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Survival of the Fittest? Entrepreneurial Human Capital and the Persistence of Underperforming Firms

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The model developed here explains why some firms survive while other firms with equal economic performance do not. We argue that organizational survival is not strictly a function of economic performance but also depends on a firm's own threshold of performance. We apply this threshold model to the study of new venture survival, in which the threshold is determined by the entrepreneur's human capital characteristics, such as alternative employment opportunities, psychic income from entrepreneurship, and cost of switching to other occupations. Using a sample of 1,547 entrepreneurs of new businesses in the U.S., we find strong support for the model. The findings suggest that firms with low thresholds may choose to continue or survive despite comparatively low performance.*

It has been frequently argued that, at least in the long run, well-performing organizations survive while poorly performing ones disappear (Alchian, 1950; Friedman, 1953; Winter, 1964; Williamson, 1991). Penrose (1952: 810) summarized this theoretical view as stating that "positive profits can be treated as the criterion of natural selection—the firms that make profits are selected or 'adopted' by the environment, others are rejected and disappear." This view implies a unidimensional relationship between economic performance (defined as the economic returns to residual claimants) and survival, since the firms most likely to discontinue are those that perform the worst. From this unidimensional model, it follows that economic performance and survival should have the same determinants or predictors. Interestingly, mounting empirical evidence suggests that the determinants of performance and survival may substantially differ (Blau, 1984; Carroll and Huo, 1986; Meyer and Zucker, 1989; Kalleberg and Leicht, 1991; Levinthal, 1991) and that factors other than performance may play a systematic role in the survival of organizations. This paper proposes a theoretical reconciliation of apparently conflicting empirical findings about the determinants of performance and survival. Our framework explains the persistence of underperforming firms and identifies predictors of such conditions.

We depart from the unidimensional model of performance and survival by arguing that organizational survival is determined by two main dimensions: (1) the organization's economic performance and (2) the organization's threshold of performance. The threshold of performance is the level of performance below which the dominant organizational constituents will act to dissolve the organization. This implies that survival is not strictly a function of economic performance, but performance relative to a firm-specific threshold. This simple elaboration, we believe, has profound consequences for theoretical and empirical research on organizational performance and survival. For example, by identifying how thresholds differ systematically across firms, we can explain why, given the same level of performance, some firms exit (discontinue operations) while others do not. We emphasize the internal attributes of the organization and, in particular, the human capital attributes of owners of new ventures, as determinants of thresholds. By considering organizational exit as a choice, our focus on organizational mor-

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tality complements existing literature in population ecology, where exit is seen as being forced by environmental conditions hostile to the firm.

EXIT, PERFORMANCE, AND THE THRESHOLD OF PERFORMANCE

Our main thesis is that organizations differ in their thresholds of performance, and exit or survival is determined by whether economic performance falls below or stays above that firm-specific threshold. While thresholds may be shaped by the multiple voluntary participants in the organization (Barnard, 1938; Simon, 1945; Aoki, 1984), the inducements and contributions of most participants are regulated through a nexus of contracts with owners. Accordingly, it is the owners' interests, as residual claimants, that are most closely tied to the economic performance of the organization (Alchian and Demsetz, 1972; Meyer and Zucker, 1989). The willingness or ability to withstand poor performance is partly determined by the mobility of the assets and resources controlled by the organization's owners. When owners with a residual claim over these resources have alternative uses for these resources, they can liquidate the firm for a reasonable value. Consequently, they may prefer to dissolve the firm when those alternatives become more appealing (Barnard, 1938; Caves and Porter, 1976; Porter, 1976). Exit, however, would not be rational at the first sign of low performance (Brüderl and Schüssler, 1990). If there is uncertainty about future payoffs, owners may be willing to accept low levels of performance with the hope that conditions will improve (Dixit and Pindyck, 1994). A firm's ability to withstand short periods of low performance should also be partly determined by buffers of accumulated resources, such as organizational slack (Cyert and March, 1963) or initial capital endowments and established relationships (Brüderl and Schüssler, 1990; Fichman and Levinthal, 1991; Levinthal, 1991). Organizations would be able to survive at least until their original resources were depleted.

Thresholds of performance may also be influenced when owners have objectives other than, or in addition to, the maximization of economic returns to their equity. Owners may seek "amenity potential" from their businesses—gaining utility from being able to influence the type of goods produced by the firm (Demsetz and Lehn, 1985: 203). For owners of professional sports teams or media companies (newspapers, TV), winning the World Series or believing that one is systematically influencing public opinion plausibly provides utility even if profit is reduced from levels otherwise achievable. For owners of family-owned businesses, the firm may not only be a source of income but also a context for family activity and embodiment of its pride and identity (Meyer and Zucker, 1989: 78).

Low organizational performance also puts the interests of owners and other organizational constituencies (non-owners) in direct conflict (Meyer and Zucker, 1989). While owners may want to terminate the business to redeploy assets in a more profitable arena, non-owner participants (managers, employees) who have developed firm-specific skills may stand to lose if the firm closes. With significant costs of exit,

non-owners may thus exercise their voice (Hirschman, 1970) through efforts to influence the decision-making structures of the organization. Thus, the threshold level of performance would also be determined by the relative organizational influence of non-owner members. Firms in which non-owner members exercise substantial organizational influence may remain in business at low levels of economic performance despite a preference by owners to terminate the business (Meyer and Zucker, 1989). In addition to internal constituents such as employees, external constituents (debt-holders, customers, suppliers, government and community organizations) may persuade low-performing but legitimate organizations to survive (as in the bailout of Lockheed and Chrysler by the U.S. government) or well-performing but illegitimate ones to dissolve (such as cartels, trusts, or local businesses posing environmental or social threats) by applying direct co-optation (Pfeffer and Salancik, 1978) or institutional (coercive and normative) pressures (Meyer and Rowan, 1977; DiMaggio and Powell, 1983). Thus, institutional embeddedness (Baum and Oliver, 1991), legitimacy, and co-optation by external organizations may also keep organizations alive despite low performance.

Contrast with Existing Views on Organizational Performance and Mortality

Our model of thresholds of performance provides a causal link between the concepts of performance and organizational survival without assuming that they are unidimensional constructs. Clearly, higher economic performance increases the likelihood of survival, everything else remaining equal. Our point is that other things are not equal, since differences in firms' thresholds of performance should also influence mortality. Organizational survival is therefore influenced by both the determinants of performance and thresholds. Certain variables will be purely related to economic performance, while others may influence survival only through the firm's threshold. For variables that simultaneously influence performance and threshold, their survival effect is determined by their combined effects on both.

Our paper complements theories of decision making, both at the individual (Kahneman and Tversky, 1979) and the organizational level (Cyert and March, 1963; March, 1988; March and Shapira, 1992), which posit that decision-making choices are determined by comparing possible outcomes relative to some reference or aspiration level. Viewing organizational discontinuance as an individual (in the case of small ventures run by an entrepreneur) or organizational choice, one may equate reference or aspiration levels to our threshold construct. From that perspective, this is the first paper we know of that links organizational survival and exit to some reference level.

Our theoretical perspective is also complementary to a large body of management research, mainly in population ecology, that has examined the same issue we address, firm mortality (see reviews by Baum, 1996; Amburgey and Rao, 1996). Population ecology studies have not been explicit, however, in recognizing whether firm mortality is mediated by low per-

formance or other mechanisms.¹ The popular use of the term "organizational failure" (Baum, 1996) seems to imply that discontinuance is primarily attributable to low performance, even though prominent scholars in population ecology (Hannan and Freeman, 1977: 940) and institutional theory (Meyer and Rowan, 1977: 353) have explicitly rejected a unidimensional interpretation of environmental selection based solely on organizational efficiency. Meyer and Zucker (1989: 55) suggested that these literatures view organizational performance and discontinuance as multiple indicators of an organization's isomorphism with its environment. Such an approach, unfortunately, avoids the causal link between these constructs and has hindered progress, since "researchers' understanding of dissolution, be it through merger, absorption, or outright failure, is limited by the dearth of studies that treat financial performance as a predictor of mortality" (Amburgey and Rao, 1996: 1274). Thus, our theoretical perspective complements and extends current organizational theories in that it explicitly recognizes the causal effect of firm performance on selection processes while also considering the selection effects of thresholds.

Exit, Performance, and Thresholds in New Ventures

While the concept of threshold has broad applicability, a narrower context of study can facilitate theoretical development, empirical specification, and testing the determinants of threshold in that specific context. This paper investigates performance, thresholds, and exit in the specific context of small entrepreneurial new ventures. Entrepreneurial exit decisions occur frequently, with more than 800,000 businesses discontinued in the United States in 1992 alone (U.S. Small Business Administration, 1994: 265). Understanding the processes that influence new venture survival has tremendous implications for the welfare of customers, suppliers, employees, and especially for entrepreneurs. Applying the concept of the threshold of performance enables us to broaden the current understanding of entrepreneurial exit by considering both economic performance and nonperformance reasons for exit. Ronstadt (1986) discovered that only 31 percent of entrepreneurs who exited did so solely because of financial difficulties, while 26 percent indicated that financial reasons played no part in their exit decisions. Mayer and Goldstein (1961) found that 20 percent of all new business closures were attributed to nonfinancial reasons, such as external job opportunities, disappointment with business ownership, or unwillingness to put up with "limited success." At least in some cases, dissolution is not forced upon the entrepreneur but involves a proactive decision to exit.

Recent studies have also found empirical evidence suggesting that factors influencing the survival of new ventures may be significantly different from those influencing performance (Carroll and Huo, 1986; Kalleberg and Leicht, 1991; Cooper, Gimeno, and Woo, 1994). Up to now, there have been few attempts to reconcile theoretically the lack of convergence on the determinants of performance and survival. We believe that considering economic performance and thresholds jointly will shed light on this important topic.

The context of entrepreneurship requires a special consideration of the determinants of performance and thresholds. In

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There are some important exceptions to this generalization. Researchers studying the liability of adolescence and honeymoon effects (Brüderl and Schüssler, 1990; Fichman and Levinthal, 1991; Levinthal, 1991) have explicitly recognized that the initial stock of assets serves as a buffer between low performance and mortality. Institutional and interorganizational linkages can also serve as a buffer and reduce mortality for high-risk organizations (Baum and Oliver, 1991; Miner, Amburgey, and Stearns, 1990).

small entrepreneurial firms, the entrepreneur is likely to exert control over organizational decisions, and non-owners therefore are less influential than in larger or older firms, where there is a separation of ownership and control (Meyer and Zucker, 1989). Moreover, the organizational contributions of the owner to the venture are not limited to founding capital but also include managerial and technical work and skills. In that sense, when determining whether to continue support for the venture, the entrepreneur will evaluate the joint returns to both the financial and human resources contributed to the venture. Since the entrepreneur's skills and objectives play a dominant role in dictating the direction of newly founded businesses (Brüderl, Preisendorfer, and Ziegler, 1992), we focus here on how the entrepreneur's traits and characteristics, or human capital, influence the performance threshold.

A Threshold Model of Entrepreneurial Exit: Human Capital Considerations

Human capital theory (Becker, 1975) uses economic logic to study individual decisions dealing with investments in productivity-enhancing skills and knowledge (schooling, training, firm-specific knowledge investment), career choices (decision to work, switching employment, labor mobility), and other work characteristics (wages, reservation wages, hours of work). It is believed that individuals choose an occupation or employment that maximizes the present value of economic and psychic benefits over their lifetimes. Human capital theorists have likened the entrepreneurial exit decision to the more general case of an individual's decision to leave current employment (Evans and Leighton, 1989; Evans and Jovanovic, 1989; Campbell, 1995; Bates, 1995). Entrepreneurs can be viewed as choosing between remaining in the current venture or obtaining alternative employment. While several studies have examined entrepreneurial exit with human capital theory (Bates, 1985, 1990; Preisendorfer and Voss, 1990; Brüderl, Preisendorfer, and Ziegler, 1992), by assuming that the factors related to poor performance will be the same as those influencing exit, they have ignored the potential for returns to the entrepreneur's human capital in alternative settings. Others have theoretically acknowledged the importance of alternative uses of human capital in entrepreneurial decision making (Evans and Jovanovic, 1989; Evans and Leighton, 1989; Bates, 1995; Campbell, 1995) but have focused on how human capital influences entry, not exit.

Expectations for ventures are generally buoyant in the early start-up stage, being generally formed under substantial uncertainty about market acceptance, competitive responses, or even the entrepreneur's actual entrepreneurial abilities and satisfaction to be obtained from the venture. As information becomes available, the entrepreneur is likely to examine the efficacy of these expectations and reconsider other options (Jovanovic, 1982). We would expect the entrepreneur to terminate the business if the expected utility of alternative employment (U_A) minus the cost inherent in switching (SC) exceeds the revised expected utility of remaining in the entrepreneurial venture (U_E):

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discontinue venture if: $U_E < (U_A - SC)$. (1)

U_E and U_A differ because of unequal economic performance and personal enjoyment, or psychic income (Becker, 1975; Evans and Leighton, 1989), with the two options. The economic performance depends in part on the entrepreneur's previous investments in education and training, which may provide general skills or skills specific to a particular job context (Becker, 1975). The entrepreneur's economic performance (EP_E) is a function of his or her stock of general human capital, represented by the vector x_1 , and of the human capital specific to the current business, represented by the vector x_2 . Meanwhile, since specific skills cannot be transferred to alternative employment, the economic returns available in alternative employment opportunities (EP_A) are a function of the stock of general human capital (x_1) and of human capital specific to the alternative occupation (x_3), but not of the human capital specific to the current business (x_2). The individual's psychic income associated with either the entrepreneurial venture (PI_E) or alternative employment (PI_A) is influenced by a number of factors (respectively, x_4 and x_5), including the individual's preference for the occupation, or personal satisfaction (Evans and Leighton, 1989). Thus, the utilities of entrepreneurship and alternative employment can be expressed as:

$$U_E = EP_E(x_1, x_2) + PI_E(x_4). \quad (2a)$$

$$U_A = EP_A(x_1, x_3) + PI_A(x_5). \quad (2b)$$

The cost inherent in switching (SC) includes those costs, usually transitory, that are a function of the expected economic cost of searching for a new alternative and the psychological cost of experiencing the uncertainty of job loss. Factors influencing the cost of switching are captured by the vector x_6 . These costs should not be confounded with the potential loss of utility experienced by switching because of lower personal enjoyment in the new alternative or an inability to redeploy skills specific to the venture, which are already captured in the relative magnitudes of psychic income and specific human capital. Substituting equations (2a) and (2b) into equation (1) and isolating EP_E on the left-hand side, leads to:

discontinue venture if:

$$EP_E(x_1, x_2) < EP_A(x_1, x_3) + PI_A(x_5) - PI_E(x_4) - SC(x_6). \quad (3)$$

The right-hand side of equation (3) is the threshold of economic performance required to sustain the entrepreneur's involvement in the current venture (T_E). Thus, the threshold (T_E) is determined by the expected economic returns available in other employment alternatives (EP_A), the difference in psychic income between alternative employment and self-employment ($PI_A - PI_E$), and the cost of switching to an alternative occupation (SC). The model predicts that the entrepreneur will discontinue or stay in business according to the following rule:

$$\begin{cases} \text{discontinue venture if} & EP_E(x_1, x_2) < T_E(x_1, x_3, x_4, x_5, x_6) \\ \text{stay in venture (survive) if} & EP_E(x_1, x_2) \geq T_E(x_1, x_3, x_4, x_5, x_6) \end{cases} \quad (4)$$

A critical insight that follows from the above model is that there may be situations in which entrepreneurs do not con-

tinue their business even though, in terms of economic performance, they are better off than other entrepreneurs. They may take this action because of the opportunity costs associated with staying in business—their level of education and training may warrant more attractive economic returns in alternative employment opportunities. Similarly, a poorly performing venture may continue because of the entrepreneur's lack of other attractive options, strong psychic attachment to the venture, or high costs associated with switching into new employment. As these cases illustrate, economic performance of the venture need not exclusively determine survival. Rather, it is economic performance relative to the threshold that drives the exit decision.

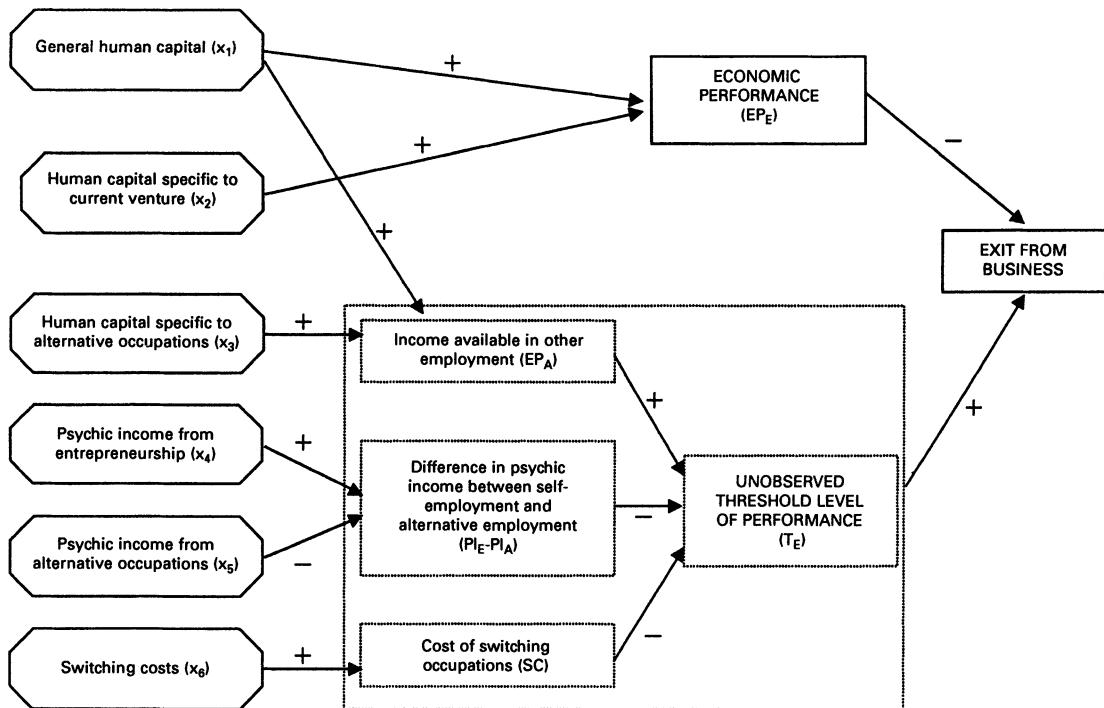
Hypotheses

From the threshold model illustrated in figure 1, we develop hypotheses that predict how four important dimensions of the human capital of an entrepreneur—general human capital (x_1), human capital specific to the current venture (x_2), psychic income from entrepreneurship (x_4), and switching costs (x_6)—influence entrepreneurial exit by their separate effects on economic performance and threshold of performance. We do not develop hypotheses about the effects of human capital specific to alternative occupations (x_3) or psychic income from alternative occupations (x_5), since we cannot determine a priori what those alternatives are. Alternative employment opportunities are nearly infinite and may include wage-earning positions, other self-employment activities, or leisure activity. To the extent that these alternative employment opportunities cannot be fully specified *ex ante*, we assume a generic alternative, letting the effect of (x_3) and (x_5) be included in the error term of the threshold equation.

General human capital. The simple model presented in equation (4) generates several theoretical insights and empirical predictions. General human capital (x_1), as measured by such constructs as formal education and the prior work experience of the entrepreneur, may lead to skills that are useful across a wide range of occupational alternatives (Becker, 1975). Work experience is commonly measured as the number of years of experience but may also be signaled by achievement levels in employment, such as management or supervisory experience (Bates, 1990). While increasing levels of education and experience are likely to elevate economic performance (EP_E), they will also broaden the opportunity set of the entrepreneurs and raise their expected income from alternative employment (EP_A). Thus, while entrepreneurs with general skills may perform better in self-employment, they would also have higher performance requirements to remain in business. How general human capital influences survival will depend on its relative payoff in the venture versus alternative employment. Evans and Leighton (1989) found that business experience had about the same returns in wage work and self-employment, while education had greater returns in self-employment. A study by Fujii and Hawley (1991) revealed that self-employment had slightly lower returns associated with both experience and education than wage work, but they did not test to see if these differences were significant. Because there is a lack of consensus

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Figure 1. Threshold model of entrepreneurial exit: Human capital considerations.



on the relative payoff of work experience and education, we hypothesize that the net effect of general human capital on entrepreneurial exit is indeterminate a priori:

Hypothesis 1 (H1): General human capital will be positively related to the economic performance of the venture and also to the entrepreneur's threshold level of performance. Hence, *a priori*, general human capital has an indeterminate effect on the likelihood of exit.

Human capital specific to the current venture. Specific human capital results from education, training, or experience that has a limited scope of applicability. Investments in specific human capital create value in a particular business context but do not have relevance in alternative occupations. Therefore, while human capital specific to the venture raises performance, it has no influence on entrepreneurs' threshold of performance. The implication is that individuals whose human capital is more specific to the venture would be less mobile (Becker, 1975). A measure of specific human capital is an entrepreneur's knowledge of customers, suppliers, products, and services within the context of the venture (x_2). This should be directly related to the degree of similarity between the new venture and the organization where the entrepreneur had previously worked. This knowledge may be critical to success, conferring a favorable asymmetry between the entrepreneurs who have been exposed to it and those who have not (Sandberg, 1986; Cooper, Gimeno, and Woo, 1994). In addition, similarity between the new venture and the prior experience may mean that the entrepreneur can build on prior relationships with relevant stakeholders and thus minimize the "liability of newness" (Stinchcombe, 1965; Aldrich and Auster, 1986). Yet such knowledge and ties largely lose their value outside of their original context.

To the extent that human capital specific to the venture raises performance (EP_E) but has no effect on performance in alternative occupations (EP_A), and therefore on the threshold (T_E), it should be negatively related to entrepreneurial exit:

Hypothesis 2 (H2): Specific human capital will be positively related to the economic performance of the venture but should have no influence on the entrepreneur's threshold level of performance. As a result, specific human capital should be negatively related to the likelihood of exit.

Hypotheses 1 and 2 assume that specific and general human capital can be measured separately. In other contexts, it may be easier to measure an individual's overall level of human capital and the degree to which such overall capital is general or specific, maybe as a ratio or a subjective evaluation. In those cases, we would expect lower thresholds for entrepreneurs with a greater ratio of specificity in their human capital, since general human capital increases thresholds while specific human capital does not. This prediction is comparable to our earlier argument that organizations (entrepreneurs) with less mobile resources (human capital) should be more willing to withstand low performance.

Psychic income from entrepreneurship. The probability of exit will also be negatively related to the psychic income, or personal satisfaction the entrepreneur derives from self-employment (x_4). Considerable research indicates that many entrepreneurs are motivated, at least in part, by noneconomic goals, including satisfaction from the autonomy of self-employment or from doing the type of work they like (Smith and Miner, 1983; Lafuente and Salas, 1989). Entrepreneurs may also be personally attached to entrepreneurial activities if their parents were self-employed (Evans and Leighton, 1989; Brüderl, Preisendorfer, and Ziegler, 1992). Since parents are seen as role models, it has been reasoned that people growing up in such families perceive entrepreneurship to be a more viable career than those without such a family background (Shapero and Giglierano, 1982). Therefore, entrepreneurs who have an intrinsic motivation for the activity or who come from entrepreneurial families are likely to obtain a higher psychic income from entrepreneurship (PI_E) than those who do not have those backgrounds and motivations. Accordingly, the threshold level of performance (T_E) is lower for such entrepreneurs, indicating that they may be willing to accept lower economic returns to gain personal satisfaction from the venture. Because a psychic attachment to the venture lowers the threshold level of performance, while having no apparent effect on the economic performance of the venture, we expect these factors to have a negative effect on the likelihood of exit:

Hypothesis 3 (H3): High psychic income from entrepreneurship should have no influence on the economic performance of the venture but should decrease the entrepreneur's threshold level of performance. As a result, higher levels of psychic income from entrepreneurship should be negatively related to the likelihood of exit.

Switching costs. Finally, the probability of entrepreneurial exit will be negatively related to the costs of switching to new employment (x_6). These costs are defined as the costs inherent in the act of switching between two alternative oc-

cupations and do not include the difference in returns in those alternative occupations. This definition reflects the efforts and expenses the individual would need to undertake in job searches and retraining, as well as the psychic costs of not knowing whether a suitable job can be found. Older people have less time to recoup the costs associated with switching jobs and thus are likely to perceive lower benefits from switching. Consistent with this view, Mincer (1974) found a tendency for investments in training to be concentrated at younger ages and to continue at a diminishing rate throughout much of a person's working life. Since employers may need to train and develop their employees, they are also more likely to prefer younger candidates, to maximize the return from their investment. Evidence suggests that older job seekers are more likely than younger ones to take more time to find a job (Shrieves, 1995) and less likely to find jobs eventually (Bortnick and Ports, 1993). For these reasons, it is expected that older entrepreneurs will be less willing to switch occupations. The existence of switching costs should decrease the threshold level of performance (T_E) and therefore decrease the likelihood of exit. This expectation was supported by the in-depth case studies of Mayer and Goldstein (1961), who found that concern about job seeking at an older age was a major reason why older entrepreneurs would continue their involvement with new businesses with marginal economic performance.

By serving as a proxy for general human capital, age may also be linked to the monetary performance of the venture (Preisendorfer and Voss, 1990). After controlling for general and specific human capital levels (hypotheses 1 and 2), however, we do not expect older entrepreneurs to perform differently from younger ones. We expect age to affect exit only through its influence on the threshold level of performance, not through economic performance:

Hypothesis 4 (H4): Factors associated with an entrepreneur's cost of switching to alternative occupations should have no influence on economic performance of the venture but should decrease the entrepreneur's threshold level of performance. As a result, higher levels of switching costs should be negatively related to the likelihood of exit.

Other influences. There are some important human capital variables that may measure a combination of general human capital, specific human capital, psychic income, or switching costs. For example, entrepreneurs with previous venture start-up or ownership experience may be endowed with human capital that is valuable in new venture situations because they have experience in the start-up process and in running their own business. This experience may not be as valuable in alternatives that include work in established firms. At the same time, owners with prior entrepreneurial experience may be psychologically attracted by the thrill of start-up and thus may decide to quit and start another venture unless current performance is high.

Another important characteristic of entrepreneurs is the number of jobs previously held. People who have been in more job settings are likely to gain general human capital that can be applied across a number of alternatives. At the same time, however, many job changes may signal that the

Table 1

Hypothesized Impact of Independent Variables on Performance, Threshold of Performance, and Exit

Variable	Economic Performance	Threshold of Performance				
		Impact on economic performance in alternative employment	Impact on psychic income from entrepreneurship	Impact on cost of switching	Overall impact on threshold	Exit
General human capital (H1)						
Formal education	+	+	0	0	+	?
Management experience	+	+	0	0	+	?
Supervisory experience	+	+	0	0	+	?
Specific human capital (H2)						
Similar business	+	0	0	0	0	-
Psychic income (H3)						
Intrinsic motivation	0	0	+	0	-	-
Parents owned a business	0	0	+	0	-	-
Switching costs (H4)						
Age of entrepreneur	0	0	0	+	-	-

individual was forced out of those jobs because of poor performance or low degrees of general human capital. Thus, a moderate number of jobs may be the strongest indicator of general human capital. In addition, entrepreneurs who have changed jobs frequently in the past may face lower switching costs. While job switching is associated with substantial stress (Mobley, 1977), those who have experienced it in the past may be better able to draw on "scripted behavior" that enables them to deal with the stress of job search (Lee and Mitchell, 1994). Thus, the number of jobs previously held by the entrepreneur may signal both general human capital and switching costs.

Our hypotheses are summarized in table 1, which shows the expected effects of the variables included in our model.

RESEARCH DESIGN

Testing the effect of human capital on thresholds of performance in new entrepreneurial ventures requires finding a sample of new ventures in which the entrepreneurs are making substantial commitments, so that the decision to exit is not trivial. This suggests that the ventures should be primarily full-time, or with the potential to become full-time businesses, and that there should be significant investment involved, so that the decision to exit may involve a careful consideration of the income available from different alternatives and not merely a reaction to immediate pressures.

The samples used in the studies noted in the literature review are not adequate for testing our theory. The 1982 Characteristics of Business Owners (CBO) sample (Bates, 1990) and the Munich Founder Study sample (Brüderl, Preisendorfer, and Ziegler, 1992) lack information about specific human capital and performance, respectively, which are critical variables in our study. The National Longitudinal Survey of Young Men (Evans and Leighton, 1989) lacks information about the business owned by the entrepreneur and provides a large enough sample size to study determinants of entrepreneurial entry, but not exit.

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The sample we used includes new members of the National Federation of Independent Business (NFIB), the largest U.S. small business trade association. NFIB members tend to have organizations with separate business addresses, full-time founders, and significant investment. For the sample, 82.2 percent of all entrepreneurs had no part-time or full-time jobs outside of the venture, and virtually all put in more than 30 hours per week and grossed more than \$25,000 in the first year. The organizations sampled at the time of the initial survey had a mean of 5.04 employees (median of three employees), and only 13.2 percent had one full-time employee or fewer (including the entrepreneur). Their median and modal investments at the time of their first sales were between \$20,000 and \$50,000.

Although sampling from a trade association with voluntary membership raises concerns of self-selection and representativeness of the population, representativeness is a slippery concept when new ventures might be defined and identified in different ways (Birley, 1984; Aldrich et al., 1989). In a preliminary comparison of our sample with other probability samples (1982 CBO, Munich Founder Study data, 1985 Statistics of Income), we found no fatal biases in the distribution of revenues, employment size, industry membership, and path to ownership, although it was apparent that the NFIB sample included fewer part-time entrepreneurs than either the 1982 CBO or the Munich data. Whether the sample is representative of full-time new businesses in the United States is difficult to discern, because there are no comparable data on the population of all new full-time businesses. The fruitfulness of this study, however, does not depend on whether the sample is fully representative. The aim is not to try to determine the precise mortality rate for all new firms but, rather, to examine the effect and implications of firm thresholds on organizational survival. We view the current analysis as illustrative rather than definitive (Sutton and Staw, 1995) and encourage further replication in samples specifically collected for this purpose.

Sample

In May 1985, we sent approximately 13,000 questionnaires to members of the National Federation of Independent Business (using the NFIB address lists) who reported that they had "been in business" for eighteen months or less. We focused on entrepreneurs who had recently become owner-managers, so that relevant facts associated with start-up would still be fresh in their minds. We had previously pre-tested the survey instrument with 154 members of the NFIB and altered it to improve clarity. We received completed surveys from 4,814 entrepreneurs (37 percent response rate), and we sent them follow-up questionnaires in May 1986 and May 1987. In the three years of the study, each survey round involved an initial mailing and two follow-up reminders. For the second and third years the response rates, calculated as a percentage of those businesses not known to have been discontinued or sold, were 47 and 39 percent, respectively. The 4,814 firms represent a broad range of industries and all geographic areas of the United States.

Determining the status (surviving, sold, or discontinued) of a firm involved several steps. If a questionnaire was not returned in the second or third years, we sent a letter to the business with an enclosed postcard, asking the owner to indicate whether the business was still in operation, was sold, or was discontinued. If we received no response, we consulted the NFIB membership records, in which the field agents of the NFIB report whether businesses (whether they continued as NFIB members or not) had discontinued or survived. We did not use the NFIB records as our primary data source, however, because the field representatives visit each business only once each year, so that, on the average, the data are six months old. Finally, if none of the above sources indicated the status of the firm, we noted if the post office reported that the mail could not be delivered.

The responses to the first questionnaire indicated that some of the businesses were, in fact, older than the NFIB records indicated, with some having been started or acquired in 1982 or earlier. For the 4,814 respondents, we were able to determine the month in which they had become owner-managers for 1983, 1984, and 1985 (4,103 ventures), while we could not verify the exact year of founding for those organizations started in "1982 or before" (711 ventures). Because our original sample had targeted new businesses, we eliminated those older businesses that had been erroneously sampled. We also eliminated from the sample those with missing or nonvalid values for the independent variables for 1985 (488 ventures). This left 3,615 firms with valid responses to the first questionnaire in the sample.

A second round of sample selection was based on the data available at the end of the third year. We maintained in the sample those firms that either had survived and responded to the third-year survey (936 observations) or were known to have discontinued by that time (611 observations). We had to eliminate those ventures that did not return the third-year survey and could not be identified as discontinued or sold (1,897 firms). We also eliminated those firms that had been sold by the third year (171 ventures). Thus, the final sample consists of 1,547 firms.

The decision to eliminate sold businesses was both theoretically grounded and supported by substantial sensitivity analysis. Sold businesses differ from discontinued businesses in that the owner may receive a premium over the liquidation value of the firm. Thus, we believe that the choice to sell may be different from discontinuing and that the two choices should not be pooled. We conducted two statistical tests based on a multinomial logit specification of the choice problem (survived, discontinued, sold) to determine whether it was appropriate either to (a) pool sold firms with those that discontinued or (b) eliminate sold firms from the sample. To examine (a), we used a log-likelihood ratio test to compare whether the vector of coefficients specific to the discontinued choice (relative to survived) were equal to the vector of coefficients specific to the sold choice (relative to survived). This test revealed that there was a statistically significant difference between the vectors of coefficients ($\chi^2 = 76.594$; d.f. = 33; $p < .0001$) and implied that discontinued and sold firms should not be pooled. The Small and

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Hsiao (1985) Independence of Irrelevant Alternatives (IIA) test showed that the coefficients specific to the discontinued and survived choices were unaffected by eliminating sold firms ($\chi^2 = 1.7748$; d.f. = 33; $p < .9999$). Given the results in both tests, and to preserve consistency with our theoretical model, we felt justified in eliminating sold firms from the analysis.

We examined the possibility of sample selection bias by comparing our final sample (1,547 observations) with those observations that we eliminated because they were sold or did not respond to the final survey (2,068 observations). We compared independent and control variables across these sets of firms using tests of differences of means (*t*-tests) for continuous variables and cross-tabs tests of independence (chi-squared tests) for categorical variables. The only significant differences between these groups were that entrepreneurs in the final sample had more education ($p < .001$), operated businesses of larger scope, were more likely to be in professional service industries, and were less likely to be in personal service industries. While this may indicate a slight sample selection bias, the magnitude of this problem does not seem to be great.

The period of time when the businesses in the sample were initiated (1983 to 1985) was characterized by a slightly lower index of net new business formations in the U.S. than for the whole decade of the 1980s (119.9 vs. 122.1, in an index for which 1967 = 100). Net formations hit their decade low in 1982 and were slowly on the rebound. The period of time for which we recorded the exits from these businesses (1986 and 1987) was characterized by a relatively high failure rate (per 10,000 concerns) compared with the whole decade of the 1980s (111 vs. 91), with 1986 being the peak of business failures for the decade (U.S. Bureau of the Census, 1996: 543). Thus, the study period might be characterized as a slightly unfavorable period for entrepreneurs, which, while it may increase the baseline rate of exit in our sample, should not affect the coefficients of the independent variables in any systematic way.

Dependent Variables

The theoretical model posits that the venture's economic performance and the entrepreneur's threshold jointly determine entrepreneurial exit. While threshold is not observable, it can be derived from comparisons of two observable outcomes: economic performance and venture discontinuance. When firms have equal economic performance, the incidence of exit can be attributed to differences in thresholds. Thus, economic performance and exit constitute the observed dependent variables in the empirical analysis.

$Exit_n$, a binary variable, represents the exit decision of firm n (0 if the firm continued, 1 if it was discontinued). For those firms that survived and returned the 1987 questionnaire, economic performance is represented by the amount of money (in the form of salaries, perquisites, and dividends) the entrepreneur withdrew from the venture during the third year. We lost a large number of observations as a result of nonresponse to the 1987 questionnaire, and data were not gathered on money withdrawn during either of the first two

years. For firms in the final sample, however, *money taken out* represents the overall returns to the entrepreneur for both the financial and human capital invested in the venture and therefore is consistent with our theoretical focus on the economic performance for the owner. Money taken out was reported as being within a range between predetermined bounds (e.g., from \$10,000 to \$15,000).

Money taken out has the disadvantage of not reflecting the extent to which an entrepreneur may choose to accept lower current benefits to support greater organizational growth. In practice, distinguishing between economic returns to investment (financial and human capital) and reinvestment intensity is problematic in the study of new ventures because this distinction hinges on sophisticated accounting concepts (accounting profits, depreciation, investment versus expense, retained earnings) seldom used in small businesses, which tend to use the cash method. It may be that reinvestment intensities substantially differ by industry, in which case the industry control dummies may partial out this effect. Below, we discuss the results in light of this potential weakness and conclude that the results do not appear to be biased by it.

Independent Variables

Measures for the independent variables introduced in earlier discussions are listed in Appendix A, while table 2 presents descriptive statistics and correlations for the independent and control variables in the entire sample. Because we could only identify the level of education (nine categories) attained by an entrepreneur, *formal education* was measured as the percentage of people in the sample with lower levels of education than the entrepreneur in the observation. This variable ranges from 0 to 1 and is scaled based on the empirical distribution of education. While this continuous measure has been seldom used, it may be a better metric than "years of education" for several reasons. First, the productivity and earnings effects of years of education are very different for different stages of education. For instance, two years of education between high school and an associate's degree may have different effects than two years between a bachelor's degree and an MBA. Also, years of education does not take into account that earnings from education are partly determined by the empirical distribution of level of education in the labor supply.

While prior research has tended to operationalize work experience in terms of the number of years of work experience (Evans and Leighton, 1989; Brüderl, Preisendorfer, and Ziegler, 1992), such a variable was not included in our surveys. While this could be viewed as a weakness of our study, years of experience may not closely reflect skills and knowledge developed. We used alternative operationalizations, meant to capture work experience through achievement level attained by the entrepreneur. We obtained three measures of attainment from one question in the survey, asking whether the highest level of management experience achieved was "supervised managers," "supervised others," "managed own business," or "supervised no one." With "supervised no one" as the reference group, *management*

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Table 2

Descriptive Statistics and Pearson Correlation Coefficients*

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9
1. Formal education	0.42	0.31									
2. Management experience	0.13	0.33	.17								
3. Supervisory experience	0.40	0.49	-.03	-.31							
4. Similar business	0.46	0.39	-.03	-.01	.02						
5. Intrinsic motivation	0.01	0.99	.03	-.03	.07	-.05					
6. Parents owned business	0.45	0.50	.05	-.02	-.02	-.01	.00				
7. Age of entrepreneur	36.65	9.35	-.02	.13	-.14	-.09	.08	-.06			
8. 1 Prior job (vs. none)	0.09	0.29	.10	.04	.01	.05	-.02	.02	-.16		
9. 2 Prior jobs (vs. none)	0.17	0.37	.06	.00	-.02	.03	.04	.02	-.08	-.14	
10. 3 or 4 Prior jobs (vs. none)	0.34	0.47	.03	.05	.03	-.02	-.05	-.04	-.02	-.23	-.32
11. 5+ Prior jobs (vs. none)	0.36	0.48	-.15	-.06	.00	.01	.05	.01	.22	-.24	-.33
12. Entrepreneurial experience	0.25	0.44	-.04	-.22	-.48	.09	-.07	.07	.16	-.07	.01
13. Hours worked per week	56.83	16.25	-.07	.04	-.01	.11	-.03	.01	-.05	-.07	.00
14. Outside job	0.14	0.30	-.08	-.04	.04	-.17	.00	.03	.00	.04	-.04
15. Initial capital (log)	10.04	1.21	.14	.14	-.11	-.03	-.07	.00	.12	.02	.01
16. Number of employees (log)	1.16	0.85	.11	.18	-.08	.12	-.17	-.01	.07	-.03	-.01
17. Acquired business	0.29	0.45	-.01	.01	-.04	-.11	.01	.03	.05	.00	.01
18. Inherited business	0.02	0.13	.03	-.05	.05	-.02	-.06	.11	-.08	-.03	.06
19. Radius of business sales	22.39	27.44	.05	.06	-.03	.11	-.02	.03	.09	-.06	.01
20. Months in business (log)	2.55	0.56	.05	.05	-.01	.06	.01	.01	.04	.00	.02
21. Informational ties	0.49	0.20	-.02	.00	.03	.10	-.07	.07	-.09	.00	.03
22. Industry-construction	0.09	0.29	-.03	.01	.01	.16	-.05	.02	-.03	-.04	-.01
23. Industry-manufacturing	0.08	0.28	.00	.03	.02	.05	-.01	.01	.04	.00	-.02
24. Industry-transportation	0.02	0.15	.00	.01	.01	.03	-.03	.03	.01	.00	-.02
25. Industry-wholesale	0.05	0.21	.02	.00	-.01	.03	-.05	.00	.04	-.04	.02
26. Industry-agriculture	0.02	0.15	.11	-.01	-.03	.05	-.03	.09	-.04	.11	.01
27. Industry-financial services	0.05	0.21	.07	.01	-.03	.06	.01	.01	.03	.01	.09
28. Industry-personal services	0.17	0.38	-.13	-.02	-.03	-.04	.02	.01	-.01	-.02	-.01
29. Industry-professional services	0.07	0.26	.32	.03	.02	.10	.14	-.06	-.04	.04	.01
30. Environmental dynamism	0.74	1.07	.04	.06	-.01	.05	-.03	.03	-.06	-.02	-.03
31. Growth in GSP	0.08	0.11	-.06	.00	-.02	-.01	-.03	-.05	.01	-.02	-.01
32. Change in competitors	0.51	0.92	.11	.03	.01	.02	.00	.02	.02	-.01	.00
Variable	10	11	12	13	14	15	16	17	18	19	20
11. 5+ Prior jobs (vs. none)	-.54										
12. Entrepreneurial experience	-.05	.10									
13. Hours worked per week	-.05	.10	.07								
14. Outside job	.00	.01	-.04	-.24							
15. Initial capital (log)	.02	-.05	.09	.12	-.10						
16. Number of employees (log)	.06	-.03	.14	.17	-.12	.37					
17. Acquired business	-.02	.00	.03	-.01	.00	.22	.04				
18. Inherited business	-.01	-.04	-.03	.00	-.03	.01	.05	-.08			
19. Radius of business sales	.01	.02	.08	.00	.01	.05	.19	-.11	.07		
20. Months in business (log)	.02	-.03	-.01	.01	-.02	.00	.14	-.02	.01	.07	
21. Informational ties	.06	-.07	-.03	.01	-.03	.13	.12	.03	.03	.03	-.03
22. Industry-construction	.08	-.05	.04	.00	-.05	-.09	.15	-.09	-.01	.04	.07
23. Industry-manufacturing	-.03	.06	.02	.01	.02	.06	.15	-.03	.01	.21	.01
24. Industry-transportation	-.01	.02	.03	.00	.01	.04	.09	-.02	.05	.11	.01
25. Industry-wholesale	.02	.01	.05	-.01	.01	.06	.04	.00	-.03	.19	.01
26. Industry-agriculture	-.03	-.05	.01	.04	-.02	.07	-.02	.02	.11	.01	.02
27. Industry-financial services	-.04	-.02	-.02	.00	-.06	-.09	-.01	-.04	.02	.00	.01
28. Industry-personal services	-.04	.04	-.01	-.03	.06	-.16	-.11	-.05	.00	-.04	-.03
29. Industry-professional services	.00	-.04	-.05	-.12	-.05	-.03	-.03	-.07	-.02	.02	.05
30. Environmental dynamism	.02	.02	.03	.13	-.09	.00	.11	-.04	-.01	.02	.01
31. Growth in GSP	.04	-.01	.03	.00	.00	-.02	.01	-.05	.04	-.03	-.01
32. Change in competitors	-.03	.03	.01	.01	.02	-.05	.05	-.09	-.01	.01	-.01
Variable	21	22	23	24	25	26	27	28	29	30	31
22. Industry-construction	.05										
23. Industry-manufacturing	-.03	-.09									
24. Industry-transportation	.02	-.05	-.05								
25. Industry-wholesale	.01	-.07	-.07	-.03							
26. Industry-agriculture	-.04	-.05	-.05	-.02	-.03						
27. Industry-financial services	-.03	-.07	-.07	-.03	-.05	-.04					
28. Industry-personal services	-.09	-.14	-.14	-.07	-.10	-.07	-.10				
29. Industry-professional services	-.04	-.09	-.09	-.04	-.06	-.04	-.06	-.13			
30. Environmental dynamism	.11	-.01	.00	.02	.06	.03	.11	-.05	.00		
31. Growth in GSP	-.02	.06	.02	-.01	-.02	-.03	-.06	.02	-.01	.05	
32. Change in competitors	.02	.03	.00	.02	-.01	-.02	.05	.04	.09	.07	.03

* N = 1,457; correlations greater than ±.07 are significant at p < .01.

experience was coded 1 if the entrepreneurs had "supervised managers," *supervisory experience* was coded 1 if the entrepreneur had "supervised others," and *entrepreneurial experience* was coded 1 if the entrepreneur had "managed own business." The survey also contained information about the number of prior full-time jobs held by the entrepreneur, which is likely to be somewhat correlated with years of work experience. To account for potential nonlinear effects, we segmented the variable describing the *number of prior jobs* into five discrete segments (0, 1, 2, 3 or 4, or 5 or more jobs).²

Our measure of specific human capital is an entrepreneur's previous experience with (a) customers, (b) suppliers, and (c) products and services, each of which we measured individually on a 5-point Likert scale and then combined (Cronbach alpha = .8723) to create the variable *similar business* (recoded to the 0-1 range). *Intrinsic motivation* was coded 1 if the entrepreneur's most important goal in starting a new venture was "to let you do the kind of work you wanted to do" or "avoid working for others"; it was coded -1 if the entrepreneur responded "to make more money than you would have otherwise" or "to build a successful organization," and 0 if the entrepreneur's goal was "other." *Parents owned a business* is a dummy variable that takes into account the parents' history in an entrepreneurial venture. Finally, the age of the entrepreneur is the age recorded at the time of the first questionnaire. To avoid multicollinearity between age and age², *age* was operationalized as deviation from the mean (36 years) and *age*² as the square of such deviation (Aiken and West, 1991: 35).

Control Variables

There are well-researched factors, unrelated to human capital, that may affect performance, threshold of performance, or entrepreneurial exit. These factors can be roughly classified as characteristics of the entrepreneur, the firm, and the environment. An important characteristic of the entrepreneur is the amount of *hours worked* in the venture. Entrepreneurs working more hours may perform better and also expect more from their ventures, while an entrepreneur's desire to readjust work hours (Mincer, 1986) to maximize the payoff to general human capital, or psychological capital, may lead to exit. Entrepreneurs who work longer hours may therefore have a higher threshold, being less willing to accept a lower level of performance. The entrepreneur's decision to maintain a full-time or part-time job outside the venture can also influence the performance and survival of the venture by drawing energy and attention from the venture and may signal the entrepreneur's lack of commitment, leading to poor performance. The effect of *outside job* on threshold is unclear. Entrepreneurs with outside employment may have lower performance thresholds because they have supplementary income to offset low performance, or they may have higher thresholds because of lower switching costs.

2

We also considered a quadratic specification, but the nonsymmetrical distribution of the variable, together with the fact that most observations fall in a relatively small number of cells (75 percent of entrepreneurs had five prior jobs or fewer), led us to prefer this discrete specification. We also ran the model with a quadratic specification but preferred the discrete stepwise operationalization when we compared the results using Akaike's Information Criterion (AIC).

Controls for firm characteristics include initial capital investment, firm's size, path of ownership (whether the business was started, acquired, or inherited), breadth of geographical niche, informational ties, and age of the venture. Both firm

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size (defined as *number of employees*) and *initial capital* may improve efficiency and reduce the liability of smallness (Hannan and Freeman, 1984; Aldrich and Auster, 1986), while initial capital investment may also provide a liquidity buffer for the firm to survive under conditions of low performance (Brüderl and Schüssler, 1990; Levinthal, 1991; Fichman and Levinthal, 1991). Firms that were started by the owner are more likely to experience a higher liability than *acquired* or *inherited businesses*, since completely new roles and ties must be developed (Stinchcombe, 1965). Inherited businesses may also experience different performance and survival dynamics because the owner may have developed prior firm-specific human capital while working for the family firm and a possible psychic attachment to the firm. *Radius of business sales* reflects the breadth of the geographical market niche, a critical dimension of the firm's strategy that is likely to influence performance and survival (Carroll, 1985; Brüderl, Preisendorfer, and Ziegler, 1992). *Informational ties* of the organization, which can convey relevant knowledge and information to the owner, was measured with an index of the use and importance of seven information and advice sources (Cronbach alpha = .5849). *Months in business* (age of the venture) may reflect the liability of newness (Stinchcombe, 1965) as well as the extent to which the venture has experienced the effects of selection (Freeman, Carroll, and Hannan, 1983).³ We controlled for the age of the venture to minimize the potential for left-censoring bias (Guo, 1993).

The venture's competitive environment also has important influences on economic performance and survival. Industry environments may differ in average performance (Bain, 1956), reinvestment intensity, sunk costs, and barriers to exit (Caves and Porter, 1976; Porter, 1976). We controlled for nine industry classifications using eight dummy variables (construction, manufacturing, transportation, wholesale, agriculture, financial services, personal services, and professional services), with retail as the reference group. The intensity of competition is also a function of the changes in the munificence of the environment. Markets that are growing may experience less intense competition for resources, and vice versa. We controlled for such munificence by including the *growth of gross state product* (GSP) between 1985 and 1987. We expected high growth of GSP to be associated with higher performance and survival. Because our ability to control for objective dimensions of the competitive and institutional environment was very limited, especially if compared with the industry-specific samples often used in population ecology studies, we used two perceptual variables to describe the environment: the entrepreneur's perceptions about the expected *change in (number of) competitors* in the next five years and how rapidly the business is changing (*environmental dynamism*). While these perceptual measures may be quite unreliable, they help minimize the data's weaknesses in terms of omitted competitive variables.

Statistical Methods

From the theoretical model formulated above, if a venture's economic performance exceeds the entrepreneur's threshold level of performance we expect the entrepreneur to con-

3

Recent ecological findings cast some doubt about the specific form of age dependence that firms experience and the liability of newness in particular. These findings suggest that, after controlling for firm size, organizational age may have a negative effect on survival, or a liability of obsolescence or aging (Ranger-Moore, 1991; Barron, West, and Hannan, 1994; Baum, 1996). Given the restricted range of organizational age in our sample (the oldest firm in our sample, as of the third year, was only five years and four months old), we cannot enter this debate. To the extent that there may be unobserved heterogeneity in the sample, we expect greater mortality of younger firms during these early stages of the venture.

tinue with the venture. Conversely, if economic performance is less than the threshold level, the entrepreneur is expected to exit the venture. Thus, the decision to continue with or exit from venture n is endogenously determined by the economic performance of the venture and the entrepreneur's threshold level of performance, following the decision rule:

$$\text{EXIT}_n = \begin{cases} 0 & \text{i.e., venture continues, if } EP_n^*(X_n) > T_n^*(X_n) \\ 1 & \text{i.e., venture is discontinued, if } EP_n^*(X_n) \leq T_n^*(X_n). \end{cases} \quad (5)$$

EP_n^* is a latent variable that represents economic performance as of the third year. When the venture is discontinued, economic performance (EP_n^*) is completely unobservable. When the venture survives, we observe, instead, money taken out_n, which indicates whether EP_n^* falls between two known bounds. T_n^* is the latent construct of threshold performance, which is never directly observed. We seek to estimate the effect of the independent variables (X_n) on economic performance and threshold level of performance. This estimation presents four methodological challenges: (1) the unobservability of economic performance in the case of exit, (2) the endogenous nature of the exit decision, (3) the total unobservability of the threshold of performance, and (4) the ordinal nature of our measure for economic performance for those ventures that continued.

Our approach combines two well-known methodologies in the econometric literature involving studies of discrete and limited dependent variables (Maddala, 1983). The first methodology, censored regression (or tobit) model with unobserved stochastic thresholds (Nelson, 1977; Smith, 1980; Maddala, 1983: 174–178), is appropriate when the dependent variable is only observed when it falls above a particular level or threshold, and this threshold varies from observation to observation as a function of some independent variables. Thus, this methodology deals with the first three challenges highlighted above. This method has been used to estimate the determinants of female labor supply (Nelson, 1977) and the predictors of market transaction costs and internal organizational costs (Masten, Meehan, and Snyder, 1991). This methodology is also useful for avoiding potential problems of self-selection bias (Heckman, 1979). When the observability of a dependent variable (in our case, economic performance) is endogenously determined by a decision (exit) in which the economic performance is itself an important factor, missing observations (on those firms that have exited) are not random. Rather, they are self-selected based on their lower economic performance, higher threshold of performance, or both, thus creating a problem of selectivity bias that could make the coefficients unreliable.

The second methodology, grouped data regression (Stewart, 1983; Greene, 1990), attends to the final challenge identified above. It is useful when the exact value of the dependent variable (in our case, economic performance, EP_n^*) is not observed but is known to be in a range between two known values. It has been applied to the analysis of income data from surveys (like ours) in which the respondent is asked whether his or her income is between some prespecified dollar amounts.

We combined both methodologies here. As in censored regression with stochastic thresholds, the decision to continue or exit is based on the comparison of the two latent constructs of economic performance and the threshold (see equation 4), which are specified as a linear function of the observable independent variables, as follows:

$$EP_n^* = \sum b_{1i} \cdot X_{in} + e_{1n} \quad (6a)$$

$$T_n^* = \sum b_{2i} \cdot X_{in} + e_{2n}, \quad (6b)$$

where X_n is the vector of independent and control variables, b_1 and b_2 are vectors of regression coefficients, and e_1 and e_2 are random disturbances.

We estimated the censored regression model on economic performance and the tobit model on threshold performance simultaneously using a maximum likelihood procedure. Since there is no standard program that produces maximum likelihood estimates for this combination of models, we mathematically derived the likelihood function and maximized it using LIMDEP 7.0. Details about this maximum likelihood estimation method are provided in Appendix B.

RESULTS

Model Significance

We tested the significance of the human capital variables in the threshold model (columns 1 and 2 of table 3) by examining whether the addition of these variables significantly improved the ability to explain exit through economic performance and performance threshold. We used a log-likelihood ratio test to compare the full model with two nested naive models (not shown); the first with only constants for economic performance and performance threshold, the second including only control variables. The first test produced a chi-square value of 692.85 (66 d.f.), while the second had a value of 154.09 (26 d.f.). Both tests were significant ($p < .0001$). The first test reflects the overall significance of the model, while the second indicates the joint significance of the independent (human capital) variables of the model.

Hypothesis Testing

The results for the independent variables generally confirm the separate effects of both economic performance and threshold on the entrepreneur's likelihood of exit. The results from the full model are presented in table 3. Columns 1 and 2 present the coefficients relating to economic performance and threshold, respectively. Column 3 presents the coefficients of a probit model on exit.⁴ The hypotheses were tested by examining these three columns. Because we had prior expectations about the direction of hypothesized relationships, we used a one-tailed test where appropriate. Similar to column 1, column 4 presents the results from a regression on economic performance but differs in that it does not control for the self-selection problem. Although column 4 is not directly related to our hypothesis testing, we introduce it to evaluate the effect of self-selection bias in estimating performance. In general, hypothesis 1 (relationships regarding general human capital) receives partial support, while hypotheses 2 through 4 (relationships regarding specific human

⁴

The probit equation could be estimated jointly with a performance equation to increase the efficiency of the exit parameter estimates. We present the single-equation probit here because it focuses on mortality alone and is therefore comparable to prior research on mortality (no prior research that we know of has used joint estimation of exit and performance). A comparison of coefficients derived from joint estimation suggests that they are not different in any meaningful way from those derived in the single-equation probit illustrated in column 3.

Table 3

Parameter Estimates of Economic Performance, Threshold of Performance, and Exit

Variables	Joint Maximum Likelihood Model							
	Economic Performance Equation*		Threshold of Performance Equation (2)		Binomial Probit on Exit (3)		Non-censored Regression on Economic Performance* (4)	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Formal education	6.84***†	(2.72)	.03†	(2.79)	-.21*	(.13)	4.95**	(2.37)
Management experience	3.75†	(2.75)	6.05***†	(2.97)	.07	(.13)	4.43*	(2.48)
Supervisory experience	5.05***†	(2.06)	1.25†	(2.19)	-.18*	(.09)	3.34*	(1.89)
Similar business	8.89***†	(2.12)	.04	(2.25)	-.38***†	(.10)	5.21***	(1.85)
Intrinsic motivation	-.39	(.77)	-1.87***†	(.79)	-.07***†	(.04)	-1.15*	(.69)
Parents owned business	-.19	(1.53)	-3.20***†	(1.63)	-.15***†	(.07)	-2.27*	(1.34)
Age of entrepreneur	.14	(.10)	-.49***†	(.11)	-.02***†	(.00)	-.10	(.09)
Age ²	.00	(.01)	.00	(.01)	.00	(.00)	.00	(.01)
1 Prior job (vs. none)	5.72	(5.28)	-7.30	(5.18)	-.55***	(.21)	-.17	(4.32)
2 Prior jobs (vs. none)	8.59*	(4.77)	-2.42	(4.63)	-.42**	(.20)	4.15	(4.11)
3 or 4 Prior jobs (vs. none)	6.75	(4.68)	-2.05	(4.43)	-.30	(.19)	3.71	(4.00)
5+ Prior jobs (vs. none)	.67	(4.69)	1.15	(4.41)	.06	(.19)	1.11	(4.06)
Entrepreneurial experience	4.07*	(2.36)	6.45***	(2.47)	.07	(.11)	5.04**	(2.14)
Hours worked	-.01	(.05)	-.04	(.05)	.00	(.00)	-.05	(.05)
Outside job	-11.68***	(2.76)	-7.34**	(2.90)	.16	(.12)	-10.82***	(2.63)
Initial capital (log)	2.76***	(.71)	-1.52**	(.77)	-.17***	(.03)	1.12*	(.61)
Number of employees (log)	9.07***	(1.01)	3.52***	(1.07)	-.16***	(.05)	8.30***	(.92)
Acquired business	1.06	(1.79)	-1.35	(1.88)	-.17**	(.08)	-1.24	(1.50)
Inherited business	2.85	(5.61)	-11.02	(7.05)	-.63**	(.30)	-3.56	(4.51)
Radius of business sales	-.03	(.03)	.10***	(.03)	.01***	(.00)	.03	(.03)
Months in business (log)	7.45***	(1.45)	-.59	(1.39)	-.35***	(.06)	3.57***	(1.30)
Informational ties	1.78	(3.92)	1.54	(4.06)	-.09	(.18)	.25	(3.42)
Industry-construction	12.22***	(2.70)	3.12	(2.77)	-.32**	(.14)	9.75***	(2.45)
Industry-manufacturing	11.11***	(2.79)	3.87	(3.11)	-.34**	(.14)	8.19***	(2.53)
Industry-transportation	9.17*	(4.92)	5.80	(4.91)	-.09	(.24)	8.88*	(4.62)
Industry-wholesale	11.62***	(3.57)	4.73	(3.91)	-.29*	(.18)	9.65***	(3.20)
Industry-agriculture	10.52**	(4.78)	-.74	(6.56)	-.55**	(.26)	6.46	(3.96)
Industry-financial services	25.13***	(3.87)	11.66***	(4.37)	-.71***	(.18)	18.90***	(2.93)
Industry-personal services	6.28***	(2.24)	-.48	(2.31)	-.28***	(.10)	3.96**	(2.01)
Industry-professional serv.	23.77***	(2.88)	6.08*	(3.18)	-.69***	(.16)	17.85***	(2.66)
Environmental dynamism	.44	(.73)	.04	(.77)	-.03	(.03)	.09	(.65)
Growth in GSP	34.01***	(7.23)	6.74	(7.53)	-1.20***	(.32)	21.23***	(6.36)
Change in competitors	-.48	(.77)	.24	(.81)	.05	(.04)	.08	(.74)
Log-likelihood			-2,433.50		-890.64		-1,558.11	
N			1547		1547		936	

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$; two-tailed Wald test unless otherwise indicated.

* Dependent variable uses grouped data methodology.

† One-tailed Wald test for hypothesized relationships.

capital, psychic income, and switching costs) receive relatively strong support.

General human capital. Measures of general human capital should raise the economic performance of the venture and the expected returns outside the venture. Because of these offsetting factors, we cannot determine the relationship of general human capital to survival *a priori*; it depends on the relative payoff of human capital in the venture versus outside the venture. Hypothesis 1 received mixed support. As expected, education, management experience, and supervisory experience are positively related to the economic performance of the venture, but only management experience has the expected positive relationship with threshold. The insignificant effect of management experience on exit seems largely driven by the offsetting influence of this variable on both performance and threshold. In contrast, it appears that the negative relationship of supervisory experience and education to exit is largely driven by a greater

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payoff to these forms of human capital in the venture. A two-tailed Wald test shows that supervisory experience has a significantly lower payoff (one-tailed Wald test: $p < .10$) in other alternatives (a lower threshold) than does management experience.

While not reported here, we explored further the effect of education on performance and threshold by operationalizing education as a set of indicator variables for five different levels of educational attainment. Consistent with the linear results, entrepreneurs with higher education (with bachelor's or graduate degrees) have significantly higher performance than those with medium levels of education (high school graduates or some college), even though those without a high school diploma do not necessarily perform worse than the rest. Paradoxically, entrepreneurs with a high school diploma or with a bachelor's degree have a lower threshold than those who did not attain their high school diploma and those who went to college but did not obtain a bachelor's degree. This nonmonotonic effect may explain the nonsignificant threshold effect of the linear operationalization of education. This result may suggest that those entrepreneurs who persisted in their studies until they obtained the degree are also more likely to persist in their business.

Human capital specific to the venture. Hypothesis 2 predicted that because an entrepreneur's specific human capital will have little value outside the venture, the decision to exit will be influenced primarily by the venture's performance. Since entrepreneurs with higher degrees of specific human capital are expected to have better performing ventures, we expect them to be less likely to exit. Our measure of specific human capital, similar business, is related as expected. As depicted in column 3, the variable has a strong, negative relationship to exit (one-tailed Wald test: $p < .001$). That relationship is driven by the very strong and positive impact on economic performance (one-tailed Wald test: $p < .001$) and the insignificant effect on threshold.

Psychic income from entrepreneurship. Hypothesis 3 argued that individuals who attach high psychic income to entrepreneurship are expected to accept a lower level of performance before exiting their ventures. While they are not necessarily performing better, we expect them to be less likely to exit their business. This hypothesis received strong support. Our measures of psychic income, intrinsic motivation (one-tailed Wald test: $p < .01$) and parents owned a business (one-tailed Wald test: $p < .05$), are both negatively related to threshold, while having no statistical relationship with economic performance. This explains the negative and significant effect of both variables on exit. It seems that entrepreneurs who are more intrinsically motivated and have a family history in entrepreneurship are simply more likely to accept a lower level of economic performance to remain in business.

Switching costs. With age of the entrepreneur as a measure of switching costs, our results support hypothesis 4. The persistence of older entrepreneurs is due to their willingness to accept a lower return, i.e., their lower threshold (one-tailed Wald test: $p < .001$), since they do not seem to

perform significantly differently than younger entrepreneurs. The main effect of age on performance is significant in a one-tailed Wald test at the $p < .10$ level, but not in a two-tailed test. Since we do not have initial theoretical expectations about the effects of age on performance, we believe the two-tailed test to be appropriate, but this result may indicate that age is picking up some omitted variables measuring the effect of human capital, such as years of work experience. Age² had no significant effects on either performance or threshold.

Other influences. Entrepreneurial experience has a positive and significant effect on economic performance (two-tailed Wald test: $p < .10$) and threshold (two-tailed Wald test: $p < .01$). It appears that the effect on threshold is greatest. Consistent with the view that too many or too few jobs may indicate low general human capital, we found that entrepreneurs with two prior jobs perform better than those with no previous work experience (two-tailed Wald test: $p < .10$) and than those with five or more prior jobs (two-tailed Wald test: $p < .001$); and entrepreneurs with three or four prior jobs perform better than those with five or more prior jobs (two-tailed Wald test: $p < .001$). The same result does not hold for the threshold equation. Instead, entrepreneurs having held five or more prior jobs have higher thresholds than entrepreneurs with only one prior job (two-tailed Wald test: $p < .05$). This suggests that entrepreneurs who have held many jobs are less willing to tolerate low performance, perhaps because they have lower economic or psychic switching costs.

Control variables. The results in table 3 also illustrate several interesting relationships for the control variables. Of the remaining variables related to the entrepreneur, hours worked was not related to any of the dependent variables. As expected, the economic returns to entrepreneurs with an outside job was significantly lower than those concentrating solely on the venture. Interestingly, outside job was also related negatively with threshold, presumably because entrepreneurs could afford to accept lower performance.

Several of the firm-level control variables had important influences on economic performance, threshold, and exit. Initial capital, number of employees, and months in business had significant positive effects (two-tailed Wald test: $p < .001$) on economic performance, suggesting that better capitalized, larger, and older firms were better performers. This explains the strong and significant negative effects of these variables on the probability of exit (two-tailed Wald test: $p < .001$). The variables, however, differed in their effect on threshold of performance. Initial capital had a significant negative effect on threshold (two-tailed Wald test: $p < .05$), number of employees had a significant positive effect (two-tailed Wald test: $p < .001$), and months in business had no significant effect on threshold. The path to ownership of the venture, whether the firm was acquired, inherited, or developed, seemed to have no significant bearing on either performance or threshold, although owners who inherited their businesses seemed to be willing to accept lower performance (two-tailed Wald test: $p < .12$) than those who started their firms. Both acquired businesses and inherited businesses were less likely to exit than start-up firms. While firms with a

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wider radius of business sales tended to exit more often, this result was due primarily to the firms' higher thresholds, because there were no significant performance differences. Information ties did not show significant effects in our analysis.

Several industry dummies also had significant effects on performance, threshold, and exit. All industries were compared against the largest industry group—retailing—and all showed higher economic performance than that group. Firms in financial and professional industries tended to perform better and exit less frequently. As expected, economic returns to the entrepreneur were greater when growth in GSP was higher. Our measures of environmental change and change in competitors had no significant influence on performance, threshold, or exit.

Effects of Self-Selection Bias

A methodological problem of studying determinants of economic performance in businesses with high attrition rates is that the dependent variable is only available for firms that survive, yet survival is more likely for firms with high performance. This creates a self-selection problem. To highlight the effects of self-selection bias on the analysis of economic performance, we compare column 4, a simple grouped data regression model without correction for self-selection bias, with column 1, which corrects for this bias. The magnitude of the self-selection problem will differ for each predictor variable, depending on whether the variable is expected to be related to the selection function, in this case survival (Heckman, 1979). Variables that have a strong effect on survival suffer more from self-selection, which biases downward their coefficients on performance, because firms that fail are more likely to have lower values of these variables. By modeling performance effects with only surviving firms, the distributions of affected variables fall within a narrower range, creating effects that are less significant.

In some cases self-selection bias can make insignificant coefficients appear to be significant in the performance equation. This bias was reflected most visibly in our measures of psychic income: intrinsic motivation and parents owned a business. From column 4, it appears that entrepreneurs who were intrinsically motivated or whose parents owned a business have lower performance, but this conclusion reflects the potentially incorrect interpretations of biased results. Our earlier discussion suggested that these entrepreneurs were more likely to survive simply because they were willing to accept lower levels of performance to stay in business. This selection mechanism led to the spurious observation that surviving "unsuccessful" entrepreneurs were more likely to have intrinsic motivation or family ties to entrepreneurship, even though the relationship was not causally related to a lack of economic success. Another interesting observation is that the coefficient of months in business, one of the strongest effects on performance, became strongly biased downward (to less than half of its unbiased value) if the estimation of the effect was only based on surviving firms. This result suggests that the apparent lack of consistency between the effect of venture age on survival and perfor-

mance—an observation that motivated Meyer and Zucker's (1989: 19) theory of permanently failing organizations—may be partly due to self-selection bias. These examples emphasize the importance of controlling for self-selection bias and are consistent with Barnett, Greve, and Park (1994), who also found that controlling for selection bias substantially influenced the statistical effects of variables on performance.

DISCUSSION

Assumptions about the relationship between performance and survival are so entrenched in social science research that little work has investigated them empirically. In some perspectives, those with Panglossian overtones, it is assumed that the efficiency of markets will lead to the "survival of the fittest." This rhetoric implies unidimensionality between performance and survival: the lowest performing organizations are also the least likely to survive. Scholars espousing other perspectives recognize that selection does not necessarily favor the best performing organizations (Hannan and Freeman, 1977; Meyer and Rowan, 1977) but have failed to study the causal relationships between these constructs (Meyer and Zucker, 1989; Amburgey and Rao, 1996). Our theoretical model and empirical results suggest that survival is enhanced by economic performance but not uniquely determined by it. Rather, organizations have different required thresholds of performance, and survival (or exit) is determined by whether performance falls above (or below) the threshold. In small and new ventures, the threshold of performance is fundamentally influenced by the human capital characteristics of the entrepreneur, including the value of this capital in alternative uses, psychic income, and switching costs. This paper is the first, we believe, to provide empirical support for the assertion that thresholds of performance differ systematically across firms and play an important role in determining firm survival. Several of the results are worth highlighting.

First, we found that entrepreneurs with more general human capital perform better but do not necessarily survive more frequently. We had expected that entrepreneurs endowed with general human capital would have higher performance requirements for their businesses and might quit if these requirements were not met. This expectation was only partially supported by our results. We found that general management experience (having managed managers) influences an entrepreneur's threshold of performance, while neither education nor supervisory experience are related. This suggests that the value of general management experience outside the venture may be comparable to its value in entrepreneurship, while returns to education and supervisory experience may be somewhat better in self-employment, findings consistent with Evans and Leighton (1989). The apparently divergent payoffs of management experience and supervisory experience are especially intriguing. While management experience may be more generally applied, it may also be that having experience "managing managers" is more valuable in larger organizations with more formal structures.

Second, we found that entrepreneurial skills that have little use outside of the venture, such as prior experience with

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the venture's customers, suppliers, products, and services are related to both performance and survival. Furthermore, by demonstrating no significant relationship with threshold, our results support the expectation that human capital that is largely specific to the venture context should have little or no bearing on returns outside of the venture. Apparently, specific human capital influences survival by increasing the gap between performance and threshold (i.e., increasing performance without raising the threshold).

Third, our findings suggest that some dimensions of human capital have important effects on persistence, even when they do not influence performance. Factors such as the entrepreneur's age, family experience with entrepreneurship, or intrinsic motivation do not have any tangible effect on performance. Yet entrepreneurs with a higher level of these attributes are willing to accept a lower level of performance to survive. Entrepreneurs who have inherited businesses are also more likely to continue, apparently because of their desire to sustain the family business (lower threshold) and not because of superior performance associated with any "extra" knowledge passed on to them.

These findings provide strong support for our threshold model of entrepreneurial exit and reconcile many of the inconsistent relationships previously found in entrepreneurial performance and survival research: some human capital variables significantly influence both performance and survival (specific human capital), some influence performance more than survival (general human capital), and some influence survival but not performance (switching costs, psychic income). This evidence suggests that there are differences in determinants of performance and survival and that research agendas ignoring the entrepreneur's choice to accept a given level of performance are incomplete.

A somewhat surprising result is that entrepreneurial experience seems to have at least as much effect on threshold as it does on economic performance of the venture. If entrepreneurial experience constitutes human capital that is specific to the venture, we would expect its effect to be greater inside the venture than outside it. We interpret the higher threshold effect as suggesting that experienced entrepreneurs have reduced switching costs into alternative employment (maybe trying again with another venture), perhaps because they have developed networks or familiarity with the routine of starting businesses. Experienced entrepreneurs may also gain a certain "thrill" from the start-up process and thus experience a negative psychic income once the venture becomes stable.

As we might expect, entrepreneurs' history of previous jobs seems to reflect their general human capital. Our findings indicate that a low number of prior jobs may be associated with a lack of outside alternatives, while a high number of prior jobs may suggest an inability to perform jobs satisfactorily. Thus, both a low and high number of jobs suggest low degrees of human capital and poor performance in the venture. At the same time, we found that a large number of prior jobs increases an entrepreneur's threshold, suggesting that these entrepreneurs are less willing to tolerate low per-

formance. This is likely due to low economic or psychic switching costs.

By incorporating the threshold construct, our analysis also provides insight into the effects of some well-studied factors bearing on organizational mortality: initial capital, size, age, and strategy of the venture. The first three variables are strongly related to performance; both initial capital and size also influence survival through their impact on threshold. The negative effect of initial capital on threshold may support the view that initial capital provides the entrepreneur a buffer to withstand poor performance and liquidity problems without having to exit the business (Brüderl and Schüssler, 1990; Levinthal, 1991; Fichman and Levinthal, 1991). It may also suggest that financial investments are largely irreversible. In contrast, the positive effect of number of employees (size) on threshold suggests that entrepreneurs of larger organizations require higher performance, perhaps because they can easily disband if they do not obtain such performance. This is assisted by a labor market that facilitates mobility. The lack of any significant relationship between age of the venture and threshold suggests that the processes underlying the "liability of newness" phenomenon tend to influence exit mainly through the performance component. Our finding that firms with broader scope exit more frequently is consistent with Brüderl, Preisendorfer, and Ziegler (1992). We found that this effect is mainly due to their higher threshold of performance.

The environmental controls show that industries differ in both their performance and threshold effects. Financial and professional services industries tend to perform better but also to have higher thresholds, while personal services and retail industries are characterized by both low performance and low thresholds. These patterns may reflect broad differences in the general human capital of entrepreneurs in those industries. Finally, environmental munificence has a positive effect on performance and exit. While it might have been expected that a good economic environment would also increase the income in alternative occupations, and thus increase threshold, the coefficient of munificence on threshold is positive but not statistically significant.

Alternative Explanations and Limitations

Our empirical findings may have alternative explanations. It could be that entrepreneurs differ in their decision-making speed and rationality when faced with poor performance. Entrepreneurs who simply delay the exit decision or experience a psychological escalation of commitment (Staw, 1981), perhaps because of less training, would appear in our results as having lower thresholds. It may be that formal education does not increase underlying ability but that it has value as a market signal that allows employers to segregate people of higher ability (Spence, 1974). Alternatively, an entrepreneur's high level of formal education may increase the legitimacy of a small business, facilitating access to better trading partners and leading to improved performance (Meyer and Rowan, 1977). These alternative theoretical justifications for our findings should be considered in future studies, as should factors beyond the scope of our model that

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are examined in prior research. Venture performance has been linked to network formation (Aldrich, Rosen, and Woodward, 1987), environments (Carroll, 1987), and strategies (McDougall, Robinson, and DeNisi, 1992), as well as interactions between environments and strategies (Romanelli, 1989; Eisenhardt and Schoonhoven, 1990). A broader array of perspectives will undoubtedly increase our insight into new venture thresholds.

There are also some empirical limitations to our research, mainly because of shortcomings in data availability and measurement. Because we chose to make the sample as broad as possible, we lacked fine-grained measures of the institutional dimensions of the environment. It would be illuminating to replicate this study in the context of a single industry or population to control more aptly for environmental dimensions. Our reliance on demographic variables (age, parents who owned a business) as proxies for psychological constructs (psychic income) or switching costs is also another limitation that could be overcome with better measures in future work. The sociological and psychological literatures may contain useful insights into how to extend our operationalization of these important constructs. Further, the lack of available information on the alternatives under consideration by entrepreneurs did not allow us to specify fully our theoretical model, which may therefore be affected by unmeasured heterogeneity. Information on liquidation values for discontinued businesses could have also helped specify the exit choice more accurately.

Another potential limitation is our measurement of economic performance as current monetary outlays. Monetary outlays to the entrepreneur may not distinguish between firms with low performance and firms with high reinvestment intensity or bright prospects. Firms with low current monetary outlays may still survive if the expected return to reinvestment activity is high, a condition that may be incorrectly reflected as a low threshold effect. Examination of our results, however, shows that lower thresholds are associated with entrepreneurs who are older, motivated by independence rather than growth or financial goals, who have little prior management or entrepreneurial experience, and who are not fully committed to the venture. This description does not fit the profile of entrepreneurs with high prospects willing to reinvest aggressively but, rather, of those with limited alternatives and positive psychic income from independence.

Implications for Entrepreneurship and Beyond

This research highlights the importance of considering the human capital characteristics of the entrepreneur in the survival of new ventures. Despite recent criticisms of inconsistent findings in the "trait" literature (Aldrich, 1990: 8), the multiple and critically important roles of the entrepreneur—as chief strategist and decision maker, as repository of much of the knowledge and skills that make up the intangible assets of the firm, as the person who develops the contacts and networks upon which the new venture depends—cannot be ignored. Our study suggests that the effects of these entrepreneurial characteristics on entrepreneurial thresholds are important for survival and can explain

prior inconsistent findings. The implication for entrepreneurship research is that more attention is due to the outside opportunities of entrepreneurs, their psychic income, and switching costs, even if those variables do not directly influence entrepreneurial performance. Prior research has shown that entry into entrepreneurship may be more likely for those with reduced options elsewhere (Fuchs, 1982; Borjas, 1986; Brittain and Freeman, 1986; Carroll and Mosakowski, 1987). This research showed that those entrepreneurs are also more likely to survive, independent of performance. Thus, a clear appreciation of thresholds is necessary to understand the entrepreneurial process.

The concept of the threshold of performance outlined in this study can serve as an integrating construct for understanding performance and survival for all organizations, not merely new ventures. The question then becomes, "Why do organizations differ in their thresholds?" Perhaps the answer to this question must come from theoretical perspectives beyond human capital theory. Future research could focus on the role of governance structures, coalition power, and intrafirm conflict (Meyer and Zucker, 1989), which may limit the ability of owners to influence their organizations and therefore be associated with persistence under low performance. Other research could articulate thresholds as a function of slack (Cyert and March, 1963), initial resource endowments, or established relationships (Brüderl and Schüssler, 1990; Miner, Amburgey, and Stearns, 1990; Levinthal, 1991; Fichman and Levinthal, 1991) and disentangle the performance and threshold effects of these important constructs. The nature of resource commitment (whether the resources are sunk or highly mobile) would also influence both performance (Ghemawat, 1991) and exit barriers (Caves and Porter, 1976) and may constitute an interesting area for future research. These multiple theoretical lenses can be brought to bear in understanding cross-sectional and longitudinal differences in thresholds of both new and established organizations. The concept of threshold may also be applied, within the firm, to determine the minimum level of performance that a multidivisional organization requires to maintain an active division.

Proponents of the unidimensional view might argue that thresholds are simply temporary "buffers" against the inevitable success of better performing firms. While initial resources or decision-making lags may delay exit, those buffers may ultimately be depleted by continued low performance (Brüderl and Schüssler, 1990; Levinthal, 1991; Fichman and Levinthal, 1991), leaving intact the long-term, unidimensional relationship between performance and exit. Even if thresholds are temporary, however, they may be an important initial condition that has long-term implications for performance and survival by providing a buffer at a crucial stage of the organization's development (Eisenhardt and Schoonhoven, 1990; Levinthal, 1991). We believe, however, that thresholds persist over time and that they reflect a willingness to accept lower performance for the reasons highlighted in this paper. Whether a temporary buffer or an enduring quality, thresholds will influence the long-term selection processes in populations of organizations. If perfor-

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mance is stochastic (as in Levinthal's model of random walks), lower initial thresholds allow firms to survive during runs of bad performance until performance improves and, therefore, have a path-dependent effect on selection outcomes. Even if interfirm performance differences are relatively deterministic and difficult to change, organizations that are willing to remain in business at low levels of economic performance (those having low thresholds, perhaps because of low resource mobility) may increase competition and have a "crowding out" effect on better performing but more mobile firms. These arguments suggest that it is difficult to determine a priori to what extent selection outcomes in a population reflect differences in efficiency and performance or differences in thresholds. Thus, our theoretical model cautions against the use of survival as a measure of performance in empirical studies, since the "survival of the fittest," as this paper shows, cannot be assumed.

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APPENDIX A: Variable Definitions

Dependent variables	Measure
Exit _n	1 = firm discontinued; 0 = firm survived.
Money taken out _n	Amount (in thousand \$) of money (including salary, draw, dividends, etc.) that the entrepreneur was able to take out in the previous 12 months. The variable is ordinal with 7 values: (1) under \$10K, (2) \$10K to \$15K, (3) \$15K to \$25K, (4) \$25K to \$35K, (5) \$35K to \$50K, (6) \$50K to \$75K, and (7) over \$75K.
Independent and control variables	
Attainment in work experience	Highest level of management experience achieved by owner (multinomial categorical variable). <i>Supervisory experience</i> equals 1 if "supervised others"; 0 otherwise. <i>Management experience</i> equals 1 if "supervised managers"; 0 otherwise. <i>Entrepreneurial experience</i> equals 1 if "managed own business"; 0 otherwise. Reference group is "supervised no one."
Formal education	Percentage of observations in sample with less formal education than entrepreneur.
Similar business	Index of similarity between present business and previous organization in (a) products or services, (b) customers, and (c) suppliers (1 = very similar, 0 = very different) (Cronbach alpha = .8734).
Intrinsic motivation	1 = the entrepreneur's most important goal in starting a new venture is to "let you do the kind of work you wanted to do" or "avoid working for others." -1 = most important goal in starting a new venture is to "make more money than you would have otherwise" or "build a successful organization." 0 = most important goal in starting a new venture is "other." 1 = parents owned a business; 0 = otherwise.
Parents owned business	Age of entrepreneur at the time of first questionnaire.
Age of entrepreneur	Total number of full-time jobs prior to venture. Transformed to multiple binary variables measuring whether there were 1 <i>prior job</i> , 2 <i>prior jobs</i> , 3 or 4 <i>prior jobs</i> , and 5 or more <i>prior jobs</i> . Reference group is no prior jobs.
Number of prior jobs	Total number of hours worked per week by the entrepreneur. 1 = entrepreneur had a full-time job outside the venture; .5 = entrepreneur had a part-time or irregular job outside the venture; 0 = entrepreneur had no job outside the venture.
Hours worked	Natural logarithm of the amount of capital (in thousand \$) invested by the time of first sale (ordinal, 8 brackets).
Outside job	Natural logarithm of the number of full-time and part-time (.5) employees (including the owner) at the time of the first questionnaire.
Initial capital (log)	How entrepreneur became owner of present business (multinominal categorical variable). <i>Acquired business</i> equals 1 if "purchased it"; 0 otherwise. <i>Inherited business</i> equals 1 if "inherited it"; 0 otherwise. Reference group is "started it."
Number of employees (log)	Radius of area in which 80% of customers are located.
Path to ownership	Natural logarithm of the number of months since business registered its first sale at the time of the first questionnaire.
Radius of business sales	Composite index of use and importance of seven information sources: (a) accountant, bookkeeper, (b) friends or relatives, (c) other business owners, (d) bankers, (e) trade organizations, (f) lawyers, attorneys, and (g) franchisers or suppliers (1 = very important; 0 = not used) (Cronbach alpha = .5849).
Months in business (log)	Eight control variables for nine different industries, including <i>construction</i> , <i>manufacturing</i> , <i>transportation</i> , <i>wholesaling</i> , <i>agriculture</i> , <i>financial services</i> , <i>personal services</i> , <i>professional services</i> . Reference group is retail industry.
Informational ties	Likert scale agreement with statement "My business is changing rapidly" (-2 = strongly agree, +2 = strongly disagree).
Industry	Change in Gross State Product from 1985 to 1987 in the U.S. state where the business is located.
Environmental dynamism	Expected change per year over next five years in number of competitors: Increase over 20% (=3), increase 11%-20% (=2), increase 3%-10% (=1), unchanged -3%--3% (=0), decrease (-1).
Growth in GSP	
Change in competitors	

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APPENDIX B: Maximum Likelihood Estimation of Model

The likelihood function represents the probability that a sample was obtained from a statistical model with given parameters. By maximizing the logarithm of the likelihood function with respect to these parameters, we are able to obtain maximum likelihood estimates of the coefficients in equations (6a) and (6b).

For a given observation in the sample, we observe exit_n (the binary variable representing exit), money taken out_n (the ordinal variable representing the range of economic performance, only observed if $\text{exit}_n = 0$), and X_n (the independent variables). The relevant parameters of the model are b_1 , the coefficients of the independent variables on economic performance, b_2 , the coefficients of the independent variables on the threshold, s_1 , the standard deviation of the disturbance of the economic performance equation (e_1), which is assumed to be normally distributed, and s , the standard deviation of the difference of the disturbances of the threshold equation and the economic performance, $e_2 - e_1$. A required assumption for the full identification of the model is the assumption that e_1 and e_2 are independent (Nelson, 1977). The likelihood function, represented by $L(b_1, b_2, s_1, s | \text{exit}_n, \text{money taken out}_n, X_n)$, captures the probability that some given sample values ($\text{exit}_n, \text{money taken out}_n, X_n$) were obtained if the parameter values were b_1, b_2, s_1 , and s .

For a given observation, the probability of observing exit is:

$$\begin{aligned} \text{Prob}(\text{exit}_n = 1) &= \text{Prob}(\text{EP}^* \leq T^*) = \text{Prob}(\sum b_{1i} \cdot X_i + e_1 \leq \sum b_{2i} \cdot X_i + e_2) \\ &= \text{Prob}(e_1 - e_2 \leq \sum (b_{2i} - b_{1i}) \cdot X_i) = \Phi\left(\frac{\sum (b_{2i} - b_{1i}) \cdot X_i}{s}\right), \end{aligned}$$

where $\Phi(z)$ represents the normal cumulative distribution function.

For a given observation, the probability of observing continuation and obtaining a value of k for money taken out_n (which means that the exact economic performance is between a known lower bound L_k and a known upper bound U_k) is:

$$\begin{aligned} \text{Prob}(\text{exit}_n = 0 \text{ and money taken out}_n = k) &= \text{Prob}(T^* < \text{EP}^* \text{ and } L_k < \text{EP}^* < U_k) \\ &= \text{Prob}(\sum b_{2i} \cdot X_i + e_2 < \sum b_{1i} \cdot X_i + e_1 \text{ and } L_k < \sum b_{1i} \cdot X_i + e_1 < U_k) \\ &= \text{Prob}(e_2 - e_1 < \sum (b_{1i} - b_{2i}) \cdot X_i \text{ and } L_k - \sum b_{1i} \cdot X_i < e_1 < U_k - \sum b_{1i} \cdot X_i) \\ &= \text{Prob}(e_2 - e_1 < \sum (b_{1i} - b_{2i}) \cdot X_i \text{ and } e_1 < U_k - \sum b_{1i} \cdot X_i) \\ &\quad - \text{Prob}(e_2 - e_1 < \sum (b_{1i} - b_{2i}) \cdot X_i \text{ and } e_1 < L_k - \sum b_{1i} \cdot X_i). \end{aligned}$$

Each of the probabilities in this equation can be represented as cumulative distribution functions of a standard bivariate normal, $\Phi_2(z_1, z_2, r)$. In this case, the first variable is $z_1 = (e_2 - e_1)/s$, and the second is $z_2 = (e_1/s_1)$, while the correlation of the variables equals $r = (-s_1/s)$. Thus, we can write $\text{Prob}(\text{exit}_n = 0 \text{ and money taken out}_n = k)$ as

$$\begin{aligned} &\Phi_2\left(\left(\frac{\sum (b_{1i} - b_{2i}) \cdot X_i}{s}\right), \left(\frac{U_k - \sum b_{1i} \cdot X_i}{s_1}\right), -\frac{s_1}{s}\right) \\ &\quad - \Phi_2\left(\left(\frac{\sum (b_{1i} - b_{2i}) \cdot X_i}{s}\right), \left(\frac{L_k - \sum b_{1i} \cdot X_i}{s_1}\right), -\frac{s_1}{s}\right). \end{aligned}$$

The likelihood function aggregates these probabilities by multiplying them over all of the observations in the sample. By taking the logarithmic transformation of this likelihood function, we then obtain the log-likelihood function, which can be written as:

$\ln L(b_1, b_2, s_1, s | \text{exit}_n, \text{money taken out}_n, X_n)$

$$\begin{aligned} &= \sum_{\text{exit}_n=1} \ln \Phi\left(\frac{\sum (b_{2i} - b_{1i}) \cdot X_i}{s}\right) \\ &\quad + \sum_{\text{exit}_n=0} \ln \left[\Phi_2\left(\left(\frac{\sum (b_{1i} - b_{2i}) \cdot X_i}{s}\right), \left(\frac{U_k - \sum b_{1i} \cdot X_i}{s_1}\right), -\frac{s_1}{s}\right)\right. \\ &\quad \left. - \Phi_2\left(\left(\frac{\sum (b_{1i} - b_{2i}) \cdot X_i}{s}\right), \left(\frac{L_k - \sum b_{1i} \cdot X_i}{s_1}\right), -\frac{s_1}{s}\right)\right]. \end{aligned}$$

This equation is maximized for values of b_1 , b_2 , s_1 , and s . The estimation is carried out in two steps. First, we use LIMDEP 7.0's grouped data regression with sample selection procedure to obtain performance and exit parameters, and from those we obtain initial estimates of b_1 , b_2 , s_1 , and s following the procedure outlined by Maddala (1983: 228–230). We then use those initial estimates for the maximization of the log-likelihood function using a Davidon-Fletcher-Powell optimization algorithm (Greene, 1990), also available in LIMDEP.