EXPLORING THE CORPORATE RISK OUTCOMES OF EFFECTIVE DYNAMIC CAPABILITIES

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Abstract

The economic turmoil over the past decade has accentuated the focus on corporate risk management and organizational adaptability under turbulent market conditions. However, there is little empirical evidence assessing whether promoted risk approaches are in fact associated with favourable corporate risk outcomes. Here we introduce the concept of dynamic capabilities as firm-specific adaptation under environmental turbulence that avoids extreme loss situations and provides stable business development. We test the relationship between effective dynamic capabilities and corporate risk outcomes in two large samples over two 10-year periods (1991-2000 and 2001-2010) representing distinctly different macro-economic conditions. The analysis uncovers significant positive risk outcomes effects in both periods, which suggests that dynamic capabilities may serve as a conceptual foundation to better understand effective risk management practices.

Keywords: Altman's Z-score, Downside risk, Dynamic capabilities, Enterprise risk management, Environmental turbulence, Organizational adaptation

Introduction

A number of empirical studies have found significant increases in performance volatility and firm exits with periods of industry leadership becoming ever shorter (Baker & Kennedy, 2002; Comin & Philippon, 2006; Thomas & D'Aveni, 2009; Wiggins & Ruefli, 2005). These findings seem to reflect a more hostile and unforgiving competitive landscape, where it is difficult to build sustainable competitive advantage, and where the consequences of mal-adaptation are increasingly severe. The challenge of competing under uncertainty has been at the core of strategy and organisation theory for a long time (Thompson, 1967), as the failure to respond to environmental change can hurt firm performance severely (Audia, Locke & Smith, 2000). These developments have promoted use of formal Enterprise Risk Management frameworks (e.g., COSO, FERMA and ISO)[1] and promoting Chief Risk Officers to oversee them (Meulbroek, 2002; Liebenberg & Hoyt, 2003; Pagach & Warr, 2011). A number of studies have investigated use of derivatives in risk management and found that they reduce price sensitivity, where lower cash flow variability is associated with more favorable financing costs and higher stock valuations (Minton & Schrand, 1999; Smithson & Simkins, 2005; Rountree, Weston & Allayannis, 2008).

In strategy, risk management is captured by the concept of dynamic capabilities. In essence, these capabilities reflect how firms sense change, develop responses, and reorganize to match the changing requirements and stabilize performance (Andersen, Denrell & Bettis, 2007; Teece, Pisano & Shuen, 1997). However, empirical studies on the risk-return effects of dynamic capabilities are far between, even though this is a fundamental concern among scholars (e.g., Teece, 2007; Zollo & Winter, 2002). Hence, there is a gap in our understanding

[1] The Committee of Sponsoring Organizations of the Treadway Commission (COSO) has established a common internal control and risk management model; The Federation of European Risk Management Associations (FERMA) facilitates exchange of experiences among risk managers based on a generic risk management framework; The International Organization for Standards (ISO) issued a standard ISO 31.000 outlining general principles and processes for managing risk.

of whether effective dynamic capabilities are in fact associated with better risk outcomes (Barreto, 2010; Protogerou, 2011). In this paper, we try to fill this gap through a comprehensive empirical study.

In this study, we test if effective dynamic capabilities (EDC) improve the firm's risk conditions measured by Altman's Z-score, the Beta-coefficient, and downside risk. The study is based on two samples of US firms during the international growth period 1991-2000 (1,097 firms) and the turbulent crisis period 2001-2010 (1,234 firms). We use two time periods to assess the robustness of results in two distinct macroeconomic environments. This is important as risk perceptions can vary over time and under different business conditions (Fiegenbaum & Thomas, 1986; Wiseman & Catanach, 1997).

Background

Strategic management tries to explain sustainable competitive advantage that leads to stable performance differentials among firms (Rumelt, Schendel & Teece, 1994). During the 1970s, '80s and '90s, industrial organisation scholars offered the view that firms' resources are homogenous, i.e. evenly distributed among firms, and that firms achieve competitive advantage by picking an attractive industry and carving out a competitive position within it (Porter, 1980). The field later shifted attention to the firms' stock of unique resources and firm-specific capabilities as the principal source of performance differentials (Hoskisson, Hitt, Wan & Yiu, 1999). However, it does not explain how resources are updated and new ones created under changing competitive conditions, which is where dynamic capabilities come into the picture (Ambrosini & Bowman, 2009).

The concept was originally defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano & Shuen, 1997: 516). Effective dynamic capabilities help the firm identify and address external threats and thereby reduce potential risk for extreme adverse outcomes.

Adaptation to environmental changes can happen by sensing external threats, seizing possible responses, enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise (Teece, 2007). The ability to sense, seize and reconfigure can reside in different parts of the firm as development and corporate restructuring (Danneels, 2002; Helfat, 1997; Karim & Mitchell, 2000; Moliterno & Wiersema, 2007), alliances (Kale, Dyer, & Singh, 2002; Kale & Singh, 2007), roll-outs (Winter, 2003) and knowledge integration (Henderson & Cockburn, 1994; Iansiti & Clark, 1994). Dynamic capabilities are seen as resource-based organisational processes (Barreto, 2010) that are tacit in nature (Easterby-Smith, Lyles, & Peteraf, 2009), path dependent (Zollo & Winter, 2002) and embedded within the firm (Eisenhardt & Martin, 2000). Hence, they are typically developed internally rather than available in the market (Makadok, 2001). The diverse micro-elements that form the concept are difficult to measure. However, the embedded responses align the firm to on-going market changes, so it maintains earnings momentum as an aggregate expression of the firm's ability to adapt to changing external requirements.

Hypothesis Development

The possession of dynamic capabilities may not necessarily equate superior risk outcomes since the relationship to competitive advantage is indeterminate (e.g., Helfat et al, 2007; Zollo & Winter, 2002; Winter, 2003). It will eventually require an empirical investigation to shed more light on both potential performance and risk relationships. There are more and less effective ways to execute dynamic capabilities and firms will create long-term competitive advantage by "using dynamic capabilities sooner, more astutely and more fortuitously than the competition" (Eisenhardt & Martin 2000: 1117). This means that firms most likely display varying levels of effectiveness in using its dynamic capabilities to achieve new resource configurations that are unique to the individual firm. Hence, firms with more effective dynamic capabilities relative to industry peers should produce more steady earnings flows compared to competitors (Andersen, 2009). The relationship between dynamic capabilities and risk can be understood from a business development as well as an operational perspective. Hence, the firm may adapt its resources to exploit untapped market potential (Helfat & Winter, 2011) related to sensed changes in customer needs, technological advancements, or shifts in economic conditions. The firm can also gain operating advantages by minimizing the risk of shortage and excess capacity and inventories during upturns and downturns respectively (Miller & Chen, 2003).

A firm with better responses and dynamic capabilities adapt to external threats and reduce the odds for lower-than-expected returns. Thus effective dynamic capabilities reduce earnings volatility and shield the firm from adverse risk outcomes. However, the environmental conditions under which dynamic capabilities are most important are disputed. The original definition implies that dynamic capabilities are mainly applicable in turbulent environments, such as IT, biotech and semiconductors (Teece, Pisano & Shuen, 1997). Martin & Eisenhardt (2000) take a broader view applying dynamic capabilities to all firms, whether they operate in turbulent industries or not. They argue that, in more stable environments, dynamic capabilities apply more stable analytical processes in contrast to experiential and unpredictable processes in turbulent environments (Eisenhardt & Martin, 2000). Hence, we will be able to ascertain both general as well as potential differential risk outcome effects across firms operating in different industry contexts and in sub-periods with different macro-economic conditions. Given that the level and severity of disruptive events arguably are increasing and have been high also during the periodic crises in the 2000s, it might be expected that the risk effect of effective dynamic capabilities will prevail unabated in different time periods. These considerations lead to the following hypothesis.

H1: Firms with effective dynamic capabilities compared to industry peers will display favourable associations to measures of corporate risk outcomes

We conducted an empirical study to test the hypothesis, which is outlined and discussed in the following.

Methodology

Sample selection

Two samples were extracted from the Compustat North America database for the two periods 1991-2000 and 2001-2010. We included both inactive and active companies to minimise survivorship bias, although it cannot be eliminated fully as only firms with data for all years within each of the periods are included. The sample is cross-sectional and includes firms in primary industries (SIC: 0-1999), manufacturing (SIC: 2000-3999), trade (SIC: 4000-4999), networks (SIC: 5000-5999) and various services (SIC: 7000-8999). All financial institutions (SIC 6000-6999) were excluded, however, as they are highly regulated and exhibit different risk-return characteristics compared to non-financial firms (Rajan & Zingales, 1995). The distribution of firms by 1-digit SIC codes is shown in Figure 1.

Insert Figure 1.

Data cleaning was kept to a minimum, but we removed firms if they displayed negative values for equity, invested capital, revenue or SG&A expenditures in one or more years. Firms with revenues below 5 mio US $ in any given year were also excluded, as they are insignificant in size and may create extreme outliers. The effect of the different screens can be seen in Table 1.

Insert Table 1.

Descriptive statistics

The R&D ratio in the 1991-2000 sample is 2.9% compared to 5.5% in 2001-2010 and is more volatile in the latter period. The average organisational slack ratio is 21.1% in the 1990s compared to 28.2% in the 2000s. Financial leverage fell slightly from 14.1% to 13.6% between the two periods likely reflecting more restricted access to debt financing. Some differences stem from distinct firm characteristics in the two samples with a higher share of young technology firms in the latter period. The general tendencies between the two periods remain, however, when investigating the descriptive statistics on a sub-sample of the 456 firms represented in both time periods.

Data from the two sub-periods were used to test the hypothesised effects and investigate whether macroeconomic environments affect the risk outcomes over time (Baucus, Golec, & Cooper, 1993; Fiegenbaum & Thomas, 1986; Ruefli, 1990). Hence, we split the analysis across two sub-periods 1991-2000 and 2001-2010. The 1990s represent a period of relative stable international expansion and economic progress with US GDP growing at an average inflation-adjusted rate of 3,4% p.a. with the S&P 500 increasing 457% percent to the end of 2000 (Figure 2). The volatility represented by the Chicago Board Options Exchange Market Volatility Index[2] (VIX), averaged 18.48 from 1991-2000 influenced by the Mexican peso crisis (1995), Asian currency crisis (1997) and Russian debt default (1998) with a 50% devaluation of the Ruble.

Insert Figure 2.

The period 2001-2010 was a more volatile commercial environment including events like the burst of the dot-com bubble, the collapse of the World Trade Centre on 9/11 2001, and the Great Financial Crisis (GFC) in 2008. US GDP grew with an average inflation-

[2] VIX measures the implied volatility of S&P 500 index options and roughly measures the expected movement in the S&P index over the upcoming 30 days. Despite often being called a ‘fear index’, in fact it captures investor expectations about both upside and downside (cboe.com)

adjusted rate of 1.6% p.a. (US Bureau of Economic Analysis) and the S&P 500 fell 3.2% during the 2000s (Figure 2). The market instability was reflected in an average VIX of 22.04 over the period.

Dependent variables

Risk outcomes – Several measures of risk outcomes have been advanced in prior studies. Here we chose three risk measures based on market as well as accounting based data: Altman's Z-score, the beta coefficient, and downside risk.

Altman's Z-score captures expected credit default risk, beta (β) is a proxy for market-based systematic risk, and downside risk reflects the propensity for below par loss outcomes. Altman's Z measures the distance from bankruptcy, which means, that a lower Z value signifies a higher likelihood of bankruptcy. Altman's Z is defined as (1.2 × working capital divided by total assets) + (1.4 × retained earnings divided by total assets) + (3.3 × earnings before interest expense and taxes divided by total assets) + (0.6 × market value of equity divided by total liabilities) + (1.0 × sales divided by total assets) (Altman, 1983).

Systematic risk is one of the most important risk metrics for publicly listed firms (McAlister, Srinivasan, & Kim, 2007). It reflects movements in equity prices caused by shifts in economy-wide factors including growth, inflation, interest and exchanges rates. Beta (ß) measures the systematic risk derived from portfolio theory, which asserts that investors can eliminate a portion of a stock's risk by combining it into a portfolio of stocks with imperfectly correlated returns (Lintner, 1965; Sharpe, 1964). The theory suggests that with a stock market in equilibrium the prices only reflect the stocks' systematic risk driven by the extent to which stock returns change with overall market returns (Bodie, 2007). The complete stock market will have a ß of 1, whereas stocks whose return falls (rises) more than market return falls (rises) will have a ß that is larger than 1. Stock whose return generally fluctuates less than the market will have a ß that is less than 1 (Bodie, 2007). Thus, ß measures how sensitive a firm is to overall market fluctuations. Following Beaver et al. (1970) and McAlister et al. (2007) we use monthly stock data to compute firm i's systematic risk measure, $ß_i$ for a 10-year period by regression firm i's returns on the indexed return of the full sample (Appendix A).

Downside risk is an accounting-based risk measure using return on assets or analyst forecast of firm income as the basis (Miller & Bromiley, 1990; Wiseman & Bromiley, 1996). Downside risk captures a firm's propensity to produce performance outcomes below a certain level compared to the general industry. It reflects a view of risk as the potential for down-side losses. Miller & Leiblein (1996) show how this conception of risk is more closely aligned with how managers and financial analysts tend to define risk (Baird & Thomas, 1990; Mao, 1970; March & Shapira, 1987; Miller and Leiblein, 1996; Miller and Reuer, 1996). We follow Miller & Leiblein (1996) and compute firm i's downside risk (DR_i) as the second-order root lower partial moment using the annual mean ROA (Appendix B).

Explanatory variables

Effective Dynamic Capabilities (EDC) are proxied by the standard deviation of the return on invested capital (St.d. (ROIC)) over a 10-year period with the measure interpreted inversely. This means that stronger dynamic capabilities are reflected in lower volatility in investment returns because the firm has been effective in adapting its resource base to the changing environmental conditions thereby guarding against major losses and securing more stable investment returns. So, the underlying intuition is that the better a firm is at adapting to its environment and avoiding excessive losses the better it is at maintaining a steady earnings flow over an extended period of time.

Using a period of 10 years to calculate EDC captures effects of dynamic capabilities as a repeatable process used intentionally and persistently by firms in agreement with scholars in the field (e.g., Helfat, 2007; Zahra, 2006; Zollo & Winter, 2002). The ability to adapt resources and engage in strategic change, as captured in a relatively EDC measure cannot, however, be fully ascribed to the presence of dynamic capabilities. This is because strategic changes also can be affected by incidents of luck (Barney, 1991), ad hoc interventions (Winter, 2003) and emergent non-deliberate processes (Mintzberg & Waters, 1985). This obviously decreases the internal validity of the measure as a proxy for effective dynamic capabilities. However, the EDC measure is a good aggregate proxy for the concept that is consistent with the underlying theory even though it entails no detailed description of the underlying phenomenon.

Control variables

We included a number of control variables to ensure that the reported effects of EDC are true and not just stem from omitted explanatory variables.

Size – often correlates negatively with risk outcomes. Based on the logic that firm size reflects past success and the accumulation of resources and competencies will enable the firm to deflect risky situations. Fama & French (1993) found support for such a logic by showing that size reflects economic fundamentals with a higher risk premium ascribed to small firms. Firm size is measured by value of total assets included as the natural logarithm of total assets to correct for a positive skew in the data (e.g., Chiu & Liaw, 2009; George, 2005; Jermias, 2008; O’Brien, 2003; Tong & Reuer, 2007).

Advertising ratio – reflects a means of product differentiation and is expected to correlate negatively with risk outcomes, as advertising spending can serve as buffer to stabilise earnings and create intangible assets that insulate the firm from economy-wide downturns (e.g., Hurdle, 1974; McAlister et al., 2007). We measure the advertising ratio as advertising expenditures divided by sales (e.g., Hurdle, 1974; Erickson & Jacobson, 1992; Joshi & Hansens, 2004; Leone, 1995; McAlister et al., 2007).

R&D intensity – reflects the firm's formal resource allocation that emphasizes new solutions to deal with changing conditions, which consequently might influence risk outcomes. It is measured as R&D expenditures committed to the development of new products and services divided by total revenue. This measure is widely used as proxy for a firm's innovation investments (e.g., Ho et al., 2006; O'Brien, 2003; Kotabe, Srinivasan, & Aulakh, 2002; Lu & Beamish, 2004). In the case of missing data for R&D expenditures, they were assumed to be zero, in line with prior studies (e.g., Minton & Schrand, 1999).

SG&A ratio – can be seen as a proxy for a firm's level of organisational slack that may affect risk outcomes in two different ways. Either it can serve as an extra resource buffer under environmental pressures that facilitates experimentation and responsive solutions to threats (Lev & Radhakrishnan, 2005) or as a safety buffer that allows the firm to postpone necessary, but risky changes (Love & Nohria, 2005). The SG&A ratio is measured as selling, general, and administrative expenses divided by total sales (Tong & Reuer, 2007).

Financial leverage – is an inverse measure of slack whereby firms operating with low financial leverage have a higher debt capacity for new responsive investment purposes, which might influence risk outcomes. Financial leverage is measured as the ratio of book value of debt to book value of total assets in line with previous studies (e.g., O'Brien, 2003; Vicente‑Lorente, 2001).

Asset growth – can be seen as a function of a firm's 'excess' earnings opportunities, where the expected return on the capital acquisition exceeds the costs of capital (Beaver, Kettler, & Scholes, 1970). In a competitive economy 'excess' earnings opportunities will diminish as firms enter the industry (Brealey, Myers, & Allen, 2007), which can affect systematic risk (Beaver, Kettler, & Scholes, 1970; McAlister et al., 2007).

Dividend payout – is viewed as a means of serving particular investor clienteles, reducing agency effects or signalling optimism about future value (Brealey et al., 2007). The effect on risk outcomes arises because dividend payout can be seen as a proxy for management's perceived uncertainty of future earnings (Beaver, Kettler, & Scholes, 1970). The empirical literature has found a *negative* relationship between dividend payout and systematic risk (e.g., Beaver, Kettler & Scholes, 1970; Ben-Zion & Shalit, 1975; Carter & Schmidt, 2008).

Variable treatment

There are systematic differences in performance across industries (e.g., McGahan & Porter, 1997; Porter, 1979, 1980; Ruefli & Wiggins, 2003). To control for potentially confounding industry-specific effects, all measures were standardised by each firm-year observation across two-digit SIC codes (see Appendix C for a description of the method). Furthermore it is important and desirable to study how the variables influence risk outcomes over time. To do so, all the standardised dependent and independent variables, except beta and effective dynamic capabilities (EDC) were averaged over each 10-year period to eliminate spurious year-on-year effects consistent with previous studies (e.g., Li & Simerly, 2002; Reuer & Leiblein, 2000).

Results

Correlations

The correlation coefficients between the standardised variables provide a first sense for the direction and strength of the direct linear relationships between all variables used in the study. The three risk measures exhibit the expected consistency in both periods as beta and downside risk are positively and significantly correlated, while they both are negatively correlated with Altman's Z (Table 2). An upward shift during the 2000s can be noted in the beta correlations with both Altman's Z and downside risk indicating a higher degree of systematic risk relative to accounting risk compared to the 1990s. EDC show the expected relationship with all three risk measures, as the measure is positively (negatively) correlated with beta and downside risk (Altman's Z). EDC are negatively correlated with financial leverage, which is consistent with the previously discussed thesis: that more stable earnings make it possible for firms to increase their leverage.

Insert Table 2.

Regression results

The hypothesis is tested with Altman's Z-score, beta, and downside risk as dependent variable and EDC plus control variables as independent variables in regressions performed for each of the two sub-periods 1991-2000 and 2001-2010.

The regression models with Altman's Z-score, beta, and downside risk as dependent variable all display statistically highly significant ($p < 0.0001$) coefficients consistent with the hypothesized risk relationships in both periods 1991-2000 and 2001-2010 respectively (Tables 3, 4, and 5). The regressions analyses display a positive (negative) and statistically significant relationship between EDC and both beta and downside risk (Altman's Z-score), which yield *support for hypothesis H1*. This suggests that firms with stronger dynamic capabilities relative to their industry peers also tend to experience lower levels of credit default risk, have stocks valued in the market with lower levels of systematic risk, and have a much lower propensity to experience excessive losses. In short, they are better at responding to and fending against the broad-based fluctuations in the economy.

Insert Table 3.

Insert Table 4.

Insert Table 5.

As expected, the analysis provides *strong support for hypothesis H1*, with significant parameter estimates with expected signs on EDC in both sub-periods. Adding EDC to the control models significantly increases their explanatory power, which attests to a strong association between dynamic capabilities and favourable risk outcomes.

Assumptions and robustness

All the regressions were analysed to understand the sensitivity to outliers. This was done by a process of removing influential outliers one by one, beginning with the observation with the highest Cook's D value and ending with the last observation in the sample with a Cook's D above 4/(n-k-1). Hence, all the reported regression results are based on the datasets with most outliers taken out, i.e., datasets only containing observations with Cook's D below 4/(n-k-1). On average 50 outliers were removed from each model to reflect stable and generalizable results. We conducted tests to ensure that potential issues that may cause biases were identified and dealt with. We tested for normality of residuals, heteroscedasticity and multicollinearity.The distributional characteristics of regression residuals were tested by visual inspection of normal probability plots. The analyses reveal only slight and immaterial variations of residual normality in the regressions. Heteroscedasticity arises when the unobservable error is non-constant. This does not bias the OLS coefficients, but the computed standard errors will be biased downward and t- and F-tests invalidated. We tested for heteroscedasticity in the regression by applying the White test (White, 1980), where the squared residuals from the OLS regression were regressed on the dependent variables as well as their squares and cross-products (Wooldridge, 2009). We reported the regression results with heteroskedasticity consistent standard errors to provide more conservative and appropriate statistical errors.

Measurement errors in the explanatory variables can introduce both bias and inconsistency in the estimation of OLS coefficients. Measurement errors arise when an imprecise measure of an economic phenomenon is used in a regression. For example, there can be potential issues with measurement error on reported R&D investments where the R&D/sales ratio is a less precise measure in companies with no or low R&D activities, such as, service-based companies (Hipp & Grupp, 2005; Kleinknecht, 1987). Similarly, we can challenge to what extent the aggregate measure of effective dynamic capabilities truly captures the complex nature of a firm's deployment of dynamic capabilities. The literature typically suggests using an instrumental variable, if it can be found. Otherwise, it is assumed that the measurement error is uncorrelated with each of the explanatory variable, which ensures unbiased and consistent estimation of OLS coefficients.

In the case of effective dynamic capabilities effectiveness, it is also reasonable to ask whether a firm can focus *too much* on continually transforming and adapting its resource and capability base? Ghemawat (1991) and Porter (1990) find that the most successful firms have a high degree of consistency in their strategy, suggesting that the firm can become too dynamic and adapt too much to its environment. Hence there seems to be a trade-off between consistency and adaptability (Selznick, 1957). In parallel, March (1991) underlined the importance of firms balancing exploring the future with exploiting current ways of doing business. We tested this by including second-order direct effects of EDC into the regressions and we do find support for the assertion of diminishing effects on the ability of dynamic capabilities to create lower-risk outcomes.

We checked for robustness by running similar regressions in both time-periods using the same sub-sample of 456 firms that operated throughout all years in the entire 20-year period. This sub-sample consists of all the firms that are part of both full samples, hence representing relatively mature and stable companies. The central insight from the test is that sampling error does not drive reported results. All the analytical results for the two sub-samples are comparable with only minor immaterial differences.

Discussion

The relatively few studies assessing the relationship between earnings stability and risk outcomes are generally consistent with the hypothesis developed herein as they show indirect evidence that cash flow volatility increases the cost of capital (e.g., Beaver, Kettler, & Scholes, 1970; Minton & Schrand, 1999).

Dynamic capabilities

There has been a general shortage of empirical studies seeking to understand the effects of effectively creating and deploying dynamic capabilities. Part of the explanation for this is the challenge connected with developing appropriate measures of firm-specific dynamic capabilities (Easterby-Smith et al., 2009). This study makes a modest contribution towards filling this gap by suggesting the 10-year average of standard deviation of a firm's return on invested capital as an inverse expression of how effective the firm is at building, maintaining and deploying dynamic capabilities. This provides an empirical basis for the argument that effective dynamic capabilities lead to superior risk outcomes. The underlying mechanism explaining this relationship is that effective dynamic capabilities enable the firm to continually deflect risk events that arise and exploit burgeoning opportunities in its markets as they change. Such enhanced adaptability ensures a steady earnings trajectory, which translates into lower risk. The findings support that this relationship holds for several accounting and market-based risk measures.

The results are also noteworthy with regard to the theoretical discussion about the environmental conditions under which dynamic capabilities are most effective. By studying two adjacent time periods with markedly different economic environments, the results generally suggest that effective dynamic capabilities persistently create favourable risk outcomes under different conditions of economic turbulence. This makes sense as effective dynamic capabilities enable firms to adapt under volatile environmental conditions. So far, the focus of dynamic capabilities has primarily been on the role in the industry environment (e.g., Eisenhardt & Martin, 2000; D. Teece et al., 1997). These results therefore invite dynamic capabilities scholars to broaden the focus to include studies of broader industry contexts and in different macroeconomic environments.

Risk management

Building on the resource-based view, the dynamic capabilities literature has been mostly occupied with the construct as a means of creating excess returns. Less attention has been directed at how developing and deploying dynamic capabilities can help the firm shape a more attractive risk profile. Thereby this study can both suggest a theoretical explanation of previous empirical findings within the finance and strategic management literatures as well as provide empirical evidence that advances the study of risk management.

Within strategic management, the results presented here corroborate with Miller & Leiblein (1996), finding a positive association between earnings variability and downside risk. Similarly, the results align with the finance literature, where Beaver, Kettler, & Scholes (1970) find a negative relationship between earnings variability and systematic risk. In parallel, Minton & Schrand (1999) find a positive relationship between cash flow volatility and the cost of debt and equity. The above scholars pay less attention to the dynamics that shape such lower earning variability. It thus makes sense to propose that it is by efficiently developing and deploying a set of dynamic capabilities that the firm is able to achieve a stable flow of earnings, resulting in lower, and thus more attractive, risk outcomes.

The risk management literature has broadened its traditional focus on hazards, economic risks and operational breakdowns to include strategic risks stemming from changes in consumer preferences, competitor strategies or regulation (Miller, 1998). As such strategic risks tend to be both highly firm-specific as well as hard to measure and foresee, several scholars (e.g. Andersen, 2009; Henriksen & Uhlenfeldt, 2006; Miller, Kurunmäki, &

O'Leary, 2008; Power, 2007) deem centralised risk management systems and standardised risk-transfer techniques less useful in dealing with such exposures. In this regard, Andersen (2008, 2009) highlights the role of organisational responsiveness as a means of managing (strategic) risks and further empirically shows that dampened earnings volatility as a result of the firm using its responsiveness to better manage exogenous risk factors strengthens firm performance (Andersen, Denrell & Bettis, 2007). The results herein build on these findings to suggest that not only do stronger firm responsiveness and adaptability strengthen performance; it also directly drives lower credit default, downside and systematic risk outcomes. This means that effective dynamic capabilities act both as a means of dealing with industry-specific strategic risks, which could lead to severe underperformance, and as a way of insulating firms from changes in the stock market and the broader economy.

Limitations

Aggregate constructs – the study measures the risk effect of effectively developing and deploying dynamic capabilities at an aggregated level. The use of rough proxies limits ability to describe the underlying real world phenomena and relationships that we are trying to portrait and understand. Hence, it would be very interesting and useful to further investigate the organisational mechanisms governing the firm-specific dynamic capabilities and how they help the firm adapt under different environmental circumstances. This requires deep qualitative analyses of firms that represent the positive risk outcomes effects, which is beyond the scope of the current study. Yet, we observe significant effects of dynamic capabilities during the 1990s and the 2000s and gaining more insights about these phenomena requires access to more granular and firm-specific data than is available in the existing accounting data. Penrose (1959) underlined the difficulty in measuring routines and processes that are likely to be idiosyncratic to firms. It might therefore make sense to conduct complementary survey-based studies or case-study analyses to understand the above questions at the industry and/or firm level as shown by, e.g., Galunic and Eisenhardt (2001), Lampel and Shamsie (2003), Pablo et al. (2007), and Rosenbloom (2000).

We have not specifically addressed the issues pertaining to endogeneity problems in this study even though it is likely that there are potential reverse causality issues playing out. It could be argued, for instance, that performance creates slack resources (e.g., Penrose, 1959), which can then affect performance both directly and indirectly by supporting the effectiveness of dynamic capabilities. However, performance is reflected in higher earnings and unless a firm deliberately increase its dividends or debt, such higher profits will be retained and thereby add to shareholder equity, which influences the capital structure directly (Miller & Bromiley, 1990). Given that capital structure is controlled for in the regressions, this minimizes the risk of reverse causality. Similarly, inverse causality may take place when we use investment return variability as a measure of dynamic capabilities. Miller & Bromiley (1990) found that firm performance influences subsequent earnings variability differently across high- and low-performing firms. They explain this with prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981) arguing that high (low) performers will tend to be more (less) risk averse, subsequently leading to less (more) variable performance. Two ways of circumventing such potential simultaneous causality issues would be to use panel data and time lags or a simultaneous equations model for estimation, such as two-stage least squares (Wooldridge, 2009).

Conclusion

This study finds general support for a key hypothesis, namely that when firms use their dynamic capabilities in an effective way to avoid threats and manage opportunities in its environment, it will lead to lower market- and accounting based risk outcomes. This indicates that effective dynamic capabilities are particularly important for shaping attractive risk outcomes when the overall economy is turbulent and volatile. The reported results invite further scholarly studies into the art of quantifying the unruly concept of dynamic capabilities and the mechanisms that lead to a more favorable risk profile. The study underscores that dynamic capabilities play a central role in risk management processes that facilitate corporate adaption under turbulent economic conditions.

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Figure 1. Distribution of Firms Across One-digit SIC-code Industries

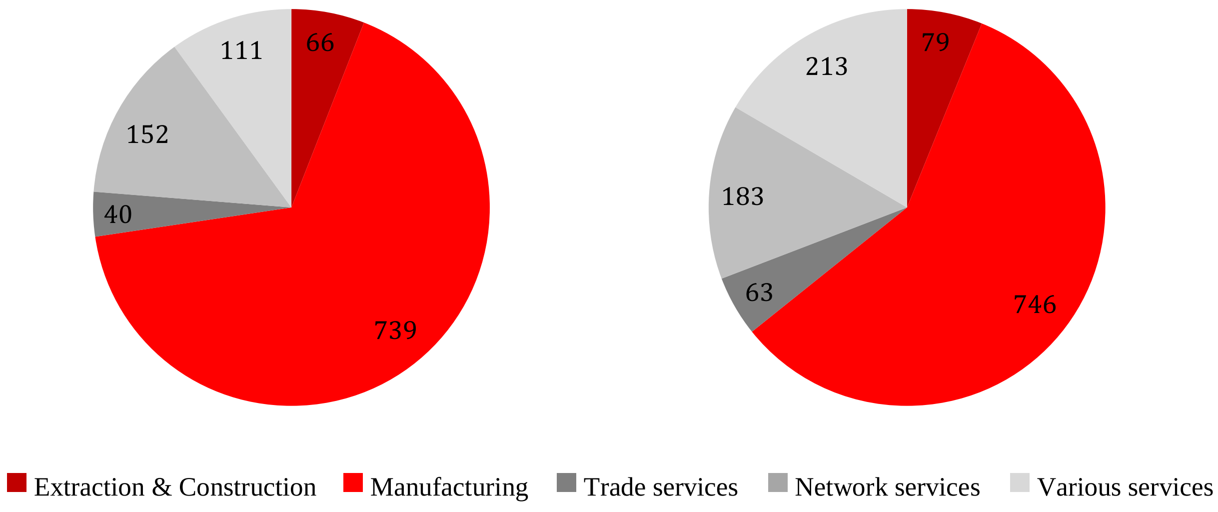
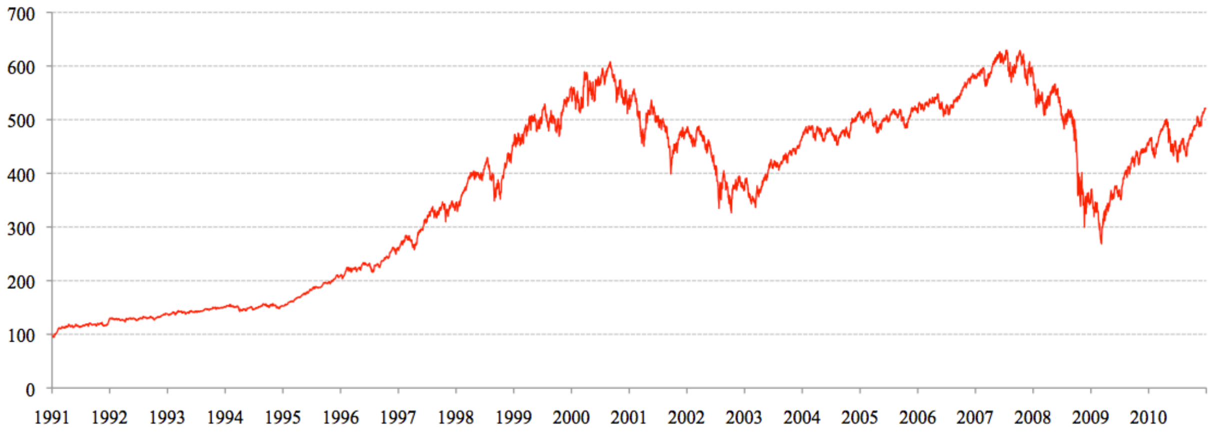


Figure 2. The Development of the S&P 500 Index 1991-2010



Source: Datastream

Table 1. Description of the Sampled Firm Data

Period	**1991-2000**	**2001-2010**
Gross sample (all non-financial companies in Compustat in the given period)	17,112	15,099
# firms with *incomplete* accounting data or negative equity, SG&A or revenue	–11,480	–10,462
# firms with less than 10 years of data	–3,648	–2,547
# firms with incomplete stock market data	–685	–489
# firms in industry with two or less firms	–73	–64
# firms with total assets or revenue less than 5m US $	–129	–303
Final sample	1,097	1,234

Table 2. Descriptive statistics and correlation analysis

1991-2000	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Altman's Z	4.501	2.602										
2 Beta	0.956	0.534	– 0.012									
3 Downside risk	0.049	0.063	– 0.228**	0.296**								
4 EDC	0.105	0.065	– 0.047	0.238**	0.591**							
5 Size	5.053	1.689	– 0.076*	– 0.203**	– 0.312**	– 0.243**						
6 Asset growth	0.120	0.174	0.239**	0.155**	– 0.089**	0.042	0.085**					
7 Dividend payout	0.303	1.768	– 0.033	– 0.171**	– 0.094**	– 0.087**	0.075*	– 0.090**				
8 Advertising ratio	0.009	0.022	0.062*	0.010	0.051^{+}	0.042	– 0.027	0.002	0.010			
9 R&D investment	0.029	0.046	0.124**	0.161**	0.182**	0.104**	0.013	0.084**	– 0.034	0.056^{+}		
10 Organiz. slack	0.211	0.124	0.212**	0.109**	0.128**	0.084**	– 0.143**	0.055^{+}	– 0.037	0.185**	0.314**	
11 Financial leverage	0.141	0.109	– 0.539**	0.038	0.061*	– 0.054^{+}	0.209**	0.052^{+}	0.016	– 0.092**	– 0.138**	– 0.227**

$^{+}$p<0.10; *p<0.05; **p<0.01; n=1,097

2001-2010	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Altman's Z	4.818	4.735										
2 Beta	1.033	0.515	– 0.169**									
3 Downside risk	0.081	0.143	– 0.344**	0.365**								
4 EDC	0.177	0.744	– 0.131**	0.218**	0.301**							
5 Size	6.317	2.007	0.002	– 0.027	– 0.312**	– 0.127**						
6 Asset growth	0.091	0.115	0.231**	– 0.048^{+}	– 0.169**	– 0.060*	0.219**					
7 Dividend payout	0.160	1.437	– 0.284**	– 0.081**	– 0.128**	– 0.038	0.105**	0.036				
8 Advertising ratio	0.010	0.024	0.305**	0.006	0.019	0.054*	0.016	0.008	– 0.668**			
9 R&D investment	0.055	0.106	– 0.088**	0.113**	0.193**	0.083**	– 0.066*	– 0.063*	– 0.021	– 0.015		
10 Organiz. slack	0.282	0.206	0.048^{+}	0.175**	0.332**	0.124**	– 0.200**	– 0.083**	– 0.267**	0.290**	0.227**	
11 Financial leverage	0.136	0.125	– 0.462**	0.040	– 0.015	– 0.057*	0.260**	– 0.030	0.079**	– 0.061*	– 0.053^{+}	– 0.158**

$^{+}$p<0.10; *p<0.05; **p<0.01; n=1,234

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Table 3. Regressions results with Altman's Z-score as dependent variable

Year	1991-2000		2001- 2010	
Intercept	−0.019	−0.009	−0.080***	−0.059**
Size	0.004	−0.030	−0.011	−0.027
Asset growth	0.372***	0.396***	0.393***	0.335***
Dividend payout	0.061*	0.052*	0.203***	0.162***
Advertising ratio	0.022	0.029	0.055***	0.059**
R&D investment	0.052⁺	0.080**	−0.015***	−0.012***
Organisational slack	0.009	0.017	−0.034	−0.018
Financial leverage	−0.558***	−0.558***	−0.467***	−0.469***
EDC		−0.080***		−0068***
Multiple R^2	0.398	0.427	0.290	0.340
Adjusted R^2	0.394	0.422	0.286	0.335
F-significance	0.000	0.000	0.000	0.000
# of observations	1046	1046	1194	1194

⁺p<0.10; *p<0.05; **p<0.01; ***p<0.001

Using heteroscedasticity consistent standard errors

Table 4. Regression results with beta as dependent variable

Year	1991-2000		2001-2010	
Intercept	0.053^{+}	0.035	0.136***	0.109***
Size	– 0.243***	– 0.181***	0.031	0.056^{+}
Asset growth	0.375***	0.405***	– 0.080	– 0.078
Dividend payout	– 0.146***	– 0.135***	– 0.314***	– 0.289***
Advertising ratio	0.008	– 0.024	– 0.028	– 0.023
R&D investment	0.346***	0.297***	0.148**	0.145**
Organisational slack	– 0.035	– 0.020	0.063^{+}	0.026
Financial leverage	0.195***	0.183***	0.026	0.045
EDC		0.150***		0.122***
Multiple R^2	0.203	0.241	0.086	0.134
Adjusted R^2	0.198	0.235	0.080	0.128
F-significance	0.000	0.000	0.000	0.000
# of observations	1052	1052	1188	1188

$^{+}p<0.10$; $*p<0.05$; $**p<0.01$; $***p<0.001$

Using heteroscedasticity consistent standard errors

Table 5. Regression results with downside risk as dependent variable

Year	1991-2000		2001- 2010	
Intercept	– 0.092***	– 0.117***	– 0.136***	– 0.178***
Size	– 0.294***	– 0.152***	– 0.182***	– 0.120***
Asset growth	– 0.242***	– 0.151***	– 0.310***	– 0.198***
Dividend payout	– 0.100*	– 0.059**	– 0.222***	– 0.151***
Advertising ratio	0.031	– 0.031+	– 0.027*	– 0.038***
R&D investment	0.236***	0.093***	0.053***	– 0.001
Organisational slack	– 0.026	0.033	0.147***	0.112***
Financial leverage	0.223***	0.225***	0.076***	0.082***
EDC		0.458***		0.248***
Multiple R^2	0.193	0.595	0.253	0.502
Adjusted R^2	0.187	0.592	0.248	0.498
F-significance	0.000	0.000	0.000	0.000
# of observations	1040	1040	1179	1179

+p<0.10; *p<0.05; **p<0.01; ***p<0.001

Using heteroscedasticity consistent standard errors

Appendix A: Methodology for calculation beta

Beta for firm i is found using monthly stock data to compute the following regression:

$$R_{i,t} = \alpha_i + \beta_i R_{sample,t} + \varepsilon_{i,t} \; ; \; t = \text{first month}, \ldots, \text{last month}$$

$R_{i,t} = Ln(D_{it} + P_{it})/P'_{it} – 1$ and $R_{sample,t} = Ln(L_t/L_t – 1)$, where $R_{i,t}$ is the ex post rate of return for stock i during month t; $R_{sample,t}$ is an index of the ex post return for all the firms in the sample during month t (i.e., a proxy for the market return[3]). α_i is the intercept of the fitted line of $R_{i,t}$ using $R_{sample,t}$; $D_{i,t}$ is the cash dividend payable on common stock i in month t; $P_{i,t}$ is the closing price of common stock i at the end of month t; $P'_{i,t} – 1$ is the closing price at the end of month t – 1 adjusted for capital changes (e.g., stock splits, stock dividends); and L_t and L_{t-1} are composite index returns for the full sample at months t and t-1 respectively, adjusted for dividends and all capital charges. The slope of the regression equation β_i (hat) is the empirical estimate of systematic risk β_i of firm i.

Appendix B: Methodology for calculation downside risk

Downside risk for firm i (DR_i) is computed as the second-order root lower partial moment using the annual mean ROA among firm i's two-digit SIC industry peers as target level ($ROA_{industry}$). It takes a value different from zero in those years where the firm performs below the industry target level:

$$DR_i = [0.1\sum(ROA_{industry,t} - ROA_t)^2]^{0.5} \; ; \; t = \text{year } 1, .., \text{year } 10 \text{ in sample},$$
$$\text{when } ROA_t < ROA_{industry,t}, \text{ otherwise } 0$$

Appendix C: Standardization methodology and discussion

The standardization calculation will look like this for a given sample firm's R&D ratio in a given year:

$$R\&D_{Stadardized,t} = \frac{R\&D_t - \overline{R\&D}_{industry,t}}{\sigma_{industry,t}}$$

A standardised variable is created by deducting the industry mean for the given variable and year from the un-standardized variable, and dividing by the industry standard deviation for the given variable and year. This approach is congruent with previous studies (e.g., Ho et al., 2006; McGrath & Nerkar, 2003; O'Brien, 2003).

[3] Usually the return of an official index, e.g., S&P 500 or all companies in the New York Stock Exchange is used as a proxy for the market return. We, however, evaluate it to be equally sound to use my full sample of 1000+ firms, as it arguably has an at least as wide coverage of different firms and industries as, e.g., the S&P 500