

The Big Five Personality Dimensions and Entrepreneurial Status: A Meta-Analytical Review

Hao Zhao

University of Illinois at Chicago

Scott E. Seibert

Melbourne Business School

In this study, the authors used meta-analytical techniques to examine the relationship between personality and entrepreneurial status. Personality variables used in previous studies were categorized according to the five-factor model of personality. Results indicate significant differences between entrepreneurs and managers on 4 personality dimensions such that entrepreneurs scored higher on Conscientiousness and Openness to Experience and lower on Neuroticism and Agreeableness. No difference was found for Extraversion. Effect sizes for each personality dimension were small, although the multivariate relationship for the full set of personality variables was moderate ($R = .37$). Considerable heterogeneity existed for all of the personality variables except Agreeableness, suggesting that future research should explore possible moderators of the personality–entrepreneurial status relationship.

Keywords: personality, entrepreneurship, meta-analysis

Personality variables may have an important role to play in developing theories of the entrepreneurial process, including such areas as entrepreneurial career intentions (e.g., Crant, 1996; Zhao, Seibert, & Hills, 2005), entrepreneurial cognition and opportunity recognition (e.g., Ardichvili, Cardozo, & Ray, 2003), entrepreneurial role motivation (e.g., Miner, 1993), and new venture survival (e.g., Ciavarella, Buchholtz, Riordan, Gatewood, & Stokes, 2004). Indicative of this importance, a substantial amount of research has examined the role of personality in entrepreneurial status (ES) over the last 4 decades. Partially reflecting the state of personality research at the time, these studies included a confusing variety of personality variables, sometimes with unknown reliability and validity and often with little theoretical justification (Chandler & Lyon, 2001; Gartner, 1989). By the late 1980s, inconsistent and even contradictory results from the empirical studies led narrative reviewers to conclude that there is no identifiable relationship between personality and ES and that future research using the trait paradigm should therefore be abandoned (Brockhaus & Horwitz, 1986; Chell, 1985; Gartner, 1988; Robinson, Stimpson, Huefner, & Hunt, 1991).

We believe that this conclusion is premature and may truncate theory development in the field of entrepreneurship by unnecessarily precluding personality variables. Two major developments that occurred in the last 15 years can help us draw more meaningful conclusions from the literature on personality and ES. First,

the emergence of the five-factor model of personality (FFM; Costa & McCrae, 1992; Digman, 1990) allows us to organize a vast variety of personality variables into a small but meaningful set of personality constructs to search for consistent and meaningful relationships. Second, psychometric meta-analysis (e.g., Hunter & Schmidt, 1990) allows us to produce a synthesized effect size estimate for each construct that accounts for research artifacts such as low reliability and sampling error that can mask the emergence of a true relationship. Thus, the purpose of this study is to provide the first meta-analytical review of the relationship between the Big Five personality dimensions and ES.

The current study is the first to use the FFM to organize the full range of personality variables that have been examined in the entrepreneurship literature. This approach has led to renewed interest in the role of personality in other areas of applied psychology, including job performance (e.g., Barrick & Mount, 1991), job satisfaction (e.g., Judge, Heller, & Mount, 2002), and leadership (e.g., Judge, Bono, Ilies, & Gerhardt, 2002). A series of recent articles (Miner & Raju, 2004; Stewart & Roth, 2001, 2004a) have examined the relationship between one personality trait—risk propensity—and ES. The placement of risk propensity within the FFM is controversial (e.g., Doster et al., 2000). Recent work by Nicholson, Fenton-O’Creevy, Soane, and William (2005) suggests that risk propensity is a compound personality trait reflecting a specific combination of scores on all five basic personality factors (namely, high Extraversion and Openness and low Neuroticism, Agreeableness, and Conscientiousness), whereas some personality researchers argue that it forms a separate sixth dimension of personality (Jackson, 1994; Paunonen & Jackson, 1996). Thus, it is appropriate to examine risk propensity as a separate construct outside of the FFM, as these previous meta-analyses have done. The current meta-analysis, however, is unique because it is the first cumulation of empirical results that addresses the relationship between the five fundamental dimensions of personality and ES.

Hao Zhao, Department of Managerial Studies, University of Illinois at Chicago; Scott E. Seibert, Melbourne Business School, Melbourne, Australia.

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Correspondence concerning this article should be addressed to Hao Zhao, Department of Managerial Studies (M/C 243), University of Illinois at Chicago, 601 South Morgan Street, Chicago, IL 60607-7123. E-mail: zhaohao@uic.edu

Personality and ES

Overwhelming evidence exists within the vocational psychology literature that mean personality scores differ across jobs, occupations, and work environments (Ones & Viswesvaran, 2003). For example, Holland's (1985) typology of vocational choice is built on substantial empirical evidence that people make occupational choices on the basis of different interest patterns, which produces different personality profiles across occupations and work environments. The literature on person–environment fit (e.g., Kristof, 1996) similarly supports the proposition that individuals gravitate toward jobs and work environments that match their personalities. For example, Schneider, Smith, Taylor, and Fleener (1998) found significant mean personality differences among managers across organizations.

Schneider's (1987) attraction–selection–attrition (ASA) model explains how individual and organizational processes produce mean differences in personality across organizational work environments. Ones and Viswesvaran (2003) adapted the ASA logic to explain the homogeneity of personality scores within jobs. Here we adapt ASA theory to explain the association between personality and ES. First, individuals with certain personality traits may be more attracted to the entrepreneurial form of employment than others may be. Second, selection by outside agents critical to founding a new venture—investment bankers, venture capitalists, potential partners, suppliers, and key employees—may favor individuals possessing certain personality traits over others. Such favorable selection will facilitate the actual founding of an entrepreneurial venture. Finally, individuals with certain personality traits may find entrepreneurial activities more satisfying and fulfilling than do others without those traits, and thus these individuals may persist long enough to actually establish the new venture and become an entrepreneur.

Following the previous research in this area (e.g., Miner & Raju, 2004; Stewart & Roth, 2001), we compare the personality traits of entrepreneurs and managers. We focus on managers as a comparison group rather than on other groups available in the literature, such as the unemployed, students, or the general population, because we believe it provides the most rigorous and valid test for personality differences in ES (Brockhaus, 1982). As reviewed above, Holland's (1985) work has shown that mean personality differences exist across occupational categories. Because entrepreneurs and managers would both be identified within Holland's "enterprising" occupational category, we expect them to be relatively similar in terms of personality. Other situational factors that may promote entrepreneurial activity, such as general business knowledge and exposure to business opportunities, are also likely to be similar for managers and entrepreneurs. By comparing managers and entrepreneurs, we hope to minimize many of these confounding factors to focus specifically on the role of personality. Thus our research question is narrowly focused on the personality factors that lead one to become an entrepreneur rather than a manager in a traditional employment situation.

The Big Five Personality Dimensions and ES

The FFM provides a parsimonious yet comprehensive taxonomy of personality. Each personality dimension describes a broad domain of psychological functioning that is composed from a set of

more specific and narrow traits. The FFM brings together over 40 years of research on the emotional, interpersonal, experiential, attitudinal, and motivational style of an individual. The work of Costa and McCrae (e.g., Costa & McCrae, 1992) has provided what is perhaps the most developed operationalization of the FFM to date. The insights provided by this work provide the basis for the hypotheses that follow.

Neuroticism

Neuroticism represents individual differences in adjustment and emotional stability. Individuals high on Neuroticism tend to experience a number of negative emotions including anxiety, hostility, depression, self-consciousness, impulsiveness, and vulnerability (Costa & McCrae, 1992). People who score low on Neuroticism can be characterized as self-confident, calm, even tempered, and relaxed.

Managers, by definition, work within an established business organization with work processes supported by established organizational procedures and practices. Entrepreneurs, on the other hand, work within a relatively unstructured environment where they have primary responsibility for all aspects of a venture. They work more hours than do managers and often lack the level of separation between work and life spheres typical of managerial work (Dyer, 1994). They also typically have a substantial financial and personal stake in the venture and lack the security of benefits typically provided to middle- and upper-level managers, such as a severance package or an independently funded retirement program. Thus, the work environment, workload, work–family conflict, and financial risk of starting and running a new business venture can produce physical and psychological stress beyond that typical of managerial work. At the same time, entrepreneurs have been described as highly self-confident (Chen, Greene, & Cricke, 1998; Crant, 1996) with a strong belief in their ability to control outcomes in the environment (Simon, Houghton, & Aquino, 2000). Remarkable self-confidence and resilience in the face of stress therefore appear to be much more important for entrepreneurs than managers. These are traits that define low levels of Neuroticism. As a result of the processes of attraction, selection, and attrition described above, we expect entrepreneurs to have a lower level of Neuroticism than managers have.

Hypothesis 1: Entrepreneurs will score lower than managers on Neuroticism.

Extraversion

Extraversion describes the extent to which people are assertive, dominant, energetic, active, talkative, and enthusiastic (Costa & McCrae, 1992). People who score high on Extraversion tend to be cheerful, like people and large groups, and seek excitement and stimulation. People who score low on Extraversion prefer to spend more time alone and are characterized as reserved, quiet, and independent. Costa and McCrae (1992) described salespersons as prototypical extraverts.

Extraversion is positively related to interest in enterprising occupations (Costa, McCrae, & Holland, 1984). Although Extraversion may be a valuable trait for managerial work, we expect Extraversion to be even more important for entrepreneurs. Entre-

preneurs must interact with a diverse range of constituents, including venture capitalists, partners, employees, and customers. They are often in the role of a salesperson, whether they are persuading an investment banker or venture capitalist to back their idea or a client to buy their product or service. In addition to these external relations, the minimal structure of a new venture and the lack of a developed human resource function suggest that the entrepreneur can expect to spend considerable time in direct interpersonal interaction with their partners and employees. Because entrepreneurship appears to require even more direct social interaction with external and internal constituents than does the typical role of manager, we expect Extraversion to be positively associated with ES.

Hypothesis 2: Entrepreneurs will score higher than managers on Extraversion.

Openness to Experience

Openness to Experience is a personality dimension that characterizes someone who is intellectually curious and tends to seek new experiences and explore novel ideas. Someone high on Openness can be described as creative, innovative, imaginative, reflective, and untraditional. Someone low on Openness can be characterized as conventional, narrow in interests, and unanalytical. Openness is positively correlated with intelligence, especially aspects of intelligence related to creativity, such as divergent thinking (McCrae, 1987).

Schumpeter (1942/1976) argued that the defining characteristic of the entrepreneur is his or her emphasis on innovation. More recent scholarship has also noted the strong desire of entrepreneurs to be creative and to create something larger than themselves (Engle, Mah, & Sadri, 1997). Founding a new venture is likely to require the entrepreneur to explore new or novel ideas, use his or her creativity to solve novel problems, and take an innovative approach to products, business methods, or strategies. Management, on the other hand, has a greater emphasis on following established rules and procedures to coordinate activity and maintain current productivity (Weber, 1947). Even in the most rapidly changing organizational environments, the managerial role is likely to place more emphasis on following established policies and implementing strategies developed at a higher level. We therefore expect the following.

Hypothesis 3: Entrepreneurs will score higher than managers on Openness to Experience.

Agreeableness

Agreeableness assesses one's interpersonal orientation. Individuals high on Agreeableness can be characterized as trusting, forgiving, caring, altruistic, and gullible. The high end of Agreeableness represents someone who has cooperative values and a preference for positive interpersonal relationships. Someone at the low end of the dimension can be characterized as manipulative, self-centered, suspicious, and ruthless (Costa & McCrae, 1992; Digman, 1990). Although Agreeableness may lead one to be seen as trustworthy and may help one form positive, cooperative working relationships, high levels of Agreeableness may inhibit one's

willingness to drive hard bargains, look out for one's own self-interest, and influence or manipulate others for one's own advantage. McClelland and Boyatzis's (1982) research has also shown that a high need for affiliation, a component of Agreeableness, can be a detriment to the careers of managers, apparently because it interferes with the manager's ability to make difficult decisions affecting subordinates and coworkers. Seibert and Kraimer (2001) also found Agreeableness negatively related to salary level and career satisfaction in a managerial sample.

Although the negative effects of Agreeableness appear to predominate for those performing managerial work in established organizations, we expect the negative effects to be even more detrimental for those in an entrepreneurial role. Because the entrepreneur often operates with less access to legal protections and with a thin financial margin of error due to limited resources, they are even more likely than managers to suffer serious consequences from even small bargaining disadvantages. In addition, managers in established organizations who operate in an overly self-interested and disagreeable manner are likely to eventually suffer negative consequences from peers and supervisors. Entrepreneurs work in smaller organizations and they are less likely to be constrained by dense and interlocking social relationships (Burt, 1992). This suggests that there may be fewer negative repercussions associated with the opportunistic behavior of entrepreneurs. Therefore, we expect ASA processes to lead to lower mean levels of Agreeableness among entrepreneurs than managers.

Hypothesis 4: Entrepreneurs will score lower than managers on Agreeableness.

Conscientiousness

Conscientiousness indicates an individual's degree of organization, persistence, hard work, and motivation in the pursuit of goal accomplishment. Some researchers have viewed this construct as an indicator of volition or the ability to work hard (Barrick & Mount, 1991). It has been the most consistent personality predictor of job performance across all types of work and occupations (Barrick, Mount, & Judge, 2001). Many scholars regard Conscientiousness as a broad personality dimension that is composed of two primary facets: achievement motivation and dependability (e.g., Mount & Barrick, 1995). Achievement motivation has been widely studied in the context of entrepreneurship (Shaver, 1995), but dependability has received much less explicit attention. We therefore examine Conscientiousness as a unitary construct and the two primary facets of Conscientiousness separately in our analyses.

McClelland (e.g., McClelland, 1961) was the first to propose that a high need for achievement would drive individuals to become entrepreneurs primarily because of their preference for situations in which performance is due to their own efforts rather than to other factors. McClelland also proposed that effective managers would not be characterized by a high need for achievement because managers in organizational environments must work with and through others. Narrative reviews of achievement motivation and entrepreneurship suggest that support for the association has been mixed or inconsistent (Johnson, 1990). Collins, Hanges, and Locke (2004) and Stewart and Roth (2004b) reported that entrepreneurs have higher achievement motivation than do

managers in their meta-analyses. This hypothesis is a replication of the earlier meta-analyses but conducted here within the context of a broader model of personality.

The dependability facet of Conscientiousness reflects the extent to which one is organized, deliberate, and methodical and can be relied on to fulfill one's duties and responsibilities. Like the overarching Conscientiousness construct, this particular constellation of attributes would appear to be valuable in a manager or an entrepreneur. However, managers working within an established organization are likely to have their responsibilities, goals, and work performance more closely structured and monitored by existing organizational systems and day-to-day interactions, mitigating somewhat the necessity of possessing dependability as an individual trait. Entrepreneurs, by contrast, operate in a more discretionary and self-directed environment, that is, a "weak" situation in which individual traits are likely to have a more important role (Snyder & Ickes, 1985). In addition, referring to the second aspect of the ASA theory, it seems that potential partners, venture capitalists, and other agents will be more likely to select entrepreneurs whom they judge to be dependable, for example, those who develop detailed plans and strategies and demonstrate the tendency to fulfill their commitments.

Hypothesis 5a: Entrepreneurs will score higher than managers on Conscientiousness.

Hypothesis 5b: Entrepreneurs will score higher than managers on achievement motivation.

Hypothesis 5c: Entrepreneurs will score higher than managers on dependability.

Moderator Hypotheses

The previous narrative reviews of personality and ES have found inconsistent and contradictory results across studies. Because data have been collected in a range of countries, it is possible that the variance in results may be attributable to national differences, including national culture. McClelland (1961), for example, linked a country's level of entrepreneurial activity and economic development to the extent to which their culture emphasized achievement. We chose to examine two dimensions of national culture developed by Project GLOBE (House, Hanges, Javidan, Dorfman, & Gupta, 2004), uncertainty avoidance and performance orientation, as moderators because they can be conceptually associated with specific dimensions of personality and entrepreneurship. Uncertainty avoidance as a culture dimension assesses the extent to which a society relies on social norms, rules, and procedures to alleviate the stress associated with unpredictability in future events. Research has shown uncertainty avoidance as a dimension of national culture to be related to average levels of neuroticism, anxiety, and stress reported by individuals within nations (Hofstede, 1980). Performance orientation is a cultural dimension conceptually derived from McClelland's work on the need for achievement (House & Javidan, 2004). It assesses the degree to which a society encourages and rewards performance improvement and high standards of excellence.

We expect uncertainty avoidance and performance orientation to moderate the relationship of Neuroticism and achievement

motivation, respectively, to ES. Although the interaction of culture and personality in the production of individual behavior may be complex, the most common view is that behavior that is consistent with cultural values will be more acceptable and therefore more likely to be exhibited than behavior that clashes with cultural values (Dorfman, 2004, p. 64). This *cultural congruence* proposition leads us to expect the negative relationship between Neuroticism and ES to be stronger in societies high on uncertainty avoidance. As we discussed above, founding a new venture is likely to be an inherently unstructured activity with unpredictable outcomes. An individual's tendency to minimize anxiety and stress by avoiding situations that involve unstructured activity and unpredictable events is likely to be enhanced in a society that values the use of rules, structures, and formalized procedures to minimize uncertainty. Using the same cultural congruence logic, we also expect the association between achievement motivation and ES to be stronger in societies that score high on performance orientation. This is because achievement oriented behaviors, such as founding a new business venture, will be more expected, rewarded, and effective in a culture that values hard work, striving for excellence, and individual accomplishment.

Hypothesis 6a: Uncertainty avoidance will moderate the relationship between Neuroticism and ES such that the relationship will be stronger for societies that score high on uncertainty avoidance.

Hypothesis 6b: Performance orientation will moderate the relationship between achievement motivation and ES such that the relationship will be stronger for societies that score high on performance orientation.

A second variable that might moderate observed relationships is the type of measurement strategy used to assess the personality construct. Miner and Raju (2004) argued on theoretical grounds that studies using projective measures and those using objective measures should be examined separately because they could yield different results for the same personality construct. Projective techniques are assumed to measure implicit or unconscious aspects of the trait that might better predict long-term or spontaneous behaviors (Meyer, 1996). Miner and Raju found projective measures of risk propensity negatively related to ES but found objective measures of presumably the same construct positively related to ES. Stewart and Roth (2004a) reported similar findings but attributed them to the limited evidence for the validity of projective measures used in entrepreneurship research, particularly the Miner Sentence Completion Scale—Form T (Wightman, 1992). Thus we view moderation by measurement technique as an important but exploratory hypothesis and propose no direction for the difference. Further, because projective measures were used only for achievement and dependability in the primary studies included in this meta-analytic review, we examine moderation by measurement types only for these two facets of Conscientiousness.

Method

Definition of Entrepreneurs and Managers

Historically, there has been little consensus among scholars regarding the definition of entrepreneurship (Busenitz et al., 2003). In this analysis,

we followed the most widely accepted practice (e.g., J. W. Carland, Hoy, Boulton, & Carland, 1984; Rauch & Frese, 2000; Stewart & Roth, 2001) and defined an entrepreneur as someone who is the founder, owner, and manager of a small business and whose principal purpose is growth. Our comparison group in this meta-analysis is managers. Like *entrepreneur*, the term *manager* can denote a diverse population that includes managers at different levels and functions. We take a relatively broad definitional approach and include managers of all ranks and functions. Excluded are comparison groups that comprise other subgroups of entrepreneurs (e.g., female entrepreneurs or less successful entrepreneurs), students, or the general population.

Searching and Screening Studies

We conducted searches in a number of electronic databases including PsycINFO, ABI-Inform, Academic Search Elite, Business Source Elite, WilsonBusiness, and Dissertation Abstracts International. We were interested in collecting all studies that compared entrepreneurs and managers on one or more psychological traits. We used a number of keyword combinations to conduct searches. For example, we searched using *entrepreneur* AND manager* AND personalit** (* is a truncation symbol to represent multiple spellings or endings; *AND* is a Boolean operator that combines search terms so that the search result contains all of the terms). We also searched using names of specific personality scales, such as *16PF* (Sixteen Personality Factor Questionnaire), *PRF* (Personality Research Form), *JPI* (Jackson Personality Inventory), and *MBTI* (Meyers-Briggs Type Indicator), as keywords. Because specific personality scales may not appear as keywords of relevant publications and thus could not be found by electronic search (Miner & Raju, 2004), we used several approaches to supplement our electronic search. First, we browsed the contents table of several major entrepreneurship research outlets, such as *Frontiers of Entrepreneurship Research* 1981–2002, *Journal of Business Venturing* 1985–2002, *Entrepreneurship Theory and Practice* (and its former title *American Journal of Small Business*) 1979–2002, and *Journal of Small Business Management* 1980–2002. Second, we went through the previous narrative reviews (e.g., Busenitz et al., 2003; Rauch & Frese, 2000) and meta-analyses (e.g., Miner & Raju, 2004; Stewart & Roth, 2001) to find relevant studies. Third, we checked the reference lists of all currently included empirical studies to identify articles of interest. All the search results were entered into a reference management program (Endnote 6.0) to identify and eliminate duplicate entries. We could not retrieve dissertations finished outside of North America, and we eliminated any study not written in English. We thus retrieved 47 studies for further screening.

We set several criteria for screening the articles we found. First, as discussed above, we eliminated articles that included samples that did not fit our definition of entrepreneur. As several scholars have observed (e.g., Gartner, 1989; Rauch & Frese, 2000), it is difficult to identify relevant studies because many entrepreneurship publications fail to provide a clear description of their sample. To make our analysis as inclusive as possible, we generally accepted the researcher's designation of a sample as *entrepreneurs* and eliminated a study only when we had information that the entrepreneur sample did not fit one or more of the specific criteria in our definition of entrepreneur. For example, our definition of an entrepreneur required that the individual must own a business. Sexton and Bowman (1983) and Sagie and Elizur (1999) were excluded because they used students majoring in entrepreneurship who did not own a business.

The second criterion for inclusion was that there be a clear comparison group that meets our definition of *managers*. We excluded studies that used a subcategory of entrepreneurs, for example unsuccessful entrepreneurs, as the comparison group (e.g., Miner, Smith, & Bracker, 1989). We also excluded comparisons between entrepreneurs and the general population (Hornaday & Bunker, 1970). Finally, we excluded two studies (Aldridge, 1997; Lynn, 1969b) that compared their entrepreneur sample to the archival data of a manager sample reported in another source, such as the

manual for the personality instrument. This procedure may introduce extraneous method errors in the difference score because the entrepreneur sample and the manager sample were collected at different times, for different purposes, and by different researchers.

The third criterion for inclusion was that the study must have included the measurement of at least one personality trait that can be categorized in terms of the FFM. Although the FFM provides a comprehensive framework for personality, some personality variables show no consistent relationship to any factor and some correlate with multiple factors. Following previous meta-analyses using a similar strategy in other substantive research areas (e.g., Judge, Bono, et al., 2002), we did not include these variables in our study. Personality measures such as the Type A personality (see Judge, Bono, et al., 2002), Kirtion's Adaptation-Innovation Inventory (see Gelade, 2002), and risk-taking propensity (see Nicholson et al., 2005; Paunonen & Jackson, 1996) fall into this category, and studies using those measures were thus excluded from our analysis.

Finally, to be included, a study had to provide sufficient data for the calculation of effect size. Many studies were excluded because of lack of sufficient statistical information (e.g., Babb & Babb, 1992). For multiple studies reporting the same pool of data (e.g., a dissertation that later became a journal article), we include only the first published study to avoid using a dependent sample. We included a total of 23 nonoverlapping studies for our analyses, and the number of studies included for each personality dimension varied.¹ Five out of the 23 studies were from sources other than journals (e.g., unpublished dissertations).

Assignments of Personality Scales to Constructs

A number of meta-analyses in the organizational sciences have used a panel of expert judges to assign personality scales to one of the Big Five dimensions (Barrick & Mount, 1991; Judge, Bono, et al., 2002). These assignments are generally made on the basis of scale definitions and have not been included in the published report. However, an extensive series of studies have accumulated over the last 15 years that either analyze existing personality instruments in terms of a hierarchical FFM or report empirical correlations between the various personality scales and a direct measure of the FFM (e.g., Costa & McCrae, 1992). Collectively, these studies provide an empirical rather than judgmental method for categorizing personality variables within the Big Five framework. In the present study, we refer to published empirical studies to assign personality inventories to Big Five factors. We assigned a trait to one of the Big Five dimensions only when consistent empirical evidence was available that the trait was correlated with that dimension and not correlated with any other dimension. The Appendix lists the personality scales assigned to each of the Big Five dimensions.

National Culture Variables

Studies were categorized for the moderation analysis on the basis of the nationality of the subject populations. Information on each society's standing on uncertainty avoidance and performance orientation was taken from the "society practices" data provided by Project GLOBE (House et al., 2004). Societies falling into Test Band A on a dimension were categorized as high for that dimension, whereas societies falling into lower bands were categorized as low. A simple high–low dichotomy was used because of the small number of countries available for each analysis.

Analytical Techniques

Using the methods of Hunter and Schmidt (1990), we conducted five main meta-analyses to estimate differences between entrepreneurs and

¹ The list of excluded studies is available from Hao Zhao on request.

managers on Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. The effect size, d , is calculated as the ratio of the mean difference and the pooled standard deviation of the entrepreneurs group and the managers group. Thus d is a standardized effect size statistic that is independent of sample size. Other forms of statistical information like the t value, F value, or point-biserial correlation r are transformed to d according to formulas provided by Hunter and Schmidt (1990). We weighted the effect size of each study by its sample size to get the average observed effect size, \bar{d} .

In our study, the only adjusted artifact is the reliability of the personality scales. Few of the studies in this area report the reliability of measures in their specific sample (Chandler & Lyon, 2001). Because reliability information was lacking in the primary studies collected here, we used reliability information provided in the published manual that accompanies standard instruments or, lacking this, reliabilities reported in large sample empirical studies using the measure or, failing either of these, reliabilities provided in review articles regarding the measure. We include a single sample-weighted average of effect sizes if a study reported comparisons between one group of entrepreneurs and multiple groups of managers (e.g., Brockhaus & Nord, 1979). If a study used multiple personality scales to measure the same Big Five dimension on the same pool of subjects (e.g., Robbins, 1986), we averaged over measures and used the single result as the effect size for the study. For fully replicated design or analysis of subgroups (e.g., Bellu, Davidsson, & Goldfarb, 1990; J. C. Carland & Carland, 1991), we included a single sample-weighted average of the effect sizes as long as the categorization criterion was not a proposed moderator, and the single sample size is the sum of the sample sizes across those independent studies (Hunter & Schmidt, 1990).

In addition to the average observed effect size, \bar{d} , and the corrected average effect size, \bar{d}_c , we reported both the 90% confidence interval (CI) and the 80% credibility interval (CRI) around the estimated population effect sizes. CIs and CRIs each provide important but unique information about meta-analytical results (Whitener, 1990). The CI is based on the uncorrected standard error of the mean effect size and provides an estimate of variability in the mean effect size. A 90% CI excluding zero indicates that we can be 95% confident that the true average effect size is nonzero. In the present case, a CI excluding zero suggests the existence of a reliable difference between the entrepreneur population and the manager population. The CRI is based on the corrected standard deviation and provides an estimate of the variability of the individual effect sizes across studies. An 80% CRI excluding zero indicates that 90% of the individual effects in the meta-analysis are positive or negative, as the case may be. In addition, the CRI provides information for evaluating the existence of moderators. A wide CRI suggests the existence of moderators.

Results

Meta-analytic results for each of the Big Five personality dimensions are shown in Table 1. The CIs for Neuroticism, Open-

ness to Experience, Agreeableness, and Conscientiousness exclude zero, providing evidence for the accuracy for the estimated effect size. Consistent with Hypotheses 1 and 4, entrepreneurs scored significantly lower than managers on Neuroticism ($\bar{d}_c = -0.37$) and Agreeableness ($\bar{d}_c = -0.16$). Consistent with Hypotheses 3 and 5a, entrepreneurs scored significantly higher than managers on Openness to Experience ($\bar{d}_c = 0.36$), and Conscientiousness ($\bar{d}_c = 0.45$). Thus we found evidence that entrepreneurs differ from managers on these four fundamental dimensions of personality. As the effect size statistic shows, the largest difference between entrepreneurs and managers was for the Conscientiousness construct. Contrary to Hypothesis 2, the CI for Extraversion includes zero, suggesting that entrepreneurs do not differ from managers on this dimension of personality. However, the CRI for the Extraversion construct suggests considerable variability over studies, and there is a possibility that the effect size for Extraversion may be positive in a majority of studies.

To examine the explanatory ability of the full FFM, we examined the multivariate relationship of the Big Five to ES. Using Hunter's (1992) regression program, we regressed ES (entrepreneurs = 1 and managers = 0) on the five personality dimensions as predictors. To form the correlation matrix that served as input to the program, we transformed the d scores in Table 1 into point-biserial correlation r scores using the formula provided by Hunter and Schmidt (1990), and we used Ones, Viswesvaran, and Reiss's (1996) meta-analytic estimates of the intercorrelations among the Big Five dimensions. Both sets of correlations were corrected for unreliability. As suggested by Viswesvaran and Ones (1995), the sample size we used for the regression was the harmonic mean of the sample size per dimension across the five dimensions in the analysis ($N = 1,914$).

The multiple regression result is shown in Table 2. Conscientiousness had the highest standardized regression coefficient ($\beta = .26, p < .01$), and Agreeableness and Openness to Experience were also significant predictors of ES ($\beta_s = -.22$ and $.18$, respectively, $p_s < .01$). The impacts of Neuroticism and Extraversion on the ES were smaller in the multiple regression. The multiple R between the personality dimensions and ES was moderate in magnitude and statistically significant ($R = .37, p < .01$).

To test Hypotheses 5b and 5c, we conducted separate meta-analyses for studies using personality scales that on the basis of face validity, could be assigned to the achievement motivation facet and those using scales that could be assigned to the dependability facet of Conscientiousness. Our results show that entrepre-

Table 1
Results of Meta-Analyses

Trait	K	N	\bar{d}	\bar{d}_c	90% CI		80% CRI	
					Lower	Upper	Lower	Upper
Neuroticism	14	2,305	-0.32	-0.37	-0.54	-0.21	-0.82	0.07
Extraversion	9	1,476	0.20	0.22	-0.01	0.45	-0.28	0.72
Openness	10	2,115	0.30	0.36	0.19	0.52	-0.01	0.72
Agreeableness	7	1,350	-0.14	-0.16	-0.27	-0.05	-0.30	-0.02
Conscientiousness	20	3,480	0.39	0.45	0.38	0.52	-0.07	0.97

Note. K = number of studies; N = total sample size; \bar{d} = average observed effect size; \bar{d}_c = average effect size corrected for reliability of the measure; CI = confidence interval; CRI = credibility interval.

Table 2
Multiple Regression With Entrepreneurial Status as the
Dependent Variable

Trait	β/R^a	SE	<i>t</i>
Neuroticism	-.12	.03	4.80*
Extraversion	.09	.02	3.88*
Openness	.18	.02	7.67*
Agreeableness	-.22	.02	9.00*
Conscientiousness	.26	.02	10.32*
Multiple <i>R</i>	.37	.02	16.94*

Note. Entrepreneur = 1, and manager = 0.

^a With the exception of the multiple *R* estimate in the last row, all estimates in the β/R column are standardized regression coefficients.

* $p < .01$.

neers scored significantly higher on achievement motivation than did managers ($\bar{d}_c = 0.59$) but that the two groups were equivalent in their levels of dependability ($\bar{d}_c = 0.01$). The CIs of achievement motivation and dependability do not overlap, suggesting a reliable difference between the effect sizes of the two facets. The CRIs for dependability and achievement are wide and suggest the potential operation of moderator variables.

Table 3 also presents the results regarding the moderation of the relationships for achievement motivation and dependability by measurement types. Both projective ($\bar{d}_c = 0.54$) and objective ($\bar{d}_c = 0.61$) measures produce moderate positive effect size estimates for achievement motivation with no evidence of moderation by measurement type. The results presented in the bottom half of Table 3 do provide support for moderation of the dependability effect by measurement type. Entrepreneurs scored somewhat higher than managers when projective tests were used to measure dependability ($\bar{d}_c = 0.22$) but did not differ when objective measures were used ($\bar{d}_c = -0.13$). The nonoverlapping CIs indicate a reliable difference between these two effects.

Hypotheses 6a and 6b proposed moderation of the relationships for Neuroticism and achievement motivation by the national culture dimensions of uncertainty avoidance and performance orientation, respectively. As shown in Table 4, The effect size of Neuroticism in societies coded as high on uncertainty avoidance was substantially larger in magnitude than that in societies coded as low ($\bar{d}_c = -0.70$ vs. -0.32), but the CIs for the two effects overlapped. The effect sizes of achievement motivation were not

much different between societies coded as high in performance orientation and those coded as low ($\bar{d}_c = 0.63$ vs. 0.45), and the CIs for the two effects also overlapped. Thus neither cultural moderation hypothesis was supported.

Discussion

Gartner (1989) suggested that scholars interested in personality and ES should have a better understanding of personality theories. Following this advice, we started from an understanding of the basic structure of personality to address a question that has occupied scholars for decades: Do entrepreneurs differ from others in terms of their basic personality? In contradiction to accepted conclusions in the field of entrepreneurship, our results suggest that indeed, entrepreneurs differ from those in managerial positions on four of the five fundamental dimensions of personality. The effect sizes for each personality dimension range from small to medium (Cohen, 1988), with the absolute value of corrected mean difference scores ranging from .16 to .45. These effect sizes are not only statistically significant but similar in magnitude to findings that have revitalized interest in personality variables in other areas of applied psychology (e.g., Barrick et al., 2001; Hurtz & Donovan, 2000). The results of the multiple regression analysis based on our meta-analytic estimates are even more supportive. When all five personality dimensions are included as a set, the multiple correlation was .37, a moderate effect size by conventional standards. These results should not be regarded as exact because they are based on estimated intercorrelations, but they are suggestive. Personality variables appear to have a role in future theories of entrepreneurship.

The personality construct with the strongest relationship to ES was Conscientiousness. Subsequent analyses examined achievement and dependability as separate constructs. Achievement motivation has been implicated as an important individual difference variable predicting entrepreneurship since the work of McClelland (1961). Our results support McClelland's (1961) original proposition and are consistent with meta-analytical results presented by Collins et al. (2004) and Stewart and Roth (2004b). Collins et al. showed further that achievement motivation is positively related to entrepreneurial performance. These studies provide growing evidence regarding the importance of achievement motivation in entrepreneurship. The effect size for dependability, the second facet of Conscientiousness, was not significantly different from

Table 3
Two Facets of Conscientiousness and Measurement Types as Moderators

Facet and measurement type	<i>K</i>	<i>N</i>	\bar{d}	\bar{d}_c	90% CI		80% CRI	
					Lower	Upper	Lower	Upper
Achievement facet	17	3,005	0.52	0.59	0.55	0.63	0.34	0.85
Projective measures	7	787	0.47	0.54	0.37	0.70	0.30	0.77
Objective measures	10	2,218	0.53	0.61	0.48	0.74	0.35	0.88
Dependability facet	13	1,980	0.01	0.01	-0.13	0.14	-0.31	0.32
Projective measures	6	767	0.20	0.22	0.06	0.39	0.02	0.43
Objective measures	7	1,213	-0.11	-0.13	-0.28	0.02	-0.37	0.11

Note. *K* = number of studies; *N* = total sample size; \bar{d} = average observed effect size; \bar{d}_c = average effect size corrected for reliability of the measure; CI = confidence interval; CRI = credibility interval.

Table 4
National Cultures as Moderators

Culture	K	N	\bar{d}	\bar{d}_c	90% CI		80% CRI		
					Lower	Upper	Lower	Upper	
Neuroticism									
High uncertainty avoidance societies	3	349	-0.60	-0.70	-1.05	-0.35	-1.10	-0.30	
Low uncertainty avoidance societies	11	1,956	-0.27	-0.32	-0.48	-0.15	-0.72	0.08	
Achievement									
High performance orientation societies	11	2,349	0.55	0.63	0.51	0.76	0.37	0.89	
Low performance orientation societies	6	656	0.39	0.45	0.30	0.60	0.31	0.59	

Note. K = number of studies; N = total sample size; \bar{d} = average observed effect size; \bar{d}_c = average effect size corrected for reliability of the measure; CI = confidence interval; CRI = credibility interval.

zero. Thus there is some evidence that facets within a single primary personality dimension can have differential relationships with ES. Exploring the role of narrow traits in the attainment of ES may therefore be a productive avenue for future research. But to add theoretical value, the burden of proof is to demonstrate that the narrow traits explain variance beyond that associated with the primary dimensions of the parsimonious FFM (Ones & Viswesvaran, 1996).

The second follow-up analysis we conducted examined possible moderation by measurement type for each facet of Conscientiousness. Our results showed no evidence for the moderation of achievement motivation—both projective and objective measures indicated equivalent positive relationship between achievement motivation and ES. However, there was evidence for moderation of the relationship involving dependability. The meta-analysis of the six studies that used projective measures indicated a small positive relationship between dependability and ES, although the seven studies that relied on objective measures showed no significant effect. Thus our results support Miner and Raju's (2004) claim that projective measures and objective measures of the same construct can yield different outcomes. Exploring the exact reasons for this difference is outside the scope of this study, but future attention to the effects of different measurement strategies is justified.

One of the unique contributions of our use of the FFM to organize the literature on personality and ES is our focus on the Openness to Experience dimension. The Openness construct brings together in one coherent dimension of personality such traits as imagination, creativity, intuition, and independence of judgment and thus allows us to draw a single clear conclusion about this important domain of psychological functioning. Our results showed that entrepreneurs scored higher on Openness than did managers. Innovation, change, and creativity are at the core of recent definitions of entrepreneurship (e.g., Shane & Venkataraman, 2000), and these traits evoke Schumpeter's (1942/1976) classic description of the entrepreneur as the agent of "creative destruction." Despite its strong intuitive appeal, relatively little attention has been devoted to the role of this global personality dimension in studies of ES to date. Our results justify further work with this construct. Recent work (e.g., Ciavarella et al., 2004) suggests a negative role for Openness to Experience in later stages

of the entrepreneurial process. Entrepreneurial tenure or venture stage may explain the variability in the individual studies included in our analysis of this dimension. We encourage more empirical studies using longitudinal design or at least reporting the venture stages of their samples so that this moderation hypothesis can be tested in future research.

For Extraversion, the CI was wide and included zero, suggesting the difference between entrepreneurs and managers on this personality dimension is not reliable or could not be measured with precision in this sample. As indicated by the CRI, there is considerable variability in the Extraversion effect across studies. The CRI suggests that we should expect the majority of studies to report a positive effect size for Extraversion. However, we could not identify and test moderators to account for the variability for Extraversion in this analysis because of the lack of relevant information in the primary studies. Thus, we do not currently understand the circumstances under which the positive relationship between extraversion and ES is likely to emerge.

Limitations

The limitations of any meta-analytical study emanate primarily from the primary studies on which the analysis is based. One limitation in the current research is that most of the primary studies in this area were based on a cross-sectional research design (Gartner, 1989). A cross-sectional design does not allow the researcher to draw causal conclusion and meta-analysis does not overcome this limitation. Our concern with the causal direction of effects is mitigated by the fact that the personality dimensions assessed in this study exhibit considerable consistency over time (Costa & McCrae, 1992), but we encourage future research taking a longitudinal approach. A second limitation concerns the relatively small number of studies included for each personality dimension. We chose to include studies that did not specifically violate our definition rather than to include only those that we were certain did fit because of the lack of full information and the small number of studies with clear entrepreneur and manager comparison groups. This may have biased our results by eliminating studies with more complete information, but it is not clear what the direction of such a bias would be. It is ironic that we report relatively few studies having sufficient information for a meta-analysis in an area that

many scholars have considered overresearched. Our results show, however, that the sample is large enough to produce reliable average effect size estimates even for the least studied construct, Agreeableness. A third limitation of our study is that we were largely unsuccessful in our attempt to identify moderating variables that would allow us to isolate homogenous subsets of studies for each personality construct. Our ability to search for moderator variables was limited by the information contained in the source articles. Other scholars have already commented on the need for more careful research design and reporting in this area (Gartner, 1989) and we concur. A fourth limitation is that we included only studies written in English. This could be a considerable impediment for testing moderation by national culture. For this reason we do not regard our failure to find moderation by national culture definitive, and we encourage future meta-analyses to include studies published in other languages.

Future Research

The results of this meta-analysis suggest several directions for future research. First, we found substantial unexplained variation in effect sizes for three personality constructs, Neuroticism, Extraversion, and Openness to Experience. This means that situational contingencies may be important, and future research should continue to search for other moderators of the personality–ES relationship. Several scholars have noted that there may be more than one type of entrepreneur or entrepreneurial venture and that these different types of entrepreneurship may involve different skills and processes that require different theoretical explanations (e.g., J. W. Carland et al., 1984; Miner, 1997). For example, Extraversion may be characteristic of entrepreneurs engaged in a venture built around a unique sales approach, whereas Openness may be characteristic of entrepreneurs whose venture involves the application of new technologies. Greater attention to the type of new ventures in which the individual is engaged may allow stronger and more consistent relationships to emerge between personality and ES.

The process perspective on entrepreneurship also suggests possible moderators of the personality–ES relationship. Baron and Markman (2005), for example, viewed entrepreneurship as a series of distinct phases. They argued that each phase has its own unique set of critical activities and key outcome variables. They noted that the criticality of specific variables, including personality traits, might change considerably over the different phases of a new venture. For example, Openness to Experience may be important in the early prelaunch phase when opportunity recognition is a critical task, whereas high Conscientiousness may be necessary in the postlaunch phase when the entrepreneur's role becomes more focused on the delivery of products or services. Attrition during the first phase might lead to differences among managers and entrepreneurs for Openness only, whereas attrition during successive phases would introduce the full range of personality differences hypothesized in this study.

We adapted Schneider's (1987) ASA theory to hypothesize personality differences among managers and entrepreneurs. Although the results of this study were consistent with predictions of ASA theory, we did not directly examine the processes of attraction, selection, and attrition in this study. We believe that closer integration between ASA theory and the process perspective of

entrepreneurship can deepen our understanding of the psychological processes affecting the attainment of ES. For example, Baron and Markman (2005) viewed entrepreneurship as a series of distinct phases. Attraction processes would appear to be most relevant during the prelaunch phase, as the individual seeks to match his or her interests and self-perceived abilities to the types of tasks and rewards offered by an entrepreneurial career track. ASA theory makes salient the processes of selection taking place during the launch phase as venture capitalists, partners, vendors, and others make decisions about their level of support for the potential entrepreneur. Although these decision makers are unlikely to make explicit use of personality testing, an implicit theory may be operative similar to the implicit leadership theories discussed by Lord and Maher (1991). Attrition processes may be most relevant through the postlaunch phase as the nascent entrepreneur evaluates the level of satisfaction he or she derives from the entrepreneurial role. We might expect the relationship between personality and ES to become stronger in samples with greater entrepreneurial tenure because of the attrition of individuals whose personality does not fit the demands of the entrepreneurial role. As these examples show, ASA theory suggests many new lines of inquiry that may lead to a more fully specified model of entrepreneurship. Future research along these lines can also test whether ASA theory or other theories of career choice (e.g., Holland, 1985) provide the best explanation for personality differences among managers and entrepreneurs.

An enhanced understanding of the relationship between personality and ES has the potential to contribute in a number of applied areas related to entrepreneurship. Theories of vocational choice have had widespread applicability in the context of career counseling, but little attention has been devoted to entrepreneurship as a career path within this literature. Our findings provide evidence regarding the personality dimensions that distinguish a person who is likely to be attracted to, selected in, and remain in an entrepreneurial career distinct from a general interest in business and management. This information will allow individuals to better match themselves to the challenges and rewards offered by an entrepreneurial occupation. Venture capitalists, government funding agencies, and others may make decisions regarding their support for specific entrepreneurs based in part on their own implicit theories of entrepreneurship and personality. Information regarding the actual relationship of personality to ES may make these decisions more accurate—or may make decision makers more realistic and humble in the application of their own implicit theories. Large organizations often seek to promote innovation by selecting employees who will take on an entrepreneurial role within the firm (*intrapreneurs*) and move them into key positions. The findings from this study may be used to develop appropriate selection and placement criteria for such decisions. Finally, this study has implications for the training of individuals interested in entrepreneurship. Although the underlying personality dimensions of the FFM are relatively stable, many of the behaviors associated with these variables can be acquired with practice and effort. For example, Barrick, Mount, and Strauss (1993) showed that individuals high on Conscientiousness were more likely to set and be committed to goals, which in turn was associated with their higher job performance. Training designed to promote the behaviors associated with the attainment of ES might be very beneficial to the individual wishing to pursue an entrepreneurial career and to

society in general, which benefits enormously from entrepreneurial activity.

We do not argue that personality theory provides a complete theory of entrepreneurship or even exhausts the range of topics that can be explored at the level of the individual entrepreneur. Rather, our results show that personality must be considered as one important component of a multidimensional model of the variables, processes, and environmental factors affecting entrepreneurship and new venture creation.

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Appendix

Assignment of Personality Scales Available in Primary Studies to the Five-Factor Model

Instrument	Scale	Author
Neuroticism		
16 Personality Adjective scales	Emotional Stability (–)	Brandstätter, 1988
16 Personality Factor Questionnaire 1-Item Scales	Emotional Stability (–), Apprehension, Tension	Cattell et al., 1970
Big Five Locator	Confident (–)	Malach-Pines et al., 2002
California Psychological Inventory	Adjustment (–)	Howard et al., 1996
Generalized work self-efficacy	Well-Being (–)	Gough & Heilbrun, 1983
Internal, Powerful Others, and Chance Scale	Generalized Work Self-Efficacy (–)	Speier & Frese, 1997
Jackson Personality Inventory	Locus of Control (–)	Levenson, 1973
Locus of Control	Anxiety, Conformity	Jackson, 1994
Locus of Control	Internal Locus of Control (–)	Furham, 1986
Locus of Control	Internal Locus of Control (–)	Rotter 1996
Extraversion		
16 Personality Adjective scales	Extraversion	Brandstätter, 1988
16 Personality Factor Questionnaire 1-Item Scales	Warmth, Liveliness, Social Boldness, Self-Reliance (–)	Cattell et al., 1970
Big Five Locator	Energy, Optimism	Malach-Pines et al., 2002
California Psychological Inventory	Sociability	Howard et al., 1996
Herrmann Brain Dominance Instrument	Dominance, Sociability	Gough & Heilbrun, 1983
Jackson Personality Inventory	Extraversion (1 item)	Herrmann, 1989
Meyers–Briggs Type Indicator	Social Confidence, Social Participation	Jackson, 1994
Personality Research Form	Introversion (–)	Myers & McCaulley, 1985
	Affiliation	Jackson, 1984
Openness to Experience		
16 Personality Factor Questionnaire 1-Item Scales	Sensitivity, Abstractedness	Cattell et al., 1970
Big Five Locator	Dreamer, Creative	Malach-Pines et al., 2002
Interest in Innovation; Readiness to Change	Openness to Experience	Howard et al., 1996
Jackson Personality Inventory	Interest in Innovation; Readiness to Change	Patchen, 1965
Meyers–Briggs Type Indicator	Innovation	Jackson, 1994
Personality Research Form	Intuition	Myers & McCaulley, 1985
Tolerance for Ambiguity	Change	Jackson, 1984
	Tolerance for Ambiguity	Budner, 1962
Agreeableness		
16 Personality Adjective scales	Independent (–)	Brandstätter, 1988
16 Personality Factor Questionnaire Big Five Locator	Vigilance (–), Openness to Change (–)	Cattell et al., 1970
California Psychological Inventory	Agreeableness	Howard et al., 1996
Machiavellism	Tolerance	Gough & Heilbrun, 1983
Meyers–Briggs Type Indicator	Machiavellism (–)	Henning & Six, 1977
Personality Research Form	Feeling	Myers & McCaulley, 1985
	Aggression (–)	Jackson, 1984
Conscientiousness		
16 Personality Adjective scales	Norm Oriented	Brandstätter, 1988
16 Personality Factor Questionnaire Need for Achievement	Rule Conscientiousness, Perfectionism	Cattell et al., 1970
Need for Achievement	Need for Achievement	Modick, 1977
Achievement Motivation	Need for Achievement	Lynn, 1969a
Action Styles	Achievement Motivation	Smith, 1973
Big Five Locator	Goal Orientation; Planfulness	Frese et al., 1987
California Psychological Inventory	Conscientiousness	Howard et al., 1996
Edwards Personal Preference Schedule	Responsibility	Gough & Heilbrun, 1983
Jackson Personality Inventory	Achievement	Edwards, 1959
Meyers–Briggs Type Indicator	Organization, Value Orthodoxy	Jackson, 1994
Miner Sentence Completion Scale—Form T	Perceiving (–)	Myers & McCaulley, 1985
Personality Research Form	Total Task Motivation	Miner, 1986
	Achievement	Jackson, 1984

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