

Risk Preferences in China – Results from Experimental Economics^{*}

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Abstract

The propensity to take risks is a fundamental trait that determines decision making. For example, risk taking is regarded as an important driver of entrepreneurial and innovative behavior in an economy. In this paper we survey the empirical evidence on individual risk taking behavior in China. We focus on studies that elicit preferences for risk taking over real monetary stakes under controlled conditions using the methods of experimental economics. The studies we summarize compare Chinese subjects to those in other countries. While non-incentivized surveys find that Chinese subjects are more willing to take risks than Germans and Americans, the existing experimental studies suggest that this relationship is less clear-cut.

Keywords: Experimental economics, risk preferences, China, survey, cross-cultural experiments

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1 Introduction

For economists the taste for risk is a fundamental human trait that characterizes individual decisions under uncertainty. The attitude towards risk is decisive in many economic models explaining, for example, educational choice, household savings or health behavior (e.g. Bonin et al., 2007, Noussair et al., 2014, and Felder & Mayrhofer, 2011). When explaining regional differences of economic outcomes based on microeconomic models, it is therefore important to know whether local preferences differ with respect to risk. In China, risk taking is necessary for entrepreneurs and innovators to cope with the country's transition, as pointed out by Tan (2001). Risk taking is also considered a driver of innovation and entrepreneurship in general (e.g. Khilstrom & Laffont, 1979, for a classical model and Åstebroet et al., 2014, for a summary of empirical evidence from behavioral economics).

Chinese have been found to behave differently from people in western countries in strategic interaction with other people (e.g. Hennig-Schmidt et al., 2008, Hennig-Schmidt & Walkowitz, 2016). In this paper we ask whether Chinese also differ systematically from people in other countries with respect to individual decision making. We focus on their risk attitudes and review evidence collected under controlled conditions using the tools of experimental economics. Nowadays, experimental methods are used by many micro- and macro-economists. As Guala (2012) summarizes, the key idea of experimentation is the observation of events under controlled conditions. Control not only concerns variables that are changed by the experimenter but it also concerns the background conditions. More specifically, in experimental economics the background conditions are partly controlled by running the experiment in a laboratory which allows decisions to be observed while controlling communication, anonymity and incentives. Following Roth (1995), the aims of experiments can be loosely classified into testing economic theories, observing regularities in human behavior and generating policy advice by testing economic institutions.

Testing theories was the most common aim of early experimental economics research – and it still is today. The laboratory allows the implementation of decision situations that closely follow theoretical models; observed decisions can then be contrasted with the theoretical predictions. Experiments that aim to uncover regularities in human behavior are closely linked to work on

testing theories: Experiments can guide the development of theories in situations for which no theories exist yet, or they can stimulate the development of new theories that are better at explaining observed behavior. The work by Kahneman and Tversky on decision making under uncertainty that led to the development of prospect theory may be the most prominent example (Kahneman & Tversky, 1979, cf. Section 2). Experiments that aim to inform policymakers, for example by comparing different market institutions, were pioneered by Smith (1991). These experiments are commonly applied in market design and have been used to study several institutions implemented in real-world markets, such as online auctions (e.g. Ockenfels et al., 2006, and Brosig-Koch & Heinrich, 2014), spectrum auctions (e.g. Grimm et al., 2003, and Abbink et al., 2005) and entry level labor markets (e.g. Kagel & Roth, 2000, and Roth, 2002).

Recently, economic experiments have also been used to compare the behavior of different subject pools in different locations. The main contribution of our paper is a systematic review of experimental results that compare the risk attitudes of Chinese to those of the inhabitants of other countries. As an additional contribution we review different approaches to conducting cross-regional experiments.

Our paper proceeds as follows: In the following section we describe several methods that are used to elicit risk preferences in experimental economics research. In Section 3 we explain the challenges of collecting comparable data in multiple locations and we summarize the results of existing studies and their attempts to create comparability. Section 4 concludes with a discussion.

2 Measuring risk preferences

An iconic example of decision making under risk is the St. Petersburg paradox. Consider a gamble that is based on a series of coin throws. If the coin comes up heads at the first throw, you earn 1 Euro and the game ends. If it comes up tails at the first throw, the stakes are doubled and you earn 2 Euros should it come up heads at the second throw. Should it come up tails, the stakes are doubled again and you earn 4 Euros if it comes up heads, and so on. This gamble has an expected value of infinity. Therefore, if you maximize expected payoffs you should be willing to pay a lot of money for being allowed to play it. Yet few people would actually do so.

Bernoulli (1738) proposed a solution for this paradox and suggested that people maximize “moral expectation” and not expected payoffs. He suggested that the marginal value of money is decreasing, i.e. that a wealthy person values an additional income of one Euro much less than a poor person values the same amount. If people derive utility from money, this can be expressed by maximizing a utility function that is increasing in money but has a decreasing slope. This kind of concave utility function implies risk aversion. For example, consider a lottery that either pays 0 Euro or 10 Euros with equal probability. A risk-averse person who owns a ticket for this lottery will be willing to sell it for any price above 5 Euros (the expected value). But because he is risk-averse and the slope of his utility is diminishing he will also accept a price below 5 Euros for his ticket. How far below 5 Euros, however, depends on the degree of risk aversion and the curvature of his utility function. In their seminal work, von Neumann & Morgenstern (1944) showed that preferences obeying a set of simple axioms could be expressed by maximizing a utility function of this kind (and of many other kinds).

The expected utility framework by von Neumann & Morgenstern (1944) is still dominant and used in many economic models today, even though it cannot explain some behavioral patterns that have been observed when people choose between lotteries.¹ Allais (1953) was one of the first who pointed out systematic violations of the independence axiom of expected utility. Consider three lotteries A , B and C . The independence axiom states that lottery A is preferred to lottery B if and only if $pA+(1-p)C$ is preferred to $pB+(1-p)C$, where p is a probability between 0 and 1. In other words, making lotteries A and B part of new compound lotteries by adding the *same* uncertainty should not alter their relative value to the decision maker. Yet as Allais (1953) demonstrated, it often does. Another prominent violation of the theory is the observation that

¹ It is important to note that decision makers (outside of casinos) seldom know exact probabilities of outcomes as assumed in expected utility theory (e.g. Knight, 1921). An early extension of expected utility theory is subjective expected utility theory by Savage (1954) which does not rely on objectively known probabilities. It assumes people to evaluate outcomes objectively but models probabilities as being based on subjective evaluation. This theory is more widely applicable but suffers from similar shortcomings (see the classical study by Ellsberg, 1961). To our knowledge, there are only two studies that compare risk preferences over lotteries with unknown probabilities between China and other countries (Vieider et al., 2015a, 2015b).

experimental subjects exhibit preference reversals over identical lotteries depending on whether they can sell or buy these lotteries (Lichtenstein & Slovic, 1971, and Lindman, 1971).

Kahneman & Tversky (1979) proposed prospect theory which is consistent with many of these behavioral patterns. It models people as valuing outcomes relative to a reference point. Gains relative to this reference point are valued with an increasing concave value function while losses are valued with an increasing convex value function, i.e. people are viewed as risk-averse with respect to gains but risk-seeking with respect to losses. In addition, probabilities are weighed non-objectively, i.e. small probabilities are overweighted and large probabilities are underweighted. Prospect theory is able to capture many deviations from expected utility theory but it also has more degrees of freedom. For this reason, many economists still prefer the more parsimonious expected utility theory.

Despite different theoretical approaches in modeling behavior under uncertainty, experimentally elicited risk preferences are widely used to explain behavior in other decision situations. There is some evidence that they are predictive of field behavior. Anderson & Mellor (2008) observe that subjects who are more risk-seeking in an experiment are also more likely to smoke cigarettes, drink heavily, to be overweight and to not use seatbelts. Noussair et al. (2014) find risk preferences to be predictive of decision making with respect to savings and portfolio choices of households. In addition, the answers to experimentally validated survey questions about self-assessed risk attitudes have been found to be associated with field behavior. Jaeger et al. (2010) observe those who are more risk-seeking to be more likely to migrate. Bonin et al. (2007) find those who are more risk-seeking to be more likely to work in occupations with high income risk. But the evidence is not clear-cut. Sutter et al. (2013), for example, only find a negative correlation of risk aversion with body mass index but no significant correlation with savings behavior, smoking or alcohol consumption in adolescents.

Risk preferences can be measured with a variety of experimental procedures. In the following we will briefly describe three popular methods that have been used in the papers we survey. Our description is based on the overviews by Harrison & Rutström (2008) and Charness et al. (2013). See their studies for further discussion and other procedures.

Multiple Price List (MPL)

The multiple price list (MPL) is one of the most commonly used methods. Most prominent is the version by Holt & Laury (2002), but according to Harrison & Rutström (2008), the first to use this mechanism were Miller et al. (1969). Table 1 shows the original price list by Holt & Laury (2002). Subjects typically face a list of two binary lotteries. In each row of the list they choose the lottery they prefer and one of the rows is randomly chosen and played to determine their payoff.

The payoffs of outcomes of the lotteries remain the same between rows but their probabilities change. The payoffs on the left (option A) have a lower spread than the payoffs on the right (option B). Moving down from row to row, the probability of the larger outcome within each lottery increases while the probability of the smaller outcome decreases. This makes the right option more attractive in terms of expected payoff when moving down the table (see the rightmost column). From the fifth row on, it is more attractive for someone who is indifferent with respect to risk to choose option B. Because the spreads differ between the lotteries of both options, however, some people might switch earlier and some later – depending on their taste for risk. In fact, those who switch before the fifth row can be considered “risk-seeking” and those who switch later as “risk-averse”. The resulting switching point gives the experimenter an estimate of an individual’s risk attitude. Note, however, that a subject may behave inconsistently and switch multiple times. Another problem is that the price list induces subjects to switch in the middle of the table, as Harrison & Rutström (2008) point out (see Ebert & Wiesen, 2014, and Heinrich & Mayrhofer, 2014, for examples).

Table 1 – Multiple price list by Holt & Laury (2002)

Row	Option A	Option B	Expected payoff difference
1	1/10 of \$2.00, 9/10 of \$1.60	1/10 of \$3.85, 9/10 of \$0.10	\$1.17
2	2/10 of \$2.00, 8/10 of \$1.60	2/10 of \$3.85, 8/10 of \$0.10	\$0.83
3	3/10 of \$2.00, 7/10 of \$1.60	3/10 of \$3.85, 7/10 of \$0.10	\$0.50
4	4/10 of \$2.00, 6/10 of \$1.60	4/10 of \$3.85, 6/10 of \$0.10	\$0.16
5	5/10 of \$2.00, 5/10 of \$1.60	5/10 of \$3.85, 5/10 of \$0.10	-\$0.18
6	6/10 of \$2.00, 4/10 of \$1.60	6/10 of \$3.85, 4/10 of \$0.10	-\$0.51
7	7/10 of \$2.00, 3/10 of \$1.60	7/10 of \$3.85, 3/10 of \$0.10	-\$0.85
8	8/10 of \$2.00, 2/10 of \$1.60	8/10 of \$3.85, 2/10 of \$0.10	-\$1.18
9	9/10 of \$2.00, 1/10 of \$1.60	9/10 of \$3.85, 1/10 of \$0.10	-\$1.52
10	10/10 of \$2.00, 0/10 of \$1.60	10/10 of \$3.85, 0/10 of \$0.10	-\$1.85

In some versions of the multiple price list, one of the two options is a degenerate lottery with certain payoffs (see Schubert et al., 1999, for an early example). In the following, we denote this elicitation method as “MPL-1L” (because it only contains one non-degenerate lottery in each choice) and the standard Holt & Laury (2002) version as “MPL-2L” (because it contains two non-degenerate lotteries in each option).

Random Lottery Pairs (RLP)

The random lottery pairs procedure (RLP) presents subjects with a series of choices between two lotteries. In each choice they express their preference for one of the two lotteries or, in some procedures, indifference. One of these choices is then selected randomly to determine payoffs. A prominent example is the study by Hey & Orme (1994). They confront subjects with a pair of two-outcome lotteries in each decision. The potential outcomes are taken from the set £0, £10, £20 and £30. The probabilities vary across lotteries and are displayed graphically in a pie chart. This approach is very easy to understand but it does not yield a clear-cut measure for the risk attitude as does the switching point in the multiple price list. As Harrison & Rutström (2008) point out, some form of statistical estimation is needed.

Figure 1 – Lottery pair by Deck & Schlesinger (2014)

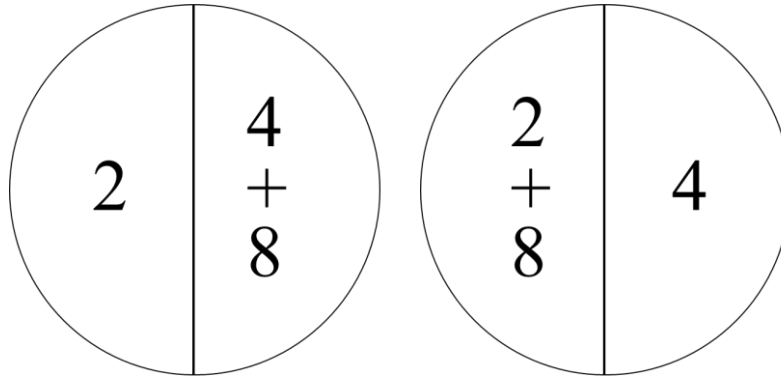


Figure 1 shows an example from the random lottery pairs developed by Deck & Schlesinger (2014), which are also used in the cross-regional comparison by Haering et al. (2017) described in the following section. Similar to Hey & Orne (1994), the probabilities are displayed in a pie chart. Different from Hey & Orne (1994), however, the random lottery pairs by Deck & Schlesinger (2014) used to elicit risk-averse or risk-seeking choices are all 50-50 lotteries, i.e. all outcomes are equally likely.² Both lotteries have an expected value of 7 but the outcomes of the lottery on the left (2 and 12) have a larger spread than those on the right (10 and 4). This means that while a risk-neutral individual would be indifferent between both lotteries, every risk-averse person should select the lottery on the right.

Becker-DeGroot-Marschak mechanism (BDM)

The mechanism suggested by Becker et al. (1964) (BDM) can be used to elicit subjects' certainty equivalents for lotteries, i.e. the amount a subject has to receive with a probability of 100 percent to be willing to sell a lottery he owns. This is a measure for risk attitude. A risk-averse subject

² The lottery pairs by Deck & Schlesinger (2014) also include lotteries to measure higher-order risk preferences like prudence and temperance by combining several 50-50 lotteries. A prudent individual saves more when his future income becomes more risky, while a temperate individual invests less in risky assets when his future income becomes more risky (Kimball, 1990, 1993). Because in other decision pairs the outcomes of different lotteries are added up, for consistency the addition of payoffs (4+8 and 2+8) is also used in the simple lottery displayed in Figure 1.

will accept a price below the expected value. The more risk-averse, the lower this price will be. The mechanism works as follows: The subject owns a lottery and is informed about its characteristics. He also learns that a price for the lottery is picked at random and that he can state the threshold at which he is willing to sell. If the price is above the threshold, the lottery will be sold at the price and he will be paid accordingly. If the price is below or equal to the threshold, the subject keeps the lottery and plays it. This mechanism is theoretically incentive-compatible, i.e. subjects will state their true threshold because they cannot gain from misstating it. Yet this logic is not always apparent. In order to pick the true threshold, one has to realize that the final selling price does not depend on the stated threshold (see Cason & Plott, 2014, for recent criticism).

3 Risk preferences in China

Control in cross-regional experiments

At first glance, conducting the same experiment in different regions, countries or cultures is a simple way to learn about behavioral differences. However, great care has to be taken to conduct experiments in a comparable way. Roth et al. (1991) ran bargaining and market experiments in Jerusalem, Ljubljana, Pittsburg and Tokyo. They were among the first to systematically address the following confounding effects that can render observations incomparable:

- (i) *Experimenter effects*: If experiments in different locations are conducted by different experimenters, these experimenters or differences in their procedures might influence decisions differently. Roth et al. (1991) defined detailed operational procedures that were followed by all experimenters. In addition, all experimenters conducted experiments in Pittsburg in order to detect pure experimenter effects.
- (ii) *Language effects*: If languages differ across locations, it becomes necessary to translate the experimental instructions. A perfect one-to-one translation is usually impossible because words may not exist in all languages or they may differ in their connotations, which might influence behavior. Roth et al. (1991) aimed to write the original English instructions in terms that could be faithfully translated into the other languages, “avoiding terms with heavy or ambiguous connotations” (p. 1072). Because they ran two treatments

in each country, they have some additional control because – if present – a translation effect would have been observed in both treatments. More commonly used is the back translation procedure (Brislin, 1970). In the first step, the instructions in the original language are translated into another language by one translator. In the second step, this translation is translated back into the original language independently by another translator. In the third step, discrepancies between original and back-translated instructions are used to identify and resolve discrepancies between original and translation.

- (iii) *Currency effects*: Subjects in economic experiments are paid real money in order to provide salient incentives (Smith, 1976). If subjects are paid in their local currency, country differences might be due to differences in incentives these payments provide. Or they might be due to the different scales, e.g. if subjects prefer round numbers. To address the first problem, Roth et al. (1991) adjusted payments based on the purchasing power in the respective countries. To address the second problem, they use “experimental currency units”, i.e. subjects in all countries decide on the same number of tokens. These tokens are converted back to local currency only at the very end when subjects are paid.

Based on the study by Roth et al. (1991), Herrman et al. (2008a, 2008b) provide a detailed discussion of these effects and additional measures to address them. For example, with respect to experimenter effects, they also highlight the importance of ensuring subjects’ anonymity and of limiting subjects’ interaction with the experimenter by conducting a computerized experiment.

The effects above are concerned with the procedures of the experiment itself. But even after these problems are addressed, subjects are not randomly assigned to locations as they would be assigned to different treatments of a regular experiment. Differences in behavior can be due to all sorts of differences between the subject pools in different locations. Of course, it is impossible to find two subject pools that differ only with respect to their cultural background or country of origin. Therefore, Roth et al. (1991) are careful enough to suggest only that “different behavior in the different subject pools can *cautiously* be used as the basis for *preliminary conjectures* about cultural differences” (p. 1068, emphasis added).

An additional control that has been recently applied is to conduct experiments at (at least) two locations within each region. This way, differences within regions can be compared to differences

between regions (see Ehmke et al., 2010, and Vieider et al., 2015a). However, this approach does not help if a confounding factor is present at all locations of a region (e.g. if recruitment procedures for subjects differ between countries for legal reasons).

Nevertheless, carefully designed experiments with hypotheses based on regional differences have discovered interesting behavioral differences across regions. Ockenfels & Weimann (1999) for example, exploited the German reunification and conducted experiments in the east and west of Germany. Using the same language and currency, they still found pronounced behavioral differences in two regions that had been governed by opposing political systems. They find eastern subjects to behave more selfishly in anonymous laboratory settings.³ To explain their finding, the authors argue that growing up in a socialist system might have led to solidarity and cooperative behavior in small non-anonymous groups and to egoism in large anonymous groups. Henrich et al. (2005) conducted ultimatum game, public good and dictator game experiments in 15 small-scale societies around the world. They observe considerable heterogeneity in behavior across these societies. They report evidence that regional differences in behavior are associated with differences in market integration and payoffs to cooperation in everyday life within the societies under study.

Comparison of studies

To shed light on risk preferences in China in comparison to other countries, we conduct a systematic literature survey. We searched for studies that elicit risk preferences in the People's Republic of China and in at least one other region. We only consider experimental studies, i.e. studies that comply with the standards of experimental economics. The main features (in comparison to experimental research in psychology) are the mandatory use of monetary incentives (Smith, 1976) and the ban on deceiving subjects (Ortmann & Hertwig, 2002). In addition, we only include studies that perform statistical tests on the differences between countries.⁴

³ See also the follow-up study by Brosig-Koch et al. (2011), which was conducted 20 years after the reunification.

⁴ We used Google Scholar (<http://scholar.google.com>) and Ideas (<http://ideas.repec.org>) for a keyword search in order to identify relevant studies in the first round of filtering. The following keywords were used: *risk China*, *risk Chinese*, *risk preferences China*, *risk preferences Chinese*, *risk behavior China*, *risk behavior Chinese*, *risk tolerance*

Table 2 summarizes, at the top, the six experimental papers that fit our criteria. In addition, at the bottom we list four prominent papers employing a survey methodology (QUE), i.e. these studies do not elicit decisions over lotteries with real monetary outcomes but ask subjects to make hypothetical decisions in a questionnaire. The first two studies (Weber & Hsee, 1998, and Hsee & Weber, 1999) were the first to focus on Chinese risk preferences. The latter two studies are, to our knowledge, the most comprehensive survey studies on global differences with respect to risk attitudes. With respect to our research question, their findings exemplify other evidence from surveys. The remaining surveys we found (Brumagim & Xianhua, 2005, Fan & Xiao, 2006, Lau & Ranyard, 2005, and Statman, 2008) all report Chinese to be less risk-averse than people from other countries.

The second column of Table 2 lists the comparison countries that are covered in the respective studies. It makes clear that the USA is the most common reference, followed by Germany. We therefore focus on Germany and the USA in the following. The next three columns list the measures taken to ensure comparability of data collection across locations with respect to the effects pointed out by Roth et al. (1991). The comparisons reveal near consensus with respect to language effects: Of the nine studies conducted in different languages, eight use the back translation method (Brislin, 1970). Despite the drawbacks mentioned by Roth et al. (1991), 8 out of 10 studies opt to display varying payoffs in local currency instead of experimental currency. This saves subjects from calculating actual payoffs and might make payoffs more salient but it potentially creates confounding scale effects. 9 of 10 studies also report how they convert payoffs between countries. All studies use measures that reflect the income differences between the respective subjective pools. However, there appears to be no consensus on the reference measure: Some studies use the country-based purchasing power parity (PPP) measure while others rely on

China, risk tolerance Chinese, Risikopräferenzen China, risk assessment China, risk cross cultural, cross cultural risk China, risk cross-country, risk preference cross-country, risk preference cross-country China, risk perception, cross cultural risk, risk cross cultural China and cross cultural risk preferences. This search results in a huge number of studies. In a second round of filtering, we focused on studies that compare China with at least one other country. In a third step, we focused on studies using the methods of experimental economics. In the last step, we excluded two studies that did not statistically compare results between countries (Bohnet et al., 2008, and Bruhin et al., 2010). We nevertheless discuss these two studies below.

more local measures, such as the wages of student research assistants. With respect to potential experimenter effects, there appears to be even more heterogeneity. Only 4 of 9 relevant studies actually mention the approach taken. All of these studies rely on the support of local researchers or interpreters. The studies by Haering et al. (2017), Rieger et al. (2014) and Falk et al. (2015) also rely on standardized protocols. Haering et al. (2017) are the only ones to control for experimenter differences by additionally having all experimenters conduct one session at the same location, as advocated by Roth et al. (1991).

In addition, Table 2 lists the general parameters of the studies we survey. The studies use different elicitation methods, different sample sizes and different control variables to capture subject pool differences. There is considerable heterogeneity with respect to the control variables. Ideally, researchers would include many demographic controls to exclude confounding subject pool differences when looking for cross-regional differences in behavior. Yet this also requires larger samples, creating additional costs.

The last two columns of Table 2 summarize the results. The “risk aversion” column lists significant differences between regions while the “other” column lists additional findings. Let us consider the survey papers first, as this methodology has been the standard approach used by economists and other social scientists to assess risk attitudes for many years. The three survey studies that compare China directly to other countries find Chinese to be less risk-averse than Germans and Americans. In this respect, they are similar to other surveys not included in Table 2 (Brumagim & Xianhua, 2005, Fan & Xiao, 2006, Lau & Ranyard, 2005, and Statman, 2008).

The fourth survey study has recently been conducted by Falk et al. (2015). It is the first study to assess risk preferences (as well as other characteristics of human decision making) in representative samples using an experimentally validated survey measure. This means that the authors also conducted another study (described in Falk et al., 2016) in which survey answers were compared to the choices with real monetary stakes of the same subjects. This allows the selection of survey questions that are highly correlated with choices over money.

The drawback of their approach is that cross-regional comparison of risk preferences is only valid if the correlation between imagined and real choices is similar across regions. Vieder et al. (2015b) find that the correlation between survey questions and incentivized measures in fact varies across countries. As they point out, the correlation is significantly positive in 19 to 29 of

the 30 countries they cover (depending on the question and the domain of payoffs). This might explain why survey questions have been found to correlate with experimentally elicited measures of risk aversion by some (Dohmen et al., 2011 and Falk et al., 2016) but not all authors (Anderson & Mellor, 2009, Lönnqvist et al., 2011).

Falk et al. (2015) do not directly compare the risk preferences between countries. Instead, they correlate the average risk attitude in 76 countries with other characteristics. They find the degree of risk aversion to be significantly and positively correlated with life expectancy, less inequality (measured by the Gini coefficient) and higher rigidity of employment laws. It is weakly significantly correlated with a larger level of redistribution (measured as the share of government transfers of national income) and a lower number of homicides. There is no significant correlation with gross domestic product (GDP) per capita or the extent of institutionalized democracy.⁵

Let us now consider the experimental studies that collect decisions over real monetary stakes. Even though we list six experimental papers, the results are only drawn from five data sets because Vieider et al. (2015a) consider a subset of the data presented in Vieider et al. (2015b). In three of the five data sets, the respective authors find differences in line with the results of the survey studies: Ehmke et al. (2010) find Chinese participants to be less risk-averse than participants in the French and American subject pools. Vieider et al. (2015b) find Chinese participants to be less risk-averse than German participants.⁶ And Haering et al. (2017) find Chinese participants to be less risk-averse than American and German participants. However, in the remaining two experimental data sets (by Kachelmeier & Shehata, 1992, and Liu et al., 2014), the authors find no significant differences between locations. These results make clear that Chinese participants *cannot* be unequivocally regarded as less risk-averse than German and

⁵ Falk et al. (2015) do not provide a direct comparison of risk preferences in China and other countries. However, based on the correlations they provide one can derive an ordering of risk preferences: When comparing China to the USA and Germany, for example, we would expect Chinese people to be the least risk-averse based on the degree of redistribution, life expectancy, and degree of inequality. Based on the rigidity of employment laws and the number of homicides per capita, we would expect Americans to be the least risk-averse.

⁶ In the case of lotteries with unknown probabilities (cf. Footnote 1), Vieider et al. (2015b, online appendix) find Chinese to be less risk-averse than Americans *and* Germans.

American participants as previous survey evidence suggests. This also highlights that more research is needed to analyze why hypothetical decisions differ from real decisions in various ways across countries.⁷

⁷ Also note that Vieider et al. (2015a) report only very small within-country differences in China and in Ethiopia while Ehmke et al. (2010) make a similar observation in the USA.

Table 2 – Comparison of studies

Study	Comparison countries ¹	Cross-regional controls				Elicitation method ²
		Experimenter	Language	Currency display	Currency conversion ³	
Kachelmeier & Shehata (1992)	CAN, USA	Assistance by local interpreter	Back translation	Local currency	n/a	BDM
Ehmke et al. (2010)	FRA, NER, USA	n/a	Back translation	Local currency	PPP	MPL-2L
Liu et al. (2014)	TWN	Not required	Not required	Experimental currency	Wage of a student research assistant	MPL-2L
Vieider et al. (2015b)	DEU, USA & 42 other	n/a	Back translation	Local currency	Wage of a student research assistant, PPP adjusted	MPL-1L
Vieider et al. (2015a)	ETH	n/a	Back-translation	Local currency	Wage of a student research assistant, PPP adjusted	MPL-1L
Haering et al. (2017)	DEU, USA	Detailed protocol, local experimenters, supervising experimenter	Back translation	Experimental currency	PPP, UBS, adjusted by local guidelines for subject payment	RLP
Weber & Hsee (1998)	DEU, POL, USA	n/a	Back translation	Local currency	Expenses of students	QUE
Hsee & Weber (1999)	USA	n/a	Back translation	Local currency	Expenses of students	QUE
Rieger et al. (2014)	DEU, USA & 50 other	Standardized oral introductions read aloud by the local lecturer	Translated by professional translators or translators with economic background	Local currency	Income and expenses of students, PPP adjusted	QUE
Falk et al. (2015)	DEU, USA & 73 other	Professional interviewers using a standardized procedure across countries	Back translation	Local currency	Median household income	QUE

1: CAN: Canada; CHE: Switzerland; CHN: People's Republic of China; DEU: Germany; ETH: Ethiopia; FRA: France; KOR: Republic of Korea; NER: Niger; POL: Poland; TWN: Taiwan; USA: United States of America.

2: BDM: Becker-DeGroot-Marschak; MPL-1L: Multiple Price List one lottery; MPL-2L: Multiple Price List two lotteries; QUE: Questionnaires, RLP: Random Lottery Pairs.

3: BNT: Berlin Numeracy Test; CRT: Cognitive Reflection Test; Econ: Economics; IRB form: In the USA, subjects need to be presented with a form by the Institutional Review Board for experiments with human subjects beforehand; Math: Mathematics; Major: Major field of study; Stats: Statistics; UBS Prices & Earnings 2014, available at: www.ubs.com/pricesandearnings.

Table 2 (continued) – Comparison of studies

Study	Subject Pool		Results	
	Country: Location or University (<i>N</i>) ¹	Control variables ³	Risk aversion ¹	Other
Kachelmeier & Shehata (1992)	CHN: Beijing Univ. (40) CAN: “Medium sized university” (32) USA: “Large university” (28)	None	No significant differences.	Subjects in China are more risk-averse when monetary payoffs are increased tenfold.
Ehmke et al. (2010)	CHN: Hangzhou (96), FRA: Grenoble (70), USA: West Lafayette (63), Manhattan (57), NER: Niamey (60)	Gender	CHN & NER < FRA & USA	Within-country differences in risk preferences are small.
Liu et al. (2014)	CHN: Beijing Univ. (185), TWN: National Taiwan Univ. (195)	Gender, age, graduate student, major, conservative upbringing, father's education, mother's education	No significant differences.	Beijing University students become significantly more risk-loving after being primed with Confucianism.
Vieider et al. (2015b)	31 universities in 30 countries (2,939)	Gender, age, major, GDP/capita, Gini coefficient	ETH < CHN < DEU	Incentivized measures correlate with survey questions in a majority of countries.
Vieider et al. (2015a)	CHN: Jiao Tong Univ. (124), Beijing Normal Univ. (80), ETH: Two campuses of Addis Ababa Univ. (83 & 62)	Gender, age, major	ETH < CHN	Within-country differences in risk preferences are small.
Haering et al. (2017)	CHN: Nankai Univ. (140), DEU: Univ. of Duisburg-Essen (145), USA: Harvard Business School (129)	Experimenter, gender, age, CRT score, BNT score, sum of math, stats & econ courses, IRB form	CHN < USA & DEU	Subjects in China are more risk-averse when monetary payoffs are increased tenfold.
Weber & Hsee (1998)	CHN: (85), DEU: (31), POL: (81), USA: (86) “Major urban universities”	Major	CHN < POL < DEU & USA	Chinese are closer to risk-neutral in pricing options.
Hsee & Weber (1999)	USA: Univ. of Chicago (99), Ohio State Univ. (66), CHN: Chengjian Univ. (110), Jiao Tong Univ. (65)	n/a	CHN < USA	Chinese are more risk-seeking in investments but not in medical or academic decisions.
Rieger et al. (2014)	>60 universities in 53 countries (6,912)	Gender, age, GDP/capita, individualism, uncertainty avoidance index	CHN < USA < DEU	People in richer countries are more risk-averse in gains.
Falk et al. (2015)	Representative samples in 76 countries (>80,000)	None	n/a	Risk aversion correlates with life expectancy, Gini coefficient, redistribution of GDP, labor regulation and number of homicides on a country level.

Two more studies have experimentally elicited risk preferences in China and in other countries but are not listed in Table 2. Bohnet et al. (2008), on the one hand, compare the attitude towards risks in which the outcome is determined by nature to the attitude towards risk in which the outcome is determined by another person. They find people in Brazil, China, Oman, Switzerland, Turkey and the USA to be “betrayal-averse”, i.e. they prefer risks in which the outcome is determined by nature. They also elicit risk preferences in each country but do not compare them directly. They compare each country to the sample mean, finding only subjects in Oman to be more risk-averse than the average. Bruhin et al. (2010), on the other hand, conduct experiments at two locations in Switzerland and at two locations in China. They are interested in identifying behavioral types, so they do not directly compare risk attitudes between countries or between locations. In both countries they find that roughly 80 percent of subjects can be classified as behaving consistent with prospect theory while the remaining subjects maximize expected values. However, they point out that some of the prospect theory type subjects in China strongly overweigh gain and underweigh loss probabilities which could explain a general tendency to be less risk averse.

4 Conclusion

We started out with the aim of assessing the risk attitude of Chinese in comparison to the inhabitants of other countries. Most commonly, survey studies have been used to compare risk attitudes across countries. These studies are based on choices over hypothetical stakes. Virtually all of them find a higher propensity of Chinese participants to take risks relative to American or German participants. However, in experimental economics we are interested in preferences over actual monetary outcomes. If we want to draw conclusions about these types of preferences based on survey studies using hypothetical outcomes, we have to assume that choices over hypothetical outcomes correlate with choices over monetary outcomes – but this is not always the case, as observed by Vieider et al. (2015b). When comparing answers across countries, we also have to assume that this correlation is similar across countries. However, with respect to China it is not always clear that instruments for empirical data collection that have been developed in Western countries can be readily transferred (see Roy et al., 2001, or Stening & Zhang, 2007, for overviews). For example, there appears to be evidence for a tendency of Chinese respondents to

choose midpoints on Likert scales in questionnaires (Shenkar, 1994). The experimental studies that are based on choices over real monetary stakes suggest that differences in preferences are less clear: Three studies find Chinese to be less risk-averse than Germans or Americans while two studies find no significant differences.

However, not all studies we cover can be readily compared to each other because of their varying designs. For example, several reported studies display the varying payoffs in local currency which might lead to confounding scale effects. For a more extensive discussion of how differences in experimental design may account for differences in behavior see Goerg et al. (2016). It is also possible that our comparison of studies is confounded by regional differences within countries or by changes of risk attitudes over time. We have not focused on the last point in this paper. Yet macroeconomic conditions have been found to influence decision making under risk (e.g. Browne et al., 2015, Cohn et al., 2015) and these conditions changed quite dramatically in China over recent decades. Also note that the number of experimental studies comparing risk preferences of the Chinese to the preferences of other people is relatively small. If more data become available, a quantitative meta-analysis would be the next step.¹

In general, our overview summarizes popular design approaches taken in cross-regional experiments. It highlights the importance of general standards, such as the back translation method, for comparability of results. A method that is not widely used yet is to run experiments in different location within the same region as a control. This is a promising approach because it allows research to compare within-region differences to between-region differences. Due to their costs, experiments are usually restricted to small samples from student subject pools. An alternative to experimental studies are experimentally validated survey measures. These can be applied to representative samples more efficiently. However, their contribution with respect to

¹ In our review we only considered individual decision making. Yet cross-regional experimental studies comparing behavior in strategic interaction between western and eastern countries generally observe a high degree of dissimilarity (see, e.g., Oosterbeek et al., 2004). For example, by exploring the negotiation behavior of teams from China and Germany, Hennig-Schmidt & Walkowitz (2016) observe that teams from Germany put great weight on fairness issues and try to reach an acceptable payoff within a reasonable time. In contrast, teams from China try to collect as much information on their negotiation partners as possible to anticipate their behavior.

risk preferences over real monetary stakes is based on a rather strong assumption: The validation that took place in one country is assumed to hold within all countries under study.

Even if risk preferences are found to differ systematically between individuals or regions, little is known at present about the underlying drivers. Often differences in risk preferences are attributed to cultural differences between countries. For example, Hsee & Weber (1999) found that Chinese people are more likely to take risks than Americans when deciding over hypothetical payoffs. They explain their finding by much lower individualism in China relative to the USA which was observed by Hofstede (1980). Based on the cushion hypothesis, people from China are therefore less likely than Americans to deal with the consequences of risky decisions on their own. Hofstede (1980) originally identified four dimensions that characterize a culture: power distance, individualism, masculinity and uncertainty avoidance. Uncertainty avoidance has also been reported to be associated with risk taking. A higher degree of uncertainty avoidance means that members of a society try to avoid situations with high uncertainties (Hofstede, 1980). This is not synonymous with risk aversion. Instead, people might also take additional risks to avoid ambiguity, i.e. situations in which probabilities of outcomes are unknown. Nevertheless, in their survey Rieger et al. (2015) observe that more uncertainty avoidance is associated with less risk taking. However, with respect to uncertainty avoidance China differs less from Western countries, for example: the USA ranks 57th and China 63rd of 69 countries surveyed (Hofstede et al., 2010).

It has also been observed that risk preferences are transmitted from one generation to the next (Dohmen et al., 2012) and that they are at least partly genetically determined (Cesarini et al., 2009). Quite recent observations by Becker et al. (2015) suggest that differences in risk preferences between countries (elicited through representative surveys) can be explained by genetic distance and migratory distance. Their results also highlight the importance of environmental factors including the prevailing institutions on shaping risk preferences (see also Callen et al., 2014, and Browne et al., 2016). Thus, given the rapid change of the living conditions and of the institutional environment in China, it remains to be seen how risk preferences develop along economic and cultural parameters. In the future, longitudinal studies that combine experiments (or experimentally validated survey measures) with representative samples will help to disentangle different drivers of decision making under uncertainty. The

observation of behavior over time could inform new theories that explain individual decision making. As an important application, these data may also explain regional differences in innovativeness and its development.

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