

**PSYCHOLOGICAL
MECHANISMS**

CHAPTER 3

KITH-AND-KIN RATIONALITY IN RISKY CHOICES

THEORETICAL MODELLING AND CROSS-CULTURAL EMPIRICAL TESTING

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Kinship, human group structure and decision rationality

Kinship is a central concept in both evolutionary analyses of social phenomena and anthropological and ecological models of social group dynamics. However, in contrast to its central position in evolutionary biology, anthropology, and ethology, kinship has been largely ignored in psychological studies of human decision making under risk.

In this chapter, I examine how dimensions of group living, particularly group size and kinship structure, affect human risk-taking. I am interested in situations where social cues are not explicitly given but implicit in the decision problem. I attempt to show that kinship and reciprocal relationships in small social groups not only determine the intimacy in social interactions among group members but also affect human reasoning and decision making in many specific and predictable ways. In particular, I hypothesize that the human species possesses a complex evolved “kith-and-kin rationality” adapted to the tasks of nepotistic decision making and risky choices in small groups. To test this hypothesis I ask subjects in China

and the United States to solve fictional decision problems about the welfare of different groups. In these problems I vary group size and relatedness while leaving the overall pay-off the same. The results are intriguing because they indicate that the human mind is not the transparent, unitary, all-purpose computer that it has been taken to be at least from the time of Descartes. Some problem solutions that humans find intuitive or plausible are irrational from the point of view of logic or game theory. The final and probably ultimate twist is that while human decision making about groups is not perfectly rational, it appears to be *adaptive*, or at least was so in our primordial past when the brain evolved.

The idea that human decision rationality can be captured by a small set of rational principles or heuristics independent of ecological and social context was long dominant in the decision-making literature. However, a growing body of empirical findings has shown that human reasoning and decision-making behaviours often violate the axioms of normative utility theories. As a result of the recognition of this inconsistency between normative decision-making principles and observed human decision-making behaviour, much effort has been spent exploring cognitive constraints on human mental processes. However, little attention has been paid to the ecological and social significance of decision mechanisms beyond information-processing efficiency. Yet such attention is critical if the adaptiveness of decision making, as distinct from its abstract logicity, is to be explored.

Over the last three decades, the recognition of the value of evolutionary and ecological approaches to understanding human behaviour has gone through several theoretical breakthroughs. For example, E.O. Wilson's landmark 1975 synthesis, *Sociobiology*, was an evolutionary approach to animal social behaviour. The general lesson appears to be that man, like other animals, is bound by many social and biological constraints that are best understood as the product of Darwinian evolution. Hamilton's (1964) inclusive fitness theory and Trivers (1971) theory of reciprocal altruism (see also Axelrod and Hamilton 1981; Williams 1966) have further enriched Darwinian theory and provided theoretical bases for interpreting and predicting a variety of human social behaviours. Most of these contributions have fallen within the broad fields of ethology, the biological study of behaviour (Eibl-Eibesfeldt 1989). Darwin's (1872) landmark study of emotions in humans is a classic of human ethology. However, the school of thought most relevant to the study of decision making is evolutionary psychology. Workers in this subdiscipline search for design features in human psychology that correspond to human-species-specific tasks and adaptations in primordial hunter-gatherer environments (see Alexander 1979, 1987; Buss 1991; Cosmides and Tooby 1992; Daly and Wilson 1988; Symons 1979, 1987, 1992; Tooby and Cosmides 1989, 1990, 1992).

Along with the exponential increase in complexity of the human brain during the last two million years or so, individual humans have been receiving and assessing more information than the members of any other species. Our unique brain allows us to form conceptual models of human-environment relationships and social interactions within and between groups. Based on these mental models, humans are then capable of symbolically anticipating possible outcomes of decisions and, for some types of problems, the probabilities of different outcomes. The selection pressures

shaping these evolved information-processing capacities are enduring and recurrent adaptation problems – challenges to our ancestors’ survival and reproduction.

The capacities to think, to imagine, to calculate, and to form symbolic representations of something would not evolve for the sole purpose of thinking, imagining, calculating, and forming symbolic representations. These could not have become ends in themselves, because individuals so preoccupied would have left fewer (if any) descendants. The genes coding for such (mental) behaviour would be weeded out of the gene pool. Rather, the evolutionary perspective leads to the expectation that these undoubted mental capacities are specialized to help in the performance of adaptive functions, including decision making.

Human species-specific social structure as an organizing factor of human social cognition

Humans have always lived in groups – families, clans, tribes, villages, and communities. The persistence of groups in human history and prehistory might have been a major force for shaping the human mind. Evidence from several disciplines suggests that there is substantial reason to anticipate that humans’ long group-living experience has helped shape social cognition. For over 95 percent of *Homo sapiens*’ existence the species lived in hunter-scavenger/gatherer societies. The social structure in this enduring social environment consisted of small, nomadic bands with kinship, reciprocity, little wealth, adult status equality, and diffuse flexible intergroup alliances (see e.g. Knauff 1991). The size of primitive hunting groups rarely exceeded a hundred people, based on converging evidence from archeological findings, the anthropology of contemporary hunter-gatherer cultures, comparisons with nonhuman primates such as chimpanzees (man’s closest relative) as well as theoretical predictions of ecological systems in equilibrium (see Dunbar 1993; Knauff 1991; Lee and DeVore 1968; Reynolds 1973). Generally speaking, evolutionary adaptation of human group living is geared to communities of multiple hunting-gathering groups, consisting of bands or households of around 25 members, linked by kinship (see Lee and DeVore 1968; Reynolds 1973).

The human evolutionary past was not considered in the development of formal decision-making theory. The concept of rationality in the decision-making literature has been normatively defined by a small set of formal rules, such as the von Neumann-Morgenstern axioms (von Neumann and Morgenstern 1947), or the Savage axioms (see Luce and Raiffa 1957; Savage 1954). This normative approach to decision making, represented by expected utility theory and its many modifications, appears to be a hybrid of utility axioms and statistical probability, as paraphrased by Laplace as “common sense reduced to calculus” (Laplace 1814/1951, p. 196). However, both theoretical and empirical attempts to describe actual decision rationality regardless of task, content or context of the decision itself have been unsuccessful. Since the advent of expected utility theory, persistent and systematic violations of utility axioms and various decision biases have been demonstrated time and again (see Luce 1992; Slovic, Lichtenstein and Fischhoff 1988; Tversky and Kahneman 1986). Advances in evolutionary thinking provide a basis for understanding these violations.

Both evolution and decision making are selection processes. As a conscious, intellectual population, humans must have been selected to match their mental models of the social world to the key features of small kith-and-kin groups. The kinship structure in human group living is then expected to be a fundamental part of human decision rationality.

Previous studies have focused on two fundamental design features of human groups (group size and its kinship structure) and have examined how these design features act as decision cues by influencing human risk preference in decision making.

In this chapter, I focus on two fundamental design features of human groups (group size and kinship structure) and examine how these design features influence human risk preference in decision making. Empirical findings come from previous studies (Wang 1996a, 1996b, 1996c; Wang and Johnston 1995) as well as data collected for this chapter. The basic assumption is that human decision makers possess a *kith-and-kin* rationality, a decision-making mechanism that takes into account group characteristics of friendship and kinship. The idea is that when making choices at risk, specialized risky-choice mechanisms are automatically (and probably subconsciously) triggered by simple and implicit cues. These cues include group size, relatedness and familiarity, group characteristics that in our evolutionary past reliably signalled that an adaptive problem existed for the group, not just the individual.

Search for empirical evidence: Activating choice mechanisms by social domain-specific cues

Group size effects

Group size is the pivotal point of social structure at which civilizations made most significant changes. According to Reynolds (1973) the most significant social revolution is marked by the change from small agricultural or pastoral communities to large populations of many thousands of people whose economic, social and political centre is the city. This first happened around three or four thousand years B.c. and spread more widely, the process accelerating over the last few centuries. As a result, living in mass communities is novel for most human populations. It is especially novel when viewed on the evolutionary time-scale which stretches back tens of millennia for distinctly human characteristics, and millions of years for characteristics shared with earlier hominids and nonhuman primates. Put differently, the rapid demographic changes of the last few millennia have probably occurred too quickly for human genes to “catch up”. Historical change may have opened a yawning gap between our current mass social environment and our evolved small-group social cognition.

The prolonged evolutionary experience in small face-to-face groups would have shaped the human mental mechanisms to be sensitive to variables characteristic of small group living in human evolution. For this reason, people may be sensitive to social cues about the size of a small group but indifferent when group size exceeds the primordial hunter-gatherer group size.

In the first two studies to be reported here, I focus on group size as a signal of adaptive significance in risky-choice situations. The hypothesis is that size is a powerful and parsimonious contextual cue for activating specific mechanisms that have been designed to solve important problems posed by human small-group living. Thus, when making choices at risk, a simple number, the size of a social group in which choice problems occur may become a reliable social cue for risk perception and risk management. The size of a social group serves as a comprehensive index about many important features of group-environment relationship, dominance and affiliation, and social interactions between groups as well as common social contracts endorsed in social transactions, reciprocity, and kinship within the group. For example, compared with large groups, members in small groups are more interdependent on each other. Therefore, in a small group situation, people may be more willing to share risks in order to pursue a fair and positive common outcome for every group member. In contrast, when a formally identical choice problem is stripped of information about its social context, or is presented in a naïve context, no specially designed mechanisms can be used to solve the problem. In such situations, we should expect the risk preferences of a decision makers to become ambiguous and inconsistent.

Our first two experiments (for details, see Wang and Johnston 1995) was designed to study (1) if human decision makers are, in fact, sensitive to cues about group size; and (2) if specific strategies of risk management can be activated by these cues in an automatic manner with little awareness.

The experiments deployed a well-known cognitive phenomenon, found in risky choices, called the *framing effect*. A classical demonstration of framing effects was provided by Tversky and Kahneman (1981) in a study using a hypothetical life-death decision problem. They found that the majority of their subjects preferred a sure outcome to a risky, probabilistic outcome when the two alternative outcomes were framed in terms of lives being saved. However, when the same outcomes, framed in terms of lives lost (i.e., number of deaths) were presented to another group of subjects, their risk preference reversed: The majority of the subjects preferred the probabilistic outcome over the sure outcome. In the decision-making literature, framing effects are often considered as a cognitive illusion that violates the invariance axiom of expected utility theory. The invariance axiom requires a rational decision maker to have a consistent preference order among choice prospects independent of the way the prospects are presented or framed (Tversky and Kahneman 1986).

The life-death decision problem provides a useful empirical paradigm to manipulate the social group context of the problem in an implicit manner. In our study (Wang and Johnston 1995), each subject was given only one version of the life-death problem. The cover story of the problem provided a hypothetical group context that differed only in the number of the people involved. All the subjects were asked to “Imagine that X people are infected by a fatal disease”. The number X, however, was different for each group of subjects. Four numbers were used – six thousand, six hundred, sixty, and six. The underlying assumption was that the simple difference among these numbers may be perceived as qualitatively different

cues for large group vs. small group conditions and as a result activate distinct risky choice mechanisms.

The second manipulation used in the study was the framing of the choice outcomes. The subjects were asked to evaluate two alternative medical plans in terms of their expected outcomes and then indicate which plan they would choose. In the *positive framing* condition, the choice outcomes were framed in terms of the number of lives to be saved. The subjects were told that if plan A was adopted one-third of the patients would be saved for certain; and if plan B was adopted, there would be a one-third probability that all the patients would be saved and a two-thirds probability that none of them would be saved. In contrast, in the *negative framing* condition, the same choice outcomes were framed in terms of the number of lives to be lost. The subjects were then told that if plan A was adopted, two thirds of the patients would die for certain; and if plan B was adopted, there would be a one-third probability that none of the patients would die and a two-thirds probability that all of them would die.

It was predicted that the effect of choice framing on risk preference would be a function of the perceived social group context. It was found, and replicated in other studies (e.g. Wang 1996c), that the framing effect (i.e., the irrational reversal in risk preference) was found only when the problem was presented in a large group context with either six thousand or six hundred people involved. However with smaller group sizes of six and sixty, the framing effect was absent, and the majority of the subjects favoured the risky probabilistic outcome under both framing conditions, suggesting a “live or die together” small group rationality (see Figure 3.1).

Kinship effects

Campbell's (1986) view of rationality, which he called collective rationality, maintains that it is primarily a rationality of the means whereby individuals maximize inclusive fitness. Campbell pointed out that although in practice an individualistic self-centredness is often assumed, we should be open to expanding the nature of the utility being maximized. Campbell argues that “Human rationality is inevitably a theory about the rationality of the goals, interests, or utilities, as well as about the rationality of decision making in service of these interests. From the standpoint of evolutionary biology, our innate pleasures, hungers, lusts, fears, and pains are subgoals, selected by mediating inclusive fitness” (p. S357).

The theory of inclusive fitness was invented by Hamilton (1964). Traditional Darwinian fitness is measured by the number of offspring produced by an individual. Hamilton redefined fitness to include an individual's effects upon genes carried by genetic relatives. Hamilton's inclusive fitness, therefore, is measured by the number of offspring produced by an individual plus the number of offspring produced by the individual's relatives discounted by the relatedness, designated by r . Hamilton (1964, p. 19) claimed that: “The social behavior of a species evolves in such a way that in each distinct behavior-evoking situation the individual will seem to value his neighbor's fitness against his own according to the coefficients of relationship appropriate to that situation”. If so, a subject would evaluate the choice outcomes only in terms of their differential effects on her/his own fitness rather

than on someone else's fitness. Inclusive fitness is not a general, abstract concept; it has to be measured with reference to the decision maker herself/himself.

From the viewpoint of inclusive fitness maximization, each choice option should be evaluated in terms of its effects on a decision maker's inclusive fitness. The next two studies thus examine whether an evolved kin cognition is tuned to the relatedness in kinship between a decision maker and decision recipients.

In two studies (Wang and Johnston 1995, and Wang 1996c), we tested the hypothesis that the observed preference shift towards the risk-seeking direction in small group contexts would be further intensified in a kinship context. The results from both studies showed that whenever six hypothetical patients were described as their close relatives, subjects always unambiguously preferred the probabilistic outcome to the sure outcome, in order to give everybody an equal chance to survive. Interestingly, as a signature pattern of this risky choice in the kinship context, the subjects, although clearly being risk-seeking, became significantly more risk-seeking if the choice outcomes were framed negatively in terms of lives lost. The risk-seeking choice percentage increased from 72 percent under positive framing to 94 percent under negative framing in the first study and from 73 percent to 90 percent in the second study. The extreme risk-seeking in kinship context appears to have been elicited by the choice outcomes that were both objectively negative and negatively worded (see Figure 3.1).

The aim of the second kinship study was to further explore whether human risk preference is sensitive to the closeness in kinship. In this study, hypothetical

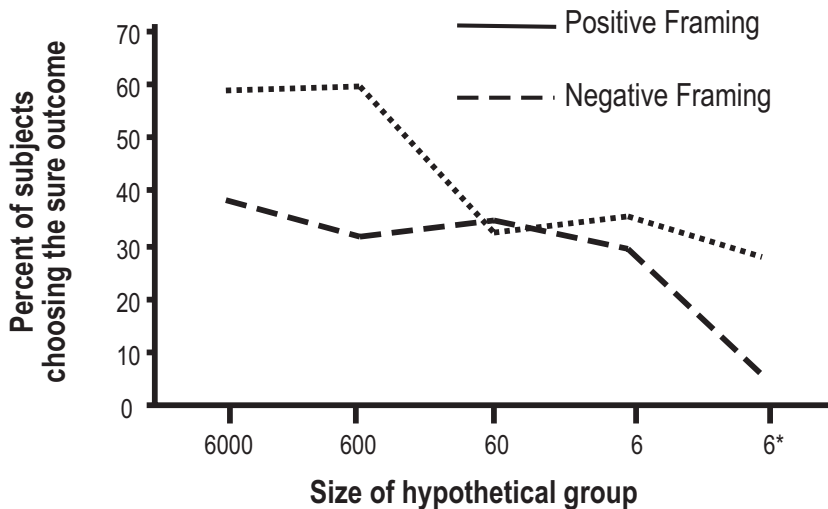


Figure 3.1 Risk proneness as a function of the group size and kinship (adapted from Wang and Johnston, 1995).

* denotes that the six hypothetical patients were described as the close kin of the subject.

patients in the life-death problem were described as subjects' relatives or an anonymous person X's relatives. The expected value for both the sure outcome and the probabilistic outcome was the same. That is, one third of hypothetical patients was expected to be saved. All the choice outcomes were described in terms of lives being saved. The sure outcome of the problem was different for subjects in different experimental groups in terms of who might be saved, close relatives ($r=0.5$) or distant relatives ($r=0.25$), while the probabilistic alternative of equal expected value remained the same. Hypothetical decision recipients were balanced in terms of their gender and age. The following are examples of the questionnaire with the sure outcome favouring remote relatives:

Imagine that six people in your family, including *your mother, your daughter, your uncles and your nephews* are infected by a fatal disease. Two alternative medical plans to treat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the plans are as follows:

If plan A is adopted, two males will be saved.

If plan B is adopted, there is a one-third probability that all six of them will be saved, and a two-thirds probability that none of them will be saved.

Which of the two plans would you favour?

Imagine that six people in your family, including *your father, your son, your aunts, and your nieces*, are infected by a fatal disease. Two alternative medical plans to treat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the plans are as follows:

If plan A is adopted, two females will be saved.

If plan B is adopted, there is a one-third probability that all six of them will be saved, and a two-thirds probability that none of them will be saved.

Which of the two plans would you favour?

Four groups of subjects were recruited from a state university in the United States. Each group contained fifty subjects. Two groups of subjects received the life-death problem in which the relatives were described as a person X's relatives (Xr groups), and the other two groups received the problem in which the decision recipients were described as subject's own kin members (Kr groups). The difference between the two Xr groups as well as between the two Kr groups was in the sure outcome in which either close kin would be saved (Xr.5 group and Kr.5 group) or remote kin would be saved (Xr.25 group and Kr.25 group). The labels of r.5 and r.25 reflect the genetic relatedness (r) between the decision maker and the survivors in the sure outcome.

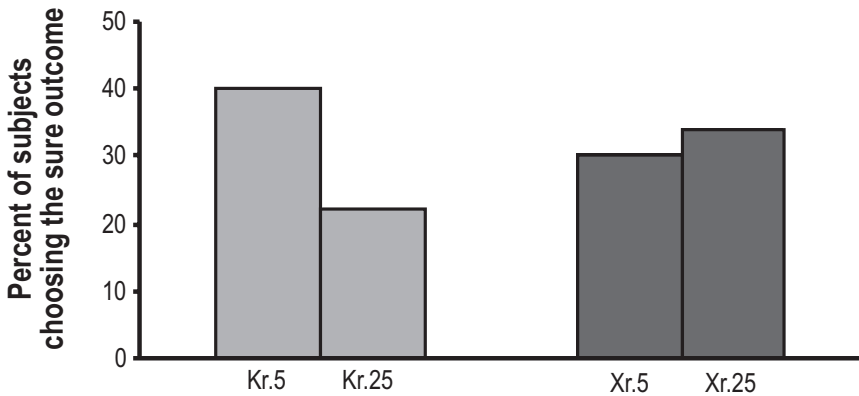
It was expected that although the dominant choice preference would be risk-seeking in a kinship context, the unfavourable sure outcome might become more attractive when the survivors of the outcome were meant to be close kin compared to remote kin. The second prediction was that this predicted difference would disappear when the hypothetical decision recipients were described as person X's family members.

Our two predictions based on Hamilton's inclusive fitness model are supported by the results. More subjects chose the sure outcome when it implied that close rel-

atives would be saved at the cost of distant relatives than when it implied that distant relatives would be saved at the cost of close relatives. The choice percentage of the sure outcome significantly increased from 22 percent in the Kr.25 group to 40 percent in the Kr.5 group (see Figure 3.2). This finding suggests that decision rationality is kinship specific.

However, as illustrated in Figure 3.2, the difference in choice frequency disappeared when the decision recipients were described as person X's relatives. No significant choice difference was found between the Xr.25 and the Xr.5 groups; the choice percentage of the sure outcome was 30 percent and 34 percent respectively. The absence of a significant difference in risk preference between the Xr.5 and the Xr.25 groups argues against an all-purpose rationality viewpoint and indicates that human choice mechanisms automatically distinguish kinship from pseudo-kinship or quasi-kinship. As a result, a decision maker evaluates the options of the choice problem differently.

It is worth mentioning that even under the Kr.5 condition, the majority of the subjects (60 percent) chose the probabilistic outcome, suggesting that subjects were willing to risk their close relatives in order to save both close and distant relatives. This finding is open to interpretation. It might be evolutionarily rational to gamble to save the entire group if saving only close kin is not enough for the survival of the group.



Experimental

Figure 3.2 The choice of the sure outcome vs. the probabilistic outcome of equal expected value as a function of the closeness in kinship between a decision maker and the hypothetical survivors in the sure outcome.

Kr.5 vs. Kr.25 denote saving close kin vs. saving distant kin by choosing the sure outcome over the probabilistic outcome. XKr.5 vs. XKr.25 denote saving person X's close kin vs. saving person X's distant kin by choosing the sure outcome over the probabilistic outcome.

Does kinship enhance risk-taking when the decision maker is also on the same boat?

Our data have shown that the willingness to take a joint risk to save the whole group was stronger in a kith-and-kin context. However, it is still not clear whether the same risk-seeking attitude would be held when a life-death decision would directly affect the survival of the decision maker as well as the decision recipients. We hypothesized that if kin selection had favoured a higher degree of cooperation among kin in small groups, it would have also favoured a risk preference for taking joint adventures together as a group. Therefore, in the case that the decision maker is part of the group at stake, the risk-seeking preference would not be reduced or reversed.

In a recent study, we randomly assigned one hundred and twenty-six subjects to each of the three experimental conditions. The subjects in each of the three experimental groups were asked to imagine that six hundred persons (or six persons, or six family members) including themselves were infected by a fatal disease. Similar to the previous experiments, each subject was then asked to make a binary decision between two alternatives: a sure outcome of saving one third of the group versus an “all or nothing” gamble of equal expected value.

The results from this experiment revealed a choice pattern that is consistent with the previous findings. A majority of the subjects (60 percent, $n=42$) in the large group condition (i.e., six hundred patients including the decision maker) favoured the sure thing. However, the subjects were clearly risk seeking in the kith-and-kin conditions (i.e., the lives at risk were “you and five of your friends” or “you and five of your family members”). Seventy percent of the subjects ($n=43$) in the friend (kith) condition and 71 percent ($n=41$) of the subjects in the kinship condition chose the gamble which offers a one-third probability of saving everybody. The risk-seeking tendency was not reduced in the situation where the decision maker himself or herself is also on the same boat with other kin-and-kith members.

The choice patterns found in the kith group context and kin group context were similar. Considering the earlier finding that close kin were favoured over distant kin, it is conceivable that if fine distinctions are made between degrees of relatedness, then friends will be given lower priority than family members.

The kith-and-kin context sensitive risky choice found in our between-subjects experiments was further confirmed in a within-subject experiment that we conducted recently. In this experiment, each subject was presented with two life-death problems. The subjects were given a positively framed problem with six hundred lives at risk followed or proceeded by a negatively framed problem with six close kin at risk. Of the total of one hundred and twenty-three subjects, sixty-two of them chose the sure outcome for one problem and the gamble for the other. These sixty-two subjects who reversed their risk-preference showed a strong within-subject consistency; 94 percent of the risk-preference reversals were in the predicted direction from risk averse in the large group context to risk seeking in the kin context.

When do you prefer a gamble to a sure thing even when the sure thing has a markedly higher expected value?

In this next study (see Wang 1996b, for details), I sought to examine how strong was the risk-seeking preference in the kith-and-kin contexts by decreasing the expected return of the favoured probabilistic outcome. Secondly, we tested how such risk-seeking preference would vary as a function of the group context.

A total of one hundred and sixty subjects were randomly assigned to four experimental groups, each consisting of forty subjects. Subjects were asked to choose between a statistically dominant sure outcome that would save two thirds of the group members and a statistically inferior probabilistic outcome that had a one-third probability of saving all the group members. The subjects in the four experimental conditions were given the life-death problem presented in the group context with six hundred, six, and three persons, and six family members, respectively.

As predicted, the number of subjects choosing the sure outcome that had a higher expected value varied as a function of the size and the kinship of the social group (see Figure 3.3).

In the large group context, with six hundred anonymous persons, 90 percent of the subjects chose the statistically dominant sure outcome. As the group context was reduced from six hundred to six, to three, the choice percentage of the sure outcome also declined from 90 percent to 75 percent, to 67.5 percent, respectively. The subjects became even more biased when in the kinship context; the percent-

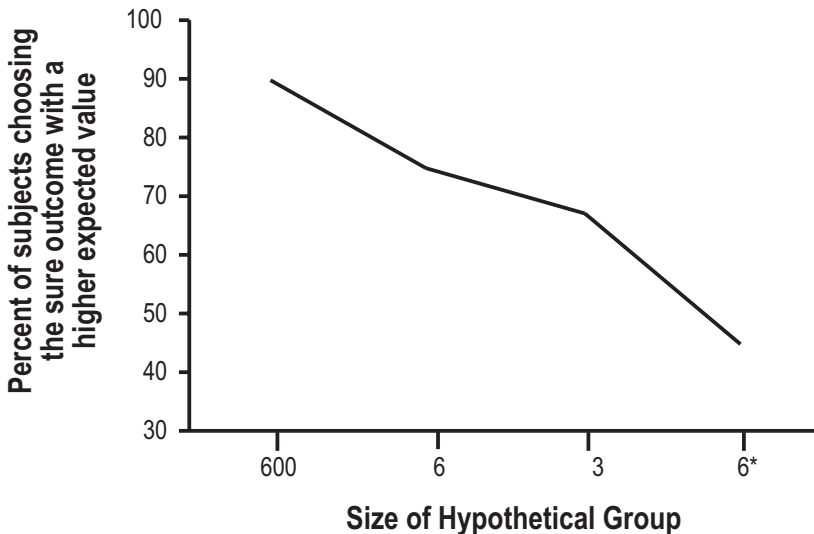


Figure 3.3 The percentage of the subjects choosing the sure outcome to the inferior probabilistic outcome in different group contexts (adapted from Wang, 1996a).

* denotes that the six hypothetical patients were described as the close kin of the subject.

age of the subjects choosing the sure outcome further declined to 45 percent. Presumably, for more than half of the subjects saving two-thirds of their kin was not enough so they resorted to the all-or-none probabilistic outcome even though it had only a one-third probability of saving all the family members and a two-thirds probability of losing everybody.

The percentage of the probabilistic choice in the large group context differed significantly from those in the two small group contexts (i.e., group sizes of six and three). In addition, the percentage of the probabilistic choice in the kinship context was significantly higher than those in the small group contexts. However, there was no significant difference in choice frequency between the two small group contexts. It is clear that the observed choice bias was not due to cognitive illusions but is a phenomenon sensitive to social group structure.

Group size, kinship, and kin mimicry mechanisms: A cross-cultural examination

In order to test the robustness and universality of the observed kith-and-kin sensitive choice phenomenon, we conducted a cross-cultural study (reported in Wang 1996b). Five pairs of the life-death decision problems framed in terms of either lives to be saved or lives to be lost were translated into Chinese. These questions were identical to those used in the first experiment discussed earlier in this chapter. The first four pairs of the life-death problems differed in the size of hypothetical group (i.e., six thousand, six hundred, sixty, and six). The last pair of the problems was presented in a kin group context with six hypothetical patients being described as a decision maker's close kin. For all versions of the choice problem, the probability of survival was equal to one third: the sure option led to a sure survival of one-third of the group, and the probabilistic option led to a survival of the whole group with a one-third chance. A total of four hundred Chinese subjects, recruited from universities, research institutes, factories, companies, and government departments in Beijing (People's Republic of China), took part in this experiment.

The general choice pattern found in this study was similar to that found in the U.S. samples. First, subjects were more risk-seeking when the life-death problem was presented in kith-and-kin contexts. Second, no irrational reversal in risk preference was found when deciding the fate of a kith or kin group, and the subjects were even more risk-seeking under the negative framing in the kin context. Third, framing effect was found in the large group context with six thousand hypothetical patients. However, at group size of six hundred, no framing effect was found, and a majority of subjects were risk-taking under both frames.

In a nutshell, the results from the Chinese study replicated the U.S. data with the one exception that the group size at which risk preference switched from risk-averse to risk-taking was larger for Chinese subjects. This finding suggests that the subjective size of the we-group (kith-group) is larger for Chinese subjects (i.e., six hundred instead of sixty). This difference in the subjective scope of local kith group appears to be related to the finding that Asian people living in western societies tend to show stronger group loyalty than their western counterparts (e.g. Triandis 1991).

Human kith-and-kin perception appears to be adjusted to specific cultural features in group living through social experiences. In other words, human kin recognition and group identification are not an instant imprinted process; they involve culturally specific social learning. There is no known “green beard effect” (see Dawkins 1982) in humans that allows an instant recognition of kith or kin members by using a conspicuous and reliable physical feature, such as the imaginary green-coloured beard. Recognition of kinship and perception of group membership are acquired from social experiences.

The demographic features of Chinese population and social structure appear to be quite different from the counterparts of the U.S. These include a large overall population, extended family size, more complex kinship structure, larger reciprocal networks, enduring social interactions within a local society over generations, and low mobility of social groups. These differences in social group structure and networks may also manifest themselves in kith-and-kin cognition through some cultural means. One of the possible means of such cultural impact may be kin mimicry mechanisms (Balch 1986; Eibl-Eibesfeldt 1972; Salter 1995). Eibl-Eibesfeldt (1972) pointed out that many problems of modern societies started to occur when they grew to a size where small-group dynamics no longer applied, when familiarity between group members was replaced by anonymity among strangers. A common method to control these problems, according to Eibl-Eibesfeldt, has been kin mimicry for creating symbolic kinship that enables group members to perceive the group as an extended family.

Historically, nepotism and “brotherhood” have a long standing in an extended ethnic network in China. The conceptual members of the we-group could include kinsmen, fellow villagers, members of local kith groups, neighbours of many generations, offspring of the friends of one’s ancestors, and people connected through marriage, factions, or gangs. In addition, collectivism rather than individualism has been a dominant social norm in China. This cultural atmosphere fosters the use of kin mimic devices and fits well with the demographic characteristics of Chinese social structure.

In sum, it appears that a larger conceptual scope of we-group for Chinese society members is a plausible result of culturally motivated adjustment to the specific features inherent in the social structures of Chinese society. The kith-and-kin decision rationality is also sensitive to the specific structures of social group living.

A mean-variance model of risky choice

Basic concepts

Recent discussions of domain-specific cognitive mechanisms for solving evolutionarily recurrent and adaptively important problems have drawn research attention to the design features of human information-processing (e.g. Cosmides 1989; Cosmides and Tooby 1992). In this light, the content and context of decision problems should not be considered as intervening or decorative variables but as the primary and defining factors of human judgment and decision making. Content and

contextual variables thus can be used either for evaluating human judgement or as a research probe to uncover the underlying psychological mechanisms (e.g. Cosmides and Tooby 1992; Gigerenzer 1996; Gigerenzer and Hug 1992; Lopes and Oden 1991).

In the following section, a model of risk preference is presented, which takes into consideration both means and variances in the expected values of choice outcomes. The model is intended to be both normative and descriptive of context-dependent decision behaviour.

The kith-and-kinship dependent choices, although incompatible with the normative theory of rational choice, are consistent with the findings from recent studies on foraging behaviours. Theories of risk-sensitive foraging often address the interaction between the mean and variance of some important environmental variables, such as the food consumed or the time spent acquiring energy (e.g. Caraco 1981; Caraco, Martindale, and Whittam 1980; Houston, Kacelnik and McNamara 1982; Real 1991; Real and Caraco 1986; Stephens and Krebs 1986). The central idea embodied in these models is that risk preference of foraging animals is contingent on their concurrent survival requirement (e.g. energy budget) and the expected mean and variance of potential outcomes.

Suppose for example that a forager must consume M calories daily in order to survive, and has to decide where to forage between two places where the mean expected daily crop on both locations is equal, but their variances differ. In the low variance location, food resources are stable whereas in the high variance location, food resources are ephemeral and hard to find, but superabundant once located. If the mean value of the expected daily intake is less than the minimum requirement M , the adaptive choice is to take a risk and forage on the high variance location. As a result of this choice, the forager will have a better chance of getting more than the required M calories of daily intake. In contrast, if the mean expected daily crop is greater than M , the forager is better off foraging on the location with a lower variance, as this decreases the chance of death. That is, for gains above a specific minimum requirement, the choices should be risk averse; but to avoid potentially disastrous losses that fall below the minimum requirement, the choices should be risk-seeking.

The emphasis on environmental variance has also been a key feature of biological studies of behavioural strategies. Organisms evolve different survival strategies to fit different types of environments. Among theories that correlate behavioural strategies with environments, the theory of r - and K - selection developed by MacArthur and Wilson (1967) is a well-known example. In a high-variance, catastrophic environment everything is too unpredictable for a risk-averse strategy. Organisms in such a high variance situation would be better off if they make a rapid maximum investment in the “hope” that some offspring will survive the “expected” catastrophe. This evolutionary strategy of maximizing reproductive effort at the expense of delicate morphological adjustment is referred to as the r strategy. Species that live in stable environments, near the maximum population size that the environment can support, will gain nothing by producing a large number of poorly adjusted progeny. In such stable and low variance environments, the selection pressure would favour the organisms who invest in a few finely tuned

offspring. This is called the *K* strategy. However, with a few exceptions (e.g. Allais 1979; Coombs 1975; Lopes 1987; Luce 1980) decision theories have largely ignored the role of variance in expected returns in determining risk-preference.

Borrowing relevant concepts from foraging theories, the present mean-variance model of risk preference assumes that decision makers are sensitive to outcome variance and risk distribution and have a minimum requirement determined by social and biological variables.

The model places a special emphasis on the three-way relationship between (1) the expected mean value of choice outcomes, (2) variances in the outcomes, and (3) a minimum requirement (MR) reference point, which may be psychologically translated into aspiration level. This three-way interaction obeys the mean-variance principle. The short-hand rule is: be risk/variance-seeking when the expected mean value of choice outcomes is below a task-relevant MR; but be risk/variance-averse when the expected mean value is above the MR.

It should be noted that in the present mean-variance model the concept of risk is correlated to but not tantamount to the concept of variance. For example, when the expected mean value of a choice outcome is just above its MR, a small variance in the outcome would be perceived as quite risky. However, when the mean value is much higher than the MR, the same or even larger amount of variance in the outcome would not be considered as risky as in the former case.

Empirical testing of predictions from the model: Effects of survival rate manipulation on risk preference

Our previous empirical findings allow us to roughly locate the setting of the MR in each of the three distinct group contexts (i.e., large group, small group, and kin group). With regard to the life-death problem, the MR can be inferred by asking what is the minimum sure outcome that is preferable to the gamble outcome? The operational measure of the MR used here is the survival rate offered by the sure outcome that is favoured by at least 50 percent of subjects, called *MR50+*.

Considering the data obtained in large group contexts under positive framing, the *MR50+* is no greater than one third of the total expected value (i.e., to save at least one third of the group members at stake). In the first study discussed in this chapter, about 60 percent of the subjects preferred the sure outcome when it resulted in the sure survival of one third of the members in a large group. However, the *MR50+* for saving hypothetical family members is significantly higher. In another study discussed earlier, 55 percent of the subjects preferred the inferior probabilistic outcome to the sure survival of two thirds of the kin members, suggesting that saving two thirds of the kin group was not enough. Therefore, the *MR50+*, the minimum requirement for more than 50 percent of the subjects, in the kinship context is to save no less than two thirds of the family members at risk. The *MR50+* for saving lives in a small group context then is expected to be in between: higher than one-third sure survival but lower than two thirds of sure survival. This analysis is illustrated in Figure 3.4.

According to the above analysis, if the expected survival rate in the life-death problem is increased from one third of the group members to two thirds of the

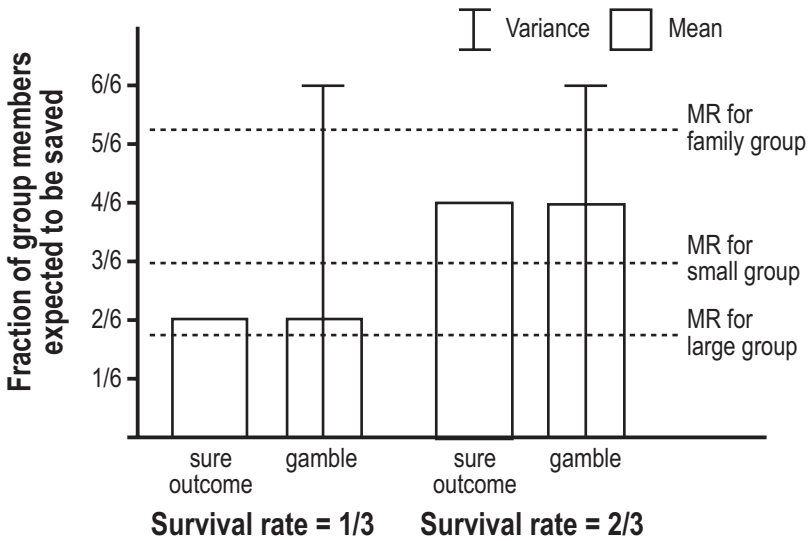


Figure 3.4 Predicted minimum requirement (MR) for the sure saving of a fraction of the hypothetical group at stake in three social group situations.

group members, the likelihood that the expected sure outcome passes the MR of the decision maker would also increase. Thus, the decision maker would be more likely to choose the sure outcome. However, the effects of increasing the expected survival rate should depend on whether the increment is large enough to pass the MR of the decision maker. Depending on the group context in which the life-death problem is presented, the effect of the increased survival rate would vary. First, in a kinship context, increasing the survival rate from one third to two thirds would not significantly increase the percentage of the risk-averse choice because the sure survival of two-thirds of the family members is still below their MR50+. That is, saving two thirds of endangered kin for sure would not be enough for more than half of the subjects. Second, in a large group context, increasing the survival rate may only have a marginal effect on subjects' risk preference because the one-third survival rate would be already acceptable for more than half of the subjects. Thirdly, the survival rate manipulation, however, should be most effective when the problem is presented in a small group context where subjects' minimum requirement for the sure outcome is likely to be above one third but below two thirds of the entire group. Therefore, we predicted that by increasing the expected survival rate from one third to two thirds in small group contexts, more subjects would choose the sure option than its gamble equivalent.

These specific predictions were tested in a recent experiment. The results, as being presented in Figure 3.5, are in agreement with the predictions from the mean-variance model of risky choice. In the study, one hundred and ninety-one student volunteers from a mid-west state university were randomly assigned to

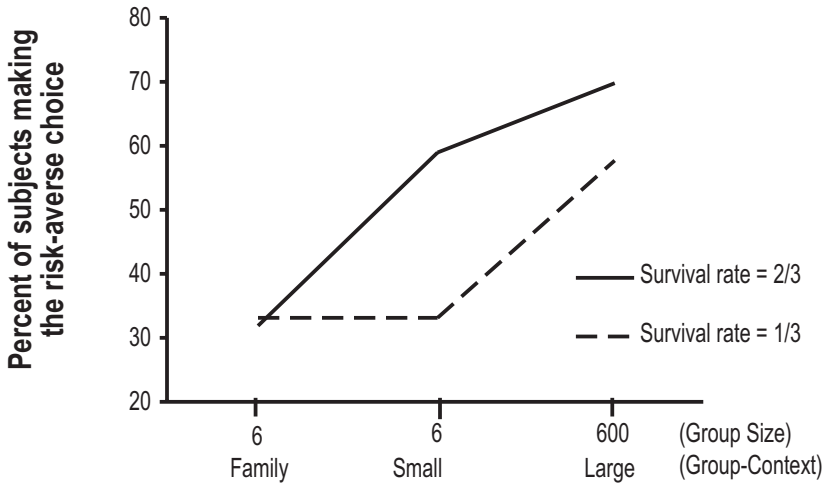


Figure 3.5 The effects of increasing survival rate of hypothetical patients on subjects' risk preference across three social group contexts.

each of the six experimental conditions with thirty-one to thirty-four subjects in each condition. The six experimental conditions comprised a 2 x 3 design (2 survival rates x 3 social group contexts).

The only significant effect of increasing the survival rate from one third to two thirds was found between the two subject-groups receiving the life-death problem presented in the small group context with six anonymous lives. Under the one-third survival rate, only 33 percent of the subjects preferred the sure outcome to the probabilistic outcome of equal expected value whereas under the two-thirds survival rate, the percentage of the sure outcome over the all-or-none probabilistic equivalent increased to 59 percent. This finding suggests that the social domain-specific MR is a key determinant of risk preference.

When my older kin is old: Effects of age and expected reproductive value on risk preference

From a kin-selection viewpoint, it is clear that the reproductive value of decision recipients should influence risk preference of the decision maker. In this final section of the chapter, I report a study (Wang 1996b) that further illustrates the implications of the mean-variance model. In this study, we manipulated the inclusive reproductive values of hypothetical decision recipients to the decision maker, using the standard life-death choice paradigm.

In making social decisions, a specific expected value of a choice option may be below or above the minimum requirement (MR) for a decision maker depending on the inclusive reproductive value of the decision recipients. The key hypothesis of the study was that a decision maker's own age, as a reference point, would affect the way the decision maker evaluates the so-called "older" or "younger" kin at stake. Compared with one's own age, the age cues of the hypothetical decision

recipients (older versus younger kin) could be used to determine their inclusive fitness values to the decision maker.

It was hypothesized that for young subjects (young college students), the manipulation of saving-young (their siblings) vs. saving-old (their parents) would yield similar reproductive and fecundity values and thus weighted similarly. In contrast, for middle-aged subjects, their younger kin would, on average, have a higher expected reproductive value than their older kin. Therefore, the expected utility of the sure outcome would be up-weighted when the sure survivors were the subjects' younger kin but down-weighted when the survivors were their older kin.

The expected differences in reproductive values of hypothetical decision recipients with regard to young and middle-aged decision makers are shown in Figure 3.6.

Three specific predictions were proposed:

The hypothesis was tested using a life-death decision problem in which six hypothetical members of a family were infected by a fatal disease. The six hypothetical patients were described as either the subject's or someone else's close relatives (parents, siblings, and offspring). The subject was asked to make a dichotomous choice between a sure outcome and a probabilistic outcome. The sure outcome led to a sure survival of one third of the kin (either two younger or two older family members) whereas the probabilistic outcome had a one-third probability of saving all of the six kin members.

As a between-subjects design each subject received only one version of the life-death problem. Therefore, the saving-young and saving-old manipulation was hidden to the subjects. A total of two hundred and nineteen student volunteers were assigned to one of the six experimental groups with thirty to forty-two subjects in each group. The six experimental conditions included two middle-aged subject groups receiving the life-death problem with either a saving-young or a saving-old

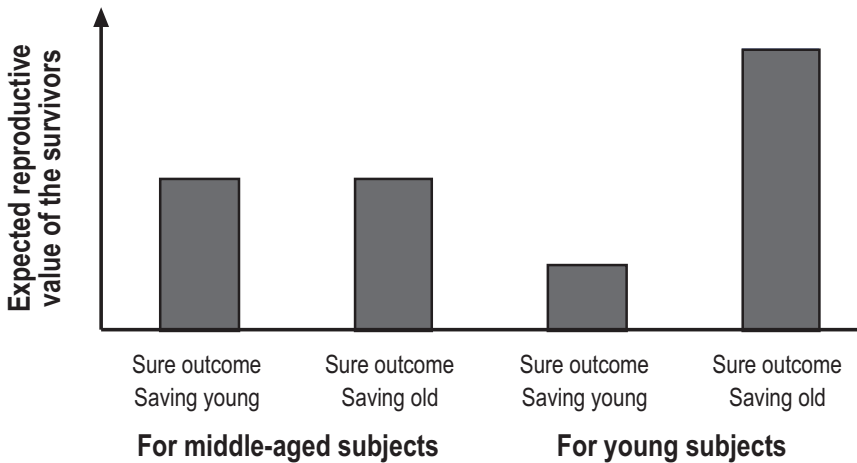


Figure 3.6 Expected reproductive values of the hypothetical survivors in the sure outcome for the young and middle-aged subjects.

sure outcome. The subjects in two of the four young-subject groups were also given the life-death problem with either a saving-young or a saving-old sure outcome as did for the middle-aged subjects. The other two young-subject groups were given either a saving-young or a saving-old version of the life-death problem with the hypothetical patients being described as a person X's kin.

The age-window of 30–55 years was used to select the middle-aged subjects and the sampling process continued until there were at least thirty subjects in each of the two middle-aged subject groups. The mean age was 20.3 years for the young subjects and 41.4 years for the middle-aged subjects.

Consistent with the expected reproductive values illustrated in Figure 3.7, the young subjects equally valued their younger and older hypothetical kin and indistinguishably favoured the probabilistic outcome (77.5 percent in the “saving-old” group and 76.2 percent in the “saving-young” group). In contrast, for the middle-aged subjects, the saving-young vs. saving-old manipulation was expected to represent different fitness values to the subjects. As expected, the middle-aged subjects were much more prone to the sure outcome when it implied saving their younger family members but were extremely risk-seeking in favour of the probabilistic outcome when the sure outcome resulted in the survival of only older kin (see Figure 3.7).

These findings indicate that the increased utility to save two younger kin for middle-aged subjects was higher than for the young subjects and thus was more likely to pass the MR. Presumably, the saving-young sure outcome was particularly attractive to those of the middle-aged subjects whose MR was not too much above randomly saving one third of the family members. In contrast, the saving-old sure

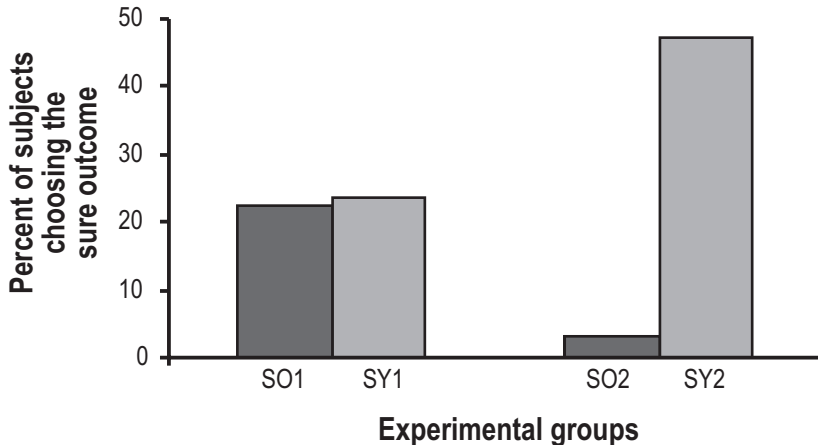


Figure 3.7 The effects of age, perspective of decision makers, and reproductive cues about decision recipients on choice preference (adapted from Wang, 1996b). SO and SY denote saving-old and saving-young manipulations in the sure outcomes; x denotes perspective change from the subject's own family to a person's family; 1 denotes young subject group; 2 denotes middle-aged subject group.

outcome would intensify the risk-seeking preference because it made the sure outcome less likely to pass subjects' MR.

Another experimental manipulation of the study concerned the effects of perspective change on subjects' risk preference. It was hypothesized that when the life-death problem was described in a context of an anonymous person's family, the subjects would not be inclined to use their own ages as a reference to measure the potential reproductive values of younger or older hypothetical survivors described in the sure outcomes. The subject would then be more likely to consider "younger" survivors as youth and "older" survivors as senile people and place higher values on the saving-young than the saving-old option. This is, in fact, the case. Although the overall choice preference was risk taking, more subjects favoured the saving-young sure outcome than saving-old sure outcome when compared with the same probabilistic outcome.

This result is consistent with the findings of a study by Burnstein, Crandall, and Kitayama (1994), in which the authors examined a key assumption of kin-selection that relatives who are helped must have sufficient fitness value (e.g. expected reproductive values) to benefit the altruist or the altruist's offspring. In this study, subjects had to decide how to use their resources to help others who vary in kinship. The study shows that the subjects' tendency to help in a live-or-die situation is affected by the hypothetical recipients' relatedness, age, health and wealth conditions, and fecundity status in directions which enhance the helpers' inclusive fitness. However, when the benefits of altruism are small, respondents, regardless of their age, conform to moral norms and help the older member. Similarly, the effects of perspective change discussed above suggest that kinship cognition is a self-referenced mechanism, which distinguishes real kinship decisions from pseudo kinship decisions. In the latter case, people tend to conform to social norms and generally value the lives of young members above the lives of elderly members of the society.

Conclusion

Darwinian theory and details of human social evolution yield rich insights into the psychological mechanisms and functional organization of human cognition. The empirical findings discussed in this chapter demonstrate the value of taking into consideration the roles of species-specific group and kinship structures in shaping human decision rationality. These experiments have shown that simple, implicit information about social group structure (especially size and kinship) strongly regulates choice behaviour. In a decision situation, kith-and-kin rationality concerning the fate of local groups differs from rationality concerning the fate of a large number of anonymous people and results in different risk preferences. It is clear that the risk preference of a decision maker is determined not only by the formal structure (i.e., the expected values and probabilities) of a choice problem but also by the problem's social content and context.

These findings also have implications for understanding the kin and ethnic networking in risky transactions. Kin favouritism and kith group loyalty can be con-

sidered as built-in choice mechanisms that have been designed to minimize the probability of betrayal and to maximize inclusive fitness by conducting risky transactions with kith and kin. In addition, kith-and-kin rationality is also subject to cultural adaptation and social manipulations such as kin mimicry. The findings of our Chinese study provide a cognitive dimension with which to understand some ethnic phenomena involving kin mimicry in organizational and trading activities. For example, ethnic middleman groups often prioritize their trading relationship on the basis of kith-and-kin recognition and manage to expand the operational definition of kith-and-kin far beyond immediate family and friends, based on beliefs/myths about common ancestry (e.g. van den Berghe 1981; Landa 1981).

The kin- and social group-specific risk-preference patterns discussed in this chapter cannot be well explained by traditional models of rational choice. In contrast, the mean-variance model of risk preference has shown great potential for explaining and predicting human risky choices in a variety of social group contexts.

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