

# Pre-Entry Knowledge, Learning, and the Survival of New Firms

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New firms are endowed with knowledge and experience at birth through the human capital of their founder(s). Existing empirical research suggests that this pre-entry knowledge and experience will influence the firm's chances of survival; however, the mechanisms underlying this relationship have yet to be investigated. We seek to better understand and unpack this relationship. Specifically, we study the extent to which a founder's pre-entry knowledge of the business activity and pre-entry management experience influence the effectiveness of two subsequent learning activities—namely, early-stage business planning and product-line change. Our findings suggest that pre-entry knowledge and management experience increase firm survival through moderating the effects of these subsequent learning activities. We also find that learning activities are not always beneficial; in our sample, early-stage business planning is associated with decreased firm survival, and product line change is associated with increased firm survival. We examine these patterns using survey data collected from 436 individuals in the Munich region who founded their own firms as an alternative to continued unemployment. Our results have theoretical implications for the entrepreneurship, evolutionary economics, and organizational learning literatures.

*Key words:* prior experience; knowledge; learning; adaptation; entrepreneurship; firm survival; human capital; unemployment; business planning; evolutionary economics

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## 1. Introduction

A number of studies have found that a firm's pre-entry knowledge and experience enhance its long-run performance and survival (Evans and Leighton 1989, Mitchell 1989, Brüderl et al. 1992, Carroll et al. 1996, Gimeno et al. 1997, Sleeper 1998, Klepper and Simons 2000, Klepper 2002, Agarwal et al. 2004, Delmar and Shane 2006, Franco and Filson 2006). Theory offers us two potential explanations for this pattern. Population ecology suggests that firms are largely inert with respect to their ability to adapt; hence, firms that enter with knowledge better suited to the environment will be more likely to succeed. Evolutionary economics suggests that the firm's pre-entry resources and capabilities may affect its ability to adapt; hence, firms better able to adapt, renew, and build on their knowledge resources will be more likely to succeed.

The explanation provided by evolutionary economics is particularly compelling to most strategy researchers and managers, because it allows room for the organization to improve itself through subsequent adaptation, while acknowledging the potential impact of pre-entry

resources and capabilities and the path dependency they can create. However, the validity of this explanation has yet to be investigated (Helfat and Lieberman 2002): Do pre-entry capabilities enhance post-entry performance by moderating the firm's ability to adapt? In this paper, we examine the following operationalization of this question: *Are the survival benefits of learning moderated by a founder's pre-entry knowledge of the business activity and pre-entry management experience* (Figure 1)? We focus attention on knowledge as a capability supporting adaptation and on firm survival as a performance measure. We analyze two learning activities—early-stage (prior to launching the venture) business planning and post-entry product-line change. We chose these learning activities because of their importance in the entrepreneurship literature as mechanisms by which firms can better understand and adapt to their environments. Moreover, past studies have found weak evidence for the effects of these learning activities on firm survival, leading us to suggest that pre-entry knowledge and management experience may be moderating the effects of early-stage business planning and product-line change.

We examine this question in the context of new firms founded by unemployed individuals. Unemployed individuals are responsible for generating a high fraction of start-up activity: Firms founded by the unemployed account for 62% of new firm foundings in Germany, 30% in Sweden, and 15% in Austria (SCB 1994, Institut für Mittelstandsforschung 2005). Despite the magnitude of this phenomenon, little is known about the ability of unemployed individuals to successfully create new firms or the extent to which they draw on their pre-entry knowledge and managerial experience as they create new firms.

From a theoretical perspective, firms founded by unemployed individuals provide a particularly useful context for examining the survival benefits generated by relevant pre-entry knowledge and experience. First, the firms are young, allowing us to study the effects of pre-entry knowledge and experience when they are likely to be most strong (Boeker 1988, Delmar and Shane 2006, Beckman and Burton 2008). Second, new firms founded by unemployed individuals have relatively few pre-existing resource endowments other than the founder's human capital, providing us with the ability to focus on the effects of a single resource: pre-entry knowledge and management experience possessed by the founder. Third, during the time period captured in our study (2001–2005), the firms in the sample tended to be small, simple organizations with few employees. In these firms, the founder generally spearheaded all decision making, reducing the presence of capabilities and routines relating to coordination and information flow within the firm and the need to factor them into the analysis (Cyert and March 1964, Simon 1965, Nelson and Winter 1982).<sup>2</sup> Fourth, the majority of firms founded by the unemployed are founded by a single individual, as opposed to a founding team, simplifying data collection and the measurement and analysis of the effects of pre-entry knowledge and experience. These contextual characteristics permit a relatively clean and efficient examination of this complex and multifaceted topic. Moreover, because we analyze the effects of pre-entry knowledge and management experience across a variety of industries, most of which are not technologically intensive, our tests provide a conservative estimate of the effects of pre-entry knowledge and experience; one would expect pre-entry knowledge and management experience to be increasingly important as the technological intensity and overall complexity of a business increases.

We analyze survey data on 436 firms created by unemployed individuals using discrete-time event history analysis. Our findings support the idea that pre-entry knowledge of the business activity and pre-entry management experience increase the survival benefits of early-stage business planning and product-line change; that is, pre-entry knowledge and management experience

moderate the relationship between learning activities and firm survival. Our findings also show that the direct effects of learning activities on new firm survival rates can be positive or negative: High levels of planning are associated with increased failure rates, particularly for founders with low levels of pre-entry knowledge and management experience. In contrast, product-line change is associated with decreased failure rates, even for founders with low levels of pre-entry knowledge and management experience.

We proceed as follows. Section 2 develops theory on the survival effects of pre-entry knowledge and experience, and learning activities in new firm creation. Section 3 describes the method and data, and §4 presents our empirical results. Section 5 discusses the generalizability and limitations of this study, and presents the theoretical and policy implications of our findings. Section 6 concludes.

## 2. Theoretical Background and Hypotheses Development

In this study, we bridge two sets of literatures: that examining the effects of pre-entry experience on firm survival and that examining learning.

### 2.1. Pre-Entry Knowledge and Firm Survival

A number of studies show that diversifying and de novo firms with pre-entry experience in fields relevant to their new venture survive longer than firms without relevant experience. Studies find that diversifying entrants with pre-entry experience in related fields survive longer than other entrants in the digital imaging (Mitchell 1989), automobile (Carroll et al. 1996), and television receiver industries (Klepper and Simons 2000). Spin-outs, that is, de novo entrants that were founded by ex-employees of incumbent firms (i.e., whose founders have worked in the industry), survive longer than other start-ups, and sometimes as long as or longer than diversifying entrants in the laser (Sleeper 1998), automobile (Klepper 2002), and disk-drive industries (Agarwal et al. 2004, Franco and Filson 2006). Going one step further in showing how the quality of pre-entry knowledge affects firm survival, Klepper (2002) and Agarwal et al. (2004) find that the quality of a spin-out's parent further increases the spin-out's likelihood of survival in the automobile and disk-drive industries, respectively. Thompson (2005) examines diversifying and de novo firms in the shipbuilding industry, and finds that firms possessing highly relevant experience (e.g., in vessel construction) outperformed those that entered with less-relevant experience.

A few studies have examined the effects of pre-entry knowledge and pre-entry management experience on new firms *across* multiple industries. These studies indicate that pre-entry industry knowledge has a positive effect on firm survival (Brüderl et al. 1992,

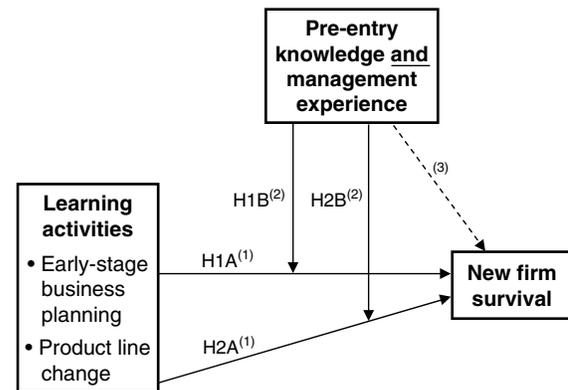
Gimeno et al. 1997, Delmar and Shane 2006). Pre-entry knowledge of the industry is argued to provide industry-specific information about the competitive landscape, profitable niches, customer preferences, supply chain issues, employment practices, industry rules and norms, etc. (Feesser and Willard 1990, Chandler and Jansen 1992). Such knowledge also shapes the opportunities that founders envision and pursue (Shane 2000). There is limited empirical evidence to suggest that pre-entry management experience has a positive effect on firm survival (Evans and Leighton 1989 finds positive effects; Bates 1990 find insignificant effects; Stuart and Abetti 1991 find insignificant effects; Gimeno et al. 1997 find insignificant effects). Pre-entry management experience is argued to provide a variety of useful skills, such as greater functional (i.e., sales, marketing, finance) knowledge, greater skill in dealing with people and external actors (e.g., employees, customers, suppliers), and the ability to more effectively identify and allocate scarce resources (Jovanovic 1982, Bates 1990, Chandler and Jansen 1992, Kaghna et al. 1999).

In sum, these findings suggest that (1) pre-entry industry knowledge affects new firm survival across a variety of industries, and (2) the effects of pre-entry management experience may be weak, and contingent on other factors such as data and sample selection issues (see Delmar and Shane 2006 for a detailed discussion of the latter issue).

Theory offers us two potential explanations for understanding why it is that pre-entry knowledge affects firm survival. On one hand, population ecology suggests a straightforward mechanism: Because firms do not adapt, pre-entry knowledge and resources determine a firm's likelihood of survival. In contrast, evolutionary economics suggests that pre-entry knowledge moderates the ability of the firm to learn and adapt to its environment, such that pre-entry knowledge not only has a direct effect on firm survival, but an indirect and ongoing effect as well (Nelson and Winter 1982). The latter explanation is particularly intriguing in light of empirical findings showing that the effects of pre-entry experience on firm survival do not diminish as firms gain subsequent post-entry experience (Thompson 2005).

The mechanism(s) by which pre-entry knowledge acts to enhance a firm's survival chances has received little empirical attention to date; however, it is a "fruitful avenue for future research" (Helfat and Lieberman 2002, pp. 752–753).<sup>3</sup> The theoretical work described in the previous paragraph highlights three patterns worthy of investigation: Pre-entry knowledge and management experience are likely to have a direct effect on survival, subsequent learning activities are likely to have direct effects on firm survival (H1A and H2A, described below), and pre-entry knowledge and management experience may also moderate the effects of subsequent learning activities on firm survival (H1B and H2B,

**Figure 1 Conceptual Model**



*Notes.* This is the first study to examine all three of the general relationships depicted jointly.

<sup>(1)</sup>Direct effect of early-stage business planning on new firm survival has been examined and results are mixed.

Direct effect of product-line change on new firm survival has not been examined.

<sup>(2)</sup>Absorptive capacity. The effect of absorptive capacity on new firm survival has not been examined.

<sup>(3)</sup>Established relationship.

described below) (Figure 1). We examine each of these patterns in this paper, paying particular attention to the third.

The notion that existing stocks of knowledge serve as a platform that acts to enhance the effectiveness of subsequent learning activities is captured by the term absorptive capacity (Cohen and Levinthal 1990, Zahra and George 2002). This existing stock of knowledge facilitates the accumulation and integration of new knowledge, influences the founder's ability to comprehend and apply new information in ways that those lacking the knowledge cannot replicate, and allows individuals to adapt to new situations (Weick 1996). Learning is thought to be most effective when knowledge stocks are more accurate, more diverse, and better matched to environmental needs (Levitt and March 1988, Huber 1991, Baum and Ingram 1998, Zahra and George 2002). Based on these arguments, we argue that higher levels of pre-entry knowledge of the business activity and management experience should increase the survival benefits of subsequent learning activities: "what an organization knows at its birth will determine what it searches for, what it experiences, and how it interprets what it encounters" (Huber 1991, p. 91).

## 2.2. Learning

Learning is widely acknowledged as being a critical activity for firms, an activity that shapes their development, growth, and ability to compete (Penrose 1959, Kogut and Zander 1992, Grant 1996, Decarolis and Deeds 1999, von Krogh et al. 1999, Winter and Szulanski 1999, Gupta and Govindarajan 2000, Hatch and Dyer 2004). The process by which firms learn

is of considerable interest to strategy researchers and organizational theorists. The Levitt and March (1988) perspective on organizational learning views learning as routine based, path dependent, and target oriented. Under this framework, actions are based on a logic of appropriateness rather than a logic of calculated choice—that is to say, they are based on routines (Cyert and March 1964, Nelson and Winter 1982). These routines are more heavily based on interpretations of the past than on interpretations of the future, adapting incrementally to feedback gained through observations of actions and their outcomes—that is to say, they are path dependent. The behavior of organizations is aimed at reaching self-set targets—that is to say, they are target oriented. Organizational learning is said to have occurred when an organization changes its routines or beliefs.

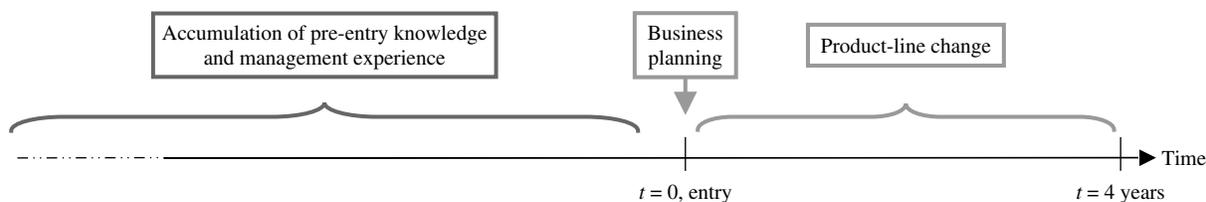
There are various methods by which a firm can learn.<sup>4</sup> In the Levitt and March (1988) model, actions are driven by routines and not by calculated choice; hence, learning comes only from adapting routines as a result of either direct experience or learning from the experience of others, that is to say, from “experiential search.” Learning from direct experience can occur through trial-and-error experimentation in which the use of a routine increases when it is associated with success in meeting a target, and decreases when it is associated with failure or organizational search, in which an organization draws from a pool of alternative routines. Learning from the experience of others (also called vicarious learning) can occur when firms attempt to understand and potentially adopt the strategies, administrative practices, and technologies used by other organizations (Zimmerman 1982, Levitt and March 1988, Huber 1991, Levinthal and March 1993, Irwin and Klenow 1994, Darr et al. 1995, Foster and Rosenzweig 1995, Miner and Haunschild 1995, Baum and Ingram 1998). Gavetti and Levinthal (2000) seek to broaden this perspective, reminding us that actions can also be driven by calculated choice or “cognitive search.” They argue that “Cognition is a forward-looking form of intelligence that is premised on an actor’s beliefs about the linkage between the choice of actions and the subsequent impact of those actions on outcomes. Such beliefs derive from the actor’s mental model of the world” (Holland et al. 1986, p. 113). Greater alignment between the actor’s mental model and reality should lead to more effective actions.

Although we might like to think of learning as an activity consistently resulting in positive outcomes for firm survival, learning can sometimes lead to suboptimal or even negative outcomes. Here we briefly discuss two such possibilities: competency traps and superstitious learning (Levitt and March 1988). Competency traps occur because the repeated use of a particular system generally improves the chances of success with that system. For example, a competency trap might manifest itself when an environmental change occurs, and hence an organization’s use of an old system is no longer appropriate; however, use of the old system might appear more beneficial in the short run due to the organization’s inability to properly implement a more appropriate system (March 1991, Levinthal and March 1993, Simon 1993). Superstitious learning occurs when the connections made between actions and outcomes are misspecified; there exists a feeling that learning has occurred, but an inaccurate or inappropriate causal link has been created. In the case of competency traps and superstitious learning, existing knowledge reduces performance. Improving performance requires not only the learning of performance-enhancing routines, but the “unlearning” of performance-detracting ones.

We examine the effects of two methods of learning whose effects are the subject of particular interest and debate in the entrepreneurship literature: early-stage business planning and post-entry product line change (Figure 2). With respect to the categorizations of learning processes above, both of these methods are hybrids of sorts. Early-stage business planning is a combination of learning from others and cognitive search. Post-entry product line change is primarily learning from experiential search. We discuss each of these learning methods below, first describing their direct effect on firm survival and then describing the moderating effect of pre-entry knowledge and firm survival. Overall, empirical evidence examining the survival benefits of each of these learning methods for young firms is mixed (see below).

**2.2.1. Early-Stage Business Planning.** Early-stage business planning is the “process by which the entrepreneur, in exploiting an opportunity, creates a vision of the future and develops the necessary objectives, resources, and procedures to achieve that vision” (Sexton and Bowman-Upton 1991, p. 118). Business plans are

**Figure 2 Pre-Entry Knowledge, Learning, and Firm Survival**



written *prior* to the launch of the new organization. Entrepreneurship education and practice strongly advocate the creation of business plans, yet entrepreneurship research finds conflicting evidence about the usefulness of business planning in new enterprises.

Proponents of business planning argue that the planning process leads to faster and better decision making, allows for the *ex ante* discovery of potential bottlenecks and problems, provides concrete objectives that prevent individuals from becoming distracted by nonvital issues, and makes it easier for goals to be communicated to others (Delmar and Shane 2003). Planning, in general, is argued to be particularly beneficial when tasks are uncertain and when decision makers cannot rely on experience or habit to process information (Campbell 1988). Systematic and careful business planning leads the entrepreneur to gather and analyze information and arrive at a more nuanced and thorough understanding of what will be required of the business to be successful (Leblebici and Salancik 1981, Block and MacMillan 1985, Eisenhardt 1989, Schrader et al. 1989, Ansoff 1991, Harrison and Phillips 1991, Castrogiovanni 1996, Dean and Sharfman 1996, Delmar and Shane 2003).

Critics of business planning argue that intuition and feedback from concrete actions are enough of a guide and planning detracts time and attention from more valuable tasks (Bird 1988, Carter et al. 1996, Bhidé 2000). Planning may also stifle creativity by focusing attention and behavior in organizations on particular outcomes and paths to those outcomes (Mintzberg 1994). Planning might also lead to “escalation of commitment” toward a failing course of action because of the decision maker’s unwillingness to admit that their prior judgments were erroneous (Staw 1981, Bowen 1987, Brockner 1992). Given that the founder typically feels personally responsible for the course of action taken in new firm creation, it is likely that her psychological attachment to earlier decisions is more pronounced than in other planning and decision-making contexts (Caldwell and O’Reilly 1982, Bazerman et al. 1984). Critics also point out that the value of knowledge acquired through business planning, particularly in uncertain environments, may have a short shelf-life and that planning will lead founders to stick to their plans, even when environmental changes require organizational adaptation (Bird 1988, Mintzberg 1994, Bhidé 2000); McGrath and MacMillan’s (2000) concept of “discovery-driven planning” highlights the balance between planning and the critical need for adaptation.

Empirical evidence on the effect of planning on new firm survival is scant and conflicting. Delmar and Shane (2003) find that business planning is beneficial to new firm survival, whereas Bhidé (2000, p. 60) finds no effect. Given these conflicting empirical findings and the conflicting theoretical arguments, it is difficult to predict the effects of early-stage business planning. Because

planning will provide founders in our sample with an opportunity to collect and analyze additional information and identify and prioritize the actions that they will need to take to create and grow their firms, we hypothesize that the overall effect of planning will be positive.

**HYPOTHESIS 1A (H1A).** *Early-stage business planning will improve the likelihood of new firm survival.*

Conflicting empirical findings further heat the planning debate and suggest the need for a contingency-based approach to planning (Gruber 2007). We focus on the moderating effects of pre-entry knowledge of the business activity and pre-entry management experience. To our knowledge this relationship has not been examined. We expect that pre-entry knowledge of the business activity and pre-entry management experience will increase the survival benefits derived from business planning.

Pre-entry knowledge of the business activity aids the entrepreneur in formulating questions, identifying the highest-quality information, interpreting and analyzing collected information in the context of the business activity, identifying potential inconsistencies or inaccuracies in collected information, and in applying information appropriately (Cooper 1986, Feeser and Willard 1990). This is not to say that planning may not aid entrepreneurs who lack pre-entry knowledge—rather, planning will be of *greater* benefit to entrepreneurs who possess pre-entry knowledge. The possession of pre-entry management experience suggests that the entrepreneur has had at least some past experience in planning, providing them with a structure for how to plan as well as practice with the cognitive act of planning (Ansoff 1991, Eisenhardt 1989, Dean and Sharfman 1996). Pre-entry knowledge and experience can be thought of as providing the absorptive capacity to collect and analyze new information and to engage in planning.

**HYPOTHESIS 1B (H1B).** *The survival benefits of early-stage business planning will be increased by pre-entry knowledge and management experience.*

**2.2.2. Product-Line Change.** Product-line change occurs when the founder adds, removes, or alters the products or service that he or she provides following the founding of the new firm. It occurs when the firm realizes that it would be more successful if it changed its product line. The literature has not yet investigated the effects of product-line change on new firm survival.<sup>5</sup> We expect product-line change to have a positive impact on firm performance, because it represents learning through experience in the product market and gaining a better understanding of what customers are willing to purchase. Learning from direct experience in the product market may be necessary for the founder for two reasons. First, knowledge of what customers desire may be “sticky,”

that is, costly to acquire, transfer, and use (von Hippel 1994, Szulanski 1995). When this is the case, learning can only take place in the context of engaging in a particular activity (von Hippel and Tyre 1995, Tyre and von Hippel 1997). Only in the course of introducing products and seeing how customers react to them can the founder gather information about actual and/or unarticulated customer desires that is used to make additions and subtractions to the product line. Second, entrepreneurial situations are characterized by newness and uncertainty. As a result, founders must often plan and act, despite missing or inaccurate information and ambiguous information signals (McGrath and MacMillan 2000). In such cases, a need to act may result in a suboptimal product line or a changing environment may lead the product line to become obsolete. Only upon observation of outcomes can the entrepreneurs revise their assumptions and redirect their actions (McGrath and MacMillan 2000, Chesbrough and Rosenbloom 2002).

*HYPOTHESIS 2A (H2A). Product-line change will improve the likelihood of new firm survival.*

Helfat and Raubitschek (2000) propose a model in which knowledge, capabilities, and products coevolve, suggesting that pre-entry knowledge and management experience will shape future product offerings. We expect that pre-entry knowledge of the business activity and pre-entry management experience will increase the survival benefits derived from product-line change. Pre-entry knowledge of the business activity may help the founder more accurately diagnose the source of the problem and devise an appropriate solution—because he or she may have a better understanding of customer needs and the offerings of competitors that will allow her to understand why her product may not be selling well. Pre-entry knowledge of the business activity will be particularly useful in cases where improving efficiency (and hence lowering price) or quality will lead to a better product for the customer, enabling the founder to more quickly and effectively enact necessary changes. Pre-entry management experience may help the founder identify that there is indeed a need to alter the product line and subsequently assess and monitor how a change may affect revenues and profitability. Pre-entry management experience may also provide the founder with structure for deciding what additional information should be collected and how to collect it, and in implementing the change (e.g., deal with operational and logistical issues, introduce the new products to customers). This is the first study to examine these effects.

*HYPOTHESIS 2B (H2B). The survival benefits of product-line change will be increased by pre-entry knowledge and management experience.*

### 3. Research Method

We examine the effects of pre-entry knowledge and management experience on the survival of new firms founded by unemployed individuals. We collected data through a one-time survey distributed to unemployed individuals who founded a firm with the assistance of a government grant ( $N = 436$ ). The firm is the focal unit of analysis. The study setting, data collection procedures, and data analysis procedures are discussed in detail below.

#### 3.1. Study Setting

Governments around the world are under pressure to reduce unemployment levels, particularly in light of recent downsizing and outsourcing trends that have left highly educated and skilled citizens jobless. One response to these pressures instituted by many national governments (e.g., Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Great Britain, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Sweden, and the United States) has been to create programs that provide unemployed individuals who choose to found their own firm with continued unemployment benefits for a short period of time (Benus 1994, OECD 1995). We study a cohort of firms founded with limited financial assistance from a branch of the German Federal Employment Agency serving the Munich region. All firms were founded in 2001 by individuals living in Munich or its suburbs. Each founder received financial assistance from the government—in the form of a monthly stipend equivalent to the amount of the unemployment check the individual would have received had they not founded a firm—to help offset their social security and living expenses while they founded a firm (Wiessner 2000). These “bridging allowances” averaged €1,000/month and were granted for a period of just six months. The funds do not require repayment. The process for obtaining bridging allowances was straightforward and administered by Munich’s Federal Employment Agency. Prospective founders were asked to submit a business plan outlining their start-up and a statement from an expert—such as a member of the chamber of commerce, or a tax consultant—attesting that the proposed venture was economically viable and sustainable. The threshold for assessing economic viability was quite low, defined as providing firm founders with an adequate income with which to support themselves (Wiessner 2000). The Agency estimates that almost 70% of individuals who submitted business plans received funding; this high acceptance rate reflects the program’s goal of supporting entrepreneurship amongst the unemployed.

#### 3.2. Data

*3.2.1. Survey Design and Response Rate.* We began our data collection by conducting 15 in-depth qualitative interviews with firm founders and staff members

of Munich's Federal Employment Agency to develop a deeper understanding of the challenges faced by this set of founders, the resources to which they had access, and the process by which they created, investigated, and pursued their entrepreneurial opportunities. We designed an eight-page survey instrument based on these findings and an extensive review of the literature. We pretested the instrument on 17 founders and four staff members.

In the spring of 2005, the survey was mailed to the home addresses of all 1,892 members of the 2001 cohort of funding recipients. Each survey was accompanied by a cover letter and a stamped return envelope. Individually addressed reminder postcards were sent to all members of the cohort seven weeks after the initial mailing. A total of 456 responses were received, resulting in a response rate of 24.1% based on the size of the full cohort or 31.4% based on the number of individuals who received the survey. Of these, only 15 responses were omitted from our survival analyses because of missing values. An additional five cases were omitted from our analyses because respondents indicated that they closed their firms for one of a variety of reasons not related to the success of the venture (e.g., health issues, retirement, accepted salaried employment). Thus, we analyze information from a sample of 436 respondents.

**3.2.2. Examination of Potential Response Bias.** Despite the satisfactory response rate, there is a possibility of response bias (in particular, survey nonresponse and survivor bias) in our sample. A number of comparisons and analyses suggest, however, that our data are representative of the population. First, to assess whether or not the sample was representative of the population, we obtained demographic data on the entire 2001 cohort of funding recipients from the Founder's Support Office (BfE 2004) and compared these data with our sample. We find that our sample is representative on all dimensions that we could assess: age, sex, education level, initial monetary investment in the firm, and area of the business activity. Second, we sought to encourage responses from founders whose firms failed. To prevent those founders from feeling that the survey was not relevant to them and thus not responding, the title page and cover letter of the questionnaire explicitly asked for their participation: 20% of all observations stem from firms that failed. This overall survival statistic as well as failure rates in Years 1, 2, and 3 correspond to the official statistics collected by the Founder's Support Office. In addition, the survival statistics for our sample are in line with survival rates documented in other studies of new firms formed by unemployed individuals in Germany (Wiessner 1998, Hinz and Jungbauer-Gans 1999, Institut für Mittelstandsforschung 2005).<sup>6</sup> Third, we tested for nonresponse bias by comparing early versus late respondents, in this case, respondents who

returned the questionnaire before versus after receiving the reminder postcard (Hendricks 1949). No indication of response bias was found.<sup>7</sup>

**3.2.3. Common Method Bias.** Common method bias occurs when some survey measures affect how the respondent reacts and responds to subsequent survey items. We used Harman's one-factor test to analyze the extent to which common method bias might influence our findings (Podsakoff and Organ 1986, p. 536). The principal components factor analysis of the main variables showed that three factors had eigenvalues greater than one, jointly accounting for 83% of the variance in the data. Common method bias does not appear to be a problem in this data set, because (a) more than one factor was identified, (b) the first factor accounts for only 32% of the variance, and (c) no general factor emerged in the unrotated factor structure.

**3.2.4. Sample Characteristics.** All funding recipients founded companies in the greater Munich region. Forty percent of founders were female. Roughly 2% of founders were under the age of 30, 32% were in their 30s, 37% were in their 40s, 25% were in their 50s, 4% were 60 or older. Individuals in our sample have high levels of education and training: For example, 49% had earned a university degree and 8% had earned a Ph.D. Less than 0.5% of founders had no educational degree. Their activities span a wide range of business types such as publishing agencies, restaurants, consulting services, editorial services, export services, travel agencies, textile sales, and graphic design agencies.

### 3.3. Variables

#### 3.3.1. Dependent Variable.

**Survival time.** Our dependent variable is the survival time (in months) of the business (Brüderl et al. 1992, Delmar and Shane 2006). Respondents reported the month and year in which they commenced business activity, as well as the month and year in which the activity was terminated. A firm still alive at the time of the survey is recorded as right censored.

#### 3.3.2. Independent Variables.

**Pre-entry knowledge of the business activity.** Pre-entry knowledge relevant to the new business activity can be obtained in a number of ways—for example, through prior work experience, education, and/or hobby or side activities (Table 1). To ensure that we captured pre-entry knowledge stemming from various sources, we constructed a measure based on the highest value of two survey questions. The first question asks the respondent to assess the extent to which the new business activity is related to their prior work experience on a five-point Likert-type scale. The second question asks the respondent to assess the extent to which pre-entry knowledge from any of the aforementioned sources of pre-entry

**Table 1 Short Cases**

African drum shop

Emma, who is in her early 40s, founded a small business through which she sells African drums and teaches the arts of African drum playing and African dance. Emma is well educated: Her university degree is in social work, and she also completed some training as a decorator. Emma has spent 10 years as a school social worker. She was the leader of her department, yet did not have the opportunity to acquire much managerial experience. Emma was unemployed for almost six months prior to starting her shop. Her prior work experience is in a field vastly different from African arts. However, Emma had a relatively high level of knowledge in this domain prior to founding her firm: African arts was a hobby that she was passionate about. In fact, she had been approached by others for lessons and had even given a few lessons and engaged in some small-scale importing of African drums prior to even beginning to think about starting a business.

Emma was very excited about the prospect of starting her own firm, even though she had no prior self-employment experience: she thought being her own boss would be a positive and healthy lifestyle choice and thought it would be exciting to create and grow her ideas into a business.

Once Emma decided to found this business, she engaged in a relatively high degree of planning. After founding her business, Emma adapted her business considerably, for example, targeting additional market segments and adding new products to her existing offerings. She sees her market as being regional, and seeks to educate individual clients, as well as clients from social and educational organizations, in the intricacies of African drumming and dance.

Her initial investment in the business was about €10,000. She works 50–60 hours per week and has two employees, both of whom work on a freelance basis. Her income is about the same as what she earned as a school social worker.

Consulting

Nik, who is in his early 40s, founded a consulting firm through which he provides engineering consulting services to small and medium-sized firms. Nik is well educated: His university degree is in electrical engineering, he has a secondary degree/minor in management, and also completed a vocational degree in the area of radio and television engineering. Overall, he has 15 years of work experience as a technician, yet had obtained relatively little management experience. Nik was unemployed for almost four months prior to founding his consulting firm.

Nik saw founding a business as something he had to do to get out of unemployment. He had no self-employment experience. He decided that providing engineering-related consulting services would be a good choice because of his prior experience, the low start-up capital required, and the possibility to quickly start working. He spoke to some potential customers about their needs and interests prior to founding the firm.

Nik engaged in a moderate amount of planning. After founding the business, Nik adapted his business considerably, addressing additional target markets and offering new services to his clients. Nik sees his target market as being small and medium-sized businesses throughout Germany.

His initial investment in the business was about €30,000. He works 60–70 hours per week and currently has one part-time employee. His income is greater than what he earned as a technician.

Sushi catering service and restaurant

Georg, who is in his early 40s, founded a Japanese catering service four years ago. He is a certified technician and has completed vocational training, specializing in electronics and electrical machinery. While employed, he went to school in the evenings for five semesters to study business administration. He possesses 20 years of work experience, with his most recent positions being in marketing and sales. During those years he gained a great deal of management experience and rose to become a marketing and sales manager for a telecommunication company. Georg was unemployed for four months prior to starting his catering service. He had no experience in the catering or restaurant industries, but felt confident that there was considerable unmet demand for sushi in his area.

Georg was very excited about the prospect of starting a sushi catering business: he would be the first Japanese food supplier in the region and he felt that it was a specialized business with high margins. Georg had dabbled with self-employment in the past, but only as a source of extra income to supplement his full-time job.

Once Georg decided to found this business, he engaged in a relatively high degree of planning. After founding his business, Georg altered his business model considerably: He went from providing catering services to running a full-service restaurant that also provides catering services. Focusing on his regional area, he seeks to attract individual diners, as well as corporate clients.

His initial investment was greater than €50,000. He works over 80 hours per week, and currently has one full-time and two part-time employees. His income is greater than what he earned as an engineer.

Store decorator

Maria, who is in her late 40s, founded a small store-decorating business. She obtained a university degree in art history and worked for seven years in the restaurant and lodging industry. She has a moderate level of managerial experience. Maria was unemployed for eight months prior to founding her business. She had no prior experience as a store decorator, but relied on advice from consultants, her own analysis, and intuition when deciding to pursue this type of business. She enjoyed the idea of being a self-employed person and liked the challenge that comes with pursuing new things.

Maria engaged in a relatively high amount of planning, strongly defining the firm's market and sources of competitive advantage. She saw her clients to be small and medium-sized firms throughout Germany, yet did not get in contact with potential customers prior to founding the firm. Although she won some client contracts, business never really picked up. Maria did not try to adjust her service offerings or redefine her target market, and eventually closed her firm two years after starting it.

Maria's initial investment in the business was about €10,000. While running the business she worked between 50 and 60 hours per week, and had one temporary employee.

She says that one of the key reasons for her failure was her lack of experience in the market and industry where she started her business. In particular, she regrets not having used an industry professional who could have shared his industry and market experience with her, and who would have been able to explain managerial issues such as business accounting to her.

knowledge was important in their decision to pursue the business opportunity on a five-point Likert-type scale.<sup>8</sup> Because the responses were slightly skewed, we used the log form of this measure in the analyses.

*Pre-entry management experience.* Pre-entry management experience indicates that founders had worked in a managerial capacity before they started the new firm (Bates 1990). Founders were asked to assess their level of management experience at the time they founded their business on a five-point Likert-type scale, from “very low” to “very high.”

*Early-stage business planning.* We measure the intensity with which strategic issues were analyzed and planned prior to launch through two survey questions (Zahra and Covin 1993). Founders were asked to assess how intensely they analyzed issues pertaining to (a) target market definition, and (b) the attainment of competitive advantage ( $\alpha = 0.76$ ). Responses to both questions were captured on five-point Likert-type scales, from “not planned at all” to “very thoroughly planned.”

*Product-line change.* This dichotomous variable captures whether or not a change was made to the firm’s product or service offerings at any time between founding and the time the survey was administered (or termination of the business activity). Founders were asked to indicate if their product or service offering did not change (0) or if it changed (1) in any of the following ways: extension or new addition, reduction or deletion, or complete replacement.

### 3.4. Control Variables

We control for a number of individual-, organizational-, and environmental-level factors that have been found to affect firm survival in earlier studies.

#### 3.4.1. Individual-Level Factors.

*Demographic characteristics.* Prior studies indicate that the founders’ demographic characteristics, namely gender and age, might influence firm survival (Bates 1990, Sexton and Bowman-Upton 1990, Shane 1996, Lévesque and Minniti 2006). Founders reported their age in one of six categories.

*Human capital.* Prior research suggests the importance of general and specific human capital in new firm survival (e.g., Carroll and Mosakowski 1987, Brüderl et al. 1992). We use five variables to control for human capital: the founders’ years of education, years of work experience up to the year of founding (2001), the industrial sector(s) of their prior work experience, and prior self-employment experience. Because human capital may depreciate with increasing duration of unemployment (Mincer and Ofek 1982), we also control for the unemployment spell prior to the self-employed activity.

(1) *Years of education.* This measure is calculated based on respondent-provided data of formal educational

attainment (degrees received, primary school through advanced university degrees) and vocational and occupational training received from first grade onwards.

(2) *Years of work experience.* Founders were asked to report the total number of years they had worked prior to the self-employed activity. Following prior studies, an apprenticeship, which typically takes three years, is counted half as work experience and half as education (Brüderl et al. 1992).

(3) *Industry of prior work experience.* Using a typology frequently applied in German labor market studies, we use dummy variables to identify the industrial sectors where founders may have acquired prior work experience: manufacturing, construction, wholesale/retail trade, finance and consulting, restaurant and tourism, transportation, health and social service, education, or other. Respondents were asked to indicate the sectors in which they have work experience.

(4) *Prior self-employment experience.* A dummy variable indicates whether or not the founder has previously founded a firm.<sup>9</sup>

(5) *Duration of unemployment.* Founders were asked to indicate unemployment duration in one of nine categories, from “less than one month” to “over 36 months.”

#### 3.4.2. Organizational-Level and Environmental-Level Factors.

*Resource endowments.* We use two controls for resource endowments: First, we control for the amount of financial capital initially invested in the business (ordinal scale with eight categories). Second, we control for the presence of a founding partner. Only 15% of firms were founded by more than one individual.<sup>10</sup>

*Innovativeness of the business idea.* Founders were asked to indicate the innovativeness of the business idea using a five-point Likert-type scale ranging from “not innovative at all” to “extremely innovative.”

*Type of business activity.* We controlled for three broad areas of business activities: trade and commerce, freelance, and craft. We created three dummy measures of each group, which were coded one if the founder’s business activity was in a specific area and zero otherwise.

### 3.5. Analytic Method

We estimate the process by which new firms either survive or fail using discrete-time event history analysis, which involves dividing durations of interest—in our case the survival time of the new firm—into subepisodes (Allison 1982, Yamaguchi 1991). Discrete-time event history analysis allows us to deal with right-censored observations, which in our case occur because of survival at the time of the survey. We treat a firm founded by an entrepreneur as the unit of risk, and define the probability that the firm fails as:

$$P_{it} = \Pr[T_i = t \mid T_i \geq t, \mathbf{x}_{it}],$$

where  $T$  is the discrete random variable that provides the uncensored time of event occurrence and  $\mathbf{x}_{it}$  is a  $K \times 1$  vector of explanatory variables. This hazard rate is the conditional probability that an event occurred at time  $t$ , given that it had not yet occurred, and can be estimated using common maximum likelihood methods (Allison 1982, p. 72). We use a particular class of such models, namely the logit model, which measures the probability associated with a specific outcome of a bivariate response model as shown below.<sup>11</sup>

$$\text{Logit: } \Pr(\text{Failure}_j = 1 \mid \mathbf{x}_j) = \exp(\mathbf{x}_j\beta) / (1 + \exp(\mathbf{x}_j\beta)).$$

In our analyses, we also control for potential self-selection bias. Specifically, individuals with low levels of prior knowledge of the new business activity may engage in higher levels of planning in an effort to compensate for their lack of knowledge. If this is the case, individuals with low levels of prior knowledge may also be the ones that engage in higher levels of planning—yet they also may be the most likely to fail—hence creating the self-selection issue. Following convention, we conducted a two-stage model to correct for potential sample selection. First, we estimated a logit model capturing how founders engage in planning. In particular, we estimated whether founders engaged in above-average levels of planning prior to entry as a function of our control variables, and the pre-entry knowledge of the business activity and pre-entry management experience measures. Because this model predicts planning, the computation of the inverse Mills ratio discussed below must include at least one covariate that significantly influences the probability of high planning but does not significantly influence the rate of failure (Greene 2000). For this reason, we included two additional variables in our model predicting planning: a measure of the extent to which the founder enjoyed challenging herself/himself with new tasks (measured on a five point Likert-type scale ranging from not at all correct to completely correct), and the amount of market and industry knowledge of the business at the time of founding (measured on a five-point scale ranging from very little to very high).<sup>12</sup> From the results of our first-stage model, we generated an inverse Mills ratio,  $\Lambda = [f(z)/F(z)]$ , where  $z$  is the estimated value stemming from the first-stage model,  $f$  is the standard normal density, and  $F$  is the cumulative normal density (Heckman 1979). We then plugged the inverse Mills ratio measure into our discrete-time event history analyses of new firm failure (second stage). As such, estimates from this second stage are logit estimates that are corrected for potential selection bias through the inclusion of the Mills ratio. These methods help ensure that we are able to correct for potential problems in this complex and multifaceted context.

## 4. Findings

Descriptive statistics and correlations for the variables used in the analyses are presented in Table 2. For illustrative purposes, we have constructed short cases describing the backgrounds and experiences of four founders based on survey data and information from open-ended questions (see Table 1) (Singer et al. 1998, Dumais 2005).

Results pertaining to the failure rate analysis with respect to controls and the pre-entry knowledge and management experience measures are provided in Table 3. Results in Model 2 of Table 3 suggest that pre-entry knowledge significantly increases the likelihood of firm survival, with pre-entry management experience having a slight positive effect on the likelihood of firm survival. Models 3 and 4 of Table 3 provide evidence to assess Hypothesis 1A (early-stage planning) and Hypothesis 2A (product-line change) on the likelihood of firm failure. Model 3 shows that greater intensity in planning is associated with a significant reduction in the chances of firm survival, a finding that is opposite what was predicted in Hypothesis 1A. However, as discussed in the theory section, several scholars have argued that early-stage planning may not add value in entrepreneurial situations (cf. Bird 1988, Mintzberg 1994, Bhidé 2000). Their arguments appear valid in light of the context and data studied here. Model 4 of Table 3 provides evidence about the effect of product line change on firm survival. Product-line change is associated with a significant increase in the likelihood of firm survival, lending support to Hypothesis 2A. In particular, results indicate that firm survival is two and a half times more likely if the founder changes the product line than if she or he did not [ $1/\exp(-0.94) = 2.56$ ].

Table 4 assesses whether the effects of business planning on survival chances are influenced by a founder's pre-entry knowledge and management experience (Hypothesis 1B). Results indicate that there is a significant interaction among pre-entry knowledge, management experience, and planning. For example, Table 4 shows that among founders who engage in high levels of planning, those with low levels of pre-entry knowledge and management experience are much more likely to fail than those with high levels of pre-entry knowledge and management experience. Nevertheless, for nearly all founders, our findings suggest that planning provides no benefit in terms of increased survival rates.

To more clearly illustrate the effects of early-stage planning on firm survival for different levels of pre-entry knowledge and management experience, we have generated predicted probabilities of failure using the statistical program CLARIFY (King et al. 2000, Tomz et al. 2003).<sup>13</sup> This postestimation program allows us to generate predicted probabilities of failure while setting control variables at different levels (e.g., mean, one standard deviation above the mean). In addition, the

**Table 2 Descriptive Statistics and Correlation Matrix**

Variable	Min	Max	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Firm failure	0	1	0.20	0.40	1										
2. Survival time (months)	6	60	53.74	14.15	-0.90	1									
3. Management experience	1	5	3.23	1.07	0.10	-0.07	1								
4. Log pre-entry knowledge	0	1.6	1.48	0.27	-0.15	0.21	-0.06	1							
5. Business planning	1	5	3.22	1.09	0.18	-0.15	0.24	0.13	1						
6. Product-line change	0	1	0.64	0.48	-0.14	0.14	-0.01	0.02	0.09	1					
7. Male	0	1	0.59	0.49	0.03	-0.04	0.08	-0.03	0.07	0.06	1				
8. Age	2	9	5.47	1.70	0.18	-0.13	0.17	-0.01	0.16	-0.08	0.05	1			
9. Years education	0	23.5	14.93	3.45	-0.10	0.10	-0.21	0.10	0.01	0.04	-0.01	-0.00	1		
10. Years work experience	0	43	15.63	9.99	0.21	-0.14	0.26	-0.03	0.19	-0.08	0.14	0.77	-0.18	1	
11. Prior self-employment	0	1	0.19	0.39	0.07	-0.06	0.10	-0.06	0.09	-0.02	-0.02	0.18	-0.03	0.09	1
12. Duration unemployed	1	9	4.13	1.93	0.20	-0.21	0.04	-0.08	0.04	0.02	-0.07	0.39	0.02	0.26	0.14
13. Prior sector: Manufacture	0	1	0.11	0.31	0.03	-0.04	-0.04	-0.09	0.03	0.05	0.06	0.01	-0.02	0.05	-0.09
14. Prior sector: Construct	0	1	0.09	0.29	-0.10	0.09	-0.17	0.00	-0.11	-0.06	0.20	-0.08	-0.09	-0.00	-0.09
15. Prior sector: Wholesale	0	1	0.12	0.32	0.02	-0.01	0.16	-0.07	0.03	0.08	0.11	0.07	-0.14	0.05	-0.01
16. Prior sector: Finance	0	1	0.08	0.27	0.05	-0.06	0.17	0.06	0.03	0.05	0.02	0.04	-0.01	0.07	-0.04
17. Prior sector: Transportation	0	1	0.02	0.13	0.02	-0.04	0.07	-0.09	-0.07	0.03	0.01	-0.09	-0.11	-0.07	0.06
18. Prior sector: Tourism	0	1	0.03	0.18	0.07	-0.07	0.08	-0.03	-0.03	-0.02	-0.05	-0.07	-0.05	-0.03	0.04
19. Prior sector: Health	0	1	0.09	0.28	0.11	-0.10	-0.07	0.01	-0.01	-0.04	-0.13	-0.02	0.02	0.01	0.01
20. Prior sector: Education	0	1	0.06	0.23	-0.04	0.03	-0.05	-0.01	-0.00	0.06	-0.15	0.08	0.02	-0.06	0.11
21. Investment	1	8	3.96	1.88	-0.13	0.12	0.02	0.10	0.16	-0.00	0.12	0.04	-0.03	0.13	-0.08
22. Number of partners	0	6	0.23	0.55	0.06	-0.08	-0.04	-0.04	0.05	-0.01	0.10	-0.07	0.08	-0.09	-0.04
23. Innovativeness of idea	1	5	2.80	1.19	0.18	-0.14	0.06	0.05	0.27	0.08	0.00	0.14	-0.09	0.20	0.11
24. Business area: Freelance	0	1	0.58	0.49	-0.03	0.04	-0.21	0.07	-0.07	0.04	-0.17	-0.01	0.35	-0.15	-0.01
25. Business area: Trade	0	1	0.32	0.47	0.10	-0.11	0.25	-0.13	0.06	-0.06	0.03	0.10	-0.26	0.16	0.08
26. Business area: Craft	0	1	0.10	0.30	-0.11	0.10	-0.05	0.10	0.03	0.03	0.23	-0.14	-0.18	-0.01	-0.11

**Table 2 (cont'd.)**

Variable	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
12. Duration unemployed	1														
13. Prior sector: Manufacture	-0.02	1													
14. Prior sector: Construct	-0.09	-0.11	1												
15. Prior sector: Wholesale	-0.02	-0.13	-0.12	1											
16. Prior sector: Finance	0.04	-0.10	-0.09	-0.11	1										
17. Prior sector: Transportation	-0.05	-0.05	-0.04	-0.05	-0.04	1									
18. Prior sector: Tourism	0.00	-0.07	-0.06	-0.07	-0.06	-0.03	1								
19. Prior sector: Health	0.03	-0.11	-0.10	-0.11	-0.09	-0.04	-0.06	1							
20. Prior sector: Education	0.18	-0.08	-0.08	-0.09	-0.07	-0.03	-0.05	-0.07	1						
21. Investment	-0.09	0.02	0.18	0.01	-0.07	-0.07	-0.02	0.06	-0.05	1					
22. Number of partners	-0.05	-0.01	0.01	0.03	-0.05	-0.06	0.06	-0.03	-0.03	0.13	1				
23. Innovativeness of idea	0.15	0.01	-0.07	0.01	-0.08	-0.02	-0.08	0.11	0.08	0.09	0.03	1			
24. Business area: Freelance	0.04	-0.08	-0.05	-0.14	0.03	-0.02	-0.09	0.05	0.10	-0.19	-0.05	-0.05	1		
25. Business area: Trade	0.03	0.03	-0.15	0.12	0.01	0.02	0.11	-0.04	-0.08	0.06	0.07	0.04	-0.80	1	
26. Business area: Craft	-0.12	0.08	0.32	0.04	-0.07	0.01	-0.02	-0.02	-0.05	0.21	-0.03	0.02	-0.39	-0.23	1

Note.  $N = 436$  founders.

program provides tests of significance for differences in failure rates for different groups. For comparison purposes, in Figure 3 we provide predicted probabilities of failure for individuals with different levels of pre-entry knowledge and management experience that were calculated from results in Model 4 of Table 3. As would be expected, Figure 3 shows that survival chances are increasing in increasing levels of pre-entry knowledge and management experience (see arrows); firms founded by individuals having the lowest levels of

pre-entry knowledge and management experience have the highest failure rates. With all other variables set at the mean, the predicted difference in failure probabilities for founders with high levels of pre-entry knowledge and management experience compared to those with low levels of pre-entry knowledge and management experience is 11.9 ( $p < 0.05$ ): Founders with low levels of pre-entry knowledge and management experience are twice as likely to fail as those with high levels of pre-entry knowledge and management experience.<sup>14</sup>

**Table 3** Estimated Effects of Pre-Entry Knowledge, Management Experience, Business Planning, and Product-Line Change on the Hazard of Firm Failure

	Model 1	Model 2	Model 3	Model 4
<b>Firm tenure</b>				
6 to 12 months	0.23 (0.45)	0.18 (0.45)	0.12 (0.45)	0.03 (0.46)
13 to 18 months	0.25 (0.46)	0.23 (0.46)	0.18 (0.47)	0.11 (0.47)
19 to 30 months	0.75 <sup>†</sup> (0.43)	0.73 <sup>†</sup> (0.43)	0.70 (0.43)	0.65 (0.44)
31 to 48 months	1.14** (0.42)	1.14** (0.42)	1.13** (0.42)	1.11** (0.42)
<b>Controls</b>				
Male	0.20 (0.26)	0.17 (0.27)	0.17 (0.28)	0.30 (0.29)
Age	0.01 (0.12)	0.03 (0.13)	0.04 (0.14)	0.00 (0.15)
Years education	-0.19* (0.07)	-0.21** (0.07)	-0.21** (0.07)	-0.21** (0.07)
Years education squared	0.004* (0.002)	0.004* (0.002)	0.004 <sup>†</sup> (0.002)	0.004* (0.002)
Work experience	0.03 (0.02)	0.02 (0.02)	0.01 (0.02)	0.02 (0.03)
Prior self-employment	-0.01 (0.29)	-0.17 (0.32)	-0.20 (0.32)	-0.20 (0.31)
Duration unemployed	0.17** (0.06)	0.17** (0.06)	0.16* (0.06)	0.19** (0.07)
Manufacturing	0.58 <sup>†</sup> (0.35)	0.42 (0.35)	0.31 (0.37)	0.28 (0.39)
Construction	-0.37 (0.69)	-0.26 (0.68)	-0.21 (0.72)	-0.37 (0.67)
Wholesale/retail	0.38 (0.40)	0.23 (0.41)	0.27 (0.41)	0.44 (0.42)
Finance	0.63 (0.44)	0.64 (0.44)	0.61 (0.44)	0.71 (0.47)
Transportation	0.97 (0.72)	0.86 (0.72)	10.08 (0.71)	1.34* (0.67)
Tourism	1.23* (0.54)	1.35* (0.54)	1.28* (0.55)	1.29* (0.51)
Health/social	0.85* (0.38)	0.76* (0.38)	0.90* (0.39)	0.96* (0.38)
Education	-0.51 (0.68)	-0.60 (0.82)	-0.59 (0.90)	-0.47 (0.88)
Investment	-0.20** (0.07)	-0.23* (0.10)	-0.27* (0.11)	-0.25* (0.10)
Number of partners	0.44* (0.19)	0.41* (0.19)	0.41* (0.20)	0.40* (0.20)
Innovativeness of idea	0.31** (0.10)	0.21 (0.32)	0.12 (0.33)	0.23 (0.34)
Freelance area	0.86 (0.55)	0.67 (0.56)	0.70 (0.56)	0.78 (0.54)
Trade area	0.82 (0.58)	0.63 (0.58)	0.62 (0.58)	0.66 (0.58)
Inverse Mills ratio	0.03 (0.37)	-0.45 (1.00)	-0.40 (1.03)	-0.10 (1.03)
<b>Pre-entry knowledge and management experience</b>				
Log pre-entry knowledge		-1.07** (0.36)	-1.29*** (0.39)	-1.33*** (0.37)
Management experience		-0.14 (0.32)	-0.23 (0.33)	-0.15 (0.33)
<b>Planning</b>				
Business planning			0.46** (0.16)	0.54*** (0.16)
<b>Adaptation</b>				
Product-line change				-0.94*** (0.25)
Constant	-4.69** (1.80)	-1.05 (4.78)	-1.49 (4.96)	-2.55 (4.96)
Log-likelihood	-309.6	-305.4	-299.3	-292.1
Chi-square	83.58	90.28	92.17	113.07
Df	25	27	28	29
Number of observations/founders	2,009/436	2,009/436	2,009/436	2,009/436

Notes. Standard errors are in parentheses. Omitted time period is 49 to 60 months.

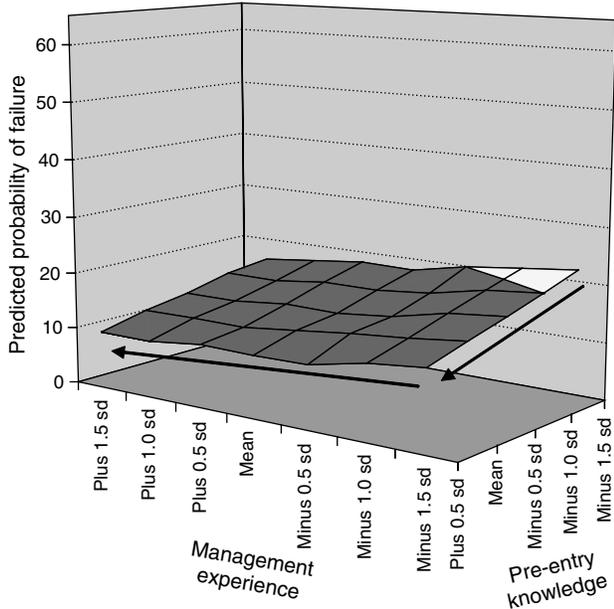
<sup>†</sup> $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$  two-tailed tests.

Figure 4 provides predicted probabilities of failure for low levels of planning (Panel (a)) and high levels of planning (Panel (b)) that were calculated from coefficients in Table 4. Two main observations stand out in the figures: first, the shape of the landscape in Panel (b), which is variation in the effect of pre-entry knowledge and management experience among founders who engage in high levels of planning; and second, the substantial differences between the landscapes depicted in Panels (a) and (b), which is variation between founders who engage in low levels of planning relative to similarly endowed founders who engage in high levels of planning.<sup>15</sup> At high levels of planning, failure rates were increasing in decreasing levels of pre-entry knowledge and management experience. For individuals with low

levels of pre-entry knowledge and management experience, high levels of planning were associated with a 67% probability of failure; for individuals with mean levels of pre-entry knowledge and management experience, high levels of planning were associated with a 21% failure rate; whereas for those with high levels of pre-entry knowledge and management experience, high levels of planning were associated with a 17% failure rate.

A comparison between Panels (a) and (b) also reveals substantial differences in survival chances among founders who engaged in different levels of planning, but who were similar in terms of pre-entry knowledge and management experience. For individuals with mean levels of pre-entry knowledge and management experience,

**Figure 3** Probability of Failure at Different Levels of Pre-Entry Knowledge and Management Experience



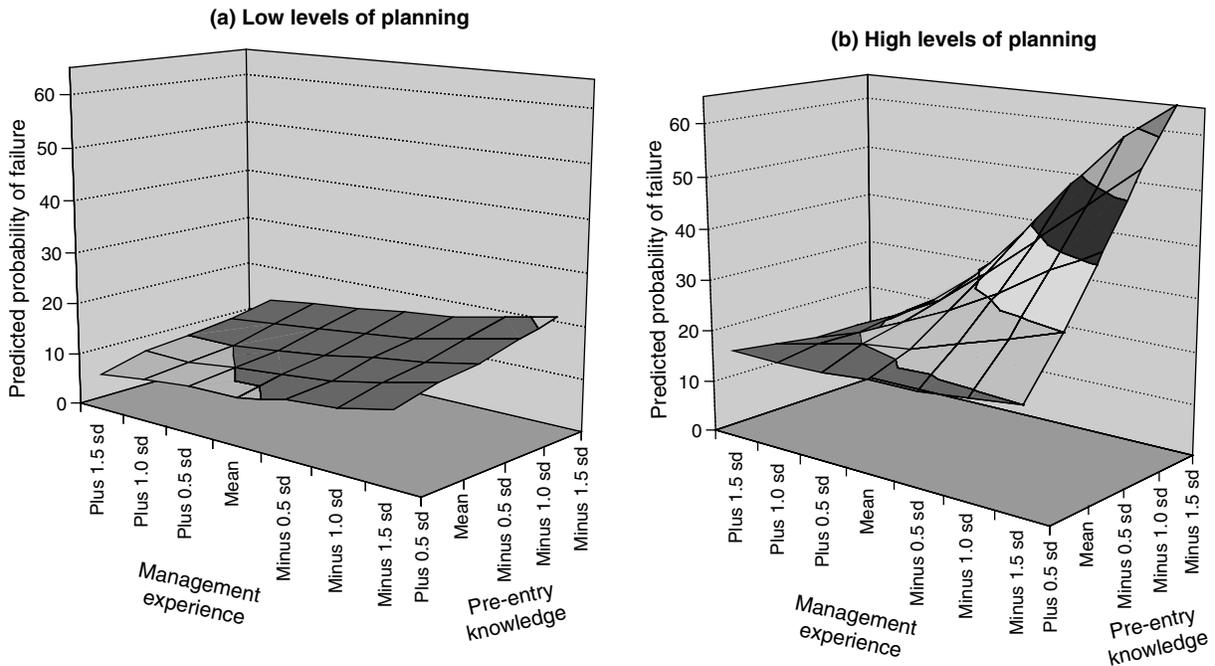
an increase in planning intensity from low to high levels is associated with a 10.7% ( $p < 0.01$ ) increase in the failure rate. For individuals with high levels of pre-entry knowledge and management experience, an increase in planning intensity from low to high levels is associated with a 9.5% ( $p < 0.05$ ) increase in the failure rate. For individuals with low levels of pre-entry knowledge and high levels of management experience, an increase in planning intensity from low to high levels is associated

with only a slight and insignificant increase in the failure rate (0.008%). For individuals with high levels of pre-entry knowledge and low levels of management experience, an increase in planning intensity from low to high levels is associated with a 5.3% increase in the failure rate. Finally, for individuals with low levels of pre-entry knowledge and low levels of management experience, an increase in planning intensity from low to high levels is associated with a 46.0% ( $p < 0.001$ ) increase in the failure rate. Taken together, results in Table 4 and Figure 4 imply that the negative effect of early-stage planning on firm survival is decreasing in increasing levels of pre-entry knowledge and management experience. In short, our findings suggest that early-stage planning provides few if any benefits to founders in our sample, with negative effects disproportionately affecting founders with little pre-entry knowledge and management experience.

Table 5 assesses whether the benefits of product-line change on survival chances are increased by pre-entry knowledge and management experience (Hypothesis 2B). The results in Model 1 lend support to Hypothesis 2B, with two main differences standing out: among founders who did not change their product lines but who had different amounts of pre-entry knowledge and management experience; and between founders who did not adapt relative to similarly endowed founders who adapted.<sup>16</sup>

Figure 5 provides predicted probabilities of failure for founders who did not adapt (Panel (a)) relative to founders who adapted (Panel (b)). A comparison between the two panels reveals that founders with low levels of pre-entry knowledge and high levels of

**Figure 4** Probability of Failure at Low and High Levels of Planning



**Table 4** Estimated Effects of the Interaction Among Pre-Entry Knowledge, Management Experience, and Business Planning on the Hazard of Firm Failure

	Model 1	
Firm tenure		
6 to 12 months	0.06	(0.46)
13 to 18 months	0.14	(0.47)
19 to 30 months	0.67	(0.44)
31 to 48 months	1.11**	(0.42)
Controls		
Male	0.13	(0.30)
Age	0.06	(0.14)
Years education	-0.23**	(0.08)
Years education squared	0.004 <sup>†</sup>	(0.002)
Work experience	0.00	(0.03)
Prior self-employment	-0.32	(0.35)
Duration unemployed	0.16*	(0.07)
Manufacturing	0.42	(0.37)
Construction	-0.20	(0.77)
Wholesale/retail	0.23	(0.42)
Finance	0.66	(0.44)
Transportation	1.14	(0.75)
Tourism	1.25*	(0.56)
Health/social	0.83*	(0.40)
Education	-0.30	(0.89)
Investment	-0.29*	(0.12)
Number of partners	0.47*	(0.20)
Innovativeness of idea	0.05	(0.37)
Freelance area	0.62	(0.56)
Trade area	0.48	(0.58)
Inverse Mills ratio	-0.68	(1.15)
Pre-entry knowledge, management experience, and business planning		
Log pre-entry knowledge	7.06*	(3.59)
Management experience	3.13*	(1.35)
Business planning	6.13**	(2.00)
Management experience * Log pre-entry knowledge	-2.34*	(0.97)
Management experience * Business planning	-3.78**	(1.39)
Log pre-entry knowledge * Business planning	-1.53**	(0.53)
Management experience * Log pre-entry knowledge * Business planning	1.03**	(0.38)
Constant	-12.68 <sup>†</sup>	(7.71)
Log-likelihood	-294.4	
Chi-square	104.02	
Df	32	
Number of observations/founders	2,009/436	

Notes. Standard errors are in parentheses. Omitted time period is 49 to 60 months.

<sup>†</sup> $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$  two tailed tests.

management experience (Panel (a)) can compensate for the lack in pre-entry knowledge by adapting their product lines: Product-line adaptation is associated with an 8.4% increase in the survival rate (Panel (b),  $p < 0.15$ ). A similar comparison indicates that adaptation is associated with a 16.9% increase in the survival rate for founders who have high levels of pre-entry knowledge and high levels of management experience ( $p < 0.01$ ). Hence, our data suggests that adaptation of the product

**Table 5** Estimated Effects of the Interaction Among Pre-Entry Knowledge, Management Experience, and Product-Line Change on the Hazard of Firm Failure

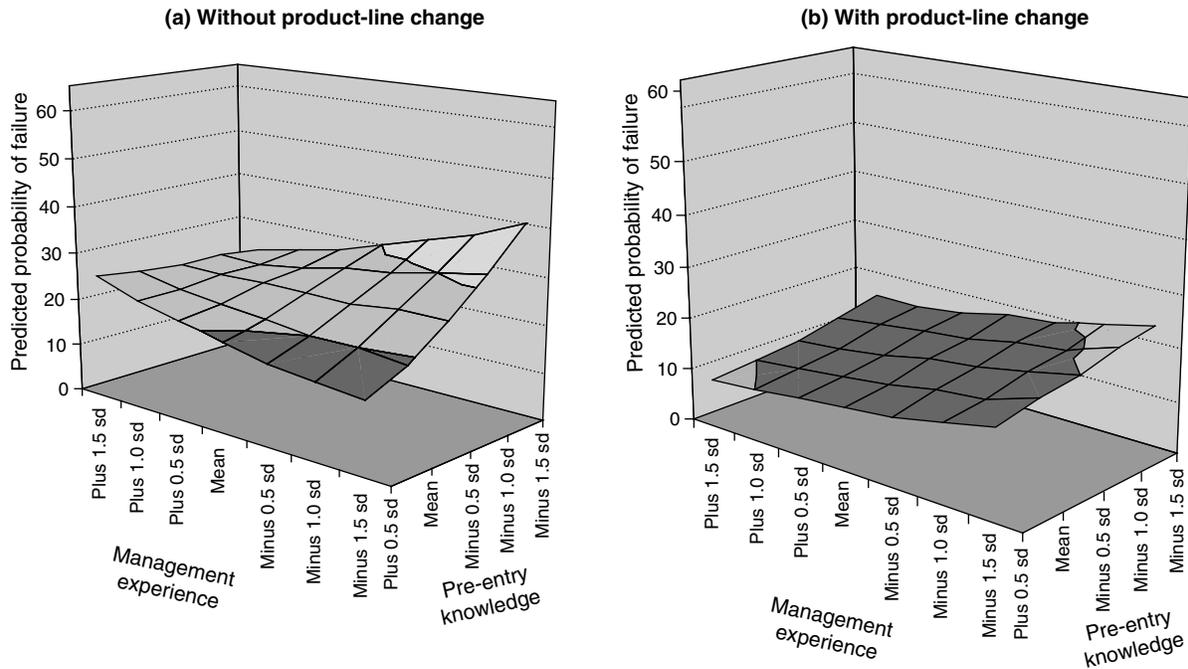
	Model 1	
Firm tenure		
6 to 12 months	0.10	(0.45)
13 to 18 months	0.15	(0.47)
19 to 30 months	0.69	(0.43)
31 to 48 months	1.12**	(0.42)
Controls		
Male	0.32	(0.28)
Age	-0.00	(0.14)
Years education	-0.19**	(0.07)
Years education squared	0.004*	(0.002)
Work experience	0.02	(0.03)
Prior self-employment	-0.22	(0.32)
Duration unemployed	0.21**	(0.07)
Manufacturing	0.39	(0.39)
Construction	-0.30	(0.67)
Wholesale/retail	0.37	(0.41)
Finance	0.84 <sup>†</sup>	(0.44)
Transportation	1.25 <sup>†</sup>	(0.72)
Tourism	1.29*	(0.51)
Health/social	0.94*	(0.38)
Education	-0.61	(0.92)
Investment	-0.23*	(0.10)
Number of partners	0.41*	(0.19)
Innovativeness of idea	0.29	(0.35)
Freelance area	0.72	(0.59)
Trade area	0.70	(0.61)
Inverse Mills ratio	-0.34	(1.09)
Pre-entry knowledge, management experience, and product-line change		
Log pre-entry knowledge	-5.58**	(1.83)
Management experience	-1.73*	(0.83)
Product-line change	-6.81 <sup>†</sup>	(3.66)
Management experience * Log pre-entry knowledge	1.25*	(0.50)
Management experience * Product-line change	4.98*	(2.48)
Log pre-entry knowledge * Product-line change	1.66 <sup>†</sup>	(0.97)
Management experience * Log pre-entry knowledge * Product-line change	-1.39*	(0.67)
Constant	4.17	(6.03)
Chi-square	112.21	
Log-likelihood	-296.9	
Number of parameters	32	
Number of observations/founders	2,009/436	

Notes. Standard errors are in parentheses. Omitted time period is 49 to 60 months.

<sup>†</sup> $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$  two tailed tests.

line is beneficial even for those founders who are already equipped with strong pre-entry endowments of knowledge and experience. Figure 5 also shows that product-line adaptation by founders possessing low pre-entry knowledge and low management experience is associated with a 16.7% increase in survival rate as compared to the survival rate of similarly endowed founders who did not adapt their product line ( $p < 0.10$ ). In addition, for founders with high pre-entry knowledge and

Figure 5 Probability of Failure Without and With Product-Line Change



low management experience, we observe only a slight increase in their firms' survival rates (2.1%) if they adapt their product line, as opposed to not adapting.

Overall, our findings suggest that learning activities have both positive *and* negative effects of new firm survival rates, and that the pre-entry knowledge and management experience moderate the impact of these learning activities on a firm's survival chances.

Our results are robust to the inclusion of different measures of our main variables of interest in the main models. Including other measures of pre-entry knowledge in our models—such as the two component variables for this measure—yielded similar patterns to those reported in the tables. For instance, using a measure of the importance the founder attached to her pre-entry knowledge in Model 4 of Table 3 resulted in similar outcomes: We found that the likelihood of failure decreased significantly in increasing importance (coefficient =  $-0.44$ ,  $p < 0.001$ ). In addition, using a measure of whether the self-employment activity was a continuation of a previous activity yielded similar results (coefficient =  $-0.14$ ,  $p < 0.07$ ).

In terms of our planning measure, we found support for the planning hypotheses from models that replaced strategic planning with operational planning (in terms of product/service placement, product/service design, and distribution activities). For instance, results were similar when we included the operational planning variable in Model 4 of Table 3, yielding a coefficient of  $0.35$  ( $p < 0.03$ ). That is, higher levels of pre-entry operational planning are associated with an increased likelihood of failure.

We also examined alternative adaptation measures, such as changing the customer base (coded zero if the founder made no customer-base changes, and one if she made any changes to the customer base). Substituting this variable for the product change variable in Model 4 of Table 3 provides some support for our claims, yielding a coefficient of  $-0.39$  ( $p < 0.13$ ). However, given that adapting a customer base may require different types of experience than would adapting a product line, we considered models where we replaced management experience with an indicator of whether the founder had pre-entry experience in marketing and sales. Including this measure in Model 4 of Table 3 yielded a coefficient for customer base change of  $-0.42$  ( $p < 0.10$ ). Moreover, including interactions among pre-entry knowledge, customer base change, and marketing and sales experience in Table 5 yields results that are largely consistent with our predictions. In further robustness tests of adaptation, we examined whether founders changed both product line and customer base. A substantial percentage of founders engaged in both types of adaptation (the correlation coefficient was  $0.43$ ). Of the 436 founders in our sample, 97 did not adapt, 53 adapted only the product line, 60 adapted only the customer base, and 226 adapted both product line and customer base. Introducing the three change categories in Model 4 of Table 3 (with founders who did not adapt as the reference category), we uncovered that founders who changed only the customer base were slightly more likely to fail than non-adaptors (coefficient =  $0.02$ ;  $p < 0.95$ ); founders who changed only the product line were least likely to fail (coefficient =  $-1.37$ ;  $p < 0.009$ ); and founders who

adapted both product line and target customer base were much less likely to fail than nonadaptors (coefficient =  $-0.84$ ;  $p < 0.004$ ).

## 5. Discussion

We investigated the mechanisms by which pre-entry knowledge and management experience increase the likelihood of survival for new firms founded by unemployed individuals. We find evidence supporting the idea that pre-entry knowledge of the business activity and pre-entry management experience indirectly increase a firm's chances of survival by moderating the survival benefits of two types of learning activities: early-stage business planning and product-line change. Below, we discuss our results and their generalizability, as well as their theoretical and practical implications.

### 5.1. Early-Stage Business Planning

Early-stage business planning, in contrast to our hypothesis, is associated with a decrease in survival. This is, however, not that surprising given the ongoing debate within the entrepreneurship literature on the benefits of planning for new firms. Several authors have argued that early-stage planning may be a source of inertia for new firms; planning may lead to a false illusion of control that decreases the organization's receptiveness to signals from the environment or even from within the organization (Mintzberg 1994). Such inertia is particularly detrimental for new firms, who may be in the process of creating a market niche and/or trying to understand where in the competitive landscape they might best fit in.<sup>17</sup> Another explanation for this finding is that the planning variable may be acting as a proxy for another factor, such as founder ability. That is, less-able individuals engage in more planning in hopes that they will compensate for their shortcomings. Although we do control for education and work experience, it is very difficult to assess "innate" ability. The planning measure may also be acting as a proxy for the difficulty or complexity of the venture: Founders who plan more might be creating more complex or risky ventures. Assuaging this concern is the finding that the innovativeness of the business idea (a proxy for complexity) is highly positively correlated with planning intensity (we control for innovativeness in all models). A third explanation is that the quality of the planning may be driving the negative result. It is possible that the individuals in our sample are not planning well and that they need training (e.g., how to gather information, how to assess the quality and reliability of information).<sup>18</sup>

As hypothesized, we find that pre-entry knowledge and management experience are associated with an increase in the survival benefits of early-stage business planning. This suggests that founders with high knowledge and experience may (1) be able to establish better

business plans early on because of their understanding of the industry; and (2) have a more nuanced understanding of how to plan, which allows them to plan more effectively. Engaging in higher levels of planning is highly detrimental to founders with low levels of pre-entry knowledge and management experience. This may reflect superstitious learning on the part of these founders, where the founder gets a new piece of information but makes erroneous conclusions based on that information (see literature review). Superstitious learning negatively affects the firms in three ways: First, it can lead to poor decisions being made; second, it can lead subsequent learning to be slow, misdirected, or erroneous; and third, it can lead to escalation of commitment. In such cases, "unlearning" is needed before productive learning can begin (Hatch and Dyer 2004). In such cases, planning is truly counterproductive in that it leads the founder to engage in mental acrobatics and what-if scenarios, when engaging in experiential learning by running the business might lead to better outcomes.

### 5.2. Product-Line Change

Our findings suggest that product-line change increases firm survival. The effect that we observe here may be particularly pronounced for newly founded firms, where newness and uncertainty limit the founder's ability to forecast future developments. As expected, pre-entry knowledge and management experience increase the survival benefits of product-line change. Thus, our findings suggest that pre-entry knowledge enhances the benefits of both planning and product-line change. However, we do not know the exact time of product-line change. Hence, we cannot rule out the possibility of simultaneity in the relationship between product-line change and survival. Descriptive statistics do, however, suggest that product-line change is not solely a function of survival.<sup>19</sup>

### 5.3. Generalizability

The generalizability of our findings may be limited by the national context in which the study was conducted, the generally small size and resource endowments of the firms studied, and the fact that we examine founders who were previously unemployed. With respect to the national context we examine, three factors suggest that our sample might be biased toward more highly educated workers, potentially leading to a higher survival rate overall and the possession of higher levels of knowledge and management experience than would be possessed by unemployed individuals in other nations or at other points in time/history. First, the German workforce is relatively highly educated and skilled. Second, German work regulations make termination of employees difficult. Third, the unemployment rate in Germany was relatively high—approximately 8%—at the time the study was conducted.

With respect to firm size, the firms in our sample are quite small throughout the time period of the study, and therefore unlikely to face many coordination issues. Hence, our findings may not be generalizable to firms who start off at a larger size or grow rapidly. In addition, these firms have relatively few pre-existing resource endowments other than the founder's pre-entry knowledge and experience (we control for funds invested into the firm). Generalizability issues arising from the fact that our entrepreneurs were previously unemployed are discussed in the body of the paper, and most significantly include the possibility that the negative effect for planning exists because, as a group, these entrepreneurs have little planning experience, and as a result, plan poorly.

Like other studies of firm survival, we also face the issue that our findings are subject to unobserved heterogeneity (cf. Brüderl and Schüssler 1990). For example, unobserved factors such as behavioral and personality characteristics may play an underlying role in the ability of an individual to convince others to share knowledge, opportunities, and resources with them.

#### 5.4. Theoretical Implications

Our findings have three key implications for the evolutionary economics, entrepreneurship and organizational learning literatures. First, we illuminate the relationship between pre-entry knowledge and experience, learning, and firm survival—an important theoretical and practical relationship that has received little empirical attention (Helfat and Lieberman 2002, p. 753). Our findings support the evolutionary economics-based reasoning that the firm's initial endowment of resources and capabilities affects its ability to enact and adapt to subsequent change (see for example, Nelson and Winter 1982, Helfat and Raubitschek 2000, Helfat and Lieberman 2002).

Second, our findings suggest that planning outcomes are contingent on founders' pre-entry knowledge endowments, providing a potential explanation as to why prior empirical research on the value of business planning has produced conflicting results (cf. Bhidé 2000, Delmar and Shane 2003, Gruber 2007).<sup>20</sup> Our results suggest that entrepreneurship scholars should develop a more nuanced understanding of the business-planning task in new firm creation: Specifically, pre-entry planning may be useful for some firms and not others. In contrast, current business-planning handbooks recommend that *all* firms devote a great deal of time and effort to pre-entry planning.

Third, our findings suggest that when founders consciously engage in learning activities to overcome gaps in knowledge resources, care should be taken in identifying appropriate learning activities (based on their level of pre-entry knowledge and experience) and avoiding superstitious learning.

#### 5.5. Policy Implications

As industries wax and wane, and as jobs flow from one city or nation to another, it should not be a surprise that many individuals will face great difficulty in finding the means to support themselves economically, either through employment or self-employment. Our findings suggest that, given the facilitating and constraining effects, policy makers must realize that knowledge and experience are indeed sticky and time consuming to acquire; because industries change those who find themselves out of work—no matter how well educated—may find it extremely challenging to successfully found firms in new, in-demand industries or sectors. If pre-entry knowledge impacts survival and learning deeply, allowing market forces to shape and redirect individual's activities may not be enough to avoid unemployment and the various economic, social, and psychological challenges it creates in the short and medium term.

From a policy perspective, our findings are of relevance to governmental and private agencies seeking to spur small-business development amongst the unemployed or soon-to-be unemployed (e.g., during corporate downsizing episodes, corporations often hire outplacement services to coach downsized employees). The results presented in this paper suggest methods by which to screen potential founders, as well as methods by which to further develop, train, and assist them. From the perspective of the individual founder as well as financial investors, our findings provide guidance on how to mold and shape knowledge acquisition activities.

The basic finding that pre-entry knowledge and management experience improve the survival benefits of subsequent learning activities should *generally* hold across entrepreneurial contexts—and some of the patterns uncovered may even find stronger support in other contexts. In this vein, future research could investigate how founders operating in different “knowledge contexts”—be they academic, employee, or user entrepreneurs—draw from different resources and knowledge bases (Shah et al. 2006).

#### 6. Conclusion

New firms are founded by a number of different types of individuals, with extant research focusing on understanding patterns of entrepreneurial activity by academic scientists and employees of existing firms who form spin-offs, because these groups are particularly important for the creation of technologically intensive start-ups (e.g., Zucker et al. 1998, Klepper 2001, Agarwal et al. 2004, Audretsch 2005). Here we examine the importance of knowledge to a set of new firms that are neither technologically intensive nor glamorous, and find that knowledge is also critical to firm survival: Knowledge has a direct impact on firm survival and moderates the survival benefits of subsequent learning activities. Learning can be a great asset for a new

firm; however, the survival benefits created by various learning activities may also be constrained or facilitated by the founders' pre-entry knowledge and experience. Given these findings, we believe that further research aimed at understanding the nuances and varieties of learning (and knowledge integration, in the case of larger firms) activities is crucial to understanding firm survival.

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### Endnotes

<sup>1</sup>All authors contributed equally. Author names are listed alphabetically.

<sup>2</sup>For the firms in our sample, both leveraging existing knowledge and experience and learning are critical activities, but coordination is less relevant; therefore, such firms are a relatively "pure case" for studying the impact of knowledge acquisition activities on firm survival. In addition to knowledge acquisition activities, larger firms must also have routines in place to ensure that the actions of individual employees are coordinated and that information is not only collected, but also processed and acted on (Cyert and March 1964, Simon 1965, Nelson and Winter 1982).

<sup>3</sup>The broader question of whether a firm's pre-entry resources and capabilities (inclusive of knowledge, financial resources, network resources, etc.) influence a firm's ability and willingness to adapt has also received relatively little attention (Helfat and Lieberman 2002). We know of only one study that begins to address this broader question empirically. Bayus and Agarwal (2007) find that among early entrants in the computer industry who do not initially select the technology that will become the product standard, diversifying firms have higher survival rates than start-ups. They argue that diversifying firms are better able to adapt (i.e., migrate to the standard) because of their pre-entry resources and capabilities.

<sup>4</sup>Finer-grained typologies of learning methods have also been made; see Huber (1991). For a detailed overview of various methods of learning, see Levitt and March (1988) and Huber (1991).

<sup>5</sup>Research has examined the survival rates of firms in technologically intensive industries who offer products incorporating the latest technology versus those that do not. This research finds that the former generally have higher survival rates (Dowell and Swaminathan 2000, Bayus and Agarwal 2007). It is argued that the ability to apply practices, routines, and knowledge is a source of competitive advantage for those firms offering products spanning generations (Burgelman 1994, Iansiti and Clark 1994). This logic is unlikely to apply to our sample.

<sup>6</sup>An earlier study of unemployed founders in the Munich region finds that 12%–17% of firms failed within the two years

of founding (Hinz and Jungbauer-Gans 1999). Our study and the Hinz and Jungbauer-Gans study suggest that firms created by the unemployed have slightly *higher* survival chances than other populations of newly created firms (this may be in part because of unemployed entrepreneurs having fewer employment opportunities, and hence low opportunity costs). For example, in their broader sample of firms in the Munich area, Brüderl et al. (1992) indicate a 37% failure rate after five years. Watson and Everett (1996) provide a thorough review of failure rates in documented in research studies conducted across many countries. Their review shows that failure rates typically range between 30% and 60% after five years.

<sup>7</sup>Surveys sent to 456 individuals were returned by the postal service; these individuals could no longer be reached in 2005 using the 2001 home address data supplied to the agency. Given that the general demographic characteristics and also the survival statistics of our sample and the complete 2001 cohort match, and that we do not find any indication of non-response bias, it is very unlikely that there is a systematic bias in these returned surveys with respect to survivorship. Munich is a metropolitan area in which individuals move relatively frequently.

<sup>8</sup>The pre-entry knowledge construct was created by using the highest score across both questions—as opposed to a summation or average of the scores—in order to avoid double-counting knowledge obtained through pre-entry work experience: The first question was aimed at assessing the knowledge overlap between the founder's pre-entry work experience and their new business activity, and the second question was aimed at assessing overlap between *any element* of the founder's pre-entry knowledge and their self-employment activity.

<sup>9</sup>Studies have also examined the effects of prior entrepreneurial experience on firm survival, finding limited evidence in support of a positive relationship (Brüderl et al. 1992 find insignificant effects; Gimeno et al. 1997 find insignificant effects; Delmar and Shane 2006 find positive effects). Prior entrepreneurial experience is argued to provide information about such activities as opportunity identification and resource acquisition (Delmar and Shane 2006). In this study, we control for prior entrepreneurial experience.

<sup>10</sup>We examined the robustness of our results when excluding firms that had been created with a founding partner, and find that results are consistent with the unrestricted sample.

<sup>11</sup>To estimate our model, it is important to choose time periods that are long enough to contain a meaningful number of firm failures (events). That is, in selecting periods, one must seek to improve precision, which is accomplished by specifying short time periods, yet meet the requirement that each period is long enough to include enough events for estimation. Based on an examination of life tables and estimates from a number of different breakpoints—as well as on prior research on firm survival (cf. Brüderl et al. 1992)—we decided to break the duration in scale in months at 12, 18, 30, and 48. The main results were robust to the selection of different breakpoints, such as every 12 months and every 6 months.

<sup>12</sup>Results from the first-stage model show that the most significant predictors of high levels of pre-entry business planning were the innovativeness of the business idea ( $p = 0.44$ ; significant  $< 0.001$ ), pre-entry management experience ( $p = 0.32$ ; significant  $< 0.05$ ), the extent to which the founder sought new challenges ( $p = 0.51$ ; significant  $< 0.01$ ), and the

founder's market and industry knowledge at the time of founding ( $p = 0.30$ ; significant  $< 0.05$ ).

<sup>13</sup>The program Clarify allows us to overcome problems with obtaining parameter estimates of interaction effects in nonlinear models (Ai and Norton 2003, Hoetker 2007). With Clarify we can set the values of the dependent variables and interaction terms at certain levels to obtain predicted likelihoods of new firm failure with other variables set at their mean.

<sup>14</sup>For low levels of pre-entry knowledge and management experience, we used 1.5 standard deviations below the mean; for high levels of management experience, we used 1.5 standard deviations above the mean; and for high levels of pre-entry knowledge, we used 0.5 standard deviations above the mean. Other variables were set at mean levels, with the exception of the time period dummies, which were set to one to calculate probability of failure for the entire duration of self-employment.

<sup>15</sup>High levels of planning are defined as one standard deviation above the mean, low levels of planning defined as one standard deviation below the mean. There were a few significant differences in survival among founders who engaged in low levels of planning. For founders with high levels of management experience (1.5 standard deviations above the mean), increasing pre-entry knowledge from low to high levels resulted in a significant increase in survival chances of 5.8%, which represented an almost twofold decrease in failure (from 13.3% to 7.5%).

<sup>16</sup>Tables 4 and 5 show that the coefficients for the pre-entry knowledge and management experience measures change signs depending on whether they are interacted with the continuation planning measure or the dichotomous product-line change measure. As Ai and Norton (2003) note, in nonlinear models, one cannot evaluate the interaction effect by simply examining the sign or magnitude of the coefficient on the interaction term, a point highlighted by the predicted probabilities presented in Figures 4 and 5. Unreported cross-validation analyses provide additional support in this regard.

<sup>17</sup>Unreported analyses provide some support for these claims. For instance, founders who engaged in very low or very high levels of planning were much less likely to change their product or target markets than were other founders.

<sup>18</sup>Our findings may be unique to unemployed individuals who found firms, because of the contextual issues, and that the firms founded tend to be small ventures (requiring little coordination between employees) with relatively simple business environments (a qualitative examination of business types suggests that the firms are not dependent on many external actors). Planning may have additional benefits for firms with many employees. Beyond the knowledge acquisition benefit, planning also has a knowledge integration/coordination benefit (whereby the plan is communicated to all employees to ensure a coordinated effort). The integration/coordination benefit is of much less importance for small firms founded, and often run, by a single individual.

<sup>19</sup>Rates of product-line change for founders exiting self-employment were 63% (exiting in Year 1); 42% (Year 2); 45% (Year 3); 65% (Year 4); and 50% (Year 5). Overall, 66% of respondents still in business in 2005 had changed their product line in some fashion, compared with 50% who had gone out of business at some point in time between 2001 and 2005. Moreover, descriptive statistics yield some differences in the types

of product change for those failing relative to those remaining self-employed at the time of the survey. For example, 42% of founders whose firms failed during the fifth year of self-employment had changed both product line and customer base (compared to 55% of founders remaining self-employed at the time of the survey). Comparing roughly similar founders (i.e., those surviving until Year 5 of self-employment), overall rates of change were 7% higher for those whose firms survived relative to those whose firm failed during the fifth year. Other tests (such as the Hausman test) produced results that are consistent with these descriptive statistics. However, because we do not observe the exact timing of product-line change, future research is needed to fully disentangle the effects of learning and survival on product-line change.

<sup>20</sup>Along these lines, our results should also be of theoretical interest to research in strategic management, where scholars have been debating the value of strategic planning in established corporations since the 1970s (Thune and House 1970, Camillus 1975, Mintzberg 1994), and—similar to research in entrepreneurship—have produced mixed empirical evidence about the value of strategic planning (Boyd 1991, Miller and Cardinal 1994).

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