

Risk mitigation factors enabling exploration by risk-averse firms

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ABSTRACT

Exploration is generally regarded as a form of risk-taking by firms. Firms with a higher tolerance for risk are expected to undertake a higher level of exploration. However, risk-averse firms do not avoid exploration altogether. In this paper, we show that the specific exploratory activities in which risk-averse firms are willing to engage can be predicted based on firm-level characteristics that partially offset the risk of exploration. Not only do we identify such characteristics, but also we use this framework to model the performance consequences of various exploration alternatives available to electric utilities in the US from 2001-2006. This setting is especially conducive because of the clear differences in expected risk preference between risk-neutral investor-owned firms and risk-averse cooperative electrical utilities. We expect cooperative firms to pursue exploration when risk-mitigating factors are in place, but that investor-owned firms do not make this distinction. We also expect to find evidence that risk-mitigated exploration generates higher long term performance for cooperatives and investor-owned utilities alike.

Firm exploration, defined here as the search for new knowledge and actions taken to develop new firm capabilities, has been an important area of management inquiry for several decades but is still subject to broad interpretation and imprecise definition (see March, 1991). One consistent element of existing definitions of exploration is the assumption of a close association between risk and exploration. However, because exploration is fundamental to the evolution and growth of firms over time (Tushman & O'Reilly, 1996), it is salient even to firms that are highly risk-averse. The purpose of this research is twofold: first, to better understand how risk-averse firms decide which exploratory activities have tolerable levels of risk and can be pursued; and second, to compare the performance implications of exploratory activities based on their riskiness to specific firms. We analyze these questions in the context of electrical utilities, where a sharp distinction in risk preference can be drawn between cooperatives, which are more risk-averse due to their ownership structure, and investor-owned utilities, which are presumed to have the risk-neutral posture associated with the obligation to maximize value for shareholders (Jensen and Meckling, 1976).

Specifically, we first test whether a firm's risk preference is positively related to the level of exploration undertaken by the firm. We then identify firm-specific risk-mitigating factors that we predict will make the risk of certain exploratory activities tolerable to a risk-averse firm. Finally, we test whether risk-mitigated exploration choices have a positive relationship with firm performance for cooperatives and investor-owned utilities alike. In sum, we expect that firm-level characteristics play an important role in determining the tolerance for risk associated with a given exploratory activity undertaken by a firm and that these differences will enable some risk-averse firms to engage in exploration more successfully than their peers.

The context of our study is producers of electricity in the United States. This industry provides an attractive setting for two important reasons. First, there are a large number of firms managed under

a cooperative governance structure in addition to an even larger number using the more common investor-owned governance model. We believe that this difference in governance structure provides significant, distinct and easily measured difference between firms with respect to their tolerance for risk. Second, because a high level of government regulation in the industry somewhat limits the diversity of options available to managers, we expect that firms in the two groups will be highly similar in many other regards. This benefits our investigation by limiting the noise from factors outside of our empirical models.

We expect our study to yield valuable insights for managers in the industry. We hope to identify attributes of cooperative governed firms that are associated with successful exploration. Specifically, we focus on innovation related to identifying and implementing new sources of energy to be used in electricity generation. Cooperative managers could benefit from a better understanding of how to effectively balance the need to explore some new innovation while simultaneously maintaining the lower risk profile expected by the firm's owners. More broadly, we expect that managers of investor owned firms could learn about the benefits of lower-risk exploration practiced by decision makers in cooperative-run enterprises.

Theory development and propositions

The seminal paper on exploration was written by March (1991), who stressed the differences between exploration and exploitation as ways for firms to learn, enabling adaptation and growth over time. Exploration has been described as "a pursuit of new knowledge" (Levinthal & March, 1993, pg. 105) and is said to create "novel competencies that enable ongoing innovation" (Voss et al., 2008, pg. 147). From the original definition, exploration includes "things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" (March, 1991, pg. 71).

Although March highlights how the managerial processes that support exploration and exploitation are fundamentally distinct and sometimes conflicting, a careful reading reveals that March does not claim that a given firm is engaged in one or the other. Instead, his central theme is that firms need to be adept at managing two divergent processes, both of which are important for ongoing viability and development.

We take this insight as the departure point for our research. Prior literature establishes that firms differ widely in the willingness to make risky investments, and not only March (1991) but also subsequent research makes the explicit point that exploration is riskier than exploitation (Koza & Lewin, 1998). At the same time, we interpret March to indicate that nearly all firms explore, at least to some degree, and those which avoid exploration altogether are unlikely to survive an ever-changing environment. Taken together, we conclude that even risk-averse firms engage in exploration.

However, we contend that the *amount* and *type* of exploration chosen by firms will depend on risk propensity (Sitkin & Pablo, 1991). Focusing on risk-averse firms, we argue that the type of exploration pursued can be predicted systematically based on observable characteristics of the firm. The underlying mechanism is risk mitigation: risk-averse firms are more willing to explore in ways that are familiar to or connected with the history of their business. In contrast, risk-neutral firms make exploration decisions based more heavily on projections of expected returns, as they do not have risk avoidance as an explicit objective. We proceed to develop propositions about the firm-specific characteristics that predict the type of exploration risk-averse firms will pursue.

Association between risk and exploration. Risk is defined in many ways in extant management literature (for example, Shapira, 1994; Sniezek, 1998; Wiseman & Gomez-Mejia, 1998). In our research, we follow a classic definition of risk as the extent to which outcomes related to a specific action can

vary. Because managers must make decisions about which actions a firm should undertake, we focus on senior firm managers in trying to understand the role of risk in firm choices. These managers must weigh the risk and reward in investment decisions as stewards of the firm. Prior research offers several considerations that affect how individual managers decide the level of risk the firm should accept in its investment choices. First, past risk behaviors may have a strong inertial effect on choice of risk behavior. Second, institutional knowledge of past results achieved at different levels of risk taking may influence future risk behaviors by managers. Third, individual managers are assumed to have a risk preference which can be driven by individual, firm and industry level factors (Pablo & Sitkin, 1992).

As noted above, exploration is taken to be risky because it entails a firm's involvement in activities with which it is unfamiliar. In some instances, exploration involves activities that are new not only to the firm, but also to the world at large. To the extent the firm's exploration is productive, it enables an array of benefits with the potential to offer considerable upside, including the development of new products, the attraction of new customers, or the reduction of costs. On the other hand, the exploration may prove to be fruitless, leaving the firm with little value to show for the time and money invested in exploratory activities. Because outcomes from exploration can range from "strikeout" to "home run," and include everything in between, high risk is exemplified.

The extensive literature on financial economics establishes that it is self-defeating for firms to make investments unless the "expected return" of those investments, adjusted for risk, exceeds the cost of capital (i.e., have a positive net present value, or NPV). We therefore take it as given that firms only pursue exploratory activities that can be plausibly argued to have positive NPV (Brealey & Myers, 2002). However, we also assume that firms face resource constraints that force choices between various investment alternatives, and that expected returns are estimated with considerable imprecision,

especially for exploratory activities. As a result, our model assumes that a firm's risk propensity is an explicit and distinct consideration when investment choices are made.

Tolerance for risk in cooperative firms. Jensen and Meckling's (1976) agency theory is widely used as the backdrop for understanding risk propensity in investment decisions. The central insight of this work is that the self-interest of decision-makers is tightly linked to the investment decisions made by firms. While the most commonly discussed agency tension is between investors, who are presumed to be risk-neutral, and managers, who are assumed to be risk-averse, the logic of agency theory can be applied more broadly to reflect the self-interest embedded in different ownership structures.

For instance, ownership structures that involve the sale of stock on public exchanges include the provision that any residual income generated by the firm belongs to its shareholders. This is designed to facilitate the flow of capital by protecting the interests of the broad set of dispersed shareholders who have invested in the firm. Managers of such firms therefore hold a fiduciary responsibility to make investment decisions that maximize the firm's value to shareholders. On this basis, an investment's expected returns become the primary basis for choosing between alternatives, after accounting properly for risk. Such firms are risk-neutral; investors do not have preconceived expectations about risk tolerance, but simply seek the highest returns possible. In theory, the financial failure of any given firm can be withstood by its investors, who have the opportunity to hold a portfolio of positions in which the losses at one firm are offset by the gains at another.

By contrast, cooperative ownership structures imply different self-interest. The capital invested in cooperatives (or mutuals) comes from a subset of major customers (alternatively, suppliers or employees), who are in turn the owners of the firm. As customers first, these owners have more at stake than a financial interest in the firm; they also rely on consistent access to the firm's products or

services in order to pursue other business interests. Being less diversified and more tied to the specific fortunes of the cooperative firm, these owners are primarily concerned with the firm's ongoing viability. Financial returns, while appealing, are a secondary consideration behind service reliability. Therefore, an analysis of the self-interest of the respective ownership types suggests that cooperative firms are more risk-averse than investor-owned firms.

Risk-averse does not imply risk-free, and as argued above, we expect that firms with cooperative ownership structures will still engage in exploration. That said, a baseline prediction to establish the validity of our research is the expectation that cooperative firms engage in exploration to a lesser degree than firms with a public shareholder structure:

P1: Cooperative governed firms are less likely to engage in exploratory innovation than similar investor owned firms.

The effect of firm characteristics on exploration. We now turn to an analysis of the firm-specific characteristics that mitigate the risk of certain exploratory activities, and thus facilitate their pursuit by risk-averse firms. Our key premise is that the riskiness of a specific exploratory activity is not constant, but instead varies by firm-specific qualities. An example may help to illustrate our point. We assume that in a poker tournament all players are playing the same game and are therefore exposed to the same risks in terms of the odds of the strength of the hand they draw. However, each player experiences a unique level of risk of losing any given hand because of their individual poker playing skills and prior playing experience. A player with high levels of both will be at far less risk of losing than a player without experience, even if they have the same cards. Similarly, we assume that firms experience different levels of risk associated with the investment choices they make because of the resources and capabilities they have.

Exploration Expertise. Learning theory is based on the premise that “[l]earning competence means that organizations become better at things they do repeatedly and successfully and that they become less competent at things they do infrequently and unsuccessfully.” (Holmqvist, 2004, pg. 71). We propose that a firm can develop a learning competence related to the process of successful exploration. Such a competence would enable a firm to be successful across a range of exploration. Even though each exploratory effort would entail the pursuit of new knowledge and new skill development, such a firm could use its exploratory capabilities to increase the chances of successful exploration across many different searches for innovation. Firms that have successfully learned via exploration create routines that make successful learning more likely in future exploratory risk taking. These routines allow firms that repeatedly explore to lower the risk of future exploration.

P2: Cooperatives are more likely to pursue exploration when they have prior experience in successful exploratory innovation.

Exploitation leads to exploration. The concept of exploitation has been characterized as the “twin concept” of exploration (Gupta et al., 2006). Originally, it was characterized as including “such things as refinement, choice, production, efficiency, selection, implementation, execution.” (March 1991, pg. 71) Levinthal and March went on to further refine the idea as “the use and development of things already known” (1993, pg. 105). Evidence of the benefits of exploitative learning can be demonstrated in the recent finding that organizations have more success that is increasingly similar as a function of their operating experience (Desai, 2008). We propose that there are circumstances in which learning via exploitation enhances exploratory learning. We argue that there are two distinct drivers that might cause successful exploitation to lead to increased exploration. First, increasing expertise from exploitation may limit opportunities for additional gains. As a firm increasingly exploits its existing knowledge, it may come closer to reaching an efficiency frontier (Porter, 1996), in which very little or no additional gains can be achieved from continued exploitation of a resource or capability. This idea is

also known as diminishing returns. When a firm has extensive success in exploitation and reaches the efficiency frontier, it is likely to turn to exploration rather than to stop trying to learn and grow. While reaching the efficiency frontier may cause firms with exploitation experience to turn to exploration, a second explanation of the relationship may be associated with lowering the risk of such exploration. Our argument is that expertise in one domain may be indicative of managerial capabilities that are applicable across domains (Barney, 1991). A firm that excels at exploiting its existing knowledge may be equally able to explore new knowledge and technological domains because its managers possess high skill levels rather than because it is somehow uniquely capable of exploitation learning.

P3: Cooperatives are more likely to pursue exploration when they have prior experience in successful exploitative innovation.

Proximity to existing knowledge. A third firm characteristic that may lower the risk of exploration is rooted in the social network literature (Uzzi, 1999). That literature argues that individuals, and the firms in which they work, can benefit from the nature of their network of contacts. One important mechanism through which social networks are expected to benefit those who are a part of them is through increased access to information. We apply these ideas in this context by proposing that the geographic proximity of the focal firm to other similarly-managed firms provides a proxy for the closeness of a tie in a social network and the likelihood of information passing between them. We are proposing that if a firm is geographically close to another firm that has already explored a particular innovation it will lower risk for the focal firm to explore that innovation (Rosenkopf & Nerkar, 2001). We expect the risk to the firm to be lower because the search costs for new knowledge should be lower, the increased chances that a known and trusted peer can be a source of new knowledge and the potential that the focal firm can gain specific information about what actions to take from its network peer.

P4: Cooperatives are more likely to pursue exploration when they are geographically closer to another cooperative that has already pursued a similar innovation.

Performance implications. Our argument to this point has been that risk-averse firms are likely to choose exploratory activities that mitigate their exposure to risk through relatedness to existing experience or observability of competitors' exploration. In contrast to risk-neutral firms, risk-averse firms consider risk mitigation factors in addition (and perhaps ahead of) expected returns when making investments. From the shareholder-centric perspective inherent to agency theory, this approach has suboptimal implications for firm performance to the extent firms pass up investments with high expected returns because they also carry substantial risk.

The logic of our decision-making model for risk-averse firms suggests a competing prediction with regard to firm performance subsequent to exploration. Whereas agency theory deals with the potential concern that managers will not pursue a sufficient level of risk because their personal self-interest implies a lower exposure to risk than is optimal for the firm, we are concerned with a different scenario in which the firm's own interests – defined from the perspective of its cooperative ownership structure – warrant a risk-averse posture toward exploration (Jensen and Meckling, 1976). Essentially, owners in a cooperative structure are willing to sacrifice the upside potential available from unfettered exploration in exchange for the more tangible benefits and less volatile outcomes available through exploration that is constrained to areas that have acceptable levels of familiarity to the existing firm. For instance, risk-averse firms may favor exploration to improve efficiency by lowering costs, as opposed to exploration that opens up the possibility of competing for customers in new markets. Such a scenario does not imply tolerance for "worse" financial returns, but does suggest a different shape to those returns, as predicted below:

P5: For risk-averse firms, exploration based on risk-mitigating factors leads to lower growth but higher efficiency than exploration not connected to risk-mitigating factors

Finally, we have built our research around the premise that forgoing exploration altogether has adverse performance effects for all firms, including those that are risk-averse. Our reasoning is that without exploration, a firm has limited capacity to adapt to changing environmental conditions, preventing it from evolving over time and continuing to thrive. The idea that firms must engage in both exploration and exploitation is a common theme in the literature (Tushman & O'Reilly, 1996). As this is a testable proposition, we include it as part of our empirical research. In a sample of risk-averse firms, we assume that excessive exploration is avoided by all, and thus within the range observed, higher levels of exploration will be associated with higher financial performance over time:

P6: For risk-averse firms, exploration based on risk-mitigating factors leads to higher financial performance over time than avoiding exploration altogether

Proposed sample

The sample for this study is comprised of cooperative-owned (COOP) and investor-owned (IOU) electricity producing utilities in the United States. The data will be gathered from multiple datasets originally collected by the Energy Information Administration, a statistical agency of the U.S. Department of Energy created by the US Congress in 1977 for the purpose of providing unbiased energy data, analysis and forecasting. One source of the specific data to be used in this study will be Form 860, which includes information such as initial date of commercial operation, generating capacity, and energy source about each generator at electric power plants owned and operated by electric utilities in the United States. A second source will be Form 861, which is a firm-level data file and contains information about firm revenue, aggregated efficiency, firm governance, and customer counts. Using data between the years 2001-2006, we can identify a minimum of 62 COOP firms and 116 IOU firms with data about our variables of interest.

We also plan to interview a small, random sample of electric utility industry experts and managers from both COOP and IOU firms. We expect these interviews to ground our thinking about the industry and decision-making processes used by its managers, guide our final selection of measures and improve our theoretical thinking about proposed relationships.

Proposed variables

- Governance structure – EIA Form 861 contains a flag identifying the governance structure as cooperative or investor owned.
- Exploration – exploration will be defined as development of an electricity generator with a new-to-the-firm source of energy. Examples of energy sources include: wind, coal, natural gas, solar, etc.
- Prior experience in exploration – a firm will have prior exploration experience if it has previously explored according to the definition above
- Prior success in exploitation – a firm will have exploitation success if it is among the most efficient users of a specific energy source for its generators. For example, if a firm achieves top efficiency with its natural gas-powered generators compared to all other generators using natural gas, we will identify it as having successfully exploited that technology
- Proximity to exploration – this will be measured as the extent to which firms in the same region as the focal firm have successfully explored according to the definition above
- Firm growth – we will measure this by growth in megawatt hours produced by the firm
- Firm efficiency – this measure is available on the EIA Form 861. It measures the efficiency with which energy inputs are transformed into electricity.

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