

Obschonka, Martin; Schmitt-Rodermund, Eva; Silbereisen, Rainer K.; Gosling, Samuel D.; Potter, Jeff

## Working Paper

The regional distribution and correlates of an entrepreneurship-prone personality profile in the United States, Germany, and the United Kingdom: A socioecological perspective

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Martin Obschonka, Eva Schmitt-Rodermund, Rainer K. Silbereisen, Samuel D. Gosling, Jeff Potter

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German Socio-Economic Panel Study (SOEP)  
DIW Berlin  
Mohrenstrasse 58  
10117 Berlin, Germany

Contact: Uta Rahmann | [soeppapers@diw.de](mailto:soeppapers@diw.de)

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Martin Obschonka, Eva Schmitt-Rodermund, Rainer K. Silbereisen

Friedrich-Schiller-University Jena, Germany

Samuel D. Gosling

University of Texas at Austin

Jeff Potter

Atof Inc., Cambridge, MA

Correspondence address: Martin Obschonka, Department of Developmental Psychology and Center for Applied Developmental Science, Friedrich-Schiller-University Jena, Am Steiger 3/1, 07743 Jena (Germany). martin.obschonka@uni-jena.de Phone: +49 (0)3641 9 45-205, Fax: +49 (0)3641 945202

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## Abstract

In recent years the topic entrepreneurship has become a major focus in the social sciences, with renewed interest in the links between personality and entrepreneurship. Taking a socioecological perspective to psychology, which emphasizes the role of social habitats and their interactions with mind and behavior, we investigated regional variation in and correlates of an entrepreneurship-prone Big Five profile. Specifically, we analyzed personality data collected from over half a million U.S. residents ( $N = 619,397$ ) as well as public archival data on state-level entrepreneurial activity (i.e., business-creation and self-employment rates). Results revealed that an entrepreneurship-prone personality profile is regionally clustered. This geographical distribution corresponds to the pattern that can be observed when mapping entrepreneurial activity across the U.S.. Indeed, the state-level correlation ( $N = 51$ ) between an entrepreneurial personality structure and entrepreneurial activity was positive in direction, substantial in magnitude, and robust even when controlling for regional economic prosperity. These correlations persisted at the level of U.S. Metropolitan Statistical Areas ( $N = 15$ ) and were replicated in independent German ( $N = 19,842$ ; 14 regions) and British samples ( $N = 15,617$ ; 12 regions). In contrast to these profile-based analyses, an analysis linking the individual Big Five dimensions to regional measures of entrepreneurial activity did not yield consistent findings. Discussion focuses on the implications of these findings for interdisciplinary theory development and practical applications.

The regional distribution and correlates of an entrepreneurship-prone personality profile in the  
U.S., Germany, and the UK: A socioecological perspective

In recent years the topic entrepreneurship has become key subject of public and political debate and a major focus of research in the social sciences (Audretsch, 2007; Shane, 2008). In today's post-industrial innovation-driven economies, entrepreneurship (which can be broadly defined as starting and managing one's own business), is considered a key driver of job creation (Birch, 1987), innovation and technological development, and economic growth and the economic renewal process (Audretsch, 2007; Schumpeter, 1934). Hisrich, Langan-Fox, and Grant (2007) further point out that "entrepreneurship is also a mechanism by which many people enter the economic and social mainstream of society, facilitating culture formation, population integration, and social mobility" (p. 575). So it is little wonder that the topic has begun to catch the interest of a growing number of psychologists (Hisrich et al., 2007).

Two major topics in entrepreneurship research are the prediction of entrepreneurial behavior (e.g., starting an own business) and entrepreneurial success (e.g., why are some entrepreneurs successful while others fail). In the present work, we focus on entrepreneurial behavior. One robust finding to emerge from entrepreneurship research is that individuals differ in their tendency towards entrepreneurial behavior (Blanchflower, Oswald, & Stutzer, 2001). Scholars of entrepreneurship have long been interested in what factors might account for such variation (Hisrich et al., 2007). Studies have shown, for example, that individual personality traits are associated with entrepreneurial behavior (Rauch & Frese, 2007a). Moreover, consistent with seminal theoretical works on the entrepreneurial personality (e.g., Schumpeter, 1934), there is growing evidence for what we call an entrepreneurship-prone personality profile (an entrepreneurial constellation of Big Five traits within the person) that is particularly predictive of entrepreneurial characteristics (e.g., Obschonka, Silbereisen, & Schmitt-Rodermund, 2010, 2011, 2012; Schmitt-Rodermund, 2004, 2007). This personality

profile is not meant to relate exclusively to entrepreneurs only but to reflect a characteristic constellation of traits that makes entrepreneurial behavior more likely.

In the present set of studies, we build on the previous individual-level findings on this entrepreneurship-prone personality profile to examine its potential operation at the level of geographic aggregations (e.g., states, cities) in the context of three major post-industrial innovation-driven economies: the U.S., Germany, and the UK. By way of comparison for the profile-level analyses, we also consider the predictive power of individual traits (the single Big Five traits) on our entrepreneurial outcome measures.

Throughout this paper, we take a *socioecological psychology perspective*, which focuses on social habitats and the mutual interplay between these social habitats on the one side, and mind and behavior on the other (Oishi & Graham, 2010). Socioecological psychology is rooted in seminal psychological theories that placed macro-minded perspectives and socioecological thinking at their core. Classic examples in this tradition include Lewin's (1939) field theory, which held that behavior is influenced by life space (“the independent field of which the person and psychological environments are part”, Oishi & Graham, 2010, p. 362), and Bronfenbrenner's (1979) human ecology theory which viewed human behavior and development as embedded in a hierarchy of changing developmental contexts ranging from distal macro contexts to proximal micro contexts.

Until recently, empirical socioecological field research has remained scarce in psychology because modern psychological studies have overwhelmingly focused on individual psychological functioning and interactions with proximal environments. In general, these studies have neglected the idea that psychological functioning and interactions with the proximal contexts are embedded in, and may affect, wider social habitats, which in turn may shape the human mind and behavior. A few sub-fields of psychological field research (e.g., cross-cultural psychology [Georgas, van de Vijver, & Berry, 2004]; research on social change and human development [Silbereisen & Chen, 2010]) retained a macro-minded orientation;

recently, however, there has been a renaissance in macro-minded psychological research, focusing on real-life phenomena in relation to the wider social and natural ecology. Today, for example, there is a growing broad interest among psychologists to better understand the emergence, persistence, and regional distribution of social habitats and their interplay with the human mind and human behavior (Oishi et al., 2007; Rentfrow, 2010; Rentfrow, Gosling, & Potter, 2008).

As noted by Oishi and Graham (2010), one key example of this emerging socioecological approach is research on the *geography of psychological characteristics*. Reflecting this trend, the American Psychological Association's flagship journal, *The American Psychologist*, recently devoted a section to "Geography and psychology" (e.g., Rentfrow, 2010). Core topics in this domain include the geography of well-being and of values such as collectivism, individualism, autonomy, self-expression, and tradition (e.g., Plaut, Markus, & Lachman, 2002; Vandallo & Cohen, 1999). Another central topic focuses on regional differences in *personality characteristics*. Here, studies have shown that geographic regions, or social habitats, have their own personality make-up (e.g., Florida, 2008; Rentfrow, 2010). Such studies have paved the way for intensified research on the macro-distribution of personality, both via the development of new theories and via the accumulation of empirical evidence. Nevertheless, we still know little about the geography of personality, possible relationships with region-level social indicators, and underlying mechanisms behind the personality-social indicators-link.

This paucity is particularly acute in the socioecological study of personality *structure* (the constellation of traits within an individual) because previous research has focused on the regional distribution of single traits. The analysis of single traits is a prominent means of describing and studying entrepreneurs (Rauch & Frese, 2007a; Stewart & Roth 2001; Zhao et al., 2010) but we propose that a more holistic configural perspective on personality is likely to

be particularly fruitful in the field of entrepreneurship because the (individual) entrepreneur might be optimally characterized by a *pattern* of personal characteristics (Schumpeter, 1934).

Past research on the regional distribution of personality characteristics has mainly focused on the U.S. context, limiting knowledge about the cross-national validity of such findings. Therefore, the present study broadens our focus by incorporating data from two other countries (Germany and the UK), in addition to an in-depth analysis of U.S. personality data.

This research also contributes to the literature by combining the approach of socioecological psychology with approaches of personality psychology and entrepreneurship research. For example, the present research makes an important contribution to entrepreneurship research by taking a socioecological personality perspective that enriches existing knowledge on factors that might affect entrepreneurial vitality at the regional level. In economics, entrepreneurship is often referred to as a “regional event” (Feldman, 2001) but we know too little about the role of the regional personality make-up as a possible crucial ingredient in this regional event (Sternberg, 2009).

In what follows, we first give a short overview of the individual-level research on personality and entrepreneurship. We then give an overview of existing socioecological personality research with an emphasis on Rentfrow et al.’s (2008) study of the regional variation of the individual Big Five personality traits across the U.S.. Next, we develop the specific research questions to be tested in this research.

#### An Entrepreneurship-Prone Big Five Profile

Consistent with Holland’s (1997) general assumption that “the choice of a vocation is an expression of personality” (p. 7), one of the classic theoretical approaches in the study of the enterprising individual focuses on the role of the individual *personality make-up* (Knight, 1921; McClelland, 1961; Schumpeter, 1934). Some scholars have challenged the usefulness of the personality approach in entrepreneurship research (Gartner, 1989; Low & MacMillan,

1988) but many studies, partly spurred by these criticisms, have found clear support for the relevance of personality when investigating correlates of an entrepreneurial career choice and behavior (for a recent meta-analysis see for example Rauch & Frese, 2007a; see also Shane, Nicolaou, Cherkas, & Spector, 2010).

More specifically, studies have found that so-called *specific entrepreneurial traits* such as risk-taking, entrepreneurial self-efficacy, or need for achievement are associated with entrepreneurial career choices (Rauch & Frese, 2007a; Stewart & Roth, 2001; Zhang & Arvey, 2009). Higher-order, broader personality dimensions such as the *Big Five* (extraversion, conscientiousness, agreeableness, openness to experience, and neuroticism, McCrae & Costa, 1999) have also been shown to relate to entrepreneurial activity (Rauch & Frese, 2007a; Shane et al., 2010; Zhao & Seibert, 2006; Zhao et al., 2010). The Big Five approach to personality is widely regarded as the best established and most cross-culturally valid model of personality structure (Benet-Martínez, & John, 1998; Digman, 1990; Schmitt, Allik, McCrae, & Benet-Martínez, 2007), so we adopt this framework in the present research.

There are two broad approaches to examining connections between personality and other variables (Magnusson & Törestad, 1993): The variable-oriented and the person-oriented approach. As described below, our main focus is on the person-oriented perspective. But, to provide a broader perspective, we also examine the variable-oriented approach, which focuses on the effects of isolated variables on behavior. For example, in the context of entrepreneurship, one might examine the connection between extraversion and entrepreneurship (Zhao et al., 2010). The person-oriented approach takes a more configural approach, focusing on the effects of *intraindividual constellations* of personality traits (Asendorpf, 2003; Asendorpf & van Aken, 1999; Block, 1971; Caspi, 2000; Meeus, van de Schoot, Klimstra, & Branje, 2011). As far back as 90 years ago, Gordon Allport (1923), one of the fathers of personality psychology, stressed the importance of looking at the person as a whole. He argued: “More fundamental than differential psychology [i.e., the psychometric

focus on dimensions of difference among people], by far, is the problem of the nature, the activity, and the unity of the *total personality*” (p. 614; original emphasis, cited in Barenbaum & Winter, 2008). Such a notion, which was also championed by Jack Block in his famous work on Q-sort methods in personality assessment (e.g., Block, 1971, 2008), is consistent with the logic of the person-oriented approach (see Magnusson, 1998 and Magnusson & Törestad, 1993), which views the person as a holistic entity. It is argued that the individual is a complex system so that the study of single isolated variables is unlikely to fully capture the complex psychological reality of the individual person (Furr, 2008). The person-oriented approach has received widespread and growing attention in psychology over the last 20 years (Reitzle & Vondracek, 2000; von Eye & Bergman, 2003). For example, longitudinal studies have used trait profiles to predict such central life outcomes as career success (Kokko, Bergman & Pulkkinen, 2003), achievement (Hart, Atkins & Fegley, 2003), overall health (Chapman & Goldberg, 2011), and delinquency (Caspi, 2000; Pulkkinen, 2009; for an overview see Pulkkinen & Caspi, 2002).

Seminal theorizing in the entrepreneurship literature emphasizes the importance of such holistic approaches to the study of *entrepreneurial* personality. In his groundbreaking work on innovation, entrepreneurship, and economic development, Joseph Schumpeter (1934), widely regarded as the father of entrepreneurship research, stressed that the entrepreneur is a “special type” characterized by *a specific set* of personality features that together drive entrepreneurial behavior. Starting a new business is a demanding, complex, and risky endeavor so a successful entrepreneur must solve many very different tasks. These tasks typically include acquiring new customers and convincing and inspiring possible investors (tasks for which higher levels in extraversion should be helpful), managing finances and overseeing the production process (tasks for which higher levels in conscientiousness are likely to be helpful), developing innovative products and services (tasks that are supported by higher levels in openness), being able to behave in non-conforming and critical ways and to

take a hard line, for example in negotiations with suppliers (behaviors which can be expected to relate to lower levels in agreeableness), and, eventually, tackling phases of high uncertainty, failures, strong risks, and work stress (demands that require lower levels in neuroticism). The idea that entrepreneurs must be good at a range of such things is supported both by biographies of entrepreneurs (e.g., Isaacson, 2011) and by several empirical studies (e.g., Lazear, 2005; Wagner, 2006).

Variable-oriented entrepreneurship research (i.e., at the level of single traits) has shown that each of the Big Five dimensions relate to entrepreneurial activity and success in characteristic ways. Evidence suggests that entrepreneurship is associated with higher levels of extraversion, conscientiousness, and openness, and lower levels of agreeableness and neuroticism (e.g., Zhao & Seibert, 2006; Zhao et al., 2010; see also Engle, Mah & Sadri, 1997; Furnham & Fudge, 2008; Schmitt-Rodermund & Vondracek, 2002). These findings concur with findings from De Fruyt and Mervielde (1997) who investigated Holland's RIASEC interest types and found that the enterprising interest type was positively related to indicators of extraversion, conscientiousness, and openness and was negatively related to indicators of agreeableness and neuroticism (see also De Fruyt & Mervielde, 1999; Costa, McCrae & Holland, 1984).

Motivated by the lack of person-oriented empirical research on entrepreneurial personality, and inspired by Holland's (1997) work on the fit between personality types and occupational environments, Schmitt-Rodermund and colleagues (Schmitt-Rodermund, 2004, 2007; Obschonka et al., 2010) recently introduced a measurement model of an entrepreneurship-prone personality profile. This model combines theoretical work on the relevance of personality structure (e.g., Schumpeter, 1934) with the cumulated variable-oriented evidence on the characteristic links between the single Big Five traits and entrepreneurship. Accordingly, the model characterizes an entrepreneurial personality structure in terms of higher levels in extraversion, conscientiousness, and openness, and lower

levels in agreeableness and neuroticism. Consistent with profile similarity research (e.g., with Cronbach & Gleser's  $D^2$ , 1953) and research on prototypical personality profiles (e.g., Asendorpf & van Aken, 1999; Block, 1971), the model quantifies an entrepreneurial personality structure by means of an individual's deviation from a statistical reference profile. In this case the reference point is an “extreme” entrepreneurial profile that statistically defines the outer limits of each single Big Five dimension within an entrepreneurial personality structure. Each individual's deviation from this reference can be assessed to compute an overall goodness-of-fit measure of entrepreneurial personality structure. Such fit measures have been used in numerous previous studies in personality psychology with convincing results (e.g., Asendorpf & van Aken, 1999; Block, 1971, 2008; Chapman & Goldberg, 2011).

Note that the entrepreneurial reference profile described above (highest possible value in extraversion, conscientiousness, and openness; lowest possible value in agreeableness and neuroticism) does not represent a real person or an ideal or perfect entrepreneur but rather a fixed statistical extreme profile by means of which each individual's entrepreneurial personality structure can be quantified and summarized into a single index. This type of fit-measure between a fixed reference profile (no variance) and an empirical profile that delivers variance does not suffer from the common caveats associated with the comparison of two profiles that both deliver variance (e.g., when assessing the profile similarity between personal characteristics and perceived characteristics of an organization via Cronbach & Gleser's  $D^2$ ; see Edwards, 1994).

A number of studies have provided empirical evidence for the validity of the entrepreneurship-prone personality profile at the individual level. Fritsch and Rusakova (2010) investigated personality differences between employed and self-employed participants of the German Socio-Economic Panel (GSOEP), a national representative study of private households in Germany. The entrepreneurship-prone personality profile predicted self-employment status, independent of other factors such as age, gender, parental self-

employment, education, and profession-specific probabilities of self-employment. Using the same dataset and analyzing predictors of Holland's (1979) six occupation types, Rusakova (2012) further showed that the entrepreneurship-prone personality profile positively predicted belonging to the enterprising type, but not to any of the other occupation types (realistic, investigative, artistic, social, and conventional). Moreover, studies that focused on the venture-creation process found positive relationships between the entrepreneurship-prone personality profile and entrepreneurial intentions as well as founders' human and social capital relevant for the process of venture creation and business success (Obschonka et al., 2010, 2011, 2012, in press). In addition, Stuetzer, Obschonka, and Schmitt-Rodermund (in press) showed that those nascent entrepreneurs scoring higher on the entrepreneurship-prone personality profile had a more balanced skill set, which in turn positively predicted venture creation success. In a study of prospective life-span data from the Terman longitudinal study on lives of gifted children in the U.S., and consistent with research indicating that personality structure in childhood and adolescence has long-term relevance for psycho-social functioning in adulthood (e.g., Chapman & Goldberg, 2011), the entrepreneurship-prone personality profile, measured around the age of 13, forecasted a subsequent entrepreneurial career in adulthood (Schmitt-Rodermund, 2007). Such research has shed light on the developmental precursors of entrepreneurship, by showing that this personality profile relates to early entrepreneurial development in adolescence (e.g., development of age-appropriate early entrepreneurial competence and enterprising career interests; Obschonka et al., 2010, 2011, 2012; Schmitt-Rodermund, 2004, 2007). Further support for the validity of this personality profile comes from evaluation research. Kösters and Obschonka (2011) showed this profile to be related to founders' perceived effectiveness of public business advice delivered during the founding process; those founders with lower levels of an entrepreneurship-prone profile benefited most from intensive advice, probably due to their lack of entrepreneurial competencies or a balanced skill set. Finally, consistent with existing theoretical models on

the mechanisms through which the Big Five traits affect entrepreneurship (Rauch & Frese, 2007b), Obschonka, Stuetzer, and Goethner (2012) found this profile to affect entrepreneurship via more specific entrepreneurial traits like self-efficacy, risk-taking, and internal locus of control.

#### Regional Differences in Personality

Past research indicates meaningful regional differences in personality (Florida, 2008; Krug & Kulhavy 1973; Plaut, Markus, & Lachman, 2002). Probably the most comprehensive and convincing results on regional differences in personality is provided by Rentfrow and colleagues, who found clear evidence for systematic regional variation in the Big Five traits across the U. S. (Rentfrow, 2010; Rentfrow et al., 2008). Analyzing personality data from over half a million U.S. residents, the authors found that each of the single Big Five dimension is not randomly distributed across the U.S. states but is regionally clustered. For example, they found that extraversion was highest in the Great Plain, Midwest, and Southeast states, and lowest in the Northwest and most of the Mid-Atlantic and East-coast states. Drawing from established theories in personality and social psychology, Rentfrow et al. (2008) present an elaborate theory on the emergence, persistence, and manifestations of regional personality difference. For example, they explain the emergence and persistence of such regional differences in personality across the U.S. in terms of selective migration patterns (historical and current migration processes) and social influence within the region (people respond, adapt to, or get socialized according to regional norms, attitude, and beliefs, e.g., via work conditions, Kohn & Schooler, 1982; see also Bisin & Verdier, 2001). They further argue that environmental influence might play a role such that the physical environment prevalent in the region (e.g., climate and urbanization) may affect personality features of the region.

Rentfrow et al. (2008) found substantial state-level correlations between single Big Five traits and indicators of social behaviors such as crime, social involvement, religiosity,

and health, even after controlling for socio-demographic factors. For instance, state-level agreeableness was negatively related to state-level indicators of antisocial behavior such as robbery per capita. The authors argue that regional personality differences become expressed and manifested at the geographical level because individual personality affects individual behavior. If certain personalities are more common in a state, this would result in higher rates of particular behaviors on the population level. This expression of regional personality differences should be further amplified by corresponding regional norms and values (partly derived from the regional personality make-up), which influence behavioral tendencies of people in that region, “even if those tendencies are contrary to their natural dispositions” (p. 344).

#### Aims of the Present Research

Inspired by the work of Rentfrow and colleagues on regional differences in the single Big Five traits, the main aim of the present analysis was to investigate the distribution and correlates of the entrepreneurship-prone Big Five profile at the regional level. By way of comparison, we also examine the correlates of the single Big Five traits at the regional level (i.e., the more conventional analysis that follows a variable-oriented perspective). Following the earlier theoretical and empirical work on regional differences in personality, we expected that the entrepreneurship-prone personality structure may systematically vary across regions. To put this assumption to a test, we followed Rentfrow et al.’s research strategy and investigated state-level relationships between this profile and relevant social indicators — in our case we looked at indicators of entrepreneurial activity, such as startup rate. Note that one cannot simply assume (without an empirical test) that the relationship between entrepreneurial personality and entrepreneurial behavior previously documented at the individual level would also be found at the regional level because individual-level relationships need not play out at the aggregate level (Inglehart & Wezel, 2003; see also Rentfrow, 2010). Generalizing such individual-level results to the aggregate-level, without actually testing the relationship at the

aggregate-level, can lead to false interpretations and to an individualistic fallacy (or “reverse ecological fallacy”, Hofstede, 2001).

Following Rentfrow et al’s (2008) assumptions that “If a disproportionately large number of individuals within a region possess certain personality traits, then there should be more psychological and behavioral manifestations of those traits in that region than in other regions where the personality traits are less common“ (p. 343), we expected to find positive aggregate-level relationships between the entrepreneurship-prone personality structure and the rate of entrepreneurial activity across regions. Although there might be certain factors moderating this relationship (e.g., regional differences in economic policy or infrastructure), a higher share of entrepreneurial people in the region should result in more entrepreneurial activity. In his cross-national analyses on need for achievement, McClelland (1961) showed, for example, that changes in need for achievement within a society over time predicted subsequent change in economic development in the same society. Moreover, if an entrepreneurial personality profile is prevalent, then entrepreneurial norms and values may also be more prevalent than in others regions, which in turn may stimulate entrepreneurial behavior even among those with less of an entrepreneurial personality profile.

In this paper, we report three studies. In our main study (Study 1), we focus on state-level variation in an entrepreneurship-prone personality profile across the U.S.. Study 1 is complemented by Studies 2 and 3, which examine the geographic variation of an entrepreneurship-prone personality profile in Germany and the UK. The aim of Studies 2 and 3 is to examine the generalizability of the U.S.-based findings to other highly developed, innovation driven countries (Audretsch, 2007). Most of the existing entrepreneurship research has been done in such highly developed, innovation driven countries. Following Rentfrow et al. (2008), we consider region-level correlations  $\geq |.20|$  as substantial and meaningful (see also Vandello & Cohen, 1999). We conclude the empirical section of our paper with an analysis of the links between entrepreneurship outcomes and the single Big Five traits.

Specifically, we repeat our region-level analysis that were conducted with the personality profile, but this time using the single traits instead of the profile. This comparison allows us to examine the convergence — or lack thereof — between the two kinds of analysis.

Study 1: Links between the entrepreneurship-prone personality profile and entrepreneurial activity in U.S. states and cities

We investigated regional differences in an entrepreneurial personality structure across the U.S. by re-analyzing the data set used by Rentfrow et al. (2008). This large-scale data set, which contains information on the personality structure of 619,397 U.S. residents, has been used in a number of important studies on regional differences in personality (e.g., de Vries, Gosling, & Potter, 2011; Rentfrow, 2010; Rentfrow et al., 2008; Rentfrow, Mellander, & Florida, 2009). We additionally considered archival data on entrepreneurial activity at the state-level to test state-level associations between entrepreneurial personality and indicators of entrepreneurial activity.

*Method*

*Regional data on personality*

Between December 1999 and January 2005, personality data on U.S. residents were collected by means of a noncommercial, advertisement-free Internet website resulting in the sample size of 619,397 (55% female; median age = 24 years,  $SD = 9.8$  years). The website could be reached via several channels (e.g., search engines, unsolicited links on other websites). Respondents volunteered to participate in the study by clicking on a button and then filled out questions on personality, demographic characteristics, and state of residence. In the end, participants were provided feedback in terms of a customized personality evaluation. The personality data collected in this online study can be considered as “generally representative of the population at large” (Rentfrow et al., 2008, p. 348). For example, the authors present evidence on the state-level representativeness with respect to the population size of each state, minority groups (e.g., Asians), and social class. More details on the data collection procedure,

demographics, and representativeness can be found in the original publication.

Data on the Big Five were collected via the Big Five Inventory (BFI; John & Srivastava, 1999), which is an established personality questionnaire (Benet-Martínez & John, 1998) and consists of 44 items (5-point Likert scale; 1 = disagree strongly, 5 = agree strongly). Rentfrow et al. (2008) presented detailed evidence for the high reliability of the Big Five measures on the individual and the state level in their online study (e.g., inter-item reliabilities for each Big Five traits at the individual and state levels, test-retest correlation, and factor analyses).

Following earlier research (e.g., Fritsch & Rusakova, 2010; Obschonka, Silbereisen, & Schmitt-Rodermund, 2010; 2011; 2012; Stuetzer, Obschonka, & Schmitt-Rodermund, in press), we computed a person's *entrepreneurship-prone personality profile* by calculating the match between the individual's Big Five profile and the reference profile defining the outer limits of the single Big Five traits within an entrepreneurship-prone personality structure (comparable to Cronbach and Gleser's  $D^2$ ). Specifically, after recoding the Big Five scores from a 1 – 5 scale to a 0 – 4 scale, the entrepreneurial reference type was defined as the highest possible score (4) on extraversion, conscientiousness, and openness, and the lowest possible score (0) on agreeableness and neuroticism. We calculated the “goodness-of-fit” of each person's Big Five profile with respect to the entrepreneurship-prone Big Five profile. To do this, we first estimated each person's squared differences between the reference values and their personal values on each of the five scales. For instance, if a person scored 3 in neuroticism, the squared difference was 9 (because the reference value was 0). Second, the five squared differences were summed for each person. Third, the algebraic sign of this sum was reversed (e.g., a value of 20 became -20). The resulting value served as the final index of entrepreneurship-prone personality ( $M = -20.50$ ;  $SD = 6.63$ ) – the closer to zero the value in this variable, the better the fit between the person's Big Five personality profile and the defined statistical reference type.

Finally, to achieve the regional scores of entrepreneurial personality for each state (and Washington, D.C.), we averaged the individual scores on the entrepreneurship-prone personality profile for all participants living in the same U.S. state. These 51 regional scores had a mean of -20.52 ( $SD = 0.31$ ).

#### *Regional data on entrepreneurial activity*

Drawing from representative archival data, we utilized established indicators of entrepreneurial activity at the state level. First, we used the *Kauffman Index of Entrepreneurial Activity* (Kauffman Foundation, 2011), which refers to business start-ups and thus to the most prototypical entrepreneurial behavior (Shane, 2009). The empirical basis here is the Current Population Survey (conducted by the U.S. Bureau of the Census and the Bureau of Labor Statistics on a monthly basis). The index measures the annual rate of the adult, non-business-owner population (20 – 64 years of age) that starts a new (non-agricultural) business. Monthly rates are calculated by drawing from the share of adults who were not entrepreneurially active in the previous month (no own business) but who had started an own business in the following survey month (as their main job with fifteen or more usual hours worked per week). In the present study, the Kauffman Index of Entrepreneurial Activity on the state level refers to the 1998-2000 period (see Kauffmann Foundation, 2011, for more details), and had a mean of 0.30 ( $SD = 0.09$ ;  $Min = 0.15$ ,  $Max = 0.53$ ).

As another index targeting founding behavior, we used the *establishment entry rate* from the year 2006 (an establishment is a new location for an existing firm). This state-level rate came from the U.S. Census Bureau (Business Dynamics Statistics / Center for Economic Studies, [http://www.ces.census.gov/docs/bds/release/tab\\_state\\_release.xls](http://www.ces.census.gov/docs/bds/release/tab_state_release.xls)) and had a mean of 12.15 ( $SD = 1.85$ ;  $Min = 9.80$ ,  $Max = 17.60$ ).

Business foundation rate represents the most typical entrepreneurial behavior (Reynolds, Hay, Bygrave, Camp, & Autio, 2000) but to maintain consistency with Study 2 (for which founding rate was not available), we also looked at self-employment as another

indicator of entrepreneurial activity (Blanchflower, Oswald, & Stutzer, 2001). Specifically, we used the number of non-farm proprietors per 1.000 labor force participants in the region. This index, published by the Small Business Foundation of Michigan (2010), refers to the year 2008 and to non-agricultural self-employment (the data were collected by the U.S. Bureau of Economic Analysis). The rate had a mean of 200.69 ( $SD = 20.80$ ;  $Min = 168.00$ ,  $Max = 243.90$ ).

#### *Regional control variables*

To control for possible confounding effects (and consistent with the analytic strategy employed by Rentfrow et al., 2008), we examined correlations between state-level entrepreneurial personality and rate of entrepreneurial activity while partialling a number of regional control variables. Economic conditions and entrepreneurial activity should be linked because individuals generally tend to prefer starting new businesses in better-off regions rather than in less prosperous regions (Armington & Acs, 2002; Sternberg, 2009; Fritsch & Mueller, 2007). So we partialled out prosperity to remove possible effects of regional differences on the relationship between personality and entrepreneurial activity.

We followed past regional research on central indicators of economic conditions relevant for entrepreneurship and focused on *gross domestic product (GDP)*, *growth in GDP*, *unemployment rate*, and *change in unemployment rate* (Armington & Acs, 2002; Audretsch & Fritsch, 1994; Fritsch & Mueller, 2007; Sternberg, 2009). Data on state-level GDP per capita for the year 2000 as well as the 2000-2010 average annual growth rate for real GDP growth were retrieved from the U.S. Bureau of Economic Analysis (<http://www.bea.gov/bea/regional/gsp/>). State-level unemployment rates for the year 2000 as well as the change in unemployment rate between 2000 and 2007 were obtained from the U.S. Bureau of Labor Statistics (<http://www.bls.gov/gps/home.htm>).

#### *Results and Discussion*

To compare the levels of entrepreneurship-prone personality profiles across the U.S., we

ranked the states according to their respective means. Table 1 presents state ranks and  $z$  scores for the entrepreneurial profile. The District of Columbia ranks highest and Mississippi lowest. This means that participants living in the state of Mississippi exhibit, on average, the lowest fit between the individual Big Five profile and the entrepreneurial reference profile (highest possible score in extraversion, conscientiousness, and openness, and lowest possible score in agreeableness and neuroticism). To illustrate the geographical distribution of the entrepreneurial profile, Figure 1 shows a map of the means, with darker colors reflecting higher levels of entrepreneurial personality. Consistent with the earlier research indicating systematic regional patterns in personality (Rentfrow et al., 2008), our analysis suggests that the entrepreneurship-prone personality profile is geographically clustered. This regional pattern corresponds nicely to the documented regional variation in entrepreneurial activity across the U.S. (Armington & Acs, 2002; Kauffman Foundation, 2011; Shane, 2008). The entrepreneurial trait profile was highest in the West and high in large parts of the South. Following Rentfrow et al.'s (2008) theory on the emergence of regional personality differences in the U.S., it may be that the high values in the American West reflect historical migration patterns within the US; perhaps it was the more "entrepreneurial" early settlers who took the challenge and ventured from the East into the West (or from outside of America such as from Asia into the West). According to Rentfrow and colleagues, this genetic founder effect (restricted gene pools emerging in the region due to selective migration into this region) could have left its imprint in today's regional personality distribution, due not only to the heritability of personality traits but also via social influence through established and passed on norms and values within the regions. These regional values and norms may have affected how residents were socialized across many generations.

An entrepreneurship-prone personality profile appeared to be particularly low in the Rust Belt area (e.g., Indiana and Ohio), which is an old industrial region that in the past may have attracted (and selected) non-entrepreneurial workers for rule-driven mass-production and

socialized their residents through this type of work and related values and norms in the region (Audretsch, 2007). Florida (2008) stressed that the “historic imprint of economic and industrial structure” (p. 201) within the region plays an important role for the clustering of personality types. Entrepreneurial personality structure was also particularly low in the East South Central States (e.g., Mississippi).

Finally, we compared the regional distribution of the entrepreneurship-prone personality profile with the regional distribution of entrepreneurial activity (Kauffman Index of Entrepreneurial Activity, establishment entry rate, self-employment). Figure 2, which shows the regional distribution of the Kauffman Index of Entrepreneurial Activity across the U.S., looks quite similar to the distribution of the entrepreneurship-prone personality profile shown in Figure 1. State-level correlations between the entrepreneurship-prone personality profile and the indicators of entrepreneurial activity ( $N = 51$  states) were positive and substantial; the trait profile correlated .39 ( $p = .005$ ) with the Kauffman Index of Entrepreneurial Activity, .53 ( $p = .000$ ) with the establishment entry rate, and .31 ( $p = .028$ ) with self-employment.

To test for possible confounding effects we next considered the regional control variables. Of the control variables, there were significant state-level relationships between change in unemployment rate and the Kauffman Index of Entrepreneurial Activity ( $r = -.38$ ,  $p = .006$ ) and the establishment entry rate ( $r = -.35$ ,  $p = .011$ ), between GDP and the entrepreneurship-prone personality profile ( $r = .31$ ,  $p = .025$ ), and between GDP growth and the Kauffman Index of Entrepreneurial Activity ( $r = .53$ ,  $p = .000$ ), the establishment entry rate ( $r = .48$ ,  $p = .000$ ), and the entrepreneurship-prone personality profile ( $r = .46$ ,  $p = .000$ ). Following Rentfrow et al.’s analysis (2008), we computed state-level partial correlations, controlling for the indicators of regional economic conditions (GDP, GDP growth, unemployment rate, change in unemployment rate). Our state-level correlations remained essentially unchanged even after adjusting for the control variables: the entrepreneurship-

prone personality profile correlated with the Kauffman Index of Entrepreneurial Activity  $r = .34$  ( $p = .023$ ), with the establishment entry rate  $r = .59$  ( $p = .000$ ), and with self-employment  $r = .27$  ( $p = .067$ ).

To put our research question to an even stricter test, we conducted *three additional robustness checks*. First, because one could argue, particularly in the American context, that sociodemographics such as race may be very differently distributed across the states, and that such characteristics may influence the way people score on (or answer) personality questionnaires, we re-ran the analyses controlling for such sociodemographic variables. We considered state-level race (% African Americans, % Asian Americans), age, and gender (we aggregated these data from the personality dataset). Again, even when controlling for these state-level sociodemographics, we still found significant state-level correlations between the entrepreneurship-prone personality profile and the state-level Kauffman Index of Entrepreneurial Activity ( $r = .37$ ;  $p = .011$ ) and the state-level establishment entry rate ( $r = .41$ ;  $p = .004$ ). The respective correlation between the profile and self-employment was  $r = .19$  ( $p = .211$ ). When considering both sociodemographics and the indicators of regional economic conditions (GDP, GDP growth, unemployment rate, change in unemployment rate) as state-level control variables, the state-level entrepreneurship-prone personality profile correlated with the state-level Kauffman Index of Entrepreneurial Activity  $r = .30$  ( $p = .050$ ), with the state-level establishment entry rate  $r = .49$  ( $p = .000$ ), and with self-employment  $r = .16$  ( $p = .306$ ). Together, these analyses indicate that the state-level relationship between personality structure and entrepreneurial activity (the two founding rates) is robust to state-level difference in these sociodemographic factors. Self-employment showed smaller (partial) correlations, which may be due to the fact that that founding rates are better indicators of entrepreneurial activity than are self-employment rates (because starting a business is the prototypical entrepreneurial behavior; Reynolds et al., 2000).

Second, it has been proposed that entrepreneurial behavior is most likely when potential entrepreneurs are met with supportive business conditions and opportunity-structures (Krueger & Brazeal, 1994; Sternberg, 2009). Therefore, we tested whether differences in entrepreneurial conditions in the regions would moderate the state-level relationship between an entrepreneurship-prone personality profile and entrepreneurial activity. To quantify the region's entrepreneurial climate in terms of local business conditions conducive to entrepreneurship we considered the Entrepreneurial Climate Index for the year 2006, published in the Entrepreneurship Score Card 2009-2010 by the Small Business Foundation of Michigan (2010). Summarizing the "broader business climate and institutional environment [that] ... provide the foundation upon which entrepreneurial activity grows" (p.24), the Small Business Foundation of Michigan annually estimates this index for each of the 50 U.S. states. The index includes information on the "general magnitude and effectiveness of investments in innovative activity, the availability of financial capital and the general level of economic dynamism" (p. 24). It considers, for example, venture capital financing, commercial and industrial lending by banks, the number of business incubators, innovation output by research institutions, GDP growth, export intensity growth, education status, labor supply, business costs, infrastructure, and the legal and regulatory environment. These data come mainly from public archival data (e.g., from the U.S. Patent and Trademark Office, the U.S. Bureau of Economic Analysis, the National Science Foundation, the U.S. Small Business Administration, the Federal Deposit Insurance Corporation, and the U.S. Census Bureau). The Entrepreneurial Climate Index, which is scaled from 1 (very low) to 5 (very high), had a mean of 2.48 ( $SD = 1.11$ ) across the 50 states. It showed positive and significant state-level correlations with the establishment entry rate ( $r = .35, p = .012$ ), self-employment ( $r = .35, p = .012$ ), and the entrepreneurship-prone personality profile ( $r = .34, p = .017$ ), and a positive but non-significant state-level correlation with the Kauffman Index of Entrepreneurial Activity ( $r = .13, p = .379$ ).

To test the potential state-level interaction effect between an entrepreneurial personality structure and the entrepreneurial climate in the prediction of entrepreneurial activity, we conducted hierarchical multiple regression analyses (using z-standardized values for the entrepreneurship-prone personality profile, the Entrepreneurial Climate Index, and for the calculation of the interaction term). We first tested whether the state-level entrepreneurship-prone personality profile would still predict entrepreneurial activity when considering the entrepreneurial climate within the region as a simultaneous predictor (this first step of the regression analysis does not yet include the interaction term). We found the effect of the personality profile to be present even when controlling for the entrepreneurial climate. The profile predicted the Kauffman Index with  $\beta = .44$  ( $p = .002$ ), the establishment entry rate with  $\beta = .60$  ( $p = .000$ ), and self-employment with  $\beta = .22$  ( $p = .133$ ). This once again underscores the relevance of the regional personality structure for regional entrepreneurial activity.

We then turned to the test of the interaction effect and, in a second step of the regression analyses, included the interaction term into the regression equation (in addition to the additive effects). For the Kauffman Index and the establishment entry rate, we found that the interaction effect between the state-level personality profile and the state-level entrepreneurial climate was positive and significant at the 10% significance level. The interaction term predicted the Kauffman Index with  $\beta = .23$  ( $p = .079$ ) and the establishment entry rate with  $\beta = .18$  ( $p = .099$ ). Given that our sample was rather small ( $N = 50$ ) and that it usually requires much larger sample sizes to detect such interaction effects (the power to detect interaction effects with hierarchical multiple regression is in general relatively low, Frazier, Tix, & Barron, 2004), it is possible that the interaction would have been significant at more conventional significance levels if there had been more cases. There was no interaction between the profile and entrepreneurial climate in the prediction of self-employment ( $\beta = .03$ ,  $p = .817$ ). Hence, again the clearest picture emerged for the founding rates.

To interpret these two interaction effects significant at the 10% level, we looked at the conditional effects of an entrepreneurial personality structure on entrepreneurial activity at different levels of the moderator variable entrepreneurial climate (low:  $M - 1SD$ , medium:  $M$ , high:  $M + 1SD$ ). We found the expected pattern with lower effects of the personality profile when the entrepreneurial climate is less supportive and higher effects in higher levels of the entrepreneurial climate. Thus, these results are consistent with our assumption that an entrepreneurial personality structure within the region should get more strongly manifested into corresponding (entrepreneurial) behavior when stimulating entrepreneurial conditions within in the region are given. This finding may also imply that a supportive entrepreneurial climate within the region (e.g., provided by policies conducive to entrepreneurship) translates into manifest entrepreneurial behavior, particularly if an entrepreneurial personality structure is prevalent. However, one has to keep in mind that we did not find interaction effects fulfilling the more conservative 5%-significance level so that future studies with better power are needed on such region-level interaction effects. Interactions between these regional characteristics may be of relevance not only for personality and entrepreneurship researchers but also for policy makers aiming to effectively stimulate entrepreneurial behavior within a region via improving the region's entrepreneurial climate (this effectiveness may depend, however, on the regional personality structure).

Finally, we examined whether the state-level relationship between the entrepreneurship-prone Big Five profile and entrepreneurial activity would also hold true when considering smaller spatial units. As has been noted elsewhere (Rentfrow et al., 2008), the states provide a very coarse level of analysis because a state captures a broad range of areas often including both densely populated cosmopolitan cities and rural areas. To provide a more fine-grained level of analysis, we also examined a narrower more homogenous unit of analysis. We focused on Metropolitan Statistical Areas (MSA) because this unit of analysis is used often in regional entrepreneurship research (e.g., Lee, Florida, &

Acs, 2004). Fortunately, the Kauffman Foundation (2011) also assessed and published the Kauffman Index of Entrepreneurial Activity for the 15 largest Metropolitan Statistical Areas (MSA) in the U.S.. Arguably, the very large  $N$  in the individual-level American personality dataset may allow us to test aggregate-level relations at the MSA level, particularly if one focuses on the largest MSA's.

We assigned participants in the American personality dataset to the MSA's by means of respondents' Zip Codes. However, the American research project had only started to collect Zip Codes from 2003, so we used a more recent version of the data set to achieve a sufficient  $N$  for the MSA analysis (data collection is ongoing). Specifically, we utilized data from U.S. residents collected between 2003 and 2011 ( $N = 1,773,234$ ). Of this sample, 328,303 lived in one of the 15 largest MSA's.

Table 2 shows the rank ordered MSA-level scores for the entrepreneurship-prone Big Five profile across the 15 MSA's. We then calculated the MSA-level correlation between the trait profile and the Kauffman Index of Entrepreneurial Activity. Consistent with our analyses on the state-level, we found a substantial relationship of similar size:  $r = .41$  ( $p = .128$ ). Given the small sample size ( $N = 15$ ), this correlation did not reach conventional levels of significance. However, this correlation is double the size of the cut-off score of  $|.20|$  taken to indicate a substantial and meaningful effect (Rentfrow et al., 2008). This result suggests that the observed state-level relationship between the entrepreneurship-prone Big Five profile and entrepreneurial activity also can be found when looking at smaller spatial levels.

The findings were promising but questions remained regarding the extent to which this entrepreneurial link is a uniquely American effect. To test the generalizability of the effects, Studies 2 and 3 examined whether the findings derived in the U.S., would replicate in two other countries with post-industrial innovation-driven economies (i.e., Germany and the UK). These countries had the advantage of the availability of large-scale household studies including Big Five data. These household studies are nationally representative with respect to

age, thereby further testing the robustness of the American analyses, which were based on datasets in which younger respondents were overrepresented.

#### Study 2: Personality-entrepreneurship links in a representative German sample

In our second study we examined the geographical variation of an entrepreneurship-prone personality profile in Germany. To gather data on personality, we utilized the German Socio-Economic Panel (GSOEP), a nationally representative longitudinal study of private households in Germany comprising information on some 21,000 individuals per annum (for details, see Wagner, Frick, & Schupp, 2007). Major topics of the survey were household composition, occupation, employment, earnings, and health. For the present study, we used the 2005 wave because this wave includes information on the Big Five personality traits. In 2005, German unification had taken place 15 years beforehand and the five new states Brandenburg, Mecklenburg-Vorpommern, Saxony, Saxony-Anhalt, Thuringia had already undergone the changes from a communist system to a free market economy. The GSOEP can be deemed representative on the federal state level (“*Bundesländer*”), but not with regard to smaller regional units. Hence, we decided to study the geographical variation on the federal state level. Note that Germany consists of 16 federal states but in the GSOEP data set two adjacent states (Saarland and Rhineland-Palatinate) are grouped together into one region because the Saarland is a very small state (around one million residents). We had to exclude 1,263 participants living in these two states because we could not clearly assign them to one of the two states, and we could not obtain summarized regional data on entrepreneurial activity for these two states. Our analysis thus refers to 14 states and to  $N = 19,842$  participants.

#### *Method*

##### *Regional data on personality*

In 2005, participants in the GSOEP were asked to fill out an established Big Five scale, based on research by McCrae and Costa (1999). Participants rated their own personality on 15 items

(e.g., “I am somebody who is shy”; seven-point Likert scales: 1 = does not apply at all, 7 = fully applies). A detailed description of the scale and evidence for reliability and validity in the GSOEP data is provided in Gerlitz and Jürgen (2005; see also Lucas & Donnellan, 2011).

As was the case in the American data set, we calculated the fit-measure for an entrepreneurship-prone personality profile (Schmitt-Rodermund, 2004, 2007). Specifically, we recoded the original trait scale from 1 – 7 into 0 – 6. We then calculated the “goodness-of-fit” between each person’s Big Five profile and the statistical reference type, using the same procedure as in Study 1. The resulting variable *entrepreneurship-prone personality profile* had a mean of -46.87 ( $SD = 15.42$ ) in our sample. Note that the mean of the German sample is not comparable to the U.S.-mean, because the range of the response scale was different (0 - 4 vs. 0 - 6 in the German sample). These 14 regional scores had a mean of -46.75 ( $SD = 0.73$ ).

#### *Regional data on entrepreneurial activity*

Unlike the U.S., there was no regional startup rate for Germany available. We thus focused on the regional self-employment rate. We drew from the German micro-census (Statistisches Bundesamt, 2007) to obtain the 2006 *self-employment rate* for each of the 14 states (share of self-employed persons in the labor force). This variable had a mean of 11.30 ( $SD = 1.81$ ;  $Min = 9.20$ ,  $Max = 16.10$ ).

#### *Regional control variables*

Consistent with Study 1, we considered *GDP per capita*, *GDP growth*, *unemployment rate*, and *change in unemployment rate* to control for possible confounds affecting the state-level correlations between the entrepreneurship-prone personality profile and entrepreneurial activity. We obtained the 2002 GDP per capita and the growth rate of GDP per capita between 2003 and 2006 from the Federal Statistical Office of Germany (“*Statistisches Bundesamt*”). State-level data on the 2002 unemployment rate and the change in unemployment rate between 2002 and 2006 were retrieved from the Federal Employment Agency of Germany (“*Bundesagentur für Arbeit*”).

### *Results and Discussion*

The rank ordered state-level scores for the entrepreneurship-prone personality profile across Germany (without Saarland and Rhineland-Palatinate) are depicted in Table 3. At the top were Berlin and Hamburg, which are two city-states with more than 1 million residents. Brandenburg and Saxony, two states in the former socialist Eastern part of Germany, ranked lowest. We were somewhat surprised about Saxony because this state is well-known for its traditional economic vitality. To investigate the possible attenuating role of older cohorts raised during the former communist system, we conducted an additional analysis with only younger participants (< 35 years; the same age range of most of the American subjects in Study 1). However, our results remained stable and Saxony ranked low once more. Drawing on Rentfrow et al's (2008) earlier results concerning the effects of migration on personalities in the U.S., a closer look at the literature on out-migration from Saxony brought up an interesting idea: Many entrepreneurs had left the state after World War II in order to escape the new socialist system and to re-establish their businesses in the Western part of Germany (Buenstorf & Guenther, 2011; Falck, Guenther, Heblich, & Kerr, 2011). There was another wave of out-migration of entrepreneurially minded persons due to economic reasons towards the more prosperous West after the fall of the Berlin Wall. Moreover, Saxony is an old industrial region with considerable mass-production during socialist times. This could have socialized residents through "non-entrepreneurial" work tasks and respective norms and values in the region.

We then studied the regional-level associations between personality and entrepreneurial activity across the German federal states ( $N = 14$ ). We found the trait-profile to correlate with the self-employment rate  $r = .56$  ( $p = .039$ ).

Finally, we calculated the partial state-level correlation between the entrepreneurship-prone personality profile and the self-employment rate, controlling for GDP, GDP growth, unemployment rate, and change in unemployment rate. The respective correlation was  $r = .26$

( $p = .473$ ), which, although non-significant in this small sample, may indicate a substantial and meaningful effect (Rentfrow et al., 2008). In sum, the German results supported our American findings.

### Study 3: Personality-entrepreneurship links in a representative UK sample

In Study 3 we utilized personality data from the British Household Panel Study (BHPS) to examine the regional distribution of the entrepreneurship-prone Big Five profile across the UK. The BHPS is a nationally representative longitudinal study of private households in the UK. The data can be acquired from the UK Data Archive (<http://www.data-archive.ac.uk>) and major topics of the annual surveys are comparable with those in the German Socio-Economic Panel (GSOEP). As in the GSOEP, the 2005 wave of the BHPS ( $N = 15,617$ ) included a Big Five questionnaire and we used these personality data to analyze the regional distribution of the Big Five profile across the 12 government regions of the UK (East Midlands, East of England, Greater London, North East England, North West England, Northern Ireland, Scotland, South East England, South West England, Wales, West Midlands, Yorkshire and the Humber).

### *Method*

#### *Regional data on personality*

The same 15-item Big Five questionnaire with seven-point Likert scales that was used in the GSOEP was also employed in the 2005 Wave in the BHPS (see Donnellan & Lucas, 2011 for details on reliability and validity). The fit measure of an *entrepreneurship-prone personality profile* was calculated in the same way as in the German data. This profile had a mean of  $-49.75$  ( $SD = 16.54$ ) at the individual level, and a mean of  $-49.01$  ( $SD = 1.63$ ) at the aggregate level.

#### *Regional data on entrepreneurial activity*

For the UK, we could retrieve data on regional entrepreneurial activity from the Global Entrepreneurship Monitor project (GEM). Specifically, we utilized data from the 2006 GEM

UK report (<http://www.gemconsortium.org/docs/download/651>), which is based on an adult population survey in the UK ( $N = 43,000$ ). The GEM project estimates the so-called *Total Early-Stage Entrepreneurial Activity Rate* (TEA), which is the percentage of the population either actively trying to start a new business (nascent entrepreneurs) or already owning and managing a business less than three and a half years old. The 2006 TEA of the 12 UK government regions had a mean of 5.34 ( $SD = 1.08$ ;  $Min = 3.70$ ,  $Max = 7.60$ ).

Finally, following our American and German analyses we also considered self-employment (self-employment rate for the year 2007, [www.statistics.gov.uk](http://www.statistics.gov.uk);  $M = 12.89$ ,  $SD = 1.91$ ;  $Min = 10.10$ ,  $Max = 15.60$ ).

#### *Regional control variables*

Regional control variables were gathered from the UK Office for National Statistics. We considered data on *GVA* (Gross Value Added), *GVA growth*, *unemployment rate*, and *change in unemployment rate*. We obtained the 2002 regional GVA rate per capita as well as the growth rate of this GVA per capita between 2002 and 2006, and the 2005 regional unemployment rate as well as the change rate in this unemployment rate between 2005 and 2009.

#### *Results and Discussion*

Table 4 shows the rank ordered region-level scores for the entrepreneurship-prone Big Five profile across the 12 government regions of the UK. At the top were East of England and Greater London, and Scotland, Wales, and Northern Ireland ranked lowest. The region-level correlation ( $N = 12$ ) between the entrepreneurship-prone Big Five profile and Total Early-Stage Entrepreneurial Activity (TEA) was  $r = .60$  ( $p = .038$ ). The region-level correlation between the entrepreneurship-prone profile and the self-employment rate was close to zero ( $.03$ ,  $p = .935$ ), which came as a surprise given the American and German results. A closer look into the data revealed a discrepancy for Northern Ireland regarding the founding rate (TEA) and the self-employment rate. Although Northern Ireland ranked lowest in the

founding rate in the UK, it was among the top two regions in the self-employment rate. This is explainable by the distinctiveness of Northern Ireland in terms of industry mix. The relatively high percentage of self-employed in Northern Ireland could be related to the greater importance of agriculture in this region (agriculture has a high self-employment rate but is not prototypical for entrepreneurship). We also examined the scatter plot for the region-level correlation between the profile and self-employment; Northern Ireland was a clear outlier. When recalculating our analysis without this region ( $N = 11$ ), we found a substantial positive correlation between the entrepreneurship-prone profile and the self-employment rate of  $r = .61$  ( $p = .046$ ).

The partial regional correlation (controlling for GVA, GVA growth, unemployment rate, and change in unemployment rate) for the entrepreneurship-prone profile and Total Early-Stage Entrepreneurial Activity (TEA) was  $r = .33$ ,  $p = .433$ ,  $N = 12$ ), which, as in the German data, did not reach statistical significance in this small sample but may still indicate a substantial and meaningful effect (Rentfrow et al., 2008). The respective partial correlation between the profile and self-employment (without Northern Ireland;  $N = 11$ ), however, did not reach the  $|\ .20 |$  cut-off value ( $r = .17$ ,  $p = .713$ ).

With the exception of this partial correlation between the profile and self-employment, our British results clearly supported the results from Studies 1 and 2, indicating that the regional distribution of the entrepreneurship-prone personality profile covaries with regional entrepreneurial activity in all three countries. Moreover, as was the case in the American analyses, the founding rate, as an indicator of prototypical entrepreneurial behavior, yielded clearer results than the self-employment rate in the British analyses.

#### Results for the Single Big Five Dimensions

We also conducted our regional analyses in the U.S., Germany, and the UK using the single Big Five dimensions, instead of the profile. This variable-oriented analysis is not the main focus of our paper but is the dominant approach in existing research on regional personality

(e.g., Rentfrow, 2010) and it figures prominently in entrepreneurship research (Zhao et al., 2010) so we deemed it important to provide the reader with these additional results. These additional findings may serve as a useful addition for readers interested in variable-oriented analyses and also as a means of comparing the patterns and consistency of the person- and variable-oriented results.

Table 5 summarizes the correlations and partial correlations between the single Big Five and regional entrepreneurial activity in the three countries under study. Some of these relationships were also substantial and comparable in size to those with the entrepreneurship-prone profile. However, none of the single Big Five delivered a consistent picture across aggregation levels (e.g., U.S. states, U.S. major cities) and countries. For example, extraversion showed a negative correlation with self-employment across U.S. states ( $r = -.42$ ,  $p = .002$ ), a close to zero correlation with the Kauffman index at the Metropolitan Statistical Area level in the US ( $r = -.04$ ,  $p = .891$ ), and a positive correlation with the founding rate in the U.K. (TEA) ( $r = .24$ ,  $p = .462$ ). Conscientiousness was positively related with the establishment entry rate across U.S. states ( $r = .20$ ,  $p = .167$ ), showed a close to zero correlation with the Kauffman index at the Metropolitan Statistical Area level in the U.S. ( $r = -.03$ ,  $p = .910$ ), and a negative correlation with self-employment in Germany ( $r = -.61$ ,  $p = .019$ ). Openness correlated positively with the Kauffman index at the Metropolitan Statistical Area level in the U.S. ( $r = .50$ ,  $p = .057$ ), and showed a negative correlation with the Kauffman index at the U.S. state level ( $r = -.14$ ,  $p = .314$ ). In Germany, openness was positively correlated with self-employment ( $r = .41$ ,  $p = .149$ ), but this correlation became negative when controlling for the region's economic prosperity ( $r = -.39$ ,  $p = .272$ ). Agreeableness showed (negative) correlations below  $|\ .20 |$  in many cases (e.g., with the Kauffman index at the Metropolitan Statistical Area level in the U.S.;  $r = -.07$ ,  $p = .819$ ). Arguably, the most consistent picture of all the Big Five dimensions is shown by the negative relationships with neuroticism but even in this case there was no substantial relationship

between neuroticism and the Kauffman index at the Metropolitan Statistical Area level in the U.S. ( $r = -.09$ ,  $p = .754$ ) or when controlling the correlation between this trait and self-employment for economic prosperity in the German data ( $r = .06$ ,  $p = .874$ ). Moreover, neuroticism showed substantially lower correlations (e.g., less than half the size) than those associated with the profile in the German and British datasets.

When comparing the results depicted in Table 5 with our findings on the entrepreneurship-prone personality profile, it is clear that the most consistent picture with respect to substantial and robust region-level correlates of entrepreneurial activity is provided by the profile. Given that profile-level analyses delivered a consistent picture but that the dimension-level analyses did not, an argument can be made that the region-level relationship between the profile and entrepreneurial activity is not a simple linear combination between one aspect of personality and the criterion. Apparently, entrepreneurship requires a specific constellation or *set* of traits, a line of reasoning that is consistent with the theoretical considerations on the entrepreneurial personality (e.g., Schumpeter, 1934), with the jack-of-all-trades view of entrepreneurship (Lazear, 2005), and with the individual-level research on the entrepreneurship-prone Big Five profile. This prior (individual-level) research suggests that an entrepreneurial constellation of traits is needed; our findings suggest that this process also plays out at a regional level.

We also tested interaction effects between regional personality and entrepreneurial climate (e.g., business conditions in the region; Entrepreneurial Climate Index 2006, Small Business Foundation of Michigan, 2010) at the level of U.S. states, as we did for the profile (applying the .10 significance level). We found a positive interaction between conscientiousness and climate ( $\beta = .55$ ,  $p = .006$ ) in the prediction of the Kauffman index; and negative interactions between openness and climate ( $\beta = -.24$ ,  $p = .098$ ) and between neuroticism and climate ( $\beta = -.34$ ,  $p = .025$ ) in the prediction of the establishment entry rate. Again, no single trait showed a more consistent picture with respect to interactions with the

region's entrepreneurial climate than the profile (which showed interactions in the prediction of both the Kauffman index and the establishment entry rate). Finally, as was the case for the profile, no single Big Five trait showed interactions with regional climate in the prediction of self-employment across U.S. states.

### General Discussion

In the present set of studies on regional personality differences we combined the approaches of socioecological psychology, person-oriented and variable-oriented personality research, and entrepreneurship research. Our main focus was on an entrepreneurship-prone personality structure, a feature of social habitats that is conceptually related to economic systems and mechanisms (McClelland, 1961). The entrepreneurship-prone personality profile, as investigated in the present set of studies, refers to a single index that 1) is rich in theoretically meaningful information (i.e., intraindividual constellation of the Big Five traits), 2) offers efficacy in empirical studies, particularly in macro-level studies where the unit of analyses may not afford ample degrees of freedom, and 3) can be used to prepare a socioecological map of entrepreneurial personality (e.g., Figure 1), which in turn allows exploration of regional patterns of entrepreneurial personality, and their historical origins (e.g., when relating the U.S. regional pattern of the Big Five profile to the settlement of the U.S. and genetic founder effects, Rentfrow et al., 2008). Together, our cross-national results delivered a remarkably consistent picture of the link between an entrepreneurship-prone personality profile and entrepreneurial activity across geographic regions. We found meaningful geographical variation in the U.S., Germany, and in the UK, as indicated by the robust aggregate-level correlations between the trait profile and entrepreneurial activity. Our additional in-depth analysis of the American data further revealed that this relationship is also present at the metropolitan level. In contrast, the single Big Five traits failed to deliver a consistent picture across aggregation-levels and countries.

The socioecological approach adopted here allowed us to make three major novel contributions to the existing research on the *regional geography of personality*. First, the findings enrich our knowledge of *entrepreneurial personality* (Rauch & Frese, 2007b). Consistent with previous research showing that an entrepreneurship-prone Big Five profile is associated with entrepreneurship at the individual level, our findings indicate that this link also is expressed at the aggregate level. This finding shows that regional differences in an entrepreneurial personality structure are consistently mirrored in regional differences in entrepreneurial activity, and thus reflected in “hard” economic factors that are crucial for the success of today’s post-industrial innovation-driven societies (Audretsch, 2007; Hisrich et al., 2007). Among the single Big Five dimensions, neuroticism appeared as the most consistent correlate of entrepreneurial activity at the region-level but it did not show a substantial correlation at the U.S. metropolitan level. Future research interested in applying a variable-oriented strategy to the link between regional personality and entrepreneurship at broader spatial levels may find it most profitable to concentrate on this dimension.

With respect to the promising results delivered by the profile and following the socioecological approach to psychology (Oishi, & Graham, 2010), the next steps should be to investigate the complex interplay of processes driving the link between the entrepreneurship-prone personality and aggregate measures of founding and maintaining new businesses (Oishi et al., 2007; Rentfrow et al., 2008). Clearly, this topic was beyond the scope of the present paper, but our additional U.S. analyses indicate that interactions between personality and regional business conditions (e.g., infrastructure, the legal and regulatory environment, and venture capital financing) could play an important role. We found indications that regional business conditions show a stronger effect on entrepreneurial vitality within the region (e.g. startup rate) when an entrepreneurship-prone personality structure is prevalent. This finding has important implications for policy makers and illustrates the far-reaching relevance of theorizing within a socioecological framework. Another profitable avenue of further

exploration would be to focus on the concrete channels through which the entrepreneurial personality structure of a region affects developmental contexts more proximal to the individual, such as the "entrepreneurial" values and norms prevalent in a region (e.g., in peer and family interactions). Such research could draw from existing regional entrepreneurship research indicating that perceptions, attitudes, skills, and networks of the population with regard to entrepreneurship may together constitute a latent "entrepreneurial spirit" within the region, which in turn translates into regional entrepreneurial activity if supportive conditions like access to capital, labor, and the necessary infrastructure are present (Audretsch & Fritsch, 1994; Sternberg, 2009). In addition, research at the regional level could also examine other ways—outside the world of entrepreneurship (e.g., in domains such as health, political orientations, or social involvement)—in which the regional entrepreneurship-prone personality profile could be manifested. Are there certain "spill-over effects" to other domains beyond entrepreneurship?

The socioecology approach to psychology further suggests that one should also aim to better understand the shaping of the social habitat — in our case the regional entrepreneurship-prone personality profile — by such processes as social influence, selective migration patterns, and the effect of physical regional factors (Rentfrow et al., 2008). Social influence processes could work by certain entrepreneurial traditions, customs, lifestyles, and daily practices that are common to an area and that may result in entrepreneurial norms and in structural conditions (e.g., the establishing of "entrepreneurial" policies or institutions), which then affect people's attitudes, traits, and behaviors. As noted by Rentfrow (2010): "Through socialization, such influence could lead people to acquire the personality traits that are valued in the region" (p. 551). The present research relied on people's self-reports regarding personality characteristics and these self-reports could also reflect personal values and aspirations, which are shaped by cultural and environmental influences. Mobility and selective migration could play an important role too in the shaping of social habitats (e.g.,

more entrepreneurial regions could attract entrepreneurial people who migrate from less entrepreneurial regions). Future studies on the region-level entrepreneurship-personality-link could try considering and measuring such migration patterns (e.g., via residential mobility, Oishi, Rothman, Snyder, Su, Zehm, Hertel, Gonzales, & Sherman, 2007). Finally, physical features of the regions (e.g., climate) may also affect the region's entrepreneurial personality but, to our knowledge, there is no existing theory that would identify those physical regional features that should be relevant to the formation of a prevalent entrepreneurial personality structure.

The second major contribution of the present work is providing the first major *cross-national replication* of such region-level correlations between personality structure and social indicators; in doing so, our results both support the robustness of these findings and validate the approach and the trustworthiness of this widely used U.S. sample. We focused on the U.S., Germany, and the UK and incorporated both broad spatial units (e.g., U.S. states) and smaller spatial units (i.e., Metropolitan Statistical Areas in the U.S.). Future studies could extend this approach by looking at other countries and cultures, and at even smaller spatial units like the county level in the U.S. (Armington & Acs, 2002).

Third, and even more broadly, the findings underscore the relevance of conceptualizing personality *structure* at the regional level. As Florida (2008) has argued, regions may have their own prevalent personality profiles and this research provides the first empirical picture of exactly how regions may differ in terms of an entrepreneurial personality structure. Such a holistic perspective clearly deserves more attention in socioecological personality research. The study of intraindividual constellations of traits, and personality as a whole, has long been a core interest in personality research (Allport, 1923). Moreover, from a conceptual level, personality as a whole may exert synergistic effects that go beyond its single components (Magnusson & Törestad, 1993). As demonstrated in the present research, future socioecological studies on intraindividual personality structures may draw on existing

individual-level research on personality profiles to generate ideas regarding which profiles (and possible correlates) could be examined from a socioecological perspective. For example, research could test whether regional variation in the resilient, overcontrolled, and undercontrolled personality types identified in children and adolescents (e.g., Asendorpf & van Aken, 1999) play out in such regional social indicators as youth crime rate and, if so, whether the link is associated with prevalent norms and values in the region that may encourage delinquent behavior.

In addition to our contributions to research on the regional geography of personality, our research also has important implications for the specific field of *entrepreneurship research* (Sternberg, 2009). First, our analyses contribute to our knowledge of possible *regional determinants* of entrepreneurial activity within the region. One major goal in contemporary regional entrepreneurship research is to find explanations for the documented regional differences in entrepreneurial attitudes and activities (Armington & Acs, 2002; Audretsch & Fritsch, 1994; Sternberg, 2009). Surprisingly, past regional entrepreneurship research has largely neglected the potential role of regional personality differences despite the fact that personality is a central topic in entrepreneurship research in general. An early promising study pointing to the relevance of regional differences in personality is Lee, Florida, and Acs' (2004) work on creativity and regional entrepreneurship. That study provided empirical evidence that regional differences in entrepreneurial activity (e.g., business start-ups) can be explained by regional differences in creativity. It is important to note, however, that in this research on creativity was not conceptualized and assessed as a personality trait but in terms of the share of the creative class (e.g., proportions of bohemians and other artistically creative people in the region). Our set of studies consistently indicates that regional differences in an entrepreneurship-prone personality profile may be an important ingredient for regional entrepreneurship. This finding suggests that future regional entrepreneurship research should take personality differences into account. The usefulness of

single traits in this field, however, remains to be established.

The second implication of our findings for the field of entrepreneurship research concerns potential explanations for *cross-national differences in entrepreneurial activity* (Blanchflower, Oswald, & Stutzer, 2001). Cross-national studies have shown that the Big Five traits vary across nations (Schmitt, Allik, McCrae, & Benet-Martínez, 2007), and this effect could also apply to an entrepreneurship-prone personality profile. Hence, cross-national research on enterprising activity may also consider differences in country-level personality when investigating why some nations are more entrepreneurial than others (Steel, Rinne, & Fairweather, 2012).

Third, our findings can inform the question of why regional (or cross-national) differences in entrepreneurial activity *persist over time* (Armington & Acs, 2002; Fritsch & Mueller, 2007; Sternberg, 2009). If indeed differences in personality play a role, then persistence in founding rates could result from the stability of regional (or cross-national) differences in personality. Normally, a region's personality should not change quickly because the processes involved need time (e.g., via selective migration or individual socialization, Rentfrow et al., 2008; see also Rentfrow's [2010] study comparisons on persisting patterns of regional personality difference). Further support for this assumption comes from economic research indicating that those regional psychological characteristics that show particularly high stability over time are the economically beneficial characteristics such as trust (Algan & Cahuc, 2010; Voigtländer & Voth, 2011). It seems plausible to assume that entrepreneurial personality yields economic benefits for the region due to the manifestation of entrepreneurial behavior, which in turn may contribute to the regional stability of entrepreneurial personality.

#### *Limitations*

The present research has a number of limitations, which should be considered when interpreting our results. First, in the American dataset younger individuals are overrepresented

(median age = 24 years; Rentfrow et al., 2008). Nevertheless, given the uniqueness of the data set, its successful utilization in a number of prior studies on regional personality differences, and, even more importantly, the congruence between the American results and the German and British results (which are based on a representative sample with regard to age), our American results remain an important and meaningful first attempt to map an entrepreneurship-prone personality profile across the U.S..

Second, differential availability of data meant that we had to draw from annual indicators of entrepreneurial activity from a variety of different years (e.g., some statistics in our American analysis refer to the years 1998-2000 and others to the year 2006). However, the effect on the results should be minimal because the regional prevalence of entrepreneurial activity is considerably stable over such periods of time (Fritsch & Mueller, 2007). Moreover, these differences would tend to diminish our effects because the time between the two measures (personality and entrepreneurship) would provide opportunities for other variables to disrupt the links hypothesized here; as a result, our effect sizes are conservative estimates.

Third, our control variables mainly focused on the economic prosperity of the region and future research may also consider other and more detailed factors. Future studies could also delve deeper into interactions between personality and regional policies and structural conditions when predicting regional entrepreneurial vitality. One could also look at interactions between the regional personality make-up and other psychological characteristics of the region, such as prevailing attitudes towards entrepreneurial failure.

Finally, our profile analyses solely refer to the (individual deviation from the) fixed entrepreneurial reference profile. This measure, which was already successfully applied in individual-level research, uses the individual raw Big Five scores, which, nevertheless, have different mean values within the samples. This means that the average deviation between a single Big Five trait and the respective extreme score in the fixed entrepreneurial extreme profile may naturally differ across the traits within the samples. We thus also utilized a fit

measure that draws from z-standardized Big Five scores (with empirical extreme scores of the standardized Big Five dimensions as reference type in same direction as the entrepreneurial extreme profile) and our results remained stable. In addition to this step, we tested the entrepreneurship-prone Big Five profile, as measured in our analyses, against a “neutral” profile to examine whether the entrepreneurship-prone Big Five profile is indeed more valid (with respect to aggregate-level correlations with entrepreneurial activity) than the neutral profile. We estimated each individual’s deviation from a neutral fixed reference profile that is composed of the mean values of the Big Five traits (raw scores). In other words, this neutral empirical profile represents each respondent’s deviation from the average Big Five scores. Across the three countries studied, we found the aggregate-level relationships between this neutral profile and entrepreneurial activity to be either substantially lower than the respective correlations with the entrepreneurship-prone Big Five profile, or close to zero. This finding indicates that the entrepreneurial profile, as studied here, is indeed much better suited to entrepreneurship at the region level than the neutral profile.

Despite these additional results indicating robustness of our findings, the reader should recall that our research employed a broad definition of an entrepreneurship-prone Big Five profile; in particular, drawing from individual-level research, the profile refers to extreme scores as target reference points. Unfortunately, current theory and literature offer no clear basis for constructing a reference profile consisting of less extreme scores. So future research should look for more finely grained reference profiles at the Big Five level (e.g., constellations in which one or more traits have moderate values) and focus on a profile that fits entrepreneurial success (e.g., comparing successful with less successful entrepreneurs). In addition, future research should investigate the possibility of different reference profiles for different subtypes of entrepreneurial behavior. Such research could employ latent class analysis and examine intra-class correlations at the region-level. Moreover, future studies may

profit from incorporating traits and constructs other than the Big Five into the reference profiles.

### *Conclusion*

To conclude, this cross-national research delivers promising new results on the social ecology related to individual psychological functioning and human behavior. Social habitats vary across regions and this variation may have important implications for the individual and his or her action in the proximal contexts and for the region's development itself. With its focus on entrepreneurship and personality, the present research introduces the geographical approach to the study of an entrepreneurship-prone personality profile and generates new hypotheses to be tested in future research (e.g., on mutual processes driving the entrepreneurship–personality profile–links at the aggregate level). This work also demonstrates the benefits of generating new synergies between socioecological research, personality research, and entrepreneurship — three fields of investigation that were not previously combined, even though they share substantial similarities (e.g., looking at the effects of human characteristics and actions as embedded in changing contexts). More broadly, the present set of studies serve as illustrative examples of how a socioecological perspective can be used to integrate the relevance of personality and social habitats with major economic parameters like entrepreneurship.

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Table 1  
*State Ranking and z Score Mean for the Entrepreneurship-Prone Personality Profile (U.S.)*

State	Sample size	Entrepreneurial personality profile
Alabama	11,985	38 (-0.57)
Alaska	4,316	6 (1.21)
Arizona	12,570	7 (1.10)
Arkansas	4,424	43 (-0.89)
California	71,873	15 (0.59)
Colorado	11,446	2 (1.82)
Connecticut	6,836	28 (-0.25)
Delaware	1,881	31 (-0.35)
District of Columbia	2,155	1 (2.86)
Florida	27,423	12 (0.65)
Georgia	18,807	11 (0.65)
Hawaii	2,940	32 (-0.40)
Idaho	3,178	24 (0.08)
Illinois	27,739	17 (0.49)
Indiana	13,515	41 (-0.80)
Iowa	6,514	35 (-0.49)
Kansas	6,976	16 (0.49)
Kentucky	7,827	48 (-1.55)
Louisiana	6,519	49 (-1.58)
Maine	3,540	36 (-0.49)
Maryland	12,286	39 (-0.73)
Massachusetts	16,153	33 (-0.42)
Michigan	21,938	26 (-0.15)
Minnesota	14,532	22 (0.22)
Mississippi	3,609	51 (-2.02)
Missouri	12,565	21 (0.22)
Montana	1,945	10 (0.75)
Nebraska	4,410	9 (1.02)
Nevada	3,531	5 (1.47)
New Hampshire	3,255	46 (-1.09)
New Jersey	16,576	44 (-0.95)
New Mexico	4,077	8 (1.04)
New York	32,602	29 (-0.29)
North Carolina	16,428	27 (-0.22)
North Dakota	2,372	23 (0.16)
Ohio	24,018	45 (-1.00)
Oklahoma	8,095	34 (0.45)
Oregon	10,211	14 (0.60)
Pennsylvania	25,915	37 (-0.56)
Rhode Island	2,021	47 (-1.27)
South Carolina	5,918	30 (-0.31)
South Dakota	1,572	4 (1.50)
Tennessee	10,661	40 (-0.77)
Texas	45,432	19 (0.39)
Utah	8,365	3 (1.78)
Vermont	1,637	42 (-0.87)
Virginia	18,091	25 (-0.10)
Washington	17,890	13 (0.60)
West Virginia	3,412	50 (-1.88)
Wisconsin	15,863	18 (0.40)
Wyoming	1,536	20 (0.35)

Table 2

*Ranking and z Score Mean for the Entrepreneurship-Prone Personality Profile across the 15 largest Metropolitan Statistical Areas (MSA) in the U.S.*

MSA	Sample size	Entrepreneurial personality profile
Atlanta–Sandy Springs–Marietta	21082	3 (1,04)
Boston–Cambridge–Quincy	17742	15 (-1,51)
Chicago–Joliet–Naperville	34372	7 (-0,01)
Dallas–Fort Worth–Arlington	22096	10 (-0,40)
Detroit–Warren–Livonia	16625	11 (-0,44)
Houston–Sugar Land–Baytown	16555	12 (-0,48)
Los Angeles–Long Beach–Santa Ana	38435	5 (0,91)
Miami–Fort Lauderdale–Pompano Beach	12991	1 (1,95)
New York–Northern New Jersey–Long Island	48858	14 (-1,26)
Philadelphia–Camden–Wilmington	19970	13 (-1,13)
Phoenix–Mesa–Glendale	16728	4 (1,03)
Riverside–San Bernardino	10539	9 (-0,39)
San Francisco–Oakland–Fremont	14779	8 (-0,39)
Seattle–Tacoma–Bellevue	17233	2 (1,08)
Washington–Arlington–Alexandria	20298	6 (0,01)

Table 3  
*State Ranking and z Score Mean for the Entrepreneurship-Prone Personality Profile (Germany)*

State	Sample size	Entrepreneurial personality profile
Baden-Württemberg	2545	11 (-0.52)
Bavaria	2942	5 (0.21)
Berlin	774	1 (1.81)
Brandenburg	894	13 (-1.23)
Bremen	151	10 (-0.25)
Hamburg	298	2 (1.70)
Hesse	1402	12 (-1.09)
Mecklenburg-Vorpommern	507	4 (0.60)
Lower Saxony	1841	9 (-0.24)
North Rhine-Westphalia	4420	6 (0.16)
Saxony	1530	14 (-1.65)
Saxony-Anhalt	895	7 (-0.12)
Schleswig-Holstein	645	3 (0.75)
Thuringia	895	8 (-0.14)

Table 4  
*State Ranking and z Score Mean for the Entrepreneurship-Prone Personality Profile (United Kingdom)*

Region	Sample size	Entrepreneurial personality profile
East Midlands	701	7 (0.25)
East of England	809	1 (1.07)
Greater London	634	2 (0.97)
North East England	342	9 (-0.22)
North West England	1020	8 (0.23)
Northern Ireland	2317	12 (-2.52)
Scotland	2514	10 (-0.72)
South East England	1143	3 (0.71)
South West England	804	5 (0.37)
Wales	2444	11 (-0.94)
West Midlands	700	6 (0.31)
Yorkshire and the Humber	776	4 (0.50)

Table 5  
*Region-Level Correlations between the Single Big Five Dimensions and Entrepreneurial Activity*

	U.S.			MSA <sup>1</sup> level (N=15) Kauffman Index	Germany		UK	
	State level (N = 51)		Self-employment		Federal State level (N = 14)		Government region level (N = 12)	
	Kauffman Index	Establishment entry rate			Self- employment	TEA <sup>2</sup>	Self- employment <sup>3</sup>	
Extraversion	-0.08, <i>p</i> =.563 (.03, <i>p</i> =.865)	-.20, <i>p</i> =.170 (-.19, <i>p</i> =.213)	-.42, <i>p</i> =.002 (-.39, <i>p</i> =.008)	-.04, <i>p</i> =.891	-.09, <i>p</i> =.771 (-.56, <i>p</i> =.096)	.24, <i>p</i> =.462 (.36, <i>p</i> =.388)	-.38, <i>p</i> =.226 (-.27, <i>p</i> =.541)	
Conscientiousness	.06, <i>p</i> =.688 (.20, <i>p</i> =.189)	.20, <i>p</i> =.167 (.26, <i>p</i> =.087)	-.17, <i>p</i> =.244 (-.10, <i>p</i> =.495)	-.03, <i>p</i> =.910	-.61, <i>p</i> =.019 (-.57, <i>p</i> =.088)	-.55, <i>p</i> =.063 (-.26, <i>p</i> =.537)	-.22, <i>p</i> =.503 (.34, <i>p</i> =.416)	
Openness	-.14, <i>p</i> =.314 (-.03, <i>p</i> =.853)	.21, <i>p</i> =.146 (.51, <i>p</i> =.000)	.41, <i>p</i> =.003 (.46, <i>p</i> =.000)	.50, <i>p</i> =.057	.41, <i>p</i> =.149 (-.39, <i>p</i> =.272)	.56, <i>p</i> =.057 (-.00, <i>p</i> =.994)	.27, <i>p</i> =.397 (-.21, <i>p</i> =.626)	
Agreeableness	-.16, <i>p</i> =.261 (.04, <i>p</i> =.775)	-.13, <i>p</i> =.359 (-.10, <i>p</i> =.511)	-.26, <i>p</i> =.071 (-.18, <i>p</i> =.226)	-.07, <i>p</i> =.819	-.14, <i>p</i> =.645 (-.70, <i>p</i> =.025)	-.59, <i>p</i> =.042 (-.57, <i>p</i> =.144)	-.21, <i>p</i> =.508 (.37, <i>p</i> =.367)	
Neuroticism	-.46, <i>p</i> =.000 (-.34, <i>p</i> =.020)	-.57, <i>p</i> =.000 (-.49, <i>p</i> =.000)	-.32, <i>p</i> =.024 (-.29, <i>p</i> =.054)	-.09, <i>p</i> =.754	-.25, <i>p</i> =.399 (.06, <i>p</i> =.874)	-.22, <i>p</i> =.494 (-.18, <i>p</i> =.667)	.26, <i>p</i> =.414 (.35, <i>p</i> =.391)	

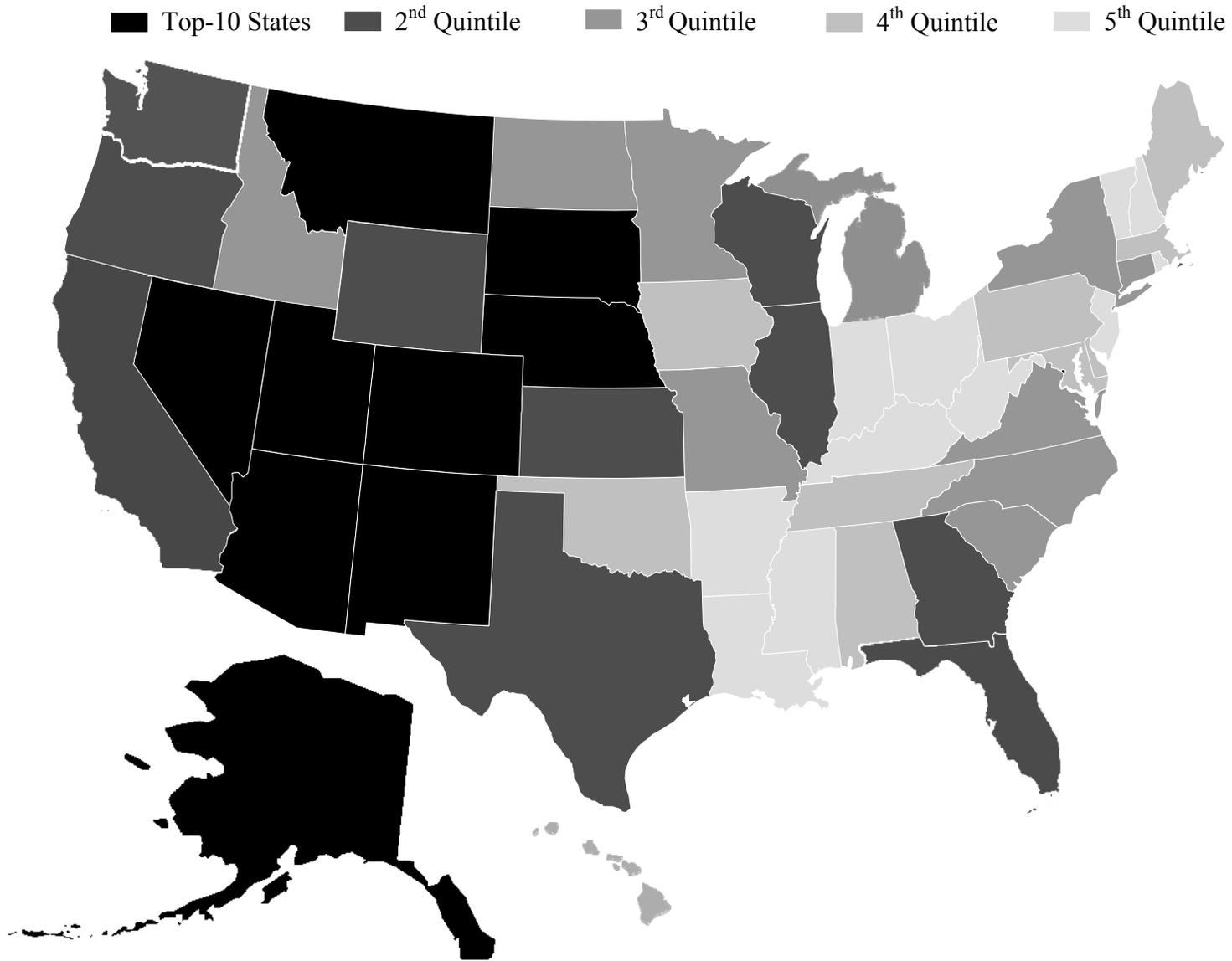
*Note.* Values in brackets show partial correlations, controlled for regional economic prosperity (GDP, GDP growth, unemployment rate, change in unemployment rate).

<sup>1</sup>MSA = Metropolitan Statistical Areas.

<sup>2</sup>Total Early-Stage Entrepreneurial Activity.

<sup>3</sup>Correlations and partial correlations between Big Five and self-employment in UK government regions without Northern Ireland (N=11): Self-employment – E = -.15, *p*=.660 (.34, *p*=.460), Self-employment – C = -.40, *p*=.225 (.37, *p*=.419), Self-employment – O = -.64, *p*=.033 (.17, *p*=.720), Self-employment – A = -.57, *p*=.066 (-.04, *p*=.934), Self-employment – N = .02, *p*=.962 (-.14, *p*=.773).

# Geography of entrepreneurial personality



*Figure 1.* Map of state-level variation in an entrepreneurship-prone personality profile across the U.S.. *Note.* The variable entrepreneurship-prone personality profile represents the fit between a person's individual Big Five profile and a statistical reference profile (highest possible value in extraversion, conscientiousness, and openness; lowest possible value in agreeableness and neuroticism).

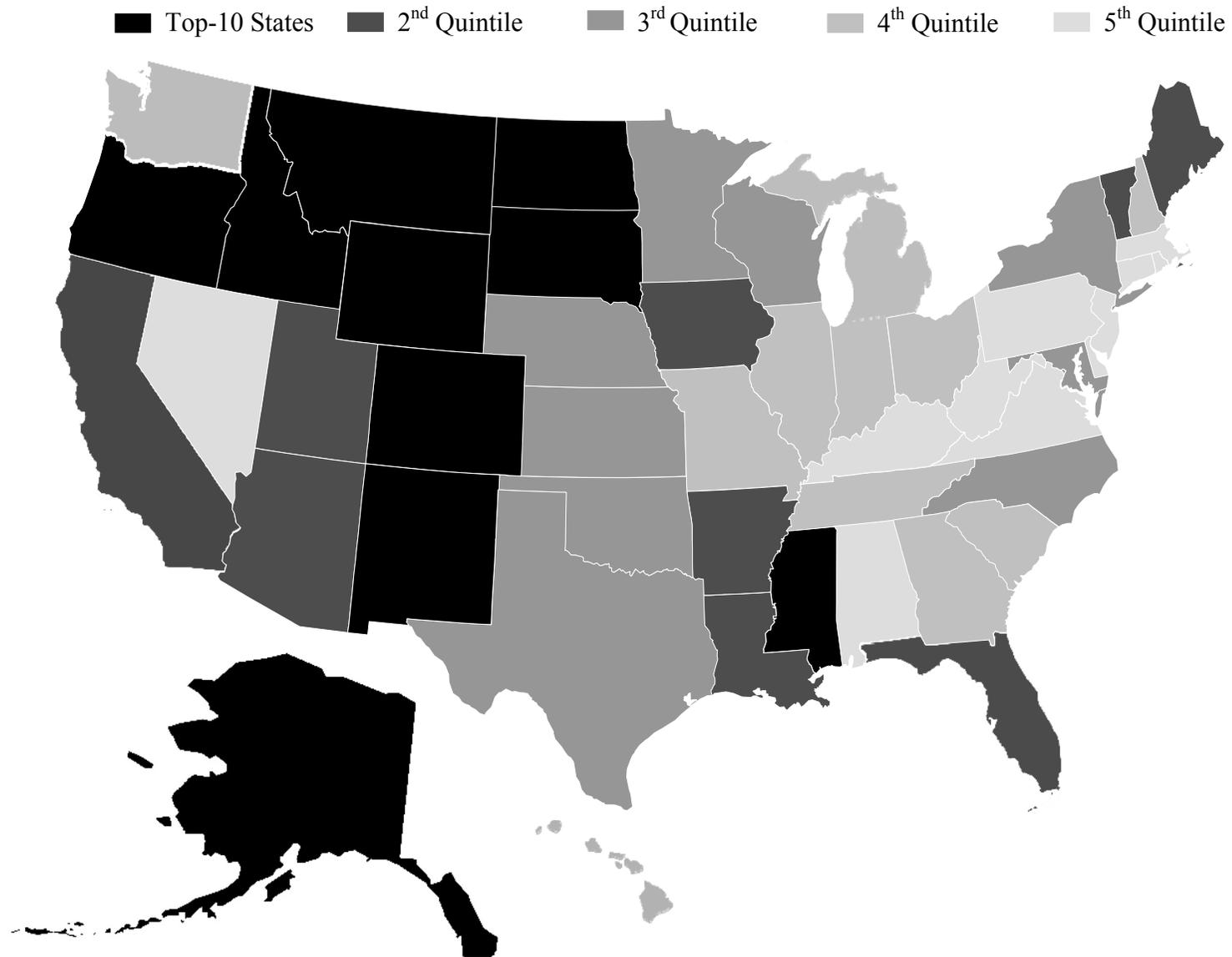


Figure 2. Map of state-level entrepreneurial activity across the U.S. (Kauffman Index of Entrepreneurial Activity 1998-2000).