Supplemental Materials for
Historical patterns of rice farming explain modern-day language use in China and Japan more than modernization and urbanization

Sharath Chandra Guntuku[1,2*], Thomas Talhelm[3*], Garrick Sherman[1,2], Angel Fan[2], Salvatore Giorgi[1], Liuqing Wei[4], Lyle H. Ungar[1,2]

[1]Department of Computer and Information Science, University of Pennsylvania, Philadelphia, PA, USA
[2]Positive Psychology Center, University of Pennsylvania, Philadelphia, PA, USA
[3]Booth School of Business, University of Chicago, Chicago, IL, USA
[4]Department of Psychology, Hubei University, Wuhan, Hubei, China

*corresponding authors: sharathg@upenn.edu, Thomas.Talhelm@chicagobooth.edu

This document contains additional discussion on the materials and methods used in the main text and supplemental figures and tables.

Materials and Methods

1. Classifying Dialects

To categorize provinces into dialect groups, we relied on the *Language Atlas of China* (map; 中国语言地图集). For the Mandarin-only analysis, we classified provinces as Mandarin or non-Mandarin. For the "excluding Cantonese" analysis, we classified provinces as Cantonese or non-Cantonese.

As is probably the case for most large countries around the world, there are debates about what should count as distinct groups. Three provinces stick out as particularly open for debate:

- Shanxi is sometimes categorized as having its own Jin dialect and sometimes as Mandarin, as in the *Language Atlas of China*. We followed the classification of Shanxi as Mandarin.
- A geographically small part of southern Jiangsu is categorized as Wu dialect. However, because most of the province is Mandarin, we classified Jiangsu as Mandarin.
- The province of Anhui is more split than Jiangsu, with areas of Mandarin, Wu, Hui, and Gan. We classified Anhui as non-Mandarin to reflect this diversity.

2. Pathogen Prevalence

We indexed pathogen prevalence based on statistics from the earliest data we could find. This study surveyed disease in 49 counties in 1976 (Chen et al. 1990). That study did not have data from a handful of provinces. To compensate for this limited data, we added statistics from the earliest statistical yearbooks we could find (from 2001 to 2008 depending on the province).

A total of 10 provinces had data from both sources. This allowed us to test how well the two sources agreed, especially considering that the statistics are separated by about 30 years. The two sources were meaningfully correlated, although it was not significant in such a small sample $r(8) = 0.43$, $P = 0.25$. With these two data sources, we had pathogen data for 15 provinces in our sample. More details on these measures are in the supplemental materials of the earlier rice-wheat study in China (Talhelm et al. 2014).

3. Herding Cultures

Although we compare rice and wheat farming, China is also home to cultures that traditionally herded, such as Mongolians, Manchu, and Tibetans. It is important to test the effect of herding because there is evidence that herding cultures are more independent and analytic-thinking than nearby farming communities (Goldschmidt 1971; Uskul et al. 2008). In addition, herding cultures are more often located near China's wheat-farming areas, which means they are more likely to have been influenced by individualistic herding cultures. We tested this possibility by indexing the percentage of the provincial population from traditional herding cultures in the 2000 Census.

China's biggest historic herding groups were Tibetans, Uyghurs, Mongolians, Manchus, and Turkic groups like the Kyrgyz. We used the following list: Uyghur, Mongolians, Manchu, Tibetan, Kyrgyz, Salar, Daur, Xibo, Tajik, Uzbek, Ewenke, Yugur, Tatar, Elunchun, Hezhe, Menba, Luoba, and Kazakh. For many of these smaller cultural groups, it is difficult to accurately estimate the percentage that herding made up of their traditional subsistence. However, decisions to include or exclude many of the small groups makes little difference to the analyses, because the groups with sparse historical records have such small populations.

4. City Tier System

Although it is common in China to refer to prefectures as first tier, second tier, and third tier, there are different lists of exactly which prefectures fall into which categories. To avoid the bias inherent in choosing which cities fall into which categories, we relied on a publicly available list from Baidu Baike (similar to Wikipedia). The full list is available in the supplemental materials.

5. Rice Suitability

We measured rice suitability using the United Nations Food and Agriculture Organization's Global Agro-Ecological Zones database. We used values for high-input rainfed current cultivated wetland rice. These scores estimate the suitability for plots of land regardless of whether people are farming rice there or not. The models use climate data from 1961 to 1990.

It is worth keeping in mind that these models are not designed exactly for our purpose—estimating historical rice suitability. Were we to design these models, we would estimate historical climate data farther back in history. We would also calculate suitability using historical breeds of rice and pre-modern tools. Thus, we believe the United Nations' estimates are useful but likely overestimate the suitability of rice historically.

It's also important to remember that suitability changes over time—not just as the climate changes, but as new rice strains develop, and as humans create new methods of farming. Suitability is not completely fixed. However, we believe these estimates are useful in providing broad outlines of historical suitability.

The database provides summary scores for each province, so we used these values directly in the province analysis. However, the database does not aggregate the values for prefectures. Thus, we used two methods to estimate suitability at the prefecture level. First, for any province that the United Nations database aggregated suitability to a score of zero, we simply assigned zero to all prefectures in the province.

Second, for provinces with aggregate scores above zero, we estimated suitability using prefecture-level temperature and rain. Temperature and rainfall both strongly predict actual rice farming, but when put in the same model, rainfall ($\beta = 0.74$, $P < 0.001$) is a much stronger predictor than temperature ($\beta = 0.11$, $P = 0.030$). We compared simple models to models that used squared predictors, gated values, and interactions between temperature and

rainfall. However, these models produced highly similar results, so we chose the basic models for the sake of simplicity and to avoid over-fitting.

6. Newly Created Theory-Driven Categories

The LIWC dictionary was not built with the goal of measuring cultural differences in mind. Thus, there were categories that we were interested in but not reflected in LIWC. We generated four new categories based on prior theorizing. In this section, we lay out the theoretical basis for each category.

In-group/out-group. Some cultural psychologists have argued that collectivistic cultures do not so much prioritize the needs of groups, but rather draw a distinction between people in familiar groups (in-group) versus unfamiliar groups (out-groups) (Triandis 1995). In China, Shanghai and other southern rice-farming regions have a reputation as being *paiwai* (排外), excluding to outsiders. This fits with the finding that people from rice-growing provinces in China drew a larger distinction between friends and strangers than people from wheat-growing provinces (Talhelm et al. 2014; Dong et al. 2019).

We created two sub-categories of in-group/out-group words to take into account that some words carry a positive connotation, and some carry a negative connotation. For example, people usually use the word *comrade/brethren* (同胞) to emphasize connection and unity among people of different groups. In contrast, people usually use the term *outsider/out-of-towner* (外地人) to criticize or look down on people outside of the local group.

Universalism. Similar to in-group/out-group words, we created a category of universalism words. These words represent a focus on humans without regard to their group membership. This reflects the opposite of the in-group/out-group distinction that researchers have theorized is a part of collectivistic cultures (Triandis 1995).

Fashion/trends. We speculate that fashion and trends may be more important in collectivistic cultures. This would make sense with the idea that people in collectivistic cultures have more socially shared standards, whereas people in individualistic cultures are more likely to have individually defined standards (Dunning and Cohen 1992). If standards for beauty are more socially consensual in collectivistic cultures, it would be more important to stay on top of social trends. Based on this reasoning, we created a fashion/trends category including words like *hot* (to describe ideas and trends, 热门), *out-of-style* (过时), and *celebrities* (名流).

Alone. Previous studies have found that people in individualistic regions are more likely to spend time alone than people in collectivistic regions. For example, Americans in individualistic states are more likely to live alone or drive alone (Vandello and Cohen 1999). In China, people were more likely to be sitting alone in cafes in more individualistic wheat-farming areas than in collectivistic rice-farming areas (Talhelm et al. 2018). These words are a limited set of words that have a connotation of spending time alone, such as *individually* (单独), *be alone* (独处). It does not include words about *feeling* alone, like "lonely."

Justice. We created a word category related to justice, such as *fair* (公平), *equal* (平等), *public welfare* (公益). The theory behind this category is the research on cultural differences in moral visions. Research using moral dilemmas across cultures has found that Americans are more likely to focus on abstract justice, whereas participants in India were more likely to focus on relational duties (Miller and Bersoff 1992).

7. Wenxin Dictionary

We also ran analyses with the Wenxin dictionary (Huang et al. 2012), which is an expanded form of the LIWC Chinese dictionary. Because the results were largely similar to the results for LIWC, we report results from LIWC, which is more broadly used in research.

8. Alternative Measures of Modernization

Some researchers have argued that GDP is not the best measure of modernization (Inglehart and Norris 2003). For example, some countries have become wealthy through mining or oil but have not really modernized their economies. Modernization theorist Ronald Inglehart has advocated for using the percentage of people employed in the service sector as a measure of modernization and the turn away from farming and heavy industry (Inglehart and Baker 2000). In China, the move from the government-led economy to the private sector may also reflect modernization. Thus, we tested recent (year 2010) and historical (1996) percentage of employed people working in the service sector and the percentage of people employed in private industry.

9. Urbanization

We used the percentage of urban residents (城镇人口比例) in each province as an index of urbanization from the year 2016 to represent modern statistics and the year 2000 to represent time-lagged differences in recent history (Li 2017).

10. Pathogen Prevalence

As a measure of historical pathogens, we used human-transmitted disease rates from a 1973-1975 study (Chen et al. 1990). Because this study was missing several provinces, we supplemented this data with disease rates from provincial statistical yearbooks from 2001 to 2008 for 14 provinces (we report more details on this method in an earlier study (Talhelm et al. 2014)).

11. Temperature

Some researchers have argued that temperature might drive differences between cultures (although the exact reason why temperature would cause differences is often unclear (Kashima and Kashima 2003)). We collected data on the average temperature for the capital city of each province. In China, average temperature is highly correlated with rice $r(31) = 0.73$, $P < 0.001$.

12. Climatic Demands

One team of researchers argued that climatic demands can explain regional differences in China (Van de Vliert et al. 2012). This theory is that humans bind together and rely on each other in response to difficult climates. We followed prior research and operationalized climatic demands as the sum deviation from 22 degrees Celsius for the average highs and lows in the coldest (January) and hottest month (July). In the supplemental materials, we test an alternative version of climatic demands theory that takes into account wealth.

13. Herding Cultures

Rice and wheat are just two types of subsistence styles. Studies comparing people in nearby farming and herding cultures have found evidence that herders tend to be more independent than farmers (Uskul et al. 2008). Areas of north and west China are home to cultures that traditionally herded, such as the Mongolians and Tibetans. As a measure of herding cultures, we calculated the percentage of the population in each province that belonged to 18 historically herding cultures from China's 2000 national census. Because this data was not normally distributed, we square root transformed the data.

14. Farming in General versus Rice Farming

Previous studies on subsistence theory compared farming cultures to herding, hunting, and fishing cultures, finding that farming cultures tend to be more interdependent (Barry et al. 1959;

Uskul et al. 2008). Thus, we need to test whether what we are calling an effect of rice is not actually an effect of farming in general. As a measure of farming in general, we collected data on the percentage of cultivated land in each province. This is actually uncorrelated with rice farming $r(31) = 0.04$, $P = 0.823$.

15. Cognitive Process Words

Are the cognitive process words related to analytic cultural thought style? As a first pass, we calculated average cognitive process word use scores for each province. Then we compared these province scores to our earlier study measuring analytic thought among college students across China (Talhelm et al. 2014). Provinces that used more cognitive process words scored marginally lower on holistic thought (or higher on analytic thought), $r(27) = -0.33$, $P = 0.083$. Aggregating scores to the province level limits the sample to 29 provinces, and the correlation was only marginally significant. However, the direction is consistent with the idea that regional differences in the use of cognitive process words reflect, to some extent, differences in holistic versus analytic thought.

16. Rice Statistics in Japan

One limitation of the rice statistics from Japan is that they do not separate dryland versus paddy rice. Theoretically, paddy rice should make cultures more interdependent than dryland rice because dryland rice grows without irrigation systems (Talhelm and Oishi 2018). However, this may not present much of a problem in Japan because national statistics (which do separate paddy rice and dryland rice) show that dryland rice accounts for just 1.6% of rice land. Thus, the rice statistics overall overwhelmingly represent paddy rice.

In the main text, we ask the question of whether the data from 1975 represents historical patterns of rice farming. One way to test this is to use data from 10 larger regional blocks going back to 1950. Although there are fewer regional blocks than prefectures, the data showed very little variation from 1950 to 1975. Data from 1950 correlated highly with data from 1975, $r(8) = 0.90$, $P = 0.001$. Even nearly 60 years later (using data from 2009), the correlation remained high, $r(8) = 0.89$, $P = 0.001$. In sum, this data suggests that regional differences in rice percentage are highly stable over time. Data spanning roughly 100 years in China shows similar results (Talhelm et al. 2014).

To calculate the correlation between environmental suitability for rice and actual rice farming, we used data from the United Nations Food and Agriculture Organizations Global Agro-Ecological Zones database. This database estimates environmental suitability for different crops based on environmental variables like rain, sun, slope, and soil. We used data for high-input wetland rice. This calculates suitability scores for plots of land, regardless of whether people are actually farming rice there or not.

Examining the data, it was clear that large cities were farming less rice than predicted by their environmental suitability scores. This suggests that buildings are taking up land that would probably otherwise be growing rice (and probably grew rice historically). Thus, we ran a regression using environmental suitability scores and statistics on the percentage of land occupied by buildings per prefecture. Taking into account buildings, environmental suitability strongly predicted rice farming $\beta = 0.78$, $P < 0.001$.

17. Japan Regional Statistics

To measure economic development, we collected 2012 prefecture GDP per capita from the Cabinet Office of Japan's *2013 Annual Report on Prefectural-Level Accounts* (*Heisei 25 nen Kenminn keizai keisan*). To measure educational attainment, we collected 2010 data on the percentage of residents who had completed a college degree from a report of the Statistics Bureau of Japan (Table E).

18. R Squared for Rice vs. Modernization in Japan

With the China data, we compared the percentage of province-level variance explained (R squared) by rice, GDP, urbanization, and the combination of GDP and urbanization (as *Z* scores). We calculated prefecture-level variance explained for Japan. However, it is tricky to compare the results in China to the results in Japan. In China, there is wide variation in rice farming. Many prefectures farm zero rice. Japan has a narrower range of variation in rice. In Japan, every prefecture farms at least some rice. Statistically, Japanese prefectures have less than half (39%) the variance in rice compared to Chinese prefectures. Thus, holding all else equal, we would expect rice to explain less variance in Japan because there is less variance in rice.

An analogy would be in testing for the effect of height on people's ability to dunk a basketball. In one study, we test 100 American 20-year-olds and find a large effect of height. Then we test 100 NBA players and find a smaller effect of height, since height varies less between NBA players than for the population at large. Thus, our expectations for the effect size need to take into account how much variation the sample has in the key variable.

For rice, the variation in China is a better representation of the world at large than Japan is. The world has many areas that farm no rice and many areas that farm a high percentage of rice. In contrast, Japan is a less representative sample of rice farming percentages, similar to how NBA players are less representative of the height of humans than regular adults.

To make matters more complicated, Japanese prefectures have more variation in GDP. We compared variance by converting GDP per capita to US dollars. Based on this, Japanese prefectures had roughly double (219%) the variance of China. Thus, rice has lower variance in Japan and therefore is expected to account for less variance in word use. However, rice still accounts for more variance in word use than GDP and urbanization in Japan, although the gap between rice and modernization is smaller in Japan than in China.

Across all LIWC categories, the average percentage of variance explained was:

Rice: 2.9%
GDP: 2.2%
Urbanization: 1.9%
GDP and urbanization: 2.2%

Across the hypothesized, the average percentage of variance explained was:

Rice: 3.7%
GDP: 3.3%
Urbanization: 2.7%
GDP and urbanization: 3.4%

Overall, the percentage of variance explained by any variable was smaller in the Japanese data than the Chinese data. There are several possible explanations. (1) Prefectures are smaller units of analysis than provinces. Larger units of analysis tend to have larger effect sizes because the data is aggregated over larger areas. (2) We had more data from China than Japan, which means the estimates from China are more precise. (3) Finally, the data comes from different platforms. There could be some difference between Weibo and Twitter that might account for the differences.

19. Convergent Validity Tests for Word Categories

To test convergent validity, we calculated the mean word usage for each province and prefecture. We then calculated region-level correlations between word usage and other markers of collectivism and individualism. The notes below the tables list the data sources for the markers of individualism and collectivism. Table 2 shows the correlations for the word categories were different between rice and wheat regions. Table S20 shows the correlations for the word categories that were not different between rice and wheat regions.

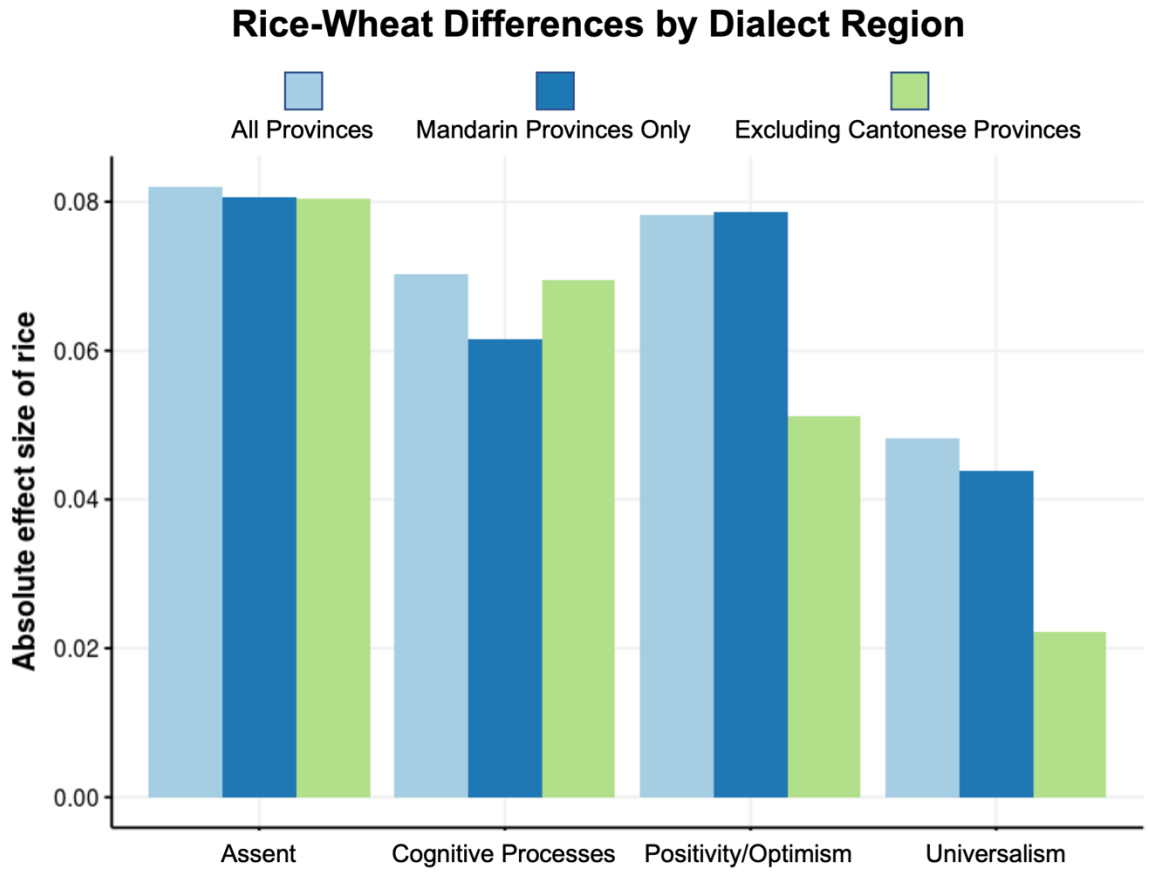
In general, the word categories that did not show rice-wheat differences tended to fail the tests of convergent validity. For example, collectivistic areas tended to use *less* "we" than individualistic areas. And although collectivistic areas also used less "I," they used far less "we." Similarly, collectivistic areas actually used fewer words related to fashion and trends.

To calculate the prefecture-level correlations, we took into account the sample size for different prefectures. The main analyses throughout this paper use multi-level analyses, which take into account the different sample sizes across prefectures. But these basic validity correlations treat each prefecture as an equal data point. Therefore, we limited the convergent validity analyses to prefectures with over 200 users. That left 50 prefectures.

Figures and Tables

Figure S1

Rice-Wheat Differences Are Largely Independent of Dialect



Note: To test whether differences in dialects are confounding the results, we ran analyses testing rice-wheat differences among all provinces (light blue) and then only for provinces in the Mandarin dialect group (dark blue). Green bars exclude Cantonese, which is the dialect outside of Mandarin with arguably the most developed writing system. Effect sizes are individual-level standardized regression coefficients. Effect sizes tend to be larger at the group level.

Table S1A
Variables Tested, Sources, and Rationale in China

Variable	Measure	Source	Rationale
% Rice: Province & Prefecture	Paddy fields area/total cultivated area	*China Statistical Yearbook* 1996; Provincial Statistical Yearbooks (mostly 2002)	Paddy rice required more work and coordination to build and operate irrigation systems.
Modern GDP: Province & Prefecture	2014 GDP per capita	*China Statistical Yearbook* 2015; *China City Statistical Yearbook* 2015	Modernization theory argues that wealth and modernization cause cultures to become more individualistic.
Historical GDP	1995 GDP per capita	*China Stat. Yearbook*, 1996	Studies have found a lag between economic growth and cultural change.
% Urban	Urban residents/total population, 2016	*China Pop. & Employment Statistical Yearbook*, 2017	We use urbanization to test the difference between urban and rural areas. Urbanization is also an alternative indicator of modernization.
% Cultivated Land	Hectares of cultivated land/province land	*China Statistical Yearbook*, 1996	This measures the density of farming in general, pulling apart general farming and rice farming in particular.
Environmental Rice Suitability: Province & Prefecture	Environmental suitability for high-input rainfed rice	UN Global Agro-Ecological Zones Database	Environmental suitability for rice (regardless of whether people actually farm rice there) helps address reverse causality—the possibility that areas that were collectivistic to begin with chose to farm rice.
% College Graduates	College graduates per school-age population, 1990, 2015	*China Statistical Yearbook*, 1991, 2016	Researchers have argued that education is an important vehicle of modernization. Education may also influence use of cognitive words. We test modern and historical statistics to account for lag in cultural change.
% Herding Cultures	Traditionally herding ethnicities/total pop.	*China Population Statistical Yearbook*, 2002	Research has found that herding cultures tend to be more individualistic than nearby farming cultures.
Average Temperature	Average high, low in January and July	Zuzu Che Weather Records	Some researchers have argued that hotter areas are more collectivistic. Temperature is correlated with disease prevalence.
Climatic Demands	Sum dev. from 22C in avg. highs/lows July, Jan	Zuzu Che Weather Records	Climatic demands theory argues that cultures in harsher climates should be more collectivistic.
% Service Industry	People employed in service jobs/employed people, 2010, 1995	*China Statistical Yearbook, 2011, 1996*	Some researchers have argued that service sector development is a better indicator of modernization than GDP. We test historical statistics because there is evidence for a lag between economic development and cultural change.
% Private Industry	People employed in priv. industry/employed people, 2010, 1995	*China Statistical Yearbook, 2011, 1996*	In China, the shift from the state-controlled economy to the private sector is an indicator of economic modernization beyond GDP. We test historical statistics because there is evidence for a lag between development and cultural change.
Internet Penetration	Internet users/province population	China Internet Development Report, 2008	Researchers have found evidence that GDP statistics in China are sometimes manipulated. Internet installation rates are less politically sensitive, presenting an alternative indicator of modernization.
Percent Han	People of Han ethnicity/ province population	*China Population Statistical Yearbook, 2002*	The percent Han could be interpreted as a measure of ethnic homogeneity (lack of diversity) or as a proxy for Confucian heritage.
Pathogen Prevalence	Human-transmitted infectious diseases rates	Chen et al., 1990; Statistical Yearbooks	Pathogen prevalence theory argues that environments with higher rates of communicable disease tend to be more collectivistic.

Table S1B

Variables Tested, Sources, and Rationale in Japan

Variable	Measure	Source	Rationale
% Prefecture Rice	Rice planted area/total planted area, 1975	Statistics and Information Department (2010). 7-14 Planted area and production of rice by prefecture (1985--2009).	Rice required more work and coordination to build and operate irrigation systems. This made rice areas more interdependent.
GDP: Prefecture	GDP per capita, 2005	Cabinet Office. (2013). The 2013 annual report on prefectural-level accounts. Tokyo, Japan: Cabinet Office of Japan.	Modernization theory argues that wealth and modernization cause cultures to become more individualistic.
% Urban	Ratio of urban inhabitants, 2005	Statistics Bureau, Ministry of Internal Affairs and Communications. (2016). Population, Population Density, Population of Densely Inhabited Districts and Area by Prefecture, All *Shi* 市 and All *Gun* 郡 (1898-2005).	We use urbanization to test the difference between urban and rural areas. Urbanization is also an alternative indicator of modernization.
Education	Percent of college graduates, 2010	Statistics Bureau, Ministry of Internal Affairs and Communications. (2016). Social indicators by prefecture.	Education is an important vehicle of modernization. Education may also make people more likely to cognitive process words.

Table S2A

Rice-Wheat Differences Hold Controlling for Temperature (Province Level)

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		GDP	0.01	0.28	0.780
		% Urban	-0.05	-0.93	0.365
		% Herding	0.01	0.96	0.345
		% Cult. Land	-0.01	-0.57	0.574
		Temperature	0.0004	0.03	0.978
		Rice %	-0.07	-3.53	0.002
	Causation	Female	-0.12	-58.55	< 0.001
		GDP	0.01	0.21	0.838
		% Urban	-0.01	-0.11	0.916
		% Herding	0.01	1.35	0.189
		% Cult. Land	0.004	0.21	0.833
		Temperature	0.005	0.31	0.759
		Rice %	-0.07	-3.58	0.002
	Certainty	Female	0.09	45.00	< 0.001
		GDP	-0.01	-0.19	0.850
		% Urban	-0.02	-0.60	0.556
		% Herding	0.01	0.71	0.485
		% Cult. Land	-0.02	-1.37	0.186
		Temperature	-0.01	-0.60	0.551
		Rice %	-0.05	-3.38	0.003
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		GDP	0.01	0.36	0.722
		% Urban	-0.04	-0.87	0.396
		% Herding	0.004	0.47	0.646
		% Cult. Land	-0.01	-0.89	0.383
		Temperature	0.004	0.31	0.761
		Rice %	-0.04	-2.66	0.015
	Assent	Female	0.18	93.52	< 0.001
		GDP	-0.003	-0.05	0.959
		% Urban	-0.02	-0.30	0.770
		% Herding	-0.01	-0.70	0.490
		% Cult. Land	-0.01	-0.38	0.707
		Temperature	0.005	0.27	0.786
		Rice %	0.08	3.32	0.003
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		GDP	-0.01	-0.22	0.828
		% Urban	0.01	0.22	0.827
		% Herding	0.01	1.71	0.100
		% Cult. Land	-0.01	-1.00	0.330
		Temperature	-0.01	-0.96	0.344
		Rice %	-0.04	-2.63	0.016
	Humans	Female	0.11	55.51	< 0.001
		GDP	-0.02	-0.29	0.772
		% Urban	-0.03	-0.45	0.655
		% Herding	0.02	1.91	0.069
		% Cult. Land	-0.01	-0.41	0.686
		Temperature	0.004	0.25	0.805
		Rice %	-0.08	-3.28	0.003
	In/Outgroup: Connecting	Female	0.0002	0.12	0.906
		GDP	0.01	0.40	0.695
		% Urban	-0.05	-1.57	0.133
		% Herding	0.02	2.39	0.025
		% Cult. Land	-0.02	-1.60	0.127
		Temperature	0.0004	0.04	0.966
		Rice %	-0.02	-1.61	0.126
	In/Outgroup: Dividing	Female	-0.01	-2.91	0.004
		GDP	-0.11	-2.17	0.043
		% Urban	0.14	2.53	0.022
		% Herding	0.01	0.47	0.641
		% Cult. Land	0.01	0.31	0.762
		Temperature	0.03	1.44	0.158
		Rice %	-0.02	-0.73	0.477
	Self	Female	-0.05	-17.61	< 0.001
		GDP	-0.01	-0.31	0.762
		% Urban	0.03	0.68	0.503
		% Herding	-0.01	-0.64	0.528
		% Cult. Land	-0.01	-1.12	0.277
		Temperature	0.01	0.47	0.642
		Rice %	-0.02	-1.14	0.269
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.67	0.504
		GDP	-0.02	-0.37	0.712
		% Urban	-0.01	-0.24	0.815
		% Herding	0.01	1.17	0.252
		% Cult. Land	-0.01	-0.44	0.666
		Temperature	0.01	0.67	0.509
		Rice %	-0.09	-3.78	0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		GDP	0.002	0.04	0.971
		% Urban	0.01	0.19	0.849
		% Herding	0.01	0.96	0.345
		% Cult. Land	0.005	0.25	0.806
		Temperature	0.001	0.06	0.953
		Rice %	-0.07	-3.04	0.006
	Fashion and Trends	Female	0.04	15.56	< 0.001
		GDP	-0.004	-0.12	0.908
		% Urban	0.01	0.37	0.712
		% Herding	0.003	0.44	0.662
		% Cult. Land	0.01	0.45	0.657
		Temperature	-0.004	-0.40	0.691
		Rice %	0.01	0.74	0.466
	Affect	Female	0.26	137.08	< 0.001
		GDP	-0.03	-0.65	0.523
		% Urban	-0.03	-0.70	0.490
		% Herding	0.02	1.67	0.108
		% Cult. Land	-0.02	-1.52	0.144
		Temperature	0.01	0.40	0.693
		Rice %	-0.02	-0.92	0.369
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		GDP	-0.01	-0.15	0.880
		% Urban	-0.01	-0.13	0.897
		% Herding	-0.005	-0.41	0.683
		% Cult. Land	-0.01	-0.38	0.706
		Temperature	-0.003	-0.16	0.876
		Rice %	0.06	2.87	0.009

Note: This table tests yearly average temperature per province. Table S2B tests temperature at the prefecture level. Yearly average temperature (C) is the average highs and lows of January and July for the capital city of each province. GDP per capita statistics are from 2012 in RMB. The main text tables use 2014 GDP at the request of a reviewer but the two correlate $r = 0.99$.

Table S2B

Differences Between Rice and Wheat Prefectures Are Independent from Temperature

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	24.19	< 0.001
		GDP	-0.03	-4.84	< 0.001
		Temp.	-0.001	-0.10	0.920
		Rice %	-0.08	-7.48	< 0.001
	Causation	Female	-0.13	-37.55	< 0.001
		GDP	0.01	1.63	0.105
		Temp.	-0.02	-2.59	0.010
		Rice %	-0.06	-6.49	< 0.001
	Certainty	Female	0.10	27.61	< 0.001
		GDP	-0.04	-5.72	< 0.001
		Temp.	-0.01	-1.15	0.252
		Rice %	-0.06	-6.03	< 0.001
	Possibility/ Openness	Female	0.08	22.96	< 0.001
		GDP	-0.03	-4.76	< 0.001
		Temp.	0.02	2.26	0.025
		Rice %	-0.06	-6.24	< 0.001
	Assent	Female	0.21	59.97	< 0.001
		GDP	-0.02	-2.48	0.014
		Temp.	0.04	4.79	< 0.001
		Rice %	0.04	3.59	< 0.001

	Word Category		*ß*	*t*	*P*
Self and Groups	Universalism	Female	-0.09	-23.28	< 0.001
		GDP	0.002	0.29	0.772
		Temp.	-0.03	-3.63	< 0.001
		Rice %	-0.02	-3.01	0.003
	Humans	Female	0.12	33.91	< 0.001
		GDP	-0.04	-6.27	< 0.001
		Temp.	-0.02	-2.20	0.029
		Rice %	-0.06	-5.48	< 0.001
	In/Outgroup: Connecting	Female	-0.0005	-0.13	0.900
		GDP	-0.04	-8.30	< 0.001
		Temp.	-0.01	-0.85	0.397
		Rice %	-0.03	-3.63	< 0.001
	In/Outgroup: Dividing	Female	-0.03	-3.40	< 0.001
		GDP	0.01	0.88	0.382
		Temp.	0.02	1.48	0.141
		Rice %	-0.02	-1.35	0.181
	Self	Female	-0.05	-10.49	< 0.001
		GDP	0.01	1.75	0.081
		Temp.	0.02	1.75	0.082
		Rice %	-0.02	-2.08	0.040

	Word Category		*ß*	*t*	*P*
Promotion Orientation and Emotion	Positivity/ Optimism	Female	-0.01	-1.69	0.091
		GDP	-0.04	-5.51	< 0.001
		Temp.	0.004	0.45	0.654
		Rice %	-0.08	-7.14	< 0.001
	Achievement	Female	-0.23	-67.35	< 0.001
		GDP	0.02	2.48	0.014
		Temp.	-0.02	-2.21	0.028
		Rice %	-0.06	-5.65	< 0.001
	Fashion and Trends	Female	0.02	3.87	< 0.001
		GDP	0.02	2.85	0.005
		Temp.	-0.01	-1.42	0.157
		Rice %	0.02	2.11	0.036
	Affect	Female	0.28	82.18	< 0.001
		GDP	-0.06	-8.75	< 0.001
		Temp.	0.02	1.96	0.050
		Rice %	-0.04	-3.23	0.001
Cog. & Dis.	Non-Fluencies	Female	0.20	57.61	< 0.001
		GDP	-0.01	-2.30	0.022
		Temp.	0.03	3.87	< 0.001
		Rice %	0.02	2.48	0.014

Note: Analyses are hierarchical linear models nested in prefectures. Yearly average temperature (Celsius) is the average highs and lows of January and July for the capital city of each province. GDP statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 prefecture GDP correlate $r = 0.98$, so the difference is negligible.

Table S3A

Rice-Wheat Differences Are Robust to Differences in Education

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		% College	-0.06	-1.72	0.101
		% Urban	0.01	0.26	0.798
		% Herding	0.01	1.09	0.286
		% Cult. Land	-0.02	-1.04	0.312
		Rice %	-0.08	-5.07	< 0.001
	Causation	Female	-0.12	-58.55	< 0.001
		% College	0.004	0.11	0.913
		% Urban	0.001	0.05	0.962
		% Herding	0.01	1.54	0.138
		% Cult. Land	0.004	0.24	0.809
		Rice %	-0.07	-3.83	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		% College	-0.03	-1.20	0.247
		% Urban	-0.01	-0.32	0.755
		% Herding	0.01	0.94	0.357
		% Cult. Land	-0.02	-1.70	0.104
		Rice %	-0.07	-4.78	< 0.001
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		% College	-0.06	-2.50	0.021
		% Urban	0.02	1.10	0.282
		% Herding	0.002	0.29	0.775
		% Cult. Land	-0.02	-1.70	0.105
		Rice %	-0.06	-4.39	< 0.001
	Assent	Female	0.18	93.53	< 0.001
		% College	0.03	0.81	0.429
		% Urban	-0.04	-1.30	0.206
		% Herding	-0.01	-0.88	0.386
		% Cult. Land	-0.005	-0.24	0.812
		Rice %	0.09	4.39	< 0.001

	Word Category		ß	*t*	*P*
Self and Groups	Universalism	Female	-0.08	-36.85	< 0.001
		% College	0.01	0.40	0.694
		% Urban	-0.01	-0.29	0.774
		% Herding	0.02	2.39	0.024
		% Cult. Land	-0.01	-0.77	0.452
		Rice %	-0.04	-3.26	0.004
	Humans	Female	0.11	55.50	< 0.001
		% College	-0.06	-1.51	0.145
		% Urban	-0.001	-0.04	0.970
		% Herding	0.02	1.99	0.058
		% Cult. Land	-0.02	-0.96	0.347
		Rice %	-0.09	-4.40	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.12	0.904
		% College	0.02	0.98	0.340
		% Urban	-0.06	-2.92	0.009
		% Herding	0.02	3.03	0.005
		% Cult. Land	-0.01	-1.29	0.213
		Rice %	-0.02	-1.38	0.181
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		% College	0.04	0.89	0.386
		% Urban	-0.004	-0.12	0.908
		% Herding	-0.01	-0.49	0.626
		% Cult. Land	-0.004	-0.21	0.837
		Rice %	0.02	0.80	0.434
	Self	Female	-0.05	-17.62	< 0.001
		% College	-0.02	-0.62	0.540
		% Urban	0.03	1.20	0.242
		% Herding	-0.01	-1.13	0.268
		% Cult. Land	-0.02	-1.50	0.150
		Rice %	-0.02	-1.25	0.226

	Word Category		ß	*t*	*P*
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.510
		% College	-0.07	-1.71	0.101
		% Urban	0.01	0.37	0.714
		% Herding	0.01	0.83	0.412
		% Cult. Land	-0.02	-1.14	0.265
		Rice %	-0.09	-4.81	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		% College	0.001	0.04	0.971
		% Urban	0.01	0.36	0.723
		% Herding	0.01	1.43	0.165
		% Cult. Land	0.005	0.27	0.792
		Rice %	-0.07	-3.40	0.002
	Fashion and Trends	Female	0.04	15.56	< 0.001
		% College	-0.02	-1.08	0.295
		% Urban	0.03	1.41	0.172
		% Herding	0.003	0.57	0.575
		% Cult. Land	0.002	0.21	0.835
		Rice %	0.001	0.10	0.922
	Affect	Female	0.26	137.09	< 0.001
		% College	-0.08	-2.78	0.012
		% Urban	-0.01	-0.26	0.801
		% Herding	0.01	1.52	0.139
		% Cult. Land	-0.04	-2.82	0.010
		Rice %	-0.03	-2.12	0.045
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		% College	-0.01	-0.38	0.709
		% Urban	-0.005	-0.15	0.884
		% Herding	-0.005	-0.51	0.615
		% Cult. Land	-0.01	-0.51	0.618
		Rice %	0.06	3.01	0.006

Note: Analyses are hierarchical linear models nested in provinces. Percent college graduates are college graduates per school-age population in the year 2015, derived from *China Statistical Yearbook* 2016. We use this as a proxy for differences in education levels for different provinces.

Table S3B

Rice-Wheat Differences Are Robust to Differences in Time-Lagged Education

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.99	< 0.001
		% Coll. 1990	-0.08	-2.89	0.009
		% Urban	0.02	0.96	0.347
		% Herding	0.01	1.33	0.193
		% Cult. Land	-0.02	-1.14	0.268
		Rice %	-0.09	-5.99	< 0.001
	Causation	Female	-0.12	-58.56	< 0.001
		% Coll. 1990	-0.05	-1.53	0.140
		% Urban	0.04	1.44	0.165
		% Herding	0.01	1.58	0.127
		% Cult. Land	-0.001	-0.04	0.969
		Rice %	-0.08	-4.82	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		% Coll. 1990	-0.05	-2.05	0.053
		% Urban	0.004	0.19	0.854
		% Herding	0.01	1.07	0.294
		% Cult. Land	-0.02	-1.85	0.079
		Rice %	-0.07	-5.44	< 0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		% Coll. 1990	-0.08	-3.40	0.003
		% Urban	0.03	1.61	0.122
		% Herding	0.003	0.50	0.620
		% Cult. Land	-0.02	-1.74	0.097
		Rice %	-0.06	-5.00	< 0.001
	Assent	Female	0.18	93.53	< 0.001
		% Coll. 1990	0.05	1.49	0.152
		% Urban	-0.06	-1.92	0.068
		% Herding	-0.01	-0.98	0.335
		% Cult. Land	-0.004	-0.24	0.812
		Rice %	0.09	4.89	< 0.001

	Word Category		*ß*	*t*	*P*
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		% Coll. 1990	0.01	0.26	0.796
		% Urban	-0.003	-0.16	0.872
		% Herding	0.02	2.36	0.026
		% Cult. Land	-0.01	-0.85	0.404
		Rice %	-0.05	-3.47	0.002
	Humans	Female	0.11	55.50	< 0.001
		% Coll. 1990	-0.08	-2.29	0.031
		% Urban	0.01	0.38	0.707
		% Herding	0.02	2.24	0.034
		% Cult. Land	-0.02	-0.98	0.337
		Rice %	-0.09	-4.93	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.12	0.905
		% Coll. 1990	0.01	0.32	0.756
		% Urban	-0.05	-2.45	0.023
		% Herding	0.02	2.91	0.007
		% Cult. Land	-0.02	-1.53	0.142
		Rice %	-0.02	-1.76	0.093
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		% Coll. 1990	0.02	0.58	0.568
		% Urban	0.01	0.18	0.857
		% Herding	-0.01	-0.56	0.576
		% Cult. Land	-0.01	-0.36	0.726
		Rice %	0.01	0.62	0.540
	Self	Female	-0.05	-17.62	< 0.001
		% Coll. 1990	-0.03	-1.10	0.286
		% Urban	0.03	1.65	0.112
		% Herding	-0.01	-1.13	0.267
		% Cult. Land	-0.02	-1.60	0.125
		Rice %	-0.02	-1.46	0.160

	Word Category		*ß*	*t*	*P*
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.509
		% Coll. 1990	-0.09	-2.70	0.013
		% Urban	0.03	0.96	0.347
		% Herding	0.01	1.04	0.307
		% Cult. Land	-0.02	-1.21	0.240
		Rice %	-0.10	-5.55	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		% Coll. 1990	-0.04	-1.24	0.229
		% Urban	0.04	1.46	0.157
		% Herding	0.01	1.45	0.158
		% Cult. Land	0.001	0.05	0.957
		Rice %	-0.08	-4.15	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		% Coll. 1990	-0.02	-0.77	0.451
		% Urban	0.02	1.16	0.259
		% Herding	0.004	0.66	0.515
		% Cult. Land	0.004	0.38	0.708
		Rice %	0.004	0.32	0.753
	Affect	Female	0.26	137.09	< 0.001
		% Coll. 1990	-0.05	-1.75	0.095
		% Urban	-0.03	-1.16	0.259
		% Herding	0.01	1.66	0.109
		% Cult. Land	-0.03	-2.24	0.036
		Rice %	-0.02	-1.47	0.156
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		% Coll. 1990	0.01	0.39	0.702
		% Urban	-0.02	-0.84	0.412
		% Herding	-0.004	-0.46	0.649
		% Cult. Land	-0.01	-0.34	0.736
		Rice %	0.06	3.47	0.002

Note: Analyses are hierarchical linear models nested in provinces. Percent college graduates are college graduates per school-age population in the year 1990, derived from *China Statistical Yearbook* 1991. We use this as a measure of regional differences in education in recent history.

Table S4A

Differences Between Rice and Wheat Provinces Are Robust to Users' Age

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.09	8.33	< 0.001
		Age	0.03	2.44	0.015
		GDP	-0.02	-0.39	0.702
		% Urban	-0.03	-0.45	0.665
		Rice %	-0.08	-4.63	0.002
	Causation	Female	-0.11	-9.75	< 0.001
		Age	0.09	7.91	< 0.001
		GDP	0.01	0.15	0.880
		% Urban	-0.01	-0.14	0.890
		Rice %	-0.09	-3.79	0.002
	Certainty	Female	0.11	10.08	< 0.001
		Age	-0.0004	-0.04	0.969
		GDP	-0.07	-1.08	0.302
		% Urban	0.02	0.34	0.739
		Rice %	-0.07	-3.83	0.003
	Possibility/ Openness	Female	0.08	7.50	< 0.001
		Age	0.02	1.86	0.063
		GDP	0.003	0.05	0.962
		% Urban	-0.05	-0.65	0.532
		Rice %	-0.04	-2.02	0.075
	Assent	Female	0.16	14.61	< 0.001
		Age	-0.09	-7.82	< 0.001
		GDP	0.01	0.07	0.948
		% Urban	-0.04	-0.39	0.704
		Rice %	0.10	3.41	0.007

	Word Category		*ß*	*t*	*P*
Self and Groups	Universalism	Female	-0.08	-6.66	< 0.001
		Age	0.03	2.89	0.004
		GDP	-0.11	-1.61	0.128
		% Urban	0.11	1.52	0.155
		Rice %	-0.07	-3.17	0.008
	Humans	Female	0.12	10.50	< 0.001
		Age	0.04	3.25	0.001
		GDP	-0.04	-0.46	0.652
		% Urban	-0.02	-0.18	0.862
		Rice %	-0.10	-3.53	0.003
	In/Outgroup: Connecting	Female	0.01	0.99	0.321
		Age	0.01	0.58	0.563
		GDP	-0.17	-3.04	0.022
		% Urban	0.11	1.89	0.120
		Rice %	-0.06	-3.35	0.023
	In/Outgroup: Dividing	Female	0.01	0.33	0.743
		Age	-0.02	-0.67	0.504
		GDP	-0.19	-1.56	0.120
		% Urban	0.21	1.76	0.079
		Rice %	-0.02	-0.72	0.469
	Self	Female	-0.03	-2.18	0.029
		Age	0.04	2.97	0.003
		GDP	0.05	0.59	0.562
		% Urban	-0.06	-0.65	0.521
		Rice %	0.02	0.96	0.353

	Word Category		*ß*	*t*	*P*
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.02	1.61	0.108
		Age	0.04	3.59	< 0.001
		GDP	-0.05	-0.69	0.500
		% Urban	0.01	0.08	0.934
		Rice %	-0.11	-4.70	< 0.001
	Achievement	Female	-0.20	-18.41	< 0.001
		Age	0.09	8.56	< 0.001
		GDP	-0.05	-0.63	0.537
		% Urban	0.05	0.62	0.544
		Rice %	-0.10	-4.42	< 0.001
	Fashion and Trends	Female	0.04	2.96	0.003
		Age	0.01	0.58	0.564
		GDP	-0.08	-1.36	0.190
		% Urban	0.08	1.35	0.198
		Rice %	0.02	1.42	0.177
	Affect	Female	0.26	24.05	< 0.001
		Age	-0.04	-4.01	< 0.001
		GDP	-0.05	-0.68	0.511
		% Urban	-0.02	-0.27	0.796
		Rice %	-0.02	-1.17	0.269
Cog. & Dis.	Non-Fluencies	Female	0.17	15.59	< 0.001
		Age	-0.08	-7.13	< 0.001
		GDP	-0.05	-0.67	0.515
		% Urban	0.02	0.29	0.779
		Rice %	0.07	3.15	0.012

Note: Analyses are hierarchical linear models nested in provinces. Provincial GDP per capita statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 GDP correlate $r = 0.99$, so the difference is negligible.

Table S4B

Differences Between Rice and Wheat Prefectures Are Robust to Users' Age

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.09	7.40	< 0.001
		Age	0.02	2.04	0.041
		GDP	-0.04	-2.85	0.005
		Rice %	-0.08	-5.35	< 0.001
	Causation	Female	-0.12	-9.99	< 0.001
		Age	0.09	7.66	< 0.001
		GDP	0.02	1.37	0.173
		Rice %	-0.09	-6.38	< 0.001
	Certainty	Female	0.11	9.14	< 0.001
		Age	-0.004	-0.32	0.747
		GDP	-0.05	-3.31	0.001
		Rice %	-0.07	-4.66	< 0.001
	Possibility/ Openness	Female	0.09	7.22	< 0.001
		Age	0.02	1.48	0.139
		GDP	-0.04	-2.41	0.018
		Rice %	-0.04	-2.66	0.009
	Assent	Female	0.16	13.79	< 0.001
		Age	-0.09	-7.39	< 0.001
		GDP	-0.02	-1.64	0.105
		Rice %	0.06	4.60	< 0.001
Self and Groups	Universalism	Female	-0.08	-6.21	< 0.001
		Age	0.03	2.58	0.010
		GDP	0.02	1.50	0.140
		Rice %	-0.04	-2.65	0.012
	Humans	Female	0.11	9.73	< 0.001
		Age	0.03	2.39	0.017
		GDP	-0.04	-3.18	0.002
		Rice %	-0.08	-5.41	< 0.001
	In/Outgroup: Connecting	Female	0.01	0.89	0.373
		Age	0.01	0.64	0.524
		GDP	-0.07	-5.39	< 0.001
		Rice %	-0.05	-4.05	< 0.001
	In/Outgroup: Dividing	Female	0.01	0.31	0.760
		Age	-0.01	-0.42	0.675
		GDP	0.04	1.16	0.248
		Rice %	-0.004	-0.11	0.910
	Self	Female	-0.04	-2.64	0.008
		Age	0.04	2.67	0.008
		GDP	0.01	0.32	0.749
		Rice %	0.003	0.15	0.882
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.02	1.24	0.216
		Age	0.04	3.27	0.001
		GDP	-0.04	-2.67	0.009
		Rice %	-0.08	-4.89	< 0.001
	Achievement	Female	-0.20	-17.59	< 0.001
		Age	0.09	8.00	< 0.001
		GDP	0.01	1.09	0.278
		Rice %	-0.09	-5.77	< 0.001
	Fashion and Trends	Female	0.03	2.30	0.021
		Age	0.01	0.58	0.563
		GDP	0.003	0.23	0.818
		Rice %	0.03	2.28	0.022
	Affect	Female	0.25	22.21	< 0.001
		Age	-0.04	-3.82	< 0.001
		GDP	-0.05	-3.76	< 0.001
		Rice %	-0.03	-2.01	0.047
Cog. & Dis.	Non-fluencies	Female	0.17	14.44	< 0.001
		Age	-0.08	-6.60	< 0.001
		GDP	-0.03	-2.67	0.009
		Rice %	0.06	4.67	< 0.001

Note: Analyses are hierarchical linear models nested in prefectures. Age data is available for a sub-sample of Weibo users. GDP per capita is 2012 prefecture data in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 prefecture GDP correlate $r = 0.98$, so the difference is negligible.

Table S5

Robustness to Dialect: Excluding Cantonese-Speaking Areas

	Word Category		*β*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	35.89	< 0.001
		GDP	-0.04	-2.74	0.012
		Rice %	-0.08	-6.16	< 0.001
	Causation	Female	-0.13	-57.48	< 0.001
		GDP	0.004	0.36	0.724
		Rice %.	-0.08	-6.31	< 0.001
	Certainty	Female	0.09	39.40	< 0.001
		GDP	-0.04	-4.27	< 0.001
		Rice %	-0.06	-6.31	< 0.001
	Possibility/ Openness	Female	0.07	31.93	< 0.001
		GDP	-0.03	-2.49	0.021
		Rice %	-0.05	-4.29	< 0.001
	Assent	Female	0.20	92.78	< 0.001
		GDP	-0.02	-1.46	0.160
		Rice %	0.09	7.22	< 0.001
Self and Groups	Universalism	Female	-0.08	-25.99	< 0.001
		GDP	0.03	1.86	0.100
		Rice %	-0.04	-4.85	< 0.001
	Humans	Female	0.10	35.52	< 0.001
		GDP	-0.001	-0.05	0.961
		Rice %	-0.07	-6.42	< 0.001
	In/Outgroup: Connecting	Female	0.001	0.23	0.815
		GDP	-0.03	-1.58	0.152
		Rice %	-0.04	-4.14	0.002
	In/Outgroup: Dividing	Female	-0.01	-2.00	0.046
		GDP	0.02	1.08	0.319
		Rice %	0.01	1.12	0.281
	Self	Female	-0.04	-10.07	< 0.001
		GDP	0.02	1.50	0.165
		Rice %	0.005	0.59	0.562
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.01	2.65	0.008
		GDP	-0.01	-0.45	0.665
		Rice %	-0.06	-5.07	< 0.001
	Achievement	Female	-0.22	-103.89	< 0.001
		GDP	0.01	0.76	0.455
		Rice %	-0.08	-6.08	< 0.001
	Fashion and Trends	Female	0.04	11.02	< 0.001
		GDP	0.02	1.43	0.182
		Rice %	0.004	0.66	0.520
	Affect	Female	0.27	128.92	< 0.001
		GDP	-0.07	-4.96	< 0.001
		Rice %	-0.03	-2.22	0.037
Cog./Dis.	Non-Fluencies	Female	0.19	86.48	< 0.001
		GDP	-0.01	-1.10	0.281
		Rice %	0.06	5.84	< 0.001

Note: Analyses are hierarchical linear models nested in provinces. Cantonese provinces are classified as Guangxi and Guangdong (based on the *Language Atlas of China*). Provincial GDP per capita statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 GDP correlate $r = 0.99$, so the difference is negligible.

Table S6

Japanese Prefectures' History of Rice Farming Predicts Word Use on Weibo: Controlling for Education

	Word Category		*β*	*t*	*P*		Word Category		*β*	*t*	*P*
Cognition and Discourse	Cognitive Processes	GDP	-0.01	-0.41	0.685	Cognition and Discourse	Possibility/ Openness	GDP	-0.001	-0.12	0.909
		% Urban	0.03	2.40	0.020			% Urban	0.01	1.30	0.202
		Education	0.01	0.92	0.364			Education	0.02	2.52	0.019
		Rice %	-0.03	-3.48	0.001			Rice %	-0.02	-2.61	0.016
	Causation	GDP	0.03	2.53	0.026		Assent	GDP	-0.05	-2.89	0.010
		% Urban	-0.01	-1.16	0.254			% Urban	-0.01	-0.58	0.566
		Education	0.03	2.99	0.005			Education	0.004	0.28	0.782
		Rice %	-0.02	-2.07	0.047			Rice %	-0.02	-2.34	0.026
	Certainty	GDP	-0.01	-0.66	0.519		Non-Fluencies	GDP	-0.03	-1.51	0.144
		% Urban	0.01	1.09	0.283			% Urban	0.003	0.23	0.819
		Education	0.003	0.23	0.820			Education	0.002	0.14	0.889
		Rice %	-0.02	-2.77	0.009			Rice %	-0.004	-0.34	0.732
Self and Groups	Humans	GDP	0.004	0.21	0.835	Promotion Orientation	Achievement	GDP	0.02	1.22	0.241
		% Urban	0.01	0.86	0.394			% Urban	0.01	0.50	0.618
		Education	-0.01	-0.39	0.700			Education	0.03	2.49	0.018
		Rice %	-0.02	-2.13	0.040			Rice %	-0.02	-1.61	0.117
	I	GDP	-0.03	-1.53	0.143		We	GDP	-0.004	-0.25	0.803
		% Urban	0.01	0.76	0.450			% Urban	0.02	1.90	0.062
		Education	-0.001	-0.07	0.943			Education	-0.02	-1.73	0.091
		Rice %	-0.02	-2.27	0.030			Rice %	-0.004	-0.43	0.670

Note: Analyses are hierarchical linear models nested in prefectures. Prefecture rice is the percentage of rice planted area.

Table S7

Provinces' Environmental Suitability for Rice Predicts Word Use on Weibo

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.97	< 0.001
		GDP	0.03	0.55	0.585
		% Urban	-0.08	-1.66	0.112
		% Herding	0.01	1.25	0.222
		% Cult. Land	0.01	0.50	0.622
		Rice Suit.	-0.05	-3.09	0.005
	Causation	Female	-0.12	-58.56	< 0.001
		GDP	0.03	0.57	0.572
		% Urban	-0.05	-0.95	0.355
		% Herding	0.01	1.39	0.177
		% Cult. Land	0.02	1.16	0.260
		Rice Suit.	-0.05	-3.31	0.003
	Certainty	Female	0.09	45.00	< 0.001
		GDP	-0.01	-0.15	0.885
		% Urban	-0.04	-1.11	0.281
		% Herding	0.01	1.21	0.235
		% Cult. Land	-0.001	-0.08	0.936
		Rice Suit.	-0.04	-3.38	0.003
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		GDP	0.03	0.69	0.500
		% Urban	-0.06	-1.58	0.128
		% Herding	0.005	0.55	0.590
		% Cult. Land	-0.003	-0.21	0.834
		Rice Suit.	-0.03	-2.37	0.026
	Assent	Female	0.18	93.53	< 0.001
		GDP	-0.01	-0.19	0.853
		% Urban	0.02	0.33	0.744
		% Herding	-0.01	-0.91	0.373
		% Cult. Land	-0.03	-1.55	0.136
		Rice Suit.	0.07	3.97	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		GDP	-0.01	-0.39	0.699
		% Urban	-0.002	-0.06	0.950
		% Herding	0.02	2.29	0.030
		% Cult. Land	0.002	0.16	0.871
		Rice Suit.	-0.04	-3.48	0.002
	Humans	Female	0.11	55.50	< 0.001
		GDP	0.004	0.07	0.945
		% Urban	-0.07	-1.24	0.229
		% Herding	0.03	2.15	0.042
		% Cult. Land	0.01	0.51	0.613
		Rice Suit.	-0.05	-2.70	0.013
	In/Outgroup: Connecting	Female	0.0002	0.11	0.912
		GDP	0.02	0.55	0.591
		% Urban	-0.06	-2.09	0.050
		% Herding	0.02	2.63	0.014
		% Cult. Land	-0.01	-1.26	0.221
		Rice Suit.	-0.02	-1.74	0.096
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		GDP	-0.09	-1.82	0.082
		% Urban	0.12	2.25	0.036
		% Herding	-0.004	-0.39	0.700
		% Cult. Land	-0.003	-0.18	0.863
		Rice Suit.	-0.001	-0.07	0.945
	Self	Female	-0.05	-17.62	< 0.001
		GDP	-0.003	-0.11	0.917
		% Urban	0.01	0.40	0.694
		% Herding	-0.01	-1.02	0.317
		% Cult. Land	-0.01	-1.13	0.270
		Rice Suit.	-0.01	-1.06	0.298
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.510
		GDP	0.01	0.15	0.884
		% Urban	-0.07	-1.21	0.239
		% Herding	0.01	1.17	0.252
		% Cult. Land	0.01	0.44	0.666
		Rice Suit.	-0.05	-3.04	0.006
	Achievement	Female	-0.21	-109.02	< 0.001
		GDP	0.01	0.28	0.779
		% Urban	-0.03	-0.48	0.636
		% Herding	0.01	1.36	0.184
		% Cult. Land	0.02	1.18	0.249
		Rice Suit.	-0.05	-3.22	0.004
	Fashion and Trends	Female	0.04	15.57	< 0.001
		GDP	-0.01	-0.43	0.674
		% Urban	0.02	0.78	0.441
		% Herding	0.001	0.10	0.921
		% Cult. Land	0.003	0.28	0.779
		Rice Suit.	-0.004	-0.46	0.652
	Affect	Female	0.26	137.08	< 0.001
		GDP	-0.02	-0.47	0.641
		% Urban	-0.05	-1.13	0.269
		% Herding	0.02	1.81	0.082
		% Cult. Land	-0.02	-1.53	0.139
		Rice Suit.	-0.01	-0.53	0.601
Cog. & Dis	Non-Fluencies	Female	0.18	90.24	< 0.001
		GDP	-0.02	-0.43	0.670
		% Urban	0.03	0.54	0.592
		% Herding	-0.004	-0.42	0.678
		% Cult. Land	-0.02	-1.25	0.226
		Rice Suit.	0.05	3.09	0.005

Note: Analyses are hierarchical linear models nested in provinces. Rice suitability is an instrumental variable that reduces the potential for reverse causality. Suitability is an index of environmental variables (such as rainfall) that determine where it is physically possible to grow paddy rice, regardless of whether people are farming rice there. We indexed herding using the percentage of traditionally herding ethnicities in each province, according to the 2000 Census. For example, Mongolian and Manchu ethnicities herded traditionally. The supplemental materials present the full list of herding groups. Provincial GDP per capita statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 prefecture GDP correlate $r = 0.98$, so the difference is negligible.

Table S8A

Rice-Wheat Differences Robust to Provinces' Climatic Demands

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.97	< 0.001
		GDP	0.02	0.58	0.571
		% Urban	-0.06	-1.38	0.184
		% Herding	0.001	0.12	0.905
		% Cult. Land	-0.01	-0.95	0.356
		Clim. Dem.	0.02	1.68	0.106
		Rice %	-0.06	-3.27	0.004
	Causation	Female	-0.12	-58.56	< 0.001
		GDP	0.02	0.48	0.635
		% Urban	-0.02	-0.40	0.690
		% Herding	0.01	0.72	0.476
		% Cult. Land	-0.001	-0.03	0.974
		Clim. Dem.	0.01	0.91	0.373
		Rice %	-0.06	-3.28	0.004
	Certainty	Female	-0.12	-58.56	< 0.001
		GDP	0.02	0.48	0.635
		% Urban	-0.02	-0.40	0.690
		% Herding	0.01	0.72	0.476
		% Cult. Land	-0.001	-0.03	0.974
		Clim. Dem.	0.01	0.91	0.373
		Rice %	-0.06	-3.28	0.004
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		GDP	0.02	0.68	0.501
		% Urban	-0.05	-1.28	0.215
		% Herding	-0.002	-0.26	0.794
		% Cult. Land	-0.03	-1.84	0.080
		Clim. Dem.	0.01	1.12	0.274
		Rice %	-0.03	-2.24	0.037
	Assent	Female	0.18	93.52	< 0.001
		GDP	-0.001	-0.03	0.977
		% Urban	-0.02	-0.32	0.752
		% Herding	-0.01	-0.50	0.618
		% Cult. Land	-0.01	-0.34	0.734
		Clim. Dem.	-0.01	-0.60	0.555
		Rice %	0.08	3.50	0.002
Self and Groups	Universalism	Female	-0.08	-36.85	< 0.001
		GDP	-0.02	-0.56	0.579
		% Urban	0.02	0.55	0.589
		% Herding	0.02	1.90	0.069
		% Cult. Land	-0.01	-0.82	0.424
		Clim. Dem.	0.003	0.29	0.771
		Rice %	-0.05	-3.28	0.004
	Humans	Female	0.11	55.50	< 0.001
		GDP	-0.001	-0.03	0.977
		% Urban	-0.05	-0.85	0.402
		% Herding	0.01	1.12	0.273
		% Cult. Land	-0.01	-0.74	0.465
		Clim. Dem.	0.02	1.36	0.187
		Rice %	-0.06	-2.85	0.009
	In/Outgroup: Connecting	Female	0.0003	0.12	0.904
		GDP	0.01	0.39	0.698
		% Urban	-0.05	-1.63	0.121
		% Herding	0.02	2.48	0.020
		% Cult. Land	-0.02	-1.56	0.137
		Clim. Dem.	-0.004	-0.36	0.726
		Rice %	-0.02	-1.90	0.074
	In/Outgroup: Dividing	Female	-0.01	-2.91	0.004
		GDP	-0.10	-2.16	0.042
		% Urban	0.13	2.65	0.016
		% Herding	0.01	1.11	0.273
		% Cult. Land	0.01	0.56	0.579
		Clim. Dem.	-0.04	-2.54	0.016
		Rice %	-0.02	-1.07	0.299
	Self	Female	-0.05	-17.60	< 0.001
		GDP	-0.01	-0.26	0.798
		% Urban	0.03	0.69	0.499
		% Herding	-0.003	-0.39	0.698
		% Cult. Land	-0.01	-1.08	0.292
		Clim. Dem.	-0.01	-0.83	0.412
		Rice %	-0.02	-1.34	0.196
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.507
		GDP	-0.004	-0.08	0.939
		% Urban	-0.03	-0.58	0.567
		% Herding	0.01	0.66	0.516
		% Cult. Land	-0.01	-0.67	0.511
		Clim. Dem.	0.01	0.34	0.734
		Rice %	-0.07	-3.46	0.002
	Achievement	Female	-0.12	-58.56	< 0.001
		GDP	0.02	0.48	0.635
		% Urban	-0.02	-0.40	0.690
		% Herding	0.01	0.72	0.476
		% Cult. Land	-0.001	-0.03	0.974
		Clim. Dem.	0.01	0.91	0.373
		Rice %	-0.06	-3.28	0.004
	Fashion and Trends	Female	0.04	15.57	< 0.001
		GDP	-0.01	-0.26	0.800
		% Urban	0.02	0.52	0.606
		% Herding	0.004	0.53	0.599
		% Cult. Land	0.01	0.53	0.601
		Clim. Dem.	0.001	0.14	0.889
		Rice %	0.01	0.62	0.543
	Affect	Female	0.26	137.08	< 0.001
		GDP	-0.02	-0.42	0.681
		% Urban	-0.05	-1.09	0.290
		% Herding	0.01	1.00	0.327
		% Cult. Land	-0.03	-1.84	0.080
		Clim. Dem.	0.01	0.90	0.379
		Rice %	-0.01	-0.32	0.755
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		GDP	-0.01	-0.28	0.784
		% Urban	-0.001	-0.01	0.989
		% Herding	-0.002	-0.16	0.878
		% Cult. Land	-0.01	-0.28	0.780
		Clim. Dem.	-0.01	-0.34	0.733
		Rice %	0.06	2.84	0.010

Note: Analyses are hierarchical linear models nested in provinces. Provincial GDP per capita statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 GDP correlate $r = 0.99$, so the difference is negligible. Climatic demands are calculated as the sum deviation from 22C in the average highs and lows of July and January. Climatic demands theory argues that cultures in harsher climates should be more collectivistic.

Table S8B

Rice-Wheat Differences Robust to Prefectures' Climatic Demands

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	24.19	< 0.001
		GDP	-0.03	-4.86	< 0.001
		Clim. Dem.	0.005	0.58	0.562
		Rice %	-0.08	-8.18	< 0.001
	Causation	Female	-0.13	-37.53	< 0.001
		GDP	0.01	1.45	0.150
		Clim. Dem.	0.01	1.94	0.054
		Rice %	-0.07	-8.10	< 0.001
	Certainty	Female	0.10	27.62	< 0.001
		GDP	-0.04	-5.64	< 0.001
		Clim. Dem.	0.01	0.94	0.350
		Rice %	-0.06	-7.09	< 0.001
	Possibility/ Openness	Female	0.08	22.94	< 0.001
		GDP	-0.03	-4.60	< 0.001
		Clim. Dem.	-0.01	-1.59	0.114
		Rice %	-0.05	-6.19	< 0.001
	Assent	Female	0.21	59.94	< 0.001
		GDP	-0.01	-2.11	0.036
		Clim. Dem.	-0.03	-3.62	< 0.001
		Rice %	0.05	5.55	< 0.001
Self and Groups	Universalism	Female	-0.09	-23.20	< 0.001
		GDP	0.002	0.46	0.644
		Clim. Dem.	0.01	1.40	0.165
		Rice %	-0.04	-5.31	< 0.001
	Humans	Female	0.12	33.91	< 0.001
		GDP	-0.05	-6.50	< 0.001
		Clim. Dem.	0.02	2.82	0.005
		Rice %	-0.07	-6.26	< 0.001
	In/Outgroup: Connecting	Female	-0.0004	-0.11	0.910
		GDP	-0.04	-8.11	< 0.001
		Clim. Dem.	0.003	0.46	0.643
		Rice %	-0.03	-4.42	< 0.001
	In/Outgroup: Dividing	Female	-0.03	-3.36	< 0.001
		GDP	0.02	1.35	0.180
		Clim. Dem.	-0.04	-2.77	0.006
		Rice %	-0.03	-2.00	0.048
	Self	Female	-0.05	-10.48	< 0.001
		GDP	0.01	2.09	0.038
		Clim. Dem.	-0.02	-2.34	0.020
		Rice %	-0.02	-2.37	0.019
Promotion Orientation and Emotion	Positivity/ Optimism	Female	-0.01	-1.68	0.092
		GDP	-0.04	-5.17	< 0.001
		Clim. Dem.	-0.01	-1.14	0.256
		Rice %	-0.08	-8.39	< 0.001
	Achievement	Female	-0.23	-67.34	< 0.001
		GDP	0.01	2.23	0.027
		Clim. Dem.	0.01	1.93	0.054
		Rice %	-0.06	-6.90	< 0.001
	Fashion and Trends	Female	0.02	3.91	< 0.001
		GDP	0.02	2.87	0.005
		Clim. Dem.	0.003	0.47	0.636
		Rice %	0.01	1.54	0.125
	Affect	Female	0.28	82.17	< 0.001
		GDP	-0.06	-8.43	< 0.001
		Clim. Dem.	-0.01	-1.42	0.155
		Rice %	-0.03	-2.93	0.004
C. & D.	Non-Fluencies	Female	0.20	57.56	< 0.001
		GDP	-0.01	-2.25	0.026
		Clim. Dem.	-0.01	-2.07	0.039
		Rice %	0.04	4.47	< 0.001

Note: Analyses are hierarchical linear models nested in prefectures. Climatic demands are calculated as the sum deviation from 22C in the average highs and lows of July and January. Climatic demands theory argues that cultures in harsher climates should be more collectivistic. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 prefecture GDP correlate $r = 0.98$, so the difference is negligible.

Table S9

Provincial Rice-Wheat Differences Are Robust to Climatic Demands Combined with GDP

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.97	< 0.001
		GDP	-0.01	-0.12	0.906
		% Urban	-0.06	-1.21	0.242
		% Herding	0.001	0.14	0.890
		% Cult. Land	-0.01	-0.79	0.437
		Clim. Dem.	0.01	0.36	0.721
		Clim. x GDP	0.03	0.44	0.666
		Rice %	-0.05	-2.84	0.010
	Causation	Female	-0.12	-58.55	< 0.001
		GDP	0.08	0.96	0.348
		% Urban	-0.03	-0.58	0.566
		% Herding	0.01	0.68	0.501
		% Cult. Land	-0.004	-0.23	0.821
		Clim. Dem.	0.04	1.16	0.260
		Clim. x GDP	-0.07	-0.83	0.414
		Rice %	-0.07	-3.36	0.003
	Certainty	Female	0.09	44.99	< 0.001
		GDP	-0.01	-0.22	0.832
		% Urban	-0.03	-0.72	0.478
		% Herding	0.0001	0.01	0.994
		% Cult. Land	-0.02	-1.61	0.124
		Clim. Dem.	0.02	0.76	0.458
		Clim. x GDP	0.01	0.14	0.890
		Rice %	-0.05	-3.11	0.006
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		GDP	-0.0004	-0.01	0.996
		% Urban	-0.05	-1.13	0.272
		% Herding	-0.002	-0.24	0.813
		% Cult. Land	-0.02	-1.08	0.292
		Clim. Dem.	0.005	0.18	0.862
		Clim. x GDP	0.03	0.36	0.719
		Rice %	-0.03	-1.91	0.071
	Assent	Female	0.18	93.52	< 0.001
		GDP	-0.15	-1.55	0.137
		% Urban	0.004	0.08	0.935
		% Herding	-0.01	-0.44	0.666
		% Cult. Land	0.001	0.05	0.960
		Clim. Dem.	-0.06	-1.83	0.081
		Clim. x GDP	0.16	1.74	0.096
		Rice %	0.09	4.03	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.84	< 0.001
		GDP	0.08	1.13	0.272
		% Urban	0.007	0.20	0.841
		% Herding	0.02	1.92	0.066
		% Cult. Land	-0.02	-1.19	0.248
		Clim. Dem.	0.04	1.55	0.134
		Clim. x GDP	-0.10	-1.59	0.125
		Rice %	-0.05	-3.74	0.001
	Humans	Female	0.11	55.50	< 0.001
		GDP	0.07	0.66	0.516
		% Urban	-0.06	-1.00	0.327
		% Herding	0.01	1.07	0.294
		% Cult. Land	-0.02	-0.90	0.378
		Clim. Dem.	0.05	1.30	0.207
		Clim. x GDP	-0.07	-0.77	0.452
		Rice %	-0.07	-2.93	0.008
	In/Outgroup: Connecting	Female	0.0003	0.13	0.895
		GDP	0.09	1.59	0.127
		% Urban	-0.06	-2.01	0.060
		% Herding	0.02	2.53	0.019
		% Cult. Land	-0.02	-1.94	0.069
		Clim. Dem.	0.03	1.23	0.232
		Clim. x GDP	-0.09	-1.58	0.129
		Rice %	-0.03	-2.43	0.026
	In/Outgroup: Dividing	Female	-0.01	-2.89	0.004
		GDP	-0.003	-0.03	0.973
		% Urban	0.12	2.39	0.028
		% Herding	0.01	1.12	0.270
		% Cult. Land	0.005	0.28	0.780
		Clim. Dem.	-0.01	-0.20	0.841
		Clim. x GDP	-0.10	-1.12	0.272
		Rice %	-0.03	-1.46	0.161
	Self	Female	-0.05	-17.59	< 0.001
		GDP	0.11	1.65	0.114
		% Urban	0.01	0.28	0.779
		% Herding	-0.004	-0.46	0.649
		% Cult. Land	-0.02	-1.62	0.123
		Clim. Dem.	0.03	1.38	0.181
		Clim. x GDP	-0.12	-2.01	0.056
		Rice %	-0.03	-2.10	0.049
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.67	0.505
		GDP	0.06	0.61	0.547
		% Urban	-0.04	-0.73	0.473
		% Herding	0.01	0.62	0.543
		% Cult. Land	-0.02	-0.82	0.422
		Clim. Dem.	0.03	0.81	0.426
		Clim. x GDP	-0.07	-0.74	0.469
		Rice %	-0.08	-3.49	0.002
	Achievement	Female	-0.21	-109.01	< 0.001
		GDP	0.14	1.42	0.171
		% Urban	-0.01	-0.26	0.795
		% Herding	0.01	0.86	0.398
		% Cult. Land	-0.004	-0.21	0.833
		Clim. Dem.	0.05	1.60	0.124
		Clim. x GDP	-0.14	-1.53	0.139
		Rice %	-0.07	-3.46	0.002
	Fashion and Trends	Female	0.04	15.57	< 0.001
		GDP	0.03	0.53	0.602
		% Urban	0.01	0.35	0.732
		% Herding	0.004	0.52	0.605
		% Cult. Land	0.004	0.33	0.743
		Clim. Dem.	0.02	0.72	0.478
		Clim. x GDP	-0.04	-0.74	0.468
		Rice %	0.004	0.29	0.777
	Affect	Female	0.26	137.07	< 0.001
		GDP	-0.08	-0.91	0.371
		% Urban	-0.04	-0.86	0.402
		% Herding	0.01	1.02	0.316
		% Cult. Land	-0.03	-1.57	0.131
		Clim. Dem.	-0.01	-0.32	0.751
		Clim. x GDP	0.06	0.82	0.423
		Rice %	-0.0001	-0.01	0.994
Cog. & Discourse	Non-Fluencies	Female	0.18	90.22	< 0.001
		GDP	-0.16	-1.76	0.094
		% Urban	0.02	0.40	0.695
		% Herding	-0.001	-0.08	0.936
		% Cult. Land	0.003	0.15	0.886
		Clim. Dem.	-0.06	-1.80	0.085
		Clim. x GDP	0.16	1.84	0.080
		Rice %	0.07	3.47	0.002

Table S10

Differences Between Rice and Wheat Prefectures Are Robust to Climatic Demands Combined with GDP

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	24.19	< 0.001
		GDP	-0.01	-0.63	0.530
		Clim. Dem.	0.01	1.07	0.287
		Clim. x GDP	-0.02	-0.90	0.367
		Rice %	-0.08	-8.20	< 0.001
	Causation	Female	-0.13	-37.53	< 0.001
		GDP	0.03	1.49	0.139
		Clim. Dem.	0.02	2.06	0.039
		Clim. x GDP	-0.02	-1.09	0.278
		Rice %	-0.07	-8.18	< 0.001
	Certainty	Female	0.10	27.62	< 0.001
		GDP	-0.01	-0.37	0.710
		Clim. Dem.	0.02	1.72	0.087
		Clim. x GDP	-0.03	-1.46	0.147
		Rice %	-0.07	-7.32	< 0.001
	Possibility/ Openness	Female	0.08	22.95	< 0.001
		GDP	-0.01	-0.29	0.774
		Clim. Dem.	-0.0003	-0.03	0.978
		Clim. x GDP	-0.02	-1.22	0.225
		Rice %	-0.05	-6.37	< 0.001
	Assent	Female	0.21	59.94	< 0.001
		GDP	-0.05	-2.36	0.019
		Clim. Dem.	-0.04	-3.69	< 0.001
		Clim. x GDP	0.04	1.80	0.073
		Rice %	0.05	5.82	< 0.001

	Word Category		*ß*	*t*	*P*
Self and Groups	Universalism	Female	-0.09	-23.19	< 0.001
		GDP	0.04	2.75	0.007
		Clim. Dem.	0.03	3.01	0.003
		Clim. x GDP	-0.05	-2.70	0.008
		Rice %	-0.04	-5.83	< 0.001
	Humans	Female	0.12	33.91	< 0.001
		GDP	-0.003	-0.11	0.912
		Clim. Dem.	0.04	3.34	< 0.001
		Clim. x GDP	-0.05	-1.98	0.048
		Rice %	-0.07	-6.62	< 0.001
	In/Outgroup: Connecting	Female	-0.0004	-0.11	0.909
		GDP	-0.05	-2.76	0.007
		Clim. Dem.	0.001	0.11	0.915
		Clim. x GDP	0.004	0.22	0.828
		Rice %	-0.03	-4.27	< 0.001
	In/Outgroup: Dividing	Female	-0.03	-3.36	< 0.001
		GDP	0.01	0.39	0.694
		Clim. Dem.	-0.04	-1.60	0.111
		Clim. x GDP	0.002	0.04	0.970
		Rice %	-0.03	-1.96	0.054
	Self	Female	-0.05	-10.46	< 0.001
		GDP	0.07	3.29	0.001
		Clim. Dem.	0.01	0.85	0.396
		Clim. x GDP	-0.06	-2.76	0.006
		Rice %	-0.03	-2.87	0.005

	Word Category		*ß*	*t*	*P*
Promotion Orientation and Emotion	Positivity/ Optimism	Female	-0.01	-1.68	0.092
		GDP	-0.01	-0.58	0.565
		Clim. Dem.	0.001	0.10	0.924
		Clim. x GDP	-0.02	-1.06	0.288
		Rice %	-0.08	-8.46	< 0.001
	Achievement	Female	-0.23	-67.34	< 0.001
		GDP	0.05	2.53	0.012
		Clim. Dem.	0.03	2.71	0.007
		Clim. x GDP	-0.04	-1.92	0.056
		Rice %	-0.06	-7.23	< 0.001
	Fashion and Trends	Female	0.02	3.90	< 0.001
		GDP	0.01	0.35	0.724
		Clim. Dem.	-0.003	-0.22	0.826
		Clim. x GDP	0.01	0.60	0.551
		Rice %	0.01	1.62	0.108
	Affect	Female	0.28	82.17	< 0.001
		GDP	-0.10	-4.11	< 0.001
		Clim. Dem.	-0.03	-2.17	0.031
		Clim. x GDP	0.04	1.65	0.100
		Rice %	-0.03	-2.46	0.015
Cog. & Dis.	Non-Fluencies	Female	0.20	57.56	< 0.001
		GDP	-0.02	-1.28	0.203
		Clim. Dem.	-0.02	-1.76	0.078
		Clim. x GDP	0.01	0.61	0.542
		Rice %	0.04	4.51	< 0.001

Note: Analyses are hierarchical linear models nested in prefectures. Climatic demands are calculated as the sum deviation from 22C in the average highs and lows of July and January. Climatic demands theory argues that cultures in harsher climates should be more collectivistic. A further version of this theory is that climatic demands have a weaker influence on culture in more developed areas because people use resources to buffer against the climate. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 prefecture GDP correlate $r = 0.98$, so the difference is negligible.

Table S11

Alternative Measures of Modernization: Service Sector

	Word Category		ß	t	P
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		Service Ind.	-0.06	-2.19	0.040
		% Urban	0.01	0.31	0.756
		% Herding	0.01	1.30	0.205
		% Cult. Land	-0.02	-1.19	0.247
		Rice %	-0.08	-5.35	< 0.001
	Causation	Female	-0.12	-58.56	< 0.001
		Service Ind.	-0.02	-0.77	0.448
		% Urban	0.02	0.79	0.438
		% Herding	0.01	1.54	0.137
		% Cult. Land	-0.00004	-0.002	0.998
		Rice %	-0.07	-4.49	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		Service Ind.	-0.03	-1.23	0.234
		% Urban	-0.01	-0.55	0.589
		% Herding	0.01	1.06	0.298
		% Cult. Land	-0.02	-1.72	0.101
		Rice %	-0.06	-4.95	< 0.001
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		Service Ind.	-0.05	-2.34	0.030
		% Urban	0.01	0.71	0.483
		% Herding	0.004	0.53	0.601
		% Cult. Land	-0.02	-1.65	0.115
		Rice %	-0.05	-4.03	< 0.001
	Assent	Female	0.18	93.53	< 0.001
		Service Ind.	0.03	0.81	0.426
		% Urban	-0.04	-1.36	0.187
		% Herding	-0.01	-0.97	0.342
		% Cult. Land	-0.004	-0.24	0.816
		Rice %	0.08	4.60	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		Service Ind.	0.01	0.42	0.678
		% Urban	-0.01	-0.28	0.780
		% Herding	0.02	2.37	0.025
		% Cult. Land	-0.01	-0.76	0.456
		Rice %	-0.05	-3.71	0.001
	Humans	Female	0.11	55.50	< 0.001
		Service Ind.	-0.05	-1.66	0.112
		% Urban	-0.01	-0.22	0.824
		% Herding	0.02	2.17	0.040
		% Cult. Land	-0.02	-1.01	0.324
		Rice %	-0.08	-4.46	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.12	0.905
		Service Ind.	0.003	0.18	0.863
		% Urban	-0.04	-2.46	0.022
		% Herding	0.02	2.90	0.007
		% Cult. Land	-0.02	-1.50	0.150
		Rice %	-0.02	-1.97	0.063
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		Service Ind.	0.07	2.16	0.043
		% Urban	-0.03	-1.01	0.322
		% Herding	-0.01	-0.66	0.512
		% Cult. Land	0.003	0.17	0.870
		Rice %	0.02	0.96	0.347
	Self	Female	-0.05	-17.61	< 0.001
		Service Ind.	0.02	0.65	0.521
		% Urban	0.004	0.21	0.836
		% Herding	-0.01	-1.06	0.300
		% Cult. Land	-0.01	-1.11	0.279
		Rice %	-0.01	-0.89	0.384
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.509
		Service Ind.	-0.05	-1.47	0.156
		% Urban	-0.002	-0.07	0.948
		% Herding	0.01	1.00	0.327
		% Cult. Land	-0.02	-1.07	0.295
		Rice %	-0.08	-4.68	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		Service Ind.	-0.01	-0.39	0.700
		% Urban	0.02	0.77	0.452
		% Herding	0.01	1.43	0.164
		% Cult. Land	0.003	0.15	0.884
		Rice %	-0.07	-3.87	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		Service Ind.	0.01	0.59	0.559
		% Urban	0.001	0.04	0.969
		% Herding	0.004	0.68	0.501
		% Cult. Land	0.01	0.69	0.497
		Rice %	0.01	0.81	0.428
	Affect	Female	0.26	137.08	< 0.001
		Service Ind.	-0.03	-1.26	0.223
		% Urban	-0.04	-1.70	0.103
		% Herding	0.01	1.65	0.112
		% Cult. Land	-0.03	-2.18	0.040
		Rice %	-0.02	-1.08	0.294
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		Service Ind.	-0.01	-0.43	0.668
		% Urban	-0.01	-0.20	0.845
		% Herding	-0.004	-0.48	0.638
		% Cult. Land	-0.01	-0.52	0.606
		Rice %	0.06	3.43	0.002

Note: Service sector employment is the percentage of employed people that are employed in the service sector per province. Modernization theorist Inglehart has argued that the shift to the service sector economy is a better indicator of modernization than GDP. Analyses are hierarchical linear models nested in provinces.

Table S12

Alternative Measures of Modernization: Private Industry

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		Private Ind.	-0.02	-0.69	0.496
		% Urban	-0.02	-0.97	0.344
		% Herding	0.01	1.40	0.174
		% Cult. Land	-0.003	-0.20	0.847
		Rice %	-0.06	-3.59	0.002
	Causation	Female	-0.12	-58.55	< 0.001
		Private Ind.	0.01	0.34	0.734
		% Urban	-0.002	-0.07	0.944
		% Herding	0.01	1.29	0.208
		% Cult. Land	0.001	0.05	0.960
		Rice %	-0.07	-3.95	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		Private Ind.	-0.02	-0.60	0.554
		% Urban	-0.02	-1.25	0.226
		% Herding	0.01	1.20	0.240
		% Cult. Land	-0.01	-0.97	0.344
		Rice %	-0.05	-3.67	0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		Private Ind.	-0.04	-1.44	0.166
		% Urban	-0.003	-0.17	0.869
		% Herding	0.01	1.04	0.309
		% Cult. Land	-0.003	-0.21	0.836
		Rice %	-0.03	-2.14	0.043
	Assent	Female	0.18	93.52	< 0.001
		Private Ind.	-0.03	-0.81	0.426
		% Urban	-0.005	-0.18	0.857
		% Herding	-0.01	-0.60	0.556
		% Cult. Land	-0.002	-0.09	0.932
		Rice %	0.09	4.30	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		Private Ind.	0.07	3.16	0.005
		% Urban	-0.03	-2.30	0.031
		% Herding	0.01	1.36	0.183
		% Cult. Land	-0.03	-2.39	0.025
		Rice %	-0.07	-5.54	< 0.001
	Humans	Female	0.11	55.51	< 0.001
		Private Ind.	0.02	0.62	0.539
		% Urban	-0.06	-2.12	0.045
		% Herding	0.02	1.69	0.103
		% Cult. Land	-0.02	-0.76	0.454
		Rice %	-0.08	-3.78	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.12	0.904
		Private Ind.	0.03	1.21	0.240
		% Urban	-0.05	-3.63	0.002
		% Herding	0.02	2.29	0.030
		% Cult. Land	-0.02	-2.04	0.054
		Rice %	-0.03	-2.45	0.023
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		Private Ind.	0.07	1.87	0.076
		% Urban	-0.01	-0.51	0.616
		% Herding	-0.02	-1.32	0.197
		% Cult. Land	-0.03	-1.43	0.167
		Rice %	-0.02	-0.73	0.470
	Self	Female	-0.05	-17.61	< 0.001
		Private Ind.	0.02	0.74	0.466
		% Urban	0.01	0.29	0.772
		% Herding	-0.01	-1.27	0.215
		% Cult. Land	-0.02	-1.56	0.132
		Rice %	-0.02	-1.31	0.204
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.507
		Private Ind.	-0.001	-0.03	0.976
		% Urban	-0.03	-1.31	0.204
		% Herding	0.01	0.92	0.366
		% Cult. Land	-0.01	-0.58	0.565
		Rice %	-0.08	-3.67	0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		Private Ind.	0.01	0.27	0.792
		% Urban	0.01	0.31	0.763
		% Herding	0.01	1.23	0.231
		% Cult. Land	0.003	0.13	0.900
		Rice %	-0.07	-3.47	0.002
	Fashion and Trends	Female	0.04	15.56	< 0.001
		Private Ind.	-0.01	-0.59	0.564
		% Urban	0.02	1.06	0.302
		% Herding	0.01	0.85	0.401
		% Cult. Land	0.01	0.76	0.454
		Rice %	0.01	0.90	0.377
	Affect	Female	0.26	137.08	< 0.001
		Private Ind.	-0.03	-1.13	0.272
		% Urban	-0.04	-2.16	0.042
		% Herding	0.02	1.95	0.063
		% Cult. Land	-0.02	-1.19	0.246
		Rice %	-0.002	-0.12	0.908
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		Private Ind.	-0.04	-1.03	0.314
		% Urban	0.003	0.14	0.886
		% Herding	-0.001	-0.05	0.959
		% Cult. Land	0.001	0.06	0.950
		Rice %	0.07	3.69	0.001

Note: Private industry employment is the percentage of employed people that are employed in private industry per province. This represents modernization in China's shift from the state-run economy to private enterprise. Analyses are hierarchical linear models nested in provinces.

Table S13

Alternative Measures of Modernization: Internet Penetration

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		Internet Pen.	-0.04	-1.21	0.240
		% Urban	0.0003	0.01	0.992
		% Herding	0.01	1.35	0.188
		% Cult. Land	-0.01	-0.76	0.455
		Rice %	-0.07	-4.22	< 0.001
	Causation	Female	-0.12	-58.55	< 0.001
		Internet Pen.	0.02	0.61	0.550
		% Urban	-0.01	-0.41	0.688
		% Herding	0.01	1.49	0.149
		% Cult. Land	0.01	0.33	0.746
		Rice %	-0.07	-4.45	< 0.001
	Certainty	Female	0.09	45.00	< 0.001
		Internet Pen.	-0.03	-0.96	0.349
		% Urban	-0.01	-0.33	0.741
		% Herding	0.01	1.14	0.267
		% Cult. Land	-0.02	-1.56	0.134
		Rice %	-0.05	-4.34	< 0.001
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		Internet Pen.	-0.03	-1.12	0.276
		% Urban	0.004	0.16	0.877
		% Herding	0.004	0.61	0.547
		% Cult. Land	-0.02	-1.13	0.271
		Rice %	-0.04	-2.92	0.008
	Assent	Female	0.18	93.52	< 0.001
		Internet Pen.	-0.04	-0.93	0.365
		% Urban	0.01	0.26	0.800
		% Herding	-0.01	-0.90	0.377
		% Cult. Land	-0.01	-0.64	0.531
		Rice %	0.09	4.67	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.84	< 0.001
		Internet Pen.	0.04	1.52	0.144
		% Urban	-0.03	-1.30	0.205
		% Herding	0.02	2.38	0.025
		% Cult. Land	-0.01	-0.63	0.534
		Rice %	-0.05	-4.35	< 0.001
	Humans	Female	0.11	55.51	< 0.001
		Internet Pen.	-0.004	-0.09	0.933
		% Urban	-0.04	-1.08	0.293
		% Herding	0.02	2.07	0.049
		% Cult. Land	-0.01	-0.55	0.587
		Rice %	-0.07	-3.83	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.13	0.895
		Internet Pen.	0.03	1.43	0.168
		% Urban	-0.07	-3.18	0.004
		% Herding	0.02	2.95	0.007
		% Cult. Land	-0.01	-1.37	0.187
		Rice %	-0.03	-2.48	0.023
	In/Outgroup: Dividing	Female	-0.01	-2.88	0.004
		Internet Pen.	0.11	3.10	0.005
		% Urban	-0.07	-2.10	0.046
		% Herding	-0.01	-0.81	0.422
		% Cult. Land	0.004	0.29	0.775
		Rice %	-0.01	-0.39	0.703
	Self	Female	-0.05	-17.59	< 0.001
		Internet Pen.	0.07	2.61	0.015
		% Urban	-0.04	-1.68	0.104
		% Herding	-0.01	-1.35	0.186
		% Cult. Land	-0.01	-0.94	0.360
		Rice %	-0.02	-1.83	0.082
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.67	0.506
		Internet Pen.	0.01	0.23	0.823
		% Urban	-0.04	-1.14	0.267
		% Herding	0.01	0.96	0.346
		% Cult. Land	-0.01	-0.62	0.544
		Rice %	-0.08	-4.20	< 0.001
	Achievement	Female	-0.21	-109.00	< 0.001
		Internet Pen.	0.05	1.28	0.214
		% Urban	-0.03	-0.76	0.452
		% Herding	0.01	1.36	0.184
		% Cult. Land	0.01	0.49	0.629
		Rice %	-0.07	-4.21	< 0.001
	Fashion and Trends	Female	0.04	15.58	< 0.001
		Internet Pen.	0.03	1.08	0.291
		% Urban	-0.01	-0.55	0.587
		% Herding	0.004	0.63	0.531
		% Cult. Land	0.01	0.78	0.445
		Rice %	0.004	0.42	0.680
	Affect	Female	0.26	137.07	< 0.001
		Internet Pen.	-0.06	-1.84	0.079
		% Urban	-0.02	-0.56	0.580
		% Herding	0.01	1.87	0.074
		% Cult. Land	-0.03	-2.26	0.034
		Rice %	-0.01	-0.36	0.719
Cog. & Dis.	Non-Fluencies	Female	0.18	90.22	< 0.001
		Internet Pen.	-0.07	-1.91	0.069
		% Urban	0.04	1.23	0.232
		% Herding	-0.003	-0.33	0.747
		% Cult. Land	-0.01	-0.76	0.454
		Rice %	0.07	4.23	< 0.001

Note: Internet penetration statistics are the percentages of internet users to total province population from the *China Internet Development Report 2008*. Internet penetration is an alternative indicator of modernization that is less sensitive to manipulation. Analyses are hierarchical linear models nested in provinces.

Table S14

Alternative Measures of Modernization: Historical GDP per Capita

	Word Category		ß	t	P
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		GDP 1995	-0.05	-1.30	0.206
		% Urban	0.003	0.10	0.922
		% Herding	0.02	1.70	0.101
		% Cult. Land	0.002	0.10	0.919
		Rice %	-0.06	-3.35	0.003
	Causation	Female	-0.12	-58.55	< 0.001
		GDP 1995	-0.001	-0.02	0.983
		% Urban	0.005	0.15	0.884
		% Herding	0.01	1.38	0.180
		% Cult. Land	0.004	0.21	0.838
		Rice %	-0.07	-3.75	0.001
	Certainty	Female	0.09	45.00	< 0.001
		GDP 1995	-0.05	-1.43	0.166
		% Urban	0.002	0.06	0.951
		% Herding	0.01	1.61	0.120
		% Cult. Land	-0.01	-0.60	0.557
		Rice %	-0.05	-3.37	0.003
	Possibility/ Openness	Female	0.08	37.81	< 0.001
		GDP 1995	-0.05	-1.34	0.194
		% Urban	0.01	0.35	0.731
		% Herding	0.01	1.07	0.297
		% Cult. Land	-0.003	-0.22	0.830
		Rice %	-0.03	-2.15	0.042
	Assent	Female	0.18	93.52	< 0.001
		GDP 1995	-0.01	-0.14	0.892
		% Urban	-0.02	-0.42	0.676
		% Herding	-0.01	-0.81	0.428
		% Cult. Land	-0.01	-0.36	0.724
		Rice %	0.08	3.91	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.85	< 0.001
		GDP 1995	0.07	2.28	0.033
		% Urban	-0.05	-1.99	0.060
		% Herding	0.01	1.36	0.187
		% Cult. Land	-0.02	-1.94	0.066
		Rice %	-0.06	-4.87	< 0.001
	Humans	Female	0.11	55.51	< 0.001
		GDP 1995	-0.01	-0.12	0.904
		% Urban	-0.04	-1.03	0.312
		% Herding	0.02	1.90	0.068
		% Cult. Land	-0.01	-0.43	0.674
		Rice %	-0.07	-3.36	0.003
	In/Outgroup: Connecting	Female	0.0003	0.12	0.903
		GDP 1995	0.02	0.81	0.428
		% Urban	-0.06	-2.56	0.018
		% Herding	0.02	2.29	0.030
		% Cult. Land	-0.02	-1.83	0.082
		Rice %	-0.03	-2.21	0.038
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		GDP 1995	0.14	2.98	0.007
		% Urban	-0.07	-1.99	0.059
		% Herding	-0.02	-1.96	0.059
		% Cult. Land	-0.04	-2.02	0.057
		Rice %	-0.03	-1.39	0.176
	Self	Female	-0.05	-17.61	< 0.001
		GDP 1995	0.04	1.23	0.233
		% Urban	-0.01	-0.50	0.624
		% Herding	-0.01	-1.52	0.139
		% Cult. Land	-0.02	-1.82	0.083
		Rice %	-0.02	-1.59	0.126
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.507
		GDP 1995	-0.02	-0.33	0.742
		% Urban	-0.02	-0.63	0.533
		% Herding	0.01	1.03	0.313
		% Cult. Land	-0.01	-0.43	0.669
		Rice %	-0.07	-3.50	0.002
	Achievement	Female	-0.21	-109.01	< 0.001
		GDP 1995	0.02	0.33	0.741
		% Urban	0.002	0.06	0.956
		% Herding	0.01	1.14	0.267
		% Cult. Land	0.002	0.08	0.934
		Rice %	-0.07	-3.50	0.002
	Fashion and Trends	Female	0.04	15.57	< 0.001
		GDP 1995	0.02	0.64	0.526
		% Urban	-0.004	-0.16	0.873
		% Herding	0.002	0.33	0.741
		% Cult. Land	0.002	0.17	0.869
		Rice %	0.003	0.23	0.816
	Affect	Female	0.26	137.08	< 0.001
		GDP 1995	-0.03	-0.85	0.406
		% Urban	-0.04	-1.31	0.203
		% Herding	0.02	1.83	0.079
		% Cult. Land	-0.02	-1.25	0.223
		Rice %	-0.004	-0.25	0.805
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		GDP 1995	-0.03	-0.71	0.487
		% Urban	0.01	0.20	0.845
		% Herding	-0.001	-0.11	0.916
		% Cult. Land	-0.001	-0.05	0.964
		Rice %	0.07	3.48	0.002

Note: Provincial GDP per capita statistics are year 1995 in RMB. Studies have found a lag between economic growth and cultural change, so we tested this historical indicator of economic development. Analyses are hierarchical linear models nested in provinces.

Table S15

Alternative Measures of Modernization: Historical Service Industry

	Word Category		ß	t	P
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		Serv. Ind. 1995	-0.03	-1.62	0.118
		% Urban	-0.01	-0.55	0.584
		% Herding	0.002	0.15	0.880
		% Cult. Land	-0.01	-0.85	0.405
		Rice %	-0.08	-5.07	< 0.001
	Causation	Female	-0.12	-58.56	< 0.001
		Serv. Ind. 1995	-0.03	-1.69	0.104
		% Urban	0.03	1.39	0.178
		% Herding	0.004	0.40	0.696
		% Cult. Land	-0.001	-0.05	0.958
		Rice %	-0.08	-4.90	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		Serv. Ind. 1995	-0.01	-0.93	0.362
		% Urban	-0.02	-1.18	0.250
		% Herding	0.003	0.36	0.720
		% Cult. Land	-0.02	-1.56	0.135
		Rice %	-0.06	-4.82	< 0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		Serv. Ind. 1995	-0.02	-1.29	0.209
		% Urban	-0.01	-0.41	0.689
		% Herding	-0.002	-0.29	0.778
		% Cult. Land	-0.02	-1.18	0.253
		Rice %	-0.05	-3.59	0.002
	Assent	Female	0.18	93.52	< 0.001
		Serv. Ind. 1995	0.01	0.49	0.627
		% Urban	-0.03	-1.20	0.243
		% Herding	-0.01	-0.53	0.598
		% Cult. Land	-0.01	-0.39	0.700
		Rice %	0.08	4.48	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		Serv. Ind. 1995	0.01	0.57	0.574
		% Urban	-0.01	-0.33	0.741
		% Herding	0.02	2.28	0.031
		% Cult. Land	-0.01	-0.80	0.433
		Rice %	-0.05	-3.62	0.001
	Humans	Female	0.11	55.50	< 0.001
		Serv. Ind. 1995	-0.04	-1.59	0.125
		% Urban	-0.02	-0.79	0.439
		% Herding	0.01	0.92	0.367
		% Cult. Land	-0.02	-0.82	0.419
		Rice %	-0.08	-4.45	< 0.001
	In/Outgroup: Connecting	Female	0.0002	0.12	0.907
		Serv. Ind. 1995	-0.02	-1.27	0.217
		% Urban	-0.03	-1.95	0.063
		% Herding	0.01	1.79	0.087
		% Cult. Land	-0.02	-1.90	0.073
		Rice %	-0.03	-2.43	0.025
	In/Outgroup: Dividing	Female	-0.01	-2.94	0.003
		Serv. Ind. 1995	0.03	1.30	0.204
		% Urban	-0.004	-0.13	0.896
		% Herding	0.003	0.20	0.844
		% Cult. Land	-0.003	-0.18	0.861
		Rice %	0.02	0.78	0.442
	Self	Female	-0.05	-17.61	< 0.001
		Serv. Ind. 1995	-0.0001	-0.01	0.994
		% Urban	0.02	0.89	0.379
		% Herding	-0.01	-0.88	0.384
		% Cult. Land	-0.02	-1.34	0.195
		Rice %	-0.01	-1.03	0.314
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.508
		Serv. Ind. 1995	-0.03	-1.32	0.197
		% Urban	-0.01	-0.60	0.557
		% Herding	0.001	0.10	0.920
		% Cult. Land	-0.02	-0.90	0.379
		Rice %	-0.08	-4.65	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		Serv. Ind. 1995	-0.02	-1.05	0.303
		% Urban	0.03	1.29	0.210
		% Herding	0.01	0.63	0.537
		% Cult. Land	0.002	0.09	0.926
		Rice %	-0.07	-4.09	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		Serv. Ind. 1995	0.01	0.60	0.556
		% Urban	0.003	0.19	0.854
		% Herding	0.01	0.89	0.378
		% Cult. Land	0.01	0.65	0.521
		Rice %	0.01	0.83	0.417
	Affect	Female	0.26	137.08	< 0.001
		Serv. Ind. 1995	-0.02	-1.05	0.306
		% Urban	-0.05	-2.51	0.019
		% Herding	0.01	0.77	0.447
		% Cult. Land	-0.03	-2.03	0.054
		Rice %	-0.02	-1.06	0.302
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		Serv. Ind. 1995	0.02	0.99	0.332
		% Urban	-0.03	-1.36	0.185
		% Herding	0.002	0.16	0.875
		% Cult. Land	-0.004	-0.25	0.805
		Rice %	0.07	3.81	< 0.001

Note: Studies have found a lag between economic growth and cultural change, so we tested this historical indicator of economic modernization. Analyses are hierarchical linear models nested in provinces. These analyses use the percentage of workers employed in the service industry as an indicator of modernization. As economies modernize, they tend to shift toward the service sector.

Table S16

Alternative Measures of Modernization: Historical Private Industry

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		Priv. Ind. 1995	0.02	0.69	0.495
		% Urban	-0.04	-2.22	0.038
		% Herding	0.01	1.25	0.222
		% Cult. Land	-0.01	-0.69	0.498
		Rice %	-0.08	-4.55	< 0.001
	Causation	Female	-0.12	-58.55	< 0.001
		Priv. Ind. 1995	0.02	0.77	0.451
		% Urban	-0.004	-0.23	0.820
		% Herding	0.01	1.58	0.127
		% Cult. Land	0.001	0.06	0.950
		Rice %	-0.07	-4.43	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		Priv. Ind. 1995	0.01	0.60	0.553
		% Urban	-0.04	-2.43	0.025
		% Herding	0.01	1.07	0.296
		% Cult. Land	-0.02	-1.49	0.151
		Rice %	-0.06	-4.57	< 0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		Priv. Ind. 1995	0.01	0.76	0.458
		% Urban	-0.03	-1.91	0.071
		% Herding	0.004	0.54	0.597
		% Cult. Land	-0.01	-1.08	0.293
		Rice %	-0.05	-3.32	0.003
	Assent	Female	0.18	93.52	< 0.001
		Priv. Ind. 1995	-0.03	-1.07	0.297
		% Urban	-0.01	-0.33	0.741
		% Herding	-0.01	-1.03	0.312
		% Cult. Land	-0.005	-0.27	0.793
		Rice %	0.09	4.66	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.86	< 0.001
		Priv. Ind. 1995	0.02	1.29	0.210
		% Urban	-0.01	-0.69	0.500
		% Herding	0.02	2.45	0.021
		% Cult. Land	-0.01	-1.21	0.242
		Rice %	-0.05	-4.22	0.001
	Humans	Female	0.11	55.51	< 0.001
		Priv. Ind. 1995	0.03	1.24	0.226
		% Urban	-0.06	-2.79	0.011
		% Herding	0.02	2.19	0.038
		% Cult. Land	-0.01	-0.80	0.433
		Rice %	-0.08	-4.29	< 0.001
	In/Outgroup: Connecting	Female	0.0002	0.12	0.906
		Priv. Ind. 1995	-0.004	-0.25	0.802
		% Urban	-0.04	-3.07	0.006
		% Herding	0.02	2.91	0.007
		% Cult. Land	-0.02	-1.52	0.143
		Rice %	-0.02	-1.81	0.084
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		Priv. Ind. 1995	0.03	1.09	0.290
		% Urban	0.01	0.38	0.707
		% Herding	-0.01	-0.63	0.535
		% Cult. Land	-0.01	-0.76	0.458
		Rice %	-0.002	-0.10	0.923
	Self	Female	-0.05	-17.62	< 0.001
		Priv. Ind. 1995	0.02	1.44	0.163
		% Urban	0.003	0.22	0.829
		% Herding	-0.01	-1.12	0.272
		% Cult. Land	-0.02	-1.72	0.100
		Rice %	-0.02	-1.60	0.123
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.506
		Priv. Ind. 1995	0.02	0.93	0.360
		% Urban	-0.05	-2.20	0.039
		% Herding	0.01	1.03	0.312
		% Cult. Land	-0.02	-0.85	0.405
		Rice %	-0.08	-4.40	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		Priv. Ind. 1995	0.01	0.45	0.659
		% Urban	0.01	0.35	0.732
		% Herding	0.01	1.46	0.157
		% Cult. Land	0.003	0.17	0.865
		Rice %	-0.07	-3.79	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		Priv. Ind. 1995	0.01	0.85	0.403
		% Urban	0.003	0.24	0.813
		% Herding	0.004	0.67	0.507
		% Cult. Land	0.003	0.32	0.749
		Rice %	0.003	0.29	0.776
	Affect	Female	0.26	137.08	< 0.001
		Priv. Ind. 1995	0.003	0.17	0.868
		% Urban	-0.06	-3.65	0.001
		% Herding	0.01	1.61	0.120
		% Cult. Land	-0.03	-1.83	0.081
		Rice %	-0.01	-0.80	0.434
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		Priv. Ind. 1995	-0.02	-0.72	0.480
		% Urban	-0.01	-0.32	0.751
		% Herding	-0.005	-0.50	0.622
		% Cult. Land	-0.005	-0.26	0.794
		Rice %	0.07	3.66	0.001

Note: Studies have found a lag between economic growth and cultural change, so we tested this historical indicator of economic modernization. Analyses are hierarchical linear models nested in provinces. This analysis uses the percentage of workers employed in private industry as a marker of modernization. This marker may be particularly important in representing China's shift from state-owned enterprises to private markets.

Table S17

Rice-Wheat Differences Robust to Differences in Ethnic Homogeneity

	Word Category		ß	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.98	< 0.001
		GDP	-0.005	-0.11	0.917
		% Urban	-0.02	-0.48	0.639
		% Han	-0.01	-1.25	0.223
		% Cult. Land	-0.01	-0.29	0.775
		Rice %	-0.08	-5.69	< 0.001
	Causation	Female	-0.12	-58.55	< 0.001
		GDP	0.002	0.03	0.975
		% Urban	0.01	0.14	0.887
		% Han	-0.01	-1.14	0.266
		% Cult. Land	0.004	0.19	0.848
		Rice %	-0.08	-5.56	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		GDP	-0.02	-0.48	0.636
		% Urban	-0.01	-0.19	0.849
		% Han	-0.005	-0.65	0.524
		% Cult. Land	-0.02	-1.26	0.221
		Rice %	-0.06	-5.93	< 0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		GDP	0.01	0.15	0.883
		% Urban	-0.03	-0.64	0.529
		% Han	-0.01	-0.79	0.435
		% Cult. Land	-0.01	-0.61	0.548
		Rice %	-0.04	-3.78	0.001
	Assent	Female	0.18	93.52	< 0.001
		GDP	-0.001	-0.02	0.986
		% Urban	-0.02	-0.39	0.701
		% Han	0.003	0.29	0.777
		% Cult. Land	-0.003	-0.14	0.886
		Rice %	0.09	5.64	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.85	< 0.001
		GDP	-0.02	-0.60	0.553
		% Urban	0.03	0.76	0.456
		% Han	-0.01	-1.17	0.256
		% Cult. Land	-0.02	-1.04	0.309
		Rice %	-0.06	-5.53	< 0.001
	Humans	Female	0.11	55.51	< 0.001
		GDP	-0.04	-0.74	0.466
		% Urban	0.01	0.12	0.903
		% Han	-0.02	-1.97	0.061
		% Cult. Land	-0.004	-0.18	0.859
		Rice %	-0.09	-5.53	< 0.001
	In/Outgroup: Connecting	Female	0.0003	0.13	0.899
		GDP	0.01	0.31	0.759
		% Urban	-0.05	-1.15	0.264
		% Han	-0.01	-1.09	0.286
		% Cult. Land	-0.03	-1.89	0.076
		Rice %	-0.04	-3.42	0.003
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		GDP	-0.10	-1.77	0.091
		% Urban	0.12	2.06	0.054
		% Han	-0.002	-0.24	0.812
		% Cult. Land	0.003	0.18	0.863
		Rice %	0.01	0.40	0.692
	Self	Female	-0.05	-17.61	< 0.001
		GDP	0.01	0.23	0.818
		% Urban	0.003	0.08	0.937
		% Han	0.01	1.17	0.253
		% Cult. Land	-0.02	-1.45	0.163
		Rice %	-0.01	-0.86	0.397
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.67	0.506
		GDP	-0.02	-0.44	0.663
		% Urban	-0.01	-0.10	0.918
		% Han	-0.01	-1.07	0.294
		% Cult. Land	-0.01	-0.36	0.719
		Rice %	-0.08	-5.41	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		GDP	0.01	0.13	0.896
		% Urban	0.01	0.18	0.855
		% Han	-0.004	-0.44	0.664
		% Cult. Land	-0.003	-0.15	0.882
		Rice %	-0.08	-5.07	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		GDP	-0.005	-0.16	0.877
		% Urban	0.02	0.46	0.647
		% Han	-0.001	-0.10	0.923
		% Cult. Land	0.003	0.26	0.799
		Rice %	0.003	0.30	0.766
	Affect	Female	0.26	137.09	< 0.001
		GDP	-0.06	-1.36	0.189
		% Urban	0.001	0.03	0.977
		% Han	-0.02	-2.42	0.023
		% Cult. Land	-0.02	-0.97	0.345
		Rice %	-0.02	-1.74	0.096
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		GDP	-0.02	-0.41	0.686
		% Urban	0.01	0.09	0.930
		% Han	-0.002	-0.22	0.828
		% Cult. Land	0.0001	0.004	0.996
		Rice %	0.07	4.41	< 0.001

Note: We indexed ethnic homogeneity using the percentage of ethnic Han per province, according to the 2000 Census. Ethnic Han are relevant because (1) different ethnicities may have substantively different cultures, (2) some ethnic groups speak in dialects or even language families that are different from the majority Han, and (3) this percentage reflects ethnic homogeneity. However, percent Han did not meaningfully predict regional differences in language use. Provincial GDP per capita statistics are from 2012 in RMB. The analyses in the main text use 2014 GDP at the request of a reviewer, but 2012 and 2014 GDP correlate $r = 0.99$, so the difference is negligible. Analyses are hierarchical linear models nested in provinces.

Table S18

Rice-Wheat Differences Robust to Pathogen Prevalence

	Word Category		*ß*	*t*	*P*
Cognition and Discourse	Cognitive Processes	Female	0.08	40.99	< 0.001
		Path. Prev.	-0.01	-0.87	0.393
		% Urban	-0.04	-2.38	0.027
		% Herding	0.01	1.10	0.280
		% Cult. Land	-0.01	-0.65	0.523
		Rice %	-0.07	-4.50	< 0.001
	Causation	Female	-0.12	-58.55	< 0.001
		Path. Prev.	-0.01	-1.40	0.175
		% Urban	-0.01	-0.51	0.618
		% Herding	0.01	1.39	0.176
		% Cult. Land	0.001	0.09	0.930
		Rice %	-0.07	-4.38	< 0.001
	Certainty	Female	0.09	45.01	< 0.001
		Path. Prev.	-0.005	-0.53	0.602
		% Urban	-0.03	-2.46	0.023
		% Herding	0.01	0.97	0.342
		% Cult. Land	-0.02	-1.44	0.164
		Rice %	-0.06	-4.60	< 0.001
	Possibility/ Openness	Female	0.08	37.82	< 0.001
		Path. Prev.	-0.01	-0.61	0.545
		% Urban	-0.03	-1.85	0.079
		% Herding	0.003	0.43	0.674
		% Cult. Land	-0.01	-1.00	0.331
		Rice %	-0.04	-3.18	0.004
	Assent	Female	0.18	93.52	< 0.001
		Path. Prev.	0.01	0.98	0.338
		% Urban	-0.01	-0.49	0.629
		% Herding	-0.01	-0.85	0.406
		% Cult. Land	-0.01	-0.38	0.705
		Rice %	0.08	4.41	< 0.001
Self and Groups	Universalism	Female	-0.08	-36.85	< 0.001
		Path. Prev.	-0.01	-0.79	0.437
		% Urban	-0.005	-0.34	0.740
		% Herding	0.02	2.24	0.033
		% Cult. Land	-0.01	-1.01	0.325
		Rice %	-0.05	-3.84	< 0.001
	Humans	Female	0.11	55.51	< 0.001
		Path. Prev.	-0.004	-0.27	0.787
		% Urban	-0.05	-2.23	0.036
		% Herding	0.02	2.02	0.054
		% Cult. Land	-0.01	-0.57	0.574
		Rice %	-0.07	-3.93	< 0.001
	In/Outgroup: Connecting	Female	0.0002	0.12	0.907
		Path. Prev.	0.005	0.63	0.534
		% Urban	-0.04	-3.10	0.006
		% Herding	0.02	3.00	0.006
		% Cult. Land	-0.02	-1.56	0.136
		Rice %	-0.02	-2.15	0.045
	In/Outgroup: Dividing	Female	-0.01	-2.93	0.003
		Path. Prev.	0.004	0.25	0.803
		% Urban	0.03	1.23	0.235
		% Herding	-0.01	-0.53	0.598
		% Cult. Land	-0.01	-0.46	0.654
		Rice %	0.01	0.40	0.691
	Self	Female	-0.05	-17.61	< 0.001
		Path. Prev.	-0.002	-0.17	0.866
		% Urban	0.01	1.00	0.327
		% Herding	-0.01	-1.07	0.291
		% Cult. Land	-0.02	-1.38	0.184
		Rice %	-0.01	-1.05	0.304
Promotion Orientation and Emotion	Positivity/ Optimism	Female	0.001	0.66	0.507
		Path. Prev.	-0.002	-0.15	0.879
		% Urban	-0.04	-1.78	0.089
		% Herding	0.01	0.95	0.349
		% Cult. Land	-0.01	-0.67	0.507
		Rice %	-0.08	-4.23	< 0.001
	Achievement	Female	-0.21	-109.01	< 0.001
		Path. Prev.	-0.01	-0.98	0.337
		% Urban	0.003	0.13	0.898
		% Herding	0.01	1.31	0.201
		% Cult. Land	0.003	0.17	0.867
		Rice %	-0.07	-3.79	< 0.001
	Fashion and Trends	Female	0.04	15.57	< 0.001
		Path. Prev.	0.004	0.53	0.602
		% Urban	0.01	1.07	0.295
		% Herding	0.005	0.75	0.458
		% Cult. Land	0.01	0.60	0.554
		Rice %	0.01	0.64	0.526
	Affect	Female	0.26	137.08	< 0.001
		Path. Prev.	0.02	1.68	0.105
		% Urban	-0.05	-3.06	0.006
		% Herding	0.02	1.91	0.067
		% Cult. Land	-0.02	-1.74	0.095
		Rice %	-0.01	-1.02	0.320
Cog. & Dis.	Non-Fluencies	Female	0.18	90.23	< 0.001
		Path. Prev.	-0.003	-0.29	0.774
		% Urban	-0.02	-0.93	0.361
		% Herding	-0.005	-0.50	0.618
		% Cult. Land	-0.01	-0.45	0.660
		Rice %	0.06	3.61	0.002

Note: Pathogen prevalence statistics measure rates of human-transmitted infectious diseases based on a study in 1976 (Chen, Campbell, Li, & Peto, 1990) that we supplemented with data from more recent Statistical Yearbooks to increase the sample of provinces. Analyses are hierarchical linear models nested in provinces.

Table S19

Rice-Wheat Border Differences for All Word Categories in Table 3

Word Category	Rice Side Words per 10,000	Wheat Side Words per 10,000	*t*	*P*	*95% CI*	
Cognitive Processes	861.12	871.21	2.91	0.004	[3.29	16.89]
Causation	87.50	89.19	2.84	0.005	[0.52	2.86]
Certainty	120.94	122.36	2.10	0.036	[0.09	2.75]
Possibility/Openness	132.45	134.58	2.61	0.009	[0.53	3.72]
Assent	460.57	446.12	-5.58	< 0.001	[-19.53	-9.38]
Non-Fluencies	54.80	53.15	-2.94	0.003	[-2.76	-0.55]
Universalism	15.21	15.24	0.13	0.897	[-0.38	0.44]
Humans	96.90	101.32	5.34	< 0.001	[2.80	6.04]
In/Outgroup: Connecting	19.45	19.89	1.78	0.074	[-0.04	0.91]
In/Outgroup: Dividing	3.47	3.43	-0.34	0.735	[-0.30	0.21]
I	127.90	130.77	2.51	0.012	[0.63	5.12]
Self	6.66	6.40	-2.32	0.020	[-0.47	-0.04]
Positivity/Optimism	20.48	22.28	5.67	< 0.001	[1.18	2.42]
Achievement	112.96	117.24	4.86	< 0.001	[2.56	6.01]
Fashion and Trends	10.79	10.42	-1.95	0.051	[-0.73	0.00]
Affect	710.86	713.00	0.74	0.462	[-3.55	7.83]
We	23.36	23.85	1.77	0.077	[-0.05	1.02]

Note: This table presents rice-wheat border tests for all word categories in Table 4. The rice-wheat border analysis in the main text focuses on the word categories that were significant for China as a whole. The border runs through Sichuan, Chongqing, Hubei, Jiangsu, and Anhui. Prefectures in these provinces are defined as rice if they devote more than 50% of cultivated land to paddies. These nearby prefectures differ sharply in rice (Talhelm and Oishi 2018) but very little in temperature, latitude, distance from contact with herding cultures, and other potential confounds.

Table S20

Convergent Validity Tests with Provincial/Prefecture Collectivism Indexes, Norm Tightness, Holistic Thought, and Self-Inflation

		Markers That Are Higher in Collectivistic Cultures								**Lower**	
	Word Category	Province Collectivism		Pref. Collectivism Index		Norm Tightness		Holistic Thought		Self-Inflation	
		r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Individualistic	Self	-0.04	0.836	-0.18	0.201	0.10	0.592	-0.24	0.200	0.33	0.083
	I	0.12	0.512	-0.09	0.557	-0.67	< 0.001	-0.21	0.257	0.04	0.825
	I/(I + We)	0.28	.126	0.11	0.437	-0.11	0.550	0.21	0.271	-0.16	0.432
	I (Controlling for General Pronoun Use)	0.38	0.039	0.11	0.456	-0.35	0.061	0.14	0.461	-0.10	0.636
Collectivistic	We	-0.28	0.122	-0.20	0.174	-0.60	< 0.001	-0.45	0.013	0.24	0.228
	Fashion/Trends	-0.23	0.204	0.14	0.321	0.31	0.088	-0.21	0.266	0.14	0.476

Note: Green shaded rows correlate in the theoretically consistent direction. Red shaded rows correlate in the inconsistent direction. The province and prefectural collectivism indexes are Z scores of (% 3-generation households - % living alone - % nuclear families – divorce to marriage ratio) based on prior indexes in the US and China (Vandello and Cohen 1999; Gong et al. 2021). The tightness of social norms comes from a survey of 11,662 people from 31 provinces. Holistic thought comes from tests using the triad categorization task with 1,019 students from 30 provinces. Self-inflation data comes from 515 college students from 28 provinces who completed the sociogram task. In the sociogram task, participants draw circles to represent the self and their friends. People in individualistic cultures draw the self much larger than friends on average, whereas people in collectivistic cultures show less self-inflation

Table S21A

Discriminant Validity: Newly Created Word Categories (Top) Correlations with LIWC (Left)

LIWC Word Categories	Newly Created Word Categories					
	Universalism	In/Outgroup: Connecting	In/Outgroup: Dividing	Self	Positivity/ Optimism	Fashion/ Trends
Achieve	0.16	0.04	0.07	0.21	0.52	0.05
Adverb	0.02	-0.02	0.01	0.08	0.28	-0.13
Affect	0.00	-0.05	-0.06	0.02	0.19	-0.07
Affiliation	0.09	0.01	-0.02	0.01	0.13	0.08
Anger	0.08	0.05	0.03	0.07	0.08	-0.11
Anxiety	0.04	-0.01	0.00	0.03	0.13	-0.07
Assent	-0.09	-0.05	-0.03	-0.06	-0.08	-0.08
Auxiliary Verbs	0.09	-0.02	0.01	0.13	0.41	-0.10
Biological Processes	-0.06	-0.06	-0.05	-0.04	0.09	-0.01
Body	-0.09	-0.05	-0.05	-0.07	-0.01	0.01
Cause	0.13	0.03	0.08	0.16	0.27	-0.07
Certainty	0.10	0.01	0.02	0.14	0.35	-0.05
Cognitive Processes	0.10	-0.01	0.04	0.17	0.42	-0.13
Comparisons	0.09	0.00	0.03	0.12	0.28	-0.04
Conjunctions	0.11	0.02	0.04	0.17	0.37	-0.11
Death	0.03	0.07	0.01	-0.01	-0.07	-0.10
Differences	0.08	0.01	0.03	0.15	0.36	-0.14
Discrepancy	0.08	-0.02	0.00	0.13	0.42	-0.10
Drives	0.16	0.06	0.06	0.14	0.35	0.02
Family	-0.06	0.00	0.00	-0.01	-0.01	-0.04
Feel	-0.06	-0.04	-0.02	-0.02	0.04	0.00
Female	-0.03	-0.01	0.01	-0.02	0.00	0.02
Focus Future	0.02	0.01	0.02	0.02	0.07	-0.05
Focus Past	-0.01	0.03	0.02	0.02	0.05	-0.11
Focus Present	0.00	0.06	0.02	0.03	0.08	-0.05
Friends	-0.02	0.10	0.01	-0.01	0.00	0.01
Function Words	0.03	-0.03	0.00	0.08	0.29	-0.16
General Particles[1]	0.09	0.00	0.02	0.11	0.25	-0.11
Health	0.04	0.00	-0.01	0.07	0.25	-0.06
Hear	-0.03	-0.01	-0.02	-0.03	-0.04	-0.03
Home	-0.06	0.00	0.01	-0.04	-0.12	0.02
Humans	0.13	0.02	0.02	0.18	0.38	-0.07
I	-0.09	-0.05	-0.04	-0.01	0.09	-0.11
Informal	-0.16	-0.09	-0.05	-0.12	-0.18	-0.10
Ingestion	-0.09	-0.04	-0.03	-0.06	-0.06	-0.02
Insight	0.01	-0.02	0.03	0.07	0.19	-0.13
Interrogatives	0.04	0.01	0.03	0.04	0.11	-0.06
Impersonal Pronouns	0.14	0.01	0.02	0.14	0.35	-0.13
Leisure	0.02	-0.01	-0.03	0.00	0.01	0.13
Male	-0.01	-0.01	0.01	0.00	-0.01	-0.05
Modal Particles	-0.17	-0.07	-0.06	-0.15	-0.26	-0.07

Note: Highlighting: $r \geq 0.20$, $r \geq 0.30$, $r \geq 0.40$, $r \geq 0.50$. Some researchers have suggested using correlations above 0.90 as clear signs of redundancy, 0.80 as a warning sign, and below 0.80 as acceptable (Rönkkö and Cho 2022). The in-group/out-group connecting category does not include "we." [1]General particles are grammatical function words, such as the possessive marker 的, which functions like the 's in "John's."

Table S21B

Discriminant Validity: Newly Created Word Categories (Top) Correlations with LIWC (Left)

LIWC Word Categories	Newly Created Word Categories					
	Universalism	In/Outgroup: Connecting	In/Outgroup: Dividing	Self	Positivity/ Optimism	Fashion/ Trends
Money	0.02	0.03	0.09	0.07	0.03	0.07
Motion	0.02	0.01	0.02	0.05	0.14	-0.04
Negations	0.08	0.00	0.02	0.13	0.36	-0.14
Netspeak	-0.11	-0.04	-0.04	-0.10	-0.21	0.08
Non-Fluencies	-0.11	-0.05	-0.04	-0.07	-0.10	-0.09
Numbers	-0.05	-0.02	-0.01	-0.03	-0.04	-0.08
Particles	-0.06	-0.06	-0.03	-0.04	-0.03	-0.11
Perceptual Processes	-0.07	-0.05	-0.05	-0.06	-0.05	0.04
Positive Emotion	-0.06	-0.08	-0.08	-0.06	0.03	0.02
Power	0.11	0.09	0.09	0.14	0.12	-0.03
Personal Pronouns	-0.01	-0.04	-0.04	0.01	0.23	-0.09
Prepositions	0.14	0.07	0.08	0.18	0.27	-0.10
Postposition[1]	0.01	0.02	0.03	0.02	0.01	-0.04
Progressive Markers[2]	-0.10	-0.03	0.00	-0.07	-0.13	-0.12
Pronouns	0.05	-0.03	-0.02	0.06	0.30	-0.11
Quantifiers	0.05	-0.02	0.01	0.07	0.18	-0.03
Measure Words[3]	-0.04	0.02	0.02	0.00	-0.06	-0.02
Relativity	0.08	0.06	0.06	0.08	0.18	-0.08
Religion	0.12	0.03	-0.01	0.05	0.09	-0.05
Reward	-0.03	-0.04	-0.04	0.00	0.17	0.01
Risk	0.12	0.06	0.06	0.16	0.31	-0.11
Sad	0.07	0.01	-0.02	0.07	0.29	-0.10
See	0.01	-0.01	-0.02	-0.03	-0.07	0.10
Sexual	-0.02	-0.05	-0.05	-0.04	0.05	0.06
She/He	0.02	0.00	0.01	0.03	0.05	-0.05
Social	0.08	0.01	0.02	0.10	0.29	-0.06
Space	0.18	0.06	0.09	0.08	0.10	-0.05
Specific Article[4]	0.05	0.02	0.03	0.02	0.02	-0.04
Swear Words	-0.05	-0.01	0.01	-0.04	-0.10	-0.07
Tense Marker[5]	-0.06	0.00	0.02	-0.03	-0.01	-0.14
Possibility/Openness (Tentat)[6]	0.05	-0.01	0.02	0.10	0.26	-0.06
They	0.07	0.06	0.03	0.07	0.06	-0.04
Time	-0.02	0.04	0.02	0.03	0.16	-0.07
Work	0.12	0.10	0.12	0.15	0.18	0.00
We	0.07	0.04	-0.01	0.05	0.16	-0.01
You	0.05	-0.04	-0.04	0.00	0.27	-0.03
You Plural[7]	-0.06	0.00	0.00	-0.06	-0.08	-0.02

Note: Highlighting: $r \geq 0.20$, $r \geq 0.30$, $r \geq 0.40$, $r \geq 0.50$, $r \leq -0.20$. The in-group/out-group connecting category does not include "we." [1]Postposition: Grammatical word that comes after the word it modifies, such as 的 to mark possession. [2]Progressive markers communicate progressive tense, such as 了. [3]Measure words count objects, such as "bowl" in "one bowl of soup" (一碗汤). [4]Specific articles denote a specific object/actor, such as 各 (each) and 某 ([a] certain [person/thing]). [5]Tense markers mark time, such as "recently" (近日). [5]We title the LIWC category of “tentative” as “possibility/openness.” [7]You plural: Second person plural, such as 你们 (similar to "y'all" in English).

Table S22A

Words in Newly Created Categories: Ingroup-Outgroup and Universalism

Ingroup-Outgroup Connecting		**Universalism**	
熟人	Acquaintance/familiar person	人类	Humanity/mankind
同胞	Compatriot	全球	Global/worldwide
同伴	Companion	博爱	Universal fraternity/love
同伙	Partner	共同	Common/shared/mutual
我们	We/us	公民	Citizen
同行	Colleague/fellow practitioner	人民	The people/populace
集体	Collective/group	公共	Public
故乡	Hometown	人间	Human world/Earth
Ingroup-Outgroup Dividing		世界	World
外地人	Outsider (from a diff. Place, not local)	宇宙	Universe
外行	Outsider (to a profession/industry)	大众	The masses/public
内部	Internal	公众	Public/audience
外部	External	团结	Unity/solidarity
局外人	Outsider (someone not a part of a group or activity)	全民	All the people/entire nation
外行人	Outsider (to a profession/industry)	环球	Global/worldwide
外人	Outsider (often refers to non-locals)	世间	The world/Earth
外地	Another place/elsewhere	世上	In the world/on Earth
异地	Different place/elsewhere	天地	Heaven and earth (meaning “world” or “everywhere”)/universe

Table S22B

Words in Newly Created Categories: Positivity/Optimism

Positivity/Optimism			
理想	Ideal	用心	Attentive/meticulous
目标	Goal/objective	改进	Improve/make better
追求	Pursue	改善	Improve/betterment
乐观	Optimistic/optimism	战胜	Defeat/overcome
积极	Positive/proactive	果断	Decisive/resolute
自信	Self-confidence	激励	Inspire/encourage
进步	Progress/improvement	坚决	Firm/resolute
鼓励	Encourage/urge	决心	Determination/resolve
努力	Effort/try hard/strive	鼓舞	Inspire/encourage
坚持	Persevere	把握	Grasp/seize
坚定	Steadfast/resolute	完善	Perfect/improve
实现	Realize (bring something into being)/fulfill	投入	Dedicate (oneself to an effort)/committed
信心	Confidence	勇敢	Brave/courageous
选择	Choose/choice	勇气	Courage/bravery
坚强	Strong/staunch/firm	梦想	Dream/aspiration
超越	Surpass/surmount	成长	Grow/growth
发愤	Make a firm resolution/make determined effort/strive	抱负	Ambition/aspiration
发奋	Work hard/make a firm resolution	雄心	Ambition/lofty aspiration
奋斗	Strive/struggle (toward a goal)	成就	Achievement/accomplishment
奋发	Work hard/make a firm resolution	励志	Inspiring/motivational
坚忍	Steadfast (in face of difficulties)	进取	Keep forging ahead/enterprising
克服	Overcome/conquer	争气	Work hard for something/bring credit to
力争	Strive/make all efforts	坚韧	Tenacious/perseverance
勤奋	Diligent/industrious	坚守	Adhere to/hold fast
勤恳	Diligent/conscientious	卓越	Excellence/outstanding
勤勉	Diligent/assiduous	前途	Prospects/future
驱策	Urge/impetus	拼搏	Go all out/strive
意志	Will/determination	坚信	Firmly believe/conviction
毅力	Willpower/perseverance/tenacity	立志	Resolve/determination
用功	Diligent/hardworking		

Table S22C

Words in Newly Created Categories: Fashion/Trends

Fashion/Trends			
潮流	Trend/tide	时装	Fashionable dress/latest fashion
热门	Popular/hot (as in “in style”)	名牌	Famous brand/name brand
畅销	Best-selling/popular	人气	Popularity/fine quality
达人	Connoisseur/enthusiast/guru	炒作	Hype/publicity stunt
时髦	Fashionable/trendy	风靡	Popular/in vogue
流行	Popular/in fashion	女星	Female star/actress
名流	Celebrities	巨星	Superstar/mega-star
名人	Celebrity/famous person	明星	Star/celebrity
过时	Outdated/out of fashion	热点	Hot topic/hotspot
趋势	Trend	热销	Hot-selling/popular
新潮	New fashion/new trend	盛宴	Grand feast/banquet
走红	Become popular/go viral	热卖	Hot-selling/best-selling
出名	Become famous/well-known	时尚	Fashion/trend
天王	Top star/emperor	高档	High-end/upscale
有名	Famous/well-known	奢华	Luxurious/luxury
影响力	Influence (noun)/impact	新款	New style/new model
知名	Well-known/renowned	品牌	Brand
品位	Taste (artistic)/style		

Note: We consulted the dictionary Pleco, ChatGPT, and the authors’ knowledge of Chinese to translate these words into English.

References

Barry H, Child IL, Bacon MK (1959) Relation of child training to subsistence economy. Am. Anthropol. 61(1):51–63

Chen J, Campbell TC, Li J et al. (1990) *Diet, life-style and mortality in China: A study of the characteristics of 65 Chinese counties.* Oxford University Press, Oxford, UK

Dong X, Talhelm T, Ren X (2019) Teens in rice county are more interdependent and think more holistically than nearby wheat county. Soc. Psychol. Personal. Sci. 10(7):966–976

Dunning D, Cohen GL (1992) Egocentric definitions of traits and abilities in social judgment. J. Pers. Soc. Psychol. 63(3):341–355

Goldschmidt W (1971) Independence as an element in pastoral social systems. Anthropol. Q. 44(3):132–142

Gong W, Zhu M, Gürel B et al. (2021) The lineage theory of the regional variation of individualism/collectivism in China. Front. Psychol.:4047

Huang C-L, Chung CK, Hui N et al. (2012) The development of the Chinese linguistic inquiry and word count dictionary. Chin. J. Psychol. 54(2):185–201

Inglehart R, Baker WE (2000) Modernization, cultural change, and the persistence of traditional values. Am. Sociol. Rev. 65(1):19–51

Inglehart R, Norris P (2003) *Rising tide: Gender equality and cultural change around the world*. Cambridge University Press, New York, NY

Kashima Y, Kashima ES (2003) Individualism, GNP, climate, and pronoun drop: is individualism determined by affluence and climate, or does language use play a role? J. Cross-Cult. Psychol. 34(1):125–134

Li X ed. (2017) *China Statistical Yearbook 2001*. National Bureau of Statistics of China, Beijing, China

Miller JG, Bersoff DM (1992) Culture and moral judgment: how are conflicts between justice and interpersonal responsibilities resolved? J. Pers. Soc. Psychol. 58(1):33–47

Rönkkö M, Cho E (2022) An updated guideline for assessing discriminant validity. Organ. Res. Methods. 25(1):6–14

Talhelm T, Oishi S (2018) How rice farming shaped culture in southern China. In: Uskul, AK, Oishi, S (eds.) Socioecon. Environ. Hum. Psychol. Oxford University Press, New York, NY, pp. 53–76

Talhelm T, Zhang X, Oishi S (2018) Moving chairs in Starbucks: observational studies find rice-wheat cultural differences. Sci. Adv. 4:eaap8469. https://doi.org/10.1126/sciadv.aap8469

Talhelm T, Zhang X, Oishi S et al. (2014) Large-scale psychological differences within China explained by rice versus wheat agriculture. Science. 344(6184):603–608

Triandis HC (1995) *Individualism & collectivism.* Westview Press, Boulder, CO

Uskul AK, Kitayama S, Nisbett RE (2008) Ecocultural basis of cognition: farmers and fishermen are more holistic than herders. Proc. Natl. Acad. Sci. 105(25):8552–8556

Van de Vliert E, Yang H, Wang Y et al. (2012) Climato-economic imprints on Chinese collectivism. J. Cross-Cult. Psychol. 44(4):589–605

Vandello JA, Cohen D (1999) Patterns of individualism and collectivism across the united states. J. Pers. Soc. Psychol. 77(2):279–292