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# DIFFERENCES BETWEEN ENTREPRENEURS AND MANAGERS IN LARGE ORGANIZATIONS: BIASES AND HEURISTICS IN STRATEGIC DECISION-MAKING

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## EXECUTIVE SUMMARY

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*The purpose of this study was to further explore differences between entrepreneurs and managers in large organizations. However, rather than focusing on previously examined individual differences, this study examined differences in the decision-making processes used by entrepreneurs and managers in large organizations. Building on nonrational decision-making models from behavioral decision theory, we asserted that entrepreneurs are more susceptible to the use decision-making biases and heuristics than are managers in large organizations.*

*To understand why entrepreneurs and managers in large organizations may vary in the extent to which they manifest biases and heuristics in their decision-making, it is important to understand the utility of nonrational decision-making. Under conditions of environmental uncertainty and complexity, biases and heuristics can be an effective and efficient guide to decision-making. In such settings, more comprehensive and cautious decision-making is not possible, and biases and heuris-*

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The authors wish to thank Dale Rude and two anonymous reviewers for their constructive comments on an earlier draft of the article.

*tics may provide an effective way to approximate the appropriate decisions. The use of heuristics has also been found to be associated with innovativeness. Perhaps a critical difference between these sets of individuals is the extent to which they manifest biases and heuristics in their decision-making. We examined differences between entrepreneurs and managers in large organizations with respect to two biases and heuristics: overconfidence (overestimating the probability of being right) and representativeness (the tendency to overgeneralize from a few characteristics or observations).*

*In this study, entrepreneurs are those who have founded their own firms and are currently involved in the start-up process with the average time since founding of 1.7 years. The analysis for this study involved responses from 124 entrepreneurs. Managers are individuals with middle to upper level responsibilities with substantial oversight in large organizations. To be included in this study, the managers had to oversee at least two functional areas (sample average was 4.55 functional areas). Usable responses were received from 95 managers.*

*The results from the logistic regression analysis show strong support for both hypotheses. Even after controlling for numerous factors, such as several traits and demographic factors, enduring support was found for the way entrepreneurs and managers in large organizations make decisions. Our overconfidence and representativeness variables correctly categorized entrepreneurs and managers more than 70% of the time. Thus, this research indicates that entrepreneurs do behave differently than do managers in large organizations and that these differences are substantial.*

*Practically, we speculate that without the use of biases and heuristics, many entrepreneurial decisions would never be made. With entrepreneurial ventures in particular, the window of opportunity would often be gone by the time all the necessary information became available for more rational decision-making. Additionally, successfully starting a new business usually involves overcoming multiple hurdles. Using biases and heuristics as simplifying mechanisms for dealing with these multiple problems may be crucial. To face such hurdles from a strict econometric approach would not only postpone decisions, but would in all likelihood make them overwhelming. More specifically, overconfidence may be particularly beneficial in implementing a specific decision and persuading others to be enthusiastic about it as well.*

*The use of biases and heuristics may also offer some help in explaining why entrepreneurs sometimes make bad managers. Whereas the use of cognitive biases may be beneficial in some circumstances, it can lead to major errors in others. Although research has yet to establish performance implications, it is possible that the more extensive use of heuristics in strategic decision-making may be a great advantage during the start-up years. However, it may also lead to the demise of a business as a firm matures. © 1997 Elsevier Science Inc.*

## INTRODUCTION

Casual observation suggests that individuals who start their own organizations are somehow different from those that work in large organizations. Entrepreneurs have been described as risk-takers and rugged individualists (Begley and Boyd 1987; McGrath et al. 1992), as engaging in deviate social behavior (Shapiro 1975), and as being a "breed apart" (Ginsberg and Buchholtz 1989). In contrast, managers in large organizations have been described as being risk averse (Amihud and Lev 1981), adhering to broadly accepted norms of behavior (Pettigrew 1973), and more professional and predictable in their decision-making (Barnard 1968; Hofer and Schendel 1978).

These casual observations have not gone untested in the research literature. Unfortunately, most efforts to empirically describe differences between entrepreneurs and managers in large organizations have met with limited success (Low and MacMillan 1988). These results have led many researchers to abandon the search for individual differences between entrepreneurs and managers in large organizations (Gartner 1988) and to look for explanations of entrepreneurial phenomena elsewhere (Aldrich and

Zimmer 1986). And yet, the observation that these differences exist continues (e.g., Bird 1988; Ginsberg and Buchholtz 1989).

The purpose of this study is to further explore differences between entrepreneurs and managers in large organizations. However, rather than focusing on previously examined individual differences, this study examines differences in the decision-making processes used by entrepreneurs and managers in large organizations. Building on non-rational decision-making models from behavioral decision theory (Pitz and Sachs 1984; Stevenson et al. 1990), we argue that the use of bias and heuristics may explain significant portions of the variations in strategic decision-making (Haley and Stumpf 1989). More specifically, we argue that entrepreneurs use biases and heuristics more extensively in their strategic decision-making than do managers in large organizations. We examine differences between entrepreneurs and managers in large organizations with respect to two biases and heuristics: overconfidence and representativeness (Tversky and Kahneman 1974; Hogarth 1987; Bazerman 1990).

## PREVIOUS RESEARCH

Previous research on differences between entrepreneurs and managers in large organizations has generally examined psychological and personal/demographic differences. After a great deal of research (e.g., McClelland 1961; Brockhaus 1980; Schere 1982), it is now often concluded that most of the psychological differences between entrepreneurs and managers in large organizations are small or nonexistent (Brockhaus and Horwitz 1986; Low and MacMillan 1988).

In the psychological differences literature, a wide variety of individual psychological attributes, including locus of control and risk-taking, has been shown not to vary significantly between entrepreneurs and managers in large organizations (Begley and Boyd 1987; Sexton and Bowman 1984). Some relatively small but consistent psychological differences have been documented such as need for achievement, tolerance for ambiguity, and need for conformity (Begley and Boyd 1987; Miner et al. 1989). Despite the fact that very few studies have shown statistically significant differences between entrepreneurs and managers in large organizations in their risk-taking propensity (Brockhaus 1980, Low and MacMillan 1988), this individual psychological difference continues to be discussed as an important variable for understanding entrepreneurial behavior (e.g., Stevenson and Gumpert 1985; Ray 1994).

Research focusing on personal/demographic differences between these types of individuals has also been met with limited success. Cooper and Dunkelberg (1987) concluded from their large sample that such differences between entrepreneurs and managers in large organizations are quite small and rarely systematic. Despite these findings, age, gender, and education are several personal/demographic differences that continue to receive attention in the entrepreneurship literature (Robinson and Sexton 1994).

There have been three fairly distinct responses to the failure to discover systematic psychological and personal/demographic differences between entrepreneurs and managers in large organizations. First, some have argued that this failure represents inadequate methodology (Ginsberg and Buchholtz 1989). Unfortunately, the application of more sophisticated methods has done little to alter earlier findings.

Second, others have argued that the search for individual differences should be abandoned, in favor of research that focuses on external causes of entrepreneurial behavior (Acs and Audretsch 1987; Aldrich and Zimmer 1986; Gartner 1988; Shapero

1984). Unfortunately, this more externally oriented work has been unable to completely abandon the individual differences approach. For example, many economists have argued that entrepreneurial behavior is caused by market imperfections that create an opportunity for entrepreneurs to earn above average economic wealth (Hebert and Link 1988). While emphasizing external market forces in motivating entrepreneurial activity, these models fail to explain why some individuals are able to perceive and exploit these opportunities, whereas others are not. This has led some economists to acknowledge that entrepreneurs have "special aptitudes" (Schumpeter 1934), "special resources" (Schultz 1975), and unusual levels of "alertness" to economic opportunities (Kirzner 1973; Kaish and Gilad 1991). Unfortunately, the sources of these individual differences are left largely unexplained in economic models of entrepreneurship.

Finally, another group of scholars continues to assert that individual differences exist between entrepreneurs and managers in large organizations. However, this group generally suggests that previous research has examined the "wrong" individual differences (e.g., Robinson et al. 1991). Rather than examining psychological and personal/demographic differences, this group of scholars suggests the importance of examining differences in behavior between these sets of individual (Gartner et al. 1992). Research is increasingly focusing on the more behavioral approach (e.g., Covin and Slevin 1991; Miller 1983; Manimala 1992; Zahra 1993). Robinson et al. (1991) developed several attitudinal scales for predicting behavioral tendencies. This study is consistent with this last group of scholars, particularly that of Manimala (1992) who identified 186 examples of very specific heuristics used by entrepreneurs. Our intent is to better understand the decision-making style of entrepreneurs. More specifically, we probe why entrepreneurs and managers in large organizations may vary in the extent to which they manifest biases and heuristics in their strategic decision-making. In this study, entrepreneurs are those who have founded their own firms. Managers are individuals with middle to upper level responsibilities with substantial oversight in large organizations.

## **THEORY**

### **Biases, Heuristics, and Entrepreneurial Decision-Making: Previous Work**

Since Simon's (1955) early work, organizational scholars have recognized that managerial decision-making often falls short of the purely rational model (e.g., Haley and Stumpf 1989). Several factors that prevent purely rational decision-making have been cited, including: (1) the high costs of such decision-making efforts (Simon 1979), (2) information-processing limits of decision-makers (Abelson and Levi 1985), (3) differences in decision-making procedures adopted by managers (Shafer 1986), and (4) differences in the values of decision-makers (Payne et al. 1992).

One of the most important classes of models that explain deviations from rational decision-making focuses on biases and heuristics (Kahneman et al. 1982; Schwenk 1988; Stevenson et al. 1990). Biases and heuristics are decision rules, cognitive mechanisms, and subjective opinions people use to assist in making decisions. Frequently, the use of biases and heuristics yields acceptable solutions to problems for individuals in an effective and efficient manner. In this study, the term "biases and heuristics" is used to refer to these simplifying strategies that individuals use to make decisions, especially in uncertain and complex conditions.

Although most previous research has been conducted in laboratory conditions, a

broad range of empirical findings suggests that most decision-makers apply biases and heuristics to simplify their decision-making most of the time (Bateman and Zeithaml 1989; Jackson and Dutton 1988; Kahneman et al. 1982; Zajac and Bazerman 1991) and that inquiry into such behavior is critical for understanding strategic decision-making (Bazerman 1990; Cowen 1991; Schwenk 1988). This research is also consistent with this observation. However, we acknowledge the possibility that all decision-makers may not be subject to these biases and heuristics in their decision-making to the same degree. In support of this research direction, decision-makers have recently been found to have different cognitive trails (Haley and Stumpf 1989; Stumpf and Dunbar 1991). Furthermore, Bazerman and Neale (1983, p. 317) noted in their review that although individuals are generally affected by systematic deviations from rationality, some individuals appear to be more accurate in their interpersonal judgments or less influenced by the frame of the situation. The possibility that there may be differences in the extent to which decision-makers are subject to biases and heuristics suggests an interesting possibility for research on differences between entrepreneurs and managers in large organizations. Biases and heuristics may be particularly critical for explaining variations in strategic decisions (Haley and Stumpf 1989). Perhaps a critical difference between these two sets of individuals is the extent to which they manifest biases and heuristics in their decision-making.

### **Differences in the Use of Bias and Heuristics**

To understand why entrepreneurs and managers in large organizations may vary in the extent to which they manifest biases and heuristics in their decision-making, it is important to understand the utility of non-rational decision-making. Under conditions of environmental uncertainty and complexity, biases and heuristics can be an effective and efficient guide to decision-making (Pitz and Sachs 1984). In such settings, more comprehensive and cautious decision-making is not possible, and biases and heuristics may provide an effective way to approximate the appropriate decisions (Tversky and Kahneman 1974; Haley and Stumpf 1989). Also, entrepreneurship has been characterized as an “enactment” process where acting precedes thinking (Gartner et al. 1992; Weick 1979). In this sense, entrepreneurship is more a function of actions taken than some objective set of conditions.

### *Decision Uncertainty*

On average, the level of uncertainty facing entrepreneurs in making decisions is greater than the level of uncertainty facing managers in large organizations in making decisions (Hambrick and Crozier 1985; Covin and Slevin 1989). At the very least, managers in large organizations usually have access to historical trends, past performance, and other information that can help reduce the level of uncertainty they face in making decisions (Mintzberg 1973). Moreover, this information can reduce the level of uncertainty facing decision-makers in large firms at relatively low costs (Thompson 1967). In this sense, managers in large organizations can more closely approximate the rational ideal in their decision-making.

Entrepreneurs, on the other hand, often have to make decisions where there are no historical trends, no previous levels of performance, and little if any specific market information (Miller and Friesen 1984). Just the decision to start a venture based on a

new product or service involves making numerous decisions for which there is little or no hard information. Furthermore, the market's acceptance of the new product or service almost always contains a great deal of uncertainty. However, efforts by entrepreneurs to reduce their uncertainty in decision-making are likely to be very costly and usually not terribly effective. And yet, decisions still need to be made if the venture is going to be launched or to quickly move forward once the venture has started (Eisenhardt 1989; Miller 1983; Wally and Baum 1994). A greater use of biases and heuristics facilitates a perceived sense of overall understanding and a sense that the "rules of the game" are now understood. Thus, we argue that those who are more susceptible to the use of biases and heuristics in decision-making are the very ones who are most likely to become entrepreneurs. The more cautious decision-makers will tend to be attracted to larger organizations where more methodical information tends to be more readily available. Entrepreneurial activities simply become too overwhelming to those who are less willing to generalize through the use of bias and heuristics.

### *Decision Complexity*

Not only are the decisions made by entrepreneurs, on average, made in a more uncertain environment than decisions made by managers in large organizations, the decision-making context facing entrepreneurs also tends to be more complex than that facing managers in large organizations (Covin and Slevin 1991; Gartner et al. 1992; Miller and Friesen 1984). Whereas they may have some potential pitfalls, biases and heuristics are likely to have more utility in these highly complex decision settings, compared with less complex decision settings (Pitz and Sachs 1984; Tversky and Kahneman 1974).

Large organizations develop elaborate policies and procedures to aid managers in their decision-making. Nelson and Winter (1982) call these decision-making practices "routines" and emphasize the ability of routines to simplify the decision-making complexity facing managers. In addition to these routines, large organizations adopt elaborate organizational charts that define areas of decision-making responsibility. These limits have the effect of reducing the complexity of the decision-making context facing a firm, thus enabling managers in large organizations not to rely on biases and heuristics as much.

Entrepreneurs, on the other hand, usually have not developed the elaborate decision-making policies and procedures characteristic of large firms (Fredrickson and Iaquinto 1989). In this context, simplifying biases and heuristics may have a great deal of utility in enabling entrepreneurs to make decisions that exploit brief windows of opportunity (Tversky and Kahneman 1974; Hambrick and Crozier 1985; Stevenson and Gumpert 1985). Furthermore, entrepreneurs are often opportunists, acting on an idea with limited information (Gartner et al. 1992). In doing so, they must convince numerous stakeholders of the credibility of the venture. Using base rate probabilities to justify their entrepreneurial ventures is usually meaningless.

It is important to recognize that we are not arguing that the decisions facing managers in large organizations are not uncertain or complex. Clearly, they often are. Rather, all we are arguing is that, on average, decisions made by entrepreneurs tend to be more uncertain and more complex than the decisions made by managers in large organizations. Also, without some unsubstantiated enthusiasm, many ventures would never be started or would quickly die following their start-up. This logic that biases and heuristics may have more utility for entrepreneurs is consistent with findings suggesting that entre-

preneurial posture and proactiveness are positively related to performance (Covin and Slevin 1989; Zahra 1993). Thus, those who make greater use of biases and heuristics in their decision-making are more likely to find themselves in an entrepreneurial context. By doing so, they should be able to filter through more information and more effectively communicate to various stakeholders the legitimacy of the venture.

### **Specific Decision-Making Differences**

As previously suggested, a large number of biases and heuristics have been studied in the nonrational decision-making literature (Hogarth 1987; Bazerman 1990). From among all these biases and heuristics, we chose to examine differences between these sets of individuals with reference to two biases and heuristics: overconfidence and representativeness. Overconfidence was chosen because it is considered somewhat characteristic of a number of other biases and heuristics identified in the literature (Kahneman et al. 1982). Representativeness is one of more widely used heuristics (Pitz and Sachs 1984; Barnes 1984; Katz 1992) and is a good indicator of how quickly one is likely to generalize from a single or limited number of experiences (Schwenk 1988).

#### *Overconfidence*

First described by Oskamp (1965), overconfidence has been shown to exist in a wide variety of settings (Lichtenstein and Fischhoff 1977; Bazerman 1990). Overconfidence exists when decision-makers are overly optimistic in their initial assessment of a situation, and then are slow to incorporate additional information about a situation into their assessment because of their initial overconfidence (Fischhoff et al. 1977; Alpert and Raiffa 1982). For example, Fischhoff et al. (1977) found that subjects who assigned odds of 1000:1 of being correct were correct only 81% of the time. Most decision-makers are overconfident in their estimation abilities and do not acknowledge the actual uncertainty that exists (Bazerman 1990). Furthermore, decision-makers are generally slow to incorporate additional information because of their confidence in their existing assumptions and opinions (Phillips and Wright 1977; Russo and Schoemaker 1989).

A priori, overconfidence seems likely to manifest itself in decisions made by entrepreneurs to a greater extent than in decision made by managers in large organizations. Overconfidence enables an entrepreneur to proceed with an idea before all the steps to that specific venture are fully known. Even though enormous uncertainties exist in this decision-making situation (e.g., is there a real economic opportunity to be exploited, how should that opportunity be exploited, how large is this opportunity, how will competitors react to this opportunity), a higher level of confidence is likely to encourage an entrepreneur to take action before it makes complete sense. Furthermore, being more optimistic than the data would suggest may serve to convince other potential stakeholders (such as investors, suppliers, customers, key employees) of the opportunity that affords them if they get in on the ground floor of the venture. Put differently, if entrepreneurs wait until all the "facts" are in to start convincing others that their venture is indeed legitimate, the opportunity they are seeking to exploit will most likely be gone by the time more complete data becomes available (Stevenson and Gumpert 1985). Managers in large organizations, on the other hand, do not have to rely on their personal confidence in making decisions to as great an extent. Rather, these managers can rely on decision-making tools and historical performance patterns to convince top management

that their projects should have priority. These observations lead to the following hypothesis:

*H1:* Entrepreneurs will manifest more overconfidence than will managers in large organizations.

Previous research provides some empirical support for H1. For example, Cooper et al. (1988) found that entrepreneurs assigned a higher probability of success to their own ventures compared with competing ventures. This is consistent with entrepreneurs having an unreasonably high level of confidence in their own decision-making ability. Also, Manimala (1992) found that entrepreneurs do manifest such tendencies in their decision-making. Although suggestive, this research only indicates that entrepreneurs do manifest overconfidence. However, as suggested earlier, most research on nonrational decision-making suggests that most decision-makers manifest various biases and heuristics including overconfidence to some extent. Unfortunately, this previous research does not examine whether or not entrepreneurs are more overconfident than managers in large organizations.

### *Representativeness*

Representativeness was first described by Tversky and Kahneman (1971) and is one of the most common of all decision-making biases and heuristics (Hogarth 1987). Decision-makers manifest this heuristic when they are willing to generalize about a person or a phenomenon based on only a few attributes of that person or only a few observations of a specified phenomenon (Nisbett and Ross 1980; Bazerman 1990). A wide variety of problems has been developed to test representativeness with studies repeatedly showing that subjects consistently ignore base rate information (e.g., Bar-Hillel 1979; Tversky and Kahneman 1974). Decision-makers consistently underestimate the error and unreliability inherent in small samples of data (Payne et al. 1992).

The particular form of representativeness examined here is a willingness of decision-makers to generalize from small, nonrandom samples (Tversky and Kahneman 1971). The law of large numbers suggests that large random samples can be used to make rigorous inferences about population statistics. However, sometimes, decision-makers are willing to make such inferences, not from large random samples, but from small, nonrandom samples. The most common type of small nonrandom sample used as a basis for generalization is, of course, personal experience (Kahneman et al. 1982).

Again, there is reason to believe that representativeness, and especially the willingness to generalize from small, nonrandom samples, is a decision-making short cut that may be particularly common in entrepreneurial settings (Katz 1992). In such setting, large random samples to reliably estimate customer demand, production costs, and other key pieces of information are rarely available. Nor do most entrepreneurs have the resources (including the time) to engage in such systematic data collection. Indeed, such systematic data collection activities might prematurely reveal an entrepreneurs products and technologies to competitors, thereby reducing the return potential of those products and technologies to competitors (Porter 1980). In this setting, entrepreneurs must be willing to rely on small, nonrandom samples in particular, their personal experience with current and potential customers to guide their decision-making. Of course, managers in large organizations have to rely less on these nonrandom samples, and thus,



on average, will be able to more closely approximate purely rational decision-making. These observations lead to the following hypothesis:

*H2: Entrepreneurs will manifest representativeness more extensively in their decision-making than will managers in large organizations.*

As with overconfidence, Manimala's (1992) research indicates that entrepreneurs do manifest representativeness in their decision-making. However, Manimala fails to examine the extent to which entrepreneurs manifest this decision-making short cut in comparison with other decision-makers, including managers in large organizations.

## METHODS

### Samples

As implied by these hypotheses, samples from two populations were drawn: a sample of entrepreneurs and a sample of managers in large organizations. Survey research was used to collect the primary data.

#### *Sample of Entrepreneurs*

The sales tax file of a state comptroller's office was used to identify potential entrepreneurs, because it has been found to be a superior source for identifying new businesses (Busenitz and Murphy In Press). These files contain the name and address of the organization, owner, organization type, SIC code, and date of first sale. A sample of firms showing a date of first sale within the past two years and having an SIC code in the 2800, 2900, 3000, 3500, 3600, 3700, and 3800 categories was selected. These SIC categories include the manufacturing of plastics, electronics, and instruments. A priori, it was thought that these categories would represent a higher percentage of newly emerging firms, because they represent more dynamic industries. This procedure resulted in a sample of 573 firms. A mail questionnaire was developed and sent to the identified sample, and 176 responses were received for a 31% response rate.

Because, historically, identifying entrepreneurs has been somewhat problematic (Gartner 1988), we wanted to be more precise in our operationalization. Our operationalization consisted of two dimensions. First, respondents had to have been a founder of the identified firm. Being responsible for an independent start-up is widely used as a distinguishing feature of entrepreneurship (e.g., Begley and Boyd 1987; Cooper et al. 1988; Miner et al. 1989) and thus was used here as a prerequisite for inclusion in the sample for this study. With the second dimension, subjects had to be currently involved in the start-up process. This was operationalized by requiring subjects to have started their venture within the last two years and/or currently planning on starting another venture within the next five years. These restrictions resulted in 124 usable responses. The average time since founding for the entrepreneurs included in this sample was 1.7 years. To test for a biased response, nonrespondents were compared with respondents based on the two-digit SIC categories identified previously. The results from the chi-square test suggested that the usable response was not biased ( $\chi^2(5) = 1.782$ ;  $p = .878$ ).

### *Sample of Managers in Large Organizations*

In this study, managers in large organizations were defined as individuals who have responsibility for at least two functional areas (such as marketing, finance, personnel, research and development, and manufacturing) and work for publicly owned organizations with more than 10,000 employees. These managers are often referred to as divisional managers or general managers because they oversee multiple functional areas (e.g., marketing, research and development, accounting, manufacturing). Contact was made with three organizations, and two agreed to participate in the study. Data collection was coordinated through the human resource departments of the respective organizations with a company cover letter attached. To be included in this sample, the managers had to oversee at least two functional areas (sample average was 4.55 functional areas). A usable response rate of 54% was received. The SIC for the managers included in this sample came from the 1300, 3400, 3500, 3600, and 3800.<sup>1</sup> The results of the chi-square test between usable responses and nonrespondents again suggest that the response was not biased ( $\chi^2(4) = 3.973; p = .59$ ).

### **Measures**

The central goal of this study was to measure the use of biases and heuristics as a part of the decision-making style of entrepreneurs and managers in large organizations. Thus, some diversity of decision problems was sought to give a better representation of the decision style in a specific context of these two groups of strategic decision-makers.

#### *Overconfidence*

To measure overconfidence, the procedure used in the widely cited studies conducted by Fischhoff et al. (1977) and Lichtenstein and Fischhoff (1977) was replicated. A series of five questions based on death rates from various diseases and accidents in the United States was developed. All items were dichotomous in nature with the general form of "Which cause of death is more frequent in the United States? A. Cancer of all types, B. Heart disease." One of the two choices is correct based on the most recent vital statistics report prepared by the National Center for Health Statistics. Subjects were asked to make two responses to each item. First, they were to choose one of the two alternatives as their best guess of the correct alternative. Second, they indicated, on a provided scale ranging from 50% to 100% the level of confidence they had in their answer. In the instructions, they were told that 50% would indicate that their answer was a total guess, whereas 70% would indicate that they thought they had seven chances in 10 of being correct. A response of 100% would indicate that they were totally confident that their choice was right. Again, in taking our cues from the earlier work of Lichtenstein and Fischhoff (1977), all "level of confidence" responses were grouped into one of six probability categories: 0.50–0.59, 0.60–0.69, 0.70–0.79, 0.80–0.89, 0.90–0.99, and 1.00 for analy-

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<sup>1</sup>Not only do these industries largely coincide with those from which our entrepreneurs came, but they are also industries characterized by high levels of research and development. Also, both organizations we sampled in these industries claimed that they attempted to recruit "intrapreneurial" managers into their organizations. The choice of these firms creates a conservative test of our individual differences hypotheses since entrepreneurial type individuals tend to be attracted to these industries.

sis purposes. Those probability responses that were in the 0.50–0.59 range were coded as 0.50, 0.60–0.69 responses as 0.60, etc.

Two primary measures were computed from this information. The first is what Fischhoff et al. (1977) referred to as the group calibration curve. This curve reveals how closely the designated probability score for each category (0.50, 0.60, etc.) and for each group (in this case entrepreneurs versus managers in large organizations) approximates the perfectly calibrated curve. For example, for all responses in the 0.70 category, perfect calibration would be reflected in correct responses to the dichotomous part of the question seven out of 10 times. If all the responses in the 0.70 category were correct only 60% of the time, one would conclude that the designated group was overconfident in that category.

For the purpose of statistical analyses on each observation, a second score was computed. Again, following the lead of Fischhoff et al. (1977), this was done by noting the mean probability response across all items for each subject and the percentage of items for which the correct alternative was selected. The difference between these two scores then becomes a measure of over- or underconfidence (a positive score indicates overconfidence, whereas a negative score indicates underconfidence). For example, a respondent who answered 0.50, 0.60, 0.70, 0.70, and 0.90 and gave the correct answer three out of five times would receive an overconfidence score of 0.08 (mean of 0.68 minus 0.60).

### *Representativeness*

To measure the representativeness, we followed the approach used by Fong et al. (1986) and Fong and Nisbett (1991) in which subjects were given scenarios representing various types of real-to-life strategic decisions. As in the scenarios developed by Fong and colleagues, both of our scenario problems portrayed a strategic decision pitting two alternatives against one another. One alternative was based on quantitative/statistical information, whereas the other was based on heuristic reasoning. Problem 1 involved the purchase of a major piece of equipment, whereas problem 2 depicted an automation update decision (see Appendix for these two problems). Subjects were told to decide between the two alternatives for each problem and then to describe their reasoning for reaching the designated decision. Coders then analyzed these responses to determine whether heuristic type reasoning was used by the respondents to answer these scenarios.

The coding schema used to analyze the responses also closely paralleled that of Fong et al. (1986) and Fong and Nisbett (1991). A code of “1” was given for responses that contained no mention of statistical reasoning, but relied instead on subjective opinions or simple rules of thumb. Examples of this form of reasoning included reference to personal experience or simple decision rules like “buy American” and “personal experience.” A code of “0” was given for responses that contained some form of statistical reasoning, including references to variability or sample size. An additional category was added because some responses from the subjects of this study were uncategorizable based on the Fong et al. (1986) criteria. These 17 uncategorizable responses were omitted from subsequent analyses.

After some initial training, all responses were coded blind to conditions according to these criteria by two individuals (one of the authors and a graduate student). There was exact agreement between coder 1 and coder 2 84% of the time across the two problems. In cases where disagreement existed, the evaluation of a third coder (another grad-

uate student) was used to resolve the disparity. These results were then summed across the two problems to create a single three-category variable (0–2). A “0” indicated that an individual used statistical reasoning across both problems, whereas a “2” indicated that only heuristic reasoning was used.

### **Control Variables**

Although previous research on differences between entrepreneurs and managers in large organizations has generated mixed results, we chose to include various measures of these variables. Also, a measure of economic alertness has been included, because it has been used to help explain entrepreneurial activity and could impact decision-making.

#### *Risk-Taking and Conformity*

The psychological trait of risk-taking propensity was included because risk is so commonly associated with entrepreneurial activity. Conformity, although not studied as frequently as risk-taking, has received some consistent empirical support. These two traits were assessed by using the Jackson Personality Inventory (Jackson 1976). Jackson (1977) reported reliability coefficients of 0.81–0.84 for risk-taking and 0.81–0.82 for conformity in terms of scale homogeneity and test-retest stability. Sexton and Bowman (1984) reduced this risk-taking scale to eight items to better accommodate survey research. The utilization of this eight-item risk-taking scale yielded a Kuder-Richardson-20 (KR-20) reliability coefficient of 0.77 in this study. A KR-20 of 0.70 was obtained for the conformity factor.

#### *Personal/Demographic Characteristics*

Age and education information was also collected, since entrepreneurship has been examined from this perspective. Additionally, it is conceivable that age and/or greater amounts of education may impact the use of biases and heuristics. Age was simply measured by asking for their birth year. Education was measured using a five-point scale ranging from high school or less to a graduate degree.

#### *Economic Factors*

Some have argued that economic concerns are what encourage entrepreneurial activity. In the context of this study, factors involving risk and profit concerns and alertness to economic opportunities may impact entrepreneurial decision-making. Kaish and Gilad (1991) recently developed several scales to measure these factors. However, due to low reliability estimates for the economic risk cue and economic profits scales received in this study (0.47 and 0.57 respectively), they were omitted from further analyses. Kaish and Gilad (1991) also developed measures of “alertness” to economic opportunities (Kirzner 1973). The nonverbal search or reading alertness for economic opportunity generated a Cronbach’s alpha reliability rating of 0.81 in this study. A second factor measuring open thinking about new ideas received a reliability rating of 0.52 in this study and thus was dropped from further analysis.

## RESULTS

Table 1 presents the means, standard deviations, and correlation coefficients among all variables. These correlations show that the overconfidence and representativeness variables are related to one's vocation (entrepreneurs versus managers in large organizations), indicating preliminary support for both hypotheses.

Further bivariate analysis was conducted with the overconfidence variable. The calibration curve shown in Figure 1 represents the aggregated results of the number of correct responses in each category (50%, 60%, 100%) divided by the total number of responses in each category. For example, if all the responses in the 0.70% category given by managers were correct seven out of 10 times, then one would conclude that as a group they tend to be perfectly calibrated (at least in that category). The charting of these two curves in Figure 1 indicates that entrepreneurs are overconfident in their choices in five out of the six probability categories, whereas managers were overconfident only three out of the six categories. Additionally, entrepreneurs were more overconfident than managers in large organizations in each of the categories except in the 0.8 range probability where they were very nearly identical.

Further analysis was conducted with the overconfidence and representativeness variables. Because the dependent variable in this model is dichotomous, logistic regression was used as the primary test of H1 and H2 (Aldrich and Nelson 1984). In this study, the dependent variable represented the entrepreneur versus manager in a large organization (coded "2" and "1" respectively).

Given the coding of the dependent variable, the coefficients for the overconfidence and representativeness variables should be positive and significant. Table 2 presents the results of the logistic regression analysis. Model 1 tested the overconfidence and representativeness variables by themselves. Both variables are significant and in the expected direction. These two variables by themselves correctly predicted entrepreneur versus manager more than 70% of the time.

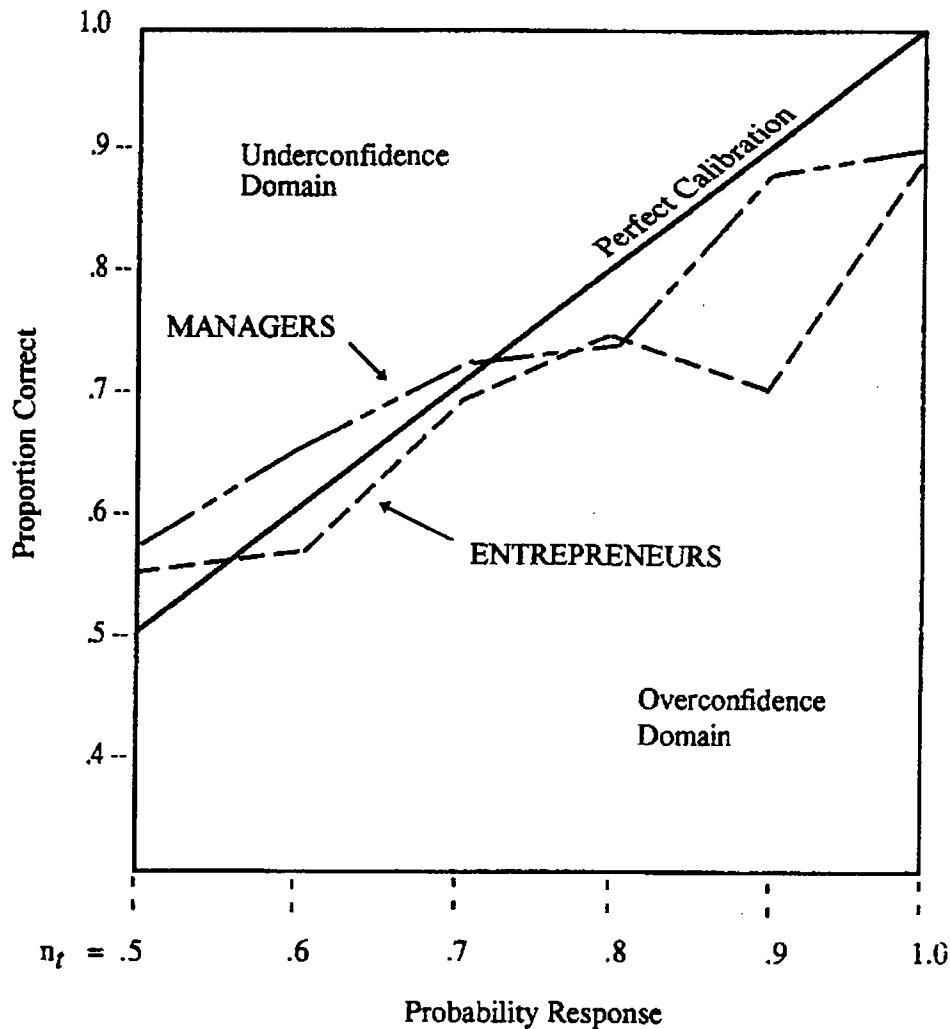
Further examination of Table 1 suggests little collinearity among independent variables. However, several moderate intercorrelations involving control variables suggest that including these variables in an analysis would be important. The results of this analysis are shown in model 2 of Table 2. Of the control variables, education, conformity, and alertness remain statistically significant. The risk-taking and age variables were non-significant. Overall, these results support the emerging consensus that psychological, personal/demographic, and broader social and economic factors have a limited ability to

**TABLE 1** Means, Standard Deviations, and Correlations

Variable	Mean	SD	1	2	3	4	5	6	7
1. Entrepreneur/Manager	1.6	0.49							
2. Representativeness	1.14	0.78	0.61 <sup>a</sup>						
3. Overconfidence	.17	0.17	0.20 <sup>b</sup>	-0.05					
4. Risk-taking	5.2	2.38	0.02	-0.04	-0.04				
5. Conformity	2.4	1.86	-0.30 <sup>b</sup>	-0.07	-0.01	-.28 <sup>b</sup>			
6. Education	3.32	1.27	-0.62 <sup>b</sup>	-0.35 <sup>b</sup>	-0.11	0.06	0.02		
7. Age	44.55	9.7	-0.07	-0.07	0.03	-0.01	-0.11	0.01	
8. Alertness	5.45	1.79	0.09	-0.04	-0.11	0.21 <sup>b</sup>	-0.19 <sup>b</sup>	0.09	0.17 <sup>a</sup>

<sup>a</sup>  $p < .05$ .

<sup>b</sup>  $p < .01$ .



**FIGURE 1** Calibration curves for entrepreneurs and managers.

distinguish entrepreneurs from managers in large organizations (the hit ratio reported in Table 2 only improved 9% with the inclusion of the control variables). More importantly for this study, continuing support was found for H1 and H2. Even after controlling for previously examined factors, the overconfidence and representativeness measures remain statistically significant and help distinguish between entrepreneurs and managers in large organizations.

To ensure that an industry effect was not confounding the results, a subanalysis was conducted. Based on the two-digit SIC classification, eight different industries were represented by these two samples. However, 62% of the entrepreneurs and 86% of the managers in large organizations came from three industries (3500, 3600, and 3800). As these three industries are closely related (industrial and commercial machinery and computer equipment; electronic equipment and components; and measuring, analyzing, and controlling instruments) and they represent the majority of the two samples, the

**TABLE 2** Results of Logistic Regression Analysis

Independent Variables	Model 1		Model 2	
	Parameter Estimate	Wald $\chi^2$	Parameter Estimate	Wald $\chi^2$
Intercept	2.07 <sup>c</sup>	30.64	6.31 <sup>c</sup>	17.6
Risk-Taking			-0.007	0.005
Conformity			-0.39 <sup>b</sup>	11.64
Education			-1.09 <sup>c</sup>	31.76
Age			-0.03	1.67
Alertness			0.34 <sup>a</sup>	6.61
Representativeness	1.6 <sup>c</sup>	36.49	1.56 <sup>c</sup>	22.09
Overconfidence	2.68 <sup>b</sup>	8.36	2.76 <sup>a</sup>	6.21
Pseudo-R <sup>2</sup>	0.21		0.37	
Model $\chi^2$	54.43 <sup>c</sup>		108.5 <sup>c</sup>	
<i>df</i>	198		185	
Hit ratio (%)	70		79 <sup>c</sup>	

<sup>a</sup>  $p < .05$ .<sup>b</sup>  $p < .01$ .<sup>c</sup>  $p < .001$ .

full logistic regression model identified earlier was again tested with this subsample. Overconfidence and representativeness still remain significant at the same levels as with the full samples reported previously. The only significant change was with the alertness variable. With the full samples reported in Table 2, it was not quite significant at the .05 level, whereas with the subsample, it did turn significant.

## DISCUSSION

These results have several important implications, both for research and for practice. These implications are discussed below.

### Theoretical Implications

Common experience suggests that entrepreneurs and managers in large organizations are, somehow, different from each other. It has been somewhat disconcerting that most academic efforts at discovering the sources of these experienced differences have met with limited success. This study presents empirical evidence suggesting that entrepreneurs do behave differently than managers in large organizations and that these differences are substantial. By applying the theory of biases and heuristics, this study has shown that entrepreneurs and managers in large organizations think differently.

This field study has important implications for future work on biases and heuristics. In particular, most previous work has focused on understanding whether specific biases and heuristics exist and the conditions that affect their usage (Abelson and Levi 1985; Stevenson et al. 1990). This research accepts this general premise and moves to another question: Do individuals vary in the extent to which biases and heuristics operate in their decision-making? The results of this study suggest that the extent to which decision-makers deviate from the strict econometric approach may not be a constant and that different individuals may utilize biases and heuristics to different degrees.

Of course, this research only examines two biases and heuristics: overconfidence and representativeness. Other biases and heuristics already identified in the literature may also differentiate between entrepreneurs and managers in large organizations. Future research will need to examine other biases and heuristics to more completely explain the differences between entrepreneurs and managers in large organizations. Also, future research will need to refine current measures of biases and heuristics, to examine not only if these phenomena exist, but also the extent to which they vary among individuals and organizations. Finally, additional samples of entrepreneurs and managers in large organizations should be examined to ensure the generalizability of the findings reported here.

In addition to extending this research to examine other kinds of biases and heuristics, future work will need to examine whether the use of biases and heuristics in strategic decision-making remains stable over time. Some have argued that biases and heuristics are often applied in an unconscious manner (Tversky and Kahneman 1981) and thus are relatively immune from change or modification. Alternatively, others have reasoned that decision biases can be corrected through training (e.g., Russo and Schoemaker 1989; Fong and Nisbett 1991). If the use of biases and heuristics are stable over time, then it would follow that those who are uncomfortable with heuristic-based decision-making, on average, will be attracted and selected into larger firms where this type of decision-making is less frequently required. On the other hand, those who are comfortable with creating and relying on these decision-making short cuts are likely to be attracted to entrepreneurial settings where these decision skills are best utilized (Schneider 1987; Haley and Stumpf 1989). An assumption future research could address is whether individuals with different decision preferences will naturally and efficiently select into organizational contexts where those preferences are valued and accepted, i.e., into entrepreneurial firms or larger organizations. Future research should also explore if the use of biases and heuristics effectively helps with career placement decisions.

This research on biases and heuristics also potentially helps resolve some counter-intuitive conclusions from previous work on risk. Few themes are as synonymous with entrepreneurship as risk, and yet, remain so clouded. Entrepreneurs clearly accept higher levels of risk in their careers and business decisions than managers in large organizations (Bird 1989), yet empirical evidence surrounding this phenomenon is diverse and often weak. For example, many psychological-based studies have shown that the risk-taking propensity of entrepreneurs is *not* greater than that of managers in large organizations (Brockhaus 1980; Low and MacMillan 1988). Thus, most academicians hold that entrepreneurs do not differ substantially in their risk-taking propensity (e.g., Ray 1994). This conclusion is widely held even though it is clear that entrepreneurs are generally involved in starting ventures that are more likely to fail than succeed. This contradiction is frequently resolved by characterizing entrepreneurs as risk accepters (versus risk seekers or risk averse). Thus, the focus has shifted toward understanding how to manage the risk inherent in an entrepreneurial opportunity (Bird 1989; Ray 1994).

For understanding entrepreneurial behavior, the issue may not be one of risk propensity or the sensitivity to probability estimates of possible outcomes, but rather how entrepreneurs think about the decisions they make surrounding the business opportunities they undertake (Ray 1994). It may be that entrepreneurs are more susceptible to the use of biases and heuristics and are likely to perceive less risk in a given decision



situation than are managers in large organizations in the same situation. By being more willing to generalize from limited experience (representativeness) and by feeling overconfident that they will be able to master the major obstacles, entrepreneurs may conclude that a situation is simply less risky than would managers in large organizations. Thus, it may not be the differences in risk propensity that distinguish entrepreneurs from managers in large organizations, but the ways they perceive and think about risk.

Finally, these observations have a potentially important impact in analyzing the relationship between decision-making and performance. Tversky and Kahneman (1974) noted that the use of heuristics may actually improve decisions by noting that they are “quite useful” (p. 1124); that they are “valuable estimation procedure[s]” (p. 1128) and that they “are highly economical and usually effective” (p. 1131). Nonetheless, such claims are typically followed by warnings that heuristics may also “lead to severe and systematic errors” (p. 1131). Rarely if ever do Tversky and Kahneman give examples of heuristics working well. However, if different individuals and organizations are cognitively biased in different ways, then they may make strategic choices in fundamentally different ways (Stumpf and Dunbar 1991). If these cognitive biases are difficult to change, they may represent sources of sustained differences among individuals and firms. Such differences, in the field of strategic management, have been shown to be sources of sustained competitive advantage and sustained competitive disadvantage (Barney 1991). By recognizing that strategic decisions can be nonrational in different ways, this research points to a possible connection between cognitive theories of decision-making, strategic management, and firm performance. Of course, additional research will need to be conducted to examine these potential linkages.

### **Practical Implications**

There are several practical implications that emerge from this study as well. We suspect that without these biases and heuristics, many decisions would never be made. In entrepreneurial ventures, in particular, the window of opportunity would often be gone by the time all the necessary information became available for more rational decision-making. Additionally, successfully starting a new business usually involves overcoming multiple hurdles. Using biases and heuristics as simplifying mechanisms for dealing with these multiple problems may be crucial. To face such hurdles from a strict econometric approach would not only postpone decisions, but would in all likelihood make them overwhelming. More specifically, a greater degree of overconfidence may be particularly beneficial in implementing a specific decision and persuading others to be enthusiastic about it as well (Russo and Schoemaker 1989).

As an illustration of the possible benefits of using biases and heuristics in decision-making, consider the following. One entrepreneur from our sample wrote to us because he took issue with the quantitative emphasis of our study. Overall, he rejected this systematic approach to decision-making. He stated:

You see, people who are engaged in businesses such as mine are rarely influenced by surveys because they don't place any stock in them. Survey reports, in general, are most highly prized by those individuals who lack sufficient knowledge of a matter in which they are required to make a decision. It is my considered opinion that those individuals are not going to be found successfully engaging in entrepreneurial businesses.

The use of biases and heuristics may also offer some help in explaining why entrepreneurs sometimes make bad managers (Schell 1991). Whereas the use of cognitive biases may be beneficial in some circumstances, it can lead to major errors in others (Tversky and Kahneman 1974). Although research has yet to establish performance implications, it is possible that more extensive use of heuristics in strategic decision-making may be a great advantage during the start-up years. However, it may also lead to the demise of a business as a firm matures.

Implications may also exist for managers in large organizations in how they manage the entrepreneurial individuals in their firms. It would appear that a fundamental decision needs to be made as to whether such individuals should be accommodated within the firm or released to go and start their own firm. As large organizations tend to be characterized by more methodical decision-making, such environments can be very stifling for those more comfortable with biased and heuristic reasoning. Thus, if an organization values such individuals, it is important to find organizational contexts for letting these individuals make their contributions. More specifically, it has been suggested that such individuals may be particularly good with problem solving and new product development (Bazerman 1990; Russo and Schoemaker 1989). A second alternative is to decide that such individuals simply will not help an organization long-term. It may be better to help these individuals to start their own firms, where their biased decision-making approach is likely to be more beneficial.

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## **APPENDIX**

### **Problem 1: Equipment Purchase Decision**

Mr. Johnson is about to invest in a new machine and has narrowed his options to Machine A, which is made in the United States or Machine B, which is made overseas. Both machines are equally capable of performing the same function. In considering this decision, Mr. Johnson said to his friend, "You know, it seems that every time I buy a piece of equipment made by a foreign manufacturer, it breaks down in the first month of use."

After further discussion, Mr. Johnson's friend remembers a recent industrial report that gives a significantly higher ranking to Machine B (the one made overseas) than to Machine A. This report bases its recommendation on extensive testing as well as on feedback from dozens of users. If you were in Mr. Johnson's position, which machine would you purchase? Why?

### **Problem 2: Automation Update Decision**

The president is urging the board of directors to accept the purchase of a state-of-the-art computerized machine that would fundamentally change their operations. After describing the capability of this machine, the president cites a recent nationwide study which examined 120 businesses making similar upgrades. Results indicated that at least 85% showed a sizable increase in productivity. In a parallel control group of firms not making the upgrade, about half as many firms (40%) showed a sizable increase in productivity. Based on this study, the president concludes that the computerized machine needs to be purchased.

One of the directors now takes the floor giving two reasons why computerized equipment is not the real reason for increased productivity. First, the managers of businesses that make such changes are likely to be more energetic and adventurous, thus creating an environment for superior performance. Second, any change is likely to lead to superior performance because of the increased interest and commitment on the part of management.

If you were participating in such a decision, whose line of reasoning (president or director) would you be more likely to accept? Why?