

Diversification and Risk Reduction: Risk and Returns for Related Diversifiers

Abstract

Diversification is a strategic option that faces many executives especially when their current industry is under pressure or they have surplus fund to invest. However, the literature is divided as to the merits of diversification, the role of relatedness to the returns for the final firm and the risk profile of the firm post diversification. In this paper I show the relationship between diversification, performance and the influence that relatedness has on the performance and risk of firms. Further detail on the methods as to how these benefits are attained are also explored. The theoretical work and the results match well and a solid result re the merits, pitfalls and outcomes around relatedness and diversification are presented.

Declaration

I declare that this research project is my own work and references have been identified. It is submitted in partial fulfilment of the requirements of the Master of Business Administration at the Gordon Institute of Business Science.

Nicholas De Canha

Date

Anknowledgements

I wish to thank my parents and sister for their support.

This is what I believe in [ref: Joan D' Arc]

Further thanks to Rodger Bryant for his help with the database, Lu Lau for his quick response with the dataset and Mike Ward for his help on the construct of the questions.

Index

Diversification and Risk Reduction: Risk and Returns for Related Diversifiers	i
Abstract.....	ii
Declaration.....	iii
Anknowledgements	iv
Index	v
Definition of Problem.....	8
Research Question	12
Introduction.....	12
The Question.....	12
Conclusion	14
Literature Review	16
Firm Forms, Performance and Diversification	16
Resource Based View	19
Conclusion	24
Industrial Organisation and Diversification.....	24
Introduction.....	24
Uncertainty and Diversification.....	25
Economics of the Integration Decision.....	33
Transfer Pricing: Vertically Related Firms Will Be A Subset Of Our Related Sample.....	35
Conclusion	37
Transaction Cost Economics	38
The Role of Relational Contracts in Transaction Cost Analysis	40
Conclusion	42
Emperical Research on Performance of Diversified Firms	43
Reasons for Diversification	43
Diversification and Discount	45
Diversification and Performance	47
Diversification and Risk	48
Reasons for Poor Performance	49
Beta and Beta Downside.....	50
Beta.....	50
Downside Beta.....	52
Proposed Research Methods.....	56
Propositions and Hypotheses	56
Proposition 1 and 2	56
Proposition 3.....	57
Proposition 4.....	58
Conclusion of Hypothesis.....	59
Classification of Relatedness	60
Hypergeometric and Matrix Measure	61
Introduction.....	61
Methodology	62
Hypothesis 1 and 2 and 3.....	65
Population.....	65
Sampling	65
Testing	66
Results.....	70
H1a.....	70



ANOVA.....	70
Regression.....	71
H1b	72
ANOVA.....	72
H2a.....	73
ANOVA.....	73
Regression.....	74
H2b	75
ANOVA.....	75
H3ai.....	77
Regression.....	77
H3aii	78
Regression.....	79
Curve Fitting.....	79
H3bi	81
ANOVA.....	81
Curve Fitting.....	82
H3bii	83
ANOVA.....	83
Regression.....	83
Curve Fitting.....	84
H4a + i	86
H4a.....	86
H4ai.....	87
H4b + i	87
H4b	88
H4bi	89
H4c.....	90
H4c.....	90
H4ci.....	91
Discussion of Results.....	94
Introduction.....	94
Limitations	95
Single Segment Firms.....	95
Data Availability.....	96
Proposition 1 and 2	98
Hypothesis 1	98
Hypothesis 2	102
Proposition 3.....	103
Beta and the Systematic Risk of the Portfolios	103
Shape of the Beta / Decile relationship.....	105
Beta Downside.....	106
Hypothesis 4	108
Effect of Subranking on Price to Earnings Multiple	109
Effect of Market Capitalisation on Returns	110
Effect of Subranking on Price to Book Multiple	112
Conclusion	113
Reference	115
Appendices	121
Appendix A.....	121
Appendix B.....	122
Appendix C.....	123



Appendix D.....	124
Appendix E.....	125

Definition of Problem

The issue of diversification, specifically the extent to which it is undertaken and its returns and risks to shareholders, is a very large topic (see Ramanujam and Varadarajan (1989) for synthesis of the 1989 extant research). Its relevance to corporate managers is only increasing as the pressures on firms to remain competitive, flexible and exposed to high growth market continues and the borders of potential markets falls worldwide (although not at an even pace). Moreover, diversification appears even more attractive when there is an industry downturn for firms, and after a period of sustained growth when there is surplus cash available to a firm. Whether or not diversification offers any advantages systematically to non diversification is disputed empirically and theoretically. Theoretically, the field is pulled between the competing disciplines of:

1. Strategic School
2. Industrial Organisation School
3. Transaction Costs School.

We will give a brief overview of the schools of thought here, the content is within the literature review:

1. The Strategic School of thought places the highest emphasis on the risks of diversification on management attention and organisational flexibility.
 - The issue of change and flexibility is very prominent in the literature and any move that reduces an organisations ability to change to the market at a pace equal or greater than the market changes is seen by this school as a major area of weakness.
 - Further, with the prominent influences of Porter (1980) and Prahalad and Bettis (1986) the effect of diversification to move attention away from key activities or

industries that the firm understands well, is seen as a critical business risk and one which any business should shy away from.

- A more recent interpretation of this school is the focus on the existence of core strategic assets. Defining the advantage in terms of strategic assets that are rare, valuable, difficult and costly to imitate and imperfectly tradable, a firm can only use diversification to its advantage if it develops these assets and their benefits are transferable (Markides and Williamson, 1996). This is an important point because it raises a very big question about the transportability of core competencies (Roll, 1986).
 - Advances in technology and capacity are the third troubled area for this school (D'Aveni and Ilinitch, 1992). When any firm is exposed to different technological advances in different areas of the business leading to the potential for different levels of technology and capacity in different divisions which are trading internally. In order for the firm to efficiently price internally and avoid double marginalisation internal pricing needs to be near the best equivalent market trading prices. However, the in house approach would influence decision making at the firm and there would be a tendency to support a division which has fallen behind in some crucial area. Further, capacity may not be added smoothly between divisions which would affect the transfer pricing strategies well away from optimal. E.g. suppose a firm had enormous capacity come on line upstream internally. To support the volumes the central decision maker might reduce the transfer price to push the volume to the downstream firm. However, at some stage there is a limit to the downstream firms use and so there are two assets being used inefficiently.
2. The Industrial Organisation / Organisational Design school places emphasis on the change in the market dynamics that a firm can engineer when undertaking diversification. This school is particularly prominent in the thinking of the regulatory bodies.

- Market power has been shown in many different forms to increase the profitability of a firm. The original and best known work here is the PIMS study (Schoeffler, Buzzell and Heany, 1974). This work is supported by numerous economic papers. The core question for the economics papers is the degree to which market power, together with product differentiation can lead to a situation where the firm can extract above average profits from its market.
 - The increasing size and dominance of a firm lead to the ability to foreclose* markets and extract rents from upstream or downstream players. Further, it is argued that foreclosure in a vertical integration sense may allow the firm to extend their control further along the value chain and so the effect magnifies itself with the continued growth of a company (Fontenay and Gans, 2005).
3. Finally the Transaction Costs Economics School places emphasis on the costs inherent in running the business that is formed and the savings that may occur. Williamson (1975) was one of the pioneers of this school of thought. Primarily the concern here is with the necessity that imperfect markets create for greater amounts of monitoring of the firms with which the firm of interest does business
- Theoretical papers focus on the cost savings derived from the internal market. These are mainly in the form of reducing monitoring, search / marketing and enforcement costs. These benefits will vary depending on the market structure and even the business itself due to imperfections in the market (see below) and the rate of change that the business undergoes.
 - Much of the imperfections that dominate the arguments are a function of ‘small numbers bargaining’. Specifically in a market of perfect competition, there is no need for vertical integration as there are no monitoring requirements because any breach of contract or understanding would allow the

other firm to immediately and perfectly efficiently switch either their customers or their suppliers. However in an imperfect market the need to monitor the partner firms increases especially when there is a set of conditions:

- High asset specificity: Increasing the risk of ex poste exploitation and hold up since the asset is not replicable.
- Empirical studies focus on the ability of a related firm to use the same cost centres across the value chain and avoid duplication of the efforts (D'Aveni and Ravenscraft, 1994)
- However, there are increased bureaucracy costs involved with diversification. Specifically the loss of market efficiency as an enforcer of pricing, the monitoring and decision making costs of hierarchy becoming responsible for internally transferring goods that were formerly sold on open markets leads to increase costs especially when these lead to decisions that lie outside of the firm managements key knowledge areas.

The very measure of diversification differs between papers. What should constitute diversified and related and single businesses depends on the methodology used and will clearly have an impact on the results. The different methodologies impose different assumptions and different restrictions on the theoretical base that is used to create the arguments for or against diversification.

¹ *Foreclosure of a market occurs when a strong competitor occupies the market place and engages in behaviour preventing other firms from entering

Research Question

Introduction

This paper focuses on two issues that concern vertical integration:

1. Does Related and Unrelated Diversification provide superior returns to shareholders
2. Does Related Diversification reduce the systematic risk to shareholders as measured by β to the market and or indexes

There have been several papers, based on United States data showing that the returns that different vertical integration strategies and differing extents of vertical integration led to different performances by firms. However, as a group the evidence is mixed about the ability of any diversification strategy to produce results that differ from the market in general.

The Question

This paper looks at both the shareholder returns and the risk associated with those returns to see whether or not there is a systematic advantage to related diversification. However the methodology differs from the papers before it:

- Measuring the returns to investors via the stock market using a portfolio is a methodology that moves away from the accounting measures most commonly used
- Reflects the data available to investors re current and future performance
- Allows us to view their stock performance in poor markets as well as strong markets

Further working with the results from Helfat and Teece (1987), we aim to examine whether or not the excess returns (positive or negative) are due to significant differences in β for the related diversified portfolio versus the market and then whether or not the differences are due

to significant differences in β^d of the portfolio versus the market. To the authors knowledge β^d and related diversifiers has not been studied but has important implications should the view be taken that related diversification is a method by which firms are able to minimise their risk in declining and volatile markets (by having a lower earnings volatility than other firms).

The interest in β^d is borne from the cornerstone ability of a firm to control the internal transfer price to maximise the payoff to the firm as a whole. Despite the differences in the application of this ability we would expect that as a group this ability may improve a firms responses to downturns more than it would affect the response to upturns in the demand environment.

The difference in application would reflect the central managements approach to the independence of the separate SBU i.e. The work of Hill (1988) and Hill, Hitt and Hoskisson (1992) separates diversified firms into C Form, CM form and M form firms where the headquarters has different levels of intervention with the SBU (Separate Business Units). This is of practical importance to the argument about related diversification as the level of involvement touches all three schools of thought about the implications of diversification and the extent to which one can control the firms performance by extending along the value chain.

Transfer pricing is particularly important with vertically integrated firms and this area has a large body of theoretical work done on it. However, even within a firm that is a related diversifier, there is likely to be some degree of internal transfer or private bargaining within the firm. When a downturn occurs, the ability to maintain output improves a firm's performance especially where there is a high degree of fixed costs and over capacity

involved. This is in part evidenced by the finding that companies which are formed after a vertical integration have a lower beta post merger / acquisition than one would expect from the equity weighted betas pre merger (Helfat and Teece, 1987). This problem extends past the cases of vertical integration. The Sharpe Lintner Black Capital Asset Pricing Model (CAPM) (Sharpe, 1964, Lintner, 1965, Black, 1972) is the cornerstone of financial valuations and business school finance courses. However, this model does not adequately address many situations that occur in the pricing of equity on the stock market and does not allow for a change in risk due to the change in operational characteristics of the target firm. Strategic decisions will affect the performance of a firm in good and bad market (Gourio, 2005 and Chatterjee, Lubatkin and Schulze, 1999), especially those where there is a large and widespread change i.e. diversification.

Conclusion

For various reasons firms may enter into a decision around diversification. Qualitative studies suggest that from a managerial perspective there is the wish to diversify away from asymmetric power in the supply chain and hedge against demand fluctuations. Further management will view the response of the capital markets to diversification and the potential positive effect on the firms market value through less volatile earnings. However, it is clear that in order to realise the benefits of diversification there must be a sophisticated and sensitive approach to managing the potential benefits. Fundamentally, the decision to diversify is strategic and has implication on performance and risk for the firms. Diversification allows access to uncorrelated income streams and benefits across units requiring the same key skills or insights. The ability of a firm to transfer a core competence across the diversified units is its ability to develop a competitive edge in each unit. The tradeoffs are unavoidable; higher internal costs of monitoring and coordination to avoid

market imperfections and higher levels of skill transfer to ensure skills across the units; what is not clear is the outcomes for the firms which diversify.

Literature Review

Firm Forms, Performance and Diversification

Firms possibly stand to gain from diversification through several mechanisms:

- Internal Governance
- Internal Capital Markets Resource Allocation
- Transference and building of Specialised Skills within the firm

However, there are costs associated with the diversification

- Bureaucracy costs of monitoring these decisions
- Flexibility costs when market conditions and or technologies change.

Different types of diversified firms will need different structures to realise the benefits. The benefits are also different depending on the level of relatedness of the separate business units.

Jones and Hill (1988) proposed that the benefits could be neatly categorised into

- Benefits of Integration: Allowing investment into specialised assets which may otherwise deter small investors, avoiding misallocation of resources due to information impactedness and the avoidance of complex contracts.
- Benefits of Scope: The synergies of different divisions may be difficult to trade over the free market. Porter (1987) presented the ability of a firm to use their core competencies as a key strategic advantage.
- Benefits of Internal Capital Markets: Since information impactedness and disciplining managers is a problem for the investors in a company, central management may be able to overcome both limitations and supposedly are in a position to make better decisions. This also protects the firm from irrational reactions to results.

Similarly Hill, Hitt and Hoskisson (1992) presented a paper in which they argue that for firms using the M form of governance (governance types proposed by Hill (1998) see Appendix E) there may be either cooperative or competitive governance styles. Implicit in their paper is that economies of scope would prevail for those firms which have business units which are closer in their relations to other units and these benefits would need to be actively sought. In contrast, when the diversification is unrelated, the optimal strategy would be for a strict M form governance whereby the central headquarters acts as a resource allocator and disciplines the business units formally based on objective criteria. The outcomes for the firms will depend on the extent to which the units must cooperate and cooperation is correlated to improved performance for related diversifiers. This is a strong case for the economies of scope argument and internal capital market argument using market returns, where these firms use internal mechanisms to ensure that there is the use of core competencies over several divisions through formal structures.

A central theme of all of the above papers is the coordination of the control and the alignment of the control with the SBU and the firm's overall goals. Govindarajan and Fisher (1990) explicitly study the linkage between the strategy of a business unit and a matrix of control. The cornerstone to all of the above dilemmas is the resource sharing that will benefit the firm create problems of control and these control problems are solved using different

- Organisational forms: Differing in the level of involvement in each decision by the central office
- Governance forms: Differing incentive structure and reporting requirements
- Internal Contracting forms: Differing contracts and expectations and mandating or not of internal trade.

The reason there is competition is, for example, the measurement of resource use and the costs of resource use versus the value produced by the output may be difficult to measure. This is particularly so when the product is imperfectly substitutable on the open market.

In a single line business the high level of involvement and familiarity of the business unit manager will allow good control mechanisms in almost all of the activity pools that drive the outcomes. However, the more diversified the firm the less likely that those controls are well developed for each activity as part of the 'dominant logic' of the firm (Prahalad and Bettis, 1986). The complexity arises from the different dimensions of the work that contributes to the actual and measurable outcomes i.e.

- Task programmability
- Output measurement
- Behaviour measurement

(See Appendix A Mahoney, 1992 typology and Appendix B Gulbrandsen typology).

The more clearly each of these variables can be measured, the more accurately costs and benefits can be allocated and the less efficiency loss there is between an internal transfer and the market transfer (making internal transfer more advantageous). This often is impossible for a firm especially where the decision makers are removed from the workings of the business units involved; the greater the distance the less able to decide on this they are. This conclusion follows from the logic that if a single firm had perfect information flowing to the headquarter management then incentivisation could be linked clearly to outcomes / behaviours in a manner that at times will offer superior governance (due to information impactedness) to that which the market could provide. It would also allow the firm to allocate resources to those business units where there would be assurance of the highest return per asset. Gulbrandsen (1990) explicitly deals with the question of asset specificity and closeness to core competence to predict the best type of governance for a transaction;

internal or market. However, the conclusions recommend that the market governance is superior in most cases except where there is high closeness to core competence and high asset specificity. This finding is consistent with the view that the higher assets specificity the higher the monitoring costs to avoid the problems of opportunism whilst the closer to core competence the better the firm is able to manage the new division with current skills. Gulbrandsen's typology reinforces the empirical research that we will see later in that related diversifiers should perform better as the closeness to core competence increases and allows improvements in transaction costs.

Resource Based View

Resource Based View of the firm also supports the case for related diversification as apposed to unrelated diversification. In this view a firm is thought to comprise several different competencies and strategic assets. The relationship between the competencies and the strategic assets is one of interdependence with the core competence acting as a catalyst to creating or sustaining the strategic asset (Markides and Williamson, 1994). The issue of the core competence is important here in that it combines work of Porter (1980) and Prahalad and Hamel (1990) in highlighting the role key activities and the competence that these activities arise from, to create the competitive advantage for a firm and is supported by the empirical findings of Gulbrandsen (1990). We shall later examine a time series of share price data, and the existence of a competitive advantage should allow the firm to perform better across industries. However, there is no empirical or theoretical evidence to suggest that a related diversified firm will perform better than a firm which specialises in one of the fields. With Resource Theory, we have a model which can allow our related diversified firm to perform particularly well compared with non related firms.

Consider two firms identical except for their interdivisional relatedness both run by rational managers. For the most part the firm with unrelated divisions would attempt to minimise the correlation between the income streams and so have low variability with the market. However, the related firm would pursue the same strategy only to the extent that it could use current competencies as a strategic barrier in the new industries. We may therefore expect that the volatility of earning of the unrelated diversifier be lower but the related diversifier to have higher profitability levels in line with the high levels of industry specific knowledge that it has.

Strategic assets are defined as those which are

- Difficult to imitate
- Difficult to transfer
- Non substitutable
- And key in the delivery of value to consumers

Further they are defensible due to

- Time compression diseconomies
- Asset mass efficiencies
- Asset interconnectedness
- Causal ambiguity

However a firm must harness their strategic assets in order to perform better than the constituents may otherwise perform. In order to convert these into an advantage in related diversification these assets must further

- Be functional substitutes for resources in pairs of industries
- Must be partly indivisible otherwise they could be replicated at no extra cost

- There must be a hindrance in the market for selling excess capacity of the asset within the primary firm (else they would sell the excess at market prices and incur no bureaucracy costs)
- Must be able to be improved internally

To that end the findings of Hill (1988), Gulbrandsen (1990) and Mahoney (1992) emphasise the relationships within a firm and the structures and controls that a firm has in place to ensure that the asset and or competence is shared between units. As noted, the very difficulty to transfer that characterises these assets is the issue that makes them potentially strategic. However any market advantage will be eroded and the competence that underpins the asset must continue to renew the asset and or potentially regenerate new assets. Related diversification is able to do this in several ways:

- Share Assets
- Share the competencies that create assets
- Find new competencies from businesses that are similar but not the same

However, the assets are not necessarily strategic and can become a liability if the playing rules are changed in a market space. The accumulation of strategic assets therefore provides the platform for a business which extends into related businesses to accumulate more strategic assets and use them both in the existing business and the new business. The market is an ineffective place for the transfer of these assets due to their inherent characteristics and they are difficult to replicate or imitate. Thus having an asset ready to use in a similar market prevents competitors from attaining the lead (even when well funded) and when that asset is maintained, prevents them from taking that lead.

The concept of related diversified and asset sharing though has proved difficult to test empirically. The nature of strategic assets is such that it presents difficulty in specifying the

difference between selling into related SIC codes and utilizing some core competencies in different markets, of which we may expect only the latter to provide superior returns in the long term due to the ability to accumulate these assets. The search for a methodology that might explain returns and relatedness though has led to a result in a Robins and Wiersema (1995) paper which shows some of the real complexity of the issue of strategic relatedness and the sharing and or accumulation of related strategic assets. In their paper they developed a construct for relatedness based on structural similarity modelling with the input derived from the technology transfer into and out of an SIC code. This provides a manner to truly establish how related the code is. The more telling addition to methodology was the summing of the weighted average of all the combinations of every SIC code within which the firm operates. Silverman (1999) showed that the patents that a firm has will predict the next industry it enters (the more related the more likely) and firms enter industries with similar R&D and advertising structures to their own; clearly a case of firms entering industries where they are most likely to outperform. Further the patent advantage related to the performance of the firm in the new industry. The Silverman and Robins and Wiersema measures of the extent to which business units were similar were more effective than the Jacquemin and Berry (1979) and the concentric measure of Caves et al (1980). The implication of this methodology is that when a more accurate measure of SIC relatedness, and then the strength of the matrix that a firm constructs, is used we can better explore the potential benefits a firm can exploit that are not available to other firms in that market. This study strongly shows that where a firm operates in many distinct but related firms there is a performance advantage (measured by ROA) and that this must be due, (since the coefficients were weak for the other two measures) not to simple size or marketing savings, but to the extent to which a firm offers each business unit insights into potentially strategic asset building competencies. This also provides some insight into the reason that unrelated diversifiers do not appear to ever

realise these benefits; there are no competencies that are sufficiently transferable to allow supernormal performance.

Jones and Hill (1988) offer a variety of reasons why some of the different diversification strategies may affect returns in different ways. Jones and Hill (1988) offer some economies that relate to the method of diversification (see Appendix C):

Internal Capital Markets: Pooled interdependence

Economies of integration: Pooled interdependence and sequential interdependence

Economies of Scope.: Pooled, sequential and reciprocal interdependence

However different diversifiers will have access to different economies and the economies will have different bureaucratic costs associated with them. Fundamentally the increased levels of interdependence will offer both opportunities for economies together with the necessary monitoring costs for running these economies. Firms at different points of relatedness scale will experience total benefits and costs depending on their competencies and level of interrelatedness of their divisions. Clearly for internal capital markets to function as an advantage to the firm, the firm size and options need be very large which occurs when unrelated diversification occurs. The Internal Capital Market would only be of benefit to a firm when there is sufficient information asymmetry in favour of the firm to make an internal investment, from the small list of business units available to the firm, better than an equivalent investment in a pure play firm openly traded. However, related diversification will show benefit earlier due to the ability to transfer skills and competencies as evidenced by Robins and Wiersema (1995) with their technological measure, Silverman (1999) with his patent relatedness measure which points to the need for linkages to extract performance. Klein and Lien (2006) showed that survivorship (the probability of new business survival) in new businesses and the decision to enter was significantly determined by the relatedness of the new business to the existing but even more significantly to the level of interrelations for

all the businesses in a firm. However, as the levels of related diversification become higher, the complexity and therefore costs increase exponentially limiting the extra abnormal profit. This relates back to the theoretical work of Prahalad and Hamel (1990) where they describe the 'dominant logic' of a firm being crucial in maintaining an advantage and it would serve here to limit the bureaucratic costs since the processes are well understood. In contrast when economies of integration or capital markets are sought, the costs rise less quickly, so here the more unrelated does not lead to a loss in net performance (see Appendix D).

Conclusion

Relatedness of firm divisions and the ability to transfer competencies that represent strategic assets are positively correlated to the performance of the unit of the firm. This conclusion has been proved and follows clearly from the theory of the core competence whereby it is difficult to imitate or trade. When a firm enters into a new business the ability to diversify some risk can be achieved simultaneously with the ability to transfer the core competencies that gave the original business its head start. Roll (1986) raises the hubris hypothesis about the real ability of a firm to transfer assets and advantages. Despite this warning, the evidence suggests that on average it will show improved performance.

Industrial Organisation and Diversification

Introduction

The industrial organisation school is concerned primarily with the impact of organisational forms and the levels of competition within an industry. Specifically attention is given to the levels of output and the prices of the output and the subsequent profit of the constituent firms. This branch of research drives many of the legal implication that limit the extent to which

firms are allowed to diversify and the extent to which they may extend their market power. Industrial organisation was given a major boost by Porter (1980) in the famous 5 forces model of organisational profitability. Further evidence was popularised in the PIMS study (Schoeffler, Buzzell and Heany, 1974) whereby a firm's market share showed a linear relationship with its profitability. Although studies such as the PIMS study have been scrutinised and found to be conditional in many respects, theory and empirical evidence do agree that there are opportunities that a firm has, when it is a monopoly or part of an oligopoly, which may not favour the consumer, and may allow it to establish a long term position with super profits. Even along a vertical chain, these opportunities may arise by the vertically integrated competitor being able to foreclose the downstream market and avoid a truly competitive market.

Further research has been along the lines of the factors within an industry which would push a firm to diversify, vertically integrate or pursue a strategy in between. Clearly the response would be in the firm's best interests and so the study of these factors may provide us with indications of the benefits that the majority of business leader, **independently** compute for their businesses.

Uncertainty and Diversification

Uncertainty plays a major role in the business decisions especially about the final business form. Beginning with Chandler (1962) organisational form will follow the pressures of the external environment and the internal goals of the firm. Uncertainty has tremendous impact on form, and this is shown in the organisational forms that are found in non first world countries where governance and uncertainty is high (Nelson, 1990).

Although we will not attempt to review the uncertainty literature, a brief outline will follow.

Milliken (1987) classified uncertainty within the environment into three areas:

- State uncertainty (some elements of the current environment unknown)
- Effect uncertainty (elements of the cause / effect relationship unknown)
- Response uncertainty (countermoves by competitors unknown).

Further when an organisation deals with the uncertainty these areas of Milliken would form part of what Williamson (1985, 1989) termed external uncertainty to which he added internal uncertainty (uncertainty about the other divisions or internal actors actions and motivations) and strategic uncertainty (uncertainty about the organisational goals). Diversification may provide a way to reduce some of these uncertainties, and or reduce their impact on the business performance long term.

Related diversification and more directly, vertical integration may provide ways for a firm to hedge uncertainty and in some senses bring uncertainty in from the external to internal forms which may be more effectively dealt with by the firm. This issue about the cost trade off will be dealt with in more detail further on in the paper. However, by internalising much of this complexity and ambiguity a firm may be able to outperform its competitors. Krickx (2000), in a qualitative study, found that uncertainty in general measure is positively correlated with the decision to vertically integrate, however more specific tests of the type of uncertainty e.g. volatility or demand variability were not correlated significantly. This finding was similar to a study by Lieberman (1991) who also did not find a correlation of vertical integration and downstream demand variability but did find a relation between the perceived upstream volatility and vertical integration. Further, technological uncertainty was negatively correlated with vertical integration. This shows that a firm will internalise those elements of uncertainty that will be reduced internally. Technological change, in a non incremental fashion, cannot be slowed through the internalisation of a business unit, indeed this will

probably put a business at risk (and this area specifically forms the basis of the strategic school of thought on vertical integration). Lieberman (1991) gives further support to the control over transfer pricing in his paper. In this empirical study he found that the variability of supply, overall importance of the input and the total sunk costs associated with the firm (fixed cost level) were significantly associated with the decision to integrate. Sutcliffe and Zaheer (1998), in a qualitative paper, showed that the main drives for vertical integration as described by the managers who underwent the process was the supplier uncertainty. In their study uncertainty was divided into

- Primary: The state in which the firm operates
- Supplier Uncertainty: Investment exploitation and supply level and price (Carlton, 1979)
- Competitive: Response to firms actions by competitors.

Only supplier uncertainty was significant in driving managers to vertically integrate; and this result has implications for the Transactions Costs Economics School of theory since it relates to the ability of a firm to regulate the agreements it makes with upstream or downstream partners but refutes the ability of integration for hedging competitive or primary uncertainty; a finding in line with our arguments here.

Further work has been done in both a theoretical and empirical test of vertical integration and the motivation to internalise the relationship. A simple model of integration and its costs and benefits (Balakrishnan and Wernerfelt, 1986) predicted that the motivation to vertically integrate is positively related to market share (a prediction we will explore in more detail later), negatively related to technical change and negatively related to bureaucratic costs. This is in line with the finding of Krickx (2000) in that higher levels of complexity will not lead to vertical integration probably due to the higher costs of internalising and enforcing these transactions. Technical change was elegantly modelled here as a Poisson distribution of

time to asset value being nil following the argument that the more specific an asset the less its alternative use value therefore the value of vertical integration to hedge technical change is negative. Balakrishnan and Wernerfelt's (1986) findings taken together with the findings of Thomadakis (1980), whereby market power protects a firm against demand uncertainty, we find support for the concept that supplier uncertainty and market foreclosure may be stronger motives to integrate than demand uncertainty. Markides and Williamson (1996) attempted to test the different mechanisms of control and check to see which of the organisational structures produced better returns at which stages. Their study contradicts many of the other studies in that they found that there was no improvement for those firms adopting a C or M form²; indeed the mixed form of governance was significantly superior to other forms of governance. This extended across different organisational types including the related diversified firms. Indeed, the CM form produces inferior results when used in a related firm compared with the CM form in unrelated firms. In this paper we expect to find that the management of relatedness benefits, which can only come about through C or CM form governance will be crucial to realising these benefits and M form firms we do not expect to be able to realise them at the same rate as the others. Reconciling this finding to the concept of resource interrelatedness and sharing is possible when the methodologies used are considered. Essentially the conclusion from the Markides and Williamson (1996) study are that no single governance type is appropriate for all firms, a finding originally by Hill (1988), and that a cross section not controlling for relatedness will find mixed results owing to the mix of unrelated and related diversifiers.

However, when viewed as a series of investment decisions, a firm will be concerned as well with its position in a competitive market to shift the balance of investment incentives ex ante.

² *See Appendix E.

M form governance is arms length governance of the business units by a central unit relying on financial report. C form governance is high levels of involvement of the central office in business unit decisions and more detailed operational reporting

Aghion et al (2006) showed the U shaped relationship between vertical integration and competition through mathematical modelling and some empirical evidence on the UK market. Part of the conclusion of his study was that with the high levels of competition, there is a disincentive to tie a firm to a single supply chain as the upstream supplier market is likely to be as competitive as is the downstream. Further, as shown above, in high levels of competition, technological uncertainty, driven by the competition, is a disincentive to integrate. Similarly when there is very low levels of competition, there is little drive by firms since they have significant power.

Chatterjee, Lubatkin and Schoenecker (1992) also showed that the reduction in beta of firms in vertical integration is lower when they have a higher concentration ratio in their industry which was used as a proxy for market power in their study. In line with this, Schmalensee (1985) and later Wernerfelt and Montgomery (1988) find that a firm's performance is primarily affected by its industry, then its diversification status then its market power. So when Chatterjee, Lubatkin and Schoenecker (1992) and Subramanyan Thomadakis (1980) ignore the industry returns we understand why they showed that if a firm is in a highly concentrated industry its returns will be strongly linked to that industry and why Thomadakis found that firm power should remove variability but still firm variability in returns was high; industries determine results more than firm structure. It is the very impact of industries on returns that causes firms to seek unrelated diversification but the lack of core competence reduces their returns just so (Wernerfelt and Montgomery, 1988) as does the usually lower levels of market power that the diversified firms have over the specialized firms (the last finding was similar to one found by Campa and Kedia, 2002).

We now should ask what is the effect of a related diversifier on the industry which it occupies in terms of the market power it may gain, and the profitability of the industry as a whole.

Since this area is of regulatory importance many of the extreme distortions have been removed. Further, the reduction in competitive barriers to allow horizontal competition and the relative transparency of the shareholder system will negatively affect the ability of a firm to distort their market. However, a brief overview shall be done here.

The central issue is that a vertically integrated firm is able to set and sustain a transfer price below what the market would allow and thus close the ability of a market to support competitors i.e. foreclosure. However, this would lead to poor overall performance of the group of companies and therefore could only be a short term position. However, in a competitive market the existence of rents (i.e. above average profits uncontested) would provide a constant stream of entrants so this position would need to be constantly maintained. Nevertheless, Buehler and Schmutzler (2006) provide a model that allows for asymmetrical vertical integration to exist in a non degenerate equilibrium outcome i.e. sustainably. Further those firms that do vertically integrate may reduce competitor investment by reducing the return on competitor investment whilst simultaneously increasing their own marginal return on investment a position known as strategic substitute, an effect which may be made stronger by the trend of the firm with higher investment to realise a higher efficiency level internally. Leahy and Montagnue (2006) also support this view in their model when they note that outsourcing will lead to a drop in the level of endogenous investment in both the outsourcing firm and the vertically integrated firm. As a market reduces the costs of integration this position of asymmetric vertical integration actually performs better than a fully vertically integrated market would for any market size.

Market power and vertical integration should not be completely related since a firm in a monopoly situation is able to limit their upstream or downstream dealings to replicate their monopoly and so extract rents. However, the firm cannot do this without facing holdup

problems from the small numbers bargaining and so must increase the number of firms it deals with potentially increasing output and therefore dropping prices away from the monopolist ideal. Vertical integration (or internalising the uncertainty and controls) will mitigate this problem but cannot sustain the arrangement when there are entrants at any level, as the incentive to leave the vertical integrated state increases constantly. De Fontenay and Gans (2005) show the effects of competition on the incentive to vertically integrate and the extent to which market power may be changed by a firm supporting the above statements. This network view of competition is also studied by Corbett and Karmarkar (2001) who show that although the vertically integrated competitors may be more profitable, especially in higher fixed cost situations, any given market may have a limit of support for the number of firms. This is the perfect example of vertically integrated (VI) firms being able to foreclose a market as there is a limit of VI firms that can be supported. However, a firm can never close all other firms out and as market size increases the lattice representation of a market will support more members and thus we will see a result similar to the asymmetric vertical integration that we saw in Buehler and Schmalzter (2006) paper. This is not bad, however, for the consumer as the VI case, in order to sustain itself, will lead to lower profits and higher quantities than if there were fewer firms.

The final question that we will address is the impact of the growth of a market on the firms and their decision to integrate. As a market grows, Stigler (1951) argues that vertical integration is a feature of a declining market due to the fact that the division of labour is limited by the size of the market. In much the same way a maturing market features increased concentration levels of firms however, vertical integration or related diversification in a declining market is unusual in empirical studies. Campa and Kedia (2002) show evidence that much of the poor performance of diversified firms (no relatedness considered) is due to the presence of a unit in a poorly performing industry. Rational managers would

surely exit rather than increase their investment. Indeed, we feel that internalisation of transactions is likely to increase in popularity as soon as the marginal revenue (MR) increases so that the higher level of investments that are incurred by integrated firms (D'Aveni and Ravenscroft, 1994) are covered. Further when there is high levels of specialisation by other firms in the market internalisation of transactions and business units becomes increasingly difficult to extract value from since the need to focus on core competencies may become increasingly difficult as complexity and coordination requirements increase. This is borne out by the work of Dufeue (1999) whose model shows that the number and proportion of vertically integrated firms to the total market will increase in the following conditions:

- Increase in demand (with a declining elasticity)
- Decline in the number of firms in the market (linking to decreased specialisation)
- Increasing number of consumers (size of the market)

although he notes that the competitor firm effect dominates i.e. when there are more firms in a market the number of vertically integrated firms drops and this effect is stronger than the consumer effect (and provides support for Aghion et al, 2006: U shaped relationship between competition and vertical integration). We would expect this change in dynamic as the downstream firm is exposed to continuously higher competition and the upstream firms continue to increase in number, the scope for effective internal monitoring and pricing becomes slimmer and so we expect more firms.

The issue of transfer pricing and the efficient price level is interrelated to the other sections in this paper specifically:

Industry structure: Has a major impact on the ability of a firm to profit from the transactions in its market

Channel Structure: Impacts the ability of a firm to push the price changes down to the customer

Asset specificity: Influences the ability of the other firms in the value chain from holdup on the firm of interest

Monitoring of the outputs is difficult with more specific assets as discussed above and can lead to incorrect transfer pricing decision.

Therefore, we will explore the issue of the appropriate transfer price and its implications and sensitivities to the above factors and attempt to identify the areas where a related diversifier and more particularly a vertically integrated firm stands to gain from it.

Economics of the Integration Decision

A Cournot equilibrium is the equilibrium that exists when more than 1 firm decides in an iterative process on their end outputs. It is a form of quantity based competition where the volumes are maximized. The more firms in a market, the closer the Cournot equilibrium will come to a perfectly competitive equilibrium. However, Cournot equilibrium may not be that unusual especially in upstream, non retailing market where the fixed costs are high, entry barriers are substantial and the overhead absorption is maximized through high volume runs. Cournot equilibrium will then allow a firm to price above the marginal costs to their downstream retailers.

However, a retailer will often exist in a Bertrand equilibrium. This condition exists where there is price competition between the firms in a market and will lead to the pricing of output goods at their marginal costs.

If we were to allow a retailer to integrate backwards, we would expect that the eventual firm would offer higher volumes to the retail market and intensify competition. Similar results would occur if upstream firms were to integrate forward into retailing. They would increase their output under the normal conditions of transfer pricing. However the integrated firm

now has a dedicated demand on it by the downstream segment and will use only the residual capacity to supply the market which would allow the upstream Cournot equilibrium quantities to reduce and the price upstream to increase. Now we may have a situation where the transfer price internally is lower than what is available on the open market which is a condition which is similar to what happens when a firm has significant monopoly power outside its market internally. Lin (1988) supports this view within an oligopoly situation whereby his model shows that vertical disintegration

Lowers end product competition

Reduces the end price volume fluctuation in response to upstream effects

Increases the system profit.

Similarly we would expect that disintermediation would lead to decrease in intrafirm volumes and therefore an increase in upstream pricing which is what Leahy and Montagna (2006) found as well as a decline in the total output of the firm.

This outcome has further implications for the regulatory environment. Specifically the entrance of a firm into a vertical agreement will lead to increase competition in the downstream market. However, another implication is the reduction in retailer margin both within and outside of the integrated firm. When intrabrand and interbrand rivalry is severe we are likely to see that there is incentive for a market player to integrate to exploit some of the efficiencies of central pricing control (Dobson and Waterson, 1996) to decrease downstream competition.

The importance of this set of outcomes will be elaborated further with reference to some complex studies in economics, however, at this stage we can already see the advantages for a firm in terms of the earning risk reduction and insulation from demand uncertainty. We note here that demand uncertainty was not found in Lieberman (1991) studies to be a significant

ex ante managerial concern when the decision to integrate is taken, however it may explain some of the reduction in beta that we consider.

Now consider two firms, one integrated, the other not integrated but subject to the market competition in the manner we suggested above. The introduction of an integrated firm will increase the competition as the integrated firm has the option of pricing the transfer goods at the net marginal revenue figure which is lower than the marginal cost of the goods. Guyo and Dong (2005) show in a theoretical paper that the introduction of first mover vertical integrator will increase the competition in the downstream market but that the competitors will not necessarily counter integrate. Their argument goes as follows, the ability to form exclusive dealing contracts will allow a firm better ability to penetrate the market although the transfer pricing will be higher than the integrated firm.

If demand in the retail market falls significantly the retailing firm drops output / sales in accordance with the Bertrand equilibrium it faces. The demand from the upstream firm drops accordingly. If demand in the retail market falls in the integrated firm, the transfer price is adjusted until the Net Marginal Revenue equals the transfer price which, when compared with the market price, by necessity, means that the transfer price will fluctuate more widely as to compensate for the volume of the firm and in so doing stabilize profits.

Transfer Pricing: Vertically Related Firms Will Be A Subset Of Our Related Sample

A key advantage of the diversified firm when there are related segments within a vertical integration chain is the ability to control the transfer price. When there is a downturn in for the final product of the firm, the firm profit level can be buffered by the ability to flex the

transfer pricing in such a way that makes the profit level maximal for the entire firm; an option not available to most market participants. However, as explored above the setting of the transfer price is subject to many difficulties in its own right including:

Information impactedness

Asset specificity

Market distance

Quality observability

The impact of organizational form on the ability to effectively price the good for transfer may depend on the organizational structure itself and its ability to overcome these difficulties. Tirole and Holmstrom (1991) explored this issue by considering firm classifications along the line of Hill (1988) i.e. C and M form versus integrated firms. Their predictions fit some intuitive arguments; vertical integration under the separate business unit form strictly dominates the non integrated case when the marketing costs are high. However, the tightly controlled C forms which set internal transfers may be superior when the cost functions of the input are sufficiently high due to the sunk costs in bad decisions. Interestingly, quality of the products may be higher than that which could have been achieved by external trade but not when that internal trade is mandated. Wagenhofer (1994) follows a similar line and supports the work of the transaction cost theorists by considering the effect of the costs of information on the best way to set transfer price. When there is full communication then a cost plus scenario, largely in line with classical economics, is the best and negotiated outcomes, due to the information asymmetry, are usually weakly inferior. However, when there is no communication between divisions then they must, in a single iteration / single bargaining session, attempt to get the appropriate price bargaining is always superior to cost plus (since there is no verification and internal exploitation through accounting manipulation may occur).

In conclusion, the issue of transfer pricing is one that affects the market structures, the competition levels between firms at all levels and the margins that the firms can extract from their respective arenas. Transfer pricing also changes the way in which a firm is able to respond to shifts in its market demand in that these integrated firms are more likely to show higher levels of both quantity and end price change than separated firms and so may be more able to defend their profits., Conversely this would imply some stickiness on the upside when potential profits were higher for separated firms. This is the case as shown above when

Conclusion

Any firm increasing its market power stands to gain from the ability to move fluctuations in the demand / supply and therefore price to either the consumer or the supplier. However, these are not in themselves sustainable positions. In a competitive market the ability for other firms to enter is ever present and provides the best measure of defence against the exploitation of firms of their market power. Internalisation of transactions to improve a firms power are a good method of achieving this. However, the reality is that it is extremely difficult for a firm to maintain efficiency when there is no clear mechanism to challenge the internal pricing of goods. This bureaucratic challenge to manage the internal transactions and competence sharing) is the strongest barrier to internalisation of transfers. As Schmalensee (1985) pointed out, there is a declining marginal return to further investments by management as their ability to effectively manage the core abilities in each segment diminishes. Further, to perform in any industry, the rate of management talent expansion is slower than the potential acquisition rate of new businesses so the acquiring or entering firm will eventually find itself competing with little or no advantage in successive ventures until it can develop competencies to share in those new businesses. Lastly, as Williamson (1975) pointed out, there is a fundamental inefficiency in firms greater than some size which will prevent the extension of the firm indefinitely, and that limit is control, expertise and intrafirm business.

Transaction Cost Economics

Competition and related diversification is a complex subject. The transaction cost economics school proposes that the more competition in a market the less problems that will exist through

- a) Small numbers bargaining and therefore ex ante exploitation
- b) Ex poste holdup through specialised investment

The pioneer in this field was Williamson in 1975 with a book which compared the efficiency of markets versus hierarchies in mediating efficient transactions. With further extensions by Klein, Crawford and Alchain (1978) we can look at the problems that market based transactions may present and the implications thereof. There are 6 main problematic areas in a market from an individual firm standpoint:

- a) Bounded Rationality
- b) Information impactedness
- c) Small numbers
- d) Asset specificity
- e) Uncertainty and complexity

Leading to the outcome that there may be opportunism in the market and that internalisation is a possible solution. Williamson (1975) was concerned that even an ex ante equal bargaining situation would be distorted long term due to differences in the rate of change of demand, asset specificity and small numbers bargaining which could allow previous partners the opportunity to take advantage of their position ex poste. His solution is that in some situations, there should be a hierarchy to take control of these decisions. However, by its nature, the market is an efficient pricing mechanism whereas when those decisions are internalised there are significant hurdles to proper, timeous pricing. Nevertheless this type of

security thinking does drive some of the decisions that lead to related diversification and vertical integration (Lieberman, 1991) particularly on the securing of supply.

The origin of the bureaucratic costs extends further to include the pricing of internal goods and services. The free market provides a good mechanism of rewarding the outputs for activities and relies on the market participants to judge value. In a hierarchy, this is avoided and pricing distorted to maximise the firms profit and long term sustainability. The importance of transaction cost analysis increases when

- There are frequent transactions
- In an environment of sufficient complexity to overwhelm bounded rationality
- By potentially opportunistic agents

And is further exacerbated by (Williamson, 1985 and Mahoney, 1992) small numbers bargaining involving specific assets. Therefore we need a system to provide rewards for output as well as coordination. The transaction environment has now been internalised analysis of how to price is crucial because the market could ordinarily do this effectively (although in conditions above, leave the firm open to ex poste exploitation). Mahoney (1992) identifies three crucial components of tasks;

- Their programmability
- Their separability
- Their specificity

This then became a typology to determine whether they could be successfully brought into a firm (Appendix A). A hierarchy is the optimal form when there is high specificity, and high non separability (i.e. observing output is a poor measure for making rewards) with the alternative relational contract for those conditions where the market offers lower switching costs by way of smaller specificity. This conclusion is similar to that of Gulbrandsen (1990), however in his paper, the closeness to core competence is examined together with the asset

specificity. Again when a firm has an option of high specificity with high closeness to their core competences then internalising the transactions has the highest probability of maximising the returns from those transactions. Closeness will minimise the transaction and process costs that occur and in what was termed 'internal costs to management' by Levy (1985) the larger the firm and less closely related the less likely the decision to integrate will be taken (as Levy puts it 'there is a finite amount of management capability which will be spread over the resulting firm'). This observation is important in that it suggests that a firm cannot simply hire more expertise; as we discussed in the resource theory section core competencies are often embedded in firms i.e they are not simply a collection of managers therefore any new hire will still need to learn the key competencies. Core competencies are also not quickly transferred or they would be distributed throughout the market rapidly, so when a new manager is recruited the process will take a long time therefore we have a limit to the rate of expansion of core competencies. Thus the optimal governance form is related to the competence format; a finding which fits well with the previous section on the resource based view of the firm.

The Role of Relational Contracts in Transaction Cost Analysis

Relational contracts exist both within and between firms i.e. within diversifiers as well as firms with a long term supply arrangement. As opposed to a formal contract, relational contracts allow expectations to be present about issues that can only be observed ex post and would be prohibitively expensive to specify ex ante. Baker, Gibbons and Murphy (2001) show in their paper, that bringing the market processes into a firm changes the temptation to renege (reduce it in a positive way for the firm) but may also improve the optimal outputs since resources are not wasted improving bargaining positions by the business units. This model relates to the manner in which firms trade; if they are allowed to the optimal product for a business unit would be one that offered good price in the external market even when this

would mean that the product could have been improved, at the same cost, to maximise its performance internally. The reason a manager may do this is simply to improve their bargaining position. However, a manager may wish to invest in a product, at the expense of their alternate use, if there is a future income stream expected; hence the formation of relational contracts and their importance. A firm could go further and mandate the price directly, however, as we have explored above, this method of control is weakly inferior to others when there is reasonable information available to the firm members (Wagenhofer, 1994). Again here we need to stress that this is possible only to the extent the central part of a firm can control these intra firm contracts (see above). The Baker, Gibbons and Murphy model points to some characteristics both of markets and firms in that as the discount rate increases, a firm's optimal choice should move toward spot contracts (not relational since the value of the relationship and the frequency of transaction is no longer a major consideration). Further the higher the alternative use of the goods as apposed to the first best use the more likely a firm will find the optimal level exists within integration. This is further support for Carlton (1979) where he points out that variations in supply are a key driver of the decision to vertically integrate. The reneging temptation is lowered by the integration and so even when there are sharp movements in the market the relational contract will survive. As the alternate use value increase the temptation to engage in ex post exploitation increases and the existence of internally mandate prices or relational contracts mitigates some of this effect. Empirical evidence for this position is also found in Sutcliffe and Zaheer (1998) where they examine the effect of supplier uncertainty on the decision to integrate and found a positive correlation. Integration also reduces the temptation of business unit managers to attempt to improve their bargaining situation by improving the alternate use of their output at the detriment of their primary use by affecting the manner in which the managers are incentivised and how the costs are allocated (Holmstrom and Tirole, 1991). Specifically when there are quality costs and search costs M forms strictly dominate non integration as does quality,

however CM form only dominates C form when the costs of the units grow according to quartenary function.

D'Aveni and Ravenscraft (1994) specifically examine the question of increasing costs in a business where the decisions are centralised and the firm is integrated. Their findings are in line with the expectations above. Specifically the selling and general administrative costs increase. However, there is some cost savings by reducing the advertising and R and D expenditure. The advertising and R&D expenditure reductions are also quoted by Levy (1985) as reasons that firms integrate. These costs are unique in that they may be replicated by two firms in the same value chain in a market due to information imperfections. Internalising the market place removes this and reduces the R&D spend as the cost commitment is borne by both the upstream and downstream business units.

Conclusion

The key role of the internalisation of the market transaction has a large amount of theoretical work attached to it. Intuitively, the ability to ensure that there is no exploitation within the firm of one business segment by another is a key stumbling block. The market for many firms is not perfect and so they may be exposed to exploitation but the ability to offset the gains from diversification with the losses from the bureaucracy of controlling the internal transactions may prove too big. The M form (separate units reporting mainly on financial results) is the easiest but as we saw above the key to improved performance is the relatedness and this requires that a firm coordinates. Different diversification strategies will need different forms to control the internal transactions, however, there is a point at which our related diversifiers should be able to outperform despite the increased requirements bureaucratically that they face.

Empirical Research on Performance of Diversified Firms

The question that the literature review has thus far led to is:

Do these related diversifiers perform better than the market

Do these related diversifiers show different risk characteristics to the market.

Reasons for Diversification

Unrelated diversification allows firms to access:

Better internal capital markets i.e. the extra option of allocating funds internally to business units which may be at an advantageous part of the business cycle to use the funds for maximal return. Fewer options should lead to dividends but often capital is inappropriately given to units beyond its marginal cost.

Tax advantages of uncorrelated income streams (Majd and Myers, 1987)

Avoid some aspects of information impactedness i.e. the inability of outsiders to know some information that is available to firm or even industry insiders

Our hypothesis is that relatedness will offer extra benefits in addition to the above. The resource view of the firm offers some insight into the reasoning behind related diversification for any given firm. Any core resource should have limited application, limited ability to transfer to another firm and be subject to improvements within a firm that continues to extend the advantage that the core resource provides. However, this uniqueness is the basis of the open market transaction difficulties which encourage internalization of diversity rather than contracting or outsourcing.

Therefore there are a number of motivators for any firm to enter into vertical contracts or related diversification:

Strategic: Resource accumulation

Transactional Cost: Reduction in non profitable product decisions and reduction in ex poste and ex ante exploitation through the market

Market Performance due to the differential investor preference and pricing of beta and downside beta

Industrial organizational: Due to the ability to affect the competitive landscape

Transfer pricing: The ability to change the incentives, quality, competition and vary the relation between profit and market demand variability.

Economies of Scope and Scale

Evidence supporting the incentive that common R&D provides is given by Silverman (1999). He found, using a methodology that linked SIC segments to patents, that relatedness does drive diversification. More specifically diversification is related to the number of applicable patents in that industry and a firm is significantly more likely to diversify into a field where the advantage is bigger than the other opportunities that the firm has. Further, in a quantitative extension of the paper the conceptual characteristics of a core competence (that it is built upon by a firm successively and is unique to the firm) are tested and it was found that the level of learning with a resource and the level of secrecy required are positively related to the decision to keep the technology and diversification inhouse (as apposed to contracting it out). Miller (2004), in support of the self selection argument for diversification, found that diversifiers are more likely to have broader patent portfolios prior to the act of diversification, and fewer patents overall. This is especially true of those firms which acquire the diversified segment. However, firms are still more likely to diversify into industries which share common levels of R&D and marketing spends because this allows the management to transfer core skills and competencies.

The decision by firms to diversify may follow from their historical performance, particularly exposure to declining industries or surplus cash and this concept was supported Campa and Kedia (2002) who show that firms which diversify are likely to be lower value firms before the event of diversification but higher value firms than those that choose to exit the industry i.e. diversifying firms may wish to strategically retain exposure to a market whilst having the means to sustain some short term poor performance. Similarly Campa and Kedia (2002) found that the reason to refocus may be a significant external shock in the original industry that the firm wants to diversify away from. So those firms who remain diversified will find that that external shock reflects in their results, not due to the diversification but due to the industry. Christensen and Montgomery (1981) also find a strong industry effect for diversification whereby they did not find differences in performance for Rumelt's groups but did note that in poorly performing industries unrelated diversification was a more common choice than related diversification and vice versa. This finding shows that diversification and the decisions and performance thereof are reactions to the market place in which a firm operates.

Diversification and Discount

There are several papers which support a diversification discount using varying methodologies. The most common methodology to investigate the discount is the categorization of a firm into either single segment or multisegment. The binary classification will discard much of the important detail about relatedness that the preceding literature review has built up. The results of diversified groups will therefore be affected by the extent to which the underlying population is related or unrelated. The results, often showing poor performance of the diversifiers, may be due to a predominance of unrelated diversification in these groups.

Berger and Ofek (1995) show that multisegment firms trade at a discount to single segment firms when measured by any of the standard multiples (Price to Earnings, Price to Sales). Further the profitability of the firms and ROA (Return on Assets) drops when they are multisegment. Crucially, in this study, when the diversification was in the same 2 digit SIC code* (as apposed to 4 digit code) then these market discounts and poor accounting performance were insignificant implying that there would be subcategories of performance in the multisegment firms. Lang and Stulz (1994) find similarly that diversified firms have a lower Tobins Q (ratio of market value of equity plus book value debt to total book value assets) than pure play firms (single segment focused firms). Again the trend is that the more segments the more the discount. In contrast to these studies, Villalonga (2004, 2004) using different databases and methodologies concludes that the discount preceding the diversification is a better predictor of the post diversification discount than the act of diversification.

Firms characteristics are one group of reasons, however there is another based in the agency problem. Denis et al (1997) finds that diversification is negatively related to ³managerial equity ownership or the presence of large institutional or other parties. In a quantitative and qualitative study they found that often external threats and financial distress contribute to the decision to diversify. The management of the diversification process will also depend on the decision on financing taken by the firm managers specifically Kochhar and Hitt (1998) find that internal diversification is financed through equity more than when the diversification is through acquisition.

³ * SIC codes are 4 digits where the first digit represents the greater sector, the second digit the greater industry, the third digit the sub industry and the fourth digit the specific part of the industry

Diversification and Performance

Selling general and administrative expenses and Research and development are the prime candidates for operational savings. D Aveni and Ravenscroft (1994) show that there are significant savings due to media, selling and general expenses through firms that vertically integrate but these savings are reduced when there is diversification. Overall their findings do show improved profitability. Bettis (1981) found that there was significant R&D savings in related diversified firms (which supports our reasoning about the accumulation of strategic assets and reasoning that related diversifiers would do better).

Rumelt (1974 and 1982) was one of the first to investigate the relationship between diversification and profitability. He found that related constrained and dominant type businesses offered the highest level of return surpassing their expected returns (as defined by the industry returns ex poste). The work of Palepu (1985) using a different measure weakly supports this, but more significantly shows that higher levels of diversification produce lower levels of profitability. Bettis (1981) also found that Related Diversifiers are linked to higher ROA than Unrelated Diversifiers. Robins and Wiersema (1995) similarly found that resource relatedness (as measured by technological transfer similarity) was significantly and independently linked to profitability in related diversified firms. Their methodology was distinct and provided a nearly continuous measure for relatedness rather than the discrete Rumelt categories. However, Jammine and Grant (1988) did not find any positive relation between related diversification and performance indeed their relations were negative if significant. Their study concludes that dominant strategies i.e. whether a business derives >70% of its revenue from a single source is significantly related to underperformance and that unrelated diversification offers superior performance to a firm.

Following the Schmalensee (1985) paper in which business segment results were affected by

Industry effects

Mildly by market share effect

but not by firm effects

Wernerfelt and Montgomery (1988) investigate the effect of focus on performance. They found that focus (as measured by the Caves, Porter and Spence, 1980 concentric methodology) was second to industry effects but ahead of market share effects. Markides (1995) examined the ex poste performance of firms which had undergone restructuring with the outcome of reduction in diversification level. He found that when a firm is amongst the most diversified in its cohort, restructuring to remove those elements that are not core will lead to an improvement in ROS, ROE and ROA.

In a paper with similar implications Pandya and Rao (1998) found that within the best performers category the undiversified firms outperformed however in the worst performance category the diversified firms outperformed. The implication being that being focused in a good industry is superior since diversification will introduce an element of non correlated income streams. As Robins and Wiersema (1995), Palich et al (2000) in a meta analysis attempts to draw out the relation of diversification to performance. Although the meta analysis techniques are difficult due to the difference in measures and methodologies, they propose a curvilinear relation between diversification and performance which is in line with our literature review above.

Diversification and Risk

Risk has been examined by several authors. Lubatkin and Rogers (1989) neatly showed that there is a significant difference in the betas between groups of firms with the related diversifiers having a beta which falls below one in most subperiod. Further, despite the lower beta the firms within this group were more likely to create value than the rest of the market. Performance and volatility in diversification are an area which need to be viewed

simultaneously. Opler and Schmidt (1994) find that in downturns leverage is a significant contributor to the decline in the market value of a firm's equity and this effect is more pronounced when a firm is single segment focused or in a concentrated industry.

Montgomery and Singh (1984) found that unrelated diversifiers have a significantly higher beta than related diversifiers (related diversifiers like vertical integrators stick to one area of business). Likewise Joehnk and Nielsen (1974), also showed that conglomerate mergers are associated with a higher beta. This paper seems to go against the theoretical work of Levy and Sarnat (1970) which suggests that unrelated diversifiers may have economies of internal capital market. A potential answer to this question is the manner in which these firms go about their diversification and leverage their results. Unrelated diversifiers, having a smaller core competence in each firm, often use more debt and are more sensitive to the growth of an industry than the related diversifiers whose competence allows them differentiation and some degree of protection from the industry's behaviour.

Reasons for Poor Performance

Over diversification may be a common problem in the market and leads to poor performance due to

A limited span of control by the manager

Increased shirking by employees

Systematic overinvestment in diversification is possible due to the propensity to retain dividends and with a limited investment pool to obtain poor reinvestment results. This is often due to decisions to support market share or failing business units.

Poor signaling in the stock market where rewards were given to firms for diversification.

Investors may reward diversification or penalize it although at any point in time they tend to

do one or the other. Investor confidence may also be affected by stable returns and hence provide an incentive for what is not in the firm's best interests.

Managerial hubris around the ability to realise their internal advantages and transfer them across businesses

Beta and Beta Downside

Beta

Markowitz (1952) laid the foundation of portfolio selection and return versus variance. Essentially he argued that by considering the correlation between stocks one is able to offset the variance in returns to achieve a more predictable outcome but there exists a level (of ratios of composite members) where the ratio of the variance for the absolute return is a minimum. However, in a universe of stocks there exist two major problems for investors:

The possible combinations of stocks reach extremely high levels meaning computations become excessive

It is not possible to know the correlation between every combination of two stocks with good certainty

Within 20 years the Sharpe-Lintner-Black Capital Asset Pricing Model (CAPM) had been developed (Sharpe, 1964; Lintner, 1965; Black 1972). This model greatly simplifies the calculations required to predict the returns on a share or a portfolio by using some assumptions about shareholders (largely around the uniformity of information, expectations, time lines and the variance of market returns). This theory leads to the outcome that every rational investor should hold the market portfolio if assets are priced efficiently in the long run. Accordingly risk is divided into systematic and unsystematic portions. Risk is

comprised of the unsystematic (firm specific) portion which accounts for around 70% and the systematic component which accounts for the remainder. The CAPM, holds that since diversification to the full market portfolio can be done at at no cost (one of the assumptions) then there should be no reward for non systematic risk. i.e. investors should only be rewarded for holding risk that varies with the entire market (a finding which is directly (Aaker and Jacobson, 1987) and indirectly (behavioural finance) challenged). Systematic risk is most commonly measured using an index β (beta) which measures the covariance of the share returns to that of the market.

There have been several attacks on the results of the CAPM. Many of these revolve around the concept that investor psychology may dictate more of the outcomes than the rational CAPM does. Fama and French (1992) described some problems with the CAPM since beta ranking of the stocks did not significantly explain the returns experienced in a market; a finding which challenges the foundation of the CAPM. The criticisms of the CAPM in its unconditional form fall into two arenas:

1. Arbitrage Pricing Theory: More than one factor drives the outcome of stocks
2. Mean Reversion / Investor Psychology: Pricing of assets on the market are relative prices meaning that the search for distortions will allow prediction of superior returns e.g size, price to earnings etc.

Since the initial Fama and French (1992) study, there have been numerous studies showing improvements on return prediction based on earnings quality, price to book value, dividend yield, price to earnings etc. However, these reversion based models do not replace the CAPM as the only theory which attempts to link the returns on stocks to a fundamental movement in an economy as proxied by the market's value.

However, Jagannathan and Wang (1990) and Leuau and Luuvigson (2001) using different methodologies add the concept of conditional betas which allow the beta of a firm to vary over time. Their final model is quite similar to those presented by the proponents of APT (Arbitrage Pricing Theory*) but the introduction of the variable beta does offer some insights into pricing on the market. Essentially there may be factors which move a firm's beta in a direction over a time period that will affect the beta in the next time period. This allows the simplification of the relation to the entire market to be relaxed allowing industry specific factors to affect a firm's returns.

Business can affect their beta through strategic decision making. Beta is a measure of the sensitivity of a firm stock price to the movement in a market. If a market moves as a whole we expect some underlying fundamental to be driving it. These drivers may be asymmetrical affecting some firms more than others e.g. Tech Stock Boom. However, despite the separation of systematic and non systematic (firm specific) risk a firm can change its real and perceived sensitivity to these factors and therefore change its systematic risk. Chatterjee, Lubatkin and Schulze (1999) reach a similar conclusion basing their interlinkages on three factors. More specifically Degree of Operating Leverage should affect a firm's beta in that high operating leverages should mean greater betas. This assumption is confirmed both in theory and empirically (Gurio, 2005). Petersin and Strongin (1996) also find factors which are strategically or industry determined which affect the cyclicity of a business which would be affected by the decision to diversify into related businesses or vertically integrate.

Downside Beta

One of the key issues that we aim to investigate in this paper is that investors as a whole may reward different elements of beta differently. Specifically the investors may move away from Mean Variance Behaviour (MVB) (Markovitz, 1991) and rather move toward Mean Semi

Variance Behaviour (Estrada 2002). This shows a pricing in of asymmetric returns. In a recent paper Estrada (2002) showed that the definition of downside beta used in his paper was significantly better at predicting stock prices in emerging markets than the traditional beta. In that paper and others (Hogan and Warren, 1974) special importance is given to the downside risk of a stock.

We propose that the factors that motivate interest in Mean Semi Variance Behaviour would be:

1. Greater uncertainty around the final profitability⁴
2. Risks around the supply of inputs for a firm
3. Volatility around the markets for inputs and outputs for a firm which would lead to swings in profitability

As we have shown, these are many of the same factors that are considered when a firm vertically integrates or undergoes related diversification. Hence, when these conditions prevail in an industry the firms within the industry may be priced along the lines of their semivariance behaviour rather than their variance behaviours. Gala (2006) shows in both empirical and theoretical model that the preference of investors changes depending on the state of the market due to the perceived (and probably real) irreversibility of investments thus making the risk behaviour differ in different conditions.

Further, the explanatory power of downside beta would be much improved in explaining excess returns from firms whose downside beta was high compared with their normal beta even after adjustments for aspects that the behavioural investors use e.g. size, book to market. Ang, chen and Xing (2006) empirically test this proposal in the US market and find that downside beta is rewarded and its inclusion removes the book to market, size and even

⁴ *Arbitrage Pricing Theory considers multiple factors to predict a firms returns which may or may not be market related

liquidity effects. There is no paper to the authors knowledge that examines multiple measures of bankruptcy risk versus the downside measure, but even with them, we would expect that the downside beta, being a more general measure would be rewarded by investors. However, Miller and Reuer (1996) do show in their paper that the mean lower partial movement of beta, and the root lower partial movement using ROE, ROA all significantly correlated with the un systematic risk of a business (measure by the non predicted returns of the CAPM model). Further, the RLPM based on ROE and ROA do correlate significantly with the Altman Z score (a broad measure of bankruptcy risk).

The changes in the related diversifiers may provide a more effective way of dealing with these issues than other firms have at their disposal. Particularly:

1. Transfer pricing control and the impact on the volumes, prices and final profitability.
Any assymetrical market movements in the supply and demand markets would be smoothed out by the ability to internally set prices
2. Incorporation of major supply into a firm and the ability to avoid ex post hold up and improve ex ante investment decisions
3. Strategic resource accumulation and the ability to recover from downturns more quickly, enter related fields, and maintain cross pollination of other businesses.

When a portfolio of stocks is examined both the overall beta and the downside beta must be examined. Superior returns by a portfolio of firms could be achieved through higher beta in a positive market or through lower downside beta in any market. Indeed we could find a situation where a portfolio with a lower beta performs better than the market due to the ability to not experience the downturns as severely as other firms in the market; the additional explanatory ability has been tested empirically by Pederson and Hwang (2007) who find that an additional 25 % of UK returns can be explained with the downside beta. This is a strong

result when we consider the stability of the UK market and so the sensitivity to the semivariance behaviour will be lower than when an emerging market is examined.

Proposed Research Methods

Propositions and Hypotheses

Proposition 1 and 2

Related diversification provides systematic benefits to the firms which undertake it. These benefits are derived from the change in market power, the coordination, the elimination of hold up and small numbers bargaining problems as well as the ability to control the transfer price. We expect that when there is a positive movement in the stock market due to demand in the overall economy, these firms will be able to respond as quickly as their non diversified peers to increase their profitability and invest in new businesses and business lines. However, when there is a downturn in the market performance, these related diversifiers should be able to withstand this better than their peers since they can coordinated different stages of the production cycle and are able to vary both prices and volumes more than other firms to stabilise earnings. However, unrelated diversifiers can access few of these benefits and although the costs of unrelated diversification may be lower the benefits are more difficult to capture especially in a well functioning market.

H1a: When ranked into deciles by relatedness, and firm performance equally weighted there will be a significant difference in the decile performance over the time period.

H1b: The excess return of a portfolio will be greater if it is related than if it is not related when firm performance is equally weighted. The relationship should be non linear since firms will be expected to find it difficult to manage the benefits across multiple divisions.

H2a: When ranked into deciles by relatedness, and firm performance equity weighted there will be a significant difference in the decile performance over the time period.

H2b: The excess return of a portfolio will be greater if it is related than if it is not related when firm performance is equally weighted. The relationship should be non linear since firms will be expected to find it difficult to manage the benefits across multiple divisions. Further larger firms will find managing benefit more difficult so the more related categories are expected to show better performance for small firms and vice versa.

Proposition 3

Vertical integration reduces the beta of the post integration firms by affecting systematic and non systematic risk. There is a potential for the related diversifier firms to show lower variance with the market returns due to their ability to internalise and coordinate transactions that a non integrated / separated firms may not be able to. However, the potential to accumulate strategic assets, to optimise the use of information asymmetries in the internal capital market, and the ability to change the market characteristics should allow these related firms to grow at a pace that matches the rest of the market during positive times of growth.

When there is a downturn in the overall market there are options available to them that are not available to other separated firms as well as some efficiencies so that they may be able to have a variance with the market that is not uniform. This would mean that the firm would move off the Security Market Line (SML). This condition can only exist with the market asymmetry that can exist when firms take different approaches to related diversification in a market and because there is a finite limit on control (in line with Williamson (1976) who commented that if the firm were to completely outperform the market there would be one enormous firm). However for the highly diversified but unrelated firms the ability to effect these coordinations and match the market conditions is limited, however, their spread should mean that they are exposed to different trends in different areas at different times. Therefore

we would expect diversified and unrelated firms to have a similarly reduced β and β^d in contrast to the greater drop in β^d versus β for the related firms.

H3ai: When ranked into deciles by relatedness the β for the equally weighted portfolios will be significantly different from each other.

H3aii: When ranked into deciles by relatedness the β for the equity weighted portfolios will be significantly different from each other.

H3ci: When ranked into deciles by relatedness the β^d for the equally weighted portfolios will be significantly different from each other.

H3ci: When ranked into deciles by relatedness the β^d for the equally weighted portfolios will be significantly different from each other.

Proposition 4

Since the relatedness variable is not an available statistic, the author considers it unlikely that there will be a relationship that determines which a non random distribution of firms with varying Price to Earnings Multiple, Price to Book Multiple and Market Capitalisation in the relatedness deciles. However, within each category we would expect to see the normal pattern of performance between high and low values of the three variables as per Fama and French (1992) which will be tested in a one way ANOVA. However, these variables may be differently distributed and have different impacts on small versus large cap firms so we will test in a multiple ANOVA the effect on every decile

H4a: When the deciles are subranked according to Price to Earnings Multiple (PEM) into quartiles there will not be any pattern relating to the interaction between the relatedness decile and the PEM quartile.

- H4ai: Overall the PEM quartiles will show a significant difference in median performance determined by a one way ANOVA.
- H4b: When the deciles are subranked according to Market Cap (MVM) there will not be any pattern relating to the interaction between the relatedness decile and the MVM quartile.
- H4bi: Overall the MVM quartiles will show a significant difference in median performance determined by a one way ANOVA
- H4c: When the deciles are subranked according to Price to Book (PBK) there will not be any pattern relating to the interaction between the relatedness decile and the PBK quartile.
- H4ci: Overall the PBK quartiles will show a significant difference in median performance determined by a one way ANOVA

Conclusion of Hypothesis

In this paper we will try to study 3 key issues:

Performance

- Does diversification; related and unrelated change the long term performance of the firm

Risk

- Does related diversification change the β or β^d firm
- Does unrelated diversification change the β or β^d of the firm

If these variables are confirmed then we will have identified a mechanism by which certain integrations will be able to reduce the systematic risk of their equity and we believe some of the non systematic risk.

These findings would provide a basis for the systematic evaluation of these options by executive decision makers. If we assume that the market offers good evidence over long term, then the superior performance of a portfolio should mean that a strategic decision taken by the members of the group is able to either reduce the risk or improve the future earnings of the firm. From a decision making point of view these considerations are very important.

Classification of Relatedness

The classification methodology based on Rumelt (1974) underpins much of the research in this field and has the advantages therefore of comparability. Further attempts to improve on the classification, notably Berry and Jacquemin (1979) and Palepu (1985), involve continuous measures of testing diversification however require some assumptions about SIC codes that are very problematic and the authors note this. Further due to the non constant interval in the discrete distribution of SIC codes statistical analysis is difficult. The three traditional methodologies are as follows:

1. Rumelt Classification: Discrete categories into which firms are put. Rumelt (1974).
 Subjective assessment of two essential elements.
 - a. Specialisation Ratio: Proportion of revenue in single biggest business
 - b. Related Ratio: Proportion of revenue to largest related businesses.
2. Entropy Measure: Continuous scale. SIC code based. Jacquemin and Berry (1979).
 - a. $E = - \sum C_i P_i \ln(1/P_i)$, where E is the entropy measure and P_i is the proportion of revenue in SIC industry i. If the SIC level is 4 digit then it is total diversification vs 2 digit where it is unrelated diversification. The difference between the two levels would provide the relatedness ratio as it would represent the difference between the unrelated diversification (related at the 2 digit level) and the total diversification (of which some is related).

3. Concentric Measure: An extension of the Herfindahl index developed by Caves et al. (1980).
- a. Diversification: Sum of $(P_{ki} \times P_{kl} \times D_{il})$ where P_{ki} = percentage of sales for firm 'k' in industry, P_{kl} = percentage of sales for firm 'l' in industry and D_{il} = weighting factor for the relatedness of the industries whereby $D_{il} = 0$ where i and l belong to the same 3-digit SIC category, $D_{il} = 1$ where i and l belong to the same 2-digit SIC group but different 3-digit SIC groups, and $D_{il} = 2$ where i and l are in different 2-digit SIC categories. i.e. the less related the firms the higher the score.

Hypergeometric and Matrix Measure

Introduction

However, the continuous measures provide a large problem in that they assume that each SIC code is equidistant from the next and that the categories are uniform. Further criticism was levelled by Markides and Williamson (1996), who pointed out that if the resource based view is correct then the Entropy and Concentric measure of diversity and relatedness would not show good correlation with outcomes as it does not specifically enough look at the interrelatedness of the competencies required for each business. Markides and Williamson (1996) go further to say that the organisational form will not have a correlation with the SIC based diversity measures for similar reasons although they do agree with Hill (1988) about the relevance of differing organisational forms to controlling different degrees of diversity.

Methodology

We can overcome this difficult assumption using the principle of survivorship and efficient markets by Klein and Lien (2005) and then combining that with a measure of full firm relatedness. These reflect better method of defining the relatedness of a firms. An initial attempt by Robins and Wiersema (1995) with an excellent technology transfer methodology based on structural equation modelling to determine the relatedness of industries. Their model was based on prior work by Scherer (1982) who classified the technology transfers. However, this data is now out of date and the survivorship method offers a good indirect means. Under the Klein and Lien (2005) methodology the relatedness of two industries could be determined by the propensity of firms to be in both industries above the random level. In two separate papers they test various relevance of this method and show it to be well correlated with entry and inversely correlated with exit.

All of the different methodologies above attempt to define the level of interrelation between the different business units that a firm operates. The focus on the relatedness versus the non relatedness is important since we are attempting to show the potential advantages that a related diversifier might have. In the literature review above we show the considerations that work to make a related diversifier more effective than an unrelated diversifier and also a single business firm. To do this with a continuous variable we must examine cutoff limits.

The use of a continuous variable like this allows us to measure the density of possible interconnections within a firm. Based on this type of measure, we would expect that the extent of asset accumulation and coordination would be maximal and therefore if there are benefits they should be visible in the portfolio.

First we need to define the relatedness of the C_2 pairs of industries by viewing relatedness as a measure of survivorship beyond random selection. Suppose that in our universe we had a given number of each of any two industries, then we can construct an estimate of the number of times they should occur in combination given that a firm may only have one industry once. Our random selection is given by the hypergeometric distribution (essentially binomial without replacement) defined by:

$$\Pr(X_{ij} = x) = f_{hg}(x, K, n_i, n_j) = \frac{\binom{n_i}{x} \binom{K - n_i}{n_j - x}}{\binom{K}{n_j}}$$

Where the expected number of firms with any given SIC combination in their portfolio is given by

$$\mu_{ij} = \frac{n_i n_j}{K}$$

Where μ_{ij} has a std deviation given by

$$\sigma^2 = \mu_{ij} \left(1 - \frac{n_i}{K}\right) \left(\frac{K - n_j}{K - 1}\right)$$

Where: n_i is the total number of occurrences of industry I in the population

n_j is the total number of occurrences of industry j in the population

x is the expected number of firms with the combination

K is the total number of firms in the population

Given we know the expected number of firms operating in any two of the ${}^n C_2$ possible combinations of industries we extract a standardised measure of the difference between the actual and the expected. When there is an excess then we would consider the industries more related since they are showing a survivorship bias to those firms that operate within the two. The standardised difference defines our relatedness of the industries.

$$IR = \frac{A(X_{ij}) - E(X_{ij})}{\sigma_{ij}^2}$$

Further we need to define the relatedness of a firm which can be given by the pairwise sum of every combination:

$$FR = \frac{\sum_{j=1}^{j=N} \sum_{i=1}^{i=N} IR_{ij} (P_i + P_j)}{N-1} \quad \forall i \neq j \text{ and only combinations permitted.}$$

Where P_i = Percentage of Sales in SIC industry i

N = Total number of SIC in which firm operates

Once we have the firm relatedness we can rank the firms into their deciles and begin to track the deciles performances. The deciles performance can be either equal weighting of the firms performance or equity weighting of the firms performance.

In order to construct our reference performance variable we will take the SP Super 1500 index and again either weighting the constituent firms returns equally or by their market capitalisation.

Hypothesis 1 and 2 and 3

Population

Firms on the NYSE (New York Stock Exchange), the ASX (American Stock Exchange) and the NASDAQ.

Data from Compustat Data Resources. Those firms included were all the firms operating in more than 1 SIC code and where the sales per SIC code information was available >95%. The firms were then ranked by relatedness and then separated into deciles. Further only firms where the sum of the SIC segment sales were within 2% of the total company sales were used. Further the unallocated or corporate sales were redistributed in line with the sales of each of the other segments.

Sampling

We need to establish our related portfolios versus the market portfolio. We rebalance the relatedness portfolios annually and track their performance monthly.

Portfolio Construction

Using the Lien and Klein (2005) methodology we ranked the firms according to their relatedness before sorting into deciles.

A market portfolio was used by using the S&P Super Composite 1500 index. This index contains the 500 large cap firms, 400 medium cap firms and 600 small cap firms all listed on either the NYSE, the ASX or the NASDAQ.

The portfolio period was from 2001 – 2007.

Testing

Hypothesis 1 and 2:

With the firms in deciles their monthly performance as given by:

$$Total\ ReturnMonth = TRM_t = \frac{[TRF * PRC]_t}{[TRF * PRC]_{t-1}}$$

Where: TRF = Total Returns including dividends and reinvestment return on dividend

PRC = Price close for the month

Testing:

H1a: The performance of the equally weighted deciles will be compared with each other using an ANOVA test ($n > 30$). The null hypothesis is that the medians are equal i.e. relatedness does not impact portfolio performance. A Tukey Kramer comparison test will also be done on the deciles.

H1b: The excess performance of the equally weighted deciles will be compared with each other using an ANOVA test ($n > 30$). The null hypothesis is that the medians are equal. A Tukey Kramer comparison test will also be done on the deciles.

H2a: The performance of the equity weighted deciles will be compared with each other using an ANOVA test ($n > 30$). The null hypothesis is that the medians are equal i.e. relatedness does not impact portfolio performance. A Tukey Kramer comparison test will also be done on the deciles.

H2b: The excess performance of the equity weighted deciles will be compared with each other using an ANOVA test ($n > 30$). The null hypothesis is that the medians are equal. A Tukey Kramer comparison test will also be done on the deciles.

We will also look at the performance against the deciles as we expect from our literature review, there to be a non linear relationship between decile and performance.

Hypothesis 3

Estimation of beta:

Asset Beta (β):

Using the equation form $R_{pt} = a_{pt} + \beta_{pt}R_{mt} + e_{pt}$ where R_{pt} is the total return to shareholder (dividends plus appreciation) from the portfolio and R_{mt} is a proxy for the total market return to investors (on a value weighted basis) at time t . We then regress the terms to find β .

Beta is otherwise the covariance of the assets returns / variance in the market returns. I.e, covariance $\beta_{pm} = E[(R_{pt} - \mu_p)(R_{mt} - \mu_m)]$ divided by the variance in the market portfolio i.e. $E[(R_m - \mu_m)^2]$.

Downside Beta (β^d):

The same equation is used for the downside risk premium with the form $R_{pt} = a_{pt} + \beta^d_{pt}R_{mt} + e_{pt}$. However the downside beta is the asset i 's downside covariance to the market portfolio i.e. downside $\beta^d_{mp} = E(\text{Min}[(R_{pt} - \mu_p), 0] \text{Min}[(R_{mt} - \mu_m), 0])$ divided by the variance in the downside only of the market portfolio i.e. $E\{\text{min}[(R_m - \mu_m)^2]\}$

Testing:

- H3ai: Using the portfolio returns on a monthly basis we can calculate the β of the equally weighted portfolios. We will calculate first from 36months then every 6 months until the β is a 60 month β and then continue every 6 months with the 60 month β . With this sample of betas for every portfolio we will check whether or not the β are significantly different from each other using an ANOVA.
- H3aii: Using the portfolio returns on a monthly basis we can calculate the β of the equity weighted portfolios. We will calculate first from 36months then every 6 months until the β is a 60 month β and then continue every 6 months with the 60 month β . With this sample of betas for every portfolio we will check whether or not the β are significantly different from each other using an ANOVA.
- H3bi: Using the portfolio returns on a monthly basis we can calculate the β^d of the equally weighted portfolios. We will calculate first from 36months then every 6 months until the β^d is a 60 month β^d and then continue every 6 months with the 60 month β^d . With this sample of β^d s for every portfolio we will check whether or not the betas are significantly different from each other using an ANOVA.
- H3bii: Using the portfolio returns on a monthly basis we can calculate the β^d of the equity weighted portfolios. We will calculate first from 36months then every 6 months until the β^d is a 60 month β^d and then continue every 6 months with the 60 month β^d . With this sample of β^d s for every portfolio we will check whether or not the betas are significantly different from each other using an ANOVA.

Hypothesis 4:

- H4a: When the deciles are subranked according to Price to Earnings Multiple (PEM) into quartiles there will not be any pattern relating to the interaction between the relatedness decile and the PEM quartile.

- H4ai: Overall the PEM quartiles will show a significant difference in median performance determined by a one way ANOVA.
- H4b: When the deciles are subranked according to Market Cap (MVM) there will not be any pattern relating to the interaction between the relatedness decile and the MVM quartile.
- H4bi: Overall the MVM quartiles will show a significant difference in median performance determined by a one way ANOVA
- H4c: When the deciles are subranked according to Price to Book (PBK) there will not be any pattern relating to the interaction between the relatedness decile and the PBK quartile.
- H4ci: Overall the PBK quartiles will show a significant difference in median performance determined by a one way ANOVA
- .

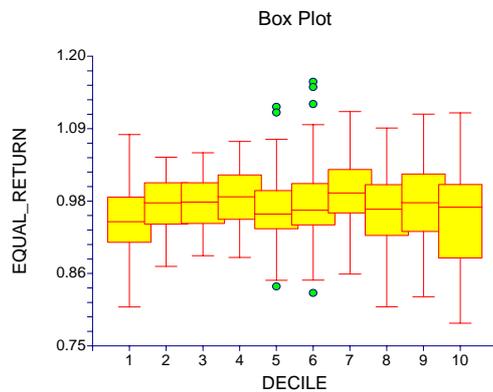
Results

H1a

Equally Weighted Profolios

ANOVA

Equally weighted portfolios had a significant ANOVA result.



Kruskal-Wallis One-Way ANOVA on Ranks

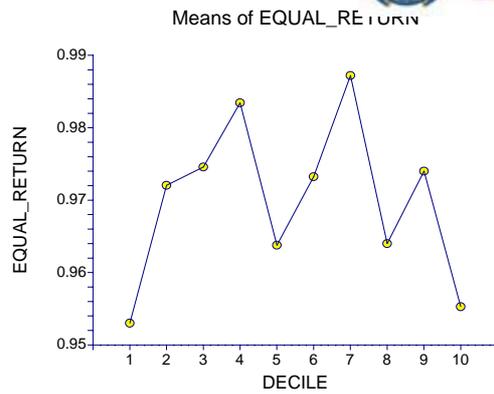
Hypotheses

Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	10	81.23734	0.000000	Reject Ho
Corrected for Ties	10	81.23739	0.000000	Reject Ho



Regression

Equally Weighted Portfolios

Estimated Model

$$\begin{aligned}
 &.950928571428571 - 2.54955908289266E-03*(DECILE=1) + 1.88601785714282E-02*(DECILE=2) + \\
 &2.17055749128915E-02*(DECILE=3) + 3.16899470899467E-02*(DECILE=4) + 9.57392857142804E- \\
 &03*(DECILE=5) + .020208137432188*(DECILE=6) + 3.59172117039583E-02*(DECILE=7) + \\
 &9.81501831501785E-03*(DECILE=8) + 2.10701940035267E-02*(DECILE=9)
 \end{aligned}$$

Analysis of Variance Section

Source	DF	R2	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1		751.0548	751.0548			
Model	9	0.0435	0.113042	1.256022E-02	3.998	0.0001	0.9961
Error	792	0.9565	2.487881	3.141264E-03			
Total(Adjusted)	801	1.0000	2.600923	3.247095E-03			

however, equity weighted portfolios did not have a significant result.

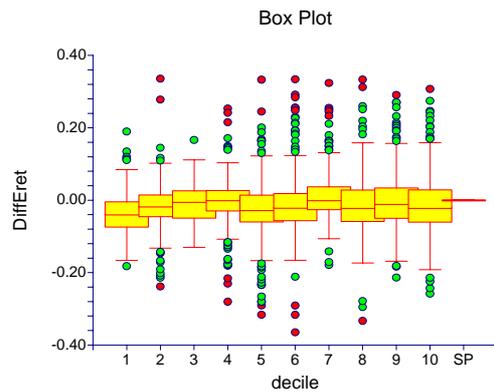
This implies smaller firms some connection but the bigger firms less. Small firms dragged down by results in 5 and 6 deciles

H1b

Equally Weighted Portfolios Performance Difference

ANOVA

The ANOVA was significant.



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

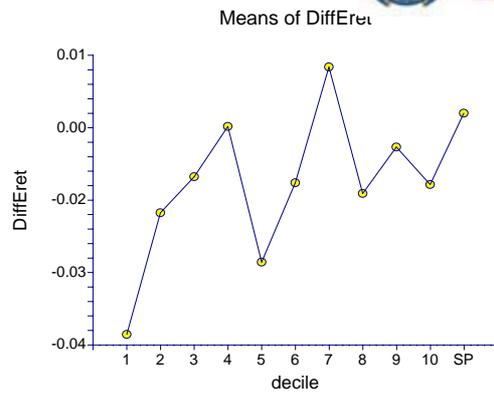
Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	10	146.7106	0.000000	Reject Ho
Corrected for Ties	10	146.7107	0.000000	Reject Ho

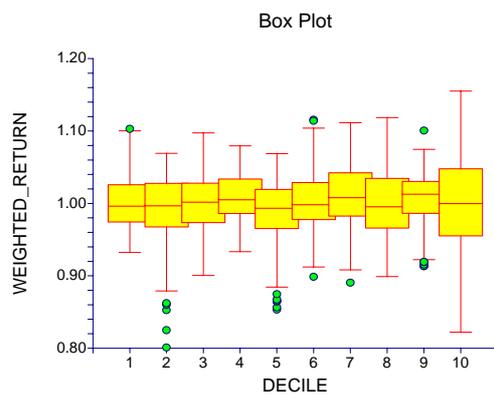
The means curve.



H2a

ANOVA

The ANOVA was non significant.



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	9	12.55144	0.183975	Accept Ho
Corrected for Ties	9	12.55148	0.183973	Accept Ho

Regression

Estimated Model

$$1.00169012987013 + 1.37798158497791E-03*(DECILE=1) - 8.45679653679838E-03*(DECILE=2) + 3.84694584788428E-03*(DECILE=3) + 4.74110300658195E-03*(DECILE=4) - 1.24217625231912E-02*(DECILE=5) + 4.67388041264635E-03*(DECILE=6) + 3.98506801905163E-03*(DECILE=7) + 3.44618726542002E-03*(DECILE=8) + 6.09984302959886E-03*(DECILE=9)$$

Analysis of Variance Section

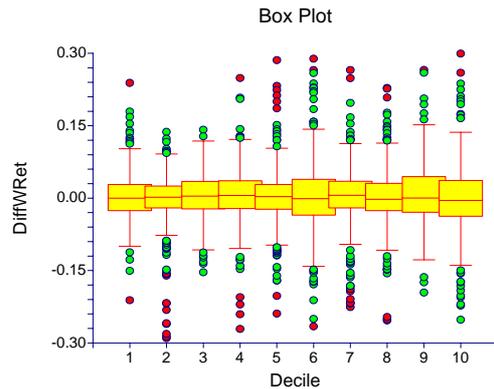
Source	DF	R2	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1		3730.3	3730.3			
Model	9	0.0065	0.1296801	0.0144089	2.705	0.0039	0.9564
Error	3702	0.9935	19.71805	5.326325E-03			
Total(Adjusted)	3711	1.0000	19.84773	5.348352E-03			

H2b

Equity Weighted Portfolio

ANOVA

The ANOVA was non significant.



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

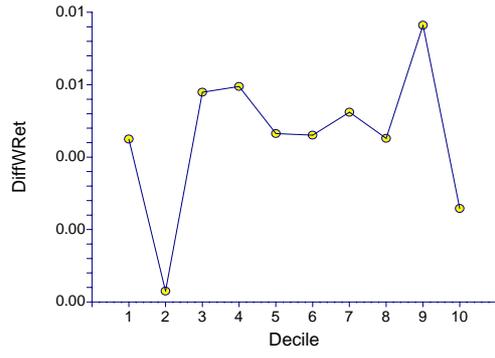
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	9	8.17802	0.516311	Accept Ho
Corrected for Ties	9	8.17802	0.516311	Accept Ho



Means of DiffWRet

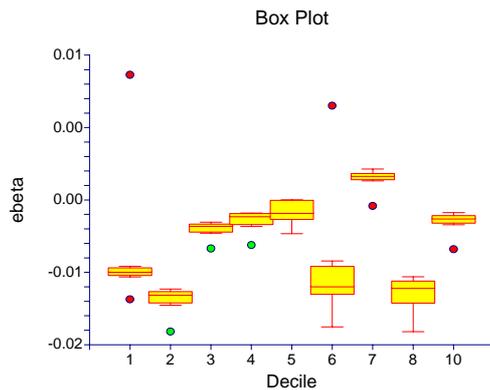


H3ai

Equally Weighted Portfolios

The ANOVA test was significant.

Equally weighted returns BETA



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	8	53.37523	0.000000	Reject Ho
Corrected for Ties	8	53.37523	0.000000	Reject Ho

Regression

Estimated Model

$$\begin{aligned}
 & -4.37743187499998E-03 - 2.70959945833336E-03 * (\text{Decile}=1) - 6.70881200000003E-03 * (\text{Decile}=2) - \\
 & 6.34482500000026E-04 * (\text{Decile}=3) + 1.07716124999968E-04 * (\text{Decile}=4) + 8.2068924999968E- \\
 & 04 * (\text{Decile}=5) - 3.90470262500003E-03 * (\text{Decile}=6) + 3.68536949999997E-03 * (\text{Decile}=7) - \\
 & 6.19231937500003E-03 * (\text{Decile}=8) - .091141116 * (\text{Decile}=9)
 \end{aligned}$$

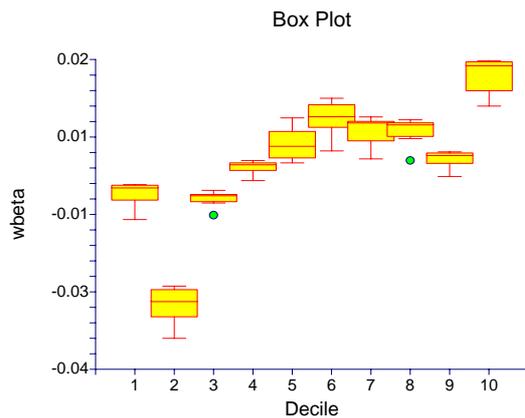
Analysis of Variance Section

Source	DF	R2	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1		1.809622E-02	1.809622E-02			
Model	9	0.9420	5.837703E-02	6.486337E-03	128.030	0.0000	1.0000
Error	71	0.0580	3.597036E-03	5.066249E-05			
Total(Adjusted)	80	1.0000	6.197407E-02	7.746759E-04			

H3a ii

Equity Weighted

The ANOVA test was significant



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	9	81.94424	0.000000	Reject Ho
Corrected for Ties	9	81.94424	0.000000	Reject Ho

Regression

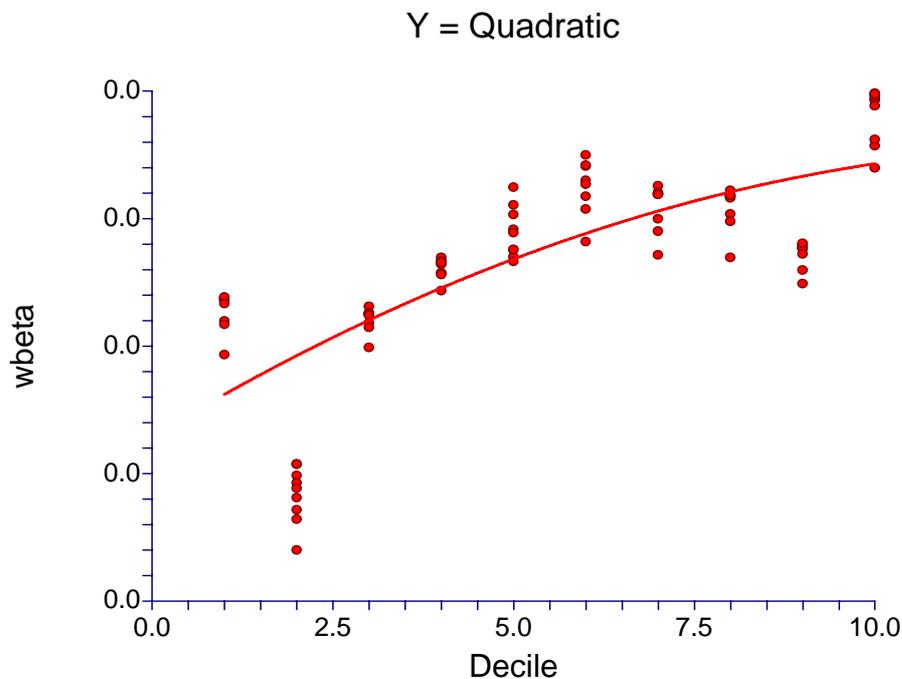
Estimated Model

.017866682875-2.37201827638889E-02*(Decile=1)-4.45192852500001E-02*(Decile=2)-
.024305676625*(Decile=3)-1.82880021250001E-02*(Decile=4)-.014157948375*(Decile=5)-
8.32788850000004E-03*(Decile=6)-.010745313875*(Decile=7)-.010793878375*(Decile=8)-
.016586867125*(Decile=9)

Analysis of Variance Section

Source	DF	R2	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1		3.328109E-05	3.328109E-05			
Model	9	0.9749	1.050179E-02	1.166865E-03	306.648	0.0000	1.0000
Error	71	0.0251	2.701711E-04	3.805226E-06			
Total(Adjusted)	80	1.0000	1.077196E-02	1.346495E-04			

Curve Fitting



Model Estimation Section

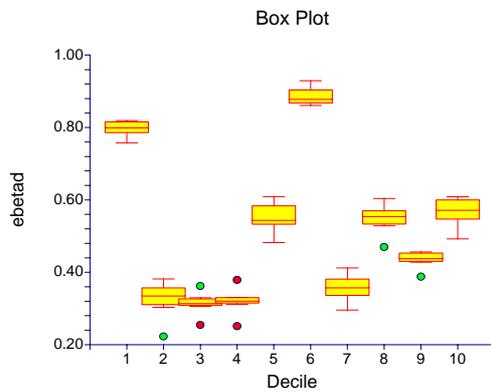


Parameter	Parameter	Asymptotic	Lower	Upper
Name	Estimate	Standard Error	95% C.L.	95% C.L.
A	-0.02063	0.00305	-0.02670	-0.01456
B	0.00514	0.00128	0.00260	0.00767
C	-0.00019	0.00011	-0.00042	0.00003
Iterations	3	Rows Read	90	
R-Squared	0.567462	Rows Used	90	
Random Seed	9522	Total Count	90	

H3bi

ANOVA

The ANOVA was significant for equally weighted



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

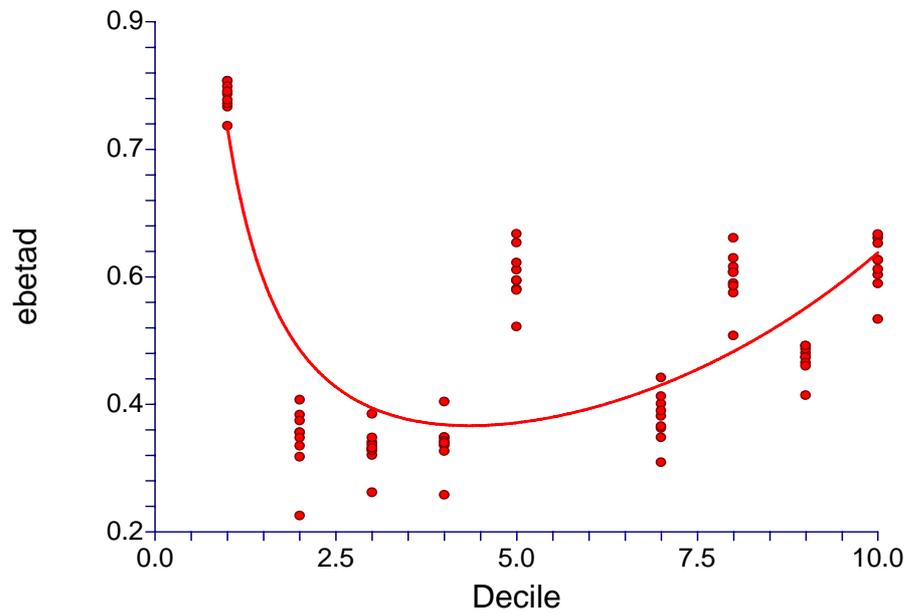
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	9	82.12885	0.000000	Reject Ho
Corrected for Ties	9	82.12885	0.000000	Reject Ho

Curve Fitting

Y = Exponential Type 1



Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	0.58403	0.02390	0.53644	0.63161
B	-1.11765	0.09939	-1.31552	-0.91977
C	-0.25717	0.02605	-0.30903	-0.20532
Iterations	5	Rows Read	81	
R-Squared	0.597850	Rows Used	81	
Random Seed	309	Total Count	81	

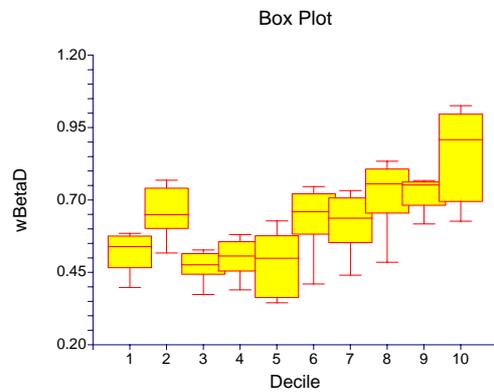
Estimated Model

$(.584027537315419) * ((Decile)^{-1.11764722155709}) * EXP(-(-.257174960608361) * (Decile))$

H3bii

ANOVA

The ANOVA was significant.



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	9	56.99805	0.000000	Reject Ho
Corrected for Ties	9	56.99805	0.000000	Reject Ho

Regression

Equity Weighted Beta Downside

Estimated Model

.890216332000001-.36827778088889*(Decile=1)-.211624416125001*(Decile=2)-.404074732125*(Decile=3)-
 .372747960750001*(Decile=4)-.4102736935*(Decile=5)-.22182716*(Decile=6)-
 .239014765000001*(Decile=7)-.136058775750001*(Decile=8)-.150831992375001*(Decile=9)

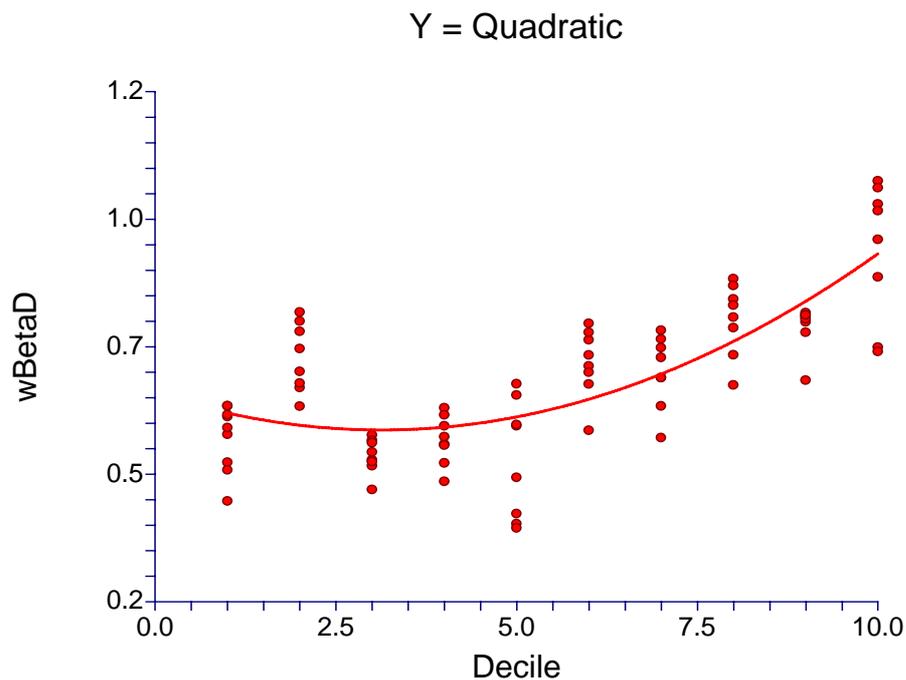

Analysis of Variance Section

Source	DF	R2	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1		32.89838	32.89838			
Model	9	0.7597	1.3428	0.1492	24.939	0.0000	1.0000
Error	71	0.2403	0.4247712	5.982693E-03			
Total(Adjusted)	80	1.0000	1.767571	2.209464E-02			

Curve Fitting

A Good R2 was achieved with quadratic

Equity Weighted Portfolios


Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	0.60846	0.03916	0.53049	0.68642
B	-0.04586	0.01656	-0.07883	-0.01290



C	0.00732	0.00170	0.00438	0.01026
Iterations	6	Rows Read	136	
R-Squared	0.580076	Rows Used	81	
Random Seed	21530	Total Count	81	

H4a + i

Price to Earnings Multiple

H4a

There was no consistent pattern on the quartiles influence on the deciles performance and the multiple ANOVA was negative for both types of portfolio.

Equally Weighted Portfolio

Analysis of Variance Table

Source		Sum of	Mean		Prob	Power
Term	DF	Squares	Square	F-Ratio	Level	(Alpha=0.05)
A: D_DECILE	9	3.974478E-02	4.416087E-03	1.39	0.186721	0.682231
B: QUARTILE	3	6.768738E-04	2.256246E-04	0.07	0.975456	0.062782
AB	27	3.360757E-02	1.244725E-03	0.39	0.997993	0.365963
S	3080	9.786777	3.177525E-03			
Total (Adjusted)	3119	9.861682				
Total	3120					

Equity Weighted Portfolio

Analysis of Variance Table

Source		Sum of	Mean		Prob	Power
Term	DF	Squares	Square	F-Ratio	Level	(Alpha=0.05)
A: D_DECILE	9	3.020164E-02	3.355738E-03	0.85	0.572056	0.432028
B: QUARTILE	3	1.411409E-02	4.704698E-03	1.19	0.312617	0.321716
AB	27	4.783619E-02	1.771711E-03	0.45	0.993865	0.424537
S	3068	12.14641	3.959065E-03			
Total (Adjusted)	3107	12.24205				
Total	3108					

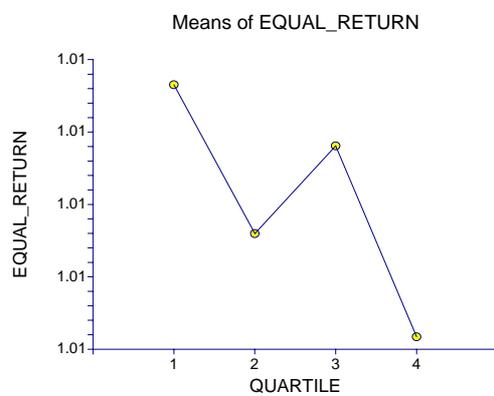
H4ai

ANOVA

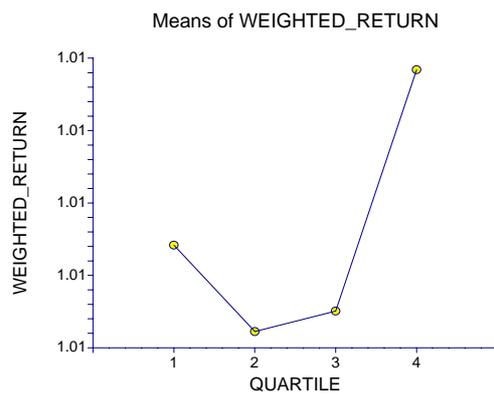
The one way ANOVA was non significant for both equally and equity weighted portfolios.

However, interestingly the means of the returns by quartile trended in different directions.

Equally Weighted Portfolios



Equity Weighted Portfolios

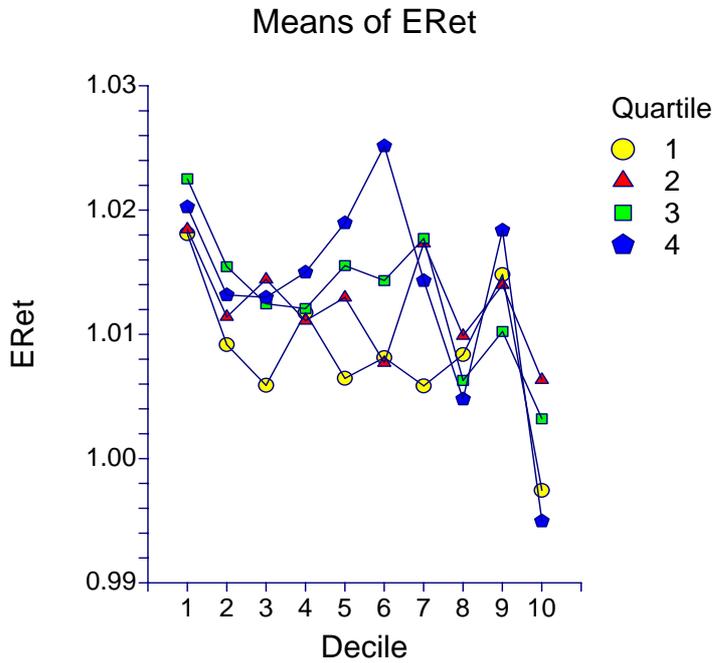


H4b + i

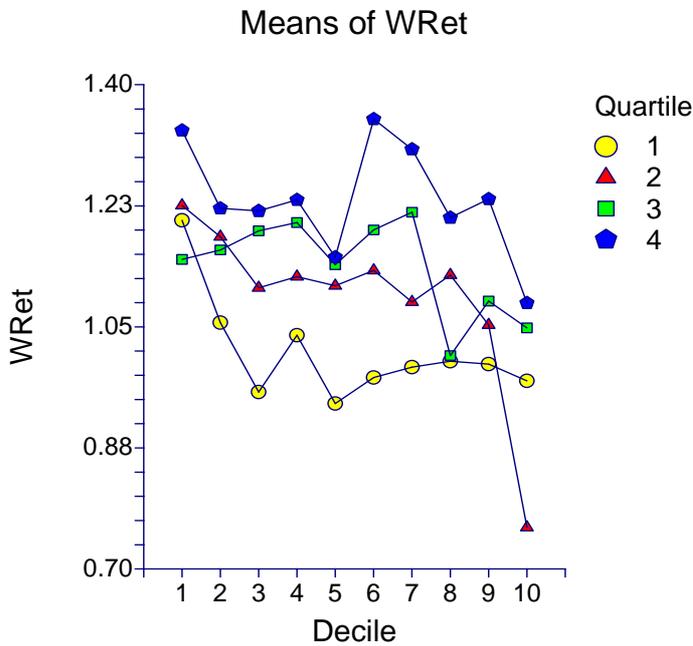
Market Value Subranked Deciles

H4b

Equally Weighted Portfolios



Equity Weighted Portfolios



The multiple ANOVA was significant only in the equity weighted portfolios.

Analysis of Variance Table

Source	Sum of	Mean	Prob	Power
Term	DF	Squares	F-Ratio	Level
				(Alpha=0.05)

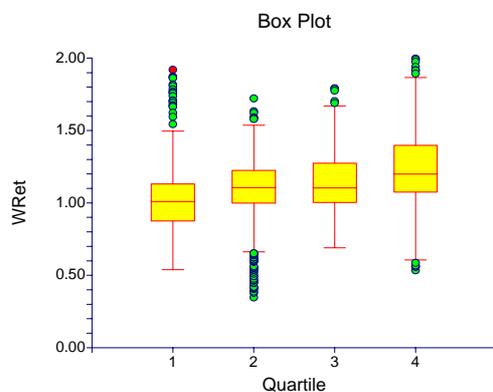
A: Decile	2	15.17751	1.40057	35.79	0.000000*	1.000000
B: Quartile	3	19.68388	6.561293	160.12	0.000000*	1.000000
AB	27	9.405965	0.3483691	8.50	0.000000*	1.000000
S	3042	124.6535	4.097749E-02			
Total (Adjusted)	3081	167.9712				
Total	3082					

H4bi

ANOVA

We found significant ANOVA for market value quartiles in the equity weighted portfolios but not the equally weighted portfolios. However, in both cases there was a strong linear pattern in the means of quartile returns.

Equity Weighted Portfolio



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

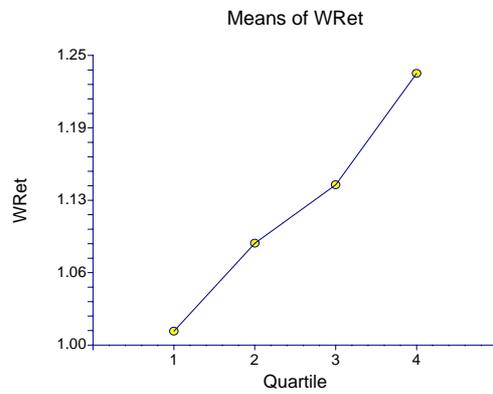
Ho: All medians are equal.

Ha: At least two medians are different.

Test Results



Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	372.2372	0.000000	Reject Ho
Corrected for Ties	3	372.2372	0.000000	Reject Ho

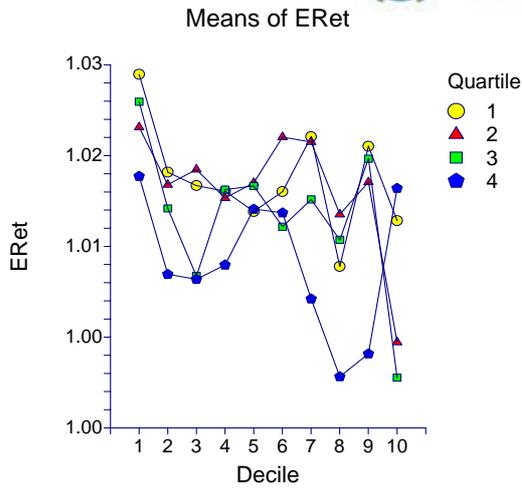


H4c

Price to Book Value

H4c

Equally Weighted Portfolios

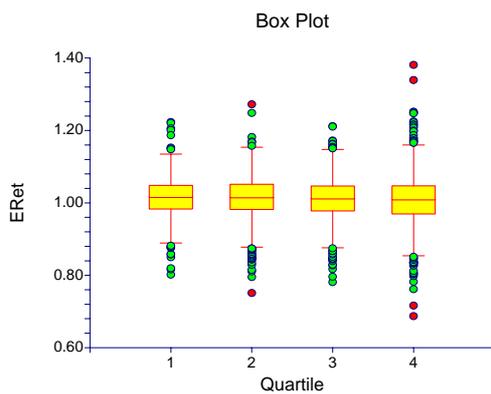


H4ci

ANOVA

The one way ANOVA was only significant in the equally weighted portfolios. It was however, not significant in the equity weighted portfolios.

Equally Weighted Portfolios



Kruskal-Wallis One-Way ANOVA on Ranks

Hypotheses

Ho: All medians are equal.

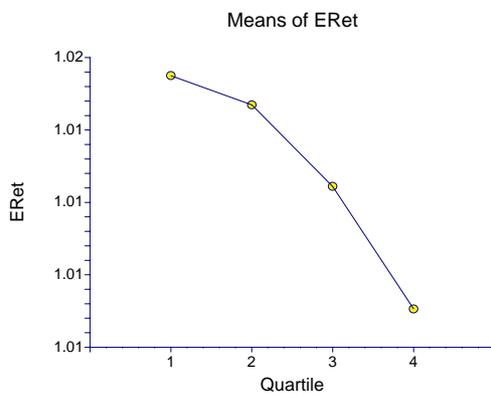
Ha: At least two medians are different.

Test Results

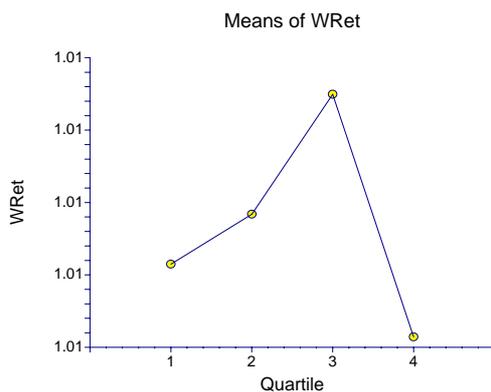
Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	3	8.523763	0.036341	Reject Ho
Corrected for Ties	3	8.523769	0.036341	Reject Ho

In the equally weighted portfolio there was a strong tendency to show a linear response of Price to book to returns. However, the equity weighted portfolio group had no clear relationship.

Equally Weighted Portfolios



Equity Weighted Portfolios



The Multiple ANOVA was not significant in either. However, in equally weighted portfolios the lowest price to book shares systematically outperformed the highest quartile.



Discussion of Results

Introduction

In a competitive environment, firms search for a strategy that will guarantee them superior returns or low levels of risk. We know that industry effects are strong in determining the outcome for a firm and often stronger than firm effects (Schmalensee, 1985). However, through strategic decision making a firm can affect its long term trajectory and therefore returns (Chatterjee and Lubatkin, 1992).

Internalising market functions within a firm has numerous difficulties but firms continue to diversify in different ways. There is no clear evidence about relatedness and firm performance in the long term. Similarly there is dispute about risk and diversification and relatedness.

The market also responds differently to different diversification strategies in firms and diversification is associated with a discount. However, what we would like to know is whether this discount represents a long term difference in market performance or is an event based discount.

In the preceding literature review it has been shown that diversification may allow a firm to be exposed to non correlated income streams. The downside of this is that diversified firms might then show poor performance against the rest of the market as their earnings will not be entirely affected by the cyclical booms that every industry undergoes. Should diversification systematically provide a manner by which a firm can have a lower beta than other firms whilst maintaining market like performance this would provide a subset of firms in the market which beats the capital asset pricing model.

Further should the portfolios systematically change their downside risk they would be able to avoid some of the variation of the downturns in the market. Especially in times of high volatility the importance of downside characteristics are important in pricing assets.

Relatedness, its ability to bring core competencies from one business to another business that is similar offers a firm the chance to engage in separate businesses with non correlated income streams thereby reducing the volatility with the market simultaneously bringing to bear on other businesses skills which represent real advantages. In a competitive landscape in a well functioning capital market unrelated diversification should be limited since the only real advantages to this are those of internal capital markets. However, with related diversification we would expect to see superior performance for the firms in multiple segments therefore offering market like returns but lower levels of correlation with the market.

Through the tests we have run against these portfolios around their risk profiles and their returns we have established a pattern of performance which is robust.

Limitations

Single Segment Firms

This is a study on relatedness. In order to see this, the firms must be involved in more than one segment. However, the majority of firms are involved in one segment.

	2001	2002	2003	2004	2005	2006
Qty_of_Active_SICS	No_of_Firms	No_of_Firms	No_of_Firms	No_of_Firms	No_of_Firms	No_of_Firms
1	2725	2839	3055	3482	2766	2992
2	764	779	782	861	795	813
3	364	360	356	369	342	344
4	129	139	134	143	132	130
5	50	49	50	49	45	41
6	16	14	17	22	21	19
7	4	4	1	7	7	7
8	3	2	1	1		2
9	0	2	2			
10	2	1	1	2	2	

Only 1/3 of the firms that are on the NYSE, NASDAQ and ASX which passed our data screening tests are multiple segment firms. This number still provides the platform for significant results and also the basis of some interpretation of our results.

Data Availability

Although the database from Standard and Poors Compustat facility is the highest quality available we still screened the data for those companies which had incomplete results. This affected our first sample and gives rise to the results above. We only considered those firms whose sum of segment sales was 98% - 102% of the quoted total company sales to avoid poorly reporting companies and ensure the validity of our data.

Further, not every company that is listed on these exchanges considered offers the information which is crucial to construct a relatedness measure that we have created. Our study was on relatedness which is a firm level score and the methodology to get the relatedness measure surpasses the prior attempts at measuring relatedness (explored in the methodology section). The prior methodologies present very stringent requirements on the SIC system itself, something which we have been able to avoid by using a survivorship bias. However, this methodology requires information that the other methodologies do not require.

When we ran the tests for the subsamples, we found that the problem with good data availability paired our sample size even further. The firms would need to have reported their balance sheets and income statements accurately as well as provided accurate data on their business units. Even so this is a paper in the smallest groups comprise over 100 firms.

Proposition 1 and 2

Hypothesis 1

- 1a: Hypothesis 1a is refuted. There are no statistically significant differences between equity weighted relatedness ranked decile portfolios in performances.
- 1b: Similarly to 1a hypothesis 1b is refuted. There are no statistically significant differences between equity weighted relatedness ranked decile portfolios excess performance over the SP 1500 index.
- 2a: Hypothesis 2a is supported. There is a statistically significant difference between equally weighted relatedness ranked deciles portfolios in performance.
- 2b: Hypothesis 2b is supported. There is a statistically significant difference between equally weighted relatedness ranked deciles portfolios excess performance over the SP1500 index.

Reason for Equally Weighted Portfolios versus Equity Weighted Portfolios Returns.

Equally weighted portfolios have a higher relative percentage of small cap stocks in them. If their performance differs between categories due to relatedness more than the large cap stocks then we will see the result that we currently have. The implications here are that relatedness does affect firm performance. Consider the situation where relatedness did not affect firm performance: then the decile ranking of either would not show any differences. The impact is more relevant in the smaller firms than in larger firms.

We would expect smaller firms to be more sensitive since they are likely to benefit more from relatedness than larger firms. This conclusion follows from the literature review. The benefits of relatedness stem from

- The sharing of core competencies
- The control of internalised processes
- The increased power in the marketplace

A smaller firm *ceteris paribus* is likely to find the bureaucratic costs of managing these requirements more manageable than a large firm. Indeed a smaller firm may be the only type of firm that is able to effectively manage the transfer process of core competencies. As firms become larger we would expect that the style of control of large firms whether or not they are related will shift to more of the M form of control (Hill, 1988). This in turn, whilst efficient and able to cope with larger firms, is not the ideal mechanism for realising the benefits from relatedness (Markides and Williamson, 1996).

This finding, that there is a difference in the applicability of the benefits of relatedness provides strong support for the governance issues that were raised at length in the literature review. The typology that was presented by Mahoney (1992) is clearly important, but what is needed in addition to the proposal by Gulbrandsen (1990) is that firm size directly affects the ability of a firm to manage the benefits. This also provides support, in kind, to the proposition of Schmalensee (1985) where he comments that diversification produces declining returns as the distance to the central leadership declines. As the firm becomes larger and takes on more managers to cope with the complexity there is an increased chance of free riding and the agency problem becomes more and more pronounced. Further, the use of the efficient M form structure promotes risk averse behaviour by managers and tends to result in shorter term decisions which may give results that are required but at the long term risk of the firm in the future. The rate at which a large firm may acquire new businesses related or not is larger

than the rate it can acquire new management talent. So running these businesses becomes more and more suboptimal from the firms overall point of view and a gap begins to emerge from the market value of the large firm and the sum of parts valuation of the firm. The market is telling the firm that there are more effective ways of running this business. This is not due to lack of effort on the part of the managers. However, when there is a large firm the agency problem increases in size which in turn requires more managers to control which further increases the size of the agency problem. D'Aveni and Ravenscroft (1994) showed that SG and A expenses increase when the firm size increases and Jones and Hill (1988) present a non linear increase in the expansion required when the firm complexity increases. This supports ours and Levy (1985) proposal that management time and focus is a limiting factor in diversification benefit realisation.

Another important implication of this discrepancy between the small cap firms and the larger firms is the issue of industrial organisation. Within the literature review we have laid out the various organisational strengths that may be tapped when a firm increases its market power and controls transfer pricing. As ever we expect these moves to either

- Reduce uncertainty
- Improve performance

Whilst both groups of firms small and large have access to these benefits it is unlikely that a small cap firm exerts large amounts of market power consistently enough to affect their portfolios. Instead we can conclude from this that the increase in profitability due to market power and market foreclosure is small if present at all (because it is available to the large firms but there is no benefit seen). As in the literature review we consider the US market to be sufficiently competitive to ensure that an insignificant number of gross distortion of a marketplace will exist for extended periods of time. However, we will come to the other benefits that we would expect from the literature review, the issues around transfer pricing

and its effects as a risk reduction method. Larger firms which decided to vertically integrate or otherwise deal within themselves, as we have shown, will tend to make the downstream market more competitive since they cost transfers at net marginal revenue (assuming they are rational players). This leads to greater variance in volume outputs but smaller variation in profitability for the firms.

Realising the Benefits from Relatedness

Above we have outlined some reasons why smaller firms may realise greater benefits from relatedness than larger firms. Although there is too much intragroup variability to fit a curve to the function with a good R^2 the pattern suggests that the middle relatedness groups perform better than the groups at either side i.e. deciles 1 and 10. Following on from our literature, we would expect that the least related businesses would show below average performance but we are still left with the question about why the other extreme is performing more poorly than expected. The answer to this question lies with similar roots to the answer to the question above. As the degree of relatedness becomes very high, to capture the benefits requires exponentially greater amount of monitoring, control and bureaucracy costs. So a firm, even when very related may find it difficult to get access to these benefits. Consider this as a sample of firms with varying numbers of SICs that they operate in (recalling that in our methodology we tried to eliminate the effect of increasing numbers of SICs on the relatedness score). We would then consider the highly related, many SIC firm to be a very difficult one to manage the benefits from. On the other hand we have a firm with few, perhaps just a couple, SICs which they need to manage. Their performance of this latter group is likely to be better than average but offset by the other group. Another interesting finding from Klein and Lien (2005) is that neighbouring SICs (that is the most related SICs within a firm) do not provide extra predictive power above relatedness around the post entry survival of a firm into

an SIC. It would appear that the most related SIC is not necessarily ensuring better performance, and here we have found support for that.

Hypothesis 2

Difference in Performance versus the SP 1500

The SP 1500 was considered a good index fund to track against due to the inclusion of large firms, medium cap firms and small firms. This is the closest approximation to the market that can be constructed reasonably and the data integrity from these firms is excellent (Data screening removed 1.5% versus up to 15% from the exchanges). Further this index is comprised on firms listed on three major exchanges the NYSE, the ASX and the NASDAQ and involved in a wide range of industries.

There was no difference in any of the means from the weighted portfolio on any decile in the pairwise returns T Test. This is an exceptional result consider the beta which we will discuss below. Essentially these portfolios performed approximately equally and gave returns that were in line with the market. The combination of the two results; i.e. that there is no significant intergroup differences in returns and that the returns are non significantly different to the market implies that all large enough portfolios of multisegment firms will perform in tandem with the market. This result follows from our intuitive argument about the search by firms for non correlated cash flows so that their returns may approximate the market. No portfolio beat the market and this result is also expected. When we view firms with multiple segments they are likely to be exposed to both industry upturns and downturns within the intrafirm portfolio and this will affect their results. However, they will never see an extreme

result from the very poor performance of just one segment due to the other segment, thus they have the trade off mentioned above; superior risk characteristics but market like returns. The result follows the result of a simple model; suppose

- N firms
- Operate in K industries
- The industry performance is binomial and $p=0.5$
- Then ${}^K C_2$ combinations of the industries will show us a continuous distribution of returns where the interquartile companies performance will be approximately 0 versus the 1st and 4th quartile companies where it will be above or below.

Leading to the result that the firm may perform better or worse than the market 50% of the time from a starting point of either better or worse.

Proposition 3

Beta and the Systematic Risk of the Portfolios

There were two points to discuss as per our intentions of the research. We shall now turn to the risk component.

Systematic risk is that risk which complete diversification within the market by holding portions of several different firms cannot reduce. According to the tradition CAPM this is the risk which investors should be rewarded for since diversifying firm specific risk (30% of total risk) where risk is the mean variance behaviour of a stock. The CAPM holds, therefore, that the total expected return to an investor is linearly related to the systematic risk that that investor holds which is measure by the ratio between the covariance of the portfolio to the market and the variance of the market returns.

Although the CAPM has been investigated seriously by different authors and found to be particularly problematic often it is the only model which allows a linkage to the market overall returns. Nevertheless portfolios are often measured on their performance versus the market and so β remains an important tool.

The portfolios of multisegment firms here have two dramatic results:

1. Their betas are exceptionally low
2. Their betas are significantly different from each other

Low Betas

Through decision making the 70% of the risk that is non systematic could be reduced and this paper has through the literature review showed the types of decisions and their implications on the risks to a firms earnings. However, we have found that all the portfolios have a beta which is significantly different to 1(except the SP1500 portfolio which had a beta of one against itself. We need to note again here that our results are on total returns to shareholders, not just price. A firm with a beta of less than 1 is one whose market performance; often correlated with the firm outlook and current accounting performance, is quite unrelated. This is possible for firms and so portfolios might be able to do the same. Indeed this finding points to our major driver for diversification which was discussed at length in the Industrial Organisation section: the active removal of risk. To the authors knowledge this is the first time that there has been evidence of this albeit indirect. The findings conclusively show that firms diversify to remove risk and this is a systematic pattern of decisions by corporate managers. This provides quantitative support for the qualitative papers by Zaheer (1998), Lieberman (1991) and Krickx (2000) which adds robustness to the proposal of uncertainty reduction as a practical driver for returns.

This trend is independent of the relatedness of the firm division; returns are linked to fluctuations in industry demand not fluctuations for core competencies so it is possible to have all of the portfolios with lower betas.

The origin of the low betas; which we have shown to be important in managerial decision making are, as discussed;

- Removal of uncertainty in supply and demand
- Ability to control transfer prices internally
- Ability to control the final market structure
- The ability to avoid market imperfections

Unlike our returns data it is important to note that both the equity and equally weighted portfolios enjoyed this benefit significantly. This shows that the internalisation of the market processes can stabilise performance efficiently for a firm, even if the costs and difficulties make this process ungainly.

Shape of the Beta / Decile relationship

The Beta / Decile relationship showed a good fit with a quadratic equation. i.e. the betas were lowest for the portfolios in decile 1 but highest and trends upward at a slowing rate for those at the latter deciles. The R^2 for this equation was 0.56 which is a reasonable fit (and certainly better than the returns vs B). However, there is a clear trend upward to Decile 10 of relatedness. The reasons behind this shape are related to the exposure to underlying markets. For the first time in a quantitative study we have shows that relatedness form a survivorship basis on SIC's i.e. where firms choose to go and survive is not into industries and markets which share the same demand characteristics. Inline with the observations above about the

betas of the portfolios in general managers actively pursue industries where the income streams are non correlated. It is very important to note that the most highly related firms (Decile 1) had the lowest betas as a portfolio and the highest decile (most unrelated segments) had the highest decile (Although still well below 1). A firm which diversifies into related SICs (defined by survivorship) will show even lower systematic risk than a firm which randomly pursues diversification into unrelated fields. This result and conclusion is significant. There is another reason for this pattern aside from the active managerial pursuit of uncertainty avoidance, that is the pattern of resources used by unrelated diversifiers is different to related diversifiers Kochhar and Hitt (1996). So characteristics of conglomerate such as their debt ratio and degree of operating leverage contribute to their higher betas. This finding is supported by the work of Montgomery and Singh (1984) and Joehnk and Nielsen (1974).

Beta Downside

The results for the Beta downside are also

- Significantly different to the SP1500 Beta D
- Significantly different to each other

Applying to both the equity and equally weighted portfolios.

Through the literature review we were at pains to point out the means by which uncertainty could be reduced and downturns avoided. The ability of diversified firms to offer

- Removal of uncertainty in supply and demand
- Ability to control transfer prices internally
- Ability to control the final market structure
- The ability to avoid market imperfections

Allows the firms to avoid the negative side of the cycle. Beta downside measure the mean semivariance behaviour of firms i.e to what extent can they escape from the market returns asymmetrically.

These results were not as low as the betas (which measure the mean variance behaviour) which is a puzzling outcome. The portfolios as shown above all achieved marketlike returns but with a lower mean variance behaviour but only a slightly lower mean semivariance behaviour. Conceptually the author was expecting the results to be the other way around however the outcomes do follow. The calculation of the Bd uses the 'min' function which effectively truncates the results of the variance to returns that are either negative else they become 0. So for a firm which often enjoys positive performance when the market is undergoing negative returns, this equation will not pick that up. However, the mean variance equation of beta will pick up this pattern and thereby dropping beta. So we can conclude that these firms often show positive returns when there is a market downturn and these results are large enough to reflect strongly on the B but due to the 'min' function embedded in the Bd they do not reflect in the Bd results.

Both the equally weighted and equity weighted portfolios enjoyed the reduction in Bd and both sets showed a good correlation with a quadratic curve (although the equity weighted portfolios enjoyed much better fit. In fact it was mainly the performance of the decile 1, 5 and 6 which moved the equally weighted portfolios off the quadratic equation. This implies that the smaller firms in these portfolios did not follow the rule as strictly. Particularly small firms in decile 1 had a much higher Bd than the larger firms. This means that the most related decile contained small firms which had much higher Bd than the bigger firms and were therefore much more susceptible to downturns than other firms. Even in the equity

weighted portfolios decile 1 had higher Bd than the other portfolios. The reasons may be as follows:

1. Decile 1 Higher Bd in both Equally and Equity Weighted
 - a. The most related firms have the lowest betas as shown above yet their Bd is one of the highest.
 - b. I refer again to the calculation methodology to explain this apparent anomaly: What is occurring is that the decile 1 firms are posting strong performances on the upside when there are market downturns but show, on the other hand, many occasions where when they do drop with the market their drop is more linked than the other deciles. So it is the higher upside during market drops that is crucial in solving this riddle.
2. Decile 1, 5, 6 Higher in Equally Weighted than Equity Weighted
 - a. Overall the Bd levels in the equally weighted portfolios was higher than equity weighted showing that smaller firms are more susceptible to the industry downturns than larger firms. This finding stems from the ability of a larger firm to have moved more transactions internally, have higher market power (initially and not due to the relatedness see above) and greater ability to avoid market imperfections.

If we look ahead at our market value subranked results we see that decile 5 and 6 showed the highest levels of outperform by small cap firms. Taken together with the calculation methodology and we have a complete reason for the abnormal results

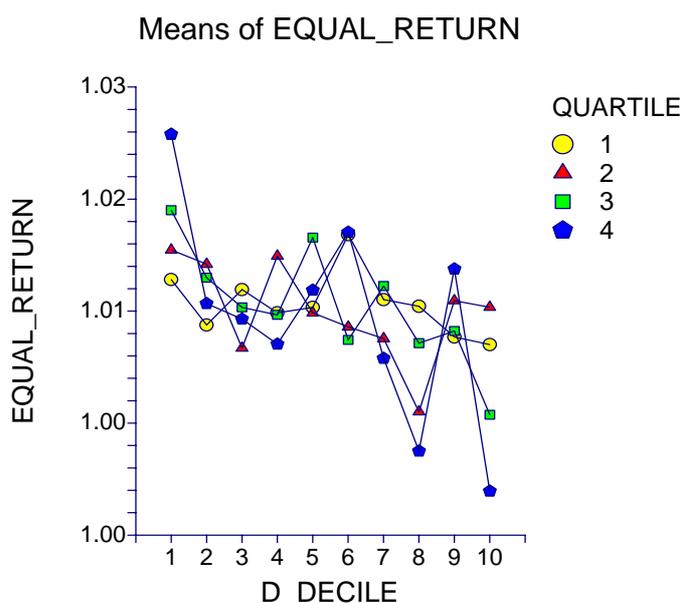
Hypothesis 4

Effects of Subranking

Effect of Subranking on Price to Earnings Multiple

Unlike the study of Fama and French (1992) we did not find any effect of the Price to Earnings Multiple in this series of data on the US market. The data series was sufficiently large to find it containing around 40 000 firm month observations which were ranked and subranked.

Interestingly the equity weighted return portfolios showed a lower return for the higher PEM firms versus the lower PEM firms. However, this trend was reversed in the equally weighted portfolios where the highest PEM firms outperformed the lowest PEM firms. Although neither was significant the author believes that this is due to investor behaviour. Essentially the Price to Earnings multiple should behave in a stable manner predicting the future performance of a firm. However, systematically low PEM firms outperform the market (and again here only as a trend and only on equity weighted portfolios). Small firms however, when awarded a high PEM perform better than large firms, and vice versa according to our data. Perhaps for these smaller firms the risks associated with poor outlooks for future earnings (thereby giving low PEM) are more accurate than with large firms.



In the subanalysis of these results it appears that the performance of the quartiles crosses (at around decile 4 or 5) for the equally related portfolios with the lowest quartile of PEM predicting very poor returns especially in the non related deciles 9 and 10 whereas being associated with improved performance in deciles 1 and 2. This implies that when there is unrelated businesses in a portfolio and the PEM is low the firm will underperform and the market is potentially correct about the ability of the firm to realise these returns in the future. Once given this poor PEM unrelated diversifiers that are small continue to underperform which justifies the concern over their earnings ability. The reason this is not found in the equity weighted portfolio is that larger firms would not face the risks the overall firm from poor performance and so 'can often revert to the mean PEM as they 'weather the bad times'.

Effect of Market Capitalisation on Returns

As in the general market and in accordance with several prior studies including Fama and French (1992) the median returns ranked into quartiles by market value were significantly different and a linear response was obtained. This finding reaffirms the fact that small cap stocks outperform large cap stock in time series.

Further we found that amongst our portfolios, the subranked quartiles for the smallest firm performed the best systematically in 9 out of the 10 firms. i.e. In the equity weighted portfolios quartile 4 (smallest firms by market value) outperformed quartile 1 (largest firms by market value). The impact on the performance was significant and reflected in the repeated measures ANOVA for subgrouping.

So within the portfolios the performance would be improved if only the smaller firms were included. However when we consider this result in conjunction with the results above for performance we again see the pattern. Recall that our Hypothesis 1 showed that the equally

weighted portfolios showed a relationship with relatedness whereas the equity weighted portfolios did not show any relationship and we explained, in some detail, the potential reasons behind that.

The reason that this ANOVA is not significant for equally weighted portfolios is that the smaller firms then have equal representation with the larger firms, so statistically, as a portfolio there should not be a difference which is the result we have. However, even so, when we look into the portfolios we see the improved performance that the smaller firms offer.

Another interesting result in the influence across different deciles of the different quartiles. The equally related portfolios finding is that the smallest quartile had a negative impact on decile 10 performance whereas in the equity portfolios there was a positive impact. The same firms are ranked into the quartiles each time so when equally weighted shows this it implies that the smaller of the quartile underperforms whereas when they are market value weighted, the larger of the small firms performs well therefore the smallest quartile will show that improved response from the larger firms. The author is unaware of any studies around the dichotomous nature of the market value rankings when considering very small firms (most studies eliminate these firms). However, we may expect the same in other quartiles, so why is this so marked only in decile 10 (unrelated) and to a lesser extent decile 9. We propose that, like above, the small firms are able to better manage the relatedness benefits due to closeness to business units. The same closeness becomes a limiting factor in a unrelated diversifier where the lack of transfereable competencies means that the small firms management and resources are spit into tow different arenas where they cannot extract benefits. This provides further evidence for the literature review where we predicted that M form governance is efficient but does not assist in relatedness benefits. A small firm that does

not have key resources in each of the unrelated industries will perform worse; and the results show that.

Effect of Subranking on Price to Book Multiple

Only the equally weighted portfolios showed a significant one way ANOVA on the price to book quartiles. There was a trend that showed the highest price to book firms outperformed the lowest price to book firms and this feature was systematically across all the deciles. However, no regression was significant since the intrasample variability versus the intersample variability was high so the R^2 was around 1%.

The equity weighted portfolios showed no clear relationship and subanalysis showed that the effect was inconsistent across deciles.

We had expected that if there were any result it would be the other direction. Lower price to book values have been shown to be a predictor of future outperformance of the firm on the stock exchange. Again here we may see an example of investor predictions being more accurate in small firms where a high Price to Book Value Ratio implies good prospects.

Conclusion

Diversification provide benefits to the firm that the investor could not achieve. Whilst an investor who can access a sufficiently big universe of stock is able to move away from non systematic risk and balance their potential future earning they have no way of improving the earning of any given portfolio of stocks.

A firm however, is able to improve the performance of several divisions that represent a diversification whilst simultaneously moving away form the industry or business segment risk. Before this finding there should be no reason why firms pay prices when they acquire new firms that are above the market price. If the firm was pursuing diversification then it could have achieved this aim through a portfolio of stocks.

Further it is not the simple cost cutting exercise which allows multisegment firms to outperform their rivals. This may be one part of the rationale but firms can seek to improve their overall performance and reduce their risk through diversification.

The relatedness of a firm as measured by the pairwise relatedness of the industries in which it operates is crucial to determining the returns a firm is going to experience and the level of risk that it will experience. This is true for both large and small firms but the difficulties with managing the unrelated diversification that some firms attempt are particularly sever on small firms and their performance confirms this.

The ability for a firm to transfer core competencies across many division is crucial to realising the benefits of diversification. When the firm enters several related industries it is able to use its experience in some industries to its benefit in others and achieve above average

returns. Further, although the bureaucratic costs of managing relatedness and its benefits are high, they must be managed and firms must ensure that they choose an organisational form which encourages the sharing of key resources.

As a firm attempts to gain these benefits which we have shown, the various means by which the benefits accrue will become evident, but as the means become evident it is also apparent that the difficulty in controlling all of these aspects and monitoring the firm to ensure the performance increases in a non linear manner.

Finally, we have shown that manager diversify to reduce the volatility in their earnings. The results we have shown say that risk reduction is a common feature of diversification, however, by considering the relatedness of the segments into which the firm enters the firm can simultaneously achieve lower risks and superior performance over and above the performance that it would have achieved had the firm pursued an unrelated diversification path.

Reference

- Aaker and Jacobson (1987). The Role of Risk in Explaining Differences in Profitability. *The Academy of Management Journal*, Vol. 30, No. 2. pp. 277-296.
- Aghion, Griffith and Howett (2006). U shaped Relationship Between Vertical Integration and Competition: Theory and Evidence. *International Journal of Economic Theory*. p 353 - 365
- Ang, Chen and Xing. (2006) Downside Risk. *The Review of Financial Studies* v 19 on 4
- Baker, Gibbons and Murphy (2002). Relational Contracts and The Theory of the Firm. *Quarterly Journal of Economics*. Vol 117 Issue 1 pp 39 – 84.
- Balakrishnan and Wernerfelt (1986). Technical Change, Competition and Vertical Integration. *Strategic Management Journal*. Vol 7 No 4 pp 347 - 429
- Berger and Ofek (1995). Diversification Effect on Firm Value. *Journal of financial Economics*. Vol 37. pp 39 – 65
- Bettis (1981) Performance Differences in Related and Unrelated Diversified Firms. *Strategic Management Journal*. Vol 2 pp379 385
- Campa and Kedia (2002). Explaining The Diversification Discount. *The Journal of Finance*. Vol 57 No 4.
- Carlton (1979). Vertical Integration in Competitive Markets Under Uncertainty. *Journal of Industrial Economics*. Vol 27 No 3 pp 189 - 209
- Caves , Porter and Spence (1980). Competition in the Open Economy, Harvard University Press. Cambridge Massachusetts.
- Chandler, A. D., Jr. 1962. Strategy and structure: Chapters on the history of the industrial
- Chatterjee, Lubatkin and Schoenecker (1992). Vertical strategies and market structure: A Systematic Risk Analysis. *Organisation Science*. Vol 3 No 1 pp 138-156

- Chatterjee, Lubatkin and Schuize (1999). Toward a Strategic Theory of Risk Premium: Moving beyond CAPM. *The Academy of Management Review*. Vol 24 No 3 pp 556 – 567
- Christensen and Montgomery (1981). Corporate Economic Performance: Diversification Strategy Versus Market Structure. *Strategic Management Journal* Vol 2 No 4 pp 327 – 343
- Christian S. Pedersen and Soosung Hwang (2007),* Does downside beta matter in asset pricing? *Applied Financial Economics*, 1–18,
- Competition Policy. Office of Fair Trading. Research Paper 12
- Corbett and Karmarkar (2001). Competition and Structure in Serial Supply Chains with Deterministic Demand. *Management Science*. Vol 47 No 7 pp 966 - 978
- D’Aveni and Ilinitch (1992). Complex Patterns of Vertical Integration in the Forest Products Industry: Systematic and Bankruptcy Risks. *The Academy of Management Journal*. Vol 35 No 3 pp 596 - 625
- D’Aveni and Ravenscraft (1994). Economies of Integration versus Bureaucracy Costs: Does Vertical Integration Improve Performance? *The Academy of Management Journal*, Vol 37 No 5 pp 1167 - 1206
- Denis, Denis and Sarin (1997) Agency Problems, Equity Ownership and Corporate Diversification. *The Journal of Finance*. Vol 52 No 1 pp 135 - 160
- Dufeu (1999). Vertical Equilibrium And Industry Growth. Unpublished Manuscript. University of Rennes
- Dufeu (2004). Market Size and Vertical Equilibrium in the Context of Successive Cournot Oligopolies. *The BE Journal of Theoretical Economics*. Vol 4 Issue 1.
- Estrada (2002). Systematic risk in emerging markets: The D CAPM. *Emerging Markets Review*. No 3 pp 365 – 379.
- Fama and French (1992). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*. No 33 p 3-56.

Fama and French (1992). The Cross-Section of Expected Stock Returns *The Journal of Finance*, Vol. 47, No. 2. pp. 427-465.

firms. *Journal of Industrial Economics*, 37: 67-83.

Fontenay and Gans (2005). Vertical Integration and Competition Between Networks. *Review of Network Economics*. Vol 4 Issue 2

Gala (2006). Investment and Returns. Thesis Submission 2006. The University of Chicago, GSB.

Govindarajan and Fisher (1990). Strategy, Control Systems, and Resource Sharing: Effects on Business-Unit Performance. *The Academy of Management Journal*, Vol. 33 No. 2. pp. 259-285

Gulbrandsen (1990). Explaining Vertical Integration: Transaction Cost Economics and Competence Considerations. Sven A Haugland Foundation for Research in Economics and Business Administration. Norwegian School of Economics and Business Administration.

Guo and Dong (2005). Vertical Integration, Exclusive Dealing and Asymmetric Equilibrium in International Differentiated Products Oligopoly.

[Gurio \(2005\). Putty Clay technology and stock market volatility. Thesis Submission Nov 2005. Available at http://people.bu.edu/fgourio/submission0ct4.pdf. University of Chicago](http://people.bu.edu/fgourio/submission0ct4.pdf)

Helfat and Teece (1987) Vertical Integration and Risk Reduction. *Journal of Law, Economics and Organisation*. Vol3 No 1, pp47 - 67

Hill, C. W. L. 1988. Internal capital market controls and financial performance in multidivisional

Hill, C. W. L., Hitt, M. A., & Hoskisson, R. E. 1992. Cooperative versus competitive structures

Jagannathan and Wang (1996). The Conditional CAPM and the Cross-Section of Expected Returns. *The Journal of Finance*, Vol. 51, No. 1., pp. 3-53.

- Jammine and Grant (1988). Performance Differences between the Wrigley/Rumelt Strategic Categories. *Strategic Management Journal*, Vol. 9, No. 4 pp. 333-346
- Joehnk and Nielsen (1974). The Effects of Conglomerate Merger activity on Systematic Risk. *Journal of Financial and Quantitative Analysis*. Pp 999 - 1013
- Jones and Hill (1988). Transaction Cost Analysis of Strategy Structure Choice. *Strategic Management Journal*. Vol 9 No 2 pp 159 – 172.
- Kochhar and Hitt (1998). Linking Corporate Strategy to Capital Structure: Diversification Strategy, Type and Source of Financing. *Strategic Management Journal*. Vol 19 No 6 pp 601 -610.
- Koopmans (1957). Three Essays on the State of Economic Science. McGraw Hill. New York
- Lang and Stulz (1994). Tobin's q, Corporate Diversification, and Firm Performance. *The Journal of Political Economy*, Vol. 102, No. 6. pp. 1248-1280.
- Lettau and Ludvigson (2001). Resurrecting the (C)CAPM: A Cross-Sectional Test When Risk Premia Are Time-Varying. *The Journal of Political Economy*. Vol. 109. no. 6]
- Levy (1985). A Transactions Costs Approach to Vertical Integrations: An Empirical examination. *The Review of Economics and Statistics*. Pp 438 – 445.
- Lieberman (1991). Determinants of Vertical Integration: An Empirical Test. *Journal of Industrial Economics*. Vol 39 No 5 pp 451-466
- Lin (1988). Oligopoly and Vertical Integration: Note. *The American Economic Review*, Vol. 78, No. 1 pp. 251-254.
- Lubatkin and Rogers (1989). Diversification, Systematic Risk, and Shareholder Return: A Capital Market Extension of Rumelt's 1974 Study. *The Academy of Management Journal*, Vol. 32, No. 2. pp. 454-465.
- Markides and Williamson (1994). Related Diversification, Core competences and corporate performance. *Strategic Management Journal*. Vol 15 pp149 - 165

- Markides and Williamson, (1990). Corporate Diversification and Organisational Structure: A Resource Based View. *The Academy of Management Journal*. Vol 39 No 2 pp 340 - 367
- Markovitz (1991). Foundations of Portfolio Theory. *Journal of Finance*. No 49. pp469 - 477
- Miller (2004). Firms Technological Resources and The Performance Effects of Diversification: A longitudinal Study. *Strategic Management Journal*. No 25 pp 1097 - 1119
- Montgomery and Singh (1984) Diversification Strategy and Systematic Risk. *Strategic Management Journal*. Vol 5 No 2 pp 181 - 191
- Montgomery and Wernerfelt (1988). Tobins Q and The Importance of Focus in Firm Performance. *The American Economic Review*. Vol 78 No 1. pp 246 - 250
- Nelson (1990). Is Their Strategy In Brazil. *Business Horizons*. July – August 1990. pp15 - 23
- Opler and Titman (1994). Financial Distress and Firm Performance. *The Journal of Finance*. Vol 49 No 3.
- Palich, Cardinal and Miller (2000). Curvilinearity in the Diversification Performance Linkage: An Examination of over Three Decades of Research. *Strategic Management Journal*. Vol 21. No 155 - 174
- Pandya and Rao (1998). Diversification and Firm Performance: An Empirical Evaluation. *Journal of Financial and Strategic Decisions*. Vol 11 No 2
- Petersin and Strongin (1996). Why Are Some Industries More Cyclical than Others? *Journal of Business & Economic Statistics*, Vol. 14, No. 2. pp. 189-198.
- Prahalad and Bettis (1986). The Dominant Logic: A New Linkage Between Diversity and Performance. *Strategic Management Journal*. Vol 7 No 6 pp 485 - 501
- Robins and Wiersema (1995). A Resource-Based Approach to the Multibusiness Firm: Empirical Analysis of Portfolio Interrelationships and Corporate Financial Performance.

Roll, R. (1986). 'The Hubris Hypothesis of corporate takeovers', *Journal of Business*. 59(2), pp. 197-216.

Rumelt (1982). Diversification Strategy and Profitability. *Strategic Management Journal*, Vol. 3, No. 4. pp. 359-369.

Schoeffler, Buzzell and Heany (1974). Impact of Strategic Planning on Profit Performance. *Harvard Business Review*. Pp 137 - 145

Subrahmanyam and Thomadakis (1980). Systematic Risk and The Theory of the Firm. *Quarterly Journal of Economics*. No 94 pp 437 451

Sutcliffe and Zaheer. Uncertainty in the transaction environment: An Empirical test. *Strategic Management Journal*. Vol 19 pp 1-23.

Tirole and Holmstrom (2005). Transfer Pricing and Organizational Form. *Journal of Law, Economics, & Organization*, Vol. 7, No. 2. pp. 201-228.

Villalonga (2004) Diversification Discount or Premium? New Evidence from the Business Information Tracking Series. *The Journal of Finance*. • VOL. LIX, NO. 2

Villalonga (2004). Does Diversification Cause the "Diversification Discount"? *Financial Management*; No 33

Wagenhofer (1994). Transfer pricing under asymmetric information. *European Accounting Review*. Vol 3 No 1

Williamson (1975). Markets and Hierarchies: Analysis and Antitrust Implications. Free Press, New York

Appendices

Appendix A

Mahoney Management Matrix

	Low Task Programmability		High task programmability	
	Low specificity	High specificity	Low specificity	High specificity
Low non-separability	1: spot market	2: long-term contract	5: spot market	6: joint venture
High non-separability	3: relational contract	4: clan (hierarchy)	7: inside contract	8: hierarchy

Definitions:

Low task programmability: Observing input (effort) is a poor measure for making rewards.

High nonseparability: Observing output is a poor measure for making rewards.

High specificity: Human, physical and/or site firm-specific investments are high.

Spot market: The price system works smoothly.

Long-term contract: Obligations of principals and agents are specified and enforced by third-parties (courts)

Relational contract: Obligations of principals and agents are specified and self-enforced. Social conditioning is applicable.

Inside contract: A hybrid arrangement between contract and hierarchy that is best described as a 'manager as monitor' setup.

Joint ventures: An equity agreement whereby a separate entity is created.

Hierarchy: A superior-subordinate relationship; financial ownership.

Clan: Organization that is based on a vital sense of human solidarity.

Appendix B

Gulbrandsen Typology

A typology of predicted governance forms

		AS	
		Low	High
CCC	Low	1. Marked High PC differences (M) High TC differences (M)	2. Marked High PC differences (M) No TC differences
	High	3. Market Marginal PC differences (M) No TC differences	4. Hierarchy High TC differences (H) Marginal PC differences (M)

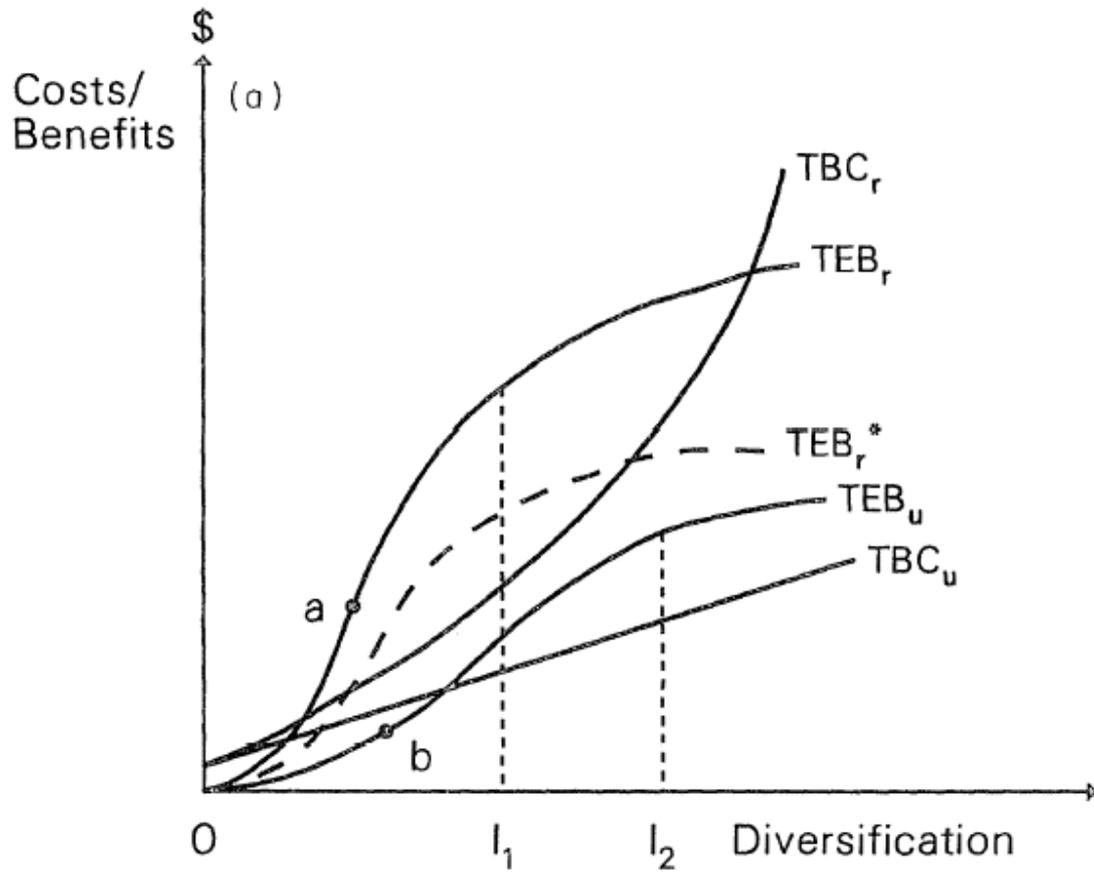
Appendix C

Jones and Hill Benefits Typology

Strategy	Interdependence	Economic Benefits
Unrelated diversification	Pooled	Internal capital market
Vertical integration	Sequential pooled	Economies of integration Internal capital market
Related diversification	Reciprocal sequential pooled	Economies of scope Economies of integration Internal capital market

Appendix D

Jones and Hill Costs and Benefits Graphs



Appendix E

Hill (1988) Matrix for Firm form Classification

