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Pull the Plug or take the Plunge: Multiple Opportunities and the Speed of Venturing Decisions in the Australian Mining Industry

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ABSTRACT

Effectively capturing opportunities requires rapid decision-making. We investigate the speed of opportunity evaluation decisions by focusing on firms' venture termination and venture advancement decisions. Experience, standard operating procedures, and confidence allow firms to make opportunity evaluation decisions faster; we propose that a firm's attentional orientation, as reflected in its project portfolio, limits the number of domains in which these speed-enhancing mechanisms can be developed. Hence firms' decision speed is likely to vary between different types of decisions. Using unique data on 3,269 mineral exploration ventures in the Australian mining industry, we find that firms with a higher degree of attention toward earlier-stage exploration activities are quicker to abandon potential opportunities in early development but slower to do so later, and that such firms are also slower to advance on potential opportunities at all stages compared to firms that focus their attention differently. Market dynamism moderates these relationships, but only with regard to initial evaluation decisions. Our study extends research on decision speed by showing that firms are not necessarily fast or slow regarding all the decisions they make, and by offering an opportunity evaluation framework that recognizes that decision makers can, in fact often do, pursue multiple potential opportunities simultaneously.

Keywords: Opportunity; Portfolio; Speed; Decision making; Opportunity Evaluation; Prospecting; Discovery; Exploration; Exploitation; New Ventures.

INTRODUCTION

The exploration and exploitation of potential opportunities is critical to firm performance (Bingham & Eisenhardt, 2011; Ireland, Hitt, Camp & Sexton, 2001; Sirmon, Hitt & Ireland, 2007). Consequently, the concept of opportunities has emerged as a central notion in a number of fields of research, including entrepreneurship (Shane & Venkataraman, 2000), strategic management (Foss, Lyngsie & Zahra, 2013; Suarez, Grodal & Gotsopoulos, 2014), and institutional theory (Battilana & Casciaro, 2012; Zietsma & Lawrence, 2010). Despite the progress we have made toward understanding opportunities and the manner in which they are explored and exploited, most prior research has assumed that actors typically identify and assess a single opportunity at a time (Gruber, MacMillan & Thompson, 2008). Recent research, however, has found that firms often identify multiple potential opportunities simultaneously (e.g., Barreto, 2012; Gruber et al., 2008; 2013). In fact, firms that identify multiple potential opportunities simultaneously may be able to select the most favorable market conditions for launching their products (Gruber et al., 2008).

While evaluating opportunities is a critical organizational activity (Bingham & Eisenhardt, 2011), it is far from easy. Many companies nowadays are faced with an abundance of heterogeneous opportunities (Bingham, Eisenhardt & Furr, 2011). Cognitive limits preclude actors from collecting complete data to sort through these options effectively (Ocasio, 1997; Shane, 2000), particularly in more dynamic environments in which the decision-making context is "more complex, more ambiguous, and less predictable" (Davis, Eisenhardt & Bingham, 2009: 414). Hence opportunity evaluation is extraordinarily challenging. Exacerbating this challenge is the fact that opportunities are inherently fleeting (Short, Ketchen, Shook & Ireland, 2009); hence, speed is crucial to their capture (Choi, Lévesque & Shepherd, 2008). Waiting for ready-made opportunities to materialize means risking being too late as "the most attractive opportunities will have already been captured"

(Bingham et al., 2011: 77). As a result, not only do firms, with their future at stake, need to sort through an abundance of complex, uncertain opportunities on the basis of incomplete data—*they need to do so fast*. What then, determines the speed at which firms make opportunity evaluation decisions in a multi-opportunity context?

Prior research has offered a number of important insights into this matter, identifying possible antecedents to firms' decision-making speed (e.g., Eisenhardt, 1989; Forbes, 2005; Kownatzki, Walter, Floyd & Lechner, 2014) and relating decision speed to firm performance (Bourgeois & Eisenhardt, 1988; Baum & Wally, 2003). By focusing on single decisions (e.g., by asking respondents to focus on and describe the most significant strategic decision made over the last two years [Forbes, 2005; Judge & Miller, 1991]), previous research has typically looked for factors that increase decision speed in general (Baum & Wally, 2003; Eisenhardt, 1989; Forbes, 2005; Judge & Miller, 1991). However, there are reasons to suggest that decision speed may not be a fixed attribute but rather an attribute that varies by the type of decision and the internal and external contexts in which the decision is made. Polaroid, for example, was proactive in seizing the instant camera market, quick in its responses to defend it against new entrants, and quick to develop manufacturing capabilities in this area. However, at the same time, it was notoriously slow at developing and marketing new products, particularly in digital imaging, and at letting go of losing ventures (Tripsas & Gavetti, 2000). This example points to the more nuanced notion that any one firm can be *quick to make some decisions but slow to make others.* This more nuanced notion of decision speed has been largely neglected by previous research on decision-making speed and opportunity pursuit.

In relation to the above, the purpose of this paper is to increase our understanding of how firms make specific types of venturing decisions more quickly or more slowly in a multi-opportunity context. We draw on the behavioral decision-making literature (Cyert & March,

1963; Levitt & March, 1988; March & Shapira, 1987) to identify a set of mechanisms that speed decision making in complex situations given bounded rationality. Using Cho and Hambrick's (2006) notion of attentional orientation, we propose that an attentional orientation toward certain stages of opportunity advancement (ranging from a relatively higher degree of attention toward earlier-stage exploration activities and related evaluation decisions to a relatively higher degree of attention toward later-stage exploitation activities and related evaluation decisions) influences decision speed, and does so differently for venture termination and venture advancement decisions made at different stages of evaluation. Specifically, we propose that a higher degree of attention toward earlier-stage exploration activities, as reflected in a firm's venture portfolio, allows for the accumulation of specific *experience* (Levitt & March, 1988), the development of *standard operating procedures* (Cyert & March, 1963; Gavetti, Levinthal & Ocasio, 2007), and the gain of domain-specific *confidence* (Levitt & March, 1988; March & Shapira, 1987). However, as attention is a limited resource because of human and organizational constraints (Cho & Hambrick, 2006; Ocasio, 1997), the domains in which a firm develops experience, standard operating procedures, and confidence are likely limited by where it focuses the majority of its decision makers' attention. As a consequence, we propose that a higher degree of attention toward earlier-stage exploration activities is likely to increase the speed of decisions that relate to early-stage exploration *but not so to the same extent for other types of decisions*. Hence, our framework departs from the notion that firms are necessarily fast or slow in general. Furthermore, as stated above, opportunity evaluation is particularly challenging in a dynamic environment. Moreover, environmental dynamism attenuates the effects of experience, standard operating procedures, and confidence (Levitt & March, 1988; Tripsas & Gavetti, 2000), and therefore is likely to moderate the effect of attention on decision speed. For this reason, we will investigate the contingent effect of environmental dynamism. Our empirical

focus is on the venture portfolios of mining firms, which represents a setting in which critical decisions about a focal potential opportunity are taken in the context of other possible opportunities.

We aim to make two key contributions with our work. First, contributing to theories of opportunities and opportunity evaluation (e.g., Haynie, Shepherd & McMullen, 2009; Wood, McKelvie & Haynie, 2014; Wood & Williams, 2014), we theorize and empirically demonstrate that the simultaneous pursuit of multiple possible opportunities influences decision making regarding a focal venture. Complementing recent research that has studied choice sets that are external to the firm prior to market entry (e.g., Gruber et al., 2008; 2013), we consider a firm's internal choice set—namely, potential opportunities already under some form of active consideration—and study how this internal choice set influences evaluation decisions at multiple stages within the opportunity-advancement process. In so doing, we shed new light on the process nature of opportunity evaluation, hence meeting recent calls to abandon a static view of opportunities (Dimov, 2011; Short et al., 2009) in favor of trying to understand their temporal dynamics (McMullen & Dimov, 2013; Short et al., 2009).

Second, we contribute to the literature on decision-making speed. As we mentioned, the literature on decision making has typically viewed speed as a general firm attribute (Baum & Wally, 2003; Eisenhardt, 1989; Forbes, 2005; Judge & Miller, 1991). By distinguishing between different types of decisions at different stages, we uncover that conventional mechanisms related to decision speed do not necessarily increase firms' overall or intrinsic speed; instead, we offer and empirically substantiate a theory that proposes that attentional orientation determines the domains in which such mechanisms are developed and thus only increases decision speed within these domains. This more nuanced notion adds an important contingency to our understanding of decision speed and helps resolve the inconsistency

between extant theory and an empirical reality in which firms regularly act quickly and decisively regarding some issues but not regarding others.

MINERAL MINING AS A SETTING OF STAGED OPPORTUNITY EVALUATION

Research in entrepreneurship (e.g. Ardichvili, Cardozo & Ray, 2003; Bhave, 1994; Shane, 2001) and innovation (e.g., Urban & Hauser, 1993; Veryzer, 1998) have offered various stage models of new product and new venture development, which typically involve stages of information gathering and analysis to determine if the venture should proceed to the next stage (Cooper, 2008). Subsequent advancement decisions typically involve an increasing and often irreversible commitment of resources, but as the process unfolds, uncertainty is often reduced (Burgelman, 1983; McGrath, 1999). In pharmaceutical drug testing (Wolfe & Shepherd, 2014), for example, the advancement of new molecular entities goes through a stage-gate funnelling process that starts from a pre-discovery phase that involves screening 5,000-10,000 potential target compounds, then proceeds with 200 to 300 of these compounds advancing to pre-clinical testing (which further narrows the list to the most promising five to ten compounds), and concludes with a phase of extensive clinical trials in the hope of finding one viable new drug.

Sequential staging of investments in a focal venture is a means of managing uncertainty by ensuring that subsequent investments are only made if the venture shows promise; if the venture does not show promise then it can be terminated and the firm's valuable resources redirected to those portfolio ventures that do (Bowman & Hurry, 1993; McGrath, 1999). Although the sequential staging of investment appears linear, the innovation process underlying it often involves much iteration within, and sometimes across, stages (Archdivilli et al., 2003; Cooper, 2008). Moreover, it appears that decision makers tend to "shift their thinking as they transition between the various phases of the entrepreneurial process" (Wood & Williams, 2014: 575).

In this paper we set our theorizing in the mining industry, a context in which staged opportunity evaluation decisions are of critical importance. Consistent with Eckhardt and Shane (2003) and Shane and Venkataraman (2000), we define opportunities as situations that allow for new goods, services, raw materials, or organizing processes to be introduced in such a way that the benefits exceed the value of the resources invested.[1] In mineral mining, opportunities take the form of ore bodies that can be systematically assessed, and mining firms typically confront multiple such opportunities at any given point in time. Decisions pertaining to the advancement or termination of a mine are of critical importance. As one mining executive told us "these decisions are neither trivial nor simple. In fact, they are absolutely critical make-or-break decisions for any mining company."

Mining companies usually pursue multiple potential opportunities simultaneously, building a portfolio of mining ventures and moving them through a stage-gate development process, with the successful management of this process being one of their primary tasks. Figure 1 presents a model of the stages of opportunity evaluation in mining. By characterizing the process in terms of prospecting, developing, and exploiting, Figure 1 focuses attention on opportunity evaluation decisions at specific stages—advancement from prospecting to developing and from developing to exploiting—and also on termination decisions.

Insert Figure 1 about here

Prospecting is the first stage of the process. It involves grassroots exploration to detect signals of potential opportunities in a location, which may be physical, i.e., a geographical area, or conceptual, e.g., a sector of an industry, a set of information channels, a technological invention, or a latent market need. In mining, the process begins with the exploration of probable potential zones (Rasheed et al., 2012) through attempts to detect

[1] As the benefits of any potential opportunity cannot be known ex ante, decision makers take action based on beliefs they form about opportunities—hence in this paper we will often refer to "potential opportunities" rather than just "opportunities" (see McMullen & Shepherd, 2006).

anomalies that signal a potential opportunity. The economic feasibility of a mining venture, however, is difficult to determine at this stage (Eggert, 1993). One of the managing directors we interviewed in conducting this study described the nature of prospecting using as an example Excalibur[2], a venture started with remote radar imaging followed by on-site exploration:

> "This image came from space radar on the NASA shuttle. Basically it hit the ground with radar pulses so it actually built up a topographical map ... What this allowed you to do was to wind up the game digitally so you could make mole hills look like mountains. ... What happened in this area [pointing to a map] … just in there is an embayment and there have been a lot of rivers coming into that. These rivers delivered a lot of titanium onto the coast. ... No one has ever explored this; no one had ever been there. ... We [leased] 40,000 square kilometers. We decided to go in deep and we took over an enormous area. … I was the first white man to walk across the sand ridges there and basically say 'Right we are on a shore line'. I could see the sand dropping down about 50-60 meters and I could see the old land form going around and I thought: 'I'm on the coast, I need to drill here.'"

This example of prospecting in the mining industry has important similarities with early-stage exploration of new products and new markets in other industries. For example, firms in the optical disk industry often engage in grassroots exploration of new territories—not geographical ones, but new knowledge domains external to the firm and distant from current technology (Rosenkopf & Nerkar, 2001). This kind of early-stage exploration can be done by probing into the future by means of experimental products and exploratory R&D (Brown & Eisenhardt, 1997; McGrath, 1999). The prospecting stage ends with a decision to terminate the venture or with a decision to progress to stage two: developing.

Developing is about advanced exploration of the signals detected through prospecting in an attempt to generate further information about the feasibility and desirability of the potential opportunity for the focal actor. The stakes and the commitment are higher in this stage than in the previous one. In mining, feasibility studies include drilling exploratory holes to estimate the quantity of ore at the site. This comes at considerable financial cost. Whereas

[2] For reasons of confidentiality, we refer to the project described here, and in other interviews from which we take excerpts, by the pseudonym Excalibur. The names of the persons we interviewed have also been changed.

the typical amounts of investments associated with prospecting might range from USD .02 to15 million, the costs of developing lie in the USD 10 to 500 million range (Hartman & Mutmansky, 2002). Estimates are also made of the cost of extracting the ore given its depth and the nature of surrounding rock, and of the cost of delivering the ore to market. These costs will be weighed against the potential revenue from the mine. Again, a parallel can be drawn between mining and other settings. In the case of new products, developing requires collecting information on potential market demand (Chrisman & McMullan, 2000) and production costs (Ardichvili et al., 2003), and assessing the opportunity's value creating capability (Ardichvili et al., 2003). However, at this stage there is not yet a full commitment to a given business model, product, or target market. To continue with the Excalibur project:

> "We had our own drilling, our own crews. We had a depot down here with a small laboratory in it.... We drilled and it took us two weeks. The third week I said to the geologist, 'How long will we be here?' He said, 'Two more days' and I said 'Go down to the bottom. The best will be in line six'. And he drilled in line six and through the deposit and on the radio the next day he said: 'Bob, we struck it, we have a mine.'"

Exploiting, stage three of the process, involves building efficient, full scale operations for products or services created by, or derived from, an opportunity (Choi et al., 2008; Choi & Shepherd, 2004). In the mining industry, exploitation takes the form of investments to extract resources for profit (Register of Australian Mining, 2012), such as excavation equipment, crushers, leaching tanks, filters, striping vessels, furnaces, moulds, and transportation. Usually the investment is substantial and cannot be recouped without incurring considerable cost. Exploitation also involves a different repertoire of operating procedures than that of the other stages. This is also true in the case of any radically new product as effective exploitation often involves establishing efficient production systems, instituting new routines, and investing in scale for efficient production (Dobrev & Carroll, 2003).

As we mentioned, mining ventures can be terminated at any stage during the process. By terminating a venture we mean ceasing activities related to the venture and divesting its

resources including the layoff or reassignment of employees (Shepherd, Patzelt, Williams & Warnecke, 2014). In mining this usually involves rehabilitating the surface and selling the land-lease or returning it to the government before walking away from the site. Only a small number of prospects eventually makes it all the way to the exploitation stage; typically over 90% are terminated somewhere along the way.

Overall then, the model depicted in Figure 1 can be viewed as a sequence of staged evaluation decisions on a venture that progresses from early-stage exploration (prospecting) to later-stage exploration (developing), and finally to exploitation. Hence there are some important similarities with March's (1991) exploration-exploitation framework, which has been widely applied in organizational learning (e.g., Holmqvist, 2004), search (e.g., Katila & Ahuja, 2002), and adaptation (e.g., Gupta, Smith & Shalley, 2006). At the venture level, exploration-exploitation is typically viewed in terms of sequential stages (Block & MacMillan, 1985), in which actors "attempt to reduce their ignorance about technology and market through knowledge accumulation arising from experimentation and search such as market research on customer demand and further development and testing of technologies" (Choi et al., 2008: 335). Depending on what is considered to be positive information revealed through exploration, the venture can progress to exploitation. Each of these general phases can consist of multiple milestones.

At the organizational level, exploration and exploitation have been viewed as fundamental activities which, certainly in capital intensive settings like mining, compete for scarce resources (March, 1991). As a consequence, firms make implicit and explicit choices between the two (Gupta, Smith & Shalley, 2006; March, 1991). Some firms may orient their resources primarily toward ventures focused on early-stage exploration, e.g., start a mining venture from buying a lease and prospecting, and then either developing the venture further, or terminating it, whereas other firms may orient their resources primarily toward ventures

focused on development, or those focused on exploitation, in which case the initial exploration phase has been performed by another firm. Yet others may choose a more balanced or mixed portfolio approach that falls somewhere in between (Hoffmann, 2007).

While in our model exploration comes before exploitation, the balance between the two can be achieved at the level of the industry as a whole rather than at the level of each individual organization (Gupta et al., 2006; March, 1991). That is, mining firms can survive by focusing on certain stages of the opportunity process, such that some organizations can focus on exploration of new deposits, while others who focus on exploitation, can access already existing opportunities at a later stage of development through acquisition. This is similar to the dynamics of other industries, like the pharmaceutical industry (Rothaermel & Deeds, 2004) and the semi-conductor industry (Gupta et al., 2006). But also IT firms like Cisco tend to engage in acquisition of small ventures to keep their business opportunity portfolio filled. In the following, we will elaborate further on one central element of successful portfolio management, namely the speed of making opportunity evaluation decisions.

ATTENTION TOWARD EARLY-STAGE EXPLORATION AND THE SPEED OF OPPORTUNITY EVALUATION DECISIONS

Decision Making Speed and Opportunity Pursuit

Decision speed is often thought of as "how quickly organizations execute all aspects of the decision making process" (Forbes, 2005: 355) and has been associated with superior firm performance (Bourgeois & Eisenhardt, 1988; Bingham & Eisenhardt, 2011; Eisenhardt, 1989; for an exception see Perlow, Okhuysen & Repenning, 2002). Decision speed enhances performance by enabling firms to exploit an opportunity before that opportunity disappears (Baum & Wally, 2003; Forbes, 2005; Stevenson & Gumpert, 1985). Furthermore, decision making to exploit an opportunity helps signal to stakeholders that the firm is proactive and

adaptable (Langley, 1995), enhances organizational learning (i.e., by making fast decisions the firm can make a greater number of decisions in a given time period, which provides a greater set of interactions and experiences that reveal information important for organizational learning [Baum & Wally, 2003; Eisenhardt, 1989; Forbes, 2005]), and can provide either a first mover advantage (Lieberman & Montgomery, 1988) or a series of transient advantages (McGrath, 2013). In particular, decision speed has been found to be important in dealing with dynamic environments (Baum & Wally, 2003; Eisenhardt & Martin, 2000; Judge & Miller, 1991), yet making fast decisions in such contexts is highly challenging as dynamism increases the difficulty of understanding the market to inform the decision making process (Priem, Rasheed & Kotulic, 1995).[3] As a consequence, a "central debate in the strategy, organization, and entrepreneurship literature surrounds how leaders effectively manage their organization and strategies in dynamic environments" (Eisenhardt, Furr & Bingham, 2010: 1263).

Decision makers can increase decision speed through, for example, the use of real time information, the development and consideration of more alternatives, reliance on intuition based on experience, and the use of active conflict resolution (Eisenhardt, 1989). Decision speed is also enhanced when decision makers are relatively younger (Forbes, 2005), when they use heuristics for capturing opportunities (Bingham & Eisenhardt, 2011), have their decision making guided by routines (Helfat & Peteraf, 2003; Nelson & Winter, 1982), rely on their intuition (Eisenhardt, 1989; Miller & Ireland, 2005; Wally & Baum, 1994), and when they draw on prior experience (Forbes, 2005).

The literature thus provides considerable insight into the importance of decision speed for grasping fleeting opportunities, its consequences for firm performance, and the antecedents to a firm's decision-making speed. However, extant literature has often considered a firm's decision speed to be relatively universal, instead of varying within a firm

[3] Environmental dynamism and velocity are different constructs but are "closely related in practice" (Baum & Wally, 2003: 1110).

across decisions (e.g., Baum & Wally, 2003; Eisenhardt, 1989; Forbes, 2005; Judge & Miller, 1991). As such, it does not yet provide a deep insight into the decision making speed of different evaluation decisions at various stages of the opportunity advancement process.

To address this, we focus on the critical role of *attention* (Ocasio, 1997). Although largely overlooked in prior research on decision speed, we believe the concept is relevant because decision makers can, and in fact often do, consider multiple potential opportunities simultaneously (Barreto, 2012; Gruber et al., 2008; 2013) yet they are boundedly rational and have limited attentional capacity (Cyert & March, 1963; Simon, 1947). Hence when confronted with potentially large and complex choice sets, decision makers cannot give full attention to all issues concurrently; attention is likely to be focused on a limited set of issues (Lavie, Stettner & Tushman, 2010; Ocasio, 2011). We will hypothesize that firms are able to develop the speed-enhancing mechanisms that prior literature has identified predominantly in areas in which their attention is focused. In so doing, we offer an explanation for how it can be that firms can make quick decisions in some situations, but make slow decisions in others.

We adopt Cho and Hambrick's (2006) concept of attentional orientation, which in turn draws on Ocasio's work on attention (1997, 2011), and apply it to a firm's degree of attention toward certain stages of opportunity advancement; ranging from a relatively higher degree of attention toward earlier-stage exploration activities and related evaluation decisions, to a relatively higher degree of attention toward later-stage exploitation activities and related evaluation decisions. Firms with a higher degree of attention toward earlier-stage exploration activities are likely to face a different set of issues than firms focused more on the development or exploitation of potential opportunities. For example, exploration focuses attention on searching for something new through a constant probing of the environment for signals of new wealth-creating opportunities (Brown & Eisenhardt, 1997; McGrath, 1999), whereas at the other extreme, exploitation focuses attention on existing opportunities and the

skills and resources needed to leverage them (Rothaermel & Deeds, 2004). We will empirically capture a firm's degree of attention toward certain stages of opportunity advancement by observing its venture portfolio, representing the firm's observable strategic choices (Cho & Hambrick, 2006) between alternatives that result from, and are based on, attentional orientations.

Theoretical Mechanisms

Our central thesis is that a firm's degree of attention toward certain stages of opportunity advancement influences the relative speed of its decisions about a focal potential opportunity. Rooted in the behavioral decision making literature (Cyert & March, 1963; Levitt & March, 1988; March & Shapira, 1987), our framework is built on three mechanisms: *experience* (Levitt & March, 1988; Ocasio, 1997)*, standard operating procedures* (Cyert & March, 1963; Gavetti et al., 2007; Ocasio, 1997) and *confidence* (Levitt & March, 1988; March & Shapira, 1987).

Experience. Through the repeated execution of certain tasks and the recurring activation of routines, firms gain experience and learn (Levitt & March, 1988). Because of the differences in critical activities, firms with a higher degree of attention toward earlier-stage exploration activities are likely to develop and possess a different set of experiences than firms whose attention is focused on later-stage development and/or exploitation. For example, early-stage exploration involves search, discovery and experimentation, whereas at the other end of the spectrum exploitation involves refinement, implementation, and execution (March, 1991). These domain-specific experiences are likely to influence the speed of decision making. Specifically, actors with domain-relevant experience are likely to spend less time gathering information, because they already have a stock of knowledge on which to draw (Forbes, 2005). Furthermore, actors with domain-relevant experience are likely to more

quickly analyze information because they have an organizing framework in place that "facilitates the storage, recall, and interpretation of data" (Forbes, 2005: 358).

Standard Operating Procedures. Over time, firms tend to develop standard organizational practices, programs, and procedures (Cyert & March, 1963; Gavetti et al., 2007). They can be thought of as a set of behavioral rules learned through attempts to adapt to operating conditions (Cyert & March, 1963). Having proposed that varying attentional orientations channel actors toward different experiences, we also see them as being likely to lead to the development of different types of operating procedures. Practices and procedures related to prospecting include, for example, how to allocate slack resources to investigate potential opportunities (George, 2005), how to normalize small failures and learn from small losses (Sitkin, 1992), and how to efficiently redeploy resources from one venture to another (Brown & Eisenhardt, 1997). In contrast, the practices and procedures related to exploitation include, for example, procedures for managing risk and maintaining strategic congruence (Greve, 2007; March, 1991), refining existing technologies and achieving efficiency (Csaszar, 2013; March, 1991), and ramping up operations to achieve economies of scale and scope (Lavie et al., 2010). Standard operating procedures guide the decisions organizations make (Cyert & March, 1963) and influence their speed. Standard operating practices and procedures permit the transfer of past learning, which can then be re-applied to new contexts (Cyert & March, 1963). Also they can set the rules for how to collect, filter and process information (Cyert & March, 1963).

Confidence. Not only does the focusing of attention on specific tasks build domain-specific experience and generate standard operating procedures, it also enhances decision makers' confidence within that domain (Levitt & March, 1988; March & Shapira, 1987). Confidence refers to "the strength of belief in the goodness, accuracy, and appropriateness of one's judgments" (Budescu & Yu, 2007: 154). By focusing attention toward earlier-stage

exploration activities, decision makers are likely to be relatively more engaged in the collection, analysis, and evaluation of information related to prospecting ventures. Domain-specific knowledge and the organization of this knowledge is likely to enhance confidence in making decisions in this domain (cf. Einhorn & Hogarth, 1985). Confidence helps decision makers sufficiently overcome the anxiety of an uncertain situation (Eisenhardt, 1989; Eisenhardt & Martin, 2000) and to "act quickly and decisively" (Judge & Miller, 1991: 450; Baum & Wally, 2003; Levitt & March, 1988).

HYPOTHESES

Firms' Degree of Attention toward Earlier-Stage Exploration and Decision Speed

On the basis of the above framework, we expect that a higher degree of attention toward earlier-stage exploration activities, as reflected in a firm's venture portfolio, influences decision making speed. Our model (see Figure 1) distinguishes between two important *types* of opportunity evaluation decisions, venture termination and venture advancement, at two different *stages* of the process, prospecting and developing.

Prospecting Stage. Firms with a higher degree of attention toward earlier-stage exploration activities are likely to gain experience, develop standard operating procedures, and build confidence related to exploration. One key exploration activity is to *terminate unpromising ventures early* (McGrath, 1999). Because of the greater variability of possible outcomes, exploration through early-stage ventures is inherently more uncertain and more likely to result in failure than the exploration of later-stage ventures (Gupta et al., 2006; McGrath, 1999). As a result, firms with a higher degree of attention toward earlier-stage exploration activities are frequently confronted with having to make the decision to terminate a venture at an early stage. Therefore, such firms are more likely to gain experience relevant to dealing with these ventures, and to develop more standard operating procedures for early fault detection and termination (McGrath, 1999) than those with an attentional orientation

toward later-stage exploration or exploitation. In addition, they are likely to be quicker to obtain and process domain specific information (Forbes, 2005), and be more confident in using it (Judge & Miller, 1991) to decide on the fate of a focal prospecting venture. We expect that this will increase the speed at which such firms terminate ventures at the prospecting stage.

Venture advancement at the prospecting stage requires a different set of experiences, standard operating procedures, and base of confidence. Indeed, venture advancement differs from venture termination in a number of respects. First, a decision to advance a venture is less about limiting downside risk and more about capturing upside potential (Bowman & Hurry, 1993; McGrath, 1999). Venture advancement from prospecting to developing requires investment of capital for a previously identified opportunity—an initial choice of one venture over others. It thus constitutes a step toward opportunity exploitation (Choi et al., 2008). Compared to firms focused on later-stage development and exploitation, those with a higher degree of attention toward earlier-stage exploration activities are less likely to attend to information pointing toward the upside potential of a venture, or have the relevant experience, operating procedures, and confidence to facilitate speedy advancement of the venture.

The above leads us to expect that an attentional orientation toward earlier stages of opportunity advancement will allow firms to make some decisions more quickly, but not all decisions *per se*. Specifically, based on our reasoning we offer our first hypothesis as follows:

> *Hypothesis 1: In the prospecting stage, a stronger attentional orientation toward earlier-stage exploration activities (a) increases the speed of venture termination decisions, but (b) decreases the speed of venture advancement decisions.*

Developing Stage. A staged perspective can reveal that seemingly similar phenomena may take on different meanings at different stages (Eckhardt & Ciuchta, 2008; McMullen & Dimov, 2013). The effect of an attentional orientation toward earlier-stage ventures on the

speed with which a firm makes decisions at the developing stage differs from that at the prospecting stage in two important ways.

First, developing a potential opportunity involves greater sunk costs (Northcraft & Wolf, 1984). *Venture termination* at this later stage is more difficult given the resources that have already been allocated and expended (Gimeno, Folta, Cooper & Woo, 1997). Nonetheless, firms that have experience in making decisions involving sunk costs are less likely to allow sunk costs to delay a decision to terminate a venture than firms that do not have the same level of experience (Garland, Sandefur & Rogers, 1990). Firms lacking development and exploitation stage experience are also likely to have fewer established practices and procedures and confidence for developing and exploiting ventures. This makes them more likely to remain committed to developed projects, and thus more likely to delay the decision to pull the plug on ventures that have reached that stage (Garland et al., 1990).

Second, the developing stage typically involves advanced studies of feasibility and efficiency rather than initial exploration. Hence practices and procedures geared toward exploration, like probing for signs of opportunity, learning from small venture failures, and redeploying resources from one venture to another (Brown & Eisenhardt, 1997; Sitkin, 1992; McGrath, 1999), will be less helpful in *venture advancement* in this stage, which calls for conducting cost-benefit analyses, refining, scaling, and achieving efficiency (Csaszar, 2013; Lavie et al., 2010; March, 1991). Compared to firms more focused on the development and exploitation of opportunities, a firm with a higher degree of attention toward earlier-stage exploration activities is likely to need more time to collect information to assess the feasibility of a venture, and to have less confidence in their ability to make such assessments, which likely decreases the speed of the decision advance a venture at the developing stage. We hence offer our second hypothesis as follows:

Hypothesis 2: In the developing stage, a stronger attentional orientation toward earlier-stage exploration activities (a) decreases the speed of venture termination decisions, and (b) decreases the speed of venture advancement decisions.

Interactions between Attentional Orientation and Environmental Dynamism

Portfolios are often constructed to manage environmental uncertainty (Adner & Levinthal, 2004; Hoffmann, 2007). One critically important attribute of a venture's environment is the level of dynamism, i.e., the degree of market change or volatility (Bakker & Knoben, 2015; Dess & Beard, 1984). Dynamism is a key variable in both the behavioral decision making (March & Simon, 1958; Simon, 1947) and the decision speed literatures (Baum & Wally, 2003; Bourgeois & Eisenhardt, 1988). Dynamism diffuses attention (Ocasio, 1997) and erodes the value and applicability of prior experiences and operating procedures (Bakker & Knoben, 2015), hence can be expected to influence the nature of the relationship between attentional orientation and the speed at which firms make decisions.

Prospecting Stage. Firms that frequently probe potential opportunities at earlier-stages of advancement are likely to be able to sense problems more quickly (Brown & Eisenhardt, 1997; McGrath, 1999). However, to gain the necessary confidence when environmental dynamism is high, decision makers need to collect, track and analyze more information (Hambrick, Finkelstein & Mooney, 2005), and this slows down decisions (Qian, Cao & Takeuchi, 2013). Although the practices and procedures developed by firms with a higher degree of attention toward earlier-stage exploration activities may speed up *venture termination* at the prospecting stage, they are less likely to do so in a dynamic environment. This is so because when dynamism is higher, previously developed knowledge, experience, and confidence are less likely to be applicable to current decisions (Bakker & Knoben, 2015). As a consequence, when dynamism is high, firms with a higher degree of attention toward earlier-stage exploration activities are less able to capitalize on their stock of knowledge, experience, and confidence (Judge & Miller, 1991; Forbes, 2005).

When a firm with a higher degree of attention toward earlier-stage exploration activities considers whether to *advance* a potential opportunity beyond the prospecting stage, the delaying effect caused by its limited experience, operating procedures, and decision making confidence for exploitation is likely to be exacerbated by a more dynamic environment. In a highly dynamic environment, obtaining information that enhances the accuracy of decisions is initially difficult (Dess & Beard, 1984). It takes time to collect, track, and analyze data (Hambrick et al., 2005; Qian et al., 2013). Furthermore, those with a higher degree of attention toward earlier-stage exploration activities have less knowledge of exploitation activities (Forbes, 2005) and hence a greater need to collect and analyze information on opportunities. This poses a greater challenge when environmental dynamism is high, because it makes the information that is available less reliable (D'Aveni, 1994). We hence offer hypothesis 3:

> *Hypothesis 3: In the prospecting stage, a stronger attentional orientation toward earlier-stage exploration activities (a) increases the speed of venture termination decisions less, and (b) decreases the speed of venture advancement decisions more, when environmental dynamism is high than when it is low.*

Developing Stage. Because firms that orient more attention on seeking out new opportunities are likely to have fewer practices and procedures for making decisions on more developed ventures, they are likely to be more susceptible to the sunk cost effect (Garland et al., 1990), which leads to delays in decisions to *terminate* ventures (Adner & Levinthal, 2004). This slowing of venture termination decisions is likely to be exacerbated by a dynamic environment. For one, information gathered in dynamic environments is less predictive, raising doubts about the accuracy of the initial assessment, and so causing even further delays in decisions to terminate ventures (Gimeno et al., 1997). Such doubt and hesitation are likely to be greater for decision makers whose firms have a higher degree of attention toward earlier-stage exploration activities because they are likely to be less able to rely on well-developed practices and procedures, and hence are likely to have less confidence in assessing

more advanced ventures. This is likely to slow decision making speed (Eisenhardt, 1989; Judge & Miller, 1991).

Decision makers similarly need to be able to confidently assess the viability of a venture before giving it the green light to be *advanced* to the developing stage. Environmental dynamism can make viability assessment more challenging (Larrañeta, et al., 2013), even more so for firms with a higher degree of attention toward earlier-stage exploration activities as their experience and practices and procedures for exploration are likely to be less applicable to exploitation decisions (March, 1991). Thus, firms with a higher degree of attention toward earlier-stage exploration activities are likely to be disproportionally affected by the effects of a more dynamic environment. Based on this reasoning, we offer our final hypothesis:

> *Hypothesis 4: In the developing stage, a stronger attentional orientation toward earlier-stage exploration activities decreases the speed of (a) venture termination decisions and (b) venture advancement decisions more when environmental dynamism is high than when it is low.*

RESEARCH METHOD

Sample and Data Sources

To test the above set of hypotheses, we study a sample of 3,269 Australian mineral exploration ventures over the 2002 to 2011 period. The mining industry is an important source of employment and economic growth globally, in part as a consequence of a gradual worldwide restructuring process that has caused a peak in demand for natural resources (Bakker, 2015; Taylor, 2011). Thirteen of the 50 largest companies in the world are involved in minerals and oil (Dicken, 2011).

There are several reasons why mineral mining is a suitable context for our study. First, in mining, opportunities take the form of ore bodies that can be systematically assessed, and mining firms typically confront multiple potential opportunities at any given point in time. Second, while the mining sector represents a single industry, mining companies are usually

engaged in multiple mineral markets (e.g., gold, silver, platinum, etc.). This provides us with sufficient variance to study environmental dynamism. Finally, mining has distinct stages characterized by increasing and less-reversible investments as one moves forward in the process, and the decisions to terminate or advance mining ventures along the way is of critical importance.

We gathered data from different sources. First, we used the *Register of Australian Mining,* a comprehensive, publicly available archive of reference books with annual data on all Australian mining companies, mining ventures, and directors. Our sample comprises all mining ventures listed in the *Register.* For publicly traded companies, the *Register*'s data collection is compiled from such diverse sources as Aspect Huntly, the Australian Stock Exchange (ASX), Bloomberg, Creamer Media, the London Stock Exchange, Marketwire, MBendi, Mining Weekly, MiningNews.net, Morningstar, Read Corporate, and Sedars, as well as from government and company websites and email alerts, and from annual and quarterly company reports. For private companies, the *Register*'s data collection is gathered and updated through direct contacts with those companies and through internet searches carried out quarterly (Bakker, 2015; Register of Australian Mining, 2012; personal communication). The data is available in digital form beginning with 2002. We checked data reliability by tracking the publicly traded companies through their ASX listings and cross-checking them with Morningstar and Sirca.

We also obtained from the Bureau of Resources and Energy Economics (BREE) monthly price data on a broad range of minerals traded on the open market. We linked mining ventures to their respective mineral using unique identifiers.

Finally, we visited mine sites in Australia and interviewed a number of senior executives and consultants active in the mining industry. Although data gathered in this way were not formally used to test the hypotheses, what we learned from Australian mining

executives and industry consultants, and observed ourselves during visits to sites, gave us a more thorough grasp of opportunity evaluation in mineral mining.

Bakker (2015) also draws on these data sources, but incorporates a different sample (1,025 mineral exploration alliances) and different independent and dependent variables. To the extent possible, we included the same control variables as Bakker (2015) in the present study.

Measures

Dependent Variable: Decision Speed. Our measure of decision speed captures *the duration of time* a mining venture spends in a stage before a decision is made to act on the venture. We began by capturing occurrences of decisions to advance and terminate mining ventures. Mining ventures in the prospecting stage are categorized as 1 (Advance to Developing) when a given venture at the prospecting stage at time t is listed at the developing stage at time $t + 1$, and as 2 (Terminate during Prospecting) when a venture at the prospecting stage that is present at time t is no longer present at time $t + 1$, and 0 otherwise. Mining ventures in the developing stage are categorized as 3 (Advance to Exploiting) when a given venture at the developing stage at time t is listed at the exploiting stage at time $t + 1$, and as 4 (Terminate during Developing) when a venture at the developing stage that is present at time t is no longer present at time $t + 1$, and 0 otherwise. Our dependent variable captures the duration of time (Duration) to reach any of the 4 events—that is, the time it takes a venture in the prospecting stage to advance to the developing stage, or to termination, and for ventures in the developing stage, the time taken to advance to the exploitation stage or to termination.

Of our sample of 3,269 mining ventures over a 9-year period, (i) 83 advanced from prospecting to developing. The average duration to reach this decision was 3.06 years (1118 days); (ii) 1526 were terminated while prospecting. The average duration to reach this decision was 2.04 years (745 days); (iii) 74 advanced from developing to exploiting. The

average duration to reach this decision was 1.72 years (628 days); (iv) 132 were terminated while developing. The average duration to reach this decision was 1.89 years (691 days).

Explanatory Variables: Orientation toward Earlier Stages of Opportunity Advancement. As we elaborated previously, we proxy a firm's degree of attention toward earlier-stage exploration activities through its venture portfolio, because a venture portfolio reflects the firm's actual resource allocation decisions hence represents the firm's observable strategic choices (Cho & Hambrick, 2006) that result from, and are based on, attentional orientations. Prior research has measured portfolios using Blau (e.g., Powell, Koput & Smith-Doerr, 1996) and Herfindahl indices (e.g., Wuyts & Dutta, 2014), or weighted means (e.g., Lin & Lee, 2011). We opted for a weighted means approach in which the weights reflect the average investment required at each stage, \$0.6875 per ton for prospecting, \$5.13 per ton for developing, and \$76.00 per ton for exploiting (Hartman & Mutmansky, 2002). More formally, we measure a firm's orientation toward earlier stages of opportunity advancement as:

$$\frac{\sum n_i f_i}{\sum n_i}$$

in which n_i refers to the number of ventures in a firm's portfolio at stage i at each stage (prospecting, developing, exploiting), and f_i refers to the factor weight applied for each venture type i. We reversed the measure so higher scores reflect a stronger orientation toward earlier stages of opportunity advancement. Our measure incorporates the notion that different strategies compete for scarce resources (March, 1991) and is consistent with information we collected from key industry informants.

Our theoretical framework suggests that a firm's orientation toward earlier stages of opportunity advancement is relatively stable over time. This notion is supported by our data. In addition to our standard one year measure, we developed 3-year and 5-year measures. They

are highly correlated with the one year measure (.84, and .86 respectively). We tested the robustness of our results by replacing our one-year measure with a 3-year and 5-year firm average, and the results remain substantially unchanged.

As a final point, our data is project-centric, meaning that when a project is sold, it remains present in the database, but under a different owner. In other words, our measure of the dependent variable is not biased toward coding ventures that are sold as being terminated. As we will mention below, we control for ventures being sold/acquired through the dummy variable *Acquisition*.

Environmental Dynamism. Environmental dynamism is a time-varying covariate that captures the price variability of a mineral (i.e., its amplitude around the trend) over the preceding 12 months. Consistent with the approach used by Dess and Beard (1984) and Boyd (1990), we take a moving window of the standard error of the coefficient (beta) from a regression of time against the monthly price of a mineral. We used the mean of the dynamism score of each mineral when a venture was involved with multiple minerals.

Control Variables

First, we controlled for ***Financial Capital.*** Availability of financial capital allows for exploration (Cyert & March, 1963), especially when opportunities are extremely costly as is the case with mining. Following George (2005), our time-varying measure of a firm's discretionary slack is the log of the net financial assets of the firm owning the venture (in millions of Australian dollars). In the case of multiple owners, we used the sum of their net financial assets.

Second, we controlled for other characteristics of the venture portfolio. We controlled for ***Portfolio Diversity*** because mining different types of minerals requires different skills and expertise. We counted the number of minerals mined by a firm, and divided it by its total number of ventures. We also controlled for the number of ***Prior Portfolio Decisions*** because

a firm's decisions regarding a focal opportunity may be shaped by its previous decisions on other ventures in the portfolio. This variable captures the sum of the total number of prior termination and advancement decisions taken by the firm across its entire portfolio during the period of observation. In the case of multiple owners, we took the mean.

Third, we controlled for characteristics of the venture itself. We control for ***Project Scope*** because the scope of a business venture has been linked to commercialization decisions (Shane, 2001). This variable takes a value of 0 when the project is involved with just one mineral (e.g., gold) and a value of 1 when there are two or more (e.g., gold and silver). In addition, by ***Acquisition*** we control for whether any given venture is sold during its lifetime. We mentioned that mining firms can survive by focusing on certain stages of the opportunity process, such that some miners can focus on exploration of new deposits, while others can access already existing opportunities at a later stage of development through acquisition. The variable Acquisition is coded 1 when a venture is acquired by a different firm over its lifetime, and 0 if it is not.

Fourth, we controlled for firm ownership, governance, and company age. ***Venture Ownership*** measures the total number of parent firms involved in a venture in a given year. We log-transformed this time-varying covariate to account for skewness. ***Board's Competence Breadth*** captures for each year the number of unique skills contributed by the firm's board members (e.g., business administration, geology, human resources, etc.). Previous studies have related skills (Eisenhardt, 1989) and board experience (Judge & Miller, 1991) to the speed of decision making. Therefore, we controlled for the ***Company Age*** of the firm owning the venture, which we measured by the number of years since its founding. In the case of ventures with multiple owners, we used the mean age of their owners.

Finally, we controlled for other important market factors. First, ***Market Trajectory*** captures the mineral price trend over the previous 12 months. This measure is based on Dess

and Beard's (1984) and Boyd's (1990) measurement of munificence and is the coefficient (beta) of a regression of time against mineral price divided by the mean of the mineral price over the period. The resulting market trajectory score for each venture is a time-varying covariate based on a moving window of the mineral price in the previous 12-months. In the case of multiple mineral ventures, we took the mean of their respective scores. In addition, we control for macro-economic conditions with ***Interest Rate,*** the Reserve Bank of Australia official cash rate lagged one year.

Analyses

To test our hypotheses, we used a competing risks event history approach (Allison, 1984). At each stage, each mining venture faces the competing risks of being terminated or advanced. Prospecting stage ventures are at risk of being advanced to the developing stage versus being terminated at the prospecting stage. Developing stage ventures are at risk of being advanced to the exploitation stage versus being terminated at the developing stage. In both stages, the baseline comparison to advancement and termination is delay, that is, not experiencing either event. Cases that do not experience an event during the entire period of observation are right-censored. Because there are too few ventures that have progressed all the way from initial prospect to operational mine during the observation period, we split our sample into two groups: ventures at the prospecting stage and ventures at the developing stage. There is no dependence between the models because they include different cases.

We ran Cox competing risks regressions through the stcrreg module in Stata13. We estimated non-exponentiated coefficients; positive coefficients indicate that the hazard rate of a venture experiencing an event increases with changes in the covariate. Hence, positive coefficients indicate that an increase in the corresponding variable *decreases* the time it takes for an event to occur and therefore speeds up the occurrence of the event. Conversely, negative coefficients indicate that an increase in the corresponding variable slows down the

occurrence of the event (Box-Steffensmeier & Jones, 2004: 59). As our data comprises repeated observations for all explanatory variables, we modeled them as time-varying covariates with a time lag of one year. To account for a possible lack of independence between same-mineral ventures, we applied robust standard errors using the Lin and Wei method, which were clustered by mineral identifier. Consistent with prior studies using event history analysis (Schoonhoven et al., 1990; Iyer & Miller, 2008), our theory makes no assumptions about the form of the baseline hazard function.

RESULTS

Table 1 reports pooled descriptive statistics and correlations. The correlations among the explanatory variables are generally small to moderate, with the exception of some higher correlations between some of our control variables, namely between Portfolio Diversity and Venture Ownership (.52) and the Board's Competence Breadth (.58), and between Venture Ownership and Prior Portfolio Decisions (.57). To verify that these correlations do not influence our findings, we ran collinearity diagnostics for all explanatory variables and found that collinearity is unlikely to confound our results (all VIFs are < 2.00). Furthermore, we ran all models with and without these control variables, and found that their inclusion or exclusion did not substantively alter the pattern of findings.

Insert Table 1 about here

Tables 2 and 3 present the results of the Cox competing risks regressions of the timing of decisions on 3,269 mining ventures over the 2002–2011 period (6,563 venture-year observations). In Table 2, we study the antecedents of the competing risks of advancing a prospect to the developing stage (N=83) versus terminating it (N=1526). In Table 3, we study the antecedents of the competing risks of advancing a venture from the developing stage to the exploiting stage (N=74) versus terminating it (N=132).

Insert Tables 2 and 3 about here

To evaluate our hypotheses, we consider both statistical significance and effect size. To obtain an interpretation of the effect size, we used the procedure by Box-Steffensmeier and Jones (2004: 60), to estimate the percentage change in the hazard rate as a function of increases in distinct values for the independent variable on the basis of its Beta coefficient.

The coefficients in Table 2 and 3 provide support for H1a and 1hb. Specifically the results of Table 2 indicate that in the prospecting stage, a stronger orientation toward earlier-stage exploration activities increases the hazard rate of venture termination ($\beta = .04$; $p < .001$). The size of the effect is such that a 1% increase in a firm's orientation toward earlier stages of opportunity advancement increases the hazard rate of venture termination by 2.05%. Table 2 also shows that in the prospecting stage, a stronger orientation toward earlier-stage exploration activities decreases the hazard rate of venture advancement decisions ($\beta = -.06$; $p < .001$). The size of the coefficient indicates that a 1% increase in a firm's orientation toward earlier stages of opportunity advancement decreases the hazard rate of venture advancement by 2.99%.

Turning to the developing stage, Table 3 shows that a stronger orientation toward earlier-stage exploration activities decreases the hazard rate of venture termination decisions ($\beta = -.08$; $p < .001$), thus supporting H2a. The results show that a 1% increase in a firm's orientation toward earlier stages of opportunity advancement decreases the hazard rate of venture termination at the developing stage by 3.98%. Finally, Table 3 reports that a stronger orientation toward earlier-stage exploration activities decreases the hazard rate of venture advancement decisions at the developing stage ($\beta = -.07$; $p < .001$), thus supporting H2b. A 1% increase in a firm's orientation toward earlier stages of opportunity advancement decreases the hazard rate of venture advancement by 3.49%.

Environmental dynamism turns out to have the hypothesized effects at the prospecting stage (H3a-b), but not at the developing stage (H4a-b). Specifically, as indicated in Table 2, the coefficient of the interaction between Orientation toward Earlier Stages of Opportunity Advancement and Environmental Dynamism has a positive and statistically significant impact on the event of terminating a venture at the prospecting stage ($\beta = .01$; $p < .001$) and a negative and significant one on the event of advancing a venture at the prospecting stage ($\beta = -.01$; $p < .01$). We plotted these interactions to determine the nature of the relationships. Figures 2a and 2b demonstrate the effects for levels of Environmental Dynamism one standard deviation above and below the mean, and provide support for Hypothesis 3a and 3b, that is, we find that in the prospecting stage, a stronger attentional orientation toward earlier-stage exploration activities increases the speed of venture termination decisions less, and decreases the speed of venture advancement decisions more, when environmental dynamism is high than when it is low. Looking now at the contingent effect of Environmental Dynamism at the developing stage, Table 3 reports relatively small and statistically non-significant effects for the interaction between Orientation toward Earlier Stages of Opportunity Advancement and Environmental Dynamism on venture termination and venture advancement at the developing stage. Hence, H4a and H4b are not supported.

Insert Figure 2a and 2b about here

ROBUSTNESS TESTS

We performed additional analyses to verify the robustness of our findings. First, the strategies that firms use are not randomly chosen, they are based on their attributes and on industry conditions (Shaver, 1998). We therefore performed a Heckman correction to assess whether endogeneity influenced the effects of a firm's Orientation toward Earlier Stages of Opportunity Advancement on our dependent variable. We followed the two-step procedure

suggested by Shaver (1998) and by Hamilton and Nickerson (2003). Specifically, we first ran a regression in which Orientation toward Earlier Stages of Opportunity Advancement is the dependent variable (selection model), calculated the inverse Mills ratio from that equation, and then added it to a probit regression of the various observed outcomes (outcome model). In the latter model we excluded two instrumental variables, Financial Capital and Acquisition, which are particularly strong predictors of Orientation toward Earlier Stages of Opportunity Advancement.[4] The results indicate that the effects of firms' orientation toward earlier stages of opportunity advancement are robust to correcting for endogeneity. In addition, we ran all the models separately for each predictor, with no other predictors or controls included, which ruled out the possibility that the effect can be explained by the venture portfolio being affected by market factors.

Second, in our main analysis, we clustered the standard errors of the regression analysis by a unique mineral identifier. The ventures in our sample are also embedded in mining companies and so there could be a lack of independence between the values of company-level variables between ventures run by the same company. To assess whether this might bias our results, we re-ran all our analyses while clustering standard errors by a unique company identifier. In the case of a venture with multiple owners, we selected the owner who had the biggest total portfolio size, as these cases would cause the most bias. We found no substantive changes.[5]

Finally, to assess whether our findings were influenced by the skewed distribution of cases across outcomes (i.e., many cases experiencing a termination decision, and few experiencing an advancement decision), we also ran our analyses as standard non-competing

[4] We ran a similar analysis using heckprob in Stata, and the results were the same.
[5] In addition, we ran logit regressions of each outcome, while simultaneously clustering standard errors by company ID and commodity ID using clus_nway (Cameron, Gelbach & Miller, 2001; Kleinbaum, Stuart & Tushman, 2013). All results were robust.

Cox regressions for each outcome separately. The results were almost identical to those reported above, thus increasing confidence in our results.

DISCUSSION

The simultaneous evaluation of multiple potential opportunities is a critical, yet challenging organizational activity (Bingham & Eisenhardt, 2011), particularly so when making speedy decisions is of the essence (Eisenhardt, 1989). Integrating insights from the behavioral decision making and learning literatures (e.g. Cyert & March, 1963; Gavetti et al., 2007; March & Simon, 1958; Ocasio, 1997) with those from the literature on decision making speed (e.g. Choi et al., 2008; Eisenhardt, 1989; Forbes, 2005), we theorized that attentional orientation, as reflected in a firm's venture portfolio, influences decision speed toward focal opportunities. Challenging the view that organizations are typically either fast or sluggish regarding *all* the decisions they make, we proposed that a firm's limited span of attention restricts the domains in which speed-enabling mechanisms can be developed (notably; experience, standard operating procedures, and confidence); hence depending on where the firm orients most of its decision makers' attention, decision speed is likely to vary across assessments at different stages of opportunity advancement. An empirical study of Australian mining firms, which typically simultaneously pursue multiple potential opportunities at varying stages of development, provided support for this framework, indicating that firms with a stronger attentional orientation toward earlier-stage exploration activities are quicker to terminate early ventures but slower to do so later in their advancement, compared to firms that have a stronger attentional orientation toward development or exploitation. Firms with a stronger attentional orientation toward earlier-stage exploration activities are also slower to advance ventures at all stages. Importantly, we found support for our theorizing that dynamism moderates the relationship between attentional orientation and the termination and advancement decisions of early-stage ventures, however, we found that dynamism did not

significantly moderate the relationship between attentional orientation and later-stage termination and advancement decisions.

These findings have a number of important theoretical implications. We will discuss these in the context of the two literatures most closely related to our research, namely, the literature on opportunity evaluation and the literature on decision speed.

Implications for Research on Opportunity Evaluation

How do decision makers evaluate potential opportunities and what factors influence those evaluations? Decision makers tend to think of acting on potential opportunities in terms of the first person ("a good opportunity for my firm") rather than the third person ("a good opportunity for someone") (McMullen & Shepherd, 2006). As a consequence, firms tend to subjectively differ in their preference and pursuit of certain types of opportunities. For example, decision makers prefer potential opportunities that are cognitively close (Shook, Priem & McGee, 2003), that are related to their resource stock (Haynie et al., 2009), and to which they have some emotional attachment (Hodgkinson & Healey, 2011). Hence the predominant answer provided by the literature so far has been that opportunity evaluation depends mainly on the resources, skills, and prior knowledge of actors, of the uncertainty, size, and stage of development of the potential opportunity, and of the relatedness of the two (Dimov, 2007; Haynie et al., 2009; McMullen & Shepherd, 2006). Our study suggests that a fuller answer to this question may entail capturing and understanding the *opportunity process* (Short et al., 2009), as well as the role of *attention* (Cho & Hambrick, 2006; Ocasio, 1997).

Regarding the opportunity process, we developed a three stage model informed by our Australian mining industry research setting. We believe it provides a valuable research framework for use in meeting a recent call (McMullen & Dimov, 2013) to more explicitly acknowledge and investigate time in opportunity research. An especially important contribution of the model is that it offers the basis for new insights into the opportunity

process—especially regarding decision speed as we will discuss below. Our investigations of the mining industry also revealed the importance of a middle stage in the journey of a potential opportunity (developing); a stage that has largely been ignored in the literature but which has the potential to provide important insights into both opportunity evaluation and advancement. Although potential opportunities at the developing stage are still being explored, the nature of the exploration is different from the earlier stage of exploration—prospecting—and these differences impact decision making. Recognizing the importance of the process between early-stage exploration and eventual exploitation helps make sense of previous observations that the relationship between early-stage exploration and later-stage exploitation is often complex, has a substantial time lag, and involves considerable change (Ardichvili et al., 2003; Dimov, 2007; 2011). Our findings highlight the differences between decisions taken at these different stages of opportunity advancement, which opens up some new research opportunities. For example, while research on effectuation (Sarasvathy, 2001, 2008) emphasizes that opportunities change over time, this process can also result in a portfolio of opportunities at different stages of advancement. The effectuation concept of affordable loss could be useful in explaining decisions to advance or terminate a focal potential opportunity given this portfolio context.

An important contribution of our work is that we uncover the role of attention in the multi-opportunity evaluation process. Attention is a limited resource (Cho & Hambrick, 2006; Ocasio, 1997), hence decision makers cannot simultaneously attend to all aspects of all possible opportunities they face. This notion of limited attention is important because it explains why a single firm may differ in the speed at which it makes different types of opportunity evaluation decisions. Furthermore, the role of attention allocation is salient when it comes to how firms will make trade-offs between choice sets external and internal to the firm. Building on recent research that has studied choices-sets external to the firm (e.g.,

Barreto, 2012; Gruber et al., 2008; 2013), we actively considered the internal opportunity choice set, i.e., potential opportunities already under some form of active consideration—those already in the firm's portfolio. Besides demonstrating the relevance of internal choice sets, our study also leads to an interesting direction for future research: how does a firm's portfolio—its internal opportunity set—influence the size and the nature of its external opportunity set? On the one hand, one might expect that attention directed to an internal opportunity set (i.e., ventures in the portfolio) would reduce that directed to external opportunities—a substitution effect. On the other hand, the ability to choose between internal opportunities may help the firm recognize and pursue external opportunities—a magnification effect between the internal and external choice set. This, we believe, represents a fascinating question for future research.

We now turn to a discussion on the moderating effect of environmental dynamism on the relationship between attentional orientation and the timing of decisions to terminate and advance potential opportunities. Our work adds to the small number of studies that, following Shane and Venkataraman (2000), consider the interrelationships between characteristics of the actor, market, and potential opportunity (Barreto, 2012; Bradley et al., 2012; Dencker et al., 2009). We find significant statistical support for a moderating effect of environmental dynamism for the initial phase of opportunity advancement (prospecting), but not for the subsequent phase (developing). This finding relates to a more general pattern in our data. In looking at the making of the two kinds of advancement decisions—prospecting to developing and developing to exploiting—we see that the effects of some of the important actor variables that were used as control variables (e.g., Financial Capital, Acquisition, Venture Ownership, Boards' Competence Breadth, Company Age) grow stronger from stage 1 to stage 2, while the direct effects of Market Trajectory, Interest Rate, and Environmental Dynamism as well as the interaction effects between the firm's Orientation toward Earlier Stages of Opportunity

Advancement and Environmental Dynamism become weaker. We speculate that this is because over time actors are likely to obtain increasingly precise site-specific geological information about the presence and size of particular mineral deposits and their approximate extraction costs. However, the risk associated with market conditions is not reduced to a comparable extent and thereby diminish the relative influence of environmental dynamism and other environmental factors in later stages of opportunity advancement. This reasoning is in line with Davidsson and Honig's (2003) observation that the further into the exploitation process, the smaller the relative importance of macro or project unspecific variables. This change in the relative importance of environmental factors points to an interesting insight for theories of opportunities; the further into the exploitation process the more influence actors can have on the process through manipulating factors that are potentially within their control (e.g., project-specific factors) than through those that are largely beyond it (e.g., price and other macro environmental factors).

Implications for Research on Decision Speed

As mentioned above, the literature on decision making has predominantly viewed speed as a general attribute of the firm and/or its decision makers (Baum & Wally, 2003; Eisenhardt, 1989; Forbes, 2005; Judge & Miller, 1991). We find that it is important to distinguish between the speed of terminating a venture and that of advancing one. This distinction may at least partially reconcile the debate between the need for speed and that for uncertainty-reducing delay: the speed at which decisions are made is subject to a general tension between competing demands to act quickly to capitalize on an opportunity and to delay to allow time to better understand its value (Eisenhardt, 1989; Perlow, Okhuysen & Repenning, 2002; Kownatzki et al., 2014). Our findings suggest that it is important to be specific about the type of decision—termination or advancement—and the stage of

advancement—prospecting, developing or exploiting—because conventional mechanisms related to decision speed do not necessarily increase firms' overall or intrinsic speed; rather we forward a theory that proposes that attentional orientation determines where speed-enhancing mechanisms (experience, standard operating procedures, and confidence) are developed, hence increasing speed only for certain types of decisions, at certain stages of opportunity advancement. This more nuanced notion helps resolve the inconsistency between extant theory and an empirical reality in which firms sometimes make some decisions quickly, yet take a long time to make others. It also signifies attention as an important antecedent to decision speed that has thus far largely been overlooked in the literature.

Our findings add an important contingency to our understanding of decision speed. Indeed, research on decision making speed has typically focused on either the speed of opportunity exploitation (e.g., Brown & Eisenhardt, 1997; Choi et al., 2008) or on the importance of rapidly terminating ventures that show little promise (McGrath, 1999). In this study we take a step toward reconciling these two streams of research by investigating the speed of both. By theorizing and finding that the decision to terminate is not simply the flipside of the decision to advance a potential opportunity, we gain a deeper understanding of the connection between the two streams of research and specifically, the domain-specific processes that allow firms to make some decisions quickly, yet which do not necessarily extend to all decision making domains. In addition, our study opens up an opportunity for future research, namely: if decision speed is indeed situation-specific rather than a general firm characteristic, how does this influence the decision speed-firm performance relationship (cf. Bourgeois & Eisenhardt, 1988; Bingham & Eisenhardt, 2011; Eisenhardt, 1989; Perlow, Okhuysen & Repenning, 2002)?

Limitations and Future Research

Our study, as all studies, has limitations. First, we investigate one industry. While this increases the precision of our model and findings, we cannot be sure of the extent to which they apply to other industries. In particular, we speculate that the boundary conditions of our theory may well align with a distinction that Greve, Baum, Mitsuhashi and Rowley (2010) made between alliances that are production-oriented and those that are R&D oriented. Our model and findings may apply more to production-oriented ventures than to creative R&D ones, or to those focused exclusively on learning. Such ventures may well be more iterative and short-lived (Bakker, Boros, Kenis & Oerlemans, 2013) than mining ventures, and their stages of development more fuzzy (Greve et al., 2010).

Second, very few cases among those in our sample had progressed all the way through the opportunity advancement process within our 10 year observation period. For this reason, we could not study the sequence of multiple decisions—for instance, does a relatively longer or shorter period of initial prospecting prior to an initial advancement decision influence the speed of subsequent advancement decisions? Looking at other industries characterized by quicker venture progression or more dynamic portfolios might offer additional insights into the sequence of multiple decisions, and into relationships between different types of venturing decisions. Also, given the nature of our dependent variable, future research could use more fine-grained duration data (months rather than years), which could lead to more precise insights into decision speed.

Third, we did not focus our analysis on the decision to start new exploration ventures during the observation period, although this could certainly lead to additional insights on the timing of decisions. Future research could fruitfully extend our work in this direction.

A fourth limitation of our research is that, despite a sizeable sample overall, this study relied on some relatively smaller subsamples (N=83 and N=74, respectively) for ventures receiving advancement decisions, reflecting the nature of mineral mining in which only a

small minority of initial exploration prospects eventually become operational mines. Our data is also limited by the fact that it does not allow us to study whether a venture's location is new (new to the firm and/or new to the industry), even though this could potentially influence the speed of termination and advancement.

Finally, our empirical study did not include an assessment of performance. While we assume that firms will time their venturing decisions in a way that serves their best interest, we cannot provide direct evidence as to whether the firms that made faster decisions performed better. We would like to see future research that investigates whether it is speed *per se* that matters or whether fit is more important, meaning that timing decisions that are in sync with the venture and its environment may lead to enhanced performance (e.g., Ancona & Chong, 1996). We think that in so doing, future research could extend our work into a broader theory of the speed and dynamics of opportunity evaluation decisions.

Managerial Implications

A take-away from our findings is that managers, by focusing their attention toward certain types of decisions, can learn how to identify early signs that a potential opportunity does not show promise and terminate it quickly, or alternatively, how to look for signs of potential and push the potential opportunity through the advancement process quickly. Early decisions to terminate free up resources for prospecting, developing and exploring other potential opportunities, whereas quick advancements limit costs and maximizes upside potential. Managers that manage to focus their attention toward areas that are most relevant to the business' future are more likely to develop experience, standard operating procedures, and confidence and hence be quicker to make "pull the plug" and "take the plunge" decisions in those areas that matter most to them.

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TABLES AND FIGURES

TABLE 1
Descriptive Statistics and Pairwise Correlations[ab]

Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Terminate during Prospecting	0.23	0.42	.00	1.00	--																
2. Advance to Developing	0.01	0.11	.00	1.00	-.06	--															
3. Terminate during Developing	0.02	0.14	.00	1.00	-.08	-.02	--														
4. Advance to Exploiting	0.01	0.11	.00	1.00	-.06	-.01	-.02	--													
5. Duration	2.15	1.39	1.00	8.00	-.04	.07	-.04	-.02	--												
6. Financial Capital[b]	4.94	.99	4.14	14.72	-.04	.01	.07	.06	-.03	--											
7. Portfolio Diversity	.53	.31	.04	1.00	-.02	.03	.00	-.01	.09	-.09	--										
8. Prior Portfolio Decisions	4.08	4.26	.00	41	.15	.01	.03	-.02	.02	.11	.13	--									
9. Project Scope	.09	.29	.00	1.00	-.01	-.01	-.03	.00	.06	-.06	.07	.01	--								
10. Acquisition	.45	.50	.00	1.00	-.18	.01	-.07	.01	.41	.01	.16	.23	.01	--							
11. Venture Ownership[b]	.26	.39	.00	2.08	-.02	.00	.02	-.04	.15	.13	.52	.57	.01	.29	--						
12. Board's Competence Breadth	.26	.30	.00	3.00	-.07	.03	.01	.04	.05	-.06	.58	-.06	.01	.10	.28	--					
13. Company Age	6.59	7.85	1.00	49.00	-.02	.00	.03	.03	.04	.16	-.02	.07	.02	.09	.08	.00	--				
14. Market Trajectory	1.08	4.07	-8.73	11.35	-.09	.02	-.03	.02	.04	.01	.00	-.04	-.01	.10	-.01	.04	.05	--			
15. Interest Rate	4.99	1.14	3.75	6.75	.08	-.02	-.05	.00	-.03	-.15	.06	.33	.12	.21	.12	.05	-.05	.09	--		
16. Environmental Dynamism	-.04	1.44	-18.5	5.75	-.01	-.02	-.04	.01	-.03	-.04	-.04	.01	-.05	.03	-.02	.00	.01	.16	.09	--	
17. Orientation toward Earlier Stages of Opportunity Advancement	1.71	2.90	.17	50.90	.05	-.04	-.12	-.08	-.02	-.19	.07	.01	.05	.02	.01	.03	-.13	-.02	.08	.04	--

[a] N = 3,269 mining ventures over the 2002–2011 period (6,563 venture-year obs.). Correlations greater than $|.03|$ are statistically significant at $p < .05$.
[b] Log-transformed

TABLE 2
Cox Competing Risks Regression: Advancing vs. Terminating at the Prospecting Stage[ab]

	Advance to Developing			*Terminate during Prospecting*		
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Financial Capital	.15 (.10)	.10 (.10)	.10 (.10)	-.08***(.02)	-.06***(.02)	-.06**(.02)
Portfolio Diversity	.88** (.32)	.90** (.31)	.89** (.31)	.20* (.08)	.18* (.08)	.18* (.08)
Prior Portfolio Decisions	.06***(.01)	.06***(.01)	.06***(.01)	.07*** (.01)	.07*** (.01)	.07*** (.01)
Project Scope	-.14 (.24)	-.10 (.23)	-.11 (.22)	-.18* (.09)	-.19* (.09)	-.18† (.10)
Acquisition	.29 (.25)	.29 (.25)	.29 (.25)	-1.05*** (.04)	-1.05*** (.04)	-1.06*** (.04)
Venture Ownership	-.92*** (.25)	-.91*** (.25)	-.91*** (.25)	-.41*** (.09)	-.41*** (.10)	-.41*** (.10)
Board's Competence Breadth	.65* (.26)	.65* (.27)	.65* (.27)	-.31**(.10)	-.30**(.10)	-.30**(.10)
Company Age	.00 (.01)	-.01 (.01)	-.01 (.01)	.01** (.00)	.01**(.00)	.01**(.00)
Market Trajectory	07* (.03)	07* (.03)	07* (.03)	-.03** (.01)	-.03** (.01)	-.03** (.01)
Interest Rate	-.34***(.06)	-.32***(.06)	-.32***(.06)	.08***(.02)	.07*** (.02)	.07*** (.02)
Environmental Dynamism	-.03* (.02)	-.03† (.02)	.37** (.14)	.00 (.02)	.00 (.02)	-.34*** (.07)
Orientation toward Earlier Stages of Opportunity Advancement		**-.06*** (.01)**	**-.06*** (.01)**		**.04***(.01)**	**.04**(.01)**
Orientation toward Earlier Stages of Opportunity Advancement X Environmental Dynamism			**-.01**(.00)**			**.01***(.00)**
Log Pseudolikelihood	-604.5	-601.6	-601.4	-11223.3	-11217.6	-11216.1

[a] N = 3,269 mining ventures over 9 year period (6,563 venture-year obs.). Advance from prospecting: N = 83; Terminate while prospecting: N = 1526; censored: N = 1,660.
[b] Table reports regression coefficients (not hazard ratios); robust standard errors (clustered by mineral) in parentheses. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

TABLE 3
Cox Competing Risks Regression: Advancing vs. Terminating at the Developing Stage[ab]

	Advance to Exploiting			*Terminate during Developing*		
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Financial Capital	.30***(.07)	.28***(.07)	.28***(.07)	.15***(.04)	.12**(.04)	.12**(.04)
Portfolio Diversity	-.18 (.35)	-.08 (.38)	-.08 (.39)	.13 (.34)	.13 (.34)	.14 (.34)
Prior Portfolio Decisions	.01 (.03)	.01 (.03)	.01 (.03)	.06** (.02)	.06** (.02)	.06** (.02)
Project Scope	.06 (.36)	.13 (.35)	.13 (.35)	-1.26†(.69)	-1.18†(.68)	-1.18†(.69)
Acquisition	.42**(.15)	.46**(.15)	.46**(.14)	-1.15***(.16)	-1.12***(.16)	-1.12***(.16)
Venture Ownership	-2.05***(.55)	-2.07***(.56)	-2.07***(.55)	.26 (.31)	.28 (.29)	.28 (.31)
Board's Competence Breadth	1.51***(.38)	1.50***(.38)	1.51***(.38)	.40**(.14)	.39*(.16)	.39*(.16)
Company Age	.02**(.01)	.02**(.01)	.02*(.01)	.02*(.01)	.02† (.01)	.02† (.01)
Market Trajectory	04 (.03)	04 (.03)	04 (.03)	-.03 (.04)	-.04 (.04)	-.04 (.04)
Interest Rate	-.04 (.13)	-.01 (.13)	-.01 (.13)	-.31**(.11)	-.28*(.11)	-.28*(.11)
Environmental Dynamism	.19 (.18)	.17 (.17)	-.91† (.55)	-.07***(.01)	-.06***(.01)	-.12 (.10)
Orientation toward Earlier Stages of Opportunity Advancement		**-.07*** (.01)**	**-.08*** (.01)**		**-.08***(.02)**	**-.09***(.02)**
Orientation toward Earlier Stages of Opportunity Advancement X Environmental Dynamism			.02 (.01)			.00 (.00)
Log Pseudolikelihood	-533.9	-527.1	-526.5	-969.8	-953.7	-953.6

[a] N = 3,269 mining ventures over 9 year period (6,563 venture-year obs.). Advance from developing: N = 74; Terminate while developing: N = 132; censored: N = 3,063.
[b] Table reports regression coefficients (not hazard ratios); robust standard errors (clustered by mineral) in parentheses. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

FIGURE 1
Stages of Opportunity Evaluation

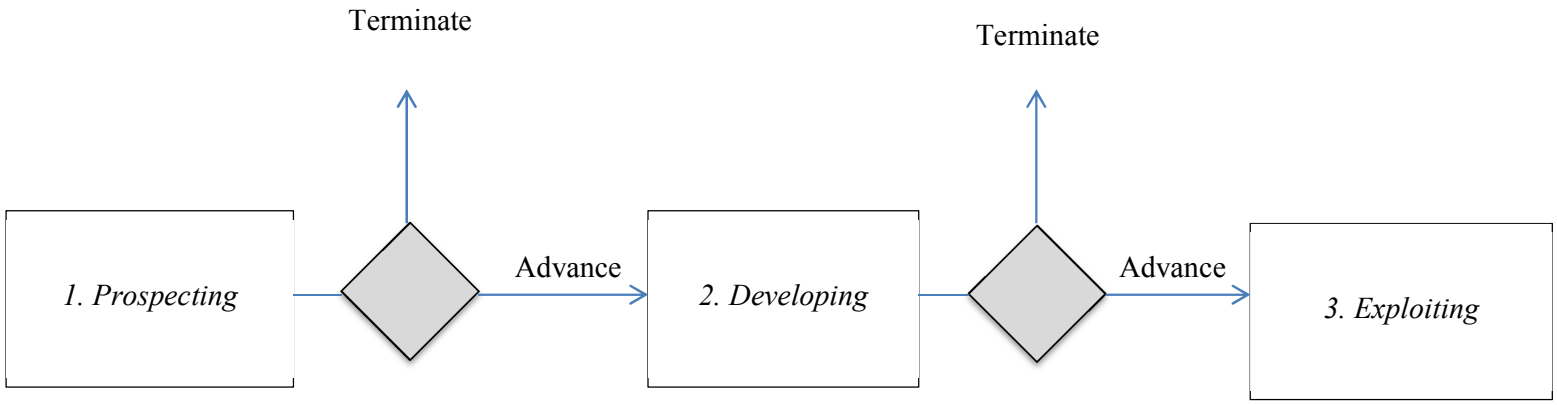


FIGURE 2A
Interaction Effect Plot: Terminating while Prospecting

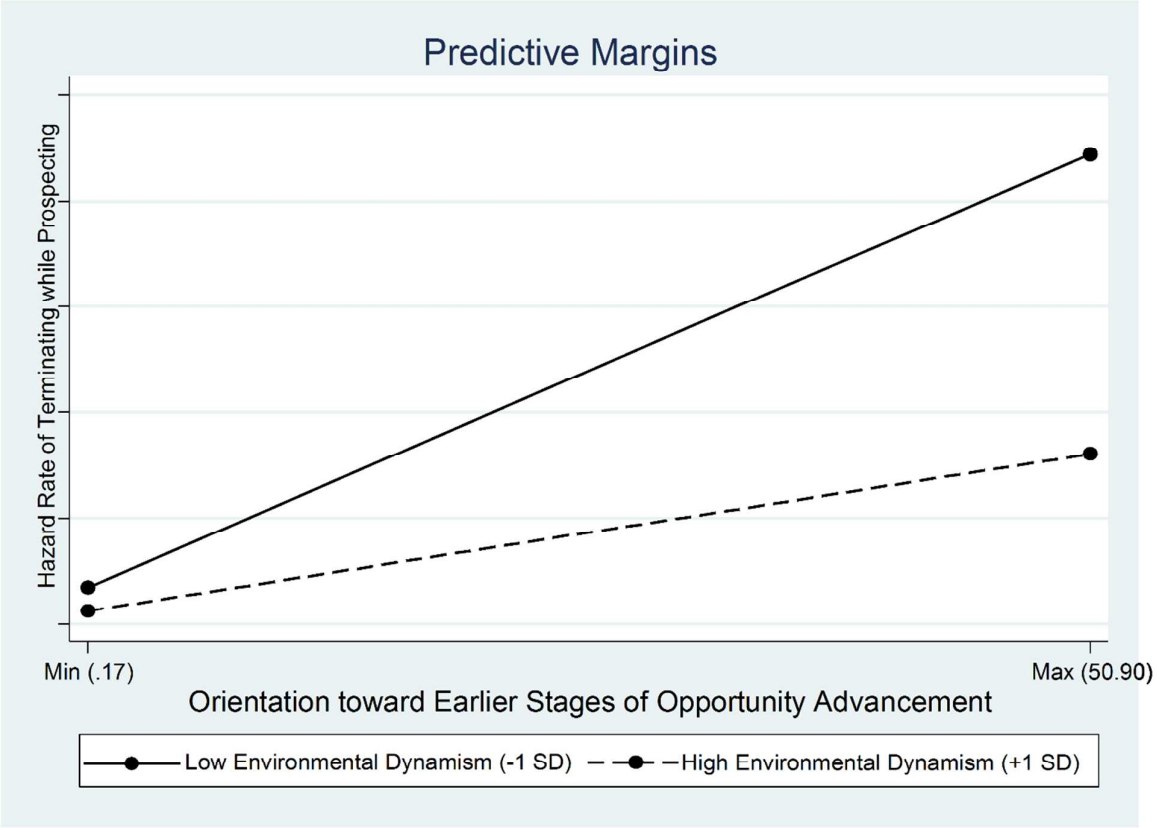
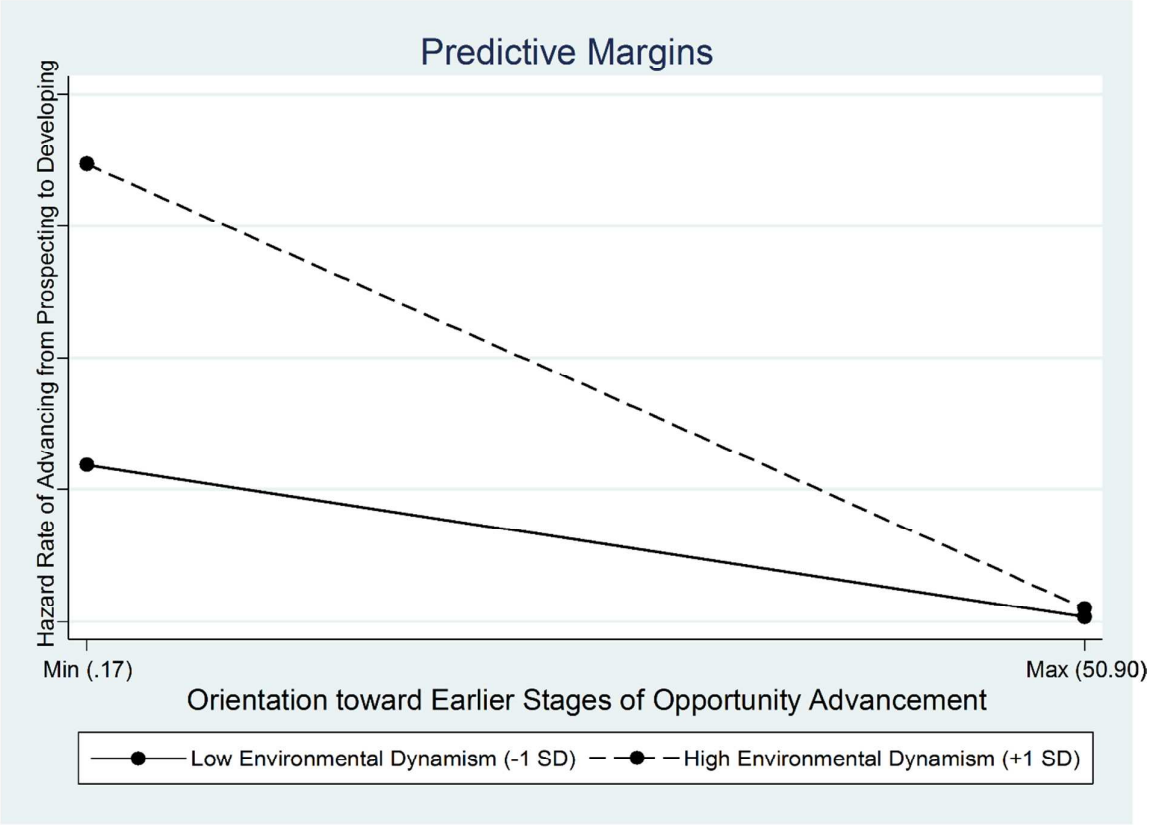


FIGURE 2B
Interaction Effect Plot: Advancing from Prospecting to Developing



Appendix A: Prospecting Potential Opportunities—Illustrations from Interviews with Industry Experts

Description of Activities	Terminating	Advancing
"Based on other occurrences around the area, based on maybe aerial mapping, geophysical and geochemical data that is already available … Essentially looking at the information that is available and saying well there is a trend here and we should pick that piece of ground up. So we have gone in and picked up various projects and what we then would do is go in and compile the information in detail, tread the ground and perhaps carry out some additional ground geophysics, more detailed work, or geochemical surveys and then we will drill." "There is enough data around that you can get at. I still think that there is still a lot of things to be found that way. The second way is similar in one respect, you mine the mines department databases and there is a shit load of data there, we have got onto a couple of things because of that. These days the ground is open, so if you are lucky enough you find something interesting in the data, then you peg it. Then the third way is that you get out there and you do a lot of regional mapping and walk along." "Prospecting is usually seen on ground and walking with foot and hammer and glass. … I found a silver mineralisation, high grade and I went back to the famers homestead, a big farm about 30, 000 acres. I said that I got that on the creek up there. He said … Before you, five companies they come with helicopters and they land on top of a hill or they land a fella on top of the hill and the guy will be picked up and then they will go to the next hill or they land on a rock. He said, I have never seen them walk anywhere. They all come in choppers".	"In the several instances we have gone in there and drilled we have found some mineralisation but it has been uneconomic and we have made a decision that it is not going to make it, so we walk away." "So it was still the exploration team who were making that decision and that is reasonably easy when they had gone and tested the concept and there had been nothing found. It becomes more difficult when you find a little bit and not quite enough to be economic and [this] decision... is one of the most difficult ones because that is a case where emotions get involved." "Our mantra is that we want to work with mineralised systems, if you don't have any mineralisation on the surface, you tend not to go out to the wild places."	"Each project is different, but the nickel project for example, you knew that you had rocks there so you could fly an airborne electromagnetic / magnetic survey for example and if there is nothing there, just walk away. If you did have a find, then you will say okay I will go to the next stage." "Where I put X is where we had the main mineralisation. It was just my knowledge of coast mines, my knowledge of gold and tin which is what I have mined in the past. ... So we did the magnetic and we found that we had lots of targets and we did the gravity and we have now come up with three major targets within what is called a job zone. This would have been like that, the rocks would have been doing that and they have gone whop. In the middle is a ten km wide zone which is absolutely fractured and smashed around. Because there is a weakness in the crust that is where you will expect minerals and hot magma coming out so now we have 60 metres to cover there and we have targets and we will go and drill them. Well we will see what comes out." "I found gold over a kilometre in a totally new area. I used to go to the top to Laverton and the geologists from Muranda and Esso used to say what the hell are you doing there Fred? There is no gold there? You have got to be in the green rocks not the white rocks. I said that I am finding plenty of gold."

Appendix B: Developing Potential Opportunities—Illustrations from Interviews with Industry Experts

Description of Activities	Terminating	Advancing
"I specifically picked up exploration permits which had known mineralisation on them so they already had some drilling in the past, in most instances a known mineral endowment. … So there had been significant work done in it … a long history of quite successful exploration, while there were no resources identified there was a good tenor of mineralization indicated and that is what I aimed for." "It is not easy to do to get the well drilled and the drill is often referred to as the lie detector. You are either going to make it or not." "This is what we have to develop and drill wells all over the place and get the resource and collect it together and then we need to put it into some sort of processing plant to strip out the CO^2 and the water and get it to pipeline specifications. You need a processing plant and then you need a pipeline…and the sort of pipeline that we are talking about it is a 48 inch line operating at schooper bottle pressure which is over 2000 PSI. ..In this case it would have to go to Gladstone which is over 2000 kms. Now that pipeline alone will be somewhere between 500 million and 1 billion dollars…. Then we would have to go into the only place that is open to us now…, and we can raise the money because all of a sudden with a reserve like that which is bankable…we can go out and borrow money."	"… we did actually acquire a project which we thought was a development project and we went out there and converted it into a resource, the resource hadn't been defined previously. We did a scoping study which involved employing a metallurgist consultant and consultant engineers and so we took it to that point. At that point it was not economic, it didn't progress." "Our guys had to think about it and so the second stage would have to have a goal that if there is going to be a mine we will probably have to produce 15,000 tonnes of nickel over ten years to be of any value to the company. So you can work out roughly the size of the body, so you can say estimate that the target would need to be say one kilometre long. If you put ten holes into the target zone, and you still haven't got anything, well you aren't going to make it. Just walk away." "… the boss of [company name] over a period of 20 years drilled 100 dry holes. He was known as "100 dry hole Jeff": 100 not out."	"So in that area, we found deposits of 100 million tonnes and we are doing quite a bit of work. Everyone said God that is remote. Where are you going to get the water from? We then bit the bullet and then in December we drilled a very deep hole down in the underlying basin and we found a huge amount of water. Massive. Right under the mine site where you want it. That was very successful, that made it feasible. Without the water there is no mine. We are still progressing and we are all very happy now and it will take another year and a bit to get through the government compliance and then we will be in a position to start looking at the full feasibility and get it finished. That was one thing. People said that was magnificent, how the hell did you guys go into the middle of nowhere and find something like that. No one had ever explored there… In one a half a km across and 5.5 kms long and we will be mining 1300 tonnes an hour and mining 10 million tonnes a year. So that is some point in the future." "So we started doing some iron work and we got some good hits and then rather than drill off the side of the magnetic anomaly we drilled the guts of the anomaly and we got the iron discovery. If they hadn't offered it up to us we probably wouldn't be looking in that area."

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