Cultural differences in risk taking and precaution: The relative roles of risk perception and risk attitude

Elke U. Weber and Jessica S. Ancker

Columbia University

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Public policies related to health and safety risks in Europe and America show
different patterns of precaution (Wiener and Rogers 2002). Among the factors identified
as possible explanations for these differences in precautionary concern are cultural
differences in risk perception and preferences. In this chapter, we review literature in the
area of behavioral decision theory and cross-cultural research that compares risk
perceptions and preferences in different countries. We will show that cross-cultural
differences in the perception of risks and thus in people’s apparent willingness to take
such risks have been identified. It will also become apparent that, the phenomenon has
not yet been systematically explored and that much research on the topic remains to be
done.

THE PRECAUTIONARY PRINCIPLE

Public policy and public health researchers generally quantify health and safety risks
as the relative frequency of known instances of morbidity, mortality or other adverse
impacts. However, conclusive evidence of adverse impacts is lacking for many potential
risks, especially those that are novel, uncertain, or require extrapolating from known to
unknown situations (e.g., from animal experiments to human health). In such situations,
waiting for deaths or cases of disease to accrue before making decisions may be
politically and morally unacceptable. In light of this problem, advocates of the
precautionary principle favor anticipatory regulation of possible risks. The precautionary
principle arises primarily in the public policy arena (Wiener and Rogers 2002), but has
also been discussed in other areas including medical decision-making and public health
(Cranor 2004; Resnik 2004; Weed 2004). The precautionary principle has been
formulated in a number of ways, ranging from very weak (e.g., regulation is permissible
in the absence of complete evidence) to strong (e.g., potentially risky activities should be
prohibited until they can be proven to pose minimal risk). It has been adopted in a highly
issue-specific fashion in both the European Union and the U.S. Wiener and Rogers (2002)
and Sunstein (this volume) have argued convincingly that the patterns of precaution are
so complex that neither the E.U. nor the U.S. can be described globally either as
precautionary or risk-averse. For example, European countries have taken a precautionary
stance on regulating genetically modified foods, whereas American policies on teenage
drinking or new drug approvals can be seen as precautionary (Wiener and Rogers 2002).
Sunstein (this volume) revives an argument by proponents of risk-risk analysis (Lave,
1981; Keeney, 1997), namely that it is in fact logically impossible to be globally
precautionary with respect to all risks, because taking measures to prevent one hazard
may increase the chances of another. For example, banning DDT to prevent ecosystem
damage may result in increased malaria rates as mosquito populations rebound (Sunstein,
this volume). The only way to think of one’s actions as precautionary is thus to take a
myopic view of the problem or issue at hand. Cognitive myopia has, of course, been
observed in many areas, from investment decision making (Benartzi and Thaler 1999) to
the consideration of consequences of multiple, related decisions (Lave 1981; Keeney
1997; Read, Loewenstein et al. 1999).
DECOMPOSING RISK-TAKING INTO RISK PERCEPTION AND RISK ATTITUDE

Because the precautionary principle focuses on preventing possible losses, including losses that have not yet happened, invocation of the precautionary principle would seem to be a sign of risk-aversion at the individual or societal level.

In popular thought, risk-attitude (i.e., degree of risk-aversion or risk-taking) is typically thought of as a personality trait. In this view, some individuals are risk-seekers across a broad range of situations and contexts, while others prefer safer options. This view, however, is undermined by a wealth of research on framing and domain effects. Framing effects refer to the finding that people's risk-taking and thus apparent risk-attitudes are strongly affected by whether outcomes are framed in terms of losses (e.g., "10 out of 100 patients will die") or gains (e.g., "90 out of 100 patients will survive"). Explanations of framing effects draw on prospect theory (Kahneman and Tversky 1979), which posits different utility functions for gains and losses, namely a concave function for gains, predicting risk-averse choices, and a convex function for losses, predicting risk-seeking choices. Furthermore, risk-taking behavior varies across content domains. An individual's apparent risk-taking in the context of gambling does not predict risk-taking in other domains such as health, recreation, financial investing, business decisions, social choices, and ethical decisions (MacCrimmon and Wehrung 1986; Weber, Blais et al. 2002).

Together, these results suggest that risk-attitudes inferred from choice (or, equivalently, from the shape of utility functions describing choice) are not stable personality attributes (Weber 2001). A promising alternative model of risk-taking, adopted from finance, describes risk-taking as a function of three variables: (1) the perceived return of available choice options, (2) the perceived riskiness of those options, and (3) the decision maker's attitude toward perceived risk, that is, his or her willingness to trade perceived risk for possible return (perceived-risk attitude) (Brachinger and Weber 1997; Weber and Milliman 1997). When individual or group differences in risk taking are examined closely, they are typically the result of differences in perceived risk and not of differences in willingness to take on perceived risk. For example, the characteristic that distinguishes entrepreneurs from other business people is not a more positive attitude towards risk, but an overly optimistic perception of the risks involved (Brockhaus 1982; Cooper, Woo et al. 1988) Although there are individual differences in perceived-risk attitude, they are far smaller than individual and group differences in perceived risk, making perceived-risk attitude a credible candidate for a stable personality trait (Weber and Milliman 1997; Weber 2001).

CULTURE AND RISK PERCEPTION

The fact that individual and situational differences in apparent risk-taking are mediated by differences in the perception of the relative risks of choice options raises the possibility that national differences in preference for precautionary policies might be caused by national or cultural differences in the perceived risks of precautionary and other policies. Before discussing cross-cultural differences in risk perception and
perceived-risk attitudes, we provide a brief overview of some developments in the psychological study of risk perception. As discussed in this section, perceptions of risk have been studied within three different research paradigms.

**Measurement-theoretical paradigm**
Normative models of risk-taking from finance (Markowitz 1959) to biology (Caraco 1980) characterize the riskiness of a risky choice option as the variance of possible outcomes (i.e., the square of the average deviation of outcomes around the mean) (Weber, Shafir et al. 2004). Sure options thus carry no risk, while a widening distribution of possible outcomes increases risk. The perception of risk, however, has long been known to differ from the variance of outcomes. For example, the possibility of outcomes below the mean affects perceived risk far more than the possibility of outcomes above the mean (Weber and Bottom 1989; Weber and Bottom 1990). One model that attempt to capture such asymmetry of the effects of outcomes above and below the mean is Luce and Weber’s conjoint expected risk (CER) model (Luce and Weber 1986). In this model, the perceived risk of a choice option is a linear combination of the probabilities of neutral, positive, and negative outcomes, and of the conditional expected values of positive outcomes and negative outcomes, raised to power functions. Model parameters allow for different weights of these different contributors to perceived risk, which provide a way of explaining individual and group differences in risk perception.

In a study of business students and security analysts in Hong Kong, Taiwan, the Netherlands, and the U.S., Bontempo, Bottom, and Weber fit the CER model to judgments of the riskiness of monetary lotteries (Bontempo, Bottom et al. 1997). The probability of a loss had a larger effect on perceived risk for the two Western samples, but the magnitude of losses had a larger effect on the two culturally Chinese samples. Cross-cultural differences in risk perception were greater than differences due to profession, suggesting that cultural upbringing and environment are more important in shaping financial risk perceptions than professional training and experience.

**Psychometric paradigm**
Another research approach, the psychometric paradigm, arose to explain lay perceptions of the risks of technological and health hazards (Fischhoff 1978; Slovic, Fischhoff et al. 1986; Slovic 1987; Peters and Slovic 1996), which were found to differ from the risk estimates of experts that were generally based on the relative frequency of negative outcomes such as death or disability (e.g., the list of mortality risks in [Slovic 1999 (1997)]p. 281). The primary question underlying this research agenda was why some hazards with low probability of negative outcomes (such as airplane travel) were perceived as riskier than others that carried a much higher probability (such as car travel). The psychometric paradigm decomposes risk perception into a set of psychological risk dimensions that can be reduced to two factors: dread and risk of the unknown. The dread of an event is heightened when a hazard has severe consequences (even if rare), provoking a gut-level “dread” reaction, and effects that are perceived as catastrophic and sudden (rather than gradual or chronic). The risk of the unknown is heightened by characteristics such as novelty, delayed impact, or undetectability (i.e., exposure to carbon monoxide is frightening in part because the gas cannot be seen or smelled). Additional variables that may also contribute to the two psychological risk factors include...
the origin of the hazard (manmade versus natural), voluntariness of the exposure to the
risk, and real or perceived controversy in the scientific community. As a result, when lay
judgments are compared to expert judgments, lay people tend to overweight risk
associated with infrequent, catastrophic, and involuntary events, and underweight risk
associated with frequent, familiar, and voluntary events. As Slovic has said, the public’s
perception of risk is “much richer” than that of the expert (Slovic 1999 (1997)).

Psychometric researchers have thus sought to persuade health and environmental
risk assessment experts to define risk not simply as the probability of adverse
consequences, but to add some measure of the uncertainty of outcomes, as has long been
accepted in financial definitions of risk (Markowitz 1959), in addition to other
psychological dimensions. While the psychometric model has extensively documented
the ways in which risk perception departs from probability, probabilities do contribute to
risk perception, increasing for example the vividness and salience (and thus the
availability) of the risk. Availability has been identified as one of the heuristics that is
generally used to estimate the frequency of an event (Tversky and Kahneman 1974),
including the frequency of adverse consequences as a measure of risk.

Holtgrave and Weber found that subjects’ judgments of financial and health and
safety risks were best explained by a hybrid model that integrated the “dread” risk
dimension with probabilities and utilities drawn from a simplified version of the conjoint
expected-risk model (Holtgrave and Weber 1993). The hybrid model provides additional
evidence that risk perception (even about monetary risks) has emotional elements that are
not captured by normative models (Loewenstein, Weber et al. 2001).

The two-factor structure of the psychometric paradigm of risk perception has been
validated in studies using respondents from a variety of different countries, including
Canada (Slovic, Kraus et al. 1991), France (Bastide, Moatti et al. 1989; Slovic, Flynn et
al. 2000) Hong Kong (Keown 1989), Hungary (Englander, Farago et al. 1986), Japan
(Kleinhessselink and Rosa 1994), Norway (Teigen, Brun et al. 1988), the Soviet Union
(Mechitov and Rebrink 1989), and Sweden (Slovic, Kraus et al. 1989). Renn and
Rohmann provide a review (Renn and Rohmann 2000). Only minor deviations from the
standard two-factor risk dimension pattern emerged, with Americans, for example, rating
high-tech hazards and risks high on the unknown axis as the most serious, whereas
Hungarians rated everyday and familiar hazards such as driving cars as posing higher
risks (Englander, Farago et al. 1986). Specific hazards in these studies often fell into
different parts of the two-dimensional risk space in ways that were sometimes attributable
to historical effects. For example, in a study conducted shortly after a Hong Kong public
awareness campaign about heroin, Hong Kong students rated illicit drugs as more
hazardous than did Americans (Keown 1989). Japanese students considered nuclear
hazards to be old and well-known, unlike American students, a difference attributed to
Japan’s unique experience as the target of nuclear weapons at the end of World War
(Kleinhessselink and Rosa 1994).

Because of its success at capturing differences in perceptions of risk within a
society, the psychometric paradigm has also been invoked to examine apparent
differences in perceived risk across societies. For example, Wiener and Rogers invoke the
psychometric paradigm of risk to suggest that Europeans’ distrust of genetically modified
foods may stem from their perception of such items as “unnatural” (Wiener and Rogers
2002). However, additional information would have to be provided to explain why
American consumers do not share the European distrust of "unnatural" genetically engineered products. Sunstein (this volume) suggests that the availability heuristic may interact with national history and the dynamics of social groups to explain cultural differences in risk behavior. For example, the vividness of a SARS outbreak in Toronto and of the Sept. 11 terrorist attacks in the U.S. can help explain why Canadians have been more concerned with SARS than with terrorism, whereas American citizens show the opposite pattern of concern (Sunstein, this volume).

Cultural theory

Both the measurement-theoretical and the psychometric paradigm were originally developed to explain individual decision-making and risk perception, especially differences between lay and expert risk judgments. By contrast, a body of work originating in anthropology and sociology suggests that risk is not decided at an individual level, but instead is culturally constructed (Douglas and Wildavsky 1982; Douglas 1992). In the cultural theory model, a risk is an event that threatens values held to be important at the cultural or societal level; such societal values serve as a frame through which members of a culture tend to view current events and future possibilities. "A risk is not only the probability of an event, but also the probable magnitude of its outcome, and everything depends on the value that is set on the outcome. The evaluation is a political, aesthetic, and moral matter" (Douglas 1992), p. 31). In this view, providing information about probabilities fails to change risk judgments "not because the public does not understand the sums, but because many other objectives which it cares about have been left out of the risk calculation" (Douglas 1992), p. 40). Risk perception reflects what a society or community fears and seeks to blame for individual or group misfortune (Douglas 1992).

The cultural theory of risk has been operationalized through an instrument that categorizes individuals according to their preferred cultural worldview or "orienting disposition" (Dake 1991). Cultures and individuals that value both rigid societal structures and strong social group loyalties are termed hierarchists. Those who value neither societal rigidity nor group solidarity are individualists. Egalitarians view group solidarity as valuable while disapproving of rigid social hierarchies. Fatalists feel trapped in a social hierarchy without feeling strong social bonds, whereas hermits renounce social connections altogether. (Most researchers restrict their attention to the first three categories, as fatalists and hermits are rare, and when fatalists are identified, they tend to behave like hierarchists.)

The orienting disposition categorization predicts differences in risk preferences (Dake 1991; Weber 2001). Members of hierarchical cultures tend to appear risk-tolerant toward industrial and technological risks because they trust the competency of the technocratic elites who handle risky decisions; social deviance is feared more than technological hazards because social change, unlike technological change, threatens the social order. Individualists are likely to see economic risk as opportunity, being willing to chance poor outcomes in order to reap the benefits of possible good ones. By contrast, egalitarians are distrustful of technological risks that may threaten equality by disproportionately harming the poor or the environment (Douglas and Wildavsky 1982; Dake 1991; Weber 2001).
Palmer used the orienting dispositions questionnaire to identify hierarchists, individualists, and egalitarians from a multiethnic population of southern Californian students (Palmer 1996). Respondents also rated the riskiness of a set of monetary and health/safety hazards, and their responses were assessed through the CER model. As predicted, Palmer found that the risk judgments of people with different worldviews were described by different components of the CER model. Hierarchists were predicted to be comfortable with risk-benefit methods of determining acceptable levels of risk (Thompson, Ellis et al. 1990). In agreement with this prediction, Palmer found that hierarchists’ risk judgments reflected all predictor variables of the CER model (i.e., gains as well as losses, and outcome levels as well as probabilities). Egalitarians, by contrast, were predicted to be suspicious of technology and to view nature as a fragile shared resource in need of protection (Thompson, Ellis et al. 1990). In agreement with this prediction, egalitarians viewed risk in terms of possible harms and provided risk judgments that reflected only the loss/harm predictor variables of the CER model. Finally, individualists have been described as viewing risk as opportunity, as long as the risk does not interfere with market mechanisms (Thompson, Ellis et al. 1990). In agreement with this prediction, individualists provided the lowest risk judgments for almost all of the risky investments and activities.

Specifics of the cultural theory of risk have been debated. For example, Dake’s categories have been criticized as “polemical abstractions” too rigid to adequately capture the complex and dynamic experience of either cultural dispositions or risk perception in the real world (Wilkinson 2001), and for being flawed by problematic data collection and statistical analyses (Rippl 2002; Sjöberg 2002). The adequacy of the Dake instrument as a measurement of culture has been called into question (Marris, Langford et al. 1998; Rippl 2002). Although ad-hoc models have been proposed as alternatives to the cultural theory, no overarching theoretical framework appears to have emerged. Sjöberg, for example, argues that in the case of perceived risk of nuclear waste, both the psychometric model and cultural theory should be jettisoned in favor of a regression model combining attitude toward nuclear power, risk attitude as a trait, attitude toward nature (the “tampering with nature” factor), perception of moral aspects of risk, and several attributes of the nuclear and radiation risk itself (Sjöberg 2002). Rohrmann suggests that globalization of the economy and media means that professional or political groups may have more in common with similar groups in other countries than with others of their own country (Rohrmann 2000). Social group differences may thus have larger effects than culture.

RISK PERCEPTION INTEGRATING INDIVIDUAL, CULTURAL, AND NATIONAL FACTORS

Among the variety of factors that influence risk perception are several that are likely to be culturally specific. Sex and race are both found to be important (Slovic 1999 (1997); Slovic, Flynn et al. 2000). For example, in the U.S., the subset of white males with good educations, high incomes, and conservative political tastes tend to perceive risks to be markedly smaller and more manageable than do other men, women, or members of minority races (Slovic 1999 (1997)). This “white male effect” (also confirmed by many other researchers (Weber, Blais et al. 2002)) may be attributable to the high status of these influential white men in America, which tends to give them more real as well as perceived control over hazards. Such gender and race effects are likely to
vary across nations as culture establishes the relative equality or inequality between the
sexes and various racial groups.

A related factor identified by Slovic as affecting risk perception is the degree of
trust in institutions (particularly those performing risk management), which can vary
across cultures as well as from individual to individual (Slovic 1999; Renn and
Rohrmann 2000). Impaired trust in social institutions implies suspicion about their
willfulness or ability to protect citizens, which could thus enhance the negative affective
response to potential hazards. In studies in Europe (Sweden, Spain, the United Kingdom,
and France), Viklund has confirmed that trust significantly predicted perceived risk
within countries and across countries, but that the relationship was fairly weak (Viklund
2003). Public trust may be enhanced or attenuated by a country’s mass media (Sjöberg,
Kolarova et al. 2000).

A large study of sexual behavior in Estonia, Georgia, Hungary, Poland, and
Russia contrasted individual perceptions of HIV risk in different countries (Realo and
Goodwin 2003). Participants were given a “collectivism scale” to assess the extent of
their orientation toward their families as a source of authority and strength (“familism”)
(Realo and Goodwin 2003). Across countries and occupations, high familism scores were
associated with more conservative sexual behavior and with lower perceived
vulnerability to HIV, but neither national origin nor profession had significant effects
(Realo and Goodwin 2003). This study can be interpreted to suggest that any national
differences in risk perception are attributable to differences in familial attitude. However,
because individual sexual history was so strongly correlated with familism and is also
strongly correlated with both objective and subjective HIV risk, any effect of national
difference may simply have been overwhelmed. It also seems possible that the Eastern
European countries targeted in this series of studies were not different enough to produce
large cultural effects, despite the authors’ argument to the contrary (Realo and Goodwin
2003).

CULTURE AND RISK PREFERENCE
In contrast to risk perception (the import or magnitude of a risk as assessed by
questionnaires), risk preference is conceptualized as the willingness to take risks and can
be measured by behavior.

In a variety of financial gamble experiments, Weber and Hsee have repeatedly
found that respondents from the People’s Republic of China are less risk-averse in
financial choices than are U.S. respondents (Weber and Hsee 1998; Weber and Hsee
1999). The finding contradicts expectations as well as, in one case, the predictions of the
participants themselves (Weber and Hsee 1999). In one study of financial choices,
American college students were more risk-averse than Chinese ones (Weber and Hsee
1999). The difference was attributed to differences in risk perception; although the
distribution of risk attitudes did not differ, Chinese participants tended to perceive
financial risks as smaller than Americans did. The cushion hypothesis attributes this
phenomenon to the collectivism of Chinese culture; individuals who lose money are
confident that they can turn to familial and social networks to “cushion” the blow. By
contrast, members of America’s individualist culture expect to shoulder the impact of
adverse financial events themselves – as well as pocket any winnings. The situation-
specific element of risk-taking (that is, the perceived risk magnitude) resembles other
theorists' formulation of risk perception as the severity of the consequences of a risk (Douglas and Wildavsky 1982; Sjöberg 2002). Another study in the People's Republic of China, the United States, Germany, and Poland involved willingness to pay for financial investment options and perceived riskiness of these options (Weber and Hsee 1998). The Chinese respondents considered the risks to be the lowest and paid the highest prices. Americans considered risks to be highest and were willing to pay the least. The cross-national differences in willingness to pay were completely accounted for by differences in risk perception. In addition, the researchers pointed out that although Germany's economy and wealth make it similar to America, its culture has collectivist elements (such as strong family and group ties and extensive social safety nets) that resemble China's (Weber and Hsee 1998).

The cushion hypothesis attributes cross-cultural differences in risk preferences to differences in social networks. Support for this hypothesis was found by Hsee and Weber, who found that Chinese had larger social networks than Americans, and that when social network measures were added to a regression model of risk preferences, the nationality variable was no longer significant (Hsee and Weber 1999). This suggests that social networks could be the means through which culture affects risk preference. The cushion hypothesis moreover predicts that risk preferences should differ with the type of risk. A member of a collectivist culture could expect that his or her social network would cushion the impact of monetary losses, but not other losses such as professional or social ones. Hsee and Weber confirmed this prediction in an experiment with Chinese and American participants. The participants were asked to make a financial decision (to invest money in a safe savings account or in risky stocks), an academic one (whether to write a term paper on a safe topic or a provocative one), and a medical one (whether to take a pain reliever with a known moderate effect or another one with an effect that could vary from high to low). The Chinese were significantly more risk-seeking than the Americans only in the financial choice (Hsee and Weber 1999). This work also calls attention to the domain-specificity of risk perception. Risk attitude does not appear to be a global trait; people express different thresholds for financial risks, health and safety risks, recreational risks, ethical risks, and social risks such as angering colleagues or friends (Weber, Blais et al. 2002).

Proverbs reflect cultural attitudes toward risk-taking (Weber, Hsee et al. 1998). In a content analysis of proverbs from Chinese and American proverbial expressions, Weber et al. found that American and Chinese raters agreed that Chinese proverbs were more likely to promote risk-taking than were American ones. Because the Chinese proverbs are in many cases centuries old, this finding suggests the different risk-seeking behavior found in the previous study may have a cultural origin rather than reflecting only current economic or political conditions. Furthermore, when given the same proverb to interpret, Chinese raters were more likely than American one to interpret the proverb to promote risk-taking in the context of financial risks, but not more likely to interpret it as risk-seeking in the domain of social risks. Also, the raters systematically judged American proverbs to be more applicable to financial-risk decisions than to social-risk decisions, but saw Chinese proverbs as being roughly equally applicable to the two domains. The proverbs produced by these two cultures may reflect the fact that a collectivist culture considers social concerns to be as important as materialistic ones, whereas an individualist culture privileges material concerns.
CONCLUSION
Numerous cross-national and cross-cultural differences in risk perception have been identified, and it is these differences in the perception of risk—rather than attitudes towards risk, proper—that seems to be responsible for cultural differences in risk-taking. A variety of explanations have been provided for observed cultural differences in risk perception: differences in the evaluation of specific risks on the psychological risk dimensions identified by the psychometric paradigm (including differences in perceived control as the result of power differentials or differences in institutional trust), as well as differences in objective circumstances (the cushion of collectivist risk diversification). Further research appears to be necessary to explain how these identified cultural differences can contribute to the understanding of differences in patterns of precaution between Europe and the United States.


