1-3-2022

The Rice Theory of Culture

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Recommended Citation

Talhelm, T. (2022). The Rice Theory of Culture. *Online Readings in Psychology and Culture*, 4(1). <https://doi.org/10.9707/2307-0919.1172>

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The Rice Theory of Culture

Abstract

The rice theory of culture is the idea that rice farming societies developed into more interdependent, tight cultures in response to the demands of the plant. Farming in general is an interdependent subsistence style, but traditional paddy rice farming was starkly different from other major crops like wheat, corn, and potatoes. Paddy rice required twice as much labor per hectare as wheat farming. Farmers responded by creating customs to share labor. Paddy rice also depended on irrigation systems to flood and drain the fields. Once farmers controlled water, they now had to coordinate how much water each farmer got, when to flood their fields, and how to divide the labor for repairing the canals. This created a tight society, where people depended on each other, and individual farmers had less freedom of movement. This article gives an overview of the theory, summarizes recent evidence of cultural differences between rice and wheat societies, and then lays out unanswered questions for future research.

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The Rice Theory of Culture

In the 1600s, there was a popular Chinese farming almanac called the *Shenshi Nongshu* or *Master Shen's Book on Agriculture* (沈氏农书). It advised farmers on when to plant crops, how to preserve foods, and how to take care of pigs. The almanac also provides a window into how different rice farming was. It recommended: "If one is short of labor, it is best to grow wheat" (Elvin, 2008, p. 30).

This is one of the key differences between rice and wheat, and it was no secret. It would have been nearly impossible for this fact to be a secret. It was obvious. Anthropologists observing traditional rice farmers found that rice required twice the number of labor hours as wheat (Bray, 1986; Buck, 1935; Fei, 1945). It's hard not to notice double.

This was true across situations. And it was true whether the farmer was in China (Fei, 1945), Malaysia (Bray, 1986), Japan (Suehara, 2006), or West Africa (Richards, 1987). It was true when the same farmer planted the same field with rice in one year and corn in the next year (Fei, 1945). Rice is a fundamentally different plant from the other major staple crops of the world, and this fundamental

The Rice Theory

Two elements of paddy rice made it starkly different from other crops: labor and irrigation. To be sure, there were other differences as well. Rice grows in wet climates. Rice areas tend to be hotter. Rice regions had denser populations. I explore some of these additional causes and outcomes at the end of the article. But labor and irrigation were the differences most fundamental to growing the rice plant.

Double the Labor

The labor burden of rice farming was crushing. Researchers have calculated that a single family could not provide enough labor to farm enough food to survive (Wong, 1971). Labor was particularly critical during short time windows of transplanting and harvesting—tasks that farmers had to complete quickly or risk rot, loss, or theft by animal. In rice villages near Shanghai, farmers would hold gatherings to drink alcohol and "shout in drunken fashion and mutually encourage each other to endure the bitter work" (Elvin, 2008, p. 211).

Rice was more work for a few reasons. Rice farming involved tasks that were not rewarded by crops like wheat, such as transplanting and flooding. You can flood wheat, but it won't produce more wheat. The differences even hold for tasks that both rice and wheat farmers had to do, like weeding. Weeding took longer for rice farmers because the wet and muddy fields made the work harder (Hayami, 1978, p. 27).

Before modern diesel pumps, some farmers flooded their fields by using their feet to pedal chains with buckets on (Bray, 1986). By one estimate, pumping water alone would take 70 hours of work for a single rice farm (Vermeer, 1977, p. 170). And as fast-growing varieties became available, rice regions could grow two or three crops a year, which

compressed the tasks even further (Richards, 1987; Talhelm, 2015).

Irrigation

Besides the labor, there was the standing water. Unlike other major crops, rice rewards farmers who can keep their fields flooded. Dryland rice produces 1.2 tons per hectare, but flooded rice produces 5 tons (Khush, 1997). Flooding also controls weeds (International Rice Research Institute, 2009). Although it is possible to grow rice on dry land, the large difference in productivity explains why only 4% of rice production around the world is dryland (International Rice Research Institute, 2009).

The irrigation systems of rice farming were important for society because they presented a commons dilemma (Aoki, 2001). An irrigation system would produce more rice for a single farmer, but it's beyond the ability of a single farmer to build one. Plus, that single farmer would not want to bear the cost of repairing the system every year. Flooding or draining fields "cannot usually be carried out without the cooperation of a relatively large community" (Bray, 1986, p. 68).

Irrigation also shifts farmers away from the equal justice of rainfall. In villages that rely on rain, it rains (or fails to rain) equally on all farmers' fields. But when farmers start controlling water, they must now decide how who gets how much water. "Using water effectively required collective organization" (Blunden, 1983, p. 208). When drought strikes, farmers in some villages needed to decide whose fields will get enough water and whose fields will remain dry.

These irrigation systems tied farmers together. For example, farmers near Shanghai set up work assignments for different farmers to fill, drain, and dredge their irrigation system (Fei, 1983). The village also punished people who failed to show up for work. In Indonesia, rice villages set up groups to manage the irrigation network and water distribution (Suarja & Thijssen, 2003). The end result is that rice farmers relied on each other more than wheat farmers.

Evidence for Rice-Wheat Differences

China provides fertile ground for testing the rice theory because it is a large, relatively homogenous country that has farmed both rice and wheat for thousands of years. Although there is certainly diversity within China, the population is over 90% ethnic Han Chinese with a single government. Han China also shares a language family and religious history. If we compare China to similarly large areas and populations like South Asia and Europe, we find more linguistic, religious, and governmental fractionalization outside of China. That diversity makes it harder to pull apart the effects of farming from religion, language, and government.

To test the theory, my colleagues and I gave psychological tests to over 1,000 people from all over China. I found that students who grew up in rice-farming parts of China had more markers of interdependent culture than students who grew up in wheat-farming areas (Talhelm et al., 2014). For example, in the sociogram task, participants drew circles to

represent themselves and their friends. What we did not tell participants is that we would measure how big they drew the circles for the self versus friends. Previous research found that Westerners tend to "self-inflate." They draw the self larger than they draw friends (Kitayama et al., 2009). Yet people in Japan did not. In China, students from wheat regions self-inflated; students from rice regions did not.

I found rice and wheat regions of China also had differences in thought style similar to East and West (Talhelm et al., 2014). Decades of research have found that people in Western countries tend to think more analytically (Nisbett et al., 2001). Analytic thinkers use more abstract thought, follow rules of non-contradiction, and focus attention on individual actors or pieces of information. In contrast, people from East Asia tend to think more holistically. Holistic thinkers think more concretely, see contradiction as an inevitable part of the world, and focus on the context or the situation as whole. Mirroring the East-West differences, students from rice provinces of China thought more holistically than students from wheat provinces—even within the same university (Talhelm et al., 2014).

Social Structures in Rice Cultures

Besides individual differences, there is evidence that rice societies have different social structures. Survey data from over 11,000 people across China found that rice regions have tighter social norms than wheat regions (Chua et al., 2019; Talhelm & English, 2020). Tight social norms make sense with the social coordination rice villages needed in order to make irrigation networks function.

Research on societies with tighter or looser norms has found that tight societies tend to have stronger social order. They have less crime, less drug abuse, and even more accurate public clocks (Gelfand, 2018). Yet they also have less individual freedom and less acceptance of immigrants. Tighter nations tend to support authoritarian governments more than looser nations.

Although these differences in China provide a tidy comparison of people within the same nation, it is important to test the theory outside of China. One study compared norm tightness in societies around the world (Talhelm & English, 2020). Rice-farming nations had tighter social norms; nations that traditionally relied on wheat or herding had looser norms (Figure 1). A study in Japan found that people in rice-farming villages were more concerned about their social reputation than people in fishing villages (Uchida et al., 2019). These results suggest that rice culture is not limited to China.

Research has also linked rice farming to the way societies structure relationships (Thomson et al., 2018). Rice-farming societies tend to have less flexible, less mobile relationships. In contrast, wheat-farming and herding societies have more flexible relationships. For example, people in Malaysia and Hong Kong reported having met fewer new people in the last month. They had also dated fewer people in their life.

These tight ties fit with the labor-sharing customs of traditional rice villages. It would be absurd to say that helping neighbors is unique to rice farming. Farmers around the world help each other. Yet anthropologists observed how rice farmers in Japan shared labor and how millet farmers in the Congo shared labor (Suehara, 2006). In the Congo, farmers shared

labor in flexible groups that celebrated with a "beer party" (Suehara, 2006). Among rice farmers in Japan and China, farmers more often shared labor with family or close acquaintances (Fei, 1945). Rather than being festive, the labor sharing was much closer to a strict form of debt.

Figure 1. Rice Predicts Norm Tightness Across Nations.

Note: Norm tightness values take the percentage of Muslim citizens (Talhelm & English, 2020) into account. Islamic societies tend to have tighter norms. Rice is square root transformed.

There is evidence that farming influenced the way societies structure family relationships. The tasks of wheat farming were better suited to flexible family relationships (Ang & Fredriksson, 2017). Because wheat farming required less work, families often filled the slack periods with herding. Some family members would live semi-nomadic lives, grazing their cattle and leading them to find water.

In line with this reasoning, societies with a legacy of wheat farming tend to rate family as less important in life (Ang & Fredriksson, 2017). They are also more likely to think that parents have to earn respect from children, rather than respect being automatic. Although fewer people farm rice today, the more binding relationships from rice farming are still reflected in how people describe their relationships (Thomson et al., 2018).

Natural Experiments

Proving causality is difficult with theories of the origins of cultural differences. We can't run the perfect experiment because we can't force people to farm rice using primitive methods for generations. However, the rice-wheat border of China offers a more controlled

comparison of people who live in the same province but in counties that farm rice or wheat. Even comparing people along the rice-wheat border, people from rice-farming counties thought more holistically (Talhelm et al., 2014).

Another natural experiment comes from a "rice island" in northern China (Dong et al., 2018). Although northern China is mostly wheat, the Yellow River cuts through northern China and provides enough water for a few isolated counties to farm rice. Comparing high school students in nearby rice and wheat counties revealed similar differences to China as a whole. Students in the rice county thought more holistically, distinguished more between friends and strangers, and drew smaller selves on the sociogram task. Differences between people in nearby counties help rule out alternative explanations like latitude and temperature.

Rice Culture in Outside the Lab

These differences extend outside the lab. For example, my colleagues and I went to Starbucks around China to test people's behavior in the real world (Talhelm et al., 2018). Inside Starbucks, we set up chairs so that they were partially blocking the aisle. The gap was wide enough so that unsuspecting customers could slow down and squeeze through or move the chairs out of their way. More people in the wheat areas moved the chairs out of the way. In rice areas, more people squeezed through the chairs, choosing to fit into the environment. This was similar to East-West differences when we set up "chair traps" in Japan and the US.

The idea of fitting into the environment extends to adjusting to new communities. A longitudinal study in China tracked students over time as they moved to college and adjusted to the new environment (English & Geeraert, 2020). Students who moved to the rice region of China adjusted better over time if they tried to change themselves to fit in to their new community. In contrast, students who move to the wheat region adjusted better over time if they were more agentic, trying to change their environment and stick firm to their private goals.

Rice-wheat differences in analytic versus holistic thought also seem to have parallels outside the lab. Wheat provinces in China had more patents for new inventions than rice provinces, even controlling for economic development and other factors (Talhelm et al., 2014). A separate study replicated the differences in invention patents at the more granular county level (Zhu et al., 2019). Differences were even larger when comparing patents filed by individuals, who presumably tend to be from the places they file from. Differences were small (but still significant) in the patents filed by companies and universities, which tend to draw people from different regions.

Why would analytic thought be related patents? Prior research has that found analytic thinkers tend to score higher on tests of creativity (Witkin et al., 1977). It also fits with the fact that cultures with tighter social norms tend to have less innovation—a downside to the stricter social order (Gelfand, 2018).

These thought style also differences showed up in the language people use on Weibo, China's Twitter (Guntunku et al., under review). People in wheat provinces used more words

related to thought, logic, and reason. For example, people in wheat provinces used more words like *cause*, *effect*, and *therefore*. These differences seem to reflect a thought *style*, rather than education, because rice-wheat differences still appeared among people with the same education and between areas with the same education rates. Although censorship is an issue in analyzing people's word use on in China, the differences replicated in comparisons of prefectures in Japan, where top-down censorship is less of a concern. These studies suggest that differences in thought style are not just artifacts of artificial laboratory tests, but show up real-world behavior.

Common Misunderstandings of Rice Culture

It's easy to misunderstand rice culture. One common misunderstanding about the rice theory is that it's about *eating* rice or wheat. The theory is about the accumulated cultural effects of *farming* rice, not eating rice. In fairness, there may also be effects of eating rice. There are nutritional differences between rice and wheat. However, the theory here focuses on the differences in how people grew rice traditionally.

A more fundamental misunderstanding stems from the words "collectivistic" and "cooperative." Saying that rice farmers needed to "cooperate" with each other can bring to mind rosy pictures of people working together. My own writing calls rice culture "collectivistic" (Talhelm et al., 2014). These descriptions are accurate but misleading.

There is already evidence that rice culture is interdependent but not lovey-dovey. For example, people from rice regions of China treat strangers more harshly than people from wheat areas (Talhelm et al., 2014). Rather being nicer or more pro-social, people from rice regions were more generous to friends but harsher toward strangers. In other words, relationships mattered more in rice areas than wheat areas.

Even within the group, not all is rosy. In rice villages, water was a scarce resource. Because irrigation put water under human control, farmers could scheme to fatten their share—or lose out if they didn't. Life in Japanese rice villages was threaded with competition underneath the surface (Smith, 1977).

This backdrop helps explain the finding that people in rice-farming areas are more vigilant toward the people around them (Liu et al., 2019). Participants from across China imagined competing for an acting role, for research funding, and other situations. Then they imagined what other people would do in the competition. People from rice-farming provinces more often imagined that their coworkers would do unethical things, such as hide other people's materials or poison their rivals.

These differences between rice and wheat regions mirrored differences between China and the US. Participants from China were more likely to anticipate unethical behavior than Americans (Liu et al., 2019). This is despite the fact that participants in China rated the people in these situations as more of in-group members than Americans did. Having a tight in-group is not the same as trusting that in-group.

How can we square this with East Asia's reputation for harmony (Hsu, 1981)? I believe East Asia's reputation comes stems in part from the demands of rice. And the reputation

seems to be rooted in truth. For example, students and employees in East Asia agree more than Westerners with accommodating their counterpart or avoiding contentious issues (Holt & DeVore, 2005; Morris et al., 2008).

The resolution to the apparent paradox is that harmony doesn't necessarily mean less conflict. It means that conflict is channeled underground. For example, at the same time as East Asian negotiators endorsed accommodating their counterparts, they also endorsed covert competitive tactics more (Figure 2, Liu et al., under review). Negotiators from East Asia were also more likely than Americans to say they were competitive but trying to hide it.

Figure 2. Hiding Competitiveness Across Cultures

Note: MBA students from China were more likely to say that they hide their competitiveness in negotiations (left) and use strategies that are competitive but hidden (right, Liu et al., under review). This finding gives nuance to the earlier findings that East Asian negotiators also endorse accommodation and avoiding conflict more than negotiators from the US (Holt & DeVore, 2005; Morris et al., 2008).

This is not just a mistake of intuition. Some cultural psychologists have *explicitly defined* competitiveness as an individualistic trait (Singelis et al., 1995). Since then, the bulk of the evidence has found that people in collectivistic cultures are more competitive—both in behavior and in surveys (Różycka-Tran et al., 2015; Wu & Talhelm, 2021). For example, Americans were slightly more likely than people in East Asia to say they “feel good” when they cooperate with others (Figure 3). In short, we must be careful to avoid confusing interdependence with being nice or feeling happy about other people.

Figure 3. Americans Endorse Cooperation as Much as People in East Asia

Note: Participants in the United States were just as likely as participants in East Asia to agree that they enjoy cooperation. This contradicts the idea that self-report survey items expressing positivity toward social groups consistently reflect collectivism. Participants were 3,757 visitors to the YourMorals.org. Bars = 1 SEM.

Rice Culture Outside of East Asia

Rice is critical to East Asia, but other cultures around the world also have a deep history with rice. One potentially valuable testing ground is India. India also has a rice-wheat split (Figure 4). One major difference about rice in India versus China is that India's split is East-West. Rice is concentrated in Eastern India, whereas Western India farms more wheat, millet, and other dryland crops.

That avoids problems with confounds of north and south. For example, rice-farming areas around the world tend to be in hot climates. Yet rice-farming areas of India are actually slightly cooler than wheat-farming areas of India (Talhelm, 2020). This provides a natural test case where temperature is separate from rice.

Dryland Rice Versus Paddy Rice

Another potential upside of testing for rice-wheat differences in India is that there is more diversity in *how* people farm rice across India. For example, most rice in China is paddy rice, but India has significant pockets of naturally flooded rice and dryland rice (Van Dis et al., 2015). These could help researchers pull apart mechanisms of the demands of the rice plant versus flooding versus human irrigation.

Because dryland rice grows without irrigation systems, it is possible that dryland rice

fosters less collectivism than paddy rice. Things may be similar in areas where nature floods the rice fields naturally every year. Naturally flooded rice may put fewer requirements on farmers to coordinate their behavior. However, these comparisons may not be as simple as they seem. For example, without irrigation channels, people in areas with naturally flooded rice may suffer from more frequent floods. And floods have the potential to bring villagers together (Elvin, 2008).

In addition, researchers should be wary of the potential for selection effects. Paddy rice and dryland rice might be determined by quirks of geography, which would create tidy natural experiments. However, regions that did not develop the more productive paddy rice may have suffered from warfare, weak states, isolation, or rugged terrain. If so, that would make it hard to compare different forms of rice farming. For example, rugged terrain would often favor dryland rice over paddy rice, but areas with rugged terrain also tend to be poorer over the long run (Nunn & Puga, 2012).

Figure 4. Paddy Rice Across India

Note: Data is from the Indian Agricultural Census from the year 1995. Percentages are the percentage of food crop area growing paddy rice.

Future Puzzles

Research in the last few years has expanded what we know about the rice culture, but there are still many things we don't know.

Are There Different Cultural Pathways for Rice?

Rice is not destiny. Although I say that rice makes cultures interdependent, this isn't quite right. Instead, the rice plant presents a problem. The rice plant will reward any farmer that can keep it in standing water, transplant seedlings at the right time, and keep up with the labor demands. The reward is calories. As two archaeologists put it, "Rice is a highly productive crop, but this productivity is paid for with labor and water" (Fuller & Qin, 2009, p. 88).

One way to solve the challenge of the rice plant is to work together. But there are other ways to solve the problem. In northern California, rice farmers flood their fields with diesel pumps. Some farmers in Australia use airplanes to plant their rice fields. I doubt that solving the challenges of the rice plant with technology will make cultures interdependent like southern China.

Even without the planes and diesel, there may still be other ways to solve the challenges of rice without interdependence (or at least different forms of interdependence). For example, rice farmers in Sierra Leone exchanged labor with more diverse types of relationships than in Japan (Richards, 1987, p. 170). The labor exchange was also more flexible—one person this season, another person the next. There were also groups of young boys who would travel around to different rice farms, working the fields to the beat of a drum to synchronize their rhythm. Maybe this is a more relationally mobile form of rice farming, suggesting a different cultural pathway for rice. Future studies will tell.

The Hidden Third Variable: The State

In most of the way I talk about rice, it is as if farmers or villages exist in a vacuum. There is no war. There is no trade. There is no government. Yet clearly these things existed.

Although I mostly ignored it above, the state may have played a critical role in the development of rice culture. The historian James Scott argues that states promoted grains, especially rice (Scott, 2017). States preferred grains over crops like potatoes, cassava, or beans for several reasons. Grains were more predictable—coming ripe at the same time. Grains were easier to tax and easier to store. Grains were easier to commandeer.

Scott argues that grains served the needs of states at least as much as they served the needs of farmers. In fact, states may have been the driving force behind pushing from low-labor rice farming to the intensive paddy rice farming I describe here. As recently as 1000 AD, rice farming in China was more relaxed, almost laidback. Farmers burned their fields instead of fertilizing them by hand (Elvin, 2008). They let nature irrigate. They threw seed into the field, rather than carefully transplanting the seedlings.

Intensive paddy rice came later. It was far more productive, but it came at a heavy

price for the farmers. The intensive farming may have been a natural outgrowth of rising population density, but it may have been the hand of the state. Strong states might have pushed rice farming toward more intensive and interdependent methods by taxing (James might say "stealing") so much rice that farmers had no choice but to farm more intensively.

If this is the case, the cultural outcomes of interdependence do not come from rice itself. Rather, it might be more accurate to see interdependence as the product of rice plus a strong state. Researchers could test this by comparing rice societies with varying degrees of "stateness," especially stretching back into history.

Rice: The Most Productive Yet Precarious Existence?

Finally, there is the paradox of the precarious productivity of rice. Rice is far more productive than other major crops (Khush, 1997; Perkins, 1969). Thus, it would be easy to predict that rice societies should be better fed, healthier, and more developed. In some ways this is true. Rice areas are some of the most densely populated areas in the world (Talhelm, 2015). Rice helped build powerful states, such as the state that built the temples of Angkor Wat (Castillo et al., 2020).

Yet rice was precarious. Archaeological records are scarce, but there is some evidence that people in the wheat regions of northern China were bigger and lived longer lives than in the rice regions of southern China (Elvin, 2008). Elvin (2008) speculates that this may have been because northerners had more diverse diets—not just grains, but more fruits, nuts, and wild game.

Rice may have been unhealthy not *despite* its productivity but *because* of it. Because rice was so productive, it incentivized people to turn all the land into rice fields (Elvin, 2008). Although this boosted productivity, it also meant farmers had less diverse diets. And it made rice villages vulnerable to disaster. If the crops failed by drought or pest or flood, there were fewer wild natural resources around the fall back on.

This raises the intriguing question of whether there are aspects of rice culture that were a response not to the growing of rice, but to precariousness of the rice ecosystem. For example, there is recent evidence that people in rice regions use more "prevention oriented" words than people in wheat regions (Guntunku et al., under review). Prevention-oriented people tend to view the world as inherently unstable and dangerous (Higgins, 1998). Rather than trying to explore and gather more, prevention-focused people more often seek the relief of avoiding failure.

In contrast, promotion-oriented people take more risks and shoot for bigger gains, often ignoring the risks. Promotion-oriented words like *dream*, *decisive*, and *confident* were more common in the social media of people in wheat-farming areas (Guntunku et al., under review). This is also true of independent versus interdependent cultures in general. Interdependent cultures tend to be more prevention oriented (Aaker & Lee, 2001). Might the precariousness of rice have encouraged prevention focus or even interdependence more broadly?

Summary

The high labor demands and irrigation systems of traditional paddy rice farming knit farmers together in interdependent social networks. Societies with a history of rice farming are now more interdependent and think more holistically than nearby areas with a history of wheat farming. There is evidence this is true comparing nearby counties within China or comparing nations around the world. Rice-farming societies have tighter social norms and more fixed, stable relationships than societies with a history of wheat farming or herding.

Although rice-farming cultures are more interdependent, it is important not to confuse that interdependence with being harmonious, happy, and nice. For example, people from rice areas of China are more loyal to close friends, but they are also more suspicious of colleagues and classmates. There is also evidence that people in interdependent cultures are more competitive.

There is still much to explore in rice culture. What are the rice cultures of West Africa like? Were fragile ecosystems a part of rice-farming societies? Did central governments fuel the increasingly intense land use of rice farming?

Finally, there is the open question of the future of rice cultures. Is rice culture fading in the modern megacities of Tokyo and Shanghai? Or is rice culture simply channeled into new forms? Only future researchers will know whether the influence of rice culture will persist into the future or fade as farming becomes more mechanized.

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About the Authors

Thomas Talhelm is an Associate Professor of Behavioral Science at the University of Chicago Booth School of Business. Thomas has lived in China for seven years as a Princeton in Asia fellow, a freelance journalist, and a Fulbright scholar. He [researches how rice farming](#) gave southern China a different culture from wheat-farming northern China. He also argues that most people [fundamentally misunderstand what collectivism is](#). While in China, he founded [Smart Air](#), a social enterprise that teaches people how to build their own DIY air purifiers and manufactures low-cost air purifiers to help people protect themselves from air pollution.

Questions for Discussion

1. What makes paddy rice so different from wheat? What features of the environment influence which places around the world grow rice?
2. Are there differences in nutrition between rice and other major grain crops like wheat? Would nutrition differences lead to cultural differences?
3. Are there other subsistence styles (such as types of farming, fishing, and trading), careers, or sports that we would expect to have influences on culture similar to rice?
4. Given all the strict requirements of rice farming, why did societies develop this method of subsistence in the first place?
5. Will differences rooted in subsistence style disappear over the next 100 years? Are there clues that we could glean by comparing the different countries we already have data for (such as in Figure 1)?
6. People in rice areas of China were less likely to move a chair in Starbucks out of their way. This is a concrete behavior, but what does it represent psychologically?