance, resource-based relatedness was positive and significantly related only to the Sharpe ratio ($\Delta R^2 = 0.12$ and $F = 6.18$, $P < 0.01$).

In Table 4(b), models 1A to 4A depict the regression of firm performance on industry performance, firm size, and product-based relatedness for the sample of firms in 1994. As for the 1991 sample, the overall models for 1994 are significant in explaining firm performance. As shown, firm relatedness as measured by the related entropy measure is not significantly related to any of the four firm performance measures. Here again, the overall lack of a significant relationship between product-based relatedness and firm performance is consistent with our findings for the sample in 1991 and those of prior research (Robins and Wiersema, 1995).

In Table 4(b), models 1B–4B depict the regression of

firm performance on industry profitability, firm size, and resource-based relatedness for the sample of firms in 1994. Firm relatedness as measured by the resource-based relatedness measure is significant and positively related to three of the four measures of firm performance. For the accounting measures of firm performance, resource-based relatedness was positive and significantly related to both ROCE ($\Delta R^2 = 0.10$ and $F = 7.35$, $P < 0.01$) and ROS ($\Delta R^2 = 0.08$ and $F = 4.24$, $P < 0.01$). For the market-based measures of firm performance, resource-based relatedness was positive and significantly related only to the Sharpe ratio ($\Delta R^2 = 0.07$ and $F = 3.66$, $P < 0.01$).

In Table 4(c), models 1A–4A depict the regression of firm performance on the control variables and product-based relatedness for the sample of firms in 1997. As for the previous two samples, the overall models for 1997 are significant in explaining firm performance. Firm relatedness as measured by the related entropy measure is not significantly related to any of the four firm performance measures. These results again argue against a relationship between product-based relatedness and firm performance.

In Table 4(c), models 1B–4B depict the regression of firm performance on industry profitability, firm size, and resource-based relatedness for the sample of firms in 1997. Firm relatedness as measured by the resource-based relatedness measure is significant and positively related to two of the four measures of firm performance. Resource-based relatedness was not significantly related to the accounting measures of firm performance. For the market-based measures of firm performance, resource-based relatedness was positive and significantly related to both the Treynor ratio ($\Delta R^2 = 0.10$ and $F = 5.55$, $P < 0.01$) and the Sharpe ratio ($\Delta R^2 = 0.04$ and $F = 4.12$, $P < 0.01$).

In Table 4(d), the results for the fully pooled sample are shown. As expected, pooling yields higher *t*-statistics due to increased degrees of freedom. The cross-sectional and fully pooled estimates appear to imply similar inferences about the relationship between related diversification and firm performance. Models 1A–4A depict the regression of firm performance on industry profitability, firm size, and product-based relatedness for the pooled sample of firms. Product-based relatedness has a significant and positive effect on the ROCE ($\Delta R^2 = 0.02$ and $F = 3.63$, $P < 0.01$), but no significant effect on any of the other performance measures.

In Table 4(d), models 1B–4B depict the regression of firm performance on industry profitability, firm size, and resource-based relatedness for the pooled sample of firms. As for the single-year estimates, firm relatedness as measured by the resource-based relatedness measure is significant and positively related to firm performance. For the accounting measures of firm performance, resource-based

relatedness was positive and significantly related to both ROCE ($\Delta R^2 = 0.04$ and $F = 6.24$, $P < 0.01$) and ROS ($\Delta R^2 = 0.05$ and $F = 6.87$, $P < 0.01$). For the market-based measures of firm performance, resource-based relatedness was positive and significant for both the Treynor ratio ($\Delta R^2 = 0.04$ and $F = 4.51$, $P < 0.01$) and Sharpe ratio ($\Delta R^2 = 0.04$ and $F = 6.62$, $P < 0.01$). The results confirm a significant positive relationship between relatedness as measured by the resource-based measure and firm performance.

Discussion and Conclusion

This study contributes to our understanding of the link between corporate strategy and performance by investigating this key relationship within the context of three European countries — Germany, Switzerland and Austria. To date, empirical investigations of the relatedness – performance linkage within Continental Europe have been extremely limited. Yet significant differences in the corporate governance and regulatory environments of these countries as compared to the US would indicate that both the portfolio strategy of the multi-business firm and its relationship to performance may be impacted by these contextual factors. As a result, it is important to ascertain whether the positive relationship found between resource-based relatedness and firm performance in US multi-business firms holds within the European context.

Despite significant institutional differences, this study's key findings suggest that resource-based relatedness has a positive influence on both accounting and market-based performance for multi-business European firms. The empirical linkage was significant across multiple time periods. These findings confirm the robustness of earlier US findings and their applicability to a non-US institutional context (Robins and Wiersema, 1995).

Product-based relatedness, as measured by the related component of the entropy index, had no significant impact on firm performance. The lack of such a relationship may be indicative of problems of measurement as indicated by the high degree of sensitivity of the related component of the entropy measure to pure diversification rather than relatedness among businesses in the portfolio (Robins and Wiersema, 1999).

Our empirical findings of a robust positive linkage between resource-based relatedness and firm performance within European multi-business firms suggest that the institutional factors within Europe are perhaps beginning to resemble those faced by firms in the US. While corporate governance factors were historically quite different in Europe, they may be undergoing the same changes that occurred within the US during the late 1980s and 1990s. The globaliz-

ation of capital markets and liberalization of national markets have resulted in a more common yardstick of performance — e.g. shareholder wealth creation. As indicated by increasing market capitalization, companies in Europe are becoming more dependent on global equity markets, as opposed to traditional bank credits, for their financing needs. Market capitalization as a percentage of GDP in Germany, for example, increased from 9 per cent in 1980 to 22 per cent in 1990 and 28 per cent in 1996 (OECD, 1998). Because of the sheer size of US institutional investments, they dominate the European equity market. According to the Conference Board Report, US institutional investor financial assets made up 67 per cent of the institutional investments in France, Germany and the UK for 1997 (Institutional Investment Report, 2000b). By relying more on the global equity market for financing, European firms have had to gain the support and confidence of the international financial community. According to Brancato, the author of the report on *International Patterns of Institutional Investors* (Conference Board, 2000), 'companies which have been sheltered from corporate governance concerns will need to play catch-up as they emerge from their closely-held status to become open equity market players'. As European companies are becoming more widely held, they in turn become more subject to institutional investor activism. At the same time, ownership by banks and other corporations is declining (for Germany, ownership by corporations and banks went from 24.2 to 17.8 per cent from 1998 to 1999) (Conference Board, 2000).

As with corporate governance, European countries are in the process of adjusting their regulatory systems to promote financial markets and an investor culture. In Germany, for instance, a number of laws have been passed recently that facilitate the development of the capital market and broaden the range of choices for investors (OECD, 1998). Of particular significance is the possibility of companies with limited liability to sell stakes held in other limited liability firms tax-free as of the beginning of the year 2001, which could change the ownership structure of German companies dramatically (Herden and Reinhard, 2000).

As a result of these recent changes in corporate governance and regulatory systems, major portfolio restructuring via mergers and acquisitions — a phenomenon that could be observed in the US in the 1980s (Bowman and Singh, 1993) — is beginning to occur within European firms (Bühner *et al.*, 1997; Davies and Petts, 1997; Richter, 1997). M&A-activity showed strong increases in the past few years in Europe. European companies constituted 37 per cent of worldwide total dollar M&A-activity in 1999 as compared to only 23 per cent in 1998 (Herden and Reinhard, 2000). At the same time, hostile takeovers, which were a very unusual means of establishing control over a firm a few years ago, are much more

common in Europe today, representing 32.6 per cent of announced transactions in Europe.

The empirical findings of this study are consistent with recent theories of corporate strategy, which emphasize the importance of modeling business interrelationships utilizing underlying strategic resources as opposed to mere product-market relatedness. The resource-based measure of relatedness employed in this study was derived from technology flows between different industries and therefore captured the aspect of potential synergy from transfer of technological know-how between different business lines of a company. The fact that the resource-based measure of relatedness was positively and significantly related to both accounting and market-based firm performance provides further evidence that problems in the operationalization of key constructs rather than weakness in theory might have been the reason for inconclusive findings in the past (Robins and Wiersema, 1999).

Further, our findings indicate that the relationship between resource-based relatedness and performance was consistent across both accounting and market-based measures of firm performance for multiple time periods. Given the differences in accounting standards from country to country, it is important to incorporate market-based performance measures in investigating the relatedness-performance linkage. The use of multiple performance measures and time periods further reduces the ambiguity in research on the relationship between firm relatedness and performance.

Finally, the results of this study point to specific recommendations that would benefit future empirical strategy research. First, our empirical investigations of theoretical linkages needs to expand to include cross-national settings. We found that despite differences in the institutional context that may distort the relationship between firm relatedness and performance, our study validated the robustness of US findings to European firms. However, there exist many strategy research issues that are equally sensitive to the institutional context of the firm that may warrant further investigation. Given the significant differences in corporate governance between European and US firms, this would be especially true for strategic issues that are highly sensitive to this contextual factor.

Similarly, many of the empirical investigations in the strategy field suffer from over reliance on cross-sectional investigation (Bowen and Wiersema, 1999) and over reliance on accounting-based measures of firm performance. As indicated in this study, empirical investigations can benefit from utilizing a longitudinal research design approach and from incorporating both market-based and accounting-based measures of performance.

Notes

1. Recent work has also begun to examine this issue within Japan (e.g. see Geringer *et al.*, 2000).
2. These countries were chosen because of a similarity in their institutional environment and the interrelatedness of their economies.
3. Bank ownership is illegal in the US.

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