

Decision Comprehensiveness and Corporate Entrepreneurship: The Moderating Role of Managerial Uncertainty Preferences and Environmental Dynamism

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ABSTRACT Although comprehensiveness is considered among the most salient and enduring strategic decision-making characteristics in organizations, its influence on firm behaviour has remained elusive. As a first step, our study builds and tests a model that specifies the influence of comprehensiveness on the firm's pursuit of corporate entrepreneurship. Our core argument is that while comprehensiveness helps decision-makers gain the knowledge needed to escape the ignorance and overcome doubt associated with this pursuit, this beneficial influence is conditional upon managerial uncertainty preferences, together with the level of dynamism in the external environment. Findings from a large sample study of CEOs from 349 SMEs provide general support for this argument and associated hypotheses.

INTRODUCTION

An important and long-standing question in strategy research is whether and under what conditions comprehensiveness impacts firm behaviour and outcomes (Atuahene-Gima and Li, 2004; Dean and Sharfman, 1996; Forbes, 2007). Comprehensiveness focuses on the extensiveness with which a firm's decision-makers systematically consider information from the external environment in making and integrating strategic decisions in the face of uncertainty (Eisenhardt, 1989; Forbes, 2007; Fredrickson, 1984; Iaquinto and Fredrickson, 1997). This line of inquiry generally builds from the premise that firms are information-processing systems that gather information from their environments, interpret the information, and then act upon this interpretation (Atuahene-Gima and Li, 2004; Dean and Sharfman, 1996; Forbes, 2007).

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Although comprehensiveness is considered among the most salient and enduring strategic decision-making characteristics in organizations (Miller, 2008; Rajagopalan et al., 1993), researchers have not yet directly specified its influence on the firm's actual behaviours, instead largely focusing on its link to performance (see Forbes, 2007) for a review). While this focus is important and informative, it does not provide a fine-grained insight about the potential link between comprehensiveness and firm behaviour. An encompassing construct that offers the potential for such insight is corporate entrepreneurship (CE), defined as the *sum* of a company's innovation, renewal, and venturing efforts (Ling et al., 2008; Zahra, 1996). We say this because the decision to engage in innovation, venturing, and renewal are fundamental choices that organizations make, and that have widespread and significant implications for performance and growth in numerous contexts (Zahra, 1996; Zahra et al., 1999). And since engaging in these pursuits entails considerable uncertainty and at times ambiguity for a firm's decision-makers (Zahra, 1996), coupled with the fact that comprehensiveness uniquely relates to uncertainty given its focus on the firm's information environment, it would seem to follow that comprehensiveness may be a salient antecedent to CE.

Consequently, we build and test a model of the impact of comprehensiveness on CE by synthesizing insights from McMullen and Shepherd's (2006) elemental view of entrepreneurial action with extant research on comprehensiveness. Consistent with McMullen and Shepherd, we envision that CE entails considerable uncertainty for an organization's decision-makers due to a lack of timely awareness of what opportunities to pursue, as well as a sense of doubt surrounding the feasibility and desirability of those opportunities. Thus, we reason that comprehensiveness will facilitate CE by enabling decision-makers to acquire the information and understanding, or simply knowledge, of entrepreneurial opportunities and assuage doubts concerning the pursuit of those opportunities – particularly, in less ambiguous environments. Like McMullen and Shepherd (2006) we also recognize that decision-makers vary in terms of their willingness to bear uncertainty associated with entrepreneurial pursuits. Therefore, and complementing our model's development, we specify the pivotal yet unexplored moderating role of decision-makers' willingness to bear uncertainty to further explain the impact of comprehensiveness on CE. Because the willingness to bear uncertainty enhances the likelihood of undertaking entrepreneurial actions (Lumpkin and Dess, 1996; McMullen and Shepherd, 2006), we specifically posit that the impact of comprehensiveness on CE will be bolstered when comprehensive decision-makers also possess high levels of risk-taking propensity and proactiveness.

Our study enriches previous research in two important ways. First, beyond directly examining the impact of comprehensiveness on CE, we demonstrate the effects of decision-makers' willingness to bear uncertainty on the consequences of engaging in comprehensive decision-making. Second, we develop a novel theoretical rationale for comprehensiveness by explaining how comprehensive processes help decision-makers to overcome ignorance and doubt that surround the organization's pursuit of CE. Taken together, our study provides a richer and more complex explanation of comprehensiveness, as well as a differentiated testing of McMullen and Shepherd's (2006, p. 133) key insight: 'both knowledge and motivation must be considered concomitantly when examining entrepreneurial action'.

THEORETICAL BACKGROUND

Rooted in the rational–normative or synoptic model of strategic decision-making, comprehensiveness, also referred to as procedural rationality or extent of analysis, is viewed as a fundamental characteristic of strategic decision-making in organizations (Eisenhardt, 1989; Forbes, 2007; Iaquinto and Fredrickson, 1997; Miller, 2008). In one of the earlier analyses of comprehensiveness, Fredrickson and Mitchell (1984) juxtaposed the synoptic perspective of decision-making with a more incrementalist one, wherein decision-making is characterized by less comprehensiveness and little effort at integration, but instead involves a remedial response to current problems, and one in which decision-makers consider alternatives and view strategy as loosely coupled decisions. Within the rational–synoptic perspective, by contrast, decision-making is viewed as a comprehensive process involving a set of sequential, analytical processes in which a set of objective criteria are used to evaluate alternatives which decision-makers initiate in response to current problems and future opportunities (Miller et al., 1998). This perspective conceives of strategic decision-making as a means by which upper-echelon executive groups consider information from their internal and external environments to identify appropriate pursuits (Forbes, 2007). In short, as Forbes (2007, p. 362) puts it, ‘comprehensiveness distills the essence of the “synoptic” approach to strategy (Ansoff, 1965; Hofer and Schendel, 1978) into a single dimension of strategic decision-making (Fredrickson and Mitchell, 1984)’.

Comprehensiveness, as a theoretical construct, is defined as the extent to which decision-makers utilize an extensive decision process when dealing with immediate opportunities and threats (Fredrickson, 1984; Miller, 2008). Comprehensiveness is, for example, said to occur when decision-makers consider multiple alternatives and apply multiple criteria to the evaluation of these alternatives (Forbes, 2007; Fredrickson and Mitchell, 1984). Thus, as Miller (2008, p. 3) puts it, ‘the nature of the process is paramount. Extensive approaches include high levels of investigatory activity aimed at developing alternative courses of action, evaluating alternatives, and developing multiple criteria to screen alternatives’. Importantly, although certainly malleable, comprehensiveness reflects a lasting property of decision-making in firms, rather than a procedural response to a specific set of decision circumstances (Fredrickson and Mitchell, 1984). In one of the few longitudinal studies of comprehensiveness, Fredrickson and Iaquinto (1989) provide evidence in support of this, suggesting that the level of comprehensiveness tends to persist over time, with only moderate changes.

While the conceptual grounding and nature of comprehensiveness construct is well established, and while previous research has moved us closer to understanding some of the complexities of comprehensiveness’ impact on firm performance, its influence on firm behaviour has remained elusive. As noted earlier, we believe that focusing on corporate entrepreneurship (CE) offers a promising approach for studying the effects of comprehensiveness on firm behaviour. CE is a fundamental orientation towards the pursuit of opportunity and growth that represents decision-makers’ attempts to create a competitive advantage through entrepreneurial behaviour on a sustained basis (Burgelman, 1983; Ireland et al., 2003; Stevenson and Jarillo, 1990). As alluded to, CE is an overarching construct that unifies three sets of activities: innovation, venturing,

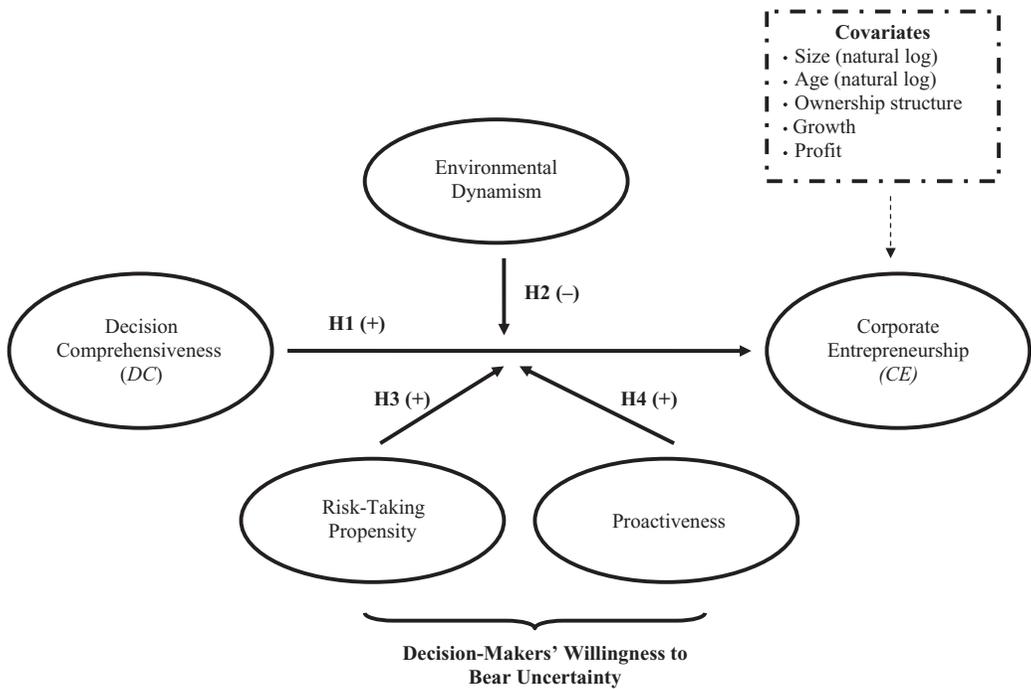


Figure 1. Theoretical model and hypothesized associations

and strategic renewal (Zahra, 1996). Additionally, although the foci of these activities differ somewhat, they are similarly subjected to considerable uncertainty intrinsic to entrepreneurial pursuits. Supporting this, recent empirical studies have demonstrated that CE is a higher-order construct that represents the common core among firms' innovation, venturing, and renewal acts (Ling et al., 2008; Simsek, 2007).

As noted earlier, our model (Figure 1) synthesizes insights from McMullen and Shepherd's (2006) elemental model of entrepreneurial action with comprehensiveness research. This model parsimoniously recasts entrepreneurial action as ensuing from escaping ignorance and overcoming doubt about entrepreneurial opportunities in the environment through knowledge and motivation (Shepherd et al., 2007). In particular, it suggests that entrepreneurial action depends on the formation of two types of opportunity beliefs: third-person and first-person. A third-person opportunity is an opportunity that exists for somebody, even if not for the prospective entrepreneur. Overcoming ignorance, a lack of information or awareness regarding the existence of entrepreneurial opportunities, is instrumental to the formation of third-person opportunity beliefs. Once a third-person opportunity belief is formed, the main obstacle to the formation of first-person opportunity belief is a sense of doubt, which concerns uncertainty regarding whether the opportunity can be feasibly and successfully exploited by the entrepreneur (Shepherd et al., 2007). Only when a decision-maker has formed a first-person opportunity belief, does entrepreneurial action ensue.

Engaging in entrepreneurial action, therefore, depends foremost upon acquiring the knowledge required to overcome the uncertainties created by ignorance and doubt. Or

as McMullen and Shepherd (2006) put it, 'knowledge reduces perceived uncertainty to a point that not only enables prospective entrepreneurs to form a belief that they have recognized a third-person opportunity, but also allows them to overcome the belief-related doubt that would otherwise prevent action' (pp. 137–8). Shepherd et al. (2007) argue that possessing sufficient information about the environment, absorptive capacity to give that information meaning, and alertness to relevant information, play key roles in helping actors escape entrepreneurial ignorance. Beyond knowledge, however, McMullen and Shepherd (2006) place special emphasis on motivation, which, at its core, concerns individuals' willingness to bear uncertainty, in explaining the propensity of individuals to act entrepreneurially. Entrepreneurial action, therefore, is a product of the conjoint influence of knowledge and motivation. In the next section, with this insight as our foundation, we begin by establishing how comprehensiveness, particularly in stable environments, might enable the pursuit of CE. Then, we specify the salient yet unexplored moderating role of decision-makers' willingness to bear uncertainty to further explain the impact of comprehensiveness on CE (see Figure 1).

HYPOTHESES DEVELOPMENT

Comprehensiveness and Corporate Entrepreneurship

As noted earlier, comprehensiveness entails considering substantial information from both inside and outside the firm (Fredrickson, 1984; Miller et al., 1998), and therefore is argued to provide the knowledge required of decision-makers to identify and evaluate entrepreneurial opportunities, that helps them to escape ignorance and doubt. Scanning the external environment, even in an unconditioned fashion (Aguilar, 1967), is likely to increase decision-makers' receptiveness and alertness to potential entrepreneurial opportunities (Barringer and Bluedorn, 1999). Decision-makers who regularly scan the customer and market environment, for instance, will be more alert to changes in consumer tastes and preferences that lead to opportunities for product innovations (Day, 1994). Similarly, decision-makers that carefully scrutinize developments in factor markets should be more predisposed to identify opportunities for renewal of resources and capabilities. And by gaining frequent exposure to ongoing trends and developments in the environment, decision-makers might begin to 'connect the dots' between seemingly independent events, constituting the basis for identifying new venturing opportunities (Baron, 2006; Eisenhardt, 1989; Hsieh et al., 2007; Ozgen and Baron, 2007). Finally, consideration of multiple perspectives can help decision-makers see opportunities beyond what would be apparent to them given their pre-existing mental models, thus preventing the development of 'groupthink' (Janis, 1982), decision-making characterized by a strong emphasis on unanimity and a shared mental model. Indeed, comprehensiveness has been argued to help decision-makers reduce some of the effects of cognitive biases and form more accurate perceptions of environment (Miller, 2008), which are often prerequisites to entrepreneurial action (McMullen and Shepherd, 2006).

Nonetheless, while comprehensiveness might help decision-makers avoid ignorance, the eventual pursuit of corporate entrepreneurial opportunities might critically hinge upon the ability of decision-makers to overcome, or otherwise contain feelings of doubt

(McMullen and Shepherd, 2006). Doubt concerns whether it is feasible, and indeed, desirable for the organization to exploit a particular opportunity (McMullen and Shepherd, 2006). Doubt, and associated anxieties, cripple decision-making and entrepreneurial action (Eisenhardt, 1989; McMullen and Shepherd, 2006). Feelings of doubt are often strongly conditioned by the risk and uncertainty intrinsic to entrepreneurial pursuits. By engaging in comprehensive decision-making, we anticipate that decision-makers can overcome some of these doubts. To begin with, considering alternative courses of action might help decision-makers cope with doubt by giving them a sense of mastery and control, as well as providing them with the requisite confidence to undertake entrepreneurial pursuits (Eisenhardt, 1989). Additionally, thorough evaluation of opportunities, using multiple criteria, provides valuable information for decision-makers pertaining to the feasibility and desirability of potential entrepreneurial opportunities that increases their understanding of the risks involved, alleviates uncertainties, and as a result, lessens doubts. Considering multiple alternatives provides decision-makers with greater preparedness and several fall-back positions, which should dispel feelings of doubt and offer increased confidence in going forward. Supporting this argument, Adidam and Bingi (2000) report evidence indicating that comprehensiveness contributes to decision confidence, as well as fosters commitment to the implementation of selected course of actions (Miller, 2008). Taken together, these points support the following prediction:

Hypothesis 1: Comprehensiveness is positively associated with the extent to which the firm pursues corporate entrepreneurship.

We suspect, however, that this simple, bivariate effect is likely to be an incomplete representation of the relationship between comprehensiveness and CE. In particular, and consistent with previous research, we introduce environmental dynamism as a potential moderator to further clarify this relationship. Dynamism (sometimes used interchangeably with such terms as volatility and turbulence) refers to both the rate of change and unpredictability of change in an organization's environment; it ranges from highly stable to highly dynamic (Dess and Beard, 1984). In dynamic, high velocity environments, 'there is rapid and discontinuous change in demand, competitors, technology, and/or regulations such that information is often inaccurate, unavailable, or obsolete' (Eisenhardt and Bourgeois, 1988, p. 816). Accordingly, as dynamism increases, decision-makers experience ambiguity, where ambiguity is defined 'as uncertainty about the outcome probabilities themselves' (Curley et al., 1986, p. 230). Conversely, less dynamic environments give rise to conditions of uncertainty wherein it is probable for decision-makers to estimate the probabilities associated with a set of possible outcomes, even though they do not know which outcomes will occur (Forbes, 2007).

When environmental dynamism increases, windows of opportunity for the identification and exploitation of entrepreneurial opportunities are fleeting (Shepherd et al., 2007). Thus, whereas comprehensiveness is time dependent, the pursuit of corporate entrepreneurial opportunities is time sensitive in fast-changing environments. As such, even though dynamic environments might give way to more opportunities, comprehensive decision-makers run the risk of diminishing the opportunity pool owing to exploitation by competitors with high profit-seeking proactiveness (McMullen and Shepherd,

2006). Due to the temporal dependency of comprehensiveness, decision-makers may also end up 'achieving tomorrow's solution to yesterday's problem' (Braybrooke and Lindblom, 1970, p. 121). Additionally, and aside from slowing down decision-making, the usefulness of comprehensiveness for CE might be limited in environments that are impervious to extensive analysis (Fredrickson and Mitchell, 1984). Increasing dynamism creates an information environment that is low in quantity and determinacy, creating ambiguity for decision-makers (Forbes, 2007; Huber and Daft, 1987). Under this condition, the level of understanding that can be obtained via comprehensiveness might be so low as to render comprehensiveness futile as a basis for initiating adaptive responses. As March (1988, p. 399) notes, 'a close articulation of decisions and information is of little use in ambiguous situations'. This is consistent with the argument that in changing environments decision-makers should prioritize the logic of incrementalism over comprehensiveness (Daft and Weick, 1984), as well as Sarasvathy's (2001) argument that the effectuation process should prevail in proportion to the level of ambiguity in the environment. Said simply, dynamic environments seem to be 'hostile territory' for comprehensiveness (Miller, 2008).

Conversely, less dynamic environments would seem to provide the perfect backdrop for comprehensiveness as both time and ambiguity are favourable in such contexts (Miller, 2008). First, these environments afford the gift of time (Miller, 2008). With demand and supply-side market forces relatively stable, a firm is faced with fewer strategic decisions per unit of available managerial time. With fewer decisions to make, decision-makers can consider each decision more extensively without risking the neglect of other important threats and opportunities. Second, cause-effect relationships become more tractable, unambiguous, and unchanging, and as a result, it progressively becomes easier for decision-makers to conceptualize and predict the current and preferred future states. And finally, because opportunities are not quite as transient as in dynamic environments, decision-makers are afforded with the opportunity to engage in the extensive analyses to identify and evaluate opportunities. Taken together, these arguments suggest that:

Hypothesis 2: Environmental dynamism has a moderating effect on the positive relationship between comprehensiveness and the extent to which the firm pursues corporate entrepreneurship. Comprehensiveness is more strongly associated with corporate entrepreneurship as dynamism decreases.

The Moderating Role of Managerial Uncertainty Preferences

So far we have argued that comprehensiveness sufficiently enables decision-makers to overcome ignorance and doubt, and therefore, pursue corporate entrepreneurial acts, particularly as environmental dynamism decreases. However, like McMullen and Shepherd (2006), we also recognize that decision-makers vary in terms of their preferences or willingness to bear uncertainty associated with the pursuit of these acts, which might critically influence and further shape the relationship between comprehensiveness and CE. Because decision-makers' willingness to bear uncertainty is often reflected in their risk-taking propensity and proactiveness (Lumpkin and Dess, 1996), we particularly

specify the moderating role of these two constructs. As an aside, we recognize that risk-taking propensity and proactiveness can directly impact CE but given the focus of our theory we will not theorize but control for these probable effects in testing our hypotheses.

Moderating role of risk-taking propensity. Risk-taking propensity generally refers to the tendency or willingness of decision-makers to take or avoid risks (Sitkin and Pablo, 1992). Thus, a risk-taking propensity captures the extent to which the decision-making group is willing to engage in behaviours and commitments with uncertain yet significant outcomes for the firm (Gilley et al., 2002; Simsek, 2007). Or as Miller and Friesen (1978) put it, it captures 'the degree to which managers are willing to make large and risky resource commitments – i.e. those which have a reasonable chance of costly failure' (p. 923).

As discussed, comprehensiveness leads to a more thorough and critical analysis of wide-ranging information, and therefore increases the likelihood that risks and costs associated with the pursuit of CE will be made explicit and salient. In this process, we expect that decision-makers with a high risk-taking propensity will be especially alert and attentive to opportunities that offer high yet variable returns. So, for example, we would expect that risk-oriented decision-makers are more likely to emphasize opportunities that involve bringing new products to the market, investing in unexplored technologies, and sponsoring high-growth new ventures (Gilley et al., 2002; Lumpkin and Dess, 1996). Similarly, decision-makers with a high risk-taking propensity are less likely to harbour feelings of doubt that delay or prevent entrepreneurial actions (McMullen and Shepherd, 2006). It follows that decision-makers who enjoy the risk and uncertainty challenges that CE entails will be more likely to undertake entrepreneurial actions than those individuals who do not (Sitkin and Pablo, 1992). We expect, therefore, that comprehensiveness will have more of an impact on CE, when decision-makers are more willing to take on the risks associated with the pursuit of entrepreneurial opportunities.

Conversely, at low levels of risk-taking propensity, we expect that comprehensiveness will have less of an impact on CE. Risk-averse decision-makers engaging in comprehensiveness may be less attentive to entrepreneurial opportunities as they are more sensitive to the presence of threats in the environment. We suspect that when risk-averse decision-makers discover potentially profitable opportunities, they are naturally doubtful, selectively perceiving and focusing only on the downside potential. As such, risk-averse decision-makers find it very difficult to overcome their feelings of doubt, even when engaging in comprehensive decision-making. Their preoccupation with doubt causes them to behave cautiously and overanalyse opportunities. As a consequence, paralysis by analysis becomes a serious impediment to CE among risk-averse decision-makers. Thus, we predict that:

Hypothesis 3: Decision-makers' risk-taking propensity has a moderating effect on the positive relationship between comprehensiveness and the extent to which the firm pursues corporate entrepreneurship. Comprehensiveness is more strongly associated with corporate entrepreneurship as risk-taking propensity increases.

Moderating role of proactiveness. Whereas risk-taking propensity captures decision-makers' preferences for risky, growth-oriented options, proactiveness involves initiative-taking or

acting to take advantage of opportunities (Lumpkin and Dess, 1996; Miller and Friesen, 1978). It captures the readiness and willingness of the decision-making group to seize the initiative, take advantage of opportunities, and shape the environment in which they operate (Lumpkin and Dess, 1996). Proactive decision-makers attach significance to entrepreneurial and competitive actions, and thus are likely to exhibit a greater awareness and motivation to engage in entrepreneurial actions (Chen, 1996). Proactive decision-makers also recognize the importance of first-mover advantage as the best strategy for exploiting market opportunities (Lieberman and Montgomery, 1988). This involves, as Lumpkin and Dess (1996) and Venkatraman (1989) argue, taking the initiative by anticipating and pursuing new opportunities and by participating in markets, which may or may not be related to the present line of operations.

It follows, therefore, that decision-makers high in proactiveness are more likely to exploit and engage in the pursuit of entrepreneurial opportunities discovered (or created) and vetted through comprehensiveness, because of their readiness and willingness to seize new opportunities, and because of their inherent motivation to capture a first mover advantage. Passiveness, the conceptual opposite of proactiveness, is best described as an 'indifference or inability to seize opportunities or lead in the marketplace' (Lumpkin and Dess, 1996, p. 147). Passive decision-makers, we would anticipate, are far less inclined and willing to bear the uncertainty intrinsic to acts of CE, than proactive decision-makers. Thus, even once identified through comprehensiveness, passive decision-makers are less likely to act on the basis of opportunities, owing to indifference, inability, or even both. Accordingly, we expect that:

Hypothesis 4: Decision-makers' proactiveness has a moderating effect on the positive relationship between comprehensiveness and the extent to which the firm pursues corporate entrepreneurship. Comprehensiveness is more strongly associated with corporate entrepreneurship as proactiveness increases.

METHODS

Sample and Data Collection

To test our model and its associated hypotheses, we chose small-to-medium sized enterprises (SMEs) as our sampling frame for both theoretical and empirical reasons. Although SMEs represent a vital component of most nations' economies, they have been overlooked by strategic management researchers, generally because data about them is not readily available. Instead they have tended to focus on larger firms, ones that typically compete with multiple businesses in multiple markets, leaving a gap in our understanding of CE behaviours in SMEs.

Our sample included SMEs located in the Republic of Ireland, which provided an interesting research context for testing our model because of its dynamic and vibrant economy. The Irish economy outperformed all other European economies in the last decade, recording a growth rate throughout the period of three times the EU average. Recently, Ireland was ranked third for GDP per capita, ahead of the United States and Switzerland, and tenth in terms of exports of goods as a percentage of GDP. Using the

Kompass Business Directory, which provides the most reliable and comprehensive listing of firms in Ireland, we identified a total of 3497 small-to-medium sized firms. Because the business directory was only updated twice annually, we contacted each firm to confirm the correct name and address of the CEO. Additionally, we cross-checked all addresses with the company registration office to further ensure accuracy.

We collected our data in multiple stages. To develop our survey, we asked a panel of seven management scholars familiar with the literature and three CEOs to review our survey and provide feedback. Based on their feedback, we modified the questionnaire, and then pretested it on 76 participants in an executive MBA class, which confirmed the reliability and factor structure of our measures. Based on this, we first sent a questionnaire to the CEOs of each of the 3479 firms in our sample. Also enclosed with the questionnaire was a letter endorsed by the director and alumni officer of a nationally reputable University Business School. These letters explained the research project, encouraged participation, and promised that each participating firm would receive an executive summary of the findings when the study was completed. Because selecting knowledgeable informants is crucial to the key informant technique (Kumar et al., 1993), our survey was strictly limited to CEOs.

After one phase of follow-ups and telephone calls, 349 CEOs of SMEs agreed to participate, a response rate of 10 per cent, 'consistent with the 10–12 percent rate typical for mailed surveys to top executives' (Hambrick et al., 1993, p. 407). An independent sample t-test indicated no significant differences in firm size between firms that agreed to participate in our study and those that did not ($t(3495) = 0.752$, n.s.). We also used an independent sample t-test to detect the presence of a significant difference in size between early and late respondents – the test ($t(457) = 0.288$, n.s.) indicated no significant difference. The 349 firms in the final sample employed, on average, 169 people, and averaged 35 years in business. Although our sample represented a broad cross-section of industries, banking and financial services (8.9 per cent) and tourism and catering (9.3 per cent) were the most represented in our sample.

In our sample, having been employed by their firm for 15 years and having had 20 years of industry experience, the average CEO was 45 years of age with 10 years tenure in the position, making them appropriate key informants for measuring our study's constructs, consistent with previous research including corporate entrepreneurship (Zahra, 1996) comprehensiveness (Fredrickson, 1984), top management team (TMT) risk-taking propensity (Simsek, 2007), TMT proactiveness (Barringer and Bluedorn, 1999), and environmental dynamism (Dess and Beard, 1984). We recognize, however, that a reliance on single respondents can potentially introduce the same source bias. We, therefore, took specific steps to mitigate this bias. In particular, following recommendations found in Huber and Power (1985), we carefully constructed all survey items, and wherever possible, used pretested, valid multidimensional constructs. Thus, because all of our constructs were of a higher order nature assessed by established multiple-item measures, this reduces the likelihood of respondents artificially inflating relationships among them, which have been shown to more likely occur at the item level than at the construct level (Harrison et al., 1996). Also, by surveying only CEOs, as the key informant from each firm, we sought to minimize the likelihood of bias. Finally, to further establish the robustness of our findings, we undertook specific steps to detect and control

for this bias. These statistics, which we report in the latter section of this paper, lend further credence to our assertion that CEOs in our sample were reasonably well informed about this study's focal constructs (Appendix B).

Measures

Corporate entrepreneurship. Based on previous research (Simsek, 2007; Zahra, 1996), we measured the extent to which a firm pursues corporate entrepreneurship as a three-dimensional, meta-construct represented by 17 items rated on a seven-point scale, ranging from 1 ('strongly disagree') to 7 ('strongly agree'). Respondents were asked to assess their firm's level of innovation (e.g. introducing a large number of new products to the market), venturing (e.g. entering new markets), and renewal (e.g. redefining the industries in which it competes). To assess the measurement validity of the corporate entrepreneurship scale, we conducted a confirmatory factor analysis (CFA). The results of the CFA revealed four items with non-significant critical ratios. Consequently all four items were eliminated ('acquiring companies in different industries'; 'financing start-up business activities outside the organization'; 'creating new and semi-autonomous units'; and 'divesting several unprofitable business units'). Incidentally, these items measure activities that are atypical for small-to-medium sized enterprises. The results of the revised model suggested good model fit (χ^2 (60, $n = 349$, $p < 0.001$) = 141, CFI = 0.95; TLI = 0.93; IFI = 0.95). The resultant coefficient alpha for the overall CE scale is 0.87.

Comprehensiveness. We evaluated comprehensiveness using Miller et al.'s (1998) five-item scale that asked executives to what extent their firm utilized various comprehensive decision procedures along a seven-point Likert scale ranging from 1 ('not at all') to 7 ('to a great extent'). These items were used by Fredrickson (1984), Fredrickson and Iaquinto (1989), and Fredrickson and Mitchell (1984) in their validity check procedures. The results of a confirmatory factor analysis suggested good model fit (χ^2 (4, $n = 349$, $p < 0.005$) = 18.34; CFI = 0.98; IFI = 0.99; TLI = 0.96). The coefficient alpha for the decision comprehensiveness scale is 0.88.

Decision-makers' willingness to bear uncertainty. As noted earlier, we referenced the willingness of decision-makers to bear uncertainty in terms of their risk-taking propensity and proactiveness. We assessed risk-taking propensity using a three-item seven-point scale from previous research (Covin and Slevin, 1986; Miller and Friesen, 1982; Simsek, 2007). The coefficient alpha for risk-taking propensity is 0.77. We assessed proactiveness using a measure originally developed by Covin and Slevin (1986). The coefficient alpha for proactiveness is 0.78. Overall, the results of a confirmatory factor analysis for decision-maker characteristics exhibited good model fit (χ^2 (8, $n = 349$, $p < 0.001$) = 59; CFI = 0.93; IFI = 0.93; TLI = 0.87).

Environmental dynamism. We assessed environmental dynamism using Miller and Friesen's (1983) six-item scale. The results of a confirmatory factor analysis suggested good model fit (χ^2 (8, $n = 349$, $p < 0.001$) = 30.89; CFI = 0.94; IFI = 0.94; TLI = 0.90). The coefficient alpha for the dynamism scale is 0.72.

Covariates

Consistent with previous theory, we controlled for firm size, age, growth, profitability, and ownership structure to mitigate any potential spurious interpretations of the findings. First, we controlled for firm growth and profitability, because as long as firm performance meets a minimal acceptable level, managers may be little concerned with pursuing new initiatives (Dutton and Duncan, 1987). Instead firms with acceptable levels of performance have a propensity for exhibiting inertia (Hannan and Freeman, 1989), and perpetuating established modes of operating (Nelson and Winter, 1982). Because our sample consisted mostly of privately-held firms for which objective performance data were not accessible, we followed the convention of asking CEOs to compare their firm's performance with that of major competitors in terms of growth (sales, market share, employees, funding for growth from profits) and profitability (return on equity, return on total assets, profit margin on sales, and growth in profitability), which ranged from 1 ('much worse') to 5 ('much better'). Second, we controlled for *firm size*, which has been associated with inertia, difficulty in processing information related to changing resources, and failure to adapt to changing resource conditions (e.g. Hannan and Freeman, 1989; Tushman and Romanelli, 1985). However, large organizations may have more unabsorbed slack resources that facilitate adaptation to shifting environmental demands by protecting organizations from downside risks (Cyert and March, 1963). We measured *firm size* as number of full-time employees, which was then log-transformed because the distribution departed from normality. Third, we measured *firm age* as the number of years since a company had been established, which was also log-transformed because the distribution departed from normality. Generally, older firms have established routines and social relationships that promote predictable behaviours guided by institutionalized norms and habits (Tushman and Romanelli, 1985). Finally, to assess *ownership structure*, we asked respondents to indicate whether their business was family-owned.

RESULTS

Table I presents means, standard deviations, and correlations for each of the measures. Given that no inter-factor correlation is above the recommended level of 0.70 (Tabachnick and Fidell, 1996), multicollinearity and, hence, problems created by a lack of discriminant validity are not likely to bias our results. Nonetheless, we undertook two further steps to detect the presence of multicollinearity. First, we examined the variance inflation factors (VIF) of each individual predictor in our model. The variance inflation factors for our individual predictors ranged from 1.011 to 1.124, suggesting the absence of multicollinearity. Second, using principal components analysis, we estimated the condition number^[1] ($\kappa = 11.54$), following the guidelines set out by Cohen et al. (2003). Given that the condition number is significantly less than 30, the rule of thumb described by Cohen et al. (2003), this further suggests that the pattern of correlations is unaffected by multicollinearity. We further examined the discriminant validity of the constructs by performing a series of CFAs to compare our constructs to one-, three-, and five-factor model structures. We used the chi-square difference test in comparing these models as suggested by Kline (1998); in all cases, there were significant differences, providing evidence of discriminant validity (Bagozzi et al., 1991).

Table I. Means, standard deviations, and correlations^a

	<i>Mean</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
Decision comprehensiveness	4.72	1.15	1								
Risk-taking propensity	4.22	1.15	0.143**	1							
Proactiveness	4.65	1.26	0.191**	0.571**	1						
Environmental dynamism	4.22	1.05	0.141**	0.207**	0.093	1					
Corporate entrepreneurship	4.23	1.07	0.397**	0.415**	0.549**	0.296**	1				
Firm size (log)	2.11	0.31	0.098	-0.029	0.015	0.015	0.052	1			
Firm age (log)	1.37	0.39	0.007	-0.159**	-0.099	-0.029	-0.070	0.220**	1		
Ownership structure	0.67	0.47	0.131*	-0.063	0.007	-0.034	0.121*	0.161**	-0.041	1	
Growth	3.64	0.75	0.131*	0.195**	0.255**	0.055	0.351**	0.067	-0.111*	-0.016	1
Profitability	3.57	0.94	0.077	0.173**	0.220**	0.024	0.221**	0.035	-0.060	0.102	0.495**

^a n = 349.

* p < 0.05; ** p < 0.01.

Hypothesis Tests

To test our hypotheses, we used hierarchical stepwise regression. All variables were centred prior to conducting regression analyses (Cohen et al., 2003). We entered our variables in three steps. In Step 1 we regressed CE onto each of our control variables. In Step 2 we regressed CE onto our centred main effect variables, comprehensiveness, environmental dynamism, risk-taking propensity, and proactiveness. And finally in Step 3 we entered each of our three cross-product interaction terms. The changes in R-squared (ΔR^2) at each step and the standardized regression coefficients are presented in Table II.

Hypothesis 1 predicted a positive relationship between comprehensiveness and CE. As shown in Table II (Step 2) this hypothesis was supported ($\beta = 0.231$, $p < 0.001$), suggesting that comprehensiveness is positively associated with the firm's pursuit of CE. To assess moderation of the relationship between comprehensiveness and CE, variables were entered into the regression model following procedures outlined by Baron and Kenny (1986). All moderators were entered as a block into the regression analysis because entering them as a block takes into account their simultaneous effects, and therefore represents a more conservative and robust approach (Mathieu and Kohler, 1990). As shown in Table II (Step 3), Hypothesis 2, which predicted that environmental dynamism would negatively moderate the positive relationship between comprehensiveness and CE, was supported ($\beta = -0.115$, $p < 0.01$). As shown in Figure 2, for firms

Table II. Results of hierarchical regression analysis^a

<i>Variables</i>	<i>Corporate entrepreneurship</i>	
	β	ΔR^2
<i>Step 1: Controls</i>		0.19***
Size (natural logarithm)	0.066	
Age (natural logarithm)	-0.061	
Ownership structure	0.090	
Growth	0.381***	
Profitability	0.047	
<i>Step 2: Main effects</i>		0.29***
Decision comprehensiveness (H1)	0.231***	
Environmental dynamism	0.194***	
Risk-taking propensity	0.066	
Proactiveness	0.371***	
<i>Step 3: Interaction terms</i>		0.03***
Decision comprehensiveness \times environmental dynamism (H2)	-0.115**	
Decision comprehensiveness \times risk-taking propensity (H3)	-0.151**	
Decision comprehensiveness \times proactiveness (H4)	0.123*	
R ²		0.51
Adjusted R ²		0.49
F		25.839***

^a n = 349.

* p < 0.05; ** p < 0.01; *** p < 0.001.

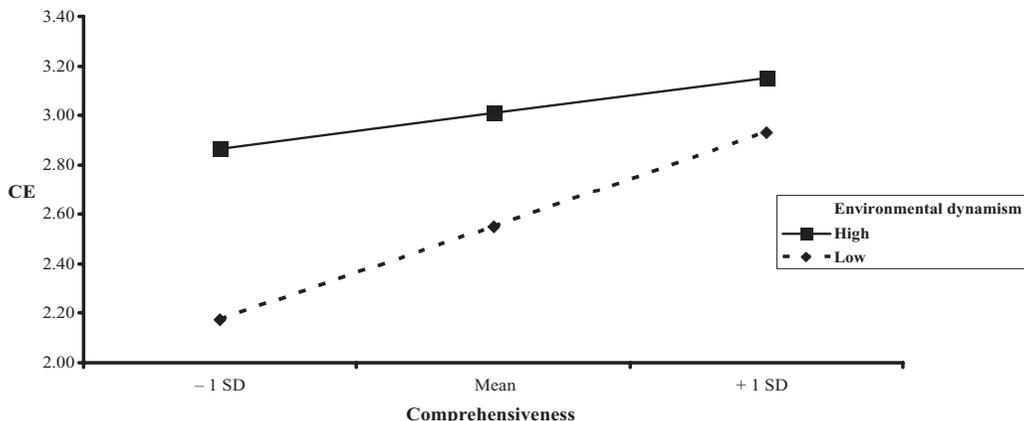


Figure 2. Moderating effect of environmental dynamism on the relationship between decision comprehensiveness and corporate entrepreneurship

confronting high levels of dynamism, increasing levels of comprehensiveness has only a slight increase on CE. This is consistent with our expectation that comprehensiveness might be of limited utility in promoting CE when environmental conditions are rapidly changing. By contrast, however, at low levels of dynamism, comprehensiveness has a strong positive impact on CE.

With respect to Hypothesis 3, contrary to our hypothesized prediction that decision-makers' risk-taking propensity would positively moderate the relationship between comprehensiveness and CE, we found that risk-taking actually negatively moderated the relationship between comprehensiveness and CE ($\beta = -0.151$, $p < 0.01$). To further interpret the interaction effect, we followed the procedure recommended by Cohen et al. (2003), by creating two simple regressions of comprehensiveness on the extent of CE, given conditional values of risk-taking propensity (mean ± 1 SD). As shown in Figure 3, when decision-makers are characterized by high levels of risk-taking propensity, increasing the level of comprehensiveness has almost little effect on the pursuit of CE. By contrast, at low levels of risk propensity, increasing the level of comprehensiveness has a significant positive impact on the pursuit of CE. Finally, our fourth hypothesis, which suggested that proactiveness would positively moderate the relationship between comprehensiveness and CE, was supported ($\beta = 0.123$, $p < 0.05$). As expected (see Figure 4), at high levels of proactiveness, increasing levels of comprehensiveness has a significant positive effect on the pursuit of CE. Conversely, at low levels of proactiveness, the effect of increasing levels of comprehensiveness on CE is attenuated.

DISCUSSION AND CONCLUSIONS

In this paper, we developed a model of the impact of comprehensiveness on the firm's pursuit of CE by synthesizing insights from McMullen and Shepherd's (2006) elemental view of entrepreneurial action with extant research on comprehensiveness. Like McMullen and Shepherd, we envisioned that entrepreneurial acts are generally

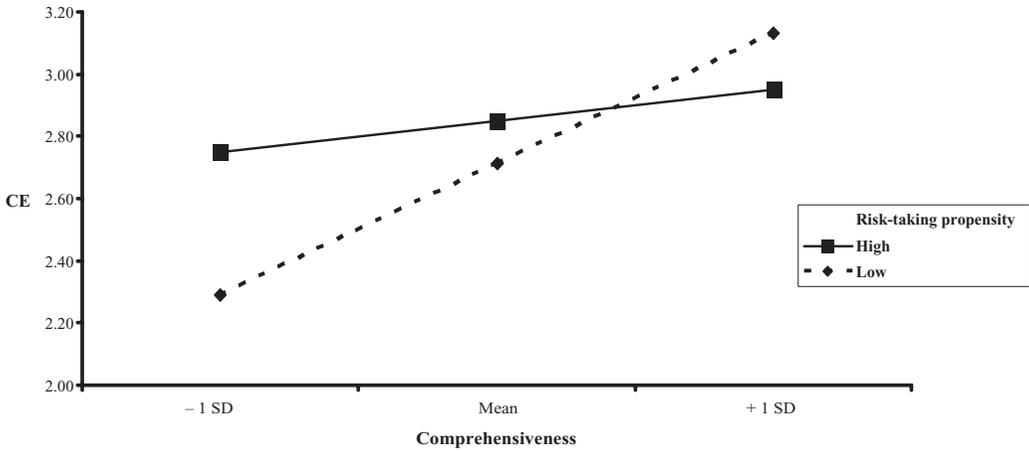


Figure 3. Moderating effect of risk-taking propensity on the relationship between decision comprehensiveness and corporate entrepreneurship

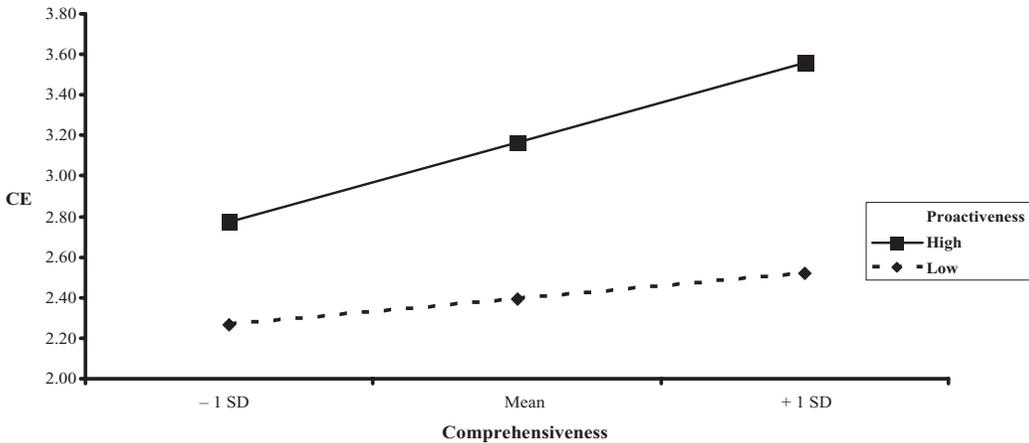


Figure 4. Moderating effect of proactiveness on the relationship between decision comprehensiveness and corporate entrepreneurship

shrouded by uncertainty due to decision-makers' lack of timely awareness of what opportunities to pursue, as well as a sense of doubt surrounding the feasibility and desirability of those opportunities. Consequently, we reasoned that comprehensiveness should facilitate CE, particularly in more stable environments, by endowing decision-makers with the knowledge needed to escape ignorance and assuage doubts. We also considered that decision-makers vary in terms of their preferences or willingness to bear uncertainty associated with CE, specifically positing that the facilitative role of comprehensiveness in enabling greater CE would be bolstered to the extent that comprehensive decision-makers are also willing to bear uncertainty. Our findings provide general support for these arguments, and in so doing, provide direct firm-level evidence for one

of McMullen and Shepherd's (2006) key insights that both knowledge and motivation must be specified concomitantly to more fully explain entrepreneurial action, which has to date remained 'somewhat of a mystery' (Shepherd et al., 2007, p. 78). Below we discuss additional implications that follow from our study.

As predicted, comprehensiveness was positively associated with the extent to which the firm pursues CE. As already noted, the predominant emphasis of research on comprehensiveness has been on its link with performance outcomes. While a worthwhile and important focus, this line of research has resulted in few direct insights into the probable implications of comprehensiveness for the firm's actual behaviour. To that end, our theory and findings suggest a salient role for comprehensiveness in enabling a complex and encompassing aspect of firm behaviour, CE. For research on CE (e.g. Barringer and Bluedorn, 1999; Teng, 2007; Zahra, 1996), the key implication of our study is that strategic decision-making characteristics matter – decision-makers can enable the firm's pursuit of CE through the procedural norms and process they use to make strategic decisions.

The significant interactive effects we found are particularly critical to comprehensiveness research for they help to clarify how the impact of comprehensiveness on firm behaviour varies with differing decision-makers and environmental characteristics. Taken together, these effects suggest that the relationship between comprehensiveness and CE may be more complex than a simple relationship that more comprehensiveness produces more CE.^[2] Going beyond the 'usual suspect', environmental dynamism, we proposed that the willingness of decision-makers to bear uncertainty, which we referenced in terms of their risk-taking propensity and proactiveness, would further explain the impact of comprehensiveness on CE.

In particular, although we predicted that decision-makers' risk-taking propensity would positively moderate the relationship between comprehensiveness and CE, the plotted interactions (Figure 3) clearly show that comprehensiveness has a stronger effect on CE at lower levels of risk-taking propensity. By contrast, when risk-taking propensity is high, the effect of increasing comprehensiveness on CE decreases. One intriguing, though speculative, explanation for this finding is that comprehensiveness and risk-taking propensity have a compensatory, rather than a synergistic, mutually enhancing relationship.^[3] In particular, because comprehensiveness represents a cautious, 'look before you leap' approach to decision-making it may be favoured by risk-averse decision-makers as a mechanism for avoiding risk and escaping the doubts needed to engage in entrepreneurial action. As such, comprehensiveness has a much more salient and pronounced impact on CE among decision-makers with a low risk-taking propensity. By contrast, when decision-makers possess a higher risk-taking propensity, comprehensiveness might be of marginal value in terms of facilitating entrepreneurial action. These decision-makers might believe they possess valuable personal insights or understanding of their strategic situations and available alternatives, such that they will not feel the need to exhaustively gather and analyse decision alternatives. Thus, it may be that decision-makers characterized by a high risk-taking propensity simply opt for a 'short cut' by choosing the riskier alternative and deem comprehensiveness as unnecessary and costly. Put in slightly different words, among decision-makers with high levels of risk propensity, more uncertainty owing to less comprehensiveness becomes less of an

issue in preventing entrepreneurial action as decision-making might be guided by a leap then look approach.

Our prediction that proactiveness positively moderates the relationship between comprehensiveness and CE was, however, fully supported. As expected, the enabling effect of comprehensiveness on CE was stronger in those firms whose decision-makers shared a preference for proactiveness. In contrast, we observed a diminished role for comprehensiveness among 'passive' decision-makers as the relationship between comprehensiveness and CE is weaker (almost flat) for firms whose decision-makers are low on proactiveness. We anticipate that in their attempt at comprehensiveness, passive decision-makers, because of their cautious approach towards entrepreneurial action, are more susceptible to the 'wait-and-see' syndrome, thus mitigating the impact of comprehensiveness on CE.

Consistent with previous research on comprehensiveness, we also examined the moderating role of environmental dynamism. As expected, dynamism negatively moderated the positive relationship between comprehensiveness and CE. Specifically, the relationship between comprehensiveness and CE is strongest under conditions of low dynamism, a finding that provides further credence to Forbes' (2007) argument that comprehensiveness would be of greater value under conditions of low environmental ambiguity. Conversely, under conditions of high dynamism, increasing levels of comprehensiveness produced only a slight increase in CE. Put differently, under conditions of high dynamism, comprehensiveness does not retard CE per se but it also does not saliently enable it either. This finding suggests a third conceptual possibility regarding the moderating role of dynamism in explaining comprehensiveness. Specifically, while some have argued for a positive moderating role (e.g. Eisenhardt, 1989; Goll and Rasheed, 1997; Priem et al., 1995) and others for a negative role (Fredrickson, 1984; Fredrickson and Iaquinto, 1989; Fredrickson and Mitchell, 1984), our findings suggest that different levels of dynamism have a different moderating impact: its low levels are salient while high levels are not. In short, it seems that comprehensiveness leads to CE under conditions of uncertainty but not ambiguity. This is an important finding given that previous research on comprehensiveness has produced an equivocal set of findings for decision-makers across stable versus dynamic environments (Forbes, 2007; Miller, 2008).

Previous research on comprehensiveness has always utilized small samples (see Forbes, 2007). As a consequence, it has often been hampered by low power, and an inability to examine more complex relationships. Additionally, we believe our findings are robust, in that we have taken a number of recommended steps to ameliorate concerns over informant bias, non-response bias, common method variance, and measurement error. None of these steps suggested a bias. Importantly, three of our four tested hypotheses pertain to *interaction* effects. Common method bias is unlikely to result in significant interaction effects or distort such effects, for 'artifactual interactions cannot be created; true interactions can be attenuated' (Evans, 1985, p. 30). In particular, while it is recognized that correlation and regression coefficients may be spuriously high due to method specificity, 'there is no a priori reason to suggest that the numerical difference between correlations of two variables measured in the same way at two levels of a third variable is influenced by method specificity' (Cummins, 1972, p. 657).

Nonetheless, this study, like any other study, is not without limitations. For example, it remains an empirical question as to whether or not our findings generalize to larger firms where strategic decision processes and as a consequence, entrepreneurial behaviours differ from those in SMEs. In larger firms decision processes are more likely to be characterized by political dynamics (Eisenhardt and Bourgeois, 1988), where decision-makers represent the often competing interests of different functional departments or product divisions. Also, top management teams are typically larger in size in larger organizations, which might give rise to a set of centrifugal forces that undermine strategic decision processes (Hambrick, 1994; Nadler and Heilpern, 1998). Finally, unlike larger firms, SMEs lack sophisticated information processing systems and institutional arrangements, such as planning departments (Lenz and Engledow, 1986), or competitive intelligence units (Ghoshal and Westney, 1991) that often serve as the information processing function in larger firms, and by so doing, considerably guide decision-makers' attention and processes (Shepherd et al., 2007). Thus, examining our hypothesized linkages in the SME context might have provided us with a more direct litmus test than in a large-firm context, where more complex decision process and information processing systems represent additional sources of variance (or invariance).

A potential problem with our study is the somewhat high correlation among risk-taking, proactiveness, and CE. While it might be suggested that they are all part of the same construct, making it difficult to untangle their separate effects, we view this as an unlikely possibility, for two reasons. First, from a theoretical and measurement standpoint, risk-taking and proactiveness are attributes of decision-makers, whereas CE is an attribute of the firm. Further, risk-taking and proactiveness reflect attitudinal properties whereas CE represents a behavioural tendency. Second, from an empirical standpoint, we used a series of CFAs to test the discriminant validity among risk-taking, proactiveness, and CE. Specifically, we compared the fit of one-, two-, and three-factor models. Chi-square difference tests suggest that risk-taking, proactiveness, and CE are best specified as separate constructs, and provide strong support for their discriminant validity.

Endogeneity also represents a potential limitation of our study given our reliance on cross-sectional data. To gauge its potential biasing influence, we probed for but failed to find appropriate instrumental variables by creating a correlation matrix depicting the correlation between each variable in our dataset and decision comprehensiveness and CE. Indeed, the criteria for instrumental variable estimation – having no direct association with the dependent variable and weak correlation with the endogenous regressors – seriously constrain the choice of such variables (Shaver, 2005; Simsek et al., 2007). With that said, given the fact that we replicated our basic finding that comprehensiveness is positively associated with CE using multi-source data, with a sub-sample of CEOs and TMT members (see Appendix B), we consider that the concern for endogeneity is partly alleviated.

Additionally, although the Irish setting of our study is a strength given the lack of prior research in this context, we had no comparison country, institutions, or firm, reducing the generalizability of our findings. However, because our research design is cross-sectional, correlational, and did not involve the manipulation of variables, cause-effect relationships cannot, of course, be inferred. For example, we cannot speak as to whether

or not comprehensiveness increases CE, per se, only that its varying levels are related to the varying levels of CE. With that said it is comforting to note that comprehensiveness is considered as an enduring characteristic of decision-making in firms, that exhibits only modest changes over time (Fredrickson and Iaquinto, 1989). Nonetheless, we are also mindful that like most examinations of CE effects, facets of our research design likely place limits on the extent to which we can place full confidence on the interpretation of our results. However, given that our tests revealed no bias and that we observed three significant interactions we view these limits as acceptable, particularly since our hypotheses dealt with complex, firm-level effects that required a large sample of firms to fully test them.

Conclusion

In concluding, although researchers have generally assumed that comprehensiveness influences firm behaviour, which in turn influence its outcomes, in most cases they have not specified and tested the former link in their empirical studies. Instead, they have tended to directly examine the comprehensiveness–performance link, or have focused on the implications of comprehensiveness for more narrowly fine grained aspects of decision process. Enriching this line of research, our study proposed and tested a model that specified the impact of comprehensiveness on the firm's pursuit of CE, which is widely viewed as a multifaceted, integral part of the strategic management of firms. As well as providing a novel account and initial evidence of the link between comprehensiveness and CE, we enrich theory by demonstrating the pivotal role that decision-makers' willingness to bear uncertainty plays in shaping this impact of comprehensiveness, coupled with the extent of environmental dynamism. Our study, however, is only a first step towards understanding the impact of comprehensiveness on CE and thus, future research on this important and complex area is warranted.

NOTES

- [1] The condition number is defined as the square root of the ratio of the largest eigenvalue (λ_{MAX}) to the smallest eigenvalue (λ_{MIN}).
- [2] We are grateful to a reviewer for suggesting this point.
- [3] We are grateful to a reviewer for suggesting this point.

APPENDIX A. RESULTS OF CONFIRMATORY FACTOR ANALYSIS FOR MEASURES

<i>Constructs and items</i>	α	<i>Factors</i>				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Decision comprehensiveness</i> (Miller et al., 1998)	0.88					
Develop many alternative responses		0.68				
Consider many diverse criteria for eliminating possible courses of action		0.70				
Thoroughly examine multiple explanations for the problem or opportunity		0.85				
Conduct multiple examinations of any suggested course of action		0.87				
Search extensively for possible responses		0.77				
<i>Corporate entrepreneurship</i> (Simsek, 2007; Zahra, 1996)	0.87					
Spending heavily (well above the industry average) on product development			0.65			
Introducing a large number of new products to the market			0.68			
Acquiring significantly more patents than its major competitors			0.47			
Pioneering the development of breakthrough innovations in its industry			0.75			
Spending on new product development initiatives			0.73			
Entering new markets			0.50			
Establishing or sponsoring new ventures			0.53			
Finding new niches in current markets			0.55			
Changing its competitive approach (strategy) for each business unit			0.45			
Reorganizing operations, units, and divisions to ensure increased coordination and communication among business units			0.51			
Redefining the industries in which it competes			0.56			
Introducing innovative human resource programmes			0.52			
Being first in the industry to introduce new business concepts and practices			0.71			
<i>Risk-taking propensity</i> (Covin and Slevin, 1986)	0.77					
Low risk projects with normal and certain rates of return versus high risk projects with unpredictable rates of return				0.74		
A cautious wait and see posture in order to minimize the probability of making costly decisions when faced with uncertainty versus a bold aggressive posture in order to maximize the probability of exploiting potential when faced with uncertainty				0.78		
Owing to the nature of the environment, it is best to explore gradually via cautious behaviour versus owing to the nature of the environment, bold wide-ranging acts are necessary to achieve the firm's objectives				0.66		

APPENDIX A. *Continued*

<i>Constructs and items</i>	α	<i>Factors</i>				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Proactiveness</i> (Covin and Slevin, 1986)	0.78					
Typically responds to actions which competitors initiate versus typically initiates actions to which competitors then respond						0.80
Is very seldom the first to introduce new products, services, and operating technologies versus is very often the first to introduce new products, services, and operating technologies						0.82
Typically seeks to avoid competitive clashes, preferring a live and let live posture versus typically adopts a very competitive undo the competitor posture						0.59
<i>Environmental dynamism</i> (Miller and Friesen, 1983)	0.72					
Major changes in the modes of production and/or service provision						0.75
A high rate of innovation						0.82
Major changes in consumer demographics						0.49
Frequent and major changes in government regulations						0.30
An increasing amount of spending on research and development						0.44
Frequent and major changes in the number of competitors						0.43

APPENDIX B. ROBUSTNESS TESTS

As noted earlier, we recognize that a reliance on single respondents can potentially introduce the same source bias. Therefore, to further establish the robustness of our key findings, we undertook additional steps. First, we analysed comprehensiveness and CE data from a sample of 102 firms, the majority of which (79 firms) were included in our original sample, whose CEOs and TMTs provided data. On average, 4.7 top managers responded within each firm (with a range of between 2 and 10 members), for an overall intra-team response rate of 76 per cent. The respondents in our sample had spent, on average, 7 years in their position, 13 years in their company, and 17 years in their industry. Using these data, we first assessed the extent of agreement among CEOs and TMT members as well as the reliability of responses, using measures of inter-rater agreement and reliability. To assess inter-rater agreement, we relied on James et al.'s (1984, 1993) commonly used *Rwg* index for multi-item scales. Consistent with our expectations, the top managers in our sample demonstrated strong agreement in their assessment of decision comprehensiveness ($Rwg = 0.92$) and CE ($Rwg = 0.93$).

To ensure the reliability of aggregating individual responses to the team level, we also calculated the scale intra-class correlations ICC (1) and ICC (2). The responses of top managers to the comprehensiveness scale (ICC (1) = 0.11, ICC (2) = 0.36, $F = 1.572$, $p < 0.005$) and corporate entrepreneurship scale (ICC (1) = 0.32, ICC (2) = 0.69,

$F = 3.190, p < 0.0001$) demonstrated acceptable levels of individual and group reliability. As a final check, we also computed the team-level scale reliability using the average item response per team as input. This strategy aligned the measurement reliability information with the level of analysis used in the substantive tests. Consistent with the individual analyses, the aggregate-level coefficients for comprehensiveness ($\alpha = 0.88$) and CE ($\alpha = 0.89$) scales suggest acceptable internal consistency.

We next combined CEO responses with TMT responses to examine the robustness of the linkage between comprehensiveness and CE using the same measurement instruments and statistical covariates as before. As in the original analysis, we used hierarchical regression, entering the variables in two steps – statistical covariates in the first step, and comprehensiveness in the second step. The results of our analysis were entirely consistent with our original findings. As further support for our first hypothesis, comprehensiveness was positively related to CE ($\beta = 0.292, p < 0.005; \Delta R^2 = 0.08, F = 4.142, p < 0.005$). As well as demonstrating the robustness of the of the comprehensiveness–CE link, this finding also partly alleviates endogeneity concerns.

Additionally, we statistically examined whether or not common method bias might have impacted our findings. To that end, we performed several tests suggested in previous research (namely, bivariate correlations and confirmatory factor analysis; Podsakoff et al., 2003). We used confirmatory factor analysis as a more sophisticated test of the hypothesis that a single factor can account for all of the variance in our data by performing a series of models to compare our measurement model to a one-factor and a three-factor model structure, which involved different combinations of our exogenous variables (e.g. to test our one-factor model we combined comprehensiveness, environmental dynamism, risk-taking propensity, proactiveness, and corporate entrepreneurship as a single factor). The goodness of fit indices indicate a poor fit for the single-factor model which suggests that biasing from common method variance is unlikely. The hypothesized model outperformed other models as evidenced by significant χ^2 reductions and significantly improved model fit.

REFERENCES

- Adidam, P. T. and Bingi, R. P. (2000). 'The importance of decision confidence to strategy outcomes'. *Journal of Applied Business Research*, **16**, 35–50.
- Aguilar, J. F. (1967). *Scanning the Business Environment*. New York: Macmillan.
- Ansoff, H. I. (1965). *Corporate Strategy: An Analytic Approach to Business Policy for Growth and Expansion*. New York: McGraw-Hill.
- Atuahene-Gima, K. and Li, H. (2004). 'Strategic decision comprehensiveness and new product development outcomes in new technology ventures'. *Academy of Management Journal*, **47**, 583–97.
- Bagozzi, R. P., Yi, Y. and Phillips, L. W. (1991). 'Assessing construct validity in organizational research'. *Administrative Science Quarterly*, **36**, 421–58.
- Baron, R. A. (2006). 'Opportunity recognition as pattern recognition: how entrepreneurs "connect the dots" to identify new business opportunities'. *Academy of Management Perspectives*, **20**, 104–19.
- Baron, R. M. and Kenny, D. A. (1986). 'The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations'. *Journal of Personality and Social Psychology*, **51**, 1173–82.

- Barringer, B. R. and Bluedorn, A. C. (1999). 'The relationship between corporate entrepreneurship and strategic management'. *Strategic Management Journal*, **20**, 421–44.
- Braybrooke, D. and Lindblom, C. E. (1970). *A Strategy of Decision: Policy Evaluation as a Social Process*. New York: Free Press.
- Burgelman, R. A. (1983). 'A process model of internal corporate venturing in the diversified major firm'. *Administrative Science Quarterly*, **28**, 223–44.
- Chen, M. (1996). 'Competitor analysis and interfirm rivalry: toward a theoretical integration'. *Academy of Management Review*, **21**, 100–34.
- Cohen, J., Cohen, P., West, S. G. and Aiken, L. S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, 3rd edition. Mahwah, NJ: Lawrence Erlbaum.
- Covin, J. G. and Slevin, D. P. (1986). 'The development and testing of an organizational-level entrepreneurship scale'. In Ronstadt, R., Hornaday, J. A., Peterson, R. and Vesper, K. H. (Eds), *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College, 628–39.
- Cummins, R. C. (1972). 'Leader-member relations as a moderator of the effects of leader behavior and attitude'. *Personnel Psychology*, **25**, 655–60.
- Curley, S., Yates, J. F. and Abrams, R. (1986). 'Psychological sources of ambiguity avoidance'. *Organizational Behavior and Human Decision Processes*, **38**, 230–56.
- Cyert, R. M. and March, J. G. (1963). *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Daft, R. L. and Weick, K. E. (1984). 'Toward a model of organizations as interpretation systems'. *Academy of Management Review*, **9**, 284–95.
- Day, G. (1994). 'The capabilities of market-driven organizations'. *Journal of Marketing*, **58**, 37–52.
- Dean, J. W. and Sharfman, M. P. (1996). 'Does decision process matter? A study of strategic decision-making effectiveness'. *Academy of Management Journal*, **39**, 368–96.
- Dess, G. G. and Beard, D. W. (1984). 'Dimensions of organizational task environments'. *Administrative Science Quarterly*, **29**, 52–73.
- Dutton, J. E. and Duncan, R. B. (1987). 'The creation of momentum for change through the process of strategic issue diagnosis'. *Strategic Management Journal*, **8**, 279–95.
- Eisenhardt, K. M. (1989). 'Making fast strategic decisions in high-velocity environments'. *Academy of Management Journal*, **42**, 543–76.
- Eisenhardt, K. M. and Bourgeois, L. J. III (1988). 'Politics of strategic decision making in high-velocity: toward a midrange theory'. *Academy of Management Journal*, **31**, 737–70.
- Evans, M. G. (1985). 'A Monte Carlo study of the effects of correlated method variance in moderated multiple regression analysis'. *Organizational Behavior and Human Decision Processes*, **36**, 305–23.
- Forbes, D. P. (2007). 'Reconsidering the strategic implications of decision comprehensiveness'. *Academy of Management Review*, **32**, 361–76.
- Fredrickson, J. W. (1984). 'The comprehensiveness of strategic decision processes: extensions, observations, future directions'. *Academy of Management Journal*, **27**, 445–66.
- Fredrickson, J. W. and Iaquinto, A. L. (1989). 'Inertia and creeping rationality in strategic decision processes'. *Academy of Management Journal*, **32**, 516–42.
- Fredrickson, J. W. and Mitchell, T. R. (1984). 'Strategic decision processes: comprehensiveness and performance in an industry with an unstable environment'. *Academy of Management Journal*, **27**, 399–423.
- Ghoshal, S. and Westney, E. D. (1991). 'Organizing competitor analysis systems'. *Strategic Management Journal*, **12**, 17–31.
- Gilley, K. M., Walters, B. A. and Olson, B. J. (2002). 'Top management team risk taking propensities and performance: direct and moderating effects'. *Journal of Business Strategies*, **19**, 95–114.
- Goll, I. and Rasheed, A. M. A. (1997). 'Rational decision-making and firm performance: the moderating role of environment'. *Strategic Management Journal*, **18**, 583–91.
- Hambrick, D. C. (1994). 'Top management groups: a conceptual integration and reconsideration of the team label'. In Staw, B. M. and Cummings, L. L. (Eds), *Research in Organizational Behavior*. Greenwich, CT: JAI Press, **16**, 171–214.
- Hambrick, D. C., Geletkanycz, M. and Fredrickson, J. (1993). 'Top executive commitment to the status quo: some tests of its determinants'. *Strategic Management Journal*, **14**, 401–18.
- Hannan, M. T. and Freeman, J. (1989). *Organizational Ecology*. Cambridge, MA: Harvard University Press.
- Harrison, D. A., McLaughlin, M. E. and Coalter, T. M. (1996). 'Context, cognition, and common method variance: psychometric and verbal protocol evidence'. *Organizational Behavior and Human Decision Processes*, **68**, 246–61.
- Hofer, C. W. and Schendel, D. (1978). *Strategy Formulation: Analytical Concepts*. St Paul, MN: West.

- Hsieh, C., Nickerson, J. A. and Zenger, T. R. (2007). 'Opportunity discovery, problem solving, and a theory of the entrepreneurial firm'. *Journal of Management Studies*, **44**, 1255–77.
- Huber, G. and Daft, R. (1987). 'The information environments of organizations'. In Jablin, F., Putnam, L., Roberts, K. and Porter, L. (Eds), *Handbook of Organizational Communication*. Newbury Park, CA: Sage, 130–64.
- Huber, G. P. and Power, D. (1985). 'Retrospective reports of strategic-level managers: guidelines for increasing their accuracy'. *Strategic Management Journal*, **6**, 171–80.
- Iaquinto, A. L. and Fredrickson, J. W. (1997). 'Top management team agreement about the strategic decision process: a test of some of its determinants and consequences'. *Strategic Management Journal*, **18**, 63–75.
- Ireland, R. D., Hitt, M. A. and Sirmon, D. G. (2003). 'A model of strategic entrepreneurship: the construct and its dimensions'. *Journal of Management*, **29**, 963–89.
- James, L. R., Demaree, R. G. and Wolf, G. (1984). 'Estimating within group interrater reliability with and without response bias'. *Journal of Applied Psychology*, **69**, 85–98.
- James, L. R., Demaree, R. G. and Wolf, G. (1993). 'R_{wg}: an assessment of within group interrater agreement'. *Journal of Applied Psychology*, **78**, 306–9.
- Janis, I. L. (1982). *Groupthink: Psychological Studies of Policy Decisions and Fiascos*. Boston, MA: Houghton Mifflin Company.
- Kline, R. B. (1998). *Principles and Practice of Structural Equation Modeling*. New York: Guildford Press.
- Kumar, N., Stern, L. W. and Anderson, J. C. (1993). 'Conducting interorganizational research using key informants'. *Academy of Management Journal*, **36**, 1633–51.
- Lenz, R. T. and Engledow, J. L. (1986). 'Environmental analysis units and strategic decision-making: a field study of selected "leading-edge" corporations'. *Strategic Management Journal*, **7**, 69–89.
- Lieberman, M. and Montgomery, D. (1988). 'First-mover advantages'. *Strategic Management Journal*, **9**, Special Issue, 41–58.
- Ling, Y., Simsek, Z., Lubatkin, M. H. and Veiga, J. F. (2008). 'Transformational leadership's role in promoting entrepreneurship: examining the CEO-TMT interface'. *Academy of Management Journal*, **51**, 557–76.
- Lumpkin, G. T. and Dess, G. G. (1996). 'Clarifying the entrepreneurial orientation construction and linking it to performance'. *Academy of Management Review*, **21**, 135–72.
- March, J. G. (1988). *Decisions and Organizations*. New York: Blackwell.
- Mathieu, J. E. and Kohler, S. S. (1990). 'A cross-level examination of group absence influences on individual absence'. *Journal of Applied Psychology*, **75**, 217–20.
- McMullen, J. and Shepherd, D. (2006). 'Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur'. *Academy of Management Review*, **31**, 132–52.
- Miller, C. C. (2008). 'Decisional comprehensiveness and firm performance: toward a more complete understanding'. *Journal of Behavioral Decision Making*, **21**, 598–629.
- Miller, C. C., Burke, L. M. and Glick, W. H. (1998). 'Cognitive diversity among upper echelon executives: implications for strategic decision processes'. *Strategic Management Journal*, **19**, 39–58.
- Miller, D. and Friesen, P. H. (1978). 'Archetypes of strategy formulation'. *Management Science*, **24**, 921–33.
- Miller, D. and Friesen, P. H. (1982). 'Innovation in conservative and entrepreneurial firms: two models of strategic momentum'. *Strategic Management Journal*, **3**, 1–25.
- Miller, D. and Friesen, P. H. (1983). 'Strategy-making and environment: the third link'. *Strategic Management Journal*, **4**, 221–35.
- Nadler, D. A. and Heilpern, J. D. (1998). 'The CEO and the executive team: managing the unique dynamics and special demands'. In Nadler, D. A. and Spencer, J. L. (Eds), *Executive Teams*. San Francisco, CA: Jossey-Bass, 83–112.
- Nelson, R. P. and Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Belknap, Harvard University Press.
- Ozgen, E. and Baron, R. A. (2007). 'Social sources of information in opportunity recognition: effects of mentors, industry networks, and professional forums'. *Journal of Business Venturing*, **22**, 174–92.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. and Podsakoff, N. P. (2003). 'Common method bias in behavioral research: a critical review of the literature and recommended remedies'. *Journal of Applied Psychology*, **88**, 879–903.
- Priem, R. L., Rasheed, A. M. A. and Kotulic, A. G. (1995). 'Rationality in strategic decision-processes, environmental dynamism and firm performance'. *Journal of Management*, **21**, 913–29.

- Rajagopalan, N., Rasheed, A. M. and Datta, D. K. (1993). 'Strategic decision processes: critical review and future directions'. *Journal of Management*, **19**, 349–84.
- Sarasvathy, S. D. (2001). 'Causation and effectuation: towards a theoretical shift from economic inevitability to entrepreneurial contingency'. *Academy of Management Review*, **26**, 243–88.
- Shaver, J. M. (2005). 'Testing for mediating variables in management research: concerns, implications, and alternative strategies'. *Journal of Management*, 330–53.
- Shepherd, D. A., McMullen, J. S. and Jennings, P. D. (2007). 'The formation of opportunity beliefs: overcoming ignorance and reducing doubt'. *Strategic Entrepreneurship Journal*, **1**, 75–95.
- Simsek, Z. (2007). 'CEO tenure and organizational performance: an intervening model'. *Strategic Management Journal*, **28**, 653–62.
- Simsek, Z., Lubatkin, M. H. and Veiga, J. F. (2007). 'The impact of the competitive environment on corporate entrepreneurship: toward understanding discretionary slack's pivotal role'. *Journal of Management Studies*, **44**, 1398–424.
- Sitkin, S. B. and Pablo, A. L. (1992). 'Reconceptualizing the determinants of risk behavior'. *Academy of Management Review*, **17**, 9–38.
- Stevenson, H. H. and Jarillo, J. C. (1990). 'A paradigm of entrepreneurship: entrepreneurial management'. *Strategic Management Journal*, **11**, Special Issue, 17–27.
- Tabachnick, B. G. and Fidell, L. S. (1996). *Using Multivariate Statistics*. New York: Harper Collins College Publishers.
- Teng, B. S. (2007). 'Corporate entrepreneurship strategies through strategic alliances: a resource-based approach toward competitive advantage'. *Journal of Management Studies*, **44**, 119–42.
- Tushman, M. and Romanelli, E. (1985). 'Organizational evolution: a metamorphosis model of convergence and reorientation'. In Cummings, L. L. and Staw, B. M. (Eds), *Research in Organizational Behavior*. Greenwich, CT: JAI Press, **7**, 171–222.
- Venkatraman, N. (1989). 'Strategic orientation of business enterprises: the construct, dimensionality, and measurement'. *Management Science*, **35**, 942–62.
- Zahra, S. A. (1996). 'Governance, ownership, and corporate entrepreneurship: the moderating impact of industry technological opportunities'. *Academy of Management Journal*, **39**, 1713–35.
- Zahra, S. A., Nielsen, A. P. and Bogner, W. C. (1999). 'Corporate entrepreneurship, knowledge, and competence development'. *Entrepreneurship Theory and Practice*, **23**, 169–89.