
INITIAL HUMAN AND FINANCIAL CAPITAL AS PREDICTORS OF NEW VENTURE PERFORMANCE

ARNOLD C. COOPER,
F. JAVIER GIMENO-GASCON,
AND CAROLYN Y. WOO

Krannert Graduate School of Management, Purdue University

EXECUTIVE SUMMARY

This research seeks to predict the performance of new ventures based on factors that can be observed at the time of start-up. Indicators of initial human and financial capital are considered to determine how they bear upon the probability of three possible performance outcomes: (1) failure, (2) marginal survival, or (3) high growth.

Four categories of initial human and financial capital are examined. General human capital, represented here by the entrepreneur's education, gender, and race, may reflect the extent to which the entrepreneur has had the opportunity to develop relevant skills and contacts. Management know-how, embodied in the entrepreneur or available through advisors or partners, reflects management-specific skills and knowledge, without regard to the kind of business. Industry-specific know-how reflects specific experience in similar businesses. Financial capital is one of the most visible resources; it can create a buffer against random shocks and allow the pursuit of more capital-intensive strategies, which are better protected from imitation.

The study utilizes a longitudinal study of 1053 new ventures, representative of all industry sectors and geographical regions. The research departs from most previous studies in considering different measures of performance (marginal survival and growth) and in considering explicitly whether the factors contributing to marginal survival differ from those contributing to high growth.

It was found that measures of general human capital influenced both survival and growth (except for gender, with women-owned ventures being less likely to grow, but just as likely to survive). Management know-how variables had more limited impact. Having parents who had owned a business contributed to marginal survival, but not to growth. Number of partners contributed to growth but not to survival. Management level, prior employment in non-profit organizations or not having been in the labor force, and the use of professional advisors did not have significant effects. Industry-specific know-how contributed to both survival and growth. Amount of initial financial capital also contributed to both.

Address correspondence to Arnold Cooper, Krannert Graduate School of Management, Purdue University, West Lafayette, IN 47907.

The authors wish to acknowledge the support and cooperation of the National Federation of Independent Business and the helpful suggestions of Gordon Wright. F. Javier Gimeno-Gascon would like to acknowledge the support of the Spanish Ministry of Science and Education. An earlier version of this article was presented at the National Meetings of the Academy of Management, August 1991.

The usefulness of the model is enhanced by the fact that the resource variables considered are relatively easy to assess and all can be considered at the time of start-up. Although some of the human capital variables cannot easily be changed, the benefits or risks associated with each can be assessed. In some cases, potential problems can be identified so that plans can be modified to improve prospects. Overall it appears that, using a model based upon the initial human and financial capital of the venture, it is possible to predict the performance of new ventures with some degree of confidence.

INTRODUCTION

Whereas, in the aggregate, new firms appear to be a vital part of the economy (Birch 1987), the prospects for any individual new firm are uncertain. The failure rate of new firms is high (Shapiro and Giglierano 1982) and many survivors achieve only marginal performance (Reynolds 1987). What is needed by entrepreneurs, their advisors, and those who might commit resources to new ventures is a better understanding of the factors relating to survival and growth. It would be particularly valuable if we could identify performance determinants that are discernible prior to or at the point of start-up, rather than after significant capital has been expended. These determinants may be based, in part, upon the initial resources of the firm. In this study, the resources focused upon are the general background of the entrepreneur, management know-how, specific industry know-how, and financial capital. This study examines the extent to which this initial resource profile can be used to predict the probabilities of different performance outcomes. Three performance outcomes are identified: (1) failure, (2) marginal survival, and (3) high growth.

If a framework can be developed to predict new venture performance before major financial and other investments have been made, it can lead to substantial benefits for entrepreneurs, those who supply resources to them, and for researchers. It may permit identification of "high risk" or "high potential" businesses at an early stage. For unpromising ventures, this assessment may help to prevent losses by suggesting caution, more extensive preparation, and even abortion of venture plans. For businesses that appear to have high growth prospects, it may provide encouragement.

A focus upon initial skill bases and other conditions observable at the birth of a venture may be particularly appropriate, given the extent to which these factors impact how firms evolve. Boeker emphasized that characteristics of founding can imprint an organization's strategy and thus influence its subsequent development. He quoted Kimberly who said, "just as for a child, the conditions under which an organization is born and the course of its development in infancy have important consequences for its later life" (Kimberly 1979; Boeker 1989:490). Initial resources, including the know-how and capital that can be drawn upon, bear upon the range of alternatives that can be considered by the entrepreneur. Thus, initial resources influence strategies, which in turn bear upon the capabilities developed in the young firm. Later competitive positions may be path-dependent, with firms that were unable to pursue desirable early strategies, later finding themselves unable to match those that could (David 1988).

Initial resources may act as a buffer against the liabilities of newness and smallness. New ventures are engaged in a process of experimentation whereby concepts are tested. The new venture does not enjoy the benefits of well established routines and administrative procedures, clearly defined institutional identity, market momentum, or credibility with customers and suppliers (Stinchcombe 1965). The process of experimentation is characterized by iterations of trial and error. Hence, the availability of entrepreneurial preparation, knowledge bases, and financial capital at start-up may influence the venture's ability to withstand unfavorable shocks and undertake corrective actions.

Although we believe that the ability to predict performance outcomes at an early stage holds many benefits, our focus does not imply that actions undertaken after start-up do not bear upon venture performance. Whereas initial resources may predispose ventures to certain paths or equip them with unequal abilities to meet challenges, they do not predetermine this future. Clearly the subsequent unfolding of events, including key decisions, strategies and the management practices of the entrepreneur, will shape the performance of the venture. Note that the focus upon resources discernible before operations have commenced is an especially severe test of whether or not venture performance can be predicted.

We should note that the predictive model specified and tested in this study does not directly examine how particular human and financial capital resources drive performance. Such demographic variables as entrepreneur's education are clearly proxies for underlying forces that may directly influence how a venture is set up and managed. Thus, again using education as an example, we do not know what the individual had studied, how much was learned or retained, or how relevant those studies were to the challenges confronted by the entrepreneur. However, we do suggest that such variables as education may be useful proxies for qualities such as commitment and problem-solving ability. This study does not examine or model the underlying behavior of the entrepreneur. Our intended contribution focuses upon the specification of a predictive model of venture performance that can be used with a high degree of confidence, is generalizable across different types of start-ups, and draws upon data that are easily accessible to the users of this model. To this end, extensive efforts were placed on the research design of this study pertaining to sample selection and the methodologies that were used for model estimation and testing.

Research on Predictors of Organizational Performance

The examination of predictors of new venture performance has been one of the major streams of entrepreneurship research to date. For instance, Cooper and Gimeno-Gascon (1992) reviewed 63 studies that considered such relationships. Fundamental to research on predictors of performance is the assumption that initial resources (including such intangibles as entrepreneurial preparation and the firm's knowledge base) will exert subsequent influence, even though the environment and the firm may continue to change. Firms with stronger resource positions are in a better position to survive environmental shocks and weather bad decisions. Entrepreneurs with stronger preparation and those who can tap into the experience of others are more likely to be able to deal with the problems that arise as their ventures develop, problems that may not even have been foreseen at the time of founding.

Despite the growing body of empirical studies that address venture performance, there is not a clear picture of how initial resources are related to subsequent performance. Findings across studies are difficult to compare and often are inconsistent. (See reviews by Low and MacMillan 1988 and Cooper and Gimeno-Gascon 1992.) There are several possible causes for this. First, there is the wide variation across samples—in venture age, industry sector, and potential. As Gartner (1985) noted, differences among entrepreneurs and among their ventures are as great as the variation between entrepreneurs and nonentrepreneurs and between new firms and established firms. Thus, it may not be surprising that there seems to be little correspondence between the predictors of success for high-growth potential firms and for “mom and pop” businesses.

Second, the lack of consistency across previous studies may also reflect the different ways in which performance has been operationalized, including survival, profits, growth,

absolute size, and subjective assessments. Although there are exceptions (Kalleberg and Leicht 1991), little attention has been devoted to whether or not choice of performance measure makes a difference.

A third problem relates to the analytical methods that have often been used. Earlier studies often utilized cross-tabulations or univariate analysis. It is only recently that much of the research in this young field has utilized the multivariate methods that allow the impact of different factors to be considered jointly.

A fourth problem of comparison arises because much previous research has included variables that can only be observed after start-up. For example, VanderWerf's model (1989) incorporated factors such as decision-making processes, organizational style, and entrepreneurial time allocation. Studies of predictors of performance for new ventures by Reynolds (1987), Stuart and Abetti (1987), Sandberg and Hofer (1987), Romanelli (1989), and Kalleberg and Leicht (1991) were in part based on actions or strategies adopted by ventures after they were started. For these models, the predictive power of only the subset of initial resources can be difficult to establish or separate from the other factors, given the likely collinearity between initial conditions and future behavior.

The work by population ecologists, focusing upon populations of firms, has examined influences upon firm survival. Much of this research has focused upon the impact of such firm characteristics as age and size and such environmental characteristics as population density upon firm survival (Stinchcombe 1965; Carroll and Delacroix 1982). Initial resources have only been examined to a limited degree (Bruderl 1992; Kimberly 1979), with some of this work considering dimensions of strategy (Romanelli 1989). Much of the population ecology stream does not cast light upon how firms that started at the same time or in similar environmental settings may have different prospects for success.

The following discussion will review previous studies for the purpose of developing expected theoretical relationships between particular sets of variables and performance. The study seeks to address some of the specific concerns relating to previous research by: (1) adopting a sampling procedure that controls for age of the venture while giving broad representation to diverse industry sectors; (2) examining explicitly whether the performance measure chosen makes a difference, in this case determining whether variables contributing to marginal survival are the same as those contributing to substantial growth; (3) using appropriate multivariate analytical methods; and (4) focusing upon variables that are discernible only at the time of start-up.

INITIAL HUMAN AND FINANCIAL CAPITAL PREDICTORS

Four categories of initial human and financial capital are considered. Access to general human capital, either in the form of the entrepreneur's own education or as life experiences providing access to general networks, may increase the problem-solving ability of the firm. Examination of general human capital also provides for more controlled evaluation of the effects of specific types of know-how, management-specific and industry-specific. Availability of management know-how (embodied in the entrepreneur or available through advisors or partners) may affect the performance of the firm through more promising strategies or better management methods. However, the value of management know-how depends on the suitability of this generic management know-how to a specific industry. Availability of industry-specific know-how can affect the performance of the venture by providing a tacit understanding of the key success factors in an industry, specialized knowledge of the product or technologies, or

accumulated goodwill with customers and/or suppliers. Finally, the availability of financial capital can affect the performance of the venture by creating a buffer against random shocks and by allowing the pursuit of more capital-intensive strategies, which are better protected from imitation.

In examining the attributes of the entrepreneur, the assumption is that for new, small businesses, the firm is built around the entrepreneur. To the extent that venturing involves extensive experimentation and learning, it could be viewed as a process of interpretation reflecting the idiosyncratic responses of the entrepreneur. Perrow (1970) cautioned against psychological reductionism whereby organization outcomes are attributed to the actions of single individuals. In the venturing context, however, outcomes cannot be understood without explicit attention to the role of the founder. Without the benefit of operating history, repositories of "hard" data, well-developed scanning capabilities, or a large management staff, the task of interpretation falls on the entrepreneur. He or she is most often solely responsible for the process that gives meaning to data, identifies the range of alternatives, determines actions, and carries these out.

Reflecting the central role of entrepreneurs, an extensive body of research has focused on their strengths and weaknesses. In this regard, variables such as education, prior work experience, and family background have often been used as proxies of capability. Similar factors are also incorporated in our model. In the following review, we will provide an overarching statement on each of the selected variables and comment on the consistency and strength of support for each as a predictor of venture performance. We note that empirical findings on the impact of these measures have been mixed and as such, we had to select between competing explanations when stating the directions of influence. For a more extensive review of each study cited in the discussion, we refer the reader to treatises by Cooper and Gimeno-Gascon (1992), Vesper (1980), and Low and MacMillan (1988). In all cases, we are hypothesizing that certain variables will contribute in a similar manner to both the probabilities of marginal survival and of growth. This is because the existing theory is not developed fully enough to predict *a priori* how particular initial resources might differentially impact these separate performance outcomes.

Prior to the discussion of specific variables and corresponding hypotheses, we need to turn our attention momentarily to the definition of performance. In this study, performance of a venture is represented by one of three outcomes: failure, marginal survival, and growth.

The explicit and separate consideration of high growth firms parallels the research of Birch (1987) and Reynolds (1987) who found that a relatively small percentage of new firms, the "gazelles" in Birch's terminology, account for much of the economic impact of new ventures. Entrepreneurship studies have typically used survival or some measure of growth as the performance measure, without explicit examination of whether or not the measure used makes a difference. Much of the new venture literature implicitly assumes that survival and success both reflect the same underlying processes. Although that justification may be appealing, there is some evidence that different factors may play a role in survival than those influencing other measures of success (Kalleberg and Leicht 1991; Carroll and Huo 1986). The current choice of three performance categories is undertaken so that we may model marginal survival and growth as separate processes.

General Background

The first class of initial resource is the availability of general human capital to the venture. The performance of the venture may reflect the higher productivity, problem-solving skills,

and favorable access to networks associated with the general background of the entrepreneur. Three factors are selected to reflect general background: level of education, minority status, and gender. All of these attributes are, of course, quite general and do not represent specific preparation for management responsibilities or for particular lines of business. Education may be somewhat controllable by the individual, but minority status and gender are not. However, all of these may serve as proxies for life experiences and access to networks and other resources that bear upon the prospects for success of individual entrepreneurs.

Education

Education is one of the most widely studied entrepreneurial variables. Presumably education is related to knowledge, skills, problem-solving ability, discipline, motivation, and self-confidence. These may enable the entrepreneur to cope with problems and thereby be more successful. However, it may be that more educated entrepreneurs perceive a higher opportunity cost in staying with a marginal business. This could lead to a higher threshold level of performance in order to stay with a venture and thus a negative or insignificant relationship between education and survival (Cooper et al. 1992). Prior research has found limited, although not uniform, support for the relationship between education and performance. One literature review reported that 10 of 17 earlier studies had found positive relationships between prior level of education and performance (Cooper and Gimeno-Gascon 1992). No studies have reported negative relationships. In this study we hypothesize that level of education is related positively to both probabilities of marginal survival and of growth.

Gender and Race

In regard to the demographic characteristics of gender and race, we might expect women and minority entrepreneurs to have had fewer opportunities to develop relevant experience, to have fewer contacts who can provide assistance, and to have greater difficulty in assembling resources (Sexton and Robinson 1989). Prior findings pertaining to these two variables are again mixed although they were more likely than not to corroborate the previous expectations. For instance, it has been reported that ventures started by minorities were more likely than others to generate lower earnings (Sexton and Robinson 1989). Findings on ventures headed by female entrepreneurs have been mixed, with Sexton and Robinson (1989) reporting poorer performance and Kalleberg and Leicht (1991) finding that businesses headed by women were not more likely to fail or perform poorly. We hypothesize that firms started by women and by minorities will do less well.

The previous discussion pertaining to indicators of general background is summarized in the following hypotheses:

H1: Probabilities of marginal survival and growth increase with levels of education.

H2: Probabilities of marginal survival and growth are lower for female entrepreneurs.

H3: Probabilities of marginal survival and growth are lower for minority entrepreneurs.

Management Know-How

Management know-how, embodied in the entrepreneur or available to the venture from other sources, can be one of the central resources of a new venture. Knowledge of how to manage a business enterprise is mostly tacit and is commonly acquired by substantial investment of

time in observing, studying, and making business decisions. A new venture can increase its chances of success by having this management know-how available through the involvement of people that embody this tacit knowledge. Management know-how embodied in the entrepreneur may result from having had parents who owned a business, from work experience in a business organization (rather than a non-profit organization or not having been in the labor force), and from previous management experience. In addition, management know-how may be obtained through use of professional advisors or from involvement of partners.

Parents Who Owned Businesses

A number of studies have noted that entrepreneurs are more likely to be from families in which the parents owned a business. It has been reasoned that individuals growing up in such families see parents as role models and that entrepreneurship is perceived as a viable career. Furthermore, growing up in such families, a young person develops knowledge of what is involved in running a business, a valuable background for future entrepreneurs (Duchesneau and Gartner 1988). They may thus be more aware of the challenges they will face and be better prepared and less disheartened when those problems arise. In this study, we hypothesize that entrepreneurs coming from families where the parents owned a business should do better.

Non-Profit Organization

The organization where the entrepreneur was located just prior to starting a firm might be viewed as an "incubator" where a number of valuable experiences take place (Cooper 1985). In this setting the entrepreneur can develop contacts and learn relevant managerial and technical skills. In terms of prior organization, entrepreneurs who have not been in the labor force or who have left non-profit organizations may have had little opportunity to observe or develop experiences directly relevant to managing a business. They would have had less exposure to what is involved in running a business, thereby making it more difficult for them to anticipate the nature and magnitude of potential challenges. Although the literature has not yielded any empirical observations on this dimension, we hypothesize that entrepreneurs with this background are less likely to do well.

Level of Management Experience

We would expect that level of prior management experience would be relevant, so that those who had supervised managers or managed a business prior to launching the current venture should do better. Their breadth of experience would better prepare them for the wide range of problems confronting new ventures. Management experience may also provide the opportunity to cultivate skills for monitoring diverse functions and interacting with different constituents and to develop contacts with potential customers and suppliers. Similar to education, management level may also serve as a proxy for greater motivation and aptitude for solving problems. On the other hand, greater management experience may lead entrepreneurs to perceive greater opportunity costs associated with marginal businesses. This could lead to negative or insignificant relationships with survival. Prior studies are difficult to compare because of differences in how management experience was operationalized. Empirical findings have generally been mixed. Some have shown positive relationships (Teach et al. 1986) and others, no significant relationships to performance (Sandberg and Hofer 1987).

Despite the inconsistency of prior findings, we hypothesize that level of management experience would be positively related to performance.

Use of Professional Advisors

Expertise can also become available through professional advisors such as lawyers, bankers, and accountants. In general, access to information networks provides specific data and encouragement, and also helps to identify blind spots. The act of seeking information may also reflect more comprehensive planning, a higher degree of managerial sophistication, and the start-up of larger, more promising ventures (Aldrich et al. 1987). Those who utilize professional advisors may also have access to more financial resources. Reliance upon different sources of professional assistance has been investigated in several studies. Use of accountants has been associated with better performance (O'Neill and Duker 1986), and use of outside advisors with greater success (Hay and Ross 1989). Time devoted to developing networks and to non-customer external contacts has also been found to be related to performance (Aldrich et al. 1987; Dollinger 1985). We hypothesize a positive relationship between use of professional advisors and performance.

Partners

The presence of partners leads to a greater breadth and depth of expertise. Resource-dependence theory suggests that partners can be viewed as means to add to the resource and skill bases of the venture. Partners may also enhance the credibility of the venture to potential lenders and other constituents (Eisenhardt and Schoonhoven 1990; Teach et al. 1986). Both the presence or absence of a team and the number of team members have been examined. Four out of five previous studies (Cooper and Gimeno-Gascon 1992) reported that firms started by teams did better than those started by single founders. A number of studies examined the number of principals and found evidence that larger teams did better.

Pertaining to management know-how, the following hypotheses are stated:

H4: Probabilities of marginal survival and growth are higher for entrepreneurs whose parents have owned a small business.

H5: Probabilities of marginal survival and growth are lower for entrepreneurs who were not in the workforce or who left non-profit institutions prior to starting the venture.

H6: Probabilities of marginal survival and growth increase with higher levels of management experience.

H7: Probabilities of marginal survival and growth are higher for ventures making greater use of professional advisors.

H8: Probabilities of marginal survival and growth are higher for ventures with partners.

Specific Industry Know-How

The third class of human capital considered here refers to the availability of know-how specific to the industry or line of business of the venture. This know-how grows out of previous experiences in the same or similar business, and ranges from tacit knowledge of the products, processes, and technology to specific human capital investment in relationships and goodwill with specific customers, suppliers, or stakeholders. This specific investment is costly to build from scratch and cannot be transferred independently of the people in whom

it is embodied. The lack of this industry-specific know-how is a major determinant of the "liability of newness," which presumably arises because of a lack of stable supplier and customer relationships, inadequately developed internal processes, and problems in acquiring resources (Stinchcombe 1965). Thus, entrepreneurs who come from similar businesses may bring with them directly relevant knowledge bases, experiences, and relationships that significantly reduce the liability of newness.

Business Similarity

Entrepreneurs starting businesses closely related to what they did in the past would have acquired repertoires of pertinent skills or the appropriate "prior mental programming" (Vesper 1980). Furthermore, such entrepreneurs are more likely to have developed networks of relationships with suppliers, distributors, and customers. These would give them credibility and enhance their ability to obtain credit, develop sales, and achieve other forms of cooperation. In previous research, higher performance was found when the new venture was related in products offered (in five of seven studies) and in markets served (in two of four studies) (Cooper and Gimeno-Gascon 1992). Note that "business similarity" implies knowledge and capabilities more specific to a particular market and task environment than that gained from having come from a business organization, the previous variable considered. We hypothesize a positive relationship between similarity to prior organization and performance.

H9: Probabilities of marginal survival and growth are higher for ventures similar to the previous organizations of the entrepreneur.

Financial Capital

The amount of capital raised should be positively associated with venture survival. There is a long tradition of studying the financing of new firms, a part of the entrepreneurial process that is clearly central to the assembly of resources. The amount of initial capital is related to the initial strategy that might be pursued. For instance, more initial capital permits a retail store to carry a broader mix of merchandise or a high technology firm to undertake more ambitious projects. More initial capital also buys time, while the entrepreneur learns or overcomes problems. Cooper and Gimeno-Gascon (1992) reported that, of eight prior studies that examined relationships between initial capital and performance, six found that more capital was associated with better performance. The hypothesis thus states:

H10: Probabilities of marginal survival and growth increase with the level of initial capital.

Control Variable: Industry Sector

In addition to the initial human and financial capital variables discussed previously, we also consider industry sector to be a control variable. Previous studies of new firm performance have found substantial differences by industry, with retail firms having the highest discontinuance rates (Reynolds 1987). Humphreys and McClung (1981) also suggested that retail and service sectors may have lower success because of greater competition and higher labor intensity characterizing such businesses. As such, we would expect new ventures in retail and personal services to do less well. The final hypothesis states:

H11: Probabilities of marginal survival and growth are lower for ventures in the retail and personal services sectors.

Definitions of the variables and their hypothesized influence on performance are summarized in Table 1.¹

METHOD

Sample

The sample is a study of 2994 entrepreneurs and their firms tracked over a 3-year period. In May 1985, approximately 13,000 questionnaires were distributed to members of the National Federation of Independent Businesses (NFIB) who reported that they had recently become business owners.² Responses were obtained from 4814 entrepreneurs, of whom 2994 were found to have become owners during the preceding 17 months. The study focuses upon these 2994 entrepreneurs and their firms.³ At the time of the first questionnaire, the average entrepreneur had been in business for 11 months. The sample represented all industries and all geographic areas of the United States. Although retail businesses and businesses in the western United States seem slightly overrepresented, it appears to be broadly representative of full-time new businesses in the United States.⁴

The reporting firms were sent follow-up questionnaires in May 1986 and May 1987. Multiple venues were used to track the status of non-respondents.⁵ The surveys, short-response postcards, checks of NFIB membership lists, and post-office return mail enabled us to determine for all but one of the 2994 ventures whether they had failed, been sold, or survived during the study period.

¹ In cases when levels of the independent variables were compressed for analyses, sensitivity tests were conducted to evaluate the impact of different operationalizations on the results. All tests pertaining to the following variables—education, management level, and prior organization—yielded no significant effects.

² The survey was initially field-tested with members of NFIB. Based upon 154 responses (from members who completed questionnaires and made suggestions), several questions were reworded to provide greater clarity. The data from the field-test were not pooled with those from this study.

³ The decision was made to focus upon businesses which, on the average, were nearing completion of their first year of business. Such businesses were sufficiently well-established to be well-represented in NFIB membership lists, but were young enough so that founding characteristics would be fresh in the minds of the founders. With a cut-off start-up date of January 1984 (17 months prior to the first questionnaire), there were 2994 firms in the sample (mean age of 11 months, with a range from 1 to 17 months). Sample characteristics were examined to determine their sensitivity to alternative cut-off points of 12 months, 17 months, and 22 months. Of the 11 variables considered in this analysis, only one (industry sector) showed sensitivity to the cut-off point using a confidence level of 0.01. The proportion of new ventures in the services and retailing sectors did drop significantly as we included older ventures in the sample.

⁴ The sample was compared with a special tabulation run by the Bureau of the Census using data from the 1982 *Characteristics of Business Owners*. The tabulation included only those firms formed in 1980 through 1982 and eliminated those with owners who worked in the business 20 hours per week or less and grossed less than \$25,000 annually. (The 1982 CBO excluded corporations except for S corporations.) The sample was also compared with data from the *Statistics of Income, 1985*, published annually by the Internal Revenue Service and based upon income tax filings. As many of these tax-paying entities are part-time activities, the sample data were compared with all corporations, partnerships, and proprietorships annually grossing more than \$25,000. The sample was also compared with data from *Dun's Business Starts, 1984*, which measures establishment openings, regardless of whether or not they are independent businesses.

The detailed results of these comparisons are reported in Cooper, Dunkelberg, Woo, and Dennis (1990:64–67). Based upon these comparisons, this sample appears to have a slight western geographic bias and a higher percentage of retail firms. Overall, it seems broadly representative of new businesses in the United States.

⁵ Non-response firms were tracked in three ways. Those who failed to return the second-year survey were sent a letter with an enclosed postcard to be returned, indicating whether they were still in business, were out of business, or had sold their firms. Secondly, those for whom the post office was unable to deliver the letter with enclosed postcard were classified as discontinued (failed). Finally, the NFIB membership records were used to classify the remaining firms. A similar approach was used to determine the status of these firms as of May 1987.

TABLE 1 Definition of Variables and Hypothesized Directions**Dependent Variables:**

Y_f =	1 if venture survived, 0 otherwise.
Y_s =	1 if the venture survived but was not classified as a 'growth firm' (i.e., it had grown less than 50% in relative employment, or added less than 2 employees) 0 otherwise.
Y_g =	1 if venture grew more than 50% in relative employment and it had added more than two employees, 0 otherwise.

Independent Variables:

EDUCATION = (+)	1 if entrepreneur had at least a bachelor's degree, 0 otherwise.
GENDER = (+)	1 if male 0 if otherwise
RACE = (+)	1 if entrepreneur was not a federally defined minority, 0 otherwise.
PARENTS = (+)	1 if entrepreneur's parents had owned a business, 0 otherwise.
NON-PROFIT = (-)	1 if before starting venture, entrepreneur worked for a non-profit organization or was not in the labor force, 0 otherwise.
MGMT = (+)	1 if highest level of management before going into venture was "supervising one or more managers"; 0 otherwise.
PROFAD =	index of use of professional advisors. Three four-point scales were used to determine relative importance of information sources. Scores were summed to develop an index of use (3 = not used, 12 = very important); (Cronbach's alpha = 0.8618).
PARTN = (+)	number of full-time partners.
SIMILAR = (+)	index of similarity to previous organization in products or services. Three five-point scales were used to determine similarity in services, in customers, and in suppliers. Scores were summed to develop an index of similarity (3 = very different; 15 = no difference); (Cronbach's alpha = 0.6228).
CAPITAL = (+)	total amount of capital invested (hundreds of thousands) by the time of first sale.
IND = (-)	1 if major business activity is retail or personal services, 0 otherwise.

Note: (): Hypothesized directions.

For the firms that survived and also returned survey responses in the third year, growth in the number of employees could be determined. After elimination of ventures for which there were missing values pertaining to resource variables, the working sample was reduced to 1053 for this study (385 failed firms and 668 surviving and reporting firms). Firms were excluded when there were incomplete data on the independent variables or the growth rates of surviving firms could not be determined because the third questionnaire was not returned.⁶

⁶ The sample of 1053 firms was compared with the 1941 firms that were excluded for the reasons indicated. The two groups were compared in regard to the 11 independent variables that are the focus of this research. There were no significant differences (at the .05 level) for these variables.

Variables

In this study, performance is operationalized as a qualitative dependent variable with three mutually exclusive categories: failure, marginal survival (survived with low growth), and growth. Firms that were sold (4.5% of the original sample) were excluded from this study. Some of the businesses may have been sold as they approached failure, whereas others may have been flourishing. Because we were unable to draw these distinctions with the data available, sold businesses were excluded from the analysis. Growth in employment was the performance measure used. It has the advantage of being a measure of economic contribution, and is usually not regarded as confidential information. It is not sensitive to decisions about owner's salary (as would be the case for profits), nor does it depend upon the owner's ability to estimate full-year performance in the middle of the year (as would be the case for annual sales). A venture was placed in the growth category if it achieved at least 50% growth in employment as well as added at least two employees. Many combinations of the two dimensions (percentage and absolute growth in employment) were evaluated to test the effect of alternative cut-off values. The chosen combination met two a priori requirements: (1) it was not sensitive to initial size of the venture so that growth was not a function of size,⁷ and (2) the combination demonstrated nominal validity so that the growth category incorporated only those new ventures that had achieved substantial expansion. A firm was placed in the marginal survival category if it did not discontinue and did not meet the criteria of the growth category.

METHODOLOGY AND FINDINGS

Given the qualitative nature of the dependent variable, two generic statistical approaches are available: discriminant analysis and logistic regression. The latter was selected because it is more robust to the violation of the normality assumption relating to categorical explanatory variables (Maddala 1983). Specifically, we employed the multinomial logit model (MNL), an extension of the common binary logit model when the dependent variable is represented by more than two categories.

For each venture (n), performance (Y_n) was represented by a set of three dummy variables that captured the observed outcome of the venture. For each venture, only one of the three dummy variables can be equal to 1. Y_n is defined as follows:

$Y_{nf} = 1$ if venture failed, $= 0$ otherwise;

$Y_{ns} = 1$ if venture survived but did not grow, $= 0$ otherwise;

$Y_{ng} = 1$ if venture grew, $= 0$ otherwise.

Corresponding probabilities for each respective outcome can be represented as:

$P_{nf} = P [Y_{nf} = 1],$

$P_{ns} = P [Y_{ns} = 1],$ and

$P_{ng} = P [Y_{ng} = 1].$

⁷ If the growth measure had been "percent growth in number of employees," the model would have been biased toward the smaller firms in the sample, with firms which initially had only one or two employees being much more likely to show large percentage increases. If the growth measure had been "growth in absolute number of employees," the measure would have been biased toward firms that were initially larger. Hence, a combination of both was used to minimize this bias.

The summation of P_{nf} , P_{ns} , and P_{ng} equals 1. The MNL model determines these probabilities as a function of the observed independent variables and their estimated coefficients, according to the following equation:

$$P_{ni} = \frac{\exp(V_{ni})}{\exp(V_{nf}) + \exp(V_{ns}) + \exp(V_{ng})} \quad i = f, s, g$$

where

$$V_{ns} = a_s + b_s x_n$$

$$V_{ng} = a_g + b_g x_n$$

$V_{nf} = 0$ (Parameters of V_{nf} (a_f and b_f) are normalized to zero so that a unique solution exists.)

The x 's represent the vector of explanatory variables denoting the initial conditions of the venture. The vector coefficients of the MNL model represent the marginal effect of an explanatory variable on the logarithm of the odds-ratio of that outcome to the normalized outcome—failure. As such, the coefficients in the MNL should be interpreted as describing the effect of the explanatory variables on the probability of a particular outcome (marginal survival or growth) relative to the probability of failure. The coefficients do not represent any *absolute* effect on the probability of that outcome.⁸

Table 2 provides means, standard deviations, and correlation coefficients for the variables used in the models. Correlations between explanatory variables do not exceed an absolute level of 0.26. Hence, multicollinearity is not a problem in this study. The MNL model was estimated by maximum likelihood using LIMDEP; results are given in Table 3.

Two vectors of coefficients (standard errors and corresponding significance) are reported in Table 3. The vector b_s represents incremental effects of the explanatory variables in the prediction of marginal survival over the normalized outcome, failure. The second vector is associated with the growth equation. Thus, we examine how each of the initial condition variables contributes to predicting whether a venture will be in the marginal survival or growth categories. Hypothesis testing was conducted by (1) examining significance of individual parameters, and (2) evaluating goodness-of-fit of the full model.⁹

A critical assumption of the MNL model is the property of independence of irrelevant alternatives (IIA). Stated succinctly, the IIA property holds that the disturbances (representing the unobserved factors that affect each of the three alternatives) are mutually independent (Ben-Akiva and Lerman 1985). Therefore, it is critical to test for significant violations of the IIA property. For this purpose, the McFadden, Tye, and Train (1976) test and the Small and Hsiao (1985) test were used. Both tests showed that the property was not violated in this study.

⁸ The absolute effect of a resource variable on a given outcome probability can be measured by the disaggregate elasticity, which represents the responsiveness of a particular individual's outcome probability to a change in the value of the same resource variable. Disaggregate elasticities can then be averaged across individuals into aggregate elasticities. Aggregate elasticities of the probabilities of failure, marginal survival, and growth with respect to all resource variables are available from the authors.

⁹ Because the sample included not only start-ups (63%), but also firms that had been purchased or inherited, it was necessary to determine whether pooling these firms together was appropriate. Separate models for "started" versus "non-started" firms were developed and compared; a likelihood ratio test showed that the samples could be pooled at or below the $\alpha = 0.1$ level of confidence.

TABLE 2 Correlation Coefficients

	Means	SD	Education	Gender	Race	Parents	Non-profit	Mgmt	Profad	Parm	Similar	Capital	Ind
Education	0.27	0.44											
Gender	0.79	0.41	.07 ^a										
Race	0.92	0.27	.03	.11 ^b									
Parents	0.44	0.50	.04	.00	.07 ^a								
Non-profit	0.09	0.29	.16 ^b	-.08 ^b	-.04	-.01							
Mgmt	0.12	0.32	.12 ^b	.06 ^a	.00	-.06	-.03						
Profad	7.80	2.65	-.02	-.02	-.03	.00	-.04	.01					
Parm	0.44	0.83	.04	.04	-.03	.00	.00	.11 ^b	.12 ^b				
Similar	8.85	4.52	-.06 ^a	.13 ^b	.01	.01	-.20 ^b	-.02	.11 ^b	.03			
Capital	0.48	0.76	.17 ^b	.11 ^b	.06	-.03	-.02	.20 ^b	.20 ^b	.16 ^b	.01		
Ind	0.64	0.48	-.16 ^b	-.15 ^b	-.05	-.07 ^a	.03	-.03	-.03	-.06 ^a	-.26 ^b	-.01	

^a $\alpha < 0.05$.
^b $\alpha < 0.01$ (two-tailed).

TABLE 3 Resource-based Model of New Venture Survival and Growth

	Vector of coefficients associated with "failure" (normalized to zero)	Vector of coefficients associated with "marginal survival" bs	Vector of coefficients associated with "growth" bg	Test of H: bs = bg t-values
Constant	0	-1.57888 ^d (0.41058)	-3.56544 ^d (0.71360)	2.8313 ^c
Education	0	0.704665 ^d (0.17410)	0.459392 ^a (0.24645)	1.1096
Gender	0	0.22150 (0.16979)	0.88629 ^c (0.32395)	-2.0802 ^b
Race	0	0.541276 ^b (0.25680)	1.03133 ^b (0.49978)	-0.9830
Parents	0	0.428887 ^c (0.14223)	0.14026 (0.20988)	1.4670
Nonprofit	0	0.40603 (0.25484)	-0.21398 (0.45781)	1.4377
Mgmt.	0	-0.20856 (0.22637)	-0.23805 (0.32588)	0.0961
Profad	0	0.04792 ^a (0.02739)	0.06453 (0.04069)	-0.4316
Partn	0	-0.02802 (0.09231)	0.226537 ^b (0.11552)	-2.4733 ^b
Similar	0	0.05131 ^c (0.01655)	0.06141 ^b (0.02469)	-0.4304
Capital	0	0.47652 ^d (0.13243)	0.37797 ^b (0.16325)	0.8059
Ind	0	-0.22478 (0.15845)	-1.03064 ^d (0.22051)	3.9072 ^d

Note: () asymptotic standard deviations.

Significance levels: ^a ($\alpha < .10$); ^b ($\alpha < 0.05$); ^c ($\alpha < 0.01$); ^d ($\alpha < .001$).

Examination of Individual Parameters

To assess the significance of the two vectors of coefficients (b_s and b_g), we used t -tests based on asymptotic standard deviations generated through maximum likelihood estimation.¹⁰ Resources that were statistically significant for marginal survival (vector b_s) included education, minority status, parents who had started ventures, experience in similar business, capital, and use of professional advisors (.10 level). Contributing to growth were education (.10 level), gender and minority status, experience in similar business, partners, capital, and

¹⁰ The use of asymptotic standard deviations can be problematic when the sample size is small. In order to assess the validity of these asymptotic standard deviations and t -tests, a bootstrapping technique was used that draws several subsamples from the original sample and uses them to approximate the real distribution of the coefficients (Efron 1979). Sixty bootstrap samples, each with 1053 observations, were generated. Bootstrap estimates of the coefficients and their standard deviations were compared to their MLE counterparts. Although the bootstrap standard deviations were in general larger than the MLE standard deviations, differences were not large.

industry sector. Coefficient directions in both functions were consistent with predictions in Table 1. The last column of Table 3 examines the differences between b_s and b_g . Except for gender, number of partners and industry sector, no significant differences between the two vectors were observed for all other variables. Hence, most resource variables appeared not to demonstrate differential impacts on whether a venture marginally survived or grew.

Goodness-of-Fit Tests

Significance of the model is usually measured with likelihood ratio tests calculated from comparisons of the proposed model with "naive" models. With MNL, there are two naive models (Ben-Akiva and Lerman 1985): one assigns to each venture equal probabilities of failure, survival, and growth, whereas the other assigns to each of the three outcomes, probabilities equal to the actual observed proportions (in our sample, .3656, .5005, and .1339, respectively). Based on the likelihood ratio tests, the χ^2 values from the comparisons of the proposed model with the two naive models were 389.1 and 146.8 ($p = .000$). Hence the current model was significantly more powerful than both naive models.

Having established the statistical significance of the model, the next step is to assess the model's predictive power. The evaluation of that predictive power is hindered by two characteristics of the model. First, the initial probabilities of the outcomes are quite dissimilar, with low probabilities for some outcomes and higher probabilities for others. Despite the high rates of failure, sample outcomes are still dominated by businesses that marginally survived. In this study, the proportions of firms that failed, marginally survived, and grew substantially were 0.3656, 0.5005, and 0.1339 respectively. The challenge for modeling is that a simple rule of assigning all ventures to the dominant category (marginally survived) would lead to correct classification of 50.05% of the cases and exceed the performance of most empirical models on entrepreneurial outcomes.

The second concern pertains specifically to the stochastic or highly random nature of the entrepreneurial process. The twists and turns taken by organizations are to some degree shaped by the occurrence of unexpected, nonrecurring or, otherwise termed, random events. The success and survival of new ventures, relative to established firms, are even more significantly dominated by these events. The thin resource base of the new venture makes it constrained in its ability to respond to surprises. This lack of flexibility magnifies its vulnerability to events that diminish market opportunities or increase competitive pressures. In addition, a venture pivots around the founder as its key provider of skills, capital, interpretation, and direction. As such, random events that enter into the life of the entrepreneur (such as health and family problems) are also likely to affect the venture. Finally, considering that the new venture will operate in uncharted waters, most of the events, even those indigenous to the structural environment, are probably new, surprising, and unanticipated for that firm. The impact of these random events renders it difficult to pinpoint the exact outcome for each individual venture.

These characteristics make our research similar to those studies in epidemiology that attempt to find characteristics which predict the occurrence of a disease. In such cases, the dominant proportion of the population does not contract the disease and hence naive classification rules based on assignment of individuals to the healthy category will outperform most models. Secondly, even individuals who demonstrate all the characteristics as specified by the model may or may not have the disease during the period of the study. In such cases, the practice is not to specify the actual occurrence of an outcome but the probability associated with the outcome. For example, predictions are made regarding the probability of survival for such a patient within a certain period of time.

We find the study of entrepreneurial ventures to be analogous to the modeling of these problems in the field of epidemiology. Thus, we turn to the latter for the tests of predictive power that accommodate the special characteristics of our model. One approach, known as "deciles of risk" (Truett, Cornfield, and Kannell 1967), groups observations that have similar estimated probabilities of occurrence of a disease. The procedure compares the estimated probability with the actual proportion of occurrences within each subgroup. This approach has several advantages: (1) it measures the fit of the model to the data much like in regression analysis, rather than comparing predictions from two models, as in likelihood ratios; (2) it is easy to assess the goodness-of-fit with the χ^2 test (Hosmer and Lemeshow 1989); and (3) it can be put in graphic form, making its interpretation much easier.

For example, to calculate the test measures for the failure outcome, observations were ranked by their estimated probabilities of failure and placed in 30 groups with equal membership. Thus, the first group was made up of those ventures that were least likely to fail, based upon the model, and the 30th group was made up of those ventures with the highest predicted probability of failure. For each group, we computed the estimated and actual number of failures. A χ^2 test was then used to evaluate the fit between both series (Hosmer and Lemeshow 1980). A similar procedure was used to evaluate the predictive power associated with the other two outcomes: marginal survival and growth. Table 4 illustrates, through graphs, the actual and predicted probabilities for each outcome. The χ^2 tests between the series indicate that equality between predicted probabilities and actual proportions cannot be rejected at any common level of significance. The probabilities that the observed differences between predicted and actual proportions were caused by random error, rather than by real underlying differences, were 0.98, 0.99, and 0.99 for failure, survived, and growth outcomes, respectively. This analysis shows that the model is able to predict, with a high degree of accuracy, the probabilities of the three outcomes.

A further assessment of predictive power can be provided with the use of a holdout sample. A subsample of 300 randomly selected observations was extracted from the sample, and the model was estimated with the remaining 753 observations. From the results of this reduced model we calculated probabilities of failure, survival, and growth for each holdout observation. Predictive power of the model as applied to the holdout sample was assessed by comparing the estimated number of outcomes in each category with the actual outcomes (Ben-Akiva and Lerman 1985). The estimated number of cases for each outcome was very close to the actual number of cases (failure : 101.48 versus 111; survived : 156.13 versus 150; and growth : 42.39 versus 39). Hence, we failed to find any significant differences between the expected and observed numbers of cases of failure, marginal survival, and growth (two-sided *p*-values of .2542, .4778, and .5620, respectively).

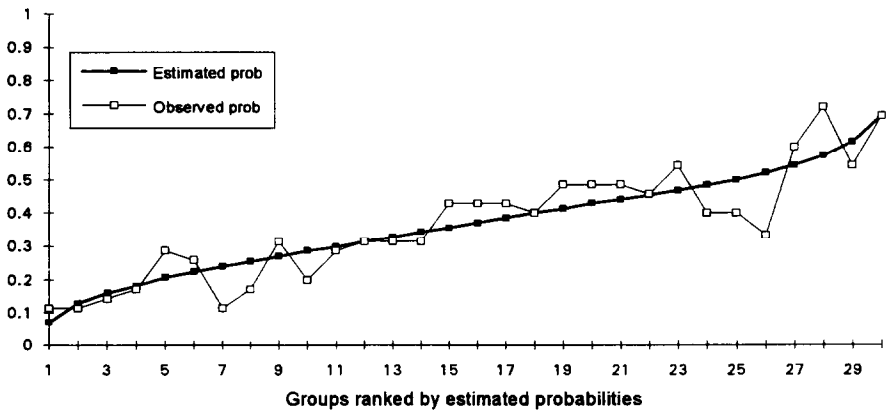
DISCUSSION OF RESULTS

Using a model based upon the initial human and financial capital of the venture, it appears possible to predict the performance of new businesses with some degree of confidence. Moreover, we found survival and growth to be governed by similar stochastic processes, with only a few variables demonstrating a strong differential impact. We believe this is one of the first studies to examine explicitly whether or not there are such differences.

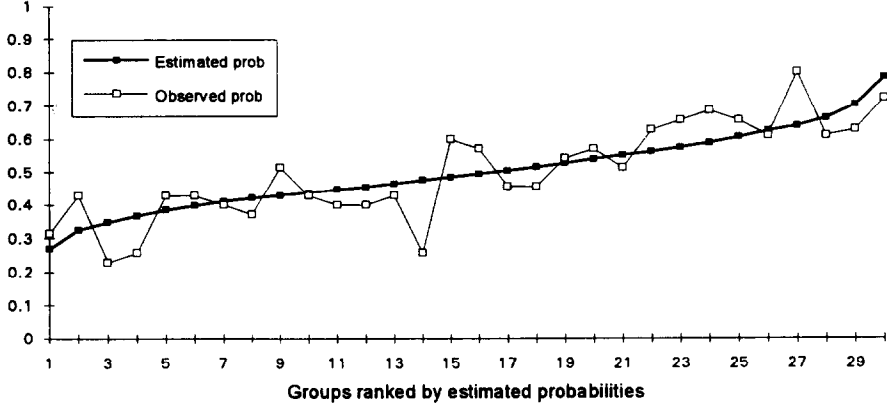
In terms of factors that contributed to the prediction of venture performance, all variables that were statistically significant supported the directions of influence as specified in the hypotheses.

TABLE 4 Comparison of Estimated Probabilities and Actual Proportions Related to the Three Performance Outcomes

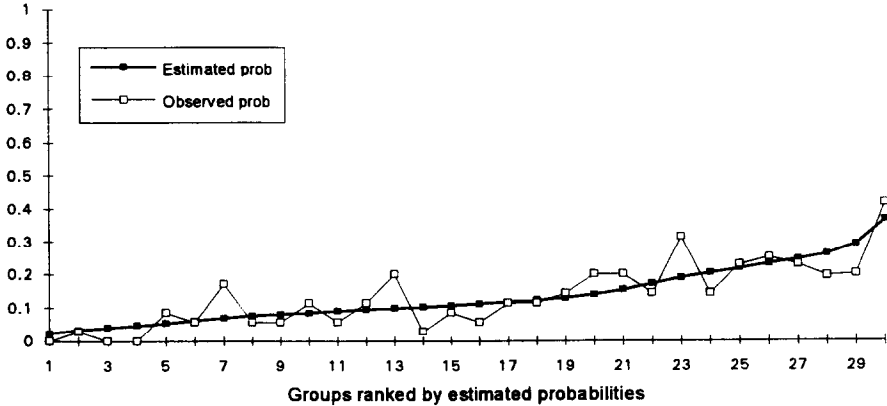
A. Estimated and Observed Probabilities for Failure



B. Estimated and Observed Probabilities for Marginal Survival



C. Estimated and Observed Probabilities for Growth



General Background

Overall, performance appeared to be enhanced by level of education. A higher level of education may lead to problem-solving skills and also reflect certain qualities of "stick-to-it-ness" through a combination of commitment, motivation, and discipline. Whereas such characteristics may merely lead the entrepreneur to hang on (despite poor results), this study showed that beyond tenacity, there was a suggestion that education might contribute to both marginal survival and achieving high growth performance (significant only at the .10 level).

Racial minority was linked to lower probabilities of both marginal survival and growth. In addition to the factors considered in this study, it has been suggested that poor location and limited access to the general market contribute to poorer performance for minority-owned businesses (America 1980). We might also note that minorities may have fewer business contacts and more difficulty in obtaining insurance, credit from suppliers, and access to prosperous customers.

Gender was significant only in the growth equation. High growth is clearly a more demanding process than marginal survival. The latter is as likely to reflect idiosyncratic choices (e.g., personal attachment to the venture) as superior economic potential. This may be particularly true when focusing upon the initial 3 years of the venture and not the later years, when economic realities may play a stronger role. In contrast, high growth indicates a certain ability to withstand the test of the market through effective choices and execution and also requires the ability to finance that growth. There is some evidence that banks may impose more stringent requirements on women business owners in regard to collateral for loans (Riding and Swift 1990). Such requirements could be one factor limiting the growth of these firms. It has also been reported that women owners are more likely to pursue other goals beside the economic goals emphasized by many male-owned firms (Brush 1992). Male entrepreneurs may be better positioned within networks and thus may benefit from improved access to suppliers and customers. They may also be more likely to start growth-oriented ventures.

Overall, the variables representing general human capital and background appear to be significantly related, although in different degrees, to both marginal survival and growth. This significance reinforces the general character of these variables. It appears that general human capital is as well rewarded in self-employment in new ventures (through higher rates of survival and growth) as it is rewarded in other alternative uses (such as employment in established firms). Similar significant findings of the effects of general human capital on new venture success were reported by Bruderl et al. (1992) in their study of German new firms.

Management Know-How

Having parents who had owned a business contributed to marginal survival, but not to growth. The dynamics behind this finding are not clear. It could be that such a background prepares the entrepreneurs to expect difficulties. As such, they may be less disheartened in the face of unfavorable shocks. They may be more committed to venturing as a career path and may hang on longer before seeking out other options. They may be satisfied with lifestyle businesses that do not experience much growth. Although such role-modeling may instill a certain perspective and tenacity, it may not provide the industry-specific skills and contacts contributing to growth. It should be noted that this finding contrasts with the Bruderl et al. (1990) study, which found that having a self-employed father did not increase survival prospects.

The number of partners emerged as a significant contributor to achieving high growth. Reiterating the reason cited earlier, high growth would be more difficult to attain and more dependent on the availability of resources and know-how. Benefits associated with the presence of partners include capital, functional expertise, and a broader range of management experience. There may also be benefits from the psychological support they can provide each other and from the lessened reliance upon a single entrepreneur's drive and judgment. These ventures are probably more sophisticated and larger in nature (Cooper, Woo, and Dunkelberg 1989). The formation of such a team may also subject the start-up process to more extensive planning, evaluation, and refinement. Interestingly, the probability of marginal survival was not increased, possibly reflecting the break-up of some partnerships because of disagreements. It has been noted that partnership team often do break up and that, when this happens, the survival of the business may be threatened (Thurston 1986).

Three variables, all under the category of management know-how, did not contribute significantly to either marginal survival or growth. They were: management level, prior employment in non-profit organization/not having been in the labor force, and use of professional advisors (significant at the .10 level for marginal survival). The findings relating to previous management level and use of professional advisors were surprising, although the latter approached significance for firms achieving marginal survival. It may be that these variables have their greatest impact on larger scale ventures than those studied here. The non-profit or not-in-the-labor-force background variable had not been investigated previously. It may be that there are few advantages to be gained from simply having been in a business context, without regard to the position held or the degree of relatedness to the new venture.

Overall, these results point toward the possibility that management know-how per se has a weak direct effect on the performance of a new venture. Again, this agrees with the Bruderl et al. (1992) findings that neither self-employment, nor leadership experience, nor a self-employed father had a significant effect on the odds of survival. Two possible explanations can be proposed. First, it may be that the only effect of management know-how on venture performance comes from the enhanced ability of firms rich in management know-how to raise initial financial capital for the business. Table 2 shows that higher initial capital is associated with higher management know-how available to the firm (in the form of management experience, use of professional advisors, and involvement of partners). Second, management know-how acquired in an industry may not be generally transferable to other industries or lines of businesses. In any case, the recurrent finding of the insignificant effect of management know-how on venture performance raises important theoretical questions to be explored by future research.

Specific Industry Know-How

Business similarity turned out to be a significant determinant of both marginal survival and growth. The experience and contacts developed in a similar business may lessen the liability of newness of the new venture, leading to less "trial and error" as the venture gets started. It also represents a key resource for enhancing high growth.

These results substantiate the finding by Bruderl et al. (1992) of a strongly significant effect of industry-specific experience on venture survival. When considering these results with the previous findings about management know-how, both Bruderl et al. (1992) and this study find that industry-specific human capital is a strong predictor of future success, whereas general management experience (defined as know-how in the role of managing a business, independent of the industry of application) is weakly or not related to success.

Financial Capital

The level of capitalization also contributed to marginal survival and growth. Capital may influence performance through both direct and indirect effects. Direct effects include the ability to buy time, undertake more ambitious strategies, change courses of actions, and meet the financing demands imposed by growth. In terms of indirect effects, capital accumulation may reflect better training and more extensive planning. Such ventures may also be more promising propositions that passed the screening of lenders and investors.

Control Variable: Industry Sector

Industry sector was only significant in the growth equation. This variable is uniquely important for attaining high growth. In this study, probability of growth tended to be higher in businesses that were not in the retail and personal services sectors. This finding is consistent both with our hypothesis and findings from earlier studies. Start-up barriers may be lower in retail and personal services and these sectors may be characterized by more intense competitive pressures. Along the same line, such businesses are less likely to possess unique capabilities or contacts that render imitation difficult. In contrast, participation in industrial businesses or professional services may be highly dependent on very specific sets of capabilities or requirements developed through prior experience or education.

In sum, of the set of hypotheses on venture performance, support is established for education (H1), gender (H2), not being a racial minority (H3), parents who owned a business (H4), number of partners (H8), experience in a similar field (H9), capital (H10), and industry sector (H11).

It appears that groups such as minority entrepreneurs and female entrepreneurs do less well. However, the use of multivariate methodology allows us to gain insight into the reasons for these results. First, the weaker performance of these businesses is explained by other variables incorporated in this study. Note in the correlation matrix (Table 2) that women are more likely to come from non-profit organizations, less likely to start similar ventures, likely to start with less capital, and more likely to be in retail or personal services. Note also that minority founders in this sample were less likely to be male and to have had parents who owned a business. Second, even after controlling for differences in know-how, capital, and industry, the multivariate analysis shows that businesses headed by minorities and females were still performing poorly. Although the results would suggest that there exists a direct effect between gender, race, and performance, there is no established theory or consistent prior empirical evidence to suggest that minorities and female entrepreneurs are inherently less promising. It is possible that other factors not captured in our multivariate model, such as access to networks or economic activity in the geographic markets served may lie behind the lower performance outcomes. Much more research is needed in this area to identify the unobserved factors that contribute to the less successful performance of minority and female entrepreneurs.

Using the model to group ventures according to their predicted probabilities of failure, survival, or growth, we found that within each group the actual proportions pertaining to these outcomes corresponded well to predictions. In general, the model indicated higher probabilities for failure and marginal survival than for substantial growth. Note that in Table 4C, even the most favored category of firms had only a predicted probability of growth of 36.5%.

CONTRIBUTIONS AND LIMITATIONS

There are major practical implications from this study. Accurate identification of the resources that contribute to survival and growth benefits entrepreneurs, those who assist, train, and advise them and those who provide capital for their ventures. In no way do we imply that the variables considered here are the only ones contributing to performance. However, these resource variables are relatively easy to assess, and all can be considered at the time of start-up. It is striking that this limited set of variables contributed substantially to the prediction of new venture outcome.

Some of the entrepreneurial capability variables cannot easily be changed. However, the benefits or risks associated with them can be assessed, with implications both for individual entrepreneurs and for public policy. Entrepreneurs whose resource base renders it less likely for them to succeed should proceed with caution or strengthen their position. Venture size, financial capital base, or lack of prior experience in business organizations work to the disadvantage of female and minority entrepreneurs; however, these problems can be identified and actions to acquire specific know-how or capital can be taken to increase the chances of success.

This study seeks to make a number of contributions to the growing literature on predictors of new venture performance. First, the model used in this study achieved a high level of predictive power based solely on conditions observable at the start-up stage. Without downplaying the significance of subsequent actions and developments, we believe that the ability to evaluate the prospects of a new venture at an early stage presents a number of advantages to both entrepreneurs and their supporters.

Second, many studies in the population ecology tradition have related survival to age and size of the venture. This study, in contrast, examined a sample of new ventures that were all relatively young and small. As such, the analysis focused on the identification of other determinants of performance. Hence, it shed light on factors that had not received much attention in the population ecology studies—factors which help to determine differences in performance among firms that are all young and small.

Third, this study explicitly models the effect of considering multiple measures of performance. It defined three categories of performance and used an estimation approach that allowed potential differences in predictors among failure, marginal survival, and growth to emerge. This approach enabled us to explicitly test rather than assume homogeneity and identified the predictors that were particularly important for achieving growth.

Fourth, noting problems in the extant literature with data accuracy on performance status, we took extreme care to obtain reliable data on this variable. Multiple venues were used. These venues included the survey, postcards for easy responses, post-office return information, and cross-checks with the NFIB membership database. As a result, we were able to determine the performance status of each of the 1053 ventures. These efforts also allow us to include all those ventures in the sample that failed within the period of study. Studies in the past have been limited by a bias toward successful ventures due to the difficulty of tracking businesses that have ceased operations. Performance was also monitored longitudinally over the first three years after launch, a period which is often characterized by turbulence as reflected in rather high failure rates.

Fifth, this study also attempted to respond to the methodological shortcomings of prior studies. Beyond the separate estimation of growth and marginal survival, this study utilized the multinomial logit model, a more robust methodology for the estimation of qualitative binary dependent variables. The fit of the model was assessed through multiple tests. These included comparison with two naive models and use of a holdout sample for testing correct

classifications. In addition, we also undertook a comparison of the actual proportions of ventures in the categories of failure, marginal survival, and growth against the predicted proportions through the "deciles of risk" approach.

Finally, the sample itself incorporated a broad array of all types of ventures. These ventures were drawn from all industry sectors and geographical regions. Except for a larger percentage of retail ventures, checks of this current sample against other large databases suggest a high degree of representativeness of the general population of small businesses. It is possible that other cross-sectional databases comprised largely of established ventures reflect the lower survival rates among retail businesses. The breadth of businesses represented in this study enable the findings to be generalized to the larger population of new ventures. The rather narrow boundaries pertaining to geographic and industry settings of prior studies were often cited as an impediment to integration among studies and systematic advancement of knowledge in the field of entrepreneurship.

On the other hand, we need to note a number of limitations associated with this study. Although the variables considered are similar to those utilized in much of the research to date, it should be recognized that these do not measure the specific skills and behaviors that directly influence performance. For example, the entrepreneur's previous level of management experience is considered, but the specific skills and behavior that may result from that experience are not. The variables considered here do have the advantage of being visible and relatively easy to assess by entrepreneurs and their advisors. However, future research can move beyond these easily accessible variables to examine specific skills, behaviors, and cognitive processes that theory suggests may be related to entrepreneurial performance. In addition, it should be recognized that directions of causality may be difficult to untangle. For instance, greater initial capital may reflect more promising ventures, and professional advisor utilization may be associated with more sophisticated entrepreneurs.

We should also note that this study focuses upon performance during the first three years. It may be that some kinds of businesses (such as high technology firms) require a longer period to demonstrate their possibilities. It is also possible that other kinds of businesses fail very quickly and are not even picked up in a study such as this.

Although the impact of initial resources on subsequent performance was extremely strong, we did not observe the process by which initial conditions shaped the opportunity set of the venture and its capacity to respond to various challenges. It seems likely that initial resources serve to imprint initial strategies and also influence the paths by which capabilities evolve. The process through which such strategies and capabilities developed was not examined in this study.

In conclusion, we believe that efforts to understand predictors of new venture performance constitute one of the most important streams of entrepreneurship research. We hope the success of the models described here, even with their obvious limitations, will provide encouragement for the work yet to be done.

REFERENCES

- Aldrich, H., Rosen, H., and Woodward, W., 1987. The impact of social networks on business foundings and profit: a longitudinal study. In N.C. Churchill et al., eds., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 154-168.
- America, R.F. 1980. How minority business can build on its strength. *Harvard Business Review* 58(3):116-121.
- Becker, G.S. 1975. *Human Capital*. New York: National Bureau of Economic Research.
- Ben-Akiva, M., and Lerman, S.R. 1985. *Discrete Choice Analysis*. Cambridge, MA: The MIT Press.

- Birch, D.L. 1987. *Job Creation in America: How Our Smallest Companies Put the Most People to Work*. New York: The Free Press.
- Boeker, W. 1989. Strategic change: the effects of founding and history. *Academy of Management Journal* 32:489–515.
- Bruderl, J., Preisendorfer, P., and Ziegler, R., 1992. Survival chances of newly founded business organizations. *American Sociological Review* 57:227–242.
- Brush, C. 1992. Research on women business owners: past trends, a new perspective and future directions. *Entrepreneurship Theory and Practice* 16(4):5–30.
- Carroll, G.R., and Delacroix, J. 1982. Organizational mortality in the newspaper industries of Argentina and Ireland: an ecological approach. *Administrative Science Quarterly* 27:169–198.
- Carroll, G.R., and Huo, Y.P. 1986. Organizational task and institutional environments in ecological perspective: findings from the local newspaper industry. *American Journal of Sociology* 91(94):838–873.
- Cooper, A.C. 1985. The role of incubator organizations in the founding of growth oriented firms. *Journal of Business Venturing* 1(1):75–86.
- Cooper, A.C., Dunkelberg, W.C., Woo, C.Y., and Dennis, W.J. Jr. 1990. *New Business in America: The Firms and Their Owners*. Washington, DC: NFIB Foundation.
- Cooper, A.C., and Gimeno Gascón, F.J. 1992. Entrepreneurs, processes of founding, and new firm performance. In D. Sexton and J. Kasarda, eds., *The State of the Art in Entrepreneurship*. Boston, MA: PWS Kent Publishing Co.
- Cooper, A.C., Folta, T., Gimeno Gascón, F.J., and Woo, C.Y. 1992. Entrepreneurs' exit decisions: the role of threshold expectations. In J.L. Wall and L.R. Jauch, eds., *Academy of Management Best Paper Proceedings*. The Academy of Management.
- Cooper, A.C., Woo, C., and Dunkelberg, W. 1989. Entrepreneurship and the initial size of firms. *Journal of Business Venturing* 4(5):317–332.
- David, P.A. 1988. Path-dependence: putting the past into the future of economics. Technical Report #533, Stanford, CA: Institute for Mathematical Studies in the Social Sciences, Stanford University.
- Dollinger, M.J. 1985. Environmental contacts and financial performance of the small firm. *Journal of Small Business Management* 23(1):24–30.
- Duchesneau, D.A., and Gartner, W.B. 1988. A profile of new venture success and failure in an emerging industry. In B.A. Kirchoff et al., eds., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 372–386.
- Effron, B. 1979. Bootstrap methods: another look at the jackknife. *Annals of Statistics* 7(1):1–26.
- Eisenhardt, K.E., and Schoonhoven, C.B. 1990. Organizational growth: linking founding team, strategy, environment and growth among U.S. semiconductor ventures, 1978–1988. *Administrative Science Quarterly* 35:504–529.
- Hay, R.K., and Ross, D.L. 1989. An assessment of success factors of non-urban start-up firms based upon financial characteristics of successful versus failed ventures. In R. Brockhaus et al., eds., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College.
- Hosmer, D., and Lemeshow, S. 1980. Goodness of fit tests for the multiple logistic regression model. *Communications in Statistics* A9(10):1043–1069.
- Hosmer, D., and Lemeshow, S. 1989. *Applied Logistic Regression*. New York: J. Wiley & Sons.
- Humphreys, M.A., and McClung, H. 1981. Women entrepreneurs in Oklahoma. *Review of Regional Economics and Business* 6(2):13–20.
- Kalleberg, A.L., and Leicht, K.T. 1991. Gender and organizational performance: determinants of small business survival and success. *Academy of Management Journal* 34(1):136–161.
- Kimberly, J. 1979. Issues in the creation of organizations: initiation, innovation and institutionalization. *Academy of Management Journal* 22:437–457.
- Low, M.B., and MacMillan, I. 1988. Entrepreneurship: past research and future challenges. *Journal of Management* 139–161.
- Maddala, G.S. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. Econometric Society Monographs, Cambridge University Press.

- McFadden, D., Tye, W., and Train, K. 1976. *Diagnostic Tests for the Independence of Irrelevant Alternatives Property of the Multinomial Logit Model*. Working paper No. 7616. Berkeley, CA: Institute of Transportation Studies, University of California.
- O'Neill, H.M., and Duker, J. 1986. Survival and failure in small business. *Journal of Small Business Management* 24(1):30-37.
- Perrow, C.B. 1970. *Organizational Analysis: A Sociological View*. Belmont, CA: Wadsworth.
- Reynolds, P. 1987. New firms: societal contribution versus potential. *Journal of Business Venturing* 2(3):231-246.
- Riding, A., and Swift, C. 1990. Women business owners and terms of credit: some empirical findings of the Canadian experience. *Journal of Business Venturing* 5(5):327-340.
- Romanelli, E. 1989. Environments and strategies of organization startups: effects on early survival. *Administrative Science Quarterly* 34:369-387.
- Sandberg, W.R., and Hofer, C.W. 1987. Improving new venture performance: the role of strategy, industry structure, and the entrepreneur. *Journal of Business Venturing* 2(1):5-28.
- Sexton, E.A., and Robinson, P.B. 1989. The economic and demographic determinants of self-employment. In R.H. Brockhaus et al., eds., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 28-42.
- Shapiro, A., and Giglierano, J. 1982. Exits and entries: a study in yellow pages journalism. In K.H. Vesper, ed., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 113-141.
- Small, K., and Hsiao, C. 1985. Multinomial logit specification tests. *International Economic Review* 26:619-627.
- Stinchcombe, A.L. 1965. Social structure and organizations. In J.G. March, ed., *Handbook of Organizations*. Chicago: Rand McNally Publishers: 142-193.
- Stuart, R., and Abetti, P.A. 1987. Start-up ventures: towards the prediction of initial success. *Journal of Business Venturing* 2(3):215-230.
- Teach, R.D., Tarpley, F.A., and Schwartz, R.G. 1986. Software venture teams. In R. Ronstadt et al., eds., *Frontiers of Entrepreneurship Research*. Wellesley, MA: Babson College: 546-562.
- Thurston, P. 1986. When partners fall out. *Harvard Business Review* 86(6):24-26,30,32,34.
- Truett, J., Cornfield, J., and Kannel W. 1967. A multivariate analysis of risk of coronary heart disease in Framingham. *Journal of Chronic Disease* 20:511-524.
- VanderWerf, P.A. 1989. Achieving empirical progress in an undefined field. *Entrepreneurship: Theory and Practice* 14(2):45-58.
- Vesper, K. 1980. *New Venture Strategies*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Wall Street Journal*. 1988. Black entrepreneurs face huge hurdles in places like Miami. May 17:1,16.