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Rice culture and the cushion hypothesis: Experimental evidence from incentivized risk taking tasks

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ABSTRACT

Cumulative evidence points to the validity of the Hsee and Weber (1999) cushion hypothesis suggesting that people in a collectivist society, such as China, have greater capacity to take on risks than members of an individualistic society such as the United States, because they are more likely to receive help if they are in need (i.e., they could be 'cushioned'), and consequently, less risk averse than those in an individualistic society. Rice theory Talhelm et al. (2014) points to a parallel between East–West difference and what differentiates the rice farming South from the wheat farming North in China in the individualism–collectivism dimension. These hypotheses jointly predict that people from China's rice farming regions would be more risk tolerant than their counterparts from the wheat farming regions. Using incentivized decision making tasks, we find support for the cushion hypothesis being applicable within China in a large sample of subjects recruited in Beijing.

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"*Simply put, you do not need to farm rice yourself to inherit rice culture.*" Talhelm et al. (2014)

1. Introduction

In *The Geography of Thought*, Nisbett (2003) writes: "Agricultural peoples need to get along with one another ... This is particularly true for rice farming, characteristic of southern China and Japan, which requires people to cultivate the land in concert with one another". This suggests that the 10,000 years history of rice farming (Huang et al., 2012) may have led to the emergence of a rice culture which has influenced, across generations, the psychology, cognition, and cultural attitudes of the Chinese people, especially in terms of their keen awareness of mutual interdependence. Nisbett also observes that by the sixth century B.C., "the Greeks were in the habit of arguing with one another in the marketplace and debating one another in the political assembly", given that they were abler to act on their own to a greater extent without the need to maintain harmony with fellows at any cost. This is consonant with Talhelm et al.'s (2014) *rice theory*, highlighted in the epigraph, which links interdependent–independent and analytic–holistic thinking types to rice farming in Southern and Northern regions in China, offering a possible parallel to the contrast between Eastern and Western cultures in the world. Talhelm et al. (2014) find that modern day students, without any exposure to actual rice farming, who were born in areas of China with high percentage of paddy farming, differ from students from wheat regions across a battery of psychological tests pointing to a more interdependent culture.

In an influential paper, Hsee and Weber (1999) propose the *cushion hypothesis* to account for the robust finding in the literature that Americans are more risk averse than Chinese:

"… people in a socially collectivist society, such as China, are more likely to receive help if they are in need (i.e., they could be cushioned if they fell); consequently, they can afford to take on more risky gambles than members of an individualistic society such as the United States, because they will be cushioned if an extremely bad outcome occurs. Since the cultural collectivism serves as mutual insurance against catastrophic losses, risks faced by members of the collective are, in fact, smaller".

Risk attitude may differ depending on the probability size of risk events. In the fourfold pattern of risk attitude (Tversky and Kahneman, 1992), people are generally risk averse towards gain risks involving moderate probabilities, e.g., 50–50, called *moderate prospects*, and towards small-probability loss risks, called *longshot hazards.* By contrast, they tend to be risk seeking when facing *moderate hazards* in which probabilities of losses are not small and when entertaining the purchasing a *longshot prospect*, e.g., lottery ticket, which delivers sizable gains with small probabilities. The intuition underpinning cushion hypothesis applies to the two kinds of risks for which risk aversion is pervasive, namely, moderate prospects and longshot hazards. It is arguably not applicable to moderate hazards and longshot prospects involving prevalent risk affinity. To test the cushion hypothesis, we make use of tasks related with moderate prospects (Even-Chance Gain,

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Sure Bet, Lower Bet, Upper Bet, and Investment) and longshot hazards (Longshot Loss) only rather than moderate hazards and longshot prospects".

In rice theory, the influence of rice culture is proxied by rice farming ratio of the birth province. Bring together rice theory and the cushion hypothesis yields a prediction in the context of China with an ethnically and politically homogeneous population, namely, the Han Chinese.

Prediction: Rice culture, proxied by rice farming ratio of the birth province, predicts greater risk tolerance towards moderate prospects and longshot hazards.

We test our prediction with 1213 Han Chinese university students in Beijing who received RMB 320 on average in an incentivized experimental study over 2010 and 2012 using nine risk taking tasks.

2. Method

Six Risk Taking Tasks

Five tasks involving gain risks with moderate probabilities and a longshot hazard task are described here. Details on the three other risk-taking tasks along with eight uncertainty related tasks, involving ambiguity, compound risks, and familiarity, are provided in the supplementary materials (SM).

Even-chance Gain. Participant faces 10 choices between (A) even-chance lottery paying ¥240 or ¥0, and (B) receiving a sure amount ranging from ¥60 to ¥140 in ten steps.

Sure Bet. Participant faces 10 choices between (A) receiving sure amount ¥120 versus (B) lottery paying ¥240 with probability p, otherwise ¥0; p ranges from 48% to 66% in ten steps.

Lower Bet. Participant faces 10 choices between (A) even-chance lottery paying ¥120 or ¥0, and (B) lottery paying ¥240 with probability p, otherwise, ¥0; p ranges from 24% to 33% in ten steps.

Upper Bet. Participant faces 10 choices between (A) even-chance lottery paying ¥120 or ¥240, and (B) lottery paying ¥240 with probability p, otherwise ¥0; p ranges from 74% to 83% in ten steps.

Investment. Participant is endowed with ¥108 and has the option to invest an amount, up to ten increments of ¥12 each, on an experimental stock which pays 2.5 times of the amount invested with 50% probability or else nothing.

Longshot Hazard. Participant faces 10 choices between (A) losing ¥60 with 2% probability, otherwise ¥0, and (B) lottery paying ¥240 with probability p, otherwise ¥0; and (B) losing a sure amount for sure; the sure loss amount ranges from ¥0.40 to ¥8 in ten steps.

Except for the investment task where risk attitude is reflected in the investment amount, risk attitudes in the other five tasks are indicated by the switch points from Option A to Option B.

Empirical Strategy

To investigate the relationship between exposure to rice culture and risk tolerance using risk taking tasks, we use both ordinary least square (OLS) regression and instrumental variable (IV) regression. The following equation is our baseline regression model:

$$Y_{i,p} = \alpha + \beta Rice_p + \lambda X_{i,p} + \eta W_p + e_{i,p} \quad (1)$$

where $Y_{i,p}$ refers to the decision of individual i in province p, $Rice_p$ is the proportion of paddy rice farming relative to the total planted area in the province p, $X_{i,p}$ refer to individual control variables including gender, family income, whether parents are farmers, and the session fixed effect. W_p refer to province level control variables such as provincial GDP per capita, the proportion of agriculture sector in the whole economy, and population density which are dated in 1996.

We apply IV regression to address potential measurement errors arising from the earlier date of the 1996 rice farming data and the possible reverse causality between rice farming and cooperative behavior. The United Nations Food and Agriculture Organizations Global Agro-ecological Zones database offers several indices on the environmental suitability for growing crops including rice, computed using multiple dimensions of geographic information from temperature, humidity, evaporation, soil quality, and slope. The suitability index for crop is widely used to measure the natural conditions for the farming of crops in the research literature. For example, Alesina et al. (2013) and Talhelm et al. (2014) use the suitability index as the instrument to address possible endogeneity problems relating to agricultural production using IV regression.

Following Talhelm et al. (2014), we adopt the rice suitability index RiceIndexp as instrument to assess the percentage of rice farming and arrive at an additional equation for the first-stage regression for IV:

$$Rice_p = \mu + \delta RiceIndex_p + \kappa X_{i,p} + \varphi W_p + \nu_{i,p} \quad (2)$$

In addition, we cluster the standard error at the province level to handle the possible correlations inside the same province due to culture or other factors.

3. Results

We investigate the five moderate prospects over gains directly related to the cushion hypothesis. As predicted, column (1) of Table 1 shows that the switch point of the Even-chance Gain relates positively to $Rice_p$ according to OLS regression with the control variables: the coefficient of $Rice_p$ is 0.746 ($p < 0.01$), indicating higher rice farming is associated with higher risk taking. Our finding is further strengthened by IV regression in column (2) showing that the coefficient of $Rice_p$ increases to 0.885 ($p < 0.01$), indicating a slightly bigger effect of rice farming on risk taking. Column (3) in Table 1 shows that the coefficient of $Rice_p$ for Sure Bet is – 0.915 ($p < 0.01$) in OLS and −1.027 ($p < 0.01$) in IV, indicating similarly strong support for the prediction. The corresponding results for the lower bet and upper bets, and for investment are similar. We do not find significant association between longshot hazard and $Rice_p$ although the negative signs of the coefficients under OLS and IV (columns 17 and 18) are in line with the cushion hypothesis. The other three risk tasks are not in the risk aversion domain according to the original cushion hypothesis and the fourfold risk pattern. As anticipated, we do not find significant association between $Rice_p$ and any of the other three tasks, namely, longshot prospect (1% chance of receiving ¥800), moderate hazard (50% chance of losing ¥120), and mixed risk (50% chance of ¥120 and 50% chance of losing ¥64).

When we combined all the 5 tasks, the estimated coefficient of $Rice_p$ on risk aversion parameter is −0.0058 ($p < 0.001$) in SM Table C.1, and it suggests that 1 percent of increasing of rice farming in the province decreases the risk aversion parameter by 0.0058 – the magnitude is small but statistically significant.

In addition, in almost all the tasks in SM Table D.6, the coefficients of the interaction term between rice farming and whether parents are farmers are not statistically significant (only one exception for the OLS for the Sure Bet task which is significant with $p < 0.1$). The overall results seem to reject the idea that having a farmer parent could make the effect larger, and are consistent with the cultural hypothesis: the effect of rice farming is being passed down through cultural means, not solely by direct farming experience.

To test whether the risk of weather-related property damages could influence risk tolerance, we added two new control variables: one is the proportion of floods in each province from 1850

Table 1
Rice culture and risk tasks.

Dependent variable:	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV	(9) OLS	(10) IV
	Even-chance gain		**Sure bet**		**Lower bet**		**Upper bet**		**Investment**	
$Rice_p$	0.746***	0.885***	−0.915**	−1.027***	−0.681**	−0.938***	−0.318	−0.553*	0.486*	0.583*
	(0.239)	(0.265)	(0.388)	(0.371)	(0.322)	(0.322)	(0.255)	(0.283)	(0.25)	(0.344)
Observations	969	969	1040	1040	1033	1033	1036	1036	1097	1097
R-squared	0.065	0.065	0.03	0.03	0.023	0.023	0.037	0.036	0.037	0.037

Dependent variable:	(11) OLS	(12) IV	(13) OLS	(14) IV	(15) OLS	(16) IV	(17) OLS	(18) IV
	Even-chance loss		**Mixed risk**		**Longshot gain**		**Longshot loss**	
$Rice_p$	0.075	−0.361	0.315	0.107	−0.365	0.021	−0.023	−0.113
	(0.274)	(0.389)	(0.379)	(0.408)	(0.311)	(0.315)	(0.383)	(0.526)
Observations	983	983	788	788	1036	1036	1038	1038
R-squared	0.024	0.023	0.092	0.092	0.043	0.042	0.023	0.023

Notes: Standard errors in parentheses clustered at the province level. The dependent variable is the switch point for the 10 choices in each risk task with one exception: Investment is the chosen level. The controls include sex, family income, parents are farmers, provincial GDP per capita in 1996, the proportion of agriculture sector in the whole economy in 1996, population density in 1996, and the session fixed effect for 21 experimental sessions. The full regression results are provided in SM.
*Significant at 10%.
**Significant at 5%.
***Significant at 1%.

to 1911, and the other is the proportion of floods and draughts affected area in each province from 1985 to 1993. We found that our main results of rice farming are robust with the new control variable in SM Table D.4 and Table D.5.

Further details on the results of the estimations along with descriptive statistics and structural estimation are provided in SM.

4. Conclusion

To our knowledge, this is the first paper testing the cushion hypothesis in conjunction with the rice theory using incentivized risk-taking tasks. We find overall support for the cushion hypothesis, especially where it concerns gain risks with moderate probabilities, being applicable within China using a large geographically representative sample of subjects recruited in Beijing. Our research echoes the work of Zhou et al. (2022) testing the rice theory in relation to cooperativeness using incentivized behavioral games. The current study further lends support to the idea of rice culture having an enduring influence on behavior, including economic decision making, independent of the individual's experience with actual farming practices.

Data availability

Data will be made available on request.

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Appendix A. Supplementary materials

Supplementary materials related to this article can be found online at https://doi.org/10.1016/j.econlet.2022.110967.

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