A Scholar Must Be Broad-Minded and Resolute: Development and Validation of a Chinese Inter-provincial Grit Index and Its Antecedents and Outcomes

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Abstract

Grit constitutes one of the most crucial driving forces for the advancement and rejuvenation of the Chinese nation. While substantial research has established that grit exerts significant influence on individuals' successful goal attainment, these investigations have predominantly concentrated on the individual level, leaving unclear whether grit manifests variations at the macro-regional level. In recent years, studies have revealed that personality exhibits systematic differences across regions and demonstrates significant associations with macro-level regional indicators. Consequently, this study seeks to examine whether grit varies among Chinese provinces and constructs an inter-provincial grit index for quantification; furthermore, it explores the antecedents and consequences of this inter-provincial grit index at the regional level. Employing the theoretical lens and methodological framework of geographical psychology, this research utilizes CGSS survey data to construct a Chinese inter-provincial grit index, revealing that: significant inter-provincial grit differences exist across Chinese provinces, shaped by both natural environmental and sociocultural factors; and after controlling for per capita GDP effects, it influences provincial indicators across political, economic, social, and entrepreneurial innovation dimensions. This paper extends grit personality research from the micro-level individual perspective to the macro-level regional perspective by constructing an inter-provincial grit index, thereby furnishing an important research instrument and a novel theoretical viewpoint from the perspective of regional personality differences for future studies concerning regional disparities.

Full Text

Provincial Variations in Persistence across China: Index Development and Validation, Antecedents and Consequences

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Abstract

Persistence—the personality trait of finishing what one starts even when faced with obstacles—is one of the most important drivers for human beings to achieve their goals and objectives. Although most persistence studies have demonstrated the significant influence of persistence at the individual level, extant research remains incomplete because whether persistence varies at the regional level is still unknown.

Recent research has indicated that personalities vary systematically across regions and correlate significantly with macro-level regional indexes. To address this literature gap, we argue that persistence varies across Chinese provinces and develop and validate a province-level persistence index (PPI) to quantify such provincial variations. We also explore the province-level antecedents and consequences of provincial variations in persistence.

We used the Chinese General Social Survey (CGSS) as our main data source for developing the province-level persistence index. CGSS measured participants' persistence in 2008 and 2011. A high correlation between the province-level persistence index in 2008 and in 2011 allowed us to combine data from the two years. Therefore, the final sample included 11,330 participants (6,006 were female) from 29 provinces, municipalities, and autonomous regions. In the CGSS, the persistence scale consisted of three items. We first carried out a survey on Credamo.com to validate the persistence scale in CGSS, which included 286 participants (142 were female). We also used data from the National Bureau of Statistics of China, CSMAR, etc., as data sources for antecedent and outcome variables of persistence.

We used STATA 15 to analyze the data. Results showed that the three-item measure of persistence in CGSS is reliable and valid, and the persistence data from CGSS is suitable for aggregation. In general, persistence does vary systematically across Chinese provinces, and the PPI we developed is significantly related to antecedent and outcome variables documented in existing research.

Specifically, the harshness of the natural environment (coldness, air pollution, and agricultural disasters) and cultural values of masculinity and collectivism are positively related to PPI. Moreover, PPI is positively related to political (local government officials' performance orientation and effort allocation distortion), economic (economic development quality, industrial structure upgrade, and foreign investment introduction), social (education attainment, income, and well-being of residents), and innovative and entrepreneurial (patent authorization, company incubation) outcomes, even after controlling for provincial GDP and year fixed effects.

The current study demonstrates systematic differences in persistence across Chinese provinces, extends individual-level research on persistence to the macro regional level, and develops province-level persistence indexes to provide an important tool for future research dealing with regional differences. We also systematically explored antecedents of provincial variations in persistence and its influences on province-level macro metrics, offering a macro-micro intersection perspective. Furthermore, we provide new references for government development policy-making and companies' branch management.

Keywords: persistence, provincial variation, index development and validation, antecedents and consequences, geographical psychology

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1.1 Problem Statement

"Scholars must be resolute, for their burden is heavy and their road is long." Persistence refers to a positive personality trait of following through and continuing to strive toward goals despite obstacles (Peterson & Seligman, 2004; Seligman et al., 2005; Howard & Crayne, 2019). Throughout China's five-thousand-year history, the persistent personality has been integrated into every aspect of breaking natural constraints, overcoming natural disaster threats, and creating socialism with Chinese characteristics in the new era, serving as a crucial willpower for the Chinese nation's vitality and rejuvenation (Guangming Daily, 2019).

Existing persistence research has examined its positive effects on individual performance from a micro perspective (Peterson & Seligman, 2004), including social skills and academic performance (Peterson & Seligman, 2004), job performance (Jachimowicz et al., 2018), creativity (Lucas & Nordgren, 2015), personal achievement (Duckworth & Gross, 2014), and entrepreneurial firm performance (Baum & Locke, 2004). However, these studies rest on a fundamental assumption that persistence differences exist only between individuals. The question remains whether such differences also exist at the macro-regional level (e.g., across Chinese provinces).

Recent research has found that personality traits vary systematically across regions (e.g., nations, provinces, states) and significantly predict macro-level regional indicators such as political ideology and economic development (McCrae

et al., 2005; Rentfrow et al., 2009; Rentfrow et al., 2013). For instance, studies have revealed systematic differences in the Big Five personality traits across the fifty U.S. states, with southwestern, midwestern, and southeastern states showing higher conscientiousness than other states, and state-level conscientiousness correlating significantly with Republican support and life expectancy (Rentfrow et al., 2008; Rentfrow et al., 2009). Compared to U.S. states, Chinese provinces exhibit more pronounced natural environmental differences (Fu et al., 2008; Hu Huanyong, 1990) and have a longer history of administrative division, making provincial personality differences more likely. Specifically, the United States was founded in the 18th century (during China's Qing Dynasty Qianlong period), with some western states not formed until the last century (e.g., Oklahoma [1907], New Mexico [1912], Arizona [1912], Alaska [1959], and Hawaii [1959]). Moreover, U.S. state boundaries are largely artificially drawn along latitude and longitude lines, with major cities even straddling state borders (e.g., Philadelphia). In contrast, China's provincial divisions were largely established during the Yuan and Ming dynasties (14th-17th centuries) (Tan Qixiang, 1982; Zhou Zhenhe, 2017), with major population centers (such as provincial capitals) typically located within provincial boundaries. Over centuries of divergence in natural environment, social culture, institutional customs, and economic production, contemporary Chinese provinces have developed stable and significant differences in psychological dimensions such as cultural values and interpersonal attitudes (Chua et al., 2019; Talhelm et al., 2014; Talhelm & English, 2020; Van de Vliert et al., 2012; Zhang Weiying & Ke Rongzhu, 2002). Therefore, persistent personality may also differ significantly across Chinese provinces and predict provincial macro indicators (Rentfrow et al., 2008). Building on this, from a geographical psychology perspective (Rentfrow & Jokela, 2016), this study proposes that differences in natural environment and social culture may lead to provincial variations in persistence, which in turn predict macro-level regional indicators (e.g., political, economic, social, and entrepreneurial/innovation dimensions) (Obschonka et al., 2013; Rentfrow et al., 2008; Rentfrow et al., 2013).

Following authoritative literature in geographical psychology (e.g., Hofstede & McCrae, 2004; McCrae et al., 2005; Obschonka et al., 2013; Rentfrow et al., 2008), this study defines provincial persistence as the overall persistence level of a province's residents, operationalized as the average persistence personality of all residents within the province. Using data from the China General Social Survey (CGSS), we construct a provincial persistence index and further explore its antecedents and consequences. This research extends persistence studies from the micro individual level to the macro regional level, not only quantifying systematic provincial differences in persistent personality (Rentfrow & Jokela, 2016) but also providing an important tool for future research explaining regional development differences and cross-regional phenomena in China (Ye Wenping et al., 2016; Zhang Weiying & Ke Rongzhu, 2002). Additionally, it explores the causes of provincial persistence differences and their explanatory power for provincial macro development disparities, offering a new macro-micro intersection perspective of regional personality differences for studying China's

provincial development gaps (Obschonka et al., 2013; Rentfrow et al., 2013). Practically, this study provides new references for policy-making aimed at promoting balanced regional development, suggesting that efforts to develop lagging regions, particularly in China's poverty alleviation work, should focus on cultivating and enhancing residents' overall persistence to inject lasting momentum into further development of poverty-alleviated areas (World Bank, 2017). Similarly, large organizations may promote development of branches in lagging regions through corporate persistence culture practices, and individuals may use the provincial persistence index to identify provinces most suitable for their persistence level, thereby improving work efficiency and life satisfaction.

1.2.1 Provincial Differences in Persistence in China

Geographical psychology theories posit that natural environmental factors alter people's daily activities and interaction patterns (Wang Yan & Chen Hao, 2017; Rentfrow et al., 2008; Wei et al., 2017), while socio-cultural factors shape social norms and traditions (Sun Xiaodong & Lai Kaisheng, 2016; Hofstede & McCrae, 2004; Schulz et al., 2019), both leading to systematic personality differences across regions (Oishi, 2014; Rentfrow & Jokela, 2016). For example, in areas with higher prevalence of infectious diseases, people must exercise caution in daily life and avoid contact with strangers who may carry pathogens, resulting in higher regional conscientiousness and lower extraversion and openness to experience (Schaller & Murray, 2008). Similarly, collectivist societies make sharp distinctions between in-groups and out-groups, requiring loyalty to in-group members and norms while offering no obligation to help out-group members (Markus & Kitayama, 1991; Schulz et al., 2019). Consequently, collectivist cultures exhibit lower levels of extraversion and openness compared to individualist cultures (Hofstede & McCrae, 2004).

Persistent personality may also vary geographically across Chinese provinces. With provincial divisions spanning hundreds of years, natural differences in climate, terrain, and altitude that affect human survival (Hu Huanyong, 1990) may create personality differences between provinces. For instance, cold natural environments pose greater survival challenges (Ellis et al., 2009; Suzman, 2020), potentially leading to provincial differences in persistent personality—that is, the tendency to persistently strive to overcome survival challenges. Moreover, centuries of historical evolution have produced distinct cultural characteristics across Chinese provinces (Chua et al., 2019; Talhelm et al., 2014), which also shape provincial personality differences (Zhang Haizhong et al., 2012; Hofstede et al., 2010). For example, masculine cultures emphasize achievement and competitiveness, while collectivist cultures impose heavier responsibilities and obligations on individuals, both potentially causing provincial differences in persistent personality (Hofstede, 1980; Hofstede et al., 2010). Accordingly, we propose that persistent personality differs significantly across Chinese provincial-level administrative regions.

1.2.2 Natural Environment and Socio-cultural Antecedents of Provincial Persistence Differences

Ecological Threat. Ecological threat refers to the degree to which ecological environments threaten human survival and development (Lu Jun et al., 2017; Gelfand et al., 2011; Thomson et al., 2018; San Martin et al., 2019), shaping regional personality by influencing how people obtain survival resources and cope with survival challenges (Oishi, 2014; Schaller & Murray, 2008). Due to provincial differences in ecological threat levels, residents face varying quantities and intensities of survival challenges (Ellis et al., 2009; Suzman, 2020), which may lead to provincial differences in persistent personality. Specifically, provinces with strong ecological threats (e.g., cold climates) have scarcer survival resources, requiring greater effort to meet basic survival needs (e.g., maintaining body temperature, obtaining food) (Ellis et al., 2009; Suzman, 2020). Consequently, these provinces are more likely to cultivate personalities characterized by persistent effort and overcoming obstacles to achieve goals—that is, stronger persistent personality. In other words, ecological threat may directly influence residents' persistent personality, resulting in higher provincial persistence index scores.

Related empirical research partially supports this view. For example, people living in cold regions place greater value on work (Oumer et al., 2020) and emphasize orderliness more (McCrae et al., 2007). Accordingly, we propose:

Hypothesis 1: Ecological threat is positively related to the provincial persistence index.

Socio-cultural Values. Socio-cultural values shape regional personality traits by influencing people's attitudes, beliefs, and behaviors (Hofstede et al., 2010). Hofstede et al. (1980, 2010) identified six dimensions of socio-cultural values that capture systematic differences across societies in power distribution, individual responsibility, achievement orientation, structural orientation, time preference, and enjoyment (Hofstede, 1980; Hofstede et al., 2010). Among these, masculinity and collectivism values may be positively related to the provincial persistence index (Hofstede et al., 2010). First, masculine cultural values emphasize achievement and competitiveness, whereas feminine cultural values stress modesty and harmony (Hofstede et al., 2010). Therefore, in masculine cultures, people are more likely to persistently strive to overcome difficulties to achieve superior outcomes and competitiveness, developing persistent personality. Second, collectivist cultural values impose heavier responsibilities on individuals: they must not only care for their immediate family members but also fulfill obligations to achieve in-group goals and protect the safety and interests of other in-group members (Schulz et al., 2019). In contrast, individualist cultures do not require individuals to care for collective members beyond the immediate family (Hofstede et al., 2010). Thus, compared to individualist cultures, individuals in collectivist cultures face more challenges and are more likely to develop persistent personality through overcoming obstacles (Peterson & Seligman, 2004).

Accordingly, we propose:

Hypothesis 2: (a) Masculinity and (b) collectivism culture are positively related to the provincial persistence index.

1.2.3 Mechanisms of Provincial Persistence Index Effects on Political, Economic, Social, and Innovation Indicators

According to geographical psychology theory (Rentfrow et al., 2008; Rentfrow & Jokela, 2016), provincial persistence differences may further lead to differences in macro development indicators across provinces (Rentfrow et al., 2013). Specifically, higher provincial persistence index scores indicate a larger proportion of individuals with strong persistent personality in the population (Obschonka et al., 2013; Rentfrow et al., 2008), while individuals with weaker persistence within a province may also be influenced by those with stronger persistence and exhibit similar psychological tendencies and behaviors (Rentfrow et al., 2008). These differences in psychological tendencies and behaviors subsequently cause variations in political, economic, social, and entrepreneurial/innovation dimensions across provinces (McCrae et al., 2005; Obschonka et al., 2013; Rentfrow et al., 2013).

Provincial Political Indicators. The provincial persistence index relates to performance orientation among officials at all levels within a province. On one hand, persistence positively correlates with individuals' goal-achievement behaviors (Peterson & Seligman, 2004). On the other hand, China implements a "promotion tournament" evaluation system where officials' advancement and appointment depend on performance assessment results during their tenure, making excellent performance one of the most important work objectives (Zhou Li'an, 2007). Against the backdrop of central emphasis on economic development and officials' advancement through "promotion tournaments" (Zhou Li'an, 2007), economic performance indicators constitute the primary basis for officials' performance assessment, while achievements in science, education, health, culture, and other fields are much less important (Fu Yong & Zhang Yan, 2007; Zhou Li'an, 2007). In provinces with higher persistence index scores, government officials may be more inclined to overcome obstacles to achieve performance targets, potentially focusing more intently on economic construction goals and concentrating energy and resources on economic tasks most relevant to performance assessment while paying less attention to other government responsibilities (Zhou Li'an, 2007; Holmstrom & Milgrom, 1991). Since officials' economic construction orientation closely correlates with economic indicators (Zhou Li'an, 2007), and considering provincial differences in economic levels, we propose that provincial persistence remains positively related to local government officials' performance orientation after controlling for provincial economic development levels. Based on this, we propose:

Hypothesis 3: After controlling for economic development level, the provincial persistence index is positively related to local government officials' performance

orientation.

Provincial Economic Indicators. The provincial persistence index relates to a province's labor productivity. Specifically, individuals with high persistence tend to improve their work efficiency and performance (Jachimowicz et al., 2018; Peterson & Seligman, 2004). In high-persistence provinces, not only is the proportion of highly persistent workers higher, but other workers with originally lower persistence may also be influenced by more persistent workers and exhibit similar psychological and behavioral tendencies (Rentfrow et al., 2008). Therefore, workers in high-persistence provinces are generally more inclined to enhance their productivity and achieve higher performance outcomes (Jachimowicz et al., 2018; Kawanishi & Tamura, 2019; Peterson & Seligman, 2004). In other words, workers in high-persistence provinces may have higher labor productivity and create greater economic benefits, leading to higher output levels in high-persistence provinces with equivalent resource inputs (Chen Shiyi & Chen Dengke, 2018). Since provinces differ in their economic development levels and resources available for productivity improvement, we propose that provincial persistence remains positively related to labor productivity after controlling for economic development level. Based on this, we propose:

Hypothesis 4: After controlling for economic development level, the provincial persistence index is positively related to provincial labor productivity.

Provincial Social Indicators. The provincial persistence index may relate to residents' education level, income, and well-being. First, students in high-persistence provinces generally work harder. This peer pressure encourages other students with weaker persistence to also study harder (Bursztyn & Jensen, 2015). Conversely, in low-persistence provinces, the peer pressure of not studying hard may prevent originally diligent students from working too hard (Bursztyn & Jensen, 2015). Overall, students in high-persistence provinces likely perform better academically, gain more educational advancement opportunities, and receive higher-level education (Duckworth et al., 2007; Peterson & Seligman, 2004). Therefore, the provincial persistence index is positively related to residents' education level. Second, high-persistence provinces have a higher proportion of workers who work hard and achieve high performance (Peterson & Seligman, 2004), while other workers with weaker persistence may also work harder to increase income due to peer pressure. Therefore, the provincial persistence index is positively related to residents' income level. Finally, people in high-persistence provinces are generally more persistent and thus more willing to satisfy their psychological needs and enhance well-being through effort (Jiang et al., 2019). Since economic development level significantly correlates with residents' education, income, and well-being (Benhabib & Spiegel, 1994; Oishi & Kesebir, 2015), we propose that provincial persistence can further promote improvements in residents' education level, income, and well-being after controlling for economic development level. Based on this, we propose:

Hypothesis 5: After controlling for economic development level, the provincial persistence index is positively related to provincial residents' (a) education level,

(b) income level, and (c) well-being.

Provincial Innovation and Entrepreneurship Indicators. The provincial persistence index may relate to a province's entrepreneurial activity intensity and innovation output level. First, persistence is an important condition for entrepreneurship, helping entrepreneurs not only overcome numerous obstacles in the entrepreneurial process but also obtain critical resources such as investment (Baum & Locke, 2004). Since people in high-persistence provinces are generally more persistent, they may be more willing to overcome obstacles to engage in entrepreneurial activities, collectively forming an entrepreneurial atmosphere (Zhong Weizhu et al., 2012). Therefore, after considering economic development level, provincial persistence may still promote a province's entrepreneurial activity intensity. Second, the effect of provincial persistence on innovation output may vary by innovation type. Specifically, China's innovation output is divided into invention patents and non-invention patents (Li Wenjing & Zheng Manni, 2016; Wang Jue & Zhu Jigao, 2018). Invention patents involve arduous innovation processes with high innovation levels and major breakthroughs in their fields, whereas non-invention patents involve relatively simple innovation processes with low innovation levels, primarily adjusting existing products in shape, structure, or color (Chua et al., 2019; Li Wenjing & Zheng Manni, 2016; Wang Jue & Zhu Jigao, 2018; Zhou Zejiang et al., 2019). During innovation, persistent personality can motivate people to work hard for extended periods and persist when encountering setbacks (Amabile, 1983; Lucas & Nordgren, 2015). For invention patents requiring overcoming many difficulties, persistence may have a positive promoting effect; however, for simple non-invention patents, persistence may have no significant effect on output quantity. Since provincial residents are generally more persistent, after controlling for economic development level, provincial persistence should still promote invention patent quantity but may have no effect on non-invention patent quantity. Based on this, we propose:

Hypothesis 6: After controlling for economic development level, the provincial persistence index is positively related to provincial (a) entrepreneurial activity intensity and (b) invention patent quantity, but unrelated to (c) non-invention patent quantity.

Figure 1 [Figure 1: see original paper] systematically presents the theoretical framework of the formation and impact mechanisms of provincial persistence differences in this study. Figure 1 Formation and Impact Mechanisms of Provincial Persistence Differences

2.1.1 Data Sources

This study uses data from the China General Social Survey (CGSS) to construct the provincial persistence index. CGSS is a regular cross-sectional survey conducted by the China Survey and Data Center at Renmin University of China in collaboration with over 40 universities and academies of social sciences

across mainland provinces, representing China's first comprehensive, continuous, and national academic survey project (China Survey and Data Center, 2020). The survey employs a multi-stage stratified PPS (Probability Proportionate to Size) random sampling method, determining the probability of selecting sampling units at each level (e.g., districts/counties, streets/townships, villages/neighborhood committees) based on size to increase sample representativeness, and combines random and systematic sampling to comprehensively and objectively collect multi-level data on provinces, communities, households, and individuals (China General Social Survey, 2019). As of December 2018, CGSS data has yielded 2,470 Chinese and English journal articles, including over 100 in top Chinese journals such as *Social Sciences in China*, *Management World*, *Sociological Studies*, and *Economic Research Journal* (China Survey and Data Center, 2019), with numerous articles published in leading international journals such as *Proceedings of the National Academy of Sciences of the United States of America* (Chua et al., 2019; Marois et al., 2021; Xie et al., 2022), *Journal of Experimental Psychology: General* (Jing et al., 2021), and *Personality and Social Psychology Bulletin* (Li et al., 2020), making it one of the most important and reliable sources for studying Chinese society (Li Wei, 2016; Bian & Li, 2012).

CGSS measured respondents' persistence in both 2008 and 2011. To expand the sample size, this study uses data from both years to calculate provincial persistence. The 2008 and 2011 surveys obtained data from 29 provinces, autonomous regions, and municipalities (missing Hainan, Tibet, Hong Kong, Macau, and Taiwan), with a total of 11,620 respondents and an average of 401 samples per province. After excluding missing values, 11,330 valid samples were obtained, with an average of 391 valid samples per province. Among them, 6,006 were female (53.00%); the average age

[Footnote 3] After excluding outliers (Heilongjiang Province), the provincial persistence scores from the 2008 and 2011 measurements showed substantial correlation ($r = 0.42$, $p < 0.05$). Therefore, this study considers it feasible to combine data from both measurements to calculate provincial persistence scores. In subsequent analyses, this study retains Heilongjiang data; however, results remain robust after excluding Heilongjiang data, with detailed results available upon request from the authors.

2.1.2 Measurement Items for Persistence

Referencing the definition of persistence and previous literature (Feather, 1962; Lufi & Cohen, 1987; Peterson & Seligman, 2004), this study selects three items from CGSS to measure persistence, as shown in Table 1 (ISSP Research Group, 2017). These items are located in sections D4 and D35 of CGSS 2008 and CGSS 2011, respectively. Both the three items in CGSS 2008 and the three items in CGSS 2011 use reverse-scored 4-point Likert scales ("1" = "strongly agree," "2" = "agree," "3" = "disagree," "4" = "strongly disagree") to measure respondents' agreement with persistence-related statements. This study reverse-

scores the raw data, with higher individual persistence scores indicating greater persistence.

Table 1 CGSS Items Used to Measure Individual Persistence

CGSS 2008 Items for Measuring Individual Persistence	CGSS 2011 Items for Measuring Individual Persistence	ISSP 2009 Items for Measuring Individual Persistence
Even when feeling slightly unwell, I still try to complete what needs to be done that day.	Even when feeling slightly unwell or having other reasons to rest, I will work hard to complete daily tasks (including all work, studies, and daily life activities).	I work hard to complete my daily tasks, even if I am slightly sick or when there is another legitimate reason for taking a break.
Even when facing tasks I dislike, I can still achieve my best performance.	Even for tasks I dislike, I will do my best (including all work, studies, and daily life activities).	I perform to the best of my ability even on a task that I do not like.
Although work may take several months to show results, I can still maintain consistent performance.	Even when a task takes a long time to produce results, I will continuously work hard to	I work hard to maintain my performance on a task, even if the task takes a long time to start producing any results.

2.1.3 Reliability of the Persistence Scale

Through item correlation analysis, this study finds that the three items of the persistence scale are significantly positively correlated, with correlation coefficients ranging from 0.41 to 0.47, indicating moderate correlation without redundancy. Additionally, the Cronbach's α coefficient reaches 0.70, demonstrating good internal consistency of the scale (Hinkin, 1998).

[Footnote 4] This study's persistence scale is a three-item single-factor model, and CFA results represent a saturated model with limited statistical significance (Kenny, 2015). Therefore, this study does not report CFA results.

2.1.4 Criterion-Related Validity Analysis of the Persistence Scale

To further examine whether the above scale reflects the persistence construct, this study conducted criterion validity testing: 360 questionnaires were distributed through the Credamo.com platform, with 286 valid questionnaires re-

turned. Respondents had an average age of 41.73 years (SD = 11.06), including 142 females (49.65%), and 65.03% held bachelor's degrees or higher.

First, in addition to the persistence scale used in this study, respondents completed two other commonly used persistence scales: the Value in Action (VIA) scale (Peterson & Seligman, 2004, Cronbach's $\alpha = 0.90$) and the perseverance subscale of the Grit scale (Duckworth & Quinn, 2009, Cronbach's $\alpha = 0.78$). All three scales used a 5-point Likert design ("1" = "strongly disagree," "5" = "strongly agree"). Results show that the persistence scale used in this study is highly correlated with both the VIA scale ($r = 0.79$, $p < 0.001$) and the perseverance subscale of the Grit scale ($r = 0.71$, $p < 0.001$).

Second, respondents reported life happiness, subjective socioeconomic status, monthly income, and demographic variables. Life happiness was measured by the positively scored 5-point Likert item "Overall, do you think your life is happy?" Subjective socioeconomic status was measured by presenting respondents with a 10-rung ladder and asking which rung they believed they occupied in society. Previous literature finds that highly persistent individuals are more likely to satisfy their inner needs and thus achieve higher happiness (Jiang et al., 2019). They are also better able to overcome obstacles to achieve goals, thereby attaining higher subjective socioeconomic status and monthly income (Duckworth & Gross, 2014). Additionally, persistence shows no gender differences (Duckworth et al., 2007). Analysis reveals that this study's persistence scale is significantly positively correlated with respondents' life happiness ($r = 0.36$, $p < 0.001$), subjective socioeconomic status ($r = 0.27$, $p < 0.001$), and monthly income ($r = 0.15$, $p = 0.02$), but unrelated to gender ($r = 0.07$, $p = 0.27$). In summary, the persistence scale used in this study adequately reflects the persistence construct.

2.1.5 Aggregation Tests for the Provincial Persistence Index

According to recommendations in existing literature (Liao Hui et al., 2018; Zhang Zhixue, 2010; Bliese, 2000; James et al., 1984) and practices in previous studies (Cai Yahua et al., 2013; Sui Yang et al., 2012; Yang Fu & Zhang Lihua, 2012; Yu Haibo & Zheng Xiaoming, 2013), before aggregating indicators, one must test whether statistical standards for aggregation are met—that is, respondents' persistence responses should have high within-province consistency and between-province differences. Most importantly, persistence scores at the provincial level should demonstrate stability; otherwise, reliable detection of relationships with other provincial indicators may be impossible. This study uses three indicators for aggregation testing: within-group agreement (Rwg), intraclass correlation coefficient (1) (ICC[1]), and intraclass correlation coefficient (2) (ICC[2]). Rwg reflects the relationship between observed variance in measurement items and theoretically maximum possible variance (James et al., 1984; LeBreton et al., 2005). An Rwg value greater than 0.70 indicates good within-province consistency in persistence scores. ICC[1] reflects between-group

differences and tests the magnitude of provincial persistence differences across provinces, where 0.01 indicates a small group effect, 0.05 a medium effect, and 0.25 a large effect (LeBreton & Senter, 2008). ICC[2] refers to reliability after aggregation and tests the stability of provincial persistence scores. Conventional wisdom suggests ICC[2] should exceed 0.70 (Lance et al., 2006; LeBreton et al., 2005).

In this study, Rwg[median] = 0.82, indicating high within-province consistency in respondents' persistence responses. F-test results ($F(28, 11301) = 14.60$, $p < 0.001$) show significant differences in persistence scores across provinces. ICC[1] = 0.034, indicating these differences fall between small and medium group effects. Considering that ICC[1] is calculated as (MSB - MSW)/[MSB + (k - 1)MSW], the relatively low ICC[1] may be due to our large provincial sample sizes (Liao Hui et al., 2018). Indeed, other large-sample geographical psychology studies have reported similar ICC[1] values (e.g., Bach et al., 2017; Buttrick et al., 2019; Chua et al., 2019; Rentfrow et al., 2013). ICC[2] = 0.93, demonstrating highly reliable stability of provincial persistence scores at the inter-provincial level.

According to Liao Hui et al. (2018) and Bliese (1998), when ICC[2] is high, relationships between group-level independent and dependent variables can be detected even when ICC[1] is relatively low. Therefore, this study concludes that respondents' persistence scores adequately meet the three aggregation standards and can be aggregated to the provincial level.

2.2.1 Measurement of Antecedent Variables

This study uses secondary data for all antecedent and outcome variables, sourced from the National Bureau of Statistics, departmental statistical yearbooks, CSMAR database, CGSS, and other professional statistical departments and institutions. In analyzing antecedents of provincial persistence, since antecedent variables temporally precede the provincial persistence index, we follow the principle of "data years earlier than 2008" when selecting antecedent variables. Based on this principle and data availability constraints, this study includes all available years of relevant antecedent variables.

Ecological Threat. This study uses provincial coldness, air pollution, and agricultural disaster severity to reflect ecological threat (Ellis et al., 2009; Oumer et al., 2020; Suzman, 2020). Specifically, provincial coldness is measured by annual average temperature, and air pollution by annual average PM10 concentration and the proportion of days with air quality above level II (days with air quality above level II/total days in a year). Since no provincial-level data are available in major environmental yearbooks, this study uses provincial capital city statistics to represent the province, with data from the *China Environmental Statistics Yearbook* (2004-2007, N = 29). Additionally, agricultural disaster severity is measured by the proportion of agricultural disaster-affected and disaster-stricken areas (disaster-affected and disaster-stricken area/crop sown

area), with data from the National Bureau of Statistics website (1997-2007, N = 29).

Masculinity and Collectivism Culture. The masculinity and collectivism cultural dimensions originate from the CGSS 2008 values survey section, measured using reverse-scored 7-point Likert scales ("1" = "strongly agree," "7" = "strongly disagree"). Considering that socio-cultural values (e.g., masculinity, collectivism, power distance, and uncertainty avoidance) remain stable over certain periods (Hofstede et al., 2010), we include 2008 data for socio-cultural variables as antecedents. The masculinity dimension has a Cronbach's α coefficient of 0.63, including 2 items such as "In any situation, a father's authority in the home should be respected." The collectivism dimension has a Cronbach's α coefficient of 0.63, including 4 items such as "I would feel proud if my fellow townspeople played important roles in society." Additionally, the CGSS 2008 values survey section includes power distance and uncertainty avoidance dimensions. The power distance dimension has a Cronbach's α coefficient of 0.63, including 2 items such as "Even when disagreeing, a subordinate should obey their superior's instructions." The uncertainty avoidance dimension has a Cronbach's α coefficient of 0.75, including 2 items such as "A life full of risks and opportunities is more desirable than an ordinary and stable life" (Hofstede et al., 2010). This study first calculates respondents' average scores on each cultural dimension, then averages scores of respondents from the same province to obtain the province's score on each cultural dimension, yielding data for 28 provinces.

2.2.2 Measurement of Outcome Variables

In analyzing outcome variables of provincial persistence, since outcome variables temporally follow the provincial persistence index, we follow the principle of "data years later than 2011" when selecting outcome variables. Based on this principle and data availability constraints, this study includes all available years of relevant outcome variables.

Political Dimension. This study uses government fiscal expenditure structure to reflect officials' performance orientation. Due to China's characteristic "promotion tournament" model and performance evaluation system dominated by economic construction goals, government officials tend to increase economic construction investment when achieving performance targets (Zhou Li'an, 2007). Conversely, investment in science, education, culture, and health unrelated to economic construction may receive less attention (Fu Yong & Zhang Yan, 2007; Zhou Li'an, 2007). This tendency is reflected in fiscal expenditure structure as higher proportions of economic construction expenditure and lower proportions of science, education, culture, and health expenditure (Fu Yong & Zhang Yan, 2007). Since officials in high-persistence provinces have stronger performance orientation, this characteristic may be more pronounced. That is, in high-persistence provinces, government economic expenditure proportions may be higher while science, education, culture, and health expenditure proportions

may be lower. Therefore, this study tests whether officials in high-persistence provinces have stronger performance orientation by analyzing the relationship between provincial persistence and economic construction expenditure proportion (economic construction expenditure/total government fiscal budget expenditure) and science-education-culture-health expenditure proportion (science-education-culture-health expenditure/total government fiscal budget expenditure). Data for this dimension come from the National Bureau of Statistics website (2012-2018, N = 203).

Economic Dimension. Provincial labor productivity is measured by overall social labor productivity (current year GDP total/social employment) (Chen Shiyi & Chen Dengke, 2018), with GDP data from the National Bureau of Statistics website and provincial employment data from provincial statistical yearbooks (2012-2018, N = 194, with some provinces' 2018 data temporarily missing).

Social Dimension. Provincial residents' education level is measured by the proportion of population with bachelor's degrees or higher (population with bachelor's degree or higher/total population) (Huang Jiawen, 2013), with data from the Sixth Population Census (2010, N = 29). Provincial residents' income level is measured by the logarithm of per capita disposable income (Luo Shougui & Gao Ruxi, 2005), with data from the National Bureau of Statistics website (2013-2018, N = 174). Residents' well-being is calculated based on the CGSS (2012, 2013, 2015, N = 85) item measuring subjective well-being: "Overall, do you think your life is happy?" ("1" = "very unhappy," "5" = "very happy") (Lu Fangwen et al., 2017).

Innovation and Entrepreneurship Dimension. Provincial entrepreneurial activity intensity is measured by the number of incubated enterprises per 10,000 people in technology incubators (number of incubated enterprises in technology incubators/permanent population) (Westlund et al., 2014), with data from the *China Science and Technology Statistics Yearbook* (2016-2018, N = 87). Provincial invention patent quantity is measured by the number of invention patents authorized per 10,000 people (number of invention patents authorized/permanent population), and provincial non-invention patent quantity is measured by the number of non-invention patents authorized per 10,000 people (number of non-invention patents authorized/permanent population) (Li Wenjing & Zheng Manni, 2016; Wang Jue & Zhu Jigao, 2018). Following existing literature, non-invention patents are the sum of utility model patents and design patents (Li Wenjing & Zheng Manni, 2016; Wang Jue & Zhu Jigao, 2018). Patent authorization data come from the National Bureau of Statistics website (2012-2018, N = 203).

Table 2 Summary of Main Variable Measurement Methods and Data Sources

[Table content summarizing variables, measurements, and sources]

2.2.3 Measurement of Control Variables

Per capita Gross Domestic Product (GDP) is the most recognized and commonly used indicator for measuring economic development level (Benhabib & Spiegel, 1994). Therefore, this study uniformly uses the logarithm of per capita GDP as the control variable (Harrington & Gelfand, 2014; Talhelm & English, 2020). When analyzing relationships between provincial persistence index and climate, culture, and other antecedents, we use the logarithm of the average per capita GDP for corresponding years; when analyzing relationships between provincial persistence index and political, economic, social, and innovation/entrepreneurship indicators, we control for the logarithm of per capita GDP for each year in the equation. All data come from the National Bureau of Statistics website (1997-2018).

3 Results

This study uses the average score of respondents in each province on the persistence scale (Chua et al., 2019; Hofstede & McCrae, 2004; McCrae et al., 2005; Obschonka et al., 2013; Rentfrow et al., 2008) as the province's persistence score, yielding the raw provincial persistence index (range: 2.787~3.120). Simultaneously, to facilitate reader understanding and following the presentation style of similar studies (e.g., Chua et al., 2019; Gelfand et al., 2011; Harrington & Gelfand, 2014), we standardize the raw provincial persistence index and add 3 to the standardized provincial persistence index, obtaining the provincial persistence index shown in Table 3 below (range: 1.221~4.708).

Based on persistence scores from provincial respondent samples, Welch's ANOVA (Levene's Test indicates unequal variances: $F(28, 11301) = 11.67$, $p < 0.001$) test results show significant provincial persistence differences across provinces: $F(28, 2985.98) = 14.60$, $p < 0.001$ (Harrington & Gelfand, 2014). As shown in Table 3, Jilin Province ranks highest on the provincial persistence index, meaning Jilin residents are the most persistent nationwide. Additionally, among the top 15 provinces in persistence, 11 are located in relatively developed central and eastern regions such as Beijing, Tianjin, Shanghai, Hubei, and Zhejiang, while among the bottom 14 provinces, 9 are in less developed central and western regions such as Guizhou, Ningxia, and Inner Mongolia, providing preliminary support for our hypothesis of positive correlations between provincial persistence and provincial economic and social indicators.

Table 3 Sample Size, Provincial Persistence Index, and Rankings by Province

[Table content is incomplete in the provided text]

3.2 Effects of Natural Environment and Socio-culture on Provincial Persistence Differences

To test the effects of natural environment and socio-culture on provincial persistence differences, this study regresses the provincial persistence index on climate and culture-related variables before and after controlling for per capita GDP and observes the results.

Hypothesis 1 proposes that ecological threat is positively related to the provincial persistence index. Table 4 presents regression results of the provincial persistence index on annual average temperature, annual average PM10 concentration, and agricultural disaster-affected area proportion before and after controlling for per capita GDP. This study finds that after controlling for per capita GDP, annual average temperature is significantly negatively related to the provincial persistence index (b = -0.01, t = -2.90, p = 0.008), meaning colder provinces are more persistent. Additionally, annual average PM10 concentration is significantly positively related to the provincial persistence index (b = 1.57, t = 2.13, p = 0.04), indicating that provinces with more severe air pollution have higher provincial persistence index scores. Finally, agricultural disaster-affected area proportion is significantly positively related to the provincial persistence index (b = 0.40, t = 2.39, p = 0.03), suggesting that provinces with more severe agricultural disasters have higher provincial persistence index scores. In summary, ecological threat is significantly positively related to the provincial persistence index. Therefore, Hypothesis 1 is supported.

[Footnote 6] This study additionally analyzed the relationship between annual high/low temperature days and provincial persistence differences. Results show that after controlling for per capita GDP, annual high temperature days are unrelated to provincial persistence differences (b = -0.26, t = -1.57, p = 0.13), while annual low temperature days are positively related to the provincial persistence index (b = 0.06, t = 2.42, p = 0.02). This may be because high temperature days occur more frequently in warm regions that pose relatively fewer survival challenges (Suzman, 2020). This result further supports our hypothesis. Detailed results are available upon request from the authors.

[Footnote 7] Analysis finds that after controlling for per capita GDP, this indicator is significantly negatively related to the provincial persistence index (b = -0.33, t = -1.80, p = 0.08), also supporting our hypothesis. Detailed results are available upon request from the authors.

[Footnote 8] Agricultural disaster severity can also be measured by the proportion of agricultural disaster-stricken area. This study finds that after controlling for per capita GDP, this indicator is also significantly positively related to provincial persistence (b = 0.58, t = 2.40, p = 0.02), supporting our hypothesis. Detailed results are available upon request from the authors.

Table 4 Effects of Ecological Threat on Provincial Persistence Index

[Table content with statistical results]

Hypothesis 2 proposes that masculinity and collectivism culture are positively related to the provincial persistence index. Table 5 presents regression results of the provincial persistence index on masculinity, collectivism, uncertainty avoidance, and power distance before and after controlling for per capita GDP. As shown, after controlling for per capita GDP, masculinity (b = 0.12, t = 2.17, p = 0.04) and collectivism (b = 0.16, t = 2.51, p = 0.02) are both significantly positively related to the provincial persistence index, while power distance (b = 0.04, t = 0.43, p = 0.67) and uncertainty avoidance (b = -0.03, t = 0.90, p = 0.38) are not significantly related to the provincial persistence index. Therefore, Hypothesis 2 is supported.

Table 5 Effects of Socio-culture on Provincial Persistence Index

[Table content with statistical results]

3.3 Effects of Provincial Persistence Differences on Political, Economic, Social, and Innovation Indicators

This study's provincial persistence index is a time-invariant variable, while all macro development indicators exhibit significant cross-sectional autocorrelation. Therefore, while including year fixed effects, this study uses pooled OLS regression to estimate the effects of the provincial persistence index on provincial macro development indicators and employs the Driscoll-Kraay method to correct standard errors (Lian Yanling et al., 2014; Driscoll & Kraay, 1998). Specifically, pooled OLS assumes independent disturbance terms across individuals (Chen Qiang, 2010) and is robust for panel data where the time dimension T is smaller than the cross-section dimension N (Driscoll & Kraay, 1998). Furthermore, this method effectively utilizes data with similar relationships by pooling multiple random samples drawn from the same population at different time points, expanding sample size and thereby improving estimation precision and power (Wooldridge, 2015; Sayrs, 1989).

Table 6 presents regression results of provincial fiscal expenditure scale and structure on the provincial persistence index. Hypothesis 3 proposes that after controlling for economic development level, the provincial persistence index is positively related to local government officials' performance orientation. This study finds that after controlling for per capita GDP, the provincial persistence index is significantly positively related to provincial economic construction expenditure proportion (b = 0.13, t = 13.59, $p < 0.001$) and significantly negatively related to science-education-culture-health expenditure proportion (b = -0.14, t = -8.62, $p < 0.001$). This result indicates that within budget constraints, government officials in high-persistence provinces allocate a larger proportion of budgets to economic construction to improve economic performance, accompanied by a lower proportion allocated to science, education, culture, and health care fields not directly related to performance evaluation (Fu Yong & Zhang Yan, 2007). This reflects that officials in high-persistence provinces demonstrate stronger performance orientation in their work than officials in other provinces.

Therefore, Hypothesis 3 is supported.

Table 6 Effects of Provincial Persistence Differences on Provincial Political Indicators

[Table content with statistical results]

Table 7 presents regression results of provincial economic indicators on the provincial persistence index. Hypothesis 4 proposes that after controlling for economic development level, the provincial persistence index is positively related to provincial labor productivity. As shown in Table 7, after controlling for per capita GDP, the provincial persistence index remains significantly positively related to overall social labor productivity ($b = 3.46$, $t = 20.83$, $p < 0.001$). This demonstrates that provincial persistence provides additional promotion of labor productivity beyond the effect of economic development level. Therefore, Hypothesis 4 is supported.

[Footnote 10] Since persistent personality relates to entrepreneurs' resource acquisition ability (Baum & Locke, 2004), we also explored the relationship between provincial persistence and foreign investment introduction using per capita FDI as an indicator. Results show that provincial persistence also provides additional promotion of foreign investment introduction after controlling for per capita GDP ($b = 0.30$, $t = 5.96$, $p = 0.004$). Detailed results are available upon request from the authors.

Table 7 Effects of Provincial Persistence Differences on Provincial Economic Indicators

[Table content with statistical results]

Table 8 presents regression results of provincial social indicators on the provincial persistence index. Hypothesis 5 proposes that after controlling for economic development level, the provincial persistence index is positively related to provincial residents' (a) education level, (b) income level, and (c) well-being. As shown in Table 8, after controlling for per capita GDP, the provincial persistence index is significantly positively related to provincial population bachelor's degree rate ($b = 0.10$, $t = 1.97$, $p = 0.06$), log of per capita disposable income ($b = 0.19$, $t = 3.94$, $p = 0.01$), and residents' subjective well-being ($b = 0.50$, $t = 3.84$, $p = 0.06$). This indicates that provincial persistence provides additional promotion of residents' education level, income level, and well-being beyond the effect of economic development level. Therefore, Hypothesis 5 is supported.

Table 8 Effects of Provincial Persistence Differences on Provincial Social Indicators

[Table content with statistical results]

Table 9 presents regression results of provincial innovation and entrepreneurship indicators on the provincial persistence index. Hypothesis 6 proposes that after controlling for economic development level, the provincial persistence index is positively related to provincial (a) entrepreneurial activity intensity and

(b) invention patent quantity, but unrelated to (c) non-invention patent quantity. As shown in Table 9, after controlling for per capita GDP, the provincial persistence index is significantly positively related to the number of incubated enterprises per 10,000 people (b = 1.29, t = 7.68, p = 0.02) and the number of invention patents authorized per 10,000 people (b = 4.15, t = 4.82, p = 0.003), consistent with the hypothesis. However, provincial persistence is significantly negatively related to the number of non-invention patents authorized per 10,000 people (b = -8.63, t = -6.14, p < 0.001), contrary to the hypothesis. This may be because highly persistent individuals tend to persist in their original direction after encountering failure rather than exploring simpler tasks, a tendency that may cause them to perform worse on simple tasks (Lucas et al., 2015). In summary, after considering economic development level, provincial persistence index provides additional promotion of provincial entrepreneurial activity intensity and invention patent quantity but hinders non-invention patent quantity. Therefore, Hypotheses 6a and 6b are supported, while Hypothesis 6c is not supported.

Table 9 Effects of Provincial Persistence Differences on Provincial Innovation and Entrepreneurship Indicators

[Table content with statistical results]

3.4 Robustness Checks

To test the robustness of the provincial persistence index's predictive power, this study conducts the following robustness checks: (1) controlling for within-province individual persistence standard deviation when analyzing relationships between the provincial persistence index and outcome variables to avoid potential effects of provincial differences in individual persistence distribution; (2) controlling for the four cultural value dimensions used in this study when analyzing relationships between the provincial persistence index and outcome variables to rule out alternative explanations; (3) constructing the provincial persistence index based on the proportion of highly persistent individuals to further test the robustness of the provincial persistence construct's predictive effects on outcome variables.

Controlling Within-Province Individual Persistence Standard Deviation. The mean reflects the overall persistence level within a province but cannot reflect the distribution of persistence within the province, which may also affect the relationship between the provincial persistence index and provincial macro indicators at the inter-provincial level. Therefore, when analyzing relationships between the provincial persistence index and outcome variables, this study further controls for within-province individual persistence standard deviation. **Table 10 -1** compares regression coefficients between the provincial persistence index and outcome variables before and after controlling for within-province individual persistence standard deviation. As shown, when controlling for per capita GDP, the direction and significance of coefficients remain con-

sistent with those without controlling for within-province persistence standard deviation. These results indicate that the provincial persistence index has good robustness in predicting each variable.

[Footnote 11] To avoid excessive length, this section does not report specific results coefficients for each regression equation; detailed results are available upon request from the authors.

Table 10-1 [TABLE:10-1] Comparison of Provincial Persistence Index Predictive Power Before and After Controlling Within-Province Persistence Standard Deviation

[Table content with statistical results]

Controlling Cultural Value Dimensions. Cultural values influence both provincial persistence levels and regional macro differences (Chua et al., 2019; Hofstede, 1980). To rule out alternative explanations from cultural values for this study's outcome variables, we further control for Hofstede's four cultural value dimensions: masculinity, collectivism, power distance, and uncertainty avoidance. As shown in **Table 10-2 [TABLE:10-2]**, when controlling for per capita GDP, all results after controlling for cultural value dimensions remain consistent with hypothesized directions, and most remain significant. Only the coefficients for predicting economic construction expenditure proportion (without cultural dimensions: $b = 0.13$, $t = 13.59$, $p < 0.001$; with cultural dimensions: $b = 0.01$, $t = 0.59$, $p = 0.58$), residents' subjective well-being (without cultural dimensions: $b = 0.50$, $t = 3.84$, $p = 0.06$; with cultural dimensions: $b = 0.36$, $t = 2.31$, $p = 0.15$), and non-invention patents authorized per 10,000 people (without cultural dimensions: $b = -8.63$, $t = -6.14$, $p < 0.001$; with cultural dimensions: $b = -2.71$, $t = -1.40$, $p = 0.21$) become non-significant after controlling for cultural dimensions, while other coefficients maintain significance consistent with those without cultural dimensions. This indicates that this study's provincial persistence index still demonstrates good incremental predictive validity after controlling for cultural value dimensions, providing further support for its predictive robustness.

Table 10-2 [TABLE:10-2] Comparison of Provincial Persistence Index Predictive Power Before and After Controlling Cultural Value Dimensions

[Table content with statistical results]

Constructing Provincial Persistence Index Based on Proportion of Highly Persistent Individuals. This study uses the mean as the aggregation indicator for provincial persistence, which is the most common aggregation method in this literature (e.g., Chua et al., 2019; Gelfand et al., 2011; Obschonka et al., 2013; Rentfrow et al., 2013; Van de Vliert et al., 2012). However, other aggregation methods (e.g., proportion of highly persistent individuals within a province) can also reflect the provincial persistence construct to some extent. Therefore, this study uses the proportion of highly persistent individuals within

each province as an alternative provincial persistence indicator to test its relationships with variables used in this study. Specifically, this study calculates the mean and standard deviation of persistence across all samples, uses the mean plus one standard deviation as the criterion for identifying highly persistent individuals, and then uses the proportion of highly persistent individuals within each province's sample as the provincial persistence indicator. As shown in **Table 10-3 [TABLE:10-3]**, regression results using the new provincial persistence index based on the proportion of highly persistent individuals conform to hypothesized expectations, and most maintain significance consistent with the original indicator. When controlling for per capita GDP, the new indicator based on proportion of highly persistent individuals shows consistent significance with the original indicator for all coefficients except for predicting total population bachelor's degree rate (based on mean: $b = 0.10$, $t = 1.97$, $p = 0.06$; based on proportion: $b = 0.12$, $t = 1.48$, $p = 0.15$). These results further demonstrate that the predictive power of this study's provincial persistence construct has good robustness.

Table 10-3 [TABLE:10-3] Comparison of Predictive Power Between Original Index and Proportion-Based Provincial Persistence Index

[Table content with statistical results]

4 Conclusion and Discussion

This study extends research on individual-level persistence personality differences to the regional level, investigating differences in persistent personality across Chinese provincial-level administrative regions. Based on CGSS data, this study finds significant differences in persistent personality among mainland Chinese provinces, with geographic clustering characteristics. Specifically, the three northeastern provinces, Beijing-Tianjin-Shanghai, three northwestern provinces, and central regions generally have stronger persistent personality than other areas. Furthermore, this study finds that provincial differences in climate and culture underlie provincial persistence differences: provinces with strong ecological threats or strong masculinity and collectivism cultures are more persistent than other provinces. Provincial persistence differences are also related to macro-level political, economic, social, and innovation/entrepreneurship differences across provinces: after controlling for economic development level, provincial persistence provides additional promotion of provincial labor productivity, education level, income level, subjective well-being, entrepreneurial activity intensity, and invention patent quantity, but hinders non-invention patent quantity. Moreover, in high-persistence provinces, officials have stronger performance orientation—that is, they are more inclined to directly improve economic performance.

4.2 Theoretical Contributions

This study makes three main theoretical contributions. First, it extends persistence personality research from the micro individual level to the macro interprovincial level, discovering that persistent personality exhibits systematic differences across Chinese provinces, and constructs a provincial persistence index that provides an important tool for future research on regional differences and cross-regional phenomena in China. Current persistence research primarily focuses on individual differences, with regional differences in persistence remaining largely theoretical (e.g., Duckworth, 2016) and rarely empirically tested. Although geographical psychology research has begun to identify regional distribution characteristics of personality (e.g., Obschonka et al., 2013; Rentfrow et al., 2008; Rentfrow et al., 2013), these studies are limited to Western contexts, with few exploring systematic personality differences across regions within China. However, Western developed countries represent a minority of the world's population yet differ significantly from other regions in economic, social, cultural, and other aspects, potentially causing theoretical and empirical biases when focusing solely on Western contexts (Henrich et al., 2010; Schulz et al., 2019). Based on this, this study uses CGSS data from 29 Chinese provinces to test and discover significant regional differences in persistent personality, expanding existing literature's understanding of regional personality differences within China. Building on this, this study constructs a provincial persistence index that quantifies provincial persistence differences, providing an available tool for future research to explain macro and micro differences across regions and study cross-regional phenomena from the perspective of regional personality differences. For instance, using this index, researchers can approach differences among Chinese provinces from the new perspective of regional personality differences and explore mechanisms and boundary conditions between provincial persistence differences and macro indicators (Obschonka et al., 2013). Moreover, the provincial persistence index can serve as a contextual variable to examine its effects on attitudes and behaviors of enterprises, teams, and individuals within regions (Jokela et al., 2015) and explain why enterprises, teams, or individuals from different regions differ. Additionally, as an indicator characterizing provincial features, the provincial persistence index can measure "persistence distance" between provinces—that is, the proximity of provincial persistence between any two Chinese provinces—and further explain cross-regional economic and social phenomena such as inter-provincial market integration, cross-provincial corporate investment and expansion, and cross-provincial population mobility (Cao Chunfang et al., 2018).

Second, this study systematically explores natural environment and sociocultural antecedents of provincial persistence differences, expanding understanding of the causes of provincial persistence differences. Although previous literature suggests that causes of regional personality differences can be divided into natural and social aspects (Oishi, 2014; Rentfrow & Jokela, 2016), only a few studies have empirically tested this, with most focusing on only one aspect

(e.g., McCrae et al., 2007; Schaller & Murray, 2008). This study simultaneously examines antecedents of provincial persistence differences from both natural and social perspectives, systematically expanding literature's understanding of provincial persistence difference causes.

Third, this study explores relationships between provincial persistence differences and political, economic, social, and innovation/entrepreneurship differences across Chinese provinces, providing a new macro-micro intersection perspective of inter-provincial personality differences for future research on provincial macro development differences in China. Existing studies on causes of China's regional development differences mainly focus on marketization processes (e.g., Gu Naihua & Li Jiangfan, 2006), factor inputs (e.g., Guo Jinlong & Wang Hongwei, 2003), formal and informal institutional arrangements (e.g., Ye Wenping et al., 2016; Zhou Li'an, 2007), and even language differences (e.g., Zhao Zile & Lin Jianhao, 2017) as macro-level influencing factors, but rarely adopt a macro-micro intersection perspective to provide explanations from regional psychological differences (see Zhang Weiying & Ke Rongzhu, 2002 on inter-provincial trust levels). However, individual psychological factors cause individual behaviors, and when aggregated to the regional level, these behaviors affect regional macro development indicator differences. Based on this, this study proposes an explanation based on provincial persistence differences for macro development differences across Chinese provinces in political, economic, social, and innovation dimensions from a geographical psychology perspective, offering a new angle of regional personality differences for understanding development differences among Chinese provinces.

4.3 Practical Implications

This study has two main practical implications. First, for governments, the provincial persistence index developed in this study can serve as a reference for policy-making. Specifically, China's regional development is unbalanced, with eastern and central regions leading the west. This study indeed finds that provinces with higher persistence indices are mainly concentrated in central and eastern regions, with only Qinghai, Gansu, and Yunnan among western provinces ranking high on the persistence index. This study's findings also indicate that regional persistence affects inter-regional political, economic, social, and innovation/entrepreneurship macro development indicators by strengthening residents' motivation and behavior to overcome obstacles and achieve goals. Therefore, when formulating regional development policies, policymakers should consider not only macro economic, social, resource, and environmental factors but also psychological factors' influence on regional differences. For instance, for economically lagging provinces, beyond focusing on resource development and foreign investment attraction, they should cultivate and improve residents' persistent personality through education systems (World Bank, 2017). As China has just achieved victory in its poverty alleviation campaign, to prevent relapse into poverty and in response to the call that "poverty alleviation does not

end after the campaign," governments at all levels should continue supporting poverty-alleviated areas while targetedly cultivating and improving overall persistence levels of residents in these areas to inject lasting momentum into their long-term rapid development (Hofstede & Bond, 1988).

Second, for large enterprises, this research can help them understand performance differences between regional branches and more targetedly improve branch performance. Specifically, even within the same corporate organizational structure, performance differences exist between provincial branches. With the provincial persistence index, enterprises can better understand differences in employees' motivation and behavior to overcome difficulties and achieve performance targets across provincial branches and promote performance improvement in lagging branches through corporate persistence culture practices.

Third, for individuals, this research helps identify environments most suitable for people with different persistence levels. This is because individuals' life satisfaction is affected by the match between their personality and the overall personality level of their environment (Jokela et al., 2015), and their goal pursuit is also influenced by peer pressure (Bursztyn & Jensen, 2015). For highly persistent individuals, moving to high-persistence provinces can help them find more suitable work and living environments, while the spur of more highly persistent peers can enable them to pursue and achieve goals more efficiently. For low-persistence individuals, moving to low-persistence provinces can help them avoid excessive peer pressure, thereby preventing burnout and even depression caused by excessive pressure.

4.4 Strengths, Limitations, and Future Research Directions

By constructing the provincial persistence index, this study quantifies provincial persistence differences in China, providing new optional tools for future research on regional differences and offering index references for regional-level decision-making by governments, enterprises, and other organizations. However, this study has several limitations that future research could address. First, due to limitations in CGSS data collection, this study's examination of provincial persistence needs further deepening. Specifically, this study only explores provincial persistence differences across 29 provincial-level administrative regions in China, without studying Tibet, Hainan, Hong Kong, Macau, and Taiwan. Future research could use the same method to survey these provinces and supplement their provincial persistence indices. Meanwhile, this study constructs a provincial persistence index, but persistence differences may also exist between cities, districts, and counties within provinces (Jokela et al., 2015). This is because Chinese provinces are large, and some differences inevitably emerge between different regions within a province (Liu Mingxing et al., 2015). However, due to sample size limitations, this study cannot conduct analyses at the city or county level. Therefore, future research could collect larger samples to develop city- or county-level persistence indices, thereby promoting understanding

of persistence differences between cities and counties within the same province. Relatedly, besides the persistence scale used in CGSS, there are other commonly used persistence scales (e.g., Duckworth & Quinn, 2009; Peterson & Seligman, 2004). Although this study's analysis shows they are highly positively correlated with the persistence scale used here, future research could use other scales to collect large-scale data nationwide for further validation and research. Finally, although CGSS used multi-stage stratified PPS methods to maximize sample representativeness (China Social Survey, 2019), this study still encourages future research to replicate and validate our conclusions using other larger-scale, more representative social survey data.

Second, this study adopts a static perspective, assuming the provincial persistence index is relatively stable. Considering factors such as cross-province population mobility, the provincial persistence index may also change over the long term. Therefore, future research could adopt a dynamic perspective and attempt to characterize the temporal change processes and mechanisms of the provincial persistence index.

Third, this study makes preliminary explorations of antecedents and outcome variables of the provincial persistence index, but these explorations may not be comprehensive enough. Specifically, this study finds that climate and cultural factors are positively related to provincial persistence. Future research could further systematically explore antecedents of provincial persistence from a socioecological psychology perspective (Oishi, 2014) to deepen our understanding of provincial persistence difference formation. Meanwhile, future research could also deeply explore the effects of the provincial persistence index on regional-, enterprise-, team-, and individual-level outcome variables. Furthermore, future research could attempt to explore interactive relationships between provincial persistence and other provincial characteristics.

4.5 Conclusion

This study represents an important exploration in developing inter-provincial personality indicators for Chinese provinces. It not only constructs a provincial persistence index that characterizes inter-provincial differences in China from a regional personality perspective but also explores the index's antecedents and its explanatory power for provincial political, economic, social, and innovation/entrepreneurship indicators. This study's index not only provides tools and references for future research involving regional differences but also serves as a foundation to help future research further construct comprehensive regional difference indices, thereby more precisely characterizing regional differences and providing clearer index references for decision-makers. This study encourages future research to continue using the geographical psychology paradigm to further explore inter-provincial differences in psychological phenomena and their antecedents and outcome variables, contributing to promoting balanced development across Chinese regions from a psychological perspective.

References

Cao Chunfang, Zhang Tingting, Fan Ziying. Market integration under regional favoritism. Economic Research Journal, 2017, 63: 91-104.

Chen Shiyi, Chen Dengke. Haze pollution, government governance, and high-quality economic development. Economic Research Journal, 2018, 64: 20-34.

Chen Qiang. Advanced Econometrics and Stata Applications. Beijing: Higher Education Press, 2010.

Fu Yong, Zhang Yan. Chinese-style decentralization and fiscal expenditure structure bias: The cost of competition for growth. Management World, 2007, 23: 4-12.

Gu Naihua, Li Jiangfan. An empirical analysis of regional differences in technical efficiency of China's service industry. Economic Research Journal, 2006, 52: 46-56.

Guangming Daily. The powerful spiritual driving force for the Chinese nation's perseverance. http://opinion.people.com.cn/n1/2019/0322/c1003-30990455.html.

Guo Jinlong, Wang Hongwei. A study on inter-regional capital flows and regional economic disparities in China. Management World, 2003, 19: 45-58.

Hu Huanyong. The distribution, zoning, and prospects of China's population. Acta Geographica Sinica, 1990, 45: 139-145.

Huang Jiawen. Education level, income level, and happiness of Chinese urban residents: An empirical analysis based on CGSS2005. Society, 2013, 33: 181-203.

Li Wei. Keeping pace with the times: The development of social survey research since the restoration and reconstruction of sociology. Sociological Studies, 2016, 31: 73-94.

Li Wenjing, Zheng Manni. Substantive innovation or strategic innovation? The impact of macro industrial policy on micro enterprise innovation. Economic Research Journal, 2016, 51.

Lian Yanling, He Xiaogang, Gao Hao. Performance expectation gap and corporate strategic adjustment: An empirical study based on Chinese listed companies. Management World, 2014, 30.

Liao Hui, Zhuang Aijia, Liu Dong. Establishment and research methods of multilevel theoretical models. In Chen Xiaoping, Shen Wei (Eds.), Empirical Methods in Organization and Management Research. Beijing: Peking University Press, 2018.

Liu Mingxing, Zhang Dong, Zhang Qi. The historical origins of regional economic development gaps: A case study of Jiangsu and Zhejiang provinces. Man-

agement World, 2015, 31: 34-50.

Lu Fangwen, Liu Guoen, Li Huiwen. Children's gender and parental happiness. Economic Research Journal, 2017, 63: 173-188.

Lu Jun, Chen Hao, Yue Guoan. Loose-tight culture: A new dimension in cross-cultural psychology research. Advances in Psychological Science, 2017, 25: 887-902.

Luo Shougui, Gao Ruxi. A study on changes in regional differences in China's economic development and residents' income since the reform and opening up: Empirical analysis and comparison of three regional Gini coefficients. Management World, 2005, 21: 45-49.

Tan Qixiang. The Historical Atlas of China. Beijing: China Cartographic Publishing House, 1982.

Wang Yan, Chen Hao. Humans are born with the qi of heaven and earth: The impact of weather on human psychology and behavior. Advances in Psychological Science, 2017, 25: 1077-1092.

Wang Jue, Zhu Jigao. Can labor protection promote innovation among highly educated employees in enterprises? An empirical study based on A-share listed companies. Management World, 2018, 34.

Xu Zhengwen. On the evolution and development of China's provincial system. Journal of Shaanxi Normal University (Philosophy and Social Sciences Edition), 1999, 28: 105-110.

Ye Wenping, Li Xinchun, Zhu Hang, et al. Implicit institutional rules: Regional relationship culture heterogeneity and index construction. Quarterly Journal of Management, 2016, 1: 73-91.

Zhang Haizhong, Jiang Yongzhi, Zhao Wenjin, et al. Theoretical exploration and empirical research on China's regional cross-cultural psychology. Advances in Psychological Science, 2012, 20: 1229-1236.

Zhang Weiying, Ke Rongzhu. Trust and its explanation: An analysis from China's inter-provincial survey. Economic Research Journal, 2002, 48: 59-70.

Zhao Zile, Lin Jianhao. The cultural hypothesis of economic development gaps: From genes to language. Management World, 2017, 33: 65-77.

China Survey and Data Center. Academic output based on China General Social Survey (CGSS) data reaches new heights. http://cgss.ruc.edu.cn/index.php?r=index/artabout&aid=34, 2019-07-08.

China Survey and Data Center. Project overview. http://cgss.ruc.edu.cn/index.php?r=index/introduce, 2020-05-03.

China General Social Survey. CGSS answers user questions (6) - Sampling design. https://www.sohu.com/a/316336071_{662110}, 2019-05-24.

Zhong Weizhu, Wang Yaping, Wang Liping. An empirical study on the impact of entrepreneurial culture on entrepreneurs' motivation. Science of Science and Management of S.&T., 2012, 33: 160.

Zhou Li'an. A study on the promotion tournament model of Chinese local officials. Economic Research Journal, 2007, 53: 36-50.

Zhou Zhenhe (Ed.). General History of China's Administrative Divisions (2nd Edition). Shanghai: Fudan University Press, 2017.

Amabile, T. M. The social psychology of creativity: A componential conceptualization. Journal of Personality and Social Psychology, 1983, 45: 357-376.

Bach, R. A., Defever, A. M., Chopik, W. J., et al. Geographic variation in empathy: A state-level analysis. Journal of Research in Personality, 2017, 68: 124-130.

Baum, J. R., Locke, E. A. The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth. Journal of Applied Psychology, 2004, 89: 587-598.

Benhabib, J., Spiegel, M. M. The role of human capital in economic development evidence from aggregate cross-country data. Journal of Monetary Economics, 1994, 34: 143-173.

Bian, Y., Li, L. The Chinese general social survey (2003-8) sample designs and data evaluation. Chinese Sociological Review, 2012, 45: 70-97.

Bliese, P. D. Group size, ICC values, and group-level correlations: A simulation. Organizational Research Methods, 1998, 1.

Bliese, P. D. Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In Klein, K. J. & Kozlowski, S. W. J. (Eds.), Multilevel Theory, Research, and Methods in Organizations: Foundations, Extensions, and New Directions. San Francisco: Jossey-Bass, 2000.

Bursztyn, L., Jensen, R. How does peer pressure affect educational investments?. The Quarterly Journal of Economics, 2015, 130: 1329-1367.

Buttrick, N., Choi, H., Wilson, T. D., et al. Cross-cultural consistency and relativity in the enjoyment of thinking versus doing. Journal of Personality and Social Psychology, 2019, 117: e71-e83.

Chua, R. Y., Huang, K. G., Jin, M. Mapping cultural tightness and its links to innovation, urbanization, and happiness across 31 provinces in China. Proceedings of the National Academy of Sciences, 2019, 116: 6720-6725.

Cox, C. M. Genetic studies of genius: Vol. 2 The early mental traits of three hundred geniuses. Stanford, CA: Stanford University Press, 1926.

Credé, M., Tynan, M. C., Harms, P. D. Much ado about grit: A meta-analytic synthesis of the grit literature. Journal of Personality and Social Psychology, 2017, 113: 492-511.

Duckworth, A. Grit: The power of passion and perseverance. New York: Scribner, 2016.

Duckworth, A., Gross, J. J. Self-control and grit: Related but separable determinants of success. Current Directions in Psychological Science, 2014, 23: 319-325.

Duckworth, A. L., Peterson, C., Matthews, M. D. et al. Grit: perseverance and passion for long-term goals. Journal of Personality and Social Psychology, 2007, 92: 1087-1101.

Duckworth, A. L., Quinn, P. D. Development and validation of the Short Grit Scale (GRIT-S). Journal of Personality Assessment, 2009, 91: 166-174.

Driscoll, J. C., Kraay, A. C. Consistent covariance matrix estimation with spatially dependent panel data. Review of Economics and Statistics, 1998, 80: 549-560.

Ellis, B. J., Figueredo, A. J., Brumbach, B. H. et al. Fundamental dimensions of environmental risk. Human Nature, 2009, 20: 204-268.

Fu, C., Jiang, Z., Guan, Z. et al. (Eds.). Regional climate studies of China. Berlin: Springer Science Business Media, 2008.

Feather, N. T. The study of persistence. Psychological Bulletin, 1962, 59: 94-115.

Gelfand, M. J., et al. Differences between tight and loose cultures: A 33-nation study. Science, 2011, 332: 1100-1104.

Harrington, J. R., Gelfand, M. J. Tightness-looseness across the 50 united states. Proceedings of the National Academy of Sciences, 2014, 111: 7990-7995.

Henrich, J., Heine, S. J., Norenzayan, A. Most people are not WEIRD. Nature, 2010, 466: 29-29.

Hinkin, T. R. A brief tutorial on the development of measures for use in survey questionnaires. Organizational Research Methods, 1998, 1: 104-121.

Hofstede, G. Culture's consequences: International differences in work-related values. Beverly Hills, CA: Sage, 1980.

Hofstede, G., Bond, M. H. The Confucius connection: From cultural roots to economic growth. Organizational Dynamics, 1988, 16: 5-21.

Hofstede, G., Hofstede, G. J., Minkov, M., Cultures and organizations: Software of the mind. Revised and Expanded 3rd Edition. New York: McGraw-Hill, 2010.

Hofstede, G., McCrae, R. R. Personality and culture revisited: Linking traits and dimensions of culture. Cross-Cultural Research, 2004, 38: 52-88.

Holmstrom, B., Milgrom, P. Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. Journal of Law Economics and Organization, 1991, 7: 24-52.

Howard, M. C., Crayne, M. P. Persistence: Defining the multidimensional construct and creating a measure. Personality and Individual Differences, 2019, 139: 77-89.

ISSP Research Group. International Social Survey Programme: Social inequality IV-ISSP 2009 ZA5400 Data File, GESIS Data Archive: Cologne. https://www.gesis.org/en/issp/modules/issp-modules-by-topic/social-inequality/2009, 2017.

Jachimowicz, J. M., Wihler, A., Bailey, E. R., et al. Why grit requires perseverance and passion to positively predict performance. Proceedings of the National Academy of Sciences, 2018, 115: 9980-9985.

Jachimowicz, J. M., Wihler, A., Bailey, E. R., et al. Reply to Guo et al. and Credé: Grit-S scale measures only perseverance, not passion, and its supposed subfactors are merely artifactors. Proceedings of the National Academy of Sciences, 2019, 116: 3942-3944.

James, L. R., Demaree, R. G., Wolf, G. Estimating within-group interrater reliability with and without response bias. Journal of applied psychology, 1984, 69: 85-98.

Jiang, W., Jiang, J., Du, X., et al. Striving and happiness: Between-and within-person-level associations among grit, needs satisfaction and subjective well-being. The Journal of Positive Psychology, 2019, 14: 1-13.

Jing, Y., Cai, H., Bond, M. H., et al. Levels of interpersonal trust across different types of environment: The micro-macro interplay between relational distance and human ecology. Journal of Experimental Psychology: General, 2021, 150.

Jokela, M., Bleidorn, W., Lamb, M. E., et al. Geographically varying associations between personality and life satisfaction in the London metropolitan area. Proceedings of the National Academy of Sciences, 2015, 112: 725-730.

Kawanishi, S., Tamura, T. The implications of grit and mindset research for behavioral economics: A new perspective on labor productivity improvement. Journal of Behavioral Economics and Finance, 2019, 12: 87-104.

Kenny, D. Measuring model fit. http://davidakenny.net/cm/fit.htm, 2015-11-24.

Lance, C. E., Butts, M. M., Michels, L. C. The sources of four commonly reported cutoff criteria: What did they really say? Organizational Research Methods, 2006, 9: 202-220.

LeBreton, J. M., James, L. R., Lindell, M. K. Recent issues regarding rWG, rWG, rWG (J), and rWG (J). Organizational Research Methods, 2005, 8: 128-138.

LeBreton, J. M., Senter, J. L. Answers to 20 questions about interrater reliability and interrater agreement. Organizational Research Methods, 2008, 11: 815-852.

Li, W., Yang, Y., Wu, J., et al. Testing the status-legitimacy hypothesis in China: Objective and subjective socioeconomic status divergently predict system justification. Personality and Social Psychology Bulletin, 2020, 46: 1044-1058.

Lucas, G. M., Gratch, J., Cheng, L., et al. When the going gets tough: Grit predicts costly perseverance. Journal of Research in Personality, 2015, 59: 15-22.

Lucas, B. J., Nordgren, L. F. People underestimate the value of persistence for creative performance. Journal of Personality and Social Psychology, 2015, 109: 232-243.

Lufi, D., Cohen, A. A scale for measuring persistence in children. Journal of Personality Assessment, 1987, 51: 178-185.

Markus, H. R., Kitayama, S. Culture and the self: Implications for cognition, emotion, and motivation. Psychological Review, 1991, 98: 224-253.

Marois, G., Gietel-Basten, S., Lutz, W. China's low fertility may not hinder future prosperity. Proceedings of the National Academy of Sciences, 2021, 118: 1-5.

McCrae, R. R., Terracciano, A., Realo, A., et al. Climatic warmth and national wealth: some culture-level determinants of national character stereotypes. European Journal of Personality, 2007, 21: 953-976.

McCrae, R. R., Terracciano, A, 79 Members of the Personality Profiles of Cultures Project. Personality profiles of cultures: Aggregate personality traits. Journal of Personality and Social Psychology, 2005, 89: 407-425.

Obschonka, M., Schmitt-Rodermund, E., Silbereisen, R. K., et al. The regional distribution and correlates of an entrepreneurship-prone personality profile in the United States, Germany, and the United Kingdom: A socioecological perspective. Journal of Personality and Social Psychology, 2013, 105: 104-122.

Oishi, S. Socioecological psychology. Annual Review of Psychology, 2014, 65: 581-609.

Oishi, S., Kesebir, S. Income inequality explains why economic growth does not always translate to an increase in happiness. Psychological Science, 2015, 26: 1630-1638.

Oumer, A., Maseland, R., Garretsen, H. Was de Montesquieu (only half) right? Evidence for a stronger work ethic in cold climates. Journal of Economic Behavior Organization, 2020, 173: 256-269.

Peterson, C., Seligman, M. E. Character strengths and virtues: A handbook and classification. Oxford University Press, 2004.

Rentfrow, P. J., Gosling, S. D., Potter, J. A theory of the emergence, persistence, and expression of geographic variation in psychological characteristics. Perspectives on Psychological Science, 2008, 3: 339-369.

Rentfrow, P. J., Gosling, S. D., Jokela, M., et al. Divided we stand: Three psychological regions of the United States and their political, economic, social, and health correlates. Journal of Personality and Social Psychology, 2013, 105: 996.

Rentfrow, P. J., Jokela, M. Geographical psychology: The spatial organization of psychological phenomena. Current Directions in Psychological Science, 2016, 25: 393-398.

Rentfrow, P. J., Jost, J. T., Gosling, S. D., et al. Statewide differences in personality predict voting patterns in 1996-2004 US presidential elections. In J. T. Jost, A. C. Kay, H. Thorisdottir (Eds.), Social and psychological bases of ideology and system justification. Oxford, UK: Oxford University Press, 2009.

San Martin, A., Sinaceur, M., Madi, A., et al. Self-assertive interdependence in Arab culture. Nature Human Behaviour, 2018, 2: 830-837.

Sayrs, L. W. Pooled time series analysis (No. 70). CA.: Sage Publications, 1989.

Schaller, M., Murray, D. R. Pathogens, personality, and culture: disease prevalence predicts worldwide variability in sociosexuality, extraversion, and openness to experience. Journal of Personality and Social Psychology, 2008, 95: 212.

Schulz, J. F., Bahrami-Rad, D., Beauchamp, J. P., et al. The Church, intensive kinship, and global psychological variation. Science, 2019, 366: 1-12.

Suzman, J. Work: A History of How We Spend Our Time. London: Bloomsbury Publishing, 2020.

Talhelm, T., Zhang, X., Oishi, S., et al. Large-scale psychological differences within China explained by rice versus wheat agriculture. Science, 2014, 344: 603-608.

Talhelm, T., English, A. S. Historically rice-farming societies have tighter social norms in China and worldwide. Proceedings of the National Academy of Sciences, 2020, 117: 19816-19824.

Thomson, R., Yuki, M., Talhelm, T., et al. Relational mobility predicts social behaviors in 39 countries and is tied to historical farming and threat. Proceedings of the National Academy of Sciences, 2018, 115: 7521-7526.

Van de Vliert, E., Yang, H., Wang, Y., et al. Climato-economic imprints on Chinese collectivism. Journal of Cross-Cultural Psychology, 2012, 44: 589-605.

Wei, W., Lu, J. G., Galinsky, A. D., et al. Regional ambient temperature is associated with human personality. Nature Human Behaviour, 2017, 1: 890-895.

Westlund, H., Larsson, J. P., Olsson, A. R. Start-ups and local entrepreneurial social capital in the municipalities of Sweden. Regional Studies, 2014, 48: 974-994.

Wooldridge, J. M. Introductory econometrics: A modern approach. Canada: Nelson Education, 2015.

World Bank. Non-Cognitive Skills: What are They and Why Should We Care? https://blogs.worldbank.org/education/non-cognitive-skills-what-are-they-and-why-should-we-care, 2017-5-8.

Xie, Y., Dong, H., Zhou, X., Song, X. Trends in social mobility in postrevolution China. Proceedings of the National Academy of Sciences, 2022, 119: e2117471119.

Note: Figure translations are in progress. See original paper for figures.