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THE MORTALITY PROBLEM OF LEARNING AND MIMETIC PRACTICE IN EMERGING INDUSTRIES: DYING TO BE LEGITIMATE

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This study seeks to disentangle claims of institutional and organizational learning theories and to shed light on the impact of Knightian (environmental) uncertainty in discovery opportunities. This article suggests, and finds empirical support for, the concept that emerging professional service industries retain high levels of causal ambiguity. High uncertainty interferes with institutional theory's claim of mortality reduction through isomorphism, but leads to superstitious learning, increasing organizational mortality hazard. Education and experience of entrepreneurs help them identify discovery (exogenous) opportunities for entrepreneurial rents, while high (but untheorized) levels of uncertainty interfere in their ability to successfully exploit these same opportunities. Copyright © 2012 Strategic Management Society.

INTRODUCTION

There is growing interest in the entrepreneurship literature around the emergence of new industries (cf. Aldrich and Fiol, 1994; Granovetter and McGuire, 1998; Sine and David, 2003), and institutional theory has become one of the most widely used theoretical frameworks in the study of the industry emergence phenomenon (cf. Battilana, 2006; Greenwood *et al.*, 2008; Ruef and Lounsbury, 2007). The main assertions of institutional theory with regard to industry emergence are: (1) high levels of uncertainty exist in emerging industries and such uncertainty helps drive mimetic behavior (DiMaggio and Powell, 1983; Rao, Greve, and Davis, 2001); (2) mimetic behavior generates legitimacy, although the creation of legitimacy is a major challenge in emerging industries (Aldrich and Baker, 2001; Aldrich and Fiol, 1994; Aldrich and Ruef, 2006); and (3) institutional work (i.e., the development of norms, boundaries, understandings) is challenging but takes place over time and through both intentional and unintentional action and at multiple levels of analysis (DiMaggio, 1988; Eisenstadt, 1980; Lawrence and Suddaby, 2006; Lawrence, Suddaby, and Leca, 2011).

However, there are conceptual difficulties with an institutional perspective, including the lack of a still fully developed concept of agency (see Battilana, 2006; Battilana, Leca, and Boxenbaum, 2009) and no empirical results on the survival benefits of organizational legitimacy in an emerging industry context. An alternative to institutional theory has also recently proved insightful with regard to the study of entrepreneurship in emerging industries (Russo and Vurro, 2010). But this alternative theory, organizational learning theory, is difficult to

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disentangle from institutional theory because predictions are often the same. These two theories may simply be alternative explanations for the same observed activities of industry members.

The purpose of this article is to explore conditions under which entrepreneurs may experience important outcomes that shed light on the convergence and divergence between institutional and organizational learning theories' interpretations and predictions. More specifically, under conditions of high uncertainty and causal ambiguity, as may exist in emerging industry contexts, do institutional theory and organizational learning theory lead to divergent predictions? If so, which theory provides greater insight into the emergence process as experienced by entrepreneurs?

I suggest under conditions of high uncertainty these theories do make differing predictions, and I find empirical support for organizational learning theory's claim of superstitious learning—learning incorrectly about causal relationships (Levitt and March, 1988). Superstitious learning increases the mortality hazard of new organizations, even when organizations learn to implement structures similar to their peers, in contrast to institutional theory's suggestion of decreased mortality hazard resulting from heightened legitimacy associated with mimetic isomorphism. During the process of stabilization of a new industry, the learning and mimetic activity in which entrepreneurs engage may not only fail to support their efforts, but prove deadly to the organization.

This study examines the ways in which professional experience and training in an emerging professional service industry context can be misleading, resulting in structure choices that limit a new firm's survival chances. More specifically, this study examines U.S. hedge fund management companies (HFMCs) through the period of industry emergence. This emergence process unfolds through attempted legitimacy seeking and learning engaged in by entrepreneurs founding new firms. Even while many of these firms may appear as second movers, the activity is entrepreneurial as founders search for and attempt to discover and exploit market imperfections (Alvarez and Barney, 2007) in the emerging and uncertain environment. The context of hedge fund management companies allows for examination of both the emergence of a new industry and the entrepreneurial experience of highly educated professionals founding firms in that emerging industry, where '. . . few theorists have examined the emergence of populations and forms . . .' (Aldrich and Ruef, 2006: 180).

This article seeks to contribute to theory in three important respects. First, by highlighting the likelihood that learning is superstitious in emerging industry contexts, this article contributes to a disentanglement of institutional and organizational learning theories. While institutional theorists indicate environmental pressures toward conformity and learning theorists suggest organizations scan their environments and actively learn from their own and others' experiences (Cohen and Levinthal, 1990; Lee and Pennings, 2002), the consequences of such activity may diverge under conditions of high uncertainty.

The second contribution follows from the first: the institutions of an industry may themselves be technically inefficient or economically not rational, not because these institutions become archaic or anomalous over time (cf. Seo and Creed, 2002; Suddaby and Greenwood, 2005), but because the social processes of accretion (Barley and Tolbert, 1997) that generate the institutions may be based on superstitious learning. As such, institutional norms may develop rapidly and without adequate attention to consequential impacts, setting an industry's institutions defectively from the outset.

The third contribution is with regard to the role of uncertainty in discovery opportunities. While discovery opportunities are risk based and exist exogenously to the entrepreneur (Alvarez and Barney, 2007), when the discovery opportunity itself exists within an emerging context, significant Knightian uncertainty (Kirzner, 1997)[1] likely remains. This residual uncertainty makes imprecise the attempts, even by experienced experts, to comprehend opportunities arising from market imperfections. To capitalize on the metaphor of Alvarez and Barney (2007), such opportunity is not an existing mountain, but an existing and shifting volcano. The contours of the volcano are uncertain, even though objectively existing. This would suggest discovery entrepre-

[1] Knightian uncertainty goes to objective unknowability, existing *in the environment*, about potential outcomes and the probability distributions on possible outcomes from actions: these are not knowable *ex ante*. This is distinct from other forms of uncertainty discussed in the management literature, such as 'perceived uncertainty' (Milliken, 1987) or 'adopter-specific uncertainty' (Rogers, 2003), which are both a quality of the individual undertaking an action. These alternative conceptualizations of uncertainty do not address the potential, *ex ante*, understandability of outcomes and probability distributions.

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neurs in emerging industries should seek to locate flexible structures that may allow for greater levels of negotiated engagement with the opportunity, as the discovery opportunity itself remains unstable and uncertain. Equipment specially crafted for building on the side of a mountain may prove deadly on a volcano.

THEORY AND HYPOTHESES

Sociological theories of the firm suggest survival is of upmost concern (cf. DiMaggio and Powell, 1983; Fligstein, 1990; Hannan and Freeman, 1977; Pfeffer and Salancik, 1978). While considerable work has examined the negative consequences of ignoring theorized sociological forces, far fewer studies have examined the failure of organizational survival due to conformity with these same social forces. Two theorized means to enhance survival prospects are through an organization's active efforts to learn (cf. Haunschild and Sullivan, 2002; Levitt and March, 1988; March, 1991), and legitimacy achieved through an organization's mimetic submission to existing institutional prescriptions. Problematically, these two theories often generate the same prediction—firms will either mimic or learn about and adopt the observed structures and practices of earlier industry entrants in order to either gain legitimacy, or to mitigate high levels of uncertainty, resulting in reduced mortality hazard. But dynamic and highly uncertainty environments, such as emerging industries, may provide theoretical leverage to disentangle these alternative theories.

Institutional theory

Institutional theory suggests organizations become isomorphic to the requirements of their particular environment (Meyer and Rowan, 1977) due to pressures arising from a variety of sources within the industry (DiMaggio and Powell, 1983; Mizruchi and Fein, 1999; Rao *et al.*, 2001).[2] Even though the institutions of an industry may not be economically efficient (cf. Dobbin *et al.*, 1993; Fligstein, 1990), organizations subscribe to them because either (1) the organizations are cognitively constrained and fail to recognize a potential for deviance (DiMaggio, 1988; Lounsbury, Ventresca, and Hirsch, 2003; Schneiberg and Clemens, 2006) or (2) the organizations understand there are legitimacy issues that can be strategically managed through displays of conformity (Deephouse, 1999; Oliver, 1991; Suchman, 1995). Subscribing to the institutions of an industry, therefore, may result in pursuit of economic inefficiencies but it simultaneously grants legitimacy (Meyer and Rowan, 1977). And legitimacy by mimetic isomorphism has been shown to significantly reduce the probability of organizational mortality (Baum and Oliver, 1991), at least in stable industry contexts.

But an emerging industry represents an inherently uncertain and unstable environment (Aldrich and Fiol, 1994; Aldrich and Ruef, 2006; Hannan, Pólos, and Carroll, 2007), one in which institutions are still developing, weak, and possibly contested (Lawrence, Hardy, and Phillips, 2002). Although an emerging industry is sometimes conceptualized as 'incompletely' institutionalized (cf. Aldrich and Fiol, 1994; Goodrick and Salancik, 1996; Greenwood, Suddaby, and Hinings, 2002), some have suggested mimetic pressures may actually be greater in emerging industries (Aldrich and Baker, 2001; Lieberman and Asaba, 2006). For example, attempts to gain legitimacy through isomorphism may be most strategically important when other forms of legitimacy declaration, such as alliances and endorsements (Stuart, Hoang, and Hybels, 1999; Swaminathan and Wade, 2001), are unavailable (Aldrich and Fiol, 1994; Aldrich and Ruef, 2006). As well, emerging industries are denoted by causal ambiguity (Lippman and Rumelt, 1982), population carrying capacity remaining uncertain (Aldrich and Ruef, 2006; Carroll and Hannan, 2000), and resource availability remaining highly constrained as suppliers and investors only begin to understand the new industry and its activities (Aldrich and Fiol, 1994). In such an environment, entrepreneurs may seek to mitigate the uncertainty of an emerging industry context by copying the resource acquisition strategies of apparently successful prior entrants (cf. Galaskiewicz and Wasserman, 1989; Spender, 1989).

While mimetic isomorphism may be an effective strategy for gaining legitimacy in an emerging industry (Aldrich and Baker, 2001; Scott, 2003;

[2]The institutions literature refers to environments as organizational fields, which are generally defined as 'those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource, and product consumers, regulatory agencies, and other organizations that produce similar services or products' (DiMaggio and Powell, 1983: 148). Herein, instead of using the term 'field,' I use the term 'industry' to connote a part of the operating environment faced by entrepreneurial ventures, and I restrict focus to such peer organizations.

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Suchman, 1995) or for entrepreneurial identity and industry membership declarations (Navis and Glynn, 2011), no studies have shown whether legitimacy through mimetic adoption of structural features carries the same critical survival advantages as found in stable industries. Because most empirical research on institutional variables, such as the survival impact of legitimacy, has been conducted in stable (i.e., already emerged) industries, in emerging industries we might find important and insightful deviation from more standard results. Industry emergence continues from the founding of the first organization until industry stability is reached, where stability implies that both participants and observers agree on meanings and boundaries (Aldrich and Ruef, 2006; Hannan *et al.*, 2007).

Entrepreneurial learning

In institutional theory, mimetic activity is sometimes described as cognitively based, amounting to subconscious compliance (DiMaggio, 1988; Schneiberg and Clemens, 2006). Others describe it as strategic choice, consciously and willfully made and representing intentional, or even strategic, activity (Oliver, 1991; Suchman, 1995). In either version, however, it is predicated on the notion that mimicking earlier entrants provides legitimacy, where legitimacy confers relative survival advantages (Baum and Oliver, 1991). In contrast to the isomorphic activity suggested by institutional theory, organizational learning theory claims a more clearly agentic and potentially interesting engagement with the environment (Cohen and Levinthal, 1990; Haunschild and Chandler, 2008; Lee and Pennings, 2002). But learning may be difficult in an emerging industry context, where causal ambiguity remains; success may lie in factors not fully understood even by existing firms (Miller, 2003), let alone by those trying to learn from existing firms' structures and practices.

Empirical studies claiming organizational learning are usually predicated on competitive or operational experience that unfolds over time (cf. Ingram and Baum, 1997). But it is also possible that organizational founders learn in the period prior to firm formation (Harrison and Leitch, 2005), where preformation learning becomes embedded in the structures of their organizations (Baum and Ingram, 1998). In stable industries, this has been referred to as congenital learning (Huber, 1991; Ingram and Baum, 1997). Here I call it entrepreneurial learning: *the learning engaged in by entrepreneurs during their pre-formation organizing activities that becomes embedded and implemented in the structures and practices of the ventures they found*.

It is likely that founding structure imprints itself significantly to the organization (Stinchcombe, 1965), generating strong path dependence (Kogut and Zander, 1992) from the entrepreneurial learning process and, therefore, implying influence over the entire life of an organization. For example, Burton (2001) demonstrated the impact of early employee hiring decisions on firm's future activities. More directly related to the claims herein, Baum, Calabrese, and Silverman (2000) found the institutional linkages and networks that entrepreneurs put into place *at the time of founding* were significantly related to mortality probabilities for new biotechnology businesses in Canada. Burton and Beckman (2007) demonstrate the long-term impact of initial position holders on their organization's culture. Similarly, Baum and Ingram (1998) discovered that for Manhattan hotels, even though able to engage in competitive and operational learning over time, success was *more fully* explained by learning in the period prior to founding (because, for example, location and architectural issues associated with fire prevention and traffic patterns effectively become fixed at the time of building a hotel). A similar result would seem likely in professional service firms because extensive pre-formation professional training and experience tends to be very specific with regard to the ways in which work is organized and performed. For example, a cardio-vascular surgeon's credentialing process likely creates lifelong implications for the structure of work, with little opportunity for new technologies or techniques to be implemented, and perhaps no ability to change to another, even highly related, line of medicine such as cardiology.

Entrepreneurial learning has been suggested elsewhere as learning by entrepreneurs that either (1) increases the likelihood of subsequent organizational experimentation (Schildt, Maula, and Keil, 2005) or (2) improves the ability for entrepreneurs to discover opportunities based on the breadth of prior experience (Lumpkin and Lichtenstein, 2005; Shane, 2000; Venkataraman, 1997). In both versions, the entrepreneur's learning prior to firm founding is critically at issue. In professional service organizations, I suggest such learning may represent not only important founding conditions for an organization, but may represent the *only* real opportunity for designing consequential organizational structure,

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an issue the organizational learning literature has not yet addressed.

In the hedge fund business, entrepreneurial learning generates contract-level (rigid) structures, in many respects similar to a hotel's choice of location (Baum and Ingram, 1998). As contracts, hedge funds are not flexible in structure after formation: choices implemented at the time a fund is opened are effective for the life of the fund. A hedge fund entrepreneur, upon opening his/her firm and offering hedge funds for investment (i.e., services for sale), is locked into his/her early structural decisions—able to make changes only in the event of offering subsequently created hedge funds. Table 1 shows the number of hedge funds offered by hedge fund management companies: more than two-thirds never open more than two funds throughout their entire organizational life. Therefore, the learning in which hedge fund entrepreneurs engage prior to founding is not only critical, but often the only time they are able to effectuate learned structure into their firm's offerings.

Low-uncertainty issues

New founders frequently try to learn about and mimic existing forms, industry prescriptions and 'recipes' (Spender, 1989) in order to enhance their own firm's legitimacy and success (cf. Guthrie, 1997). Through the use of trade association-provided material and attendance at industry conferences (Aldrich and Baker, 2001), discussions with various service providers (SEC, 2003), as well as media coverage, formal education, and prior experience

Table 1. Number of hedge funds offered per hedge fund management company

Safe harbor exempts registration		SEC registration mandated	
Number hedge fund management cos.	Number hedge funds managed	Number hedge fund management cos.	Number hedge funds managed
1,198	1	8	16
554	2	6	17
246	3	2	18
140	4	2	19
107	5	2	20
68	6	7	21
51	7	3	22
35	8	3	23
14	9	1	24
25	10	5	25
17	11	2	26
21	12	4	28
9	13	2	29
9	14	1	33
9	15	1	34
2,503 total firms (97.8%)		1	35
		2	37
		1	39
		1	42
		1	50
		1	55
		1	61
		57 total firms (2.2%)	

- 2,655 U.S. domiciled hedge fund management companies founded from January 1949 to December 2003 (included in analysis are 2,560 firms, after excluding firms founded in states with fewer than 15 firms).
- 97.8% (2,503) of U.S. domiciled hedge fund management companies always fit the ICA safe harbor requirement (15 or fewer hedge fund vehicles) and, therefore, are exempt from mandatory SEC registration.
- 46.8% of U.S. domiciled hedge fund management companies never managed more than a single hedge fund (an additional 312 offer a single hedge fund in both onshore and offshore forms, implying 59.0% offer only a single hedge fund structure).
- 90.44% of U.S. domiciled hedge fund management companies never managed more than six hedge funds.

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(Brown, Goetzmann, and Park, 2001), professional service entrepreneurs are able to observe the variety of structural forms adopted by already existing firms (Ingram and Baum, 1997) and learn from those observations about what are the legitimated norms and 'appropriate' structures available for founding their own firms (Rogers, 2003). In practice, it is difficult to disentangle mimetic activity from active learning, as both theories suggest significant benefits from copying prior entrants. On issues where causal ambiguity is low, an emerging industry's heightened uncertainty about outcomes and probability distributions is otherwise attenuated and these two theories converge in their predictions. Knowledge structures from many industries become transferable to the new context, and so multiple theories of action suggest similar results. Two such hypothesized relationships follow.

Diversify the client base

A major issue about which professional service entrepreneurs learn is with respect to the numbers and types of clients they seek. Not only does a greater number of clients help ensure firm survival (Aldrich and Auster, 1986; Scott, 2003), but so does the diversity of those clients (Jaeger, 2003). This may be true because different types of clients may be disparately impacted by both macroeconomic and geographically specific conditions.

Because of the depressing impact on potential returns (Kane and Malkiel, 1965), many hedge fund managers prefer to *concentrate*, not diversify, their investments (Jaeger, 2003). Nonetheless, hedge fund entrepreneurs may attempt to diversify their investors, recognizing that investors have differing objectives and tolerances for performance variability. Hedge fund managers need not alter or reduce risk *in* their portfolios, but rather can increase the number and type of investors who may be attracted to their funds just as a cardiovascular surgeon would not diversify his/her medical expertise to other specializations, but might try to diversify his/her patients across age and gender cohorts and family history profiles. This allows managers to maintain highly concentrated product portfolios, while potentially reducing aggregate investor redemptions during periods of negative performance. In the case of hedge fund management companies (HFMCs), investors can generally be classified into 'sophisticated' (i.e., 'wealthy') individual U.S. citizens, sophisticated non-U.S. citizens, and institutional investors (such as endowment, pension, or sovereign wealth funds) (U.S. House, 1996; USCS, 1940), allowing for potential client type diversification.

Client diversification is common across many industry contexts and is easy to understand and implement. As professional service entrepreneurs learn to increase the number and diversity of clients,[3] organizational mortality rates should be reduced. Both institutional and organizational learning theories point to the same unambiguous action and there is likely to be significant mortality reduction associated with adopting such structures.

Hypothesis 1 (H1): Companies using structures that increase the size and diversity of their client base will experience a lower mortality hazard than will companies not using such structures.

Increase switching costs

A second major issue about which entrepreneurs learn is to lock clients into the firm and its products by increasing switching costs. Commonly taught in business schools are examples of dependent goods, such as razor blade manufacturers learning to capture consumers by giving away shaving implements using only a single type of blade, or first movers locking consumers into their networks. If switching costs are relatively high, a consumer locked into dependent goods is one that can be counted on for ongoing future sales, improving the success chances of the firm (Bygrave and Zacharakis, 2008). Across many business contexts, entrepreneurs are taught this, and they learn to mimic the high switching cost strategy. To the extent HFMCs can lock their investors into their firms' offerings, managers need not worry about redemption runs during the inevitable periods of negative performance (Ackermann, McEnally, and Ravenscraft, 1999; Baquero and Verbeek, 2006). Both institutional and organizational learning theories point to the same unambiguous action, and there is likely to be significant mortality reduction associated with adopting such structures.

Hypothesis 2 (H2): Companies utilizing structures to increase switching costs by either directly or indirectly locking clients into the firm's prod-

[3] Hedge funds are regulatory limited in size and client type; the only way an HFMC may diversify clients is by opening additional funds (allowing for greater numbers of investors, as well as differing types of investors).

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ucts will experience a lower mortality hazard than will companies not employing such structural features.

High-uncertainty issues

The two prior hypotheses suggest consistent predictions across institutional and organizational learning theories with regard to issues having low causal ambiguity, even in highly dynamic contexts such as emerging industries. Around low uncertainty issues, entrepreneurs engage in a nonproblematic learning process, or in a simple mimetic adoption process, where each leads to probable survival benefits. But herein it is suggested that learning in an emerging industry context *is* challenging, and isomorphism may not aid in mortality hazard reduction. Problems arise because even discovery opportunities (Alvarez and Barney, 2007) are not stable in emerging industry contexts, resulting in significant residual environmental uncertainty. This means outcomes are impossible to delimit and assess: even the observed outcomes achieved by earlier entrants are ambiguous in the probability distribution of those outcomes (Kirzner, 1997). This suggests a potential divergence between the predictions of organizational learning and institutional theories.

If outcomes and their probabilities are not knowable, then mimetic activity could develop around highly destructive structures, allowing for development of legitimacy but simultaneously decreasing the survival benefits normally associated with legitimacy (Baum and Oliver, 1991). Similarly, learning in such an environment may be challenging, and the lack of clear means-ends relationships (Beckert, 2003) suggests the potential to learn incorrectly about causality. Organizational learning theory refers to this as superstitious learning. Superstitious learning occurs when actions and outcomes *appear* correlated, but where cause and effect relations are misunderstood; i.e., in situations marked by causal ambiguity. Under such circumstances, an organization may learn inappropriately that performance of a particular action leads to a certain result when, in fact, the action and result are not causally connected (Levitt and March, 1988). Superstitious learning can occur through either own-firm learning or through vicarious learning from the observation of peer organizations (cf. Aldrich and Baker, 2001; Cohen and Levinthal, 1990; Haunschild and Sullivan, 2002; Levitt and March, 1988; Porac, Thomas, and Baden-Fuller, 1989). When learning from peers, peer organizations are observed for clues about appropriate strategies, structures, and practices that may best match environmental demands (cf. Bromiley, 2005; Lee and Pennings, 2002). But when observing peer organizations, significant issues arise that may limit the validity of the observation—whether because information is disguised for competitive reasons, is encoded in tacit routines, or is itself based on the earlier inaccurate learning by the observed peer (cf. Bromiley, 2005; Greve, 2011). Entrepreneurial learning is inherently tied to peer observation, both formally and informally, as such learning happens prior to own-firm formation.

Organizational learning theory has recently been extended to the industry level (Haunschild and Chandler, 2008), suggesting the potential for learning by a population of actors, such as the entrepreneurs entering a professional service industry. Industry-level learning may result from, among other causes, the unintentional accretion of imperfectly reproduced structures and practices by members of the industry (Haunschild and Chandler, 2008). This process implies, however, not only imperfect reproduction, but also that perfectly reproduced but inappropriate structures and practices may represent a form of industry-level learning. The suggestion here is only that industries contain cognitive structures that professionals access and deploy, and these are readily available to industry entrants (Rao, 2001). If the knowledge of an industry (e.g., the generally agreed best structure) is defective, then entrants accessing this knowledge will learn superstitious lessons of cause and effect.

One way in which superstitious learning may be propelled through a population is via information cascades (Bikhchandani, Hirshleifer, and Welch, 1998)—information flows that generate misleading assumptions regarding the motives behind, and impacts of, the structures or activities being observed. For example, if Entrepreneur B learns that Firm A adopted a structure, Entrepreneur B may speculate that Firm A's adoption was informed, and he/she may mimic the adoption in the formation of Firm B without making inquiry as to the suitability of the observed structure. Entrepreneur C later learns that both A and B adopted this structure and, therefore, also decides to adopt without further investigation. But the prior adoption by Firm B was itself uninformed and, therefore, did not provide valid insight to Entrepreneur B's decisions; C may have just learned and copied a structure that will not serve his/her interests. Information cascades have been found

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to exist in financial services (Rao *et al.*, 2001) and other contexts where it may be relatively easy to observe peers' structures but not to observe the strategies that gave rise to such structures (Bikhchandani *et al.*, 1998).

Information cascades suggest learning and adoption may arise around untested and ineffective structures (Greve, 2011). This may be especially true in emerging industries, where entrepreneurs may seek to reduce uncertainty by copying existing prescriptions (Lieberman and Asaba, 2006; Navis and Glynn, 2011). In this situation, the developing 'normal structures' of a new industry, whether due to institutional mimetic pressures or the result of (superstitious) learning, may generate legitimacy but may simultaneously fail to generate survival benefits and, in fact, may *increase* mortality hazard. Superstitious learning, a component of organizational learning theory, then allows for divergence in prediction from institutional theory, as examined in the hypotheses developed below.

Local environments

While entrepreneurs may easily learn some issues because of general applicability and appropriateness across a wide range of industry contexts (i.e., client diversification and switching costs), issues less explicitly connected (either conceptually or temporally) to outcomes are likely more difficult and, therefore, are more susceptible to superstitious learning. One such set of issues revolves around the local environment. Entrepreneurs call upon resources situated across their environment in order to exploit opportunities, and the configuration of actors and resources (i.e., regulators, advisors, potential competitors, employees, consumers, and technologies) within the environment can have a significant impact on their firms' success (Aldrich and Fiol, 1994; Murmann and Tushman, 2001). Because in an emerging industry actors and resources are not yet fully identified or understood, rapid learning about resource configurations is likely to be problematic (Aldrich and Baker, 2001) and possibly superstitious.

For example, what regulations impact an industry and its participants? With regard to hedge funds, the U.S. government preempted local regulation of the financial services industries (U.S. House, 1996). But regulatory preemption may generate significant causal ambiguity for professional service entrepreneurs because it implies local regulation is inconsequential; entrepreneurs may be likely to believe so, but this may represent superstitious learning about local environments. Similarly, to the extent professionals learn they are entering a 'national market' without geographic constraints on availability of clients or advisors, they may be superstitiously learning about the impact of local competitive forces. The local legal (Dobbin and Dowd, 1997, 2000; Edelman, 1990; Lounsbury, 2007) as well as the local competitive (Wade, Swaminathan, and Saxon, 1998) environments in which organizations domicile might significantly influence survival.

Variation across local environments has been shown to impact organizational strategy, structure, and practice in a variety of industries (cf. Carroll and Swaminathan, 2000; Guthrie and Roth, 1999; Miller, 2008). This is likely true for HFMCs, but rather than examine the structural impacts of locale, I suggest local variation will be consequentially associated with organizational mortality. For example, researchers have found variation in local support for entrepreneurship (Goetz, 2008) and local cultural beliefs about such activity (Cardon, Stevens, and Potter, 2011), where each may influence founding and mortality probabilities. Rather than learning of the significant mortality hazard risk (or benefit) associated with some environments, professional service entrepreneurs superstitiously learn they may ignore this important issue (because of, for example, federal regulatory preemption), causing entrepreneurs to select local environments in much the same way most select industry—without regard to levels of competition or resources, but rather with regard to convenience and personal preference (Shane, 2008).

> *Hypothesis 3 (H3): A company's mortality hazard is related to the local environment in which it is domiciled, with some environments generating lower hazard and others higher organizational hazard rates.*

Claim expertise

Perhaps the most interesting issue involved in the formation of professional service firms, including HFMCs, has to do with claims of skill. In the training academies for professional service industries, people spend years learning the content and techniques of their industry. This is true whether we discuss law school, medical school, business school, or any of the other professional schools. After schooling, most professional service entrepreneurs

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spend additional time taking certification exams, and perhaps even gaining valuable apprentice-level training under the tutelage of current practitioners and experts. Upon founding their own firms, most professional service entrepreneurs have accumulated considerable experience and possibly even professional expertise.

But for all the knowledge gained in their preformation stage, do claims of expertise aid organizational stability and longevity? It seems clear the 'common wisdom' for professional service entrepreneurs is that it must, and entrepreneurs often learn to tout their experience and expertise through advertising, professional memberships, and other areas of interaction with actual or potential clients. A similar phenomenon exists in academia: junior faculty members tell students of their considerable academic training, the experts under whom they studied, and the research in which they have been involved. This is the received wisdom, learned by professional service practitioners everywhere.

However, while it is likely true that claims of expertise help legitimate the new firm as implicit endorsements (Baum and Oliver, 1992; Stuart *et al.*, 1999), these same claims may also increase the risk of organizational failure (Ashforth and Gibbs, 1990). Learning to claim expertise is superstitious learning, irrespective of the actual skill held by an entrepreneur. I suggest this is so because claims of skill are a form of storytelling (Lounsbury and Glynn, 2001) designed to prime clients to believe the new firm is fully capable of displaying special competence (Rindova, Pollock, and Hayward, 2006); when a firm fails to do so, it is likely penalized more substantially than a firm that does not make dramatic representations of skill and expertise (Ashforth and Gibbs, 1990; Rindova *et al.*, 2006). Hence, making and adopting claims of skill may not draw more clients, but rather more skeptical and impatient clients.

> *'(It's) . . . the self-promoter's paradox: since (claims) of competence are more likely when actual competence is problematic or unknown . . .* ***the more skeptical will constituents be of*** *(the claims).'* (Ashforth and Gibbs, 1990: 186, emphasis in original)

In the case of hedge fund entrepreneurs, they have learned their profession in classrooms and on the job, and they seek the mantle of legitimacy for their newly founded ventures through claims of skill (Lounsbury and Glynn, 2001; Rindova *et al.*, 2006). The mythology of skill is of such great significance to this industry that it has acquired a special name: *alpha*. Alpha is the claim that hedge fund managers have skill (Jaeger, 2003) allowing them to generate superior returns, even while maintaining lower portfolio risk than exists in underlying markets (cf. Brown, Fraser, and Liang, 2007; Stulz, 2007). The claim is interesting, as it runs counter to the efficient market hypothesis (Friedman, 1953), a theory suggesting financial market movements are random; that it is impossible to consistently 'beat the market' (Bookstaber, 2007; Brunnermeier and Nagle, 2004; Jaeger, 2003). There is considerable reason to believe claims of skill will *never* be factually supported and relative claims of skill are misleading (see Brown, Goetzmann, and Ibbotson, 1999). Much of the finance literature on hedge funds investigates this issue. Their conclusion: return persistence (the ability to generate consistently positive returns) is *nonexistent* (cf. Agarwal and Naik, 2000). Still, entrepreneurs' belief in the efficacy of the claim is learned and copied from the claims of others.

> *'Incentive fees imply skill: the higher the fee, the greater the skill. Because there is almost no way to know the (manager's) skill ahead of time, we learn to signal (skill) by the fee structure. If we use higher fees, investors will think, prospectively, that we have higher skill. Of course, we all want to think we have higher skill, so we charge higher fees . . .'* (Ji Xan (Jason) Dai, Soros Fund Management, pers. comm.)

Some conceive skill as firm specific (March, 1991; but see McCall, 1998), and the making of such claims would then provide a competitive advantage vis-à-vis other firms in an industry where differentiation is difficult to achieve or assess due to restrictions on advertising.[4] But because skill at 'running money' (like skill or the quality in delivery of

[4] Incentive fees represent a compensation strategy, and most hedge fund managers earn the majority of their compensation from incentive fees (Jaeger, 2003). This fee is an option on the investment returns of the fund, with the manager taking a percent of the positive returns; the higher the percent, the greater the earnings. Work on human capital suggests earnings potential, and actual income, are positively correlated with education levels, experience, and skill (Hitt et al., 2001). Hedge fund entrepreneurs behave in accordance with such and, therefore, managers believing in, or proclaiming, their skill charge higher fees. As such, incentive fee levels become a proxy for their claims of skill (Ackermann et al., 1999; Dai, pers. comm.).

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medical or legal services, for example), even if one were able to 'beat the market,' is *not prospectively observable*, investors (i.e., clients, patients) look for proxies, and hedge fund entrepreneurs have learned to signal claims of skill through these easy to duplicate structural proxies. Claims of skill reify as difficult to change structural elements of their firms. Therefore, it is likely that causal ambiguity between claims of skill and survival is so extreme that this issue represents superstitious learning and is consequentially mortality increasing (even if legitimizing). Counterintuitively then:

Hypothesis 4 (H4): A company's mortality hazard is positively related to its increasing claims of skill.

DATA AND METHODS: THE HEDGE FUND CONTEXT

The study context is novel in the management literature; Table 2 is provided as a helpful glossary of industry terms used herein.

Data

Hedge fund entrepreneurs are discovery entrepreneurs (Alvarez and Barney, 2007) attempting to build HFMCs to support and exploit their own novel insights in the 'running of money' (Biggs, 2006; Drobny, 2006; Fung and Hsieh, 2006; Jaeger, 2003). But hedge funds are prohibited from marketing their existence and services, are available only to limited numbers of investors (all of substantial wealth) and then only by private offering, and are not required by regulation to register or file regular reports with any public entity (USCS, 1940). Consequently, high-quality data on hedge funds are hard to find. In order to avoid accidentally running afoul of legal prohibitions on marketing, until recently HFMCs have been reluctant to disclose their existence, let alone detailed information about their strategies or holdings (John Dumasi, pers. comm.). Nonetheless, public disclosure of existence is one of the few ways in which HFMCs can alert potential investors of their offerings, and managers have, therefore, supported development of several trade associations, and these make membership directories available to industry insiders and qualified investors. Unlike databases covering the mutual fund industry, however, commercial hedge fund data sets cover only those funds that have *voluntarily* provided data. Therefore, each data set is inherently incomplete: each presents a unique, limited, and at least partially *inaccurate* (Liang, 2000; Miller and Brown, 2009) view of the industry—i.e., how many firms exist and the size and strategy of each firm. There is no compendium of all hedge funds and the coverage overlap between data sets is small; only one-quarter of all hedge funds are colisted across the two largest membership directories.

Ultimately, hedge funds report only to the data set(s) to which their (potential) clients demand they report, so the only way to understand the industry is to compile the multiple data sets available to HFMCs. The largest commercial data set is published by Hedge Fund Research, Inc. This data set (HFR) contains entries on 7,068 *live* hedge funds and funds of hedge funds (FoF), as well as data on 4,874 *dead* hedge funds and FoF, where *live* means a hedge fund operating at the end of 2007 and *dead* means a hedge fund that had disbanded in any earlier period. HFR is used in approximately 25 percent of academic finance articles and is widely used by media outlets, regulators, and industry insiders. The second largest data set comes from TASS Management Limited (TASS), owned by Thomson/Reuters and used in about two-thirds of the academic finance literature on hedge funds, but rarely outside academia. The TASS data set contain entries on 4,931 live hedge funds and FoF and 3,982 dead hedge funds and FoF, as of the end of 2007. The third large data set, CISDM (formerly MARS), is published by the University of Massachusetts, Amherst, and contains data on 6,148 hedge funds and FoF (both live and dead; CISDM does not segregate hedge funds by life status). This data set is rarely used outside the industry and supports few academic papers. A few highly specialized directories also exist, but contain virtually no additional U.S. HFMCs: a supplemental search of both HFN and Bloomberg, two such sources, yielded no uniquely new hedge fund management companies. This study makes use of data compiled from HFR, TASS, and CISDM.

Data definitions and structures vary across directories, as do the particular data elements a manager is able to report, creating challenges when combining data sets. For example, in HFR, 'main strategy' is recorded in a single field that may take any of five values. In TASS, 'main strategy' is recorded via a set of 12 dummy variables, allowing funds to record more than one 'main strategy.' The extant finance literature on hedge funds is of little help in this

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Table 2. Glossary of hedge fund industry terms

Term	Definition
Alpha	The hedge fund manager's claim of specialized (risk-neutral) skill.
Arbitrage	The practice of taking advantage of (profiting from) temporary price differences between two different markets for the same asset.
Derivatives	A financial instrument that has value based on the (potential) future value of underlying financial contracts (not on real assets).
Embedded leverage	'Implied' or 'embedded' leverage arises because one contract may imply an investment in a greater number of subordinated contracts. Exists in options and derivatives contracts.
Equity hedge	Main strategy of investing in equities markets; may or may not use hedging strategy.
Event-driven	Main strategy of investing in an organization's equity and debt instruments, around the occurrence (or speculation of occurrence) of some particular event. For example, 'bets' on the probability of an announced merger actually closing.
Fund of funds (FoF)	Main strategy of investing *only* in other hedge funds
Global macro	Main strategy of investing in macro-level and micro-level assets, globally. Frequently includes currency and sovereign debt speculation.
Hedge fund	A contract representing a private pool of capital, invested according to a particular set of potential main strategies.
High-water mark	A hedge fund contractual feature that eliminates incentive fees for positive returns achieved after a period of negative performance. The high-water mark sets at the highest value achieved by the fund, and fees are not earned until the fund exceeds that earlier level.
Incentive (performance) fee	A fee earned on the performance of assets held (positive return = positive fee; negative return equals no incentive fee income); incentive fees are never negative.
Leverage	The use of margin and other forms of loans to increase the amount of money available for investment; leverage of 2x means the portfolio controls assets equal to twice the number of investor dollars.
Lockup	A hedge fund contractual feature that forces investors to keep their money with a hedge fund manager for some specific period of time after investing with the manager.
Main strategy	The primary strategy designation selected by an HFMC upon registering their hedge fund to a commercial data set provider—based on the selection made in the hedge fund contract itself.
Managed futures	Main strategy of investing in a variety of financial assets, including options and derivatives.
Management fee	A fee earned on the management of money; paid quarterly or annually on assets held, regardless of return.
Margin	Money lent by a prime broker to an investor. The amount lent is usually a portion of the dollar value of investments held by the broker for the investor (i.e., 50% of portfolio value). A margin loan is a loan generating leverage.
Merger arbitrage	Subtype of the event-driven main strategy; investments on the (potential) future value of corporate assets assuming a merger is completed (or fails to be completed).
Multi-strategy	Main strategy utilizing more than one of the listed primary main strategies.
Prime broker	The brokerage firm used by an HFMC to clear investment trades with the relevant market. The prime broker also usually performs custodial duties, maintaining physical control of the assets in the account.
Private pool of capital	A fund, by regulation not advertised, offered to only limited numbers of sophisticated investors.
Relative value	A main strategy based on asset price arbitrage, usually using bond instruments (i.e., arbitraging interest rates).
Short biased	Main strategy of investing in equities markets; directional (negative), not hedged.
Shorting	A strategy of selling equities not currently held in the portfolio. This strategy allows one to profit from downward pricing action. This strategy is frequently used to hedge long positions (current portfolio holdings): when the portfolio's holdings go down, the shorts should increase in value.

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regard, necessitating development of a detailed approach to integrating the data structures across data sets. Because HFR contained 43.9 percent of the total records (TASS held 32.8%, CISDM 22.6%), HFR's variable definitions and categorizations were imposed on TASS and CISDM raw data, as this represented the solution with the least risk of misspecification. However, because TASS allows for richer data reporting (i.e., multiple main strategies), when combining raw data, TASS records were preferentially preserved.

In order to determine where duplicates might exist across commercial data sets, HFMC and hedge fund names were first normalized. After conforming data structures, data were aggregated and sorted by company and then by fund name. This placed, for example, 'The Agile Equity Growth Fund Ltd.' and 'Agile Equity Growth Limited' next to each other in the comparison list, allowing a comparison of funds of similar names that appeared to be from the same company. Funds were combined if their dates (start and end dates) or assets under management at inception (a currency figure for the size of the fund at inception) matched, as long as (1) the main strategy was an exact match and (2) the annualized average rate of return was an approximate match. If either of these conditions failed, the funds may not actually be the same; i.e., they may have been managed by different managers at the same HFMC and, therefore, such records were not merged.

Each of the commercial data sets is organized by hedge fund; the initial combination amounted to 27,209 hedge funds worldwide. After merging duplicates, the final proprietary database numbers 9,783 U.S. hedge funds operated by 2,994 HFMCs. Because the commercial hedge fund data sets were all founded in the period around 1990, I also conducted an extensive search of SEC records (cf. SEC, 1969), as well as media coverage of the early industry (cf. Loomis, 1966) and interview notes from early industry participants. This search yielded an additional 238 dead HFMCs (early firms still alive ultimately entered a commercial data set).

Table 3 demonstrates the significance of combining these large commercial data sets, specifically by looking at the implications for a single firm. Combining the data sets paints in a very different picture of the HFMC 'RG Niederhoffer' than emerges from any one of the data sets alone; analysis of the data contained only within any single data set would be inherently misleading. The combined proprietary database is more likely to capture firms that failed to register all of their hedge funds to each commercial data set and, thus, is more likely to represent a full census, while also enabling a more accurate picture of those firms that report disparately across data sets.

Figure 1 shows the industry's density since inception; Figure 2 shows foundings and failures per year (1965 to 2007). These diagrams indicate the industry has only recently reached the period where competition pressures arising from new foundings have come to dominate legitimation enhancements created by new foundings (Hannan and Carroll, 1992); the number of HFMCs peaked in late-2005. Alternatively, assets controlled by the industry (assets under management) peaked in mid-2008 at approximately $1.9 trillion (HFR, 2008) and since 2003, an increasingly large share of assets under management have originated from institutional investors (Le Moigne and Savaria, 2006), representing a rapidly growing new source of investment funds and indicating the spread of cognitive legitimacy (Suchman, 1995). Because this industry has only recently reached a point where competitive pressure has resulted in greater failures, as well as high levels of legitimacy, I examine the period of emergence as extending from inception (1949) through 2003 (Fung and Hsieh, 2006), when institutional money managers begun increasing their investments with HFMCs (Rogers, 2003).

Model

I use an event history analysis to test the impact of entrepreneurial learning and mimetic conformity on the instantaneous rate of failure of HFMCs (Blossfeld, Golsch, and Rohwer, 2007). Because the data are coded by month (company start-up and failure month), I am able to analyze monthly spells throughout the history of the industry. There were a total of 3,026 HFMCs founded from March 1949 to December 2003 (657 months). Some of these firms are missing strategy, structure, or domicile information, reducing the analyzable set to 2,655 firms. I removed another 95 HFMCs founded in states with total state density of fewer than 15 firms, as these observations obscure important statistical relationships associated with local environments. The analysis makes use of 2,560 firms (84.6% of all U.S. firms), across 178,426 observed monthly spells. Other than state of domicile, the 15 percent of firms excluded appear statistically similar to those included.

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Table 3. The impact of combining data sets: an example

Data source	Firm name	Firm strategy	Number of hedge funds offered	Average fund life	Firm life (total)	Initial AUM ($)	Prime brokerage relationships
HFR (Live and Dead)	Niederhoffer Investments	Global macro	17	58 Months	20 years 11 months	1.213 billion	1) Refco 2) Shakin 3) Carr
TASS (Live and Dead)	R. G. Niederhoffer Capital Mgmt. Inc.	Managed futures	7	79 Months	15 years 3 months	0.510 billion	1) Morgan Stanley
CISDM	Roy G. Niederhoffer Company	Multi-strategy	9	54 Months	12 years 9 months	0.865 billion	No listed prime broker
Proprietary (combined) database	RG Niederhoffer	Multi-strategy	20	67 Months	20 years 11 months	1.681 billion	1) Morgan Stanley 2) Refco 3) Shakin 4) Carr

This table demonstrates one example of the net impact achieved by combining the largest commercial hedge fund directories (HFR Live and Dead, TASS Live and Dead, and CISDM). Note that each of the commercial data sets presents only a partial view of the example firm. Combination of the data sets allows the incomplete data from each commercial data set to inform the proprietary database about firm and product existence, start and end dates, life duration, firm size, and other data elements. While data exists on this particular firm in each commercial data set, in some other instances this may not be true, but entry to the proprietary database occurs upon existence in any commercial data set.
Where conflicting information exists between commercial data sets, the earliest performance data determines the fund start date, the latest performance data determines the fund end date, and the earliest and latest surviving funds determine the firm start and end dates, as well as firm life duration. Number of funds in the proprietary database is based on the number of unique funds listed across all commercial data sets. 'Main strategy' is coded to the proprietary database based on the fund strategies as coded in the individual commercial data sets, although disagreement across commercial data sets about the main strategy for a specific fund also results in a dummy code for 'misreporting strategy.'

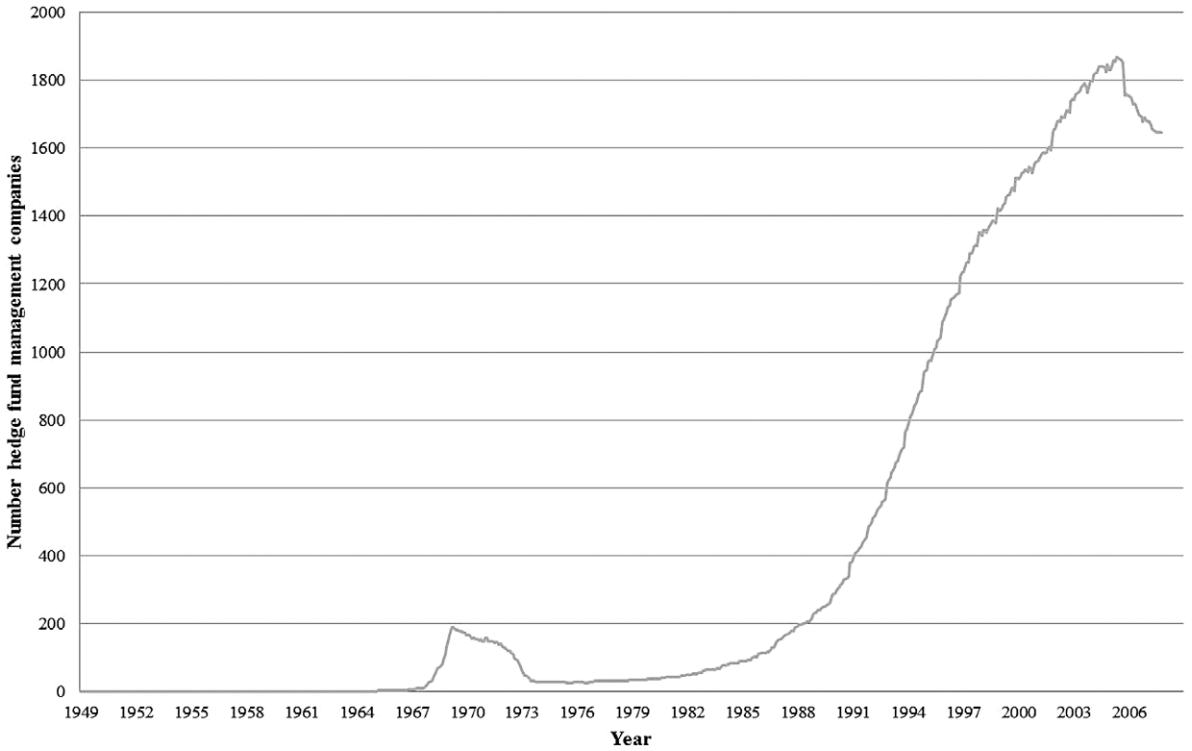

Figure 1. Density of the filed of U.S. hedge fund management companies, 1949–2007

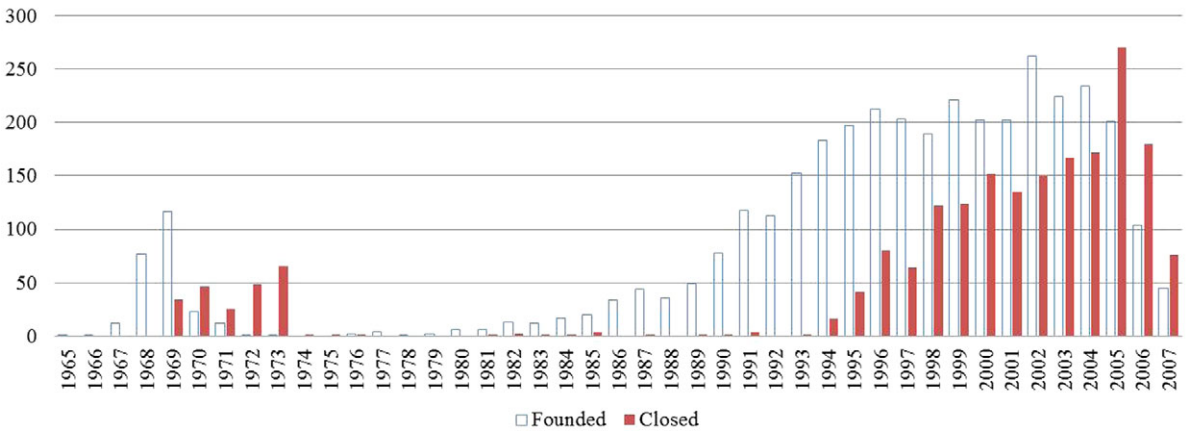

Figure 2. U.S. hedge fund management company yearly foundings and closings, 1965–2007

A semi-parametric model is unbiased and is preferable (Blossfeld *et al.*, 2007) when not all organizational members need face a future of death. By method of partial likelihood, the Cox model 'can be shown to yield consistent and asymptotically efficient estimates of the parameters under quite general conditions, including mild assumptions concerning the distribution of censoring . . .' (Wu, 2003: 488).

The Cox model allows the baseline hazard rate to be an unknown and unspecified function of time, effectively controlling for time dependency. The Cox model takes the functional form:

$$h_i(\mathbf{t}) = h(\mathbf{t})\exp(\mathbf{x}_i\boldsymbol{\beta}) \quad (1)$$

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where h_i represents the instantaneous mortality hazard rate at time t for the i^{th} firm, $h(t)$ is the unspecified baseline mortality hazard rate, $\mathbf{x}_i$ is a vector of covariates for the ith hedge fund management company, and β is a vector of coefficients associated with those covariates. The Breshlow method is used to handle ties.

There may be unobserved heterogeneity among hedge fund managers, for example, associated with shared information, social networks, and even pre-formation training regimes where such come to represent shared structural traits (Haunschild and Miner, 1997). Heterogeneity might alternatively be based on a manager's beliefs about his/her own skill (see de Figueiredo and Rawley, 2008), although Brown *et al.* (2008) suggest unobserved heterogeneity is clustered more appropriately on issues of operational risk, where both operational risk profiles and pre-formation experience might be strongly influenced by the demands of an HFMC's initial prime brokers. A fixed effects model to control for unobserved heterogeneity is not usable in this study, as there is no variation in $\mathbf{x}_i$; independent variables are associated with fixed structural attributes of HFMCs (Blossfeld *et al.*, 2007; Cleves *et al.*, 2008). A random effects, or shared frailty, model may be used to control for unobserved heterogeneity where $\mathbf{x}$ is invariant across observations, provided low correlation between the random effect and $\mathbf{x}$. Because of likely unobserved heterogeneity associated with prime brokerages, I utilize the random effects model, with shared effects clustered on the prime broker utilized by an HFMC at time of founding. There is low correlation among prime brokerage groups and $\mathbf{x}$, and the random effects' estimated betas are consistent with the standard Cox model estimates, indicating no problems with biased estimators. The random effects model takes the functional form:

$$h_{ij}(t) = h_0(t)\alpha_j \exp(\mathbf{x}_{ij}\beta) \quad (2)$$

where α_j is the group level random effect for the j^{th} shared frailty (prime brokerage) group. Random effects results are reported later.

> *'(A shared) frailty is a latent random effect that enters multiplicatively on the hazard function . . . (The shared frailty) is . . . estimated from the data.'* (Cleves *et al.*, 2008: 156)

Variables

Dependent variable

In this study, I am interested in failure of success, as defined by mortality of founded organizations (see Aldrich and Ruef, 2006; Delmar and Shane, 2003; Shane, 2008). The dependent variable for the event history analysis is firm disbanding, which is here equivalent to the firm stopping reports to all commercial databases for a period greater than one year.[5] By the end of 2003, 982 (38.4% of firms) failures occur, with Failure was coded '1' in the month of failure and '0' in all other months, with 1,578 HFMCs surviving (coded '0' in all months), and consequently being right censored. Life spans range from 1 month to 657 months (mean = 69.7 months). The industry is marked by considerable entrepreneurial founding and disbanding, with each founding based on the discovery of objectively existing opportunity (Alvarez and Barney, 2007). Table 4 provides variable descriptive statistics.

Independent variables

Hedge fund managers can diversify investors only by opening additional, differently structured, funds. I operationalize this issue using three variables: *Number Hedge Funds Managed* is a count of the number of distinct hedge fund contracts offered by the HFMC. This variable ranges from 1 to 61, with a mean of 3.05 hedge funds per firm. Controlling for those firms that must register with the U.S. SEC (i.e., offer more than 15 funds), the mean decreases to 2.0 funds, indicating that the average HFMC remains very small. *Use of Multiple Strategies* is coded '1' for HFMCs that offer multiple main strategies across their funds; each main strategy represents a unique product type, and the use of multiple main strategies would likely appeal to investors with differing risk-tolerance profiles; only 16 percent of HFMCs utilize multiple main strategies. *Use of Onshore & Offshore* is coded '1' for management companies that employ *both* onshore and offshore hedge fund contracts, as regulation dictates differential funds for U.S. citizens and foreign nationals; 37 percent of HFMCs utilize both contract types (see Table 2 for term definitions).

[5] The literature on entrepreneurial exit (cf. DeTienne, 2010) suggests entrepreneurs may exit in a number of ways, ranging from 'harvesting' through sale or public offering, to failure. It is important to note that HFMCs are professional service organizations (like law firms or medical offices), and harvesting events are, therefore, very rare because clients often perceive themselves as purchasing the professional services of a specific individual. More mundane exits, such as retirement of the founder, can happen, but an important social caveat attaches: managers who leave this industry are almost never able to return (Brown et al., 2001). Therefore, the overwhelming source of exits is firm failure. The combined data suggest less than 1 percent of closings are related to nonfailure events.

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Table 4. Variable definitions and descriptive statistics

Variable	Definition	Mean	Min.	Max.	s.d.
Control variables					
Density	Industry density at founding of HFMC[A]	1030.73	1	1791	576.29
Density squared	Industry density squared (divided by 1,000)	1394.38	0.001	3207.68	1081.47
Dow performance	Average monthly performance of DJIA over life of firm	0.0605	−0.0170	3.350	0.2063
Other business	Dummy = 1 if HFMC engages in (non-hedge fund) businesses	0.0109	0	1	0.1040
Only fund of funds	Dummy = 1 if HFMC offers only fund-of-hedge funds contracts	0.0836	0	1	0.2768
Inclusion in multiple data sets	Dummy = 1 if HFMC is listed in multiple commercial data sets	0.5613	0	1	0.4963
Misreported strategy	Dummy = 1 if HFMC reports different strategies across data sets	0.0879	0	1	0.2832
Alive before 1975	Dummy = 1 if HFMC living in the period prior to 1975	0.0957	0	1	0.2942
Diversification variables					
Number hedge funds managed	Number hedge funds managed by HFMC	3.046	1	61	4.362
Use of onshore and offshore funds	Dummy = 1 if HFMC offers both on- and offshore hedge funds	0.3688	0	1	0.4826
Use of multiple strategies	Dummy = 1 if HFMC offers multiple hedge fund strategies	0.1625	0	1	0.3690
Switching cost variables					
Use of lockup periods	Dummy = 1 if HFMC employs redemption lockup periods	0.6035	0	1	0.4893
Use of high-water marks	Dummy = 1 if HFMC employs high-water marks for fees	0.7961	0	1	0.4030
Max management fee	Maximum management fee charged by HFMC	1.48	0	20	1.04
Local environment variables					
Connecticut domicile	Dummy = 1 if HFMC domiciled in Connecticut	0.0766	0	1	0.2659
Illinois domicile	Dummy = 1 if HFMC domiciled in Illinois	0.0809	0	1	0.2727
New Jersey domicile	Dummy = 1 if HFMC domiciled in New Jersey	0.0434	0	1	0.2037
Pennsylvania domicile	Dummy = 1 if HFMC domiciled in Pennsylvania	0.0148	0	1	0.1210
Entrepreneurial climate	Entrepreneurial climate of state of domicile	0.0163	−0.092	0.136	0.0530
Claims of expertise variables					
Use of leverage	Dummy = 1 if HFMC employs leverage	0.7941	0	1	0.4044
Max incentive fee	Maximum incentive fee charged by HFMC	19.48	0	65	5.22

[A] HFMC = hedge fund management company.
All variables measured and coded at the firm (HFMC) level except density, density squared (industry level), Dow performance (national environmental), and entrepreneurial climate (local environmental level), which are measured and coded as environmental variables.
2,560 observations, March 1949 to December 2003.

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Three variables capture structures that may lock investors into the firm. The dummy variables *Lockup Period* and *High-water Mark* are coded '1' for HFMCs that report such structures; 60.4 percent and 79.6 percent of HFMCs employ these devices, respectively. The variable *Maximum Fund Management Fee* is equal to the maximum management fee charged across all the hedge funds operated by the HFMC. This variable ranges from 0 to 20 percent, averaging 1.48 percent. Management fees are paid prospectively on funds under management and, therefore, management fees create switching costs.

Local environments are operationalized at the state level (Dobbin and Dowd, 1997; Guthrie and Roth, 1999) with dummy variables coded for each state. Each HFMC may be domiciled in only a single state; for example, *New York Domicile* is coded '1' for the 40.8 percent of HFMCs domiciled in New York State. I also code each HFMC for the *Entrepreneurial Climate* (Goetz, 2008) associated with their state of domicile. Entrepreneurial climate is a measure of support provided by the local environment for entrepreneurial ventures, ranging in value from −1 to 1; see Goetz (2008) for specific values.

Skill is operationalized through two distinct variables: *Leverage* is coded '1; for HFMCs that report the use of leverage in their hedge funds (76.1%).[6] The variable *Maximum Fund Incentive Fee* is equal to the maximum incentive (performance) fee charged across the hedge funds operated by the HFMC. This variable ranges from 0 to 65 percent, with a mean of 19.18 percent. Where management fees are earned on all assets, incentive fees are earned only on investor profits and are variable compensation.

Control variables

In accordance with ecological work showing both legitimation and competition effects associated with increasing population density (Carroll and Hannan, 1989; Hannan and Carroll, 1992), I created controls for *Density,* representing the density of the industry at the date of formation of each individual HFMC, and *Density Squared*. To control for issues associated with an expanding economy and increasing awareness of, and investment in, financial markets, I include a control for *Dow performance*, representing the average monthly increase or decrease in the value of the Dow Jones Industrial Average during the life of the particular HFMC. To control for alternative measures of firm size, I include a dummy (coded '1') for firms engaged in *other businesses* while also operating a hedge fund. For example, the Bank of Bermuda and Blackstone Group have each operated hedge funds. These firms may enter and exit the hedge fund industry without implications for firm survival and, therefore, their entry and exit patterns likely differ from full-time HFMCs. During the observation period, there were 70 such firms. I also control for use of a specific strategy type (*fund of hedge funds, FoF*), where this strategy may be associated with significantly different life probabilities based on portfolio diversification across other hedge funds (Brown *et al.*, 2007; Lhabitant and Learned, 2002). Further, I control for two issues associated with the commercial data sets: a dummy (coded '1') for firms that report to *multiple commercial data sets*, where such activity may imply greater access to potential investors and (coded '1') for *misreporting of strategy*, where a particular fund is reported to one data set with one strategy while also reporting to another with a different strategy, as this has highly ambiguous implications for the present study (8.8% of firms engaged in this practice). I also control for entry prior to 1975, where such entry would have both (1) exposed the firm to the 1969 to 1974 secular bear market (Biggs, 2006) and (2) meant I manually collected information about the firm from noncommercial data sources.

[6]Leverage means the use of borrowed (margin) funds to increase the purchasing power of a fund so that greater numbers of securities can be held in an investment portfolio. Leverage significantly increases variance in financial returns. By way of example, suppose an HFMC has one hedge fund with $1 million in actual investor funds, referred to as 'assets under management' or AUM. If the firm is able to borrow (obtain leverage) at 10 times AUM, the firm would be able to borrow $10 million, and the resulting $11 million might be invested into equities. If the value of those equities increases from $11 million to $12 million over time (a reasonable 9% return on investment), the HFMC can repay the loan and recognize an increase in value of $1 million on the original AUM of $1m (an amazing 100% return on assets). Unfortunately, leverage is even more significant on the way down. If the investment declines from $11 million to $9.999 million (a loss of slightly more than 10%), the HFMC is unable to fully repay the loan it took and is unable to return any money to its investors (a staggering loss of 100% on AUM and failure of the firm). Because of the increase in financial performance variance, leverage is very dangerous. A skilled investor can use leverage to great benefit, but lack of skill (and/or lack of luck) can be disastrous. Therefore, only the most skilled professional money managers are willing to use leverage. For example, while actually not prohibited by law, almost no mutual funds use leverage. A professional money manager creating structural permission for his use of leverage is effectively stating to his investors that they should trust his superior judgment, and his investors are relying on that claim of skill.

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Table 5. Variable correlations matrix

Variable	1	2	3	4	5
1. Density					
2. Dow performance	–0.360**				
3. Other business	–0.047*	–0.022			
4. Only fund of fund	0.092**	–0.069**	–0.005		
5. Multiple data sets	0.101**	–0.249**	0.055**	0.011	
6. Misreported strategy	–0.016	–0.068**	0.046*	–0.028	0.277**
7. Period before 1975	–0.508**	0.657**	–0.020	–0.097**	–0.344**
8. Entrepreneurial climate	–0.052**	0.077**	0.042*	–0.036	0.018
9. Number of funds	–0.117**	–0.103**	0.318**	0.015	0.300**
10. On- and off shore funds	0.011	–0.166**	0.098**	–0.032	0.371**
11. Use of multi-strategies	–0.063**	–0.097**	0.155**	–0.134**	0.252**
12. Use of lockup	–0.007	0.151**	0.009	–0.028	0.019
13. Use of high-water mark	0.250**	–0.172**	0.043*	–0.041*	0.189**
14. Management fee	–0.064**	–0.093**	0.031	–0.032	0.093**
15. Use of leverage	–0.135**	0.108**	0.044*	–0.168**	0.026
16. Incentive fees	–0.064**	0.025	0.025	–0.483**	0.026

*$p < 0.05$ *(two-tailed test);* **$p < 0.01$ *(two-tailed test).*

I also created a variable *Clustered Prime Brokerage* to test the random effects; there are 10 prime brokerage groups, as noted in Table 6. Prime brokerage groups may represent networks through which knowledge flows and pre-formation training was acquired (Haunschild and Chandler, 2008; Haunschild and Miner, 1997; Jaeger, 2003) and may be associated with differential frailties.

RESULTS AND ANALYSIS

Table 5 provides the correlation matrix for the independent variables. Only ten pair-wise correlations exceed 0.3, with only three of those exceeding 0.5; no correlations appear excessive. The individual VIFs are well behaved, with only one exceeding 2.6, and the condition number on the entire set of regression variables (excluding *Density Squared*) is 19.99, indicating multicollinearity is not a problem (Greene, 2003).

Table 6 presents the results of the event history analyses. The table reports the marginal increase or decrease in period-specific mortality hazard rates for each variable in exponential form, as well as the standard errors on the beta coefficients. A relative hazard of –0.10 indicates a 9.5 percent reduction in probability of within period mortality associated with a one-unit change in the variable ($e^{-.10} - 1$). Positive (negative) coefficients are associated with an increased (decreased) probability of instantaneous within-period organizational mortality, where the period is defined as one month.

To the extent a parametric model yields the same coefficients, model preference should be based on overall model fit (Wu, 2003). In this instance, the Weibull distribution is consistent with the Cox estimated coefficients reported, but the Cox model provides a superior model fit based on χ^2. As a robustness check, several splined piecewise exponential models were estimated with time splines corresponding to variations in the federal regulatory environment, as well as piecewise exponential models with constant duration (five-, 10-, and 20-year) windows. Again, results are similar across models and the Cox model provides superior fit. Additionally, regressions were run with data running from 1949 through 1996, and through 2000 (effectively imposing more restrictive definitions on the period of emergence); results are consistent.

Regression Model 1 presents the control variables. Model 2 adds variables associated with diversifying structures. Model 3 adds variables associated with structures increasing switching costs; Models 4 and 5 add variables associated with local environments; Model 6 adds variables associated with structural claims of skill. Statistical significance is generally stable across all models, as are standard

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6	7	8	9	10	11	12	13	14	15
–0.086**									
–0.020	0.124								
0.322**	–0.138**	0.002							
0.173**	–0.215**	0.068**	0.456**						
0.219**	–0.123**	–0.020	0.501**	0.307**					
0.000	0.252**	0.110**	0.117**	0.097**	0.073**				
0.066**	–0.200**	0.028	0.178**	0.236**	0.167**	0.233**			
0.071**	–0.145**	–0.036	0.248**	0.167**	0.192**	–0.087**	0.032		
0.089**	0.165**	–0.023	0.133**	0.087**	0.124**	0.036	–0.003	0.089**	
0.080**	0.035	–0.007	0.114**	0.078**	0.147**	0.025	0.115**	0.172**	0.166**

errors. All models incorporate random (shared frailty) effects, and the random effect is significant in all models (the likelihood ratio test of theta calculated to zero and χ^2 statistics are reported under 'random effects' in Table 6); all regression betas reported are subject to baseline hazard dependent upon HFMCs' prime brokerage groups.

Significant support is found for Hypothesis 1: learning and implementing structures to diversify clients are mortality reducing. The addition of one more fund to the firm's portfolio decreases period-specific mortality hazard by 25.3 percent ($e^{-0.2918} - 1$) in the full model, relative to the shared frailty group's baseline mortality hazard ($p < 0.001$). Further, opening both onshore and offshore funds reduces the hazard rate by 14.0 percent ($p < 0.1$), while opening funds using different main strategies reduces period-specific mortality hazard by 31.2 percent, ($p < 0.01$).

Hypotheses 2 (increase switching costs to lock investors into the firm) is strongly supported in all models. Instituting a mandatory lockup period is associated with a decreased period-specific mortality of 32 percent in the full model ($p < 0.001$), while increasing switching costs through the use of high-water marks reduces period-specific mortality by 26 percent ($p < 0.001$). Management fees are also significantly associated with decreased period-specific mortality hazard rates: a 1 percent *increase* in management fees results in a 5.9 percent *decrease* in period-specific mortality hazard ($p = 0.1$).[7]

There is empirical support for the local environments hypothesis (Hypothesis 3): local environments significantly differ with regard to mortality hazard. New York is home to the greatest number of HFMCs, and regression betas on state of domicile are *as compared to New York*.[8] Interestingly, period-specific mortality hazard in the financial center state of Illinois is 42.8 percent greater than in New York ($p < 0.001$). In the other direction, New Jersey domiciled HFMCs experience a 26.4 percent ($p < 0.1$) *lower* probability of period-specific mortality hazard (relative to New York), and Pennsylvania firms show a 72.4 percent *lower* mortality hazard ($p < 0.1$); most states are statistically insignificant and are not dis-

[7] Because management fees and incentive fees (see the results on Hypothesis 4) work in the opposite direction (with regard to mortality), until the variable incentive fees is added in the full model, the significance of management fees remains disguised.

[8] Hypothesis 3 was tested with all HFMCs located in each state with a population greater than 15. New York had the largest population (40.8%) and was the omitted category; therefore, all regression betas are relative to New York, and those states with insignificant beta coefficients are statistically indistinguishable from New York. With the exception of California, most such states had small HFMC populations. Instead of presenting 35 insignificant dummies, only a select set of states are presented for brevity and clarity.

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Table 6. Event history: maximum likelihood estimates of hedge fund management company mortality during any period

Variable name	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Controls						
Density	0.0022***	0.0019***	0.0019***	0.0019***	0.0019***	0.0018***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Density squared	–0.0005**	–0.0004*	–0.0003*	–0.0003†	–0.0003*	–0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Dow performance	3.201***	3.219***	3.182***	3.200***	3.189***	3.203***
	(0.1881)	(0.1888)	(0.1886)	(0.1888)	(0.1887)	(0.1890)
Other business	–0.4767	1.382**	1.231***	1.286**	1.256**	1.203**
	(0.4509)	(0.4728)	(0.4709)	(0.4718)	(0.4714)	(0.4719)
Fund of funds only	–0.9654***	–0.9061***	–0.9713***	–0.9488***	–0.9736***	–0.8007***
	(0.1658)	(0.1678)	(0.1672)	(0.1675)	(0.1673)	(0.1752)
Multiple data sets	–0.7468***	–0.3989***	–0.3750***	–0.3801***	–0.3675***	–0.3728***
	(0.0796)	(0.0819)	(0.0820)	(0.0824)	(0.0821)	(0.0827)
Misreported firm strategy	0.0249	0.3453**	0.2897**	0.2817*	0.2826*	0.2397†
	(0.1473)	(0.1470)	(0.1471)	(0.1472)	(0.1472)	(0.1478)
Founded prior to 1975	1.040***	0.7853***	1.138***	1.015***	1.148***	0.9583***
	(0.1408)	(0.1401)	(0.1553)	(0.1561)	(0.1558)	(0.1611)
Diversification						
Number funds managed		–0.3218***	–0.3298***	–0.2978***	–0.2950***	–0.3070***
		(0.0404)	(0.0408)	(0.0404)	(0.0401)	(0.0408)
On- and offshore		–0.2207**	–0.1885*	–0.1709†	–0.1872*	–0.1654†
		(0.1076)	(0.1079)	(0.1079)	(0.1077)	(0.1079)
Use of multiple strategies		–0.3752**	–0.3872**	–0.3716**	–0.3607**	–0.3714**
		(0.1506)	(0.1504)	(0.1511)	(0.1512)	(0.1511)
Switching costs						
Lockup period			–0.4187***	–0.3918***	–0.4138***	–0.3837***
			(0.0860)	(0.0812)	(0.0807)	(0.0813)
High-water mark			–0.2885***	–0.2826***	–0.2907***	–0.3033***
			(0.0732)	(0.0736)	(0.0731)	(0.0739)
Max management fee			–0.0233	–0.0357	–0.0229	–0.0612†
			(0.0412)	(0.0417)	(0.0411)	(0.0424)

played. Tests on state dummies are two tailed; all other regression tests are one tailed.

As an alternative test of Hypothesis 3, in Model 5, instead of state domicile dummies, I substitute the variable *Entrepreneurial Climate*. This variable, which varies across states based on local legal and economic support for entrepreneurs (Goetz, 2008), helps clarify the issue at work. Some jurisdictions provide significantly better organizational outcomes on average because they provide more supportive climates for entrepreneurial activities. This result indicates that moving to states with better entrepreneurial climates can result in dramatic reductions in mortality hazard ($p < 0.01$). Model 5 shows significant support for Hypothesis 3: entrepreneurs are superstitiously learning that they may select state of organizational domicile without regard to potential impact on firm mortality.

The results on Hypothesis 4 are strongly supported in all models: entrepreneurial learning to make claims of skill significantly *increases* mortality hazard. The use of leverage is associated with *increased* likelihood of firm mortality (29% ($p < 0.01$) in the full model). *Increasing* incentive fees are strongly associated with *increasing* mortality probability in all models ($p < 0.001$), with an approximately 1.2 percent increase in period-specific mortality for each 1 percent increase in incentive fees in

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Table 6. (*Continued*)

Variable name	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Local environments						
Connecticut domicile				0.1770		0.1764
				(0.1217)		(0.1212)
Illinois domicile				0.3890***		0.3576***
				(0.1041)		(0.1050)
New Jersey domicile				–0.3094†		–0.3047†
				(0.1705)		(0.1706)
Pennsylvania domicile				–0.9548†		–0.9827†
				(0.5033)		(0.5034)
Entrepreneurial climate					–1.009**	
					(0.6221)	
Claims of expertise						
Leverage						0.2521**
						(0.0911)
Max incentive fee						0.0143*
						(0.0068)
Random effects						
Theta (on prime broker)	0.3062	0.2067	0.2036	0.1986	0.2051	0.1970
	(0.1525)	(0.1179)	(0.1163)	(0.1143)	(0.1169)	(0.1135)
LR theta = 0 (χ2)	136.68***	36.33***	37.11***	36.53***	37.66***	37.39***
Df	8	11	14	18	15	20
Wald χ^2	650.44***	759.26**	779.14***	800.04***	780.95***	815.05***

****p < 0.001; **p < 0.01; *p < 0.05; †p < 0.1.*
(one-tailed tests, except for state domicile variables, which are two tailed).

- N = 2,560 for all models; monthly spells at risk = 178,426 for all models.
- Cox hazard rate model; coefficients reported are exponentials.
- Negative (positive) values indicate reduction (increase) mortality hazard from baseline rate.
- Random effects model, all hazard ratios and standard errors subject to the shared frailty (random effects) theta.
- Number of random effects clusters = 10; minimum observations per group = 41, maximum = 694.
- Random effects (coefficients for Model 6):

Shared frailty group 1 (No prime broker recorded):	0.4062
Shared frailty group 2 (Minor-sized prime brokerage):	0.2753
Shared frailty group 3 (Bank of America):	–0.2560
Shared frailty group 4 (Bear Stearns):	0.1259
Shared frailty group 5 (CitiGroup):	–0.1816
Shared frailty group 6 (Goldman Sachs):	–0.2441
Shared frailty group 7 (Merrill Lynch):	0.3638
Shared frailty group 8 (Morgan Stanley):	0.1196
Shared frailty group 9 (U.S. bank):	–1.3100
Shared frailty group 10 (Use of multiple prime brokerages):	–0.1978

the full model. Interestingly, implications for firm mortality differ starkly between incentive and management fee structures.

Organizational learning theory suggests operational learning is important. The issue is beyond the scope of this study, but in confirmatory analyses not reported here, support for operational learning was not economically significant. With regard to structural characteristics, these firms' pre-formation learning was much more likely to influence organizational mortality probabilities.

Overall model fit is significant, with a Wald χ^2 of 822.52 ($p < 0.001$). The Harrell's C concordance score indicates the full model accurately predicts 84.14 percent of failures.

DISCUSSION

The discovery opportunity literature (cf. Alvarez and Barney, 2007) emphasizes the objective nature of environment and opportunity (Shane, 2000) and the resulting analyzability of a determinable risk set in entrepreneurial activity. But the present study suggests discovery entrepreneurship is considerably more complex. Rather than risky environments, considerable Knightian (environmental) uncertainty

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(Kirzner, 1997; Shane, 2000) may remain within the discovery opportunity paradigm. Suggestions that uncertainty is an immaterial contributor to potential organizational success may result in discovery entrepreneurs learning too quickly (and, hence, incorrectly) about the stability and analyzability of the opportunities they pursue.

This issue is especially likely in an emerging industry context. The emerging industry context (Aldrich and Fiol, 1994; Aldrich and Ruef, 2006) is one of contestation about meaning and form (Hannan *et al.*, 2007). In emerging industry contexts, high levels of causal ambiguity remain and, therefore, founding entrepreneurs may not understand the implications of the practices and structures they learn and mimic, as already existing (i.e., considered to be successful) firms may not yet have gained enough experience to prove the efficacy of their own choices (Greve, 2011; Miller, 2003). Professional service industries may also represent contexts in which causal ambiguity remains, even though industry participants are highly trained and specialized. The discovery entrepreneur is typical in professional service industries: individuals who receive extensive professional training and then seek out (hopefully) underserved market niches in order to exploit their expertise in pursuit of economic gain. But training is generally limited to the ways in which industry-specific services are created and delivered, with little attention to the rigid structures this training imparts to created organizations or the performance impacts of these structures.

Nonetheless, causal ambiguity may be attenuated in emerging industries around issues where knowledge structures are common and transferrable from many other contexts. With regard to structures that allow for either diversifying or locking investors into the firm, results are strongly supportive of survival. By diversifying clients, hedge fund entrepreneurs seek investors with differing tolerances for poor performance, thereby increasing their ability to mitigate and survive potential redemption runs resulting from occasional but inevitable poor performance. Similarly, using structures that increase switching costs to either directly or indirectly lock clients into the firm provides hedge fund entrepreneurs an ability to proactively prevent redemptions. The industry norms in these respects represent effective solutions to easily understandable and analyzable risks faced by HFMCs. In the hedge fund industry, investor redemptions are easily understood risks defined by objective probability distributions: entrepreneurial learning occurs around the issues of inability to prevent occasional negative returns, the speed with which money flows out of 'down' (losing) funds, the mortality problem of redemption runs, and the simple structures that can mitigate such risk. In the instances where discovery entrepreneurs face understandable risk, both entrepreneurial learning and institutional isomorphism are accurate and effective, and both theories lead to convergent and supported predictions.

However, when entrepreneurs face high levels of uncertainty, learning is much less effective; as this study demonstrates, it can be superstitious and even deadly. Unlike the easily quantifiable risk of investor redemptions, issues related to the influence of experience and location are problematic. How will investors (or clients or patients) react to claims of experience and skill? How will a decision of convenience or commute preference impact one's professional practice? These questions are hard to address in the context of professional service firms and even harder in the context of an emerging industry—a context where prior entrants may not have enough history to provide reliable answers or perhaps never bothered to make relevant investigation from the outset. High uncertainty attaches, even though founders of HFMCs (or law firms, doctors' offices, veterinarian clinics, etc.) are discovery entrepreneurs pursuing their expert knowledge in uncovering objective, exogenous opportunities for entrepreneurial rents (Alvarez and Barney, 2007). With regard to issues defined by high levels of causal ambiguity, discovery entrepreneurs operate in environments with significant levels of residual Knightian uncertainty (Kirzner, 1997), suggesting potential divergence in the accuracy of predictions between institutional and organizational learning theories.

Local environment variables are interesting, as they demonstrate both the significant influence of local environments on survival and superstitious learning about organizational domicile. HFMCs are subject to a national regulatory regime that specifically preempts state-based regulation of financial services (U.S. House, 1996), but as businesses they are still organized under the laws of the particular states in which they domicile. Hedge fund entrepreneurs also understand their market as geographically unrestricted, with the ability to find investors and advisors anywhere. But results here demonstrate differential mortality hazards for HFMCs organized in the different states.

If HFMCs are regulated exclusively at the federal level, what might account for dramatic differences

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in mortality hazard across states? The obvious explanation would be local *competitive* environments (Wade *et al.*, 1998): states with greater density should demonstrate greater mortality hazard because increased density drives competition effects more than legitimation effects (Hannan and Carroll, 1992). This, however, turns out to be largely incorrect; state dummies are measured relative to New York (the greatest density state) and, therefore, lower state-level density in Illinois cannot explain greater hazard. Similarly, like New York, Illinois is a financial center and, therefore, cognitive legitimacy cannot be fully explanatory (Baum and Haveman, 1997). Alternatively, perhaps it is state-level tax regimes, although comparison of tax rates indicates otherwise: Illinois corporate tax rates are marginally lower and personal tax rates are significantly lower than those in New York, even while Illinois' HFMCs experience higher mortality hazard.

As a robustness check on this issue, I conducted a set of regressions on all firms domiciled only within a particular state. Coefficients on explanatory variables remain approximately as reported earlier, indicating little variation in the 'normal' and legitimated structures across state boundaries; therefore, it is not differential structure driving this result. As well, in no state do density and density squared terms take on the curvilinear shape suggested by density dependence theory (Bogaert, Boone, and Carroll, 2006; Carroll and Hannan, 1989), further suggesting local competition forces do not drive this result during the study period.

Although not definitive, Model 5 points toward a reasonable explanation: in this model *Entrepreneurial Climate* (Goetz, 2008) is substituted for state of domicile. Improving entrepreneurial climate from bad to average (−1 to 0) or from average to good (0 to 1) reduces period-specific mortality hazard by 63.5 percent ($p < 0.01$). Entrepreneurial climate is related to state support for entrepreneurs (Goetz, 2008). Although HFMCs' products are regulated (exclusively) at the federal level, local environments remain significant influencers of organizational mortality probabilities due to their ability to support (or deny support to) entrepreneurs in their organizing activities. This highlights the interesting nature of New Jersey and Connecticut as contrasted with New York. A hypothetical hedge fund entrepreneur commuting 45 minutes across the Hudson River, from the suburbs of New York City to an office in Jersey City, New Jersey, would experience a 26 percent *reduction* in mortality hazard compared to a compatriot commuting 45 minutes into the City ($p = 0.073$), all else equal. But a hedge fund entrepreneur commuting 45 minutes in the opposite direction to Greenwich, Connecticut, gains no such benefit. This is true even though cognitive legitimacy (Suchman, 1995), availability of professional advisors, and the local client pool are all approximately indistinguishable. This result echoes claims of regional variation in cultural support for and explanations of entrepreneurial activity and the agglomeration of certain types of such activity (cf. Cardon *et al.*, 2011; Saxenian, 1996). Learning that such variations are inconsequential is problematic.

Local environments impact organizational survival probabilities, even in industries where state-based industry regulation is preempted by federal statute. But a unified federal regulatory regime might actually *help induce* superstitious learning by obscuring the relationship between state of domicile and survival. Entrepreneurs may desire to open their businesses in prestigious locations, inexpensive locations, or convenient locations, but investigation about local regulations, incentives, and support for entrepreneurial activity could dramatically improve life expectancy: to the extent professional service entrepreneurs learn they may ignore the organizational mortality implications of local environments, they are learning superstitiously. Superstitious learning about state of domicile results in a dramatic loss of insight about the survival implications of organizational domicile, and the error is proving deadly. This finding holds wide-ranging implications for local policy makers as well: local policy can help or hinder entrepreneurs and, therefore, communities and states have significant ability to influence the economic realities faced by local businesses and, consequently, significant ability to affect the economic welfare of their citizens.

Among all the hypotheses, however, most interesting is the hypothesis associated with claims of expertise. Hedge fund entrepreneurs learn about and adopt the mythology of skill in the structures they implement. But learning to conform to this aspect of the industry's emerged practice is *strongly mortality increasing*. One of the two primary structures used to express expertise is leverage (J. Dumasi, pers. comm.). Regression results on leverage are clear: leverage dramatically increases risk of HFMC failure in all models. Economic theory could rationally support the use of leverage (to maximize short-term returns) or the lack of leverage (to maximize long-term earnings); hedge fund analysts believe the

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use of leverage increases with manager hubris (Hayward and Hambrick, 1997; Jaeger, 2003). But because hedge fund entrepreneurs who fail are almost never able to return to the industry (Brown *et al.*, 2001), higher mortality rates associated with leverage are very costly not only to hedge fund investors experiencing losses, but also to hedge fund entrepreneurs themselves. This suggests leverage (a structure used by 80.4% of non-FoF HFMCs), in addition to being mortality increasing, is not economically rational *post hoc*. Because excessive leverage is also associated with increased systemic risk to financial markets (Hildebrand, 2007; SEC, 2003), regulators may wish to pay particular attention to this issue, and it is deserving of considerably more academic research.

In addition to leverage, hedge fund entrepreneurs learn to implement the structure of incentive fees as implicit indicia of expertise (earnings could, alternatively, be supported by non-skill-based management fees, as are mutual fund managers'). Managers believe incentive fees imply skill: superior managers can charge higher fees and, therefore, higher fees mean greater expertise (Dumasi, pers. comm.; Jaeger, 2003; Dai, pers. comm.). But it is more likely that as incentive fees (and their implicit claims of skill) increase, hedge fund investors become less forgiving of poor performance (Ashforth and Gibbs, 1990). The implication is that cloaking oneself in the mythology of skill may actually be harmful, as consumers more quickly defect from those claiming quality when the proxy fails, resulting in increased probability of organizational failure; regression results strongly confirm this. Perhaps it is not only divergent investments in human capital that may lead to increased performance variability (Sirmon and Hitt, 2009), but also divergent *claims* of human capital. Here, divergent claims are always of the 'more' variety and variance in performance is always 'disappointing' (Brown *et al.*, 1999).

Interestingly, this stands in stark contrast to findings on management fees. Increasing management fees *decreases* period-specific mortality hazard, while increasing incentive fees *increases* the hazard. This implies a *differential* ability to accurately learn about (1) implicitly locking investors to the firms through switching cost generated by management fees and (2) skill claiming as signaled through incentive fee structures. There is, similarly, a strong divergence in the levels of causal ambiguity across these two issues, resulting in much greater levels of uncertainty around issues of skill claiming. The differential results across fee structures lends further support to the insight that institutional and organizational learning theories diverge in their predictive capacity in high uncertainty contexts. From a practical perspective, this suggests managers are far too fast in their learning about fee structures; they may have considerable room to negotiate fee arrangements that are significantly more beneficial to both themselves *and* their investors.

Building on this idea, in results not reported here, a control for normalized monthly average returns (returns relative to average) was added; those few firms that were able to actually demonstrate 'skill' were not rewarded with reduced mortality (the regression beta on returns indicated a marginally higher mortality hazard in returns, although without statistical significance). Interestingly, therefore, displays of 'real' skill are not rewarded, while *claims* of skill are punished.

I suggest similarities to mythologies of expertise or quality in other professional service industries where quality is hard to assess. In this result, we might generalize that in professional service industries, it is not superior performance at the core activity, but merely competence, that is necessary: once core competence has been achieved, professionals should seek to broaden their skill sets to related *business* activities (such as raising funds, finding clients, or perhaps even supporting professional associations and building networks). For example, being a great lawyer may prove less powerfully predictive of future results than being a competent lawyer with an extensive network of contacts constantly in need of legal services. The professional academies could benefit future professional service entrepreneurs by extending training beyond core competencies to general business issues.

Beyond the morality hazard experienced by a particular HFMC, superstitious learning by entrepreneurs feeds back upon the emerging recipes of an emerging industry (Haunschild and Chandler, 2008), not by updating those norms with more thoughtful insight or more highly verified outcomes, but rather by reinforcing emerging norms through ongoing information cascades (Bikhchandani *et al.*, 1998). To the extent hedge fund entrepreneurs simply learn to mimic structures of already established firms, new entrepreneurs again learn to adopt structures not based on valid outcomes, but rather based simply on prior adoption. This insight suggests emerging institutional norms may be based on superstitiously acquired knowledge and, therefore, the emerging

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norms themselves start as only partially effectual solutions to problems of legitimacy. In this manner, superstitious learning in emerging industries is likely an *origin* of the inefficient and 'archaic' norms that others have suggested develop slowly, over time, and only as they become technically and politically obsolete. If so, how do some firms survive, and how do industries overcome these obstacles? While beyond the scope of this article, it would seem the answer would exist in variation and selection mechanisms (Aldrich, 1999) and ongoing intended and unintentional institutional work (Suddaby, 2010); some entrepreneurs seek differentiation and that may create effective variation.

Limitations and further research

This study context is an emerging professional services industry and, therefore, the findings may not be fully generalizable, although the issues themselves seem to resonate across professional service industries more generally: discovery entrepreneurs engage in extensive training activities (formally and informally) in the period prior to founding their own firms, and that training is likely to imprint itself to the structures they implement. These structures often represent rigid aspects of the firms and offerings of professional service organizations; to the extent such structures were built through superstitious learning, they might prove deadly, even if legitimate. Given the potentially significant negative ramifications of superstitious learning to professional service entrepreneurs, it would be interesting to test the implications of this research in other contexts.

For example, the findings here demonstrate that the level of causal ambiguity remaining around specific issues is significantly related to variation in the effectiveness of entrepreneurs' choices. Could it be possible that causal ambiguity varies across issues in stable industries as well? If so, this suggests claims of purely analyzable risk in discovery opportunities are seriously overstated. Conversely, it may be that only emerging industries are subject to this phenomenon, and research to uncover the extent and implications of causal ambiguity in stable industries is warranted.

Additionally, it may be that pre-formation entrepreneurial learning regimes are uniquely culturally specific and, therefore, testing these insights across national contexts could prove insightful. For example, the second greatest population of HFMCs exists in the U.K., a common law nation but with very different forms of professional training and apprenticeship. Even more, research that has found regional variation in entrepreneurial culture mirrors findings here about state variation in organizational survival probabilities and, therefore, it would be interesting to test the mortality hazard implications of state contexts in other industries and entrepreneurial endeavors. Such testing could significantly influence professional training and public policy initiatives, as well as generate nuance for theory.

CONCLUSION

Disentangling institutional and organizational learning theories is difficult because both seem to make similar predictions: actors will mimic (or learn of and copy) structures from their industry's earlier founders, with such structures leading to lower levels of mortality hazard. But under conditions of high uncertainty, conditions especially likely to arise in emerging industry contexts, institutional theory and organizational learning theory potentially diverge. Institutional theory's prediction of mimetic activity leading to mortality-reducing legitimacy may fail, while organizational learning theory's suggestion of superstitious learning and consequently higher mortality hazard may be more predictive of observed outcomes.

I find empirical support for the suggestion that high uncertainty environments sometimes interfere in the ability to select appropriate structures. In the emerging industry context, where significant causal ambiguity remains, organizational learning theory's claim of superstitious learning is supported with respect to adopted structures of organizational domicile and skill claiming. Both are superstitious learning and both prove to significantly increase mortality hazard rates, regardless of how legitimating such structural choices may be.

The results I have presented demonstrate that adopting developing norms of organizational structure in an emerging industry may not consistently support organizational survival. Until causal ambiguity is resolved, such activity may well provide only symbolic legitimacy without also serving to improve organizational survival prospects, and some learned and adopted structures appear deadly. In this regard, institutional theory's claim that conforming to legitimated structure increases survival probabilities (cf. Baum and Oliver, 1991; Meyer and Rowan, 1977) does not hold, at least with regard to structures

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adopted mimetically in response to causally ambiguous issues. Similarly, entrepreneurs' active attempts at learning in uncertain environments may be stymied by information cascades and indeterminate means-ends relations, resulting in superstitious learning about significant structural devices and increasing organizational mortality hazard. The pivot appears to be associated with the level of residual uncertainty existing around discovery opportunities (Alvarez and Barney, 2007): low uncertainty allows entrepreneurs to select structures in conformance with the predictions of both organizational learning and institutional theories and reduce mortality hazard, while high uncertainty results in superstitious learning, leading to divergent predictions between organizational learning and institutional theories and increased mortality hazard.

Hedge fund management company founders' learned and copied rigid structures of skill and location provide exemplar demonstrations of very smart, highly educated discovery entrepreneurs encountering unexpected (and untheorized) uncertainty in their discovery opportunities. Discovery entrepreneurs in emerging industries need to learn more slowly, evaluate more potential configurations, and develop flexible structures able to withstand previously untheorized residual Knightian uncertainty.

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