

# Cross-cultural Differences in Risk Perception, but Cross-cultural Similarities in Attitudes Towards Perceived Risk

Elke U. Weber • Christopher Hsee

*Department of Psychology and Department of Management and Human Resources, The Ohio State University,  
1885 Neil Avenue, Columbus, Ohio 43210*

*Graduate School of Business, University of Chicago, 1101 East 58th Street, Chicago, Illinois 60615*

---

In this study, respondents from the P.R.C., U.S.A., Germany, and Poland were found to differ in risk preference, as measured by buying prices for risky financial options. Chinese respondents were significantly less risk-averse in their pricing than Americans when risk preference was assessed in the traditional expected-utility framework. However, these apparent differences in risk preference were associated primarily with cultural differences in the *perception of the risk* of the financial options rather than with cultural differences in *attitude towards perceived risk*. In all cultures, an equal proportion (the majority) of respondents was willing to pay more for options perceived as less risky, i.e., were perceived-risk averse. These results are most naturally explained within a risk-return conceptualization of risky choice. They have practical implications for cross-cultural negotiation and commerce by suggesting the locus of cultural differences in risky choice that may allow for the creation of joint gains.

(*Risk; Risk Perception; Risk Preference; Risk Attitude; Risky Choice*)

---

## 1. Introduction

Differences in perceptions and preferences lie at the source of many conflicts and communication failures between individuals or groups. Seemingly paradoxically, the negotiation literature tells us that such differences also open the door for the creation of integrative agreements that make both parties better off (e.g., Pruitt 1981). The concept of an integrative agreement is related to Deutsch's (1973) discussion of the constructive consequences of conflict. When conflict serves as a signal that two parties differ on some subjective estimate or valuation and when the two sides can determine the nature of these differences, it is possible to generate tradeoffs and agreements that leave both parties "satisfied with their outcomes and [with the] feel[ing] that they have gained as a result of the conflict (p. 17)." With cross-cultural political and economic interactions grow-

ing at an exponential pace, it is becoming important to be aware of the existence and precise nature of cultural differences in perception and / or preference, not only to avoid the conflicts and resulting failures that have been reported for many cross-cultural interactions—for example, cross-national joint ventures (Warner 1995)—, but also to leverage those cultural differences to achieve joint gains.

### 1.1. Risk-Return Conceptualization of Risk Preference

Differences between parties in the perception of the risk of risky options have direct implications for their exchange. The pioneering work of Markowitz (1959) in the theory of finance conceptualized people's willingness to pay (WTP) for risky option  $X$  as a compromise between the option's return or value ( $V$ ) and its risk ( $R$ ) and assumed that decision makers seek to

minimize the risk of a portfolio for a given level of expected return:

$$WTP(X) = f(V(X), R(X)) = V(X) - bR(X). \quad (1)$$

Traditional risk-return models in finance equate  $V(X)$  with the expected value of option  $X$  and  $R(X)$  with its variance, a formalization that is compatible with a quadratic utility function for money (Levy and Markowitz 1979) and that is still widely used. Recent work (Bell 1995, Jia and Dyer 1997, Sarin and M. Weber 1993) has shown that a broad range of utility functions have risk-return interpretations. Different utility functions imply different measures of risk under the assumption of risk aversion and the equation of return with expected value. These generalized risk-return models allow for the fact that the perception of the riskiness of risky options may differ between individuals or groups or may differ as a function of the decision context.

### 1.2. Role of Risk Perception Versus Perceived-Risk Attitude in Risk Preference

Equation (1) implies that individual or group differences in preference or willingness-to-pay for  $X$  can come about in the following two ways. They may result either from differences in the perception of the riskiness of option  $X$  (i.e., from differences in the value of  $R(X)$ ) or from differences in the risk-value tradeoff (i.e., from differences in coefficient  $b$ ), assuming that perceptions of the attractiveness or value of option  $X$  ( $V(X)$ ) do not differ significantly between individuals or groups. (See Weber, Anderson, and Birnbaum 1992 for empirical support for that assumption). Slovic (1964) made essentially the same theoretical distinction by describing two reasons for apparent differences in risk preference between two groups. Risk preference is a label used to describe a person's choice when faced with two options that are equal in expected value but differ on a dimension assumed to affect the riskiness of options, for example the variance of outcomes. Some people may choose a higher-variance option over a lower-variance option of equal expected value (i.e., behave as if they were risk-seeking) because they equate riskiness with variance and have a positive attitude towards risk; that is, they truly seek out the option perceived to be riskier. Other people who show the same choice pattern may

choose the presumably riskier option because they have a different subjective impression of the relative risks of the two choice options; for a variety of reasons (which may involve aspiration levels for returns) they may perceive the higher-variance option that they choose to be the less risky of the two options and therefore are, in fact, perceived-risk averse. Recently, empirical evidence has been provided for both of these processes. Weber and Milliman (1997) and Mellers, Schwartz, and Weber (1997) show for a variety of decision domains (gambling, stock market, and commuting decisions) that within- and between-subject differences in apparent risk preference may either be the result of differences in attitude towards perceived risk (i.e., in the tradeoff coefficient  $b$ ) or of differences in the way risk is perceived and defined (i.e., in  $R(X)$ ).

### 1.3. Implications of Risk Perception—Perceived-Risk Attitude Distinction

Distinguishing between these two reasons for differences in apparent risk preference is important because each reason points to a different and distinct locus in the decision process at which individual or group differences come into play to influence risky choice. Each reason also corresponds to a distinct psychological mechanism that underlies observed differences in choice, preference, or willingness to pay. An understanding of the decision process and some knowledge about which component(s) of it may be affected by a decision maker's characteristics makes for better prediction of one's opponent's reactions to changes in the situation or of his or her preferences in subsequent decisions. It is also crucial if one wants to utilize existing differences to create integrative solutions in a bargaining situation. If differences in *risk perception* are the driving force behind differences in risk preference, then an effective mutual exploration of possible differences should focus on *cognitive and perceptual* variables; that is, information should be gathered about how the other party defines and perceives the riskiness of the choice options. If, on the other hand, differences in *perceived-risk attitude* are the driving force behind differences in risk preference, then the focus of exploration should be the other party's *affective* response towards perceived risk. Cooper, Woo, and Dunkelberg (1988) provide a

concrete example for the utility of differentiating between group differences in risk perception versus group differences in perceived-risk attitude. Contrary to popular myths about the risk-taking propensity of entrepreneurs, they found that the factor that differentiated entrepreneurs from other managers was not a greater willingness to take on risks but, instead, an overly optimistic perception of the risks involved in risky choice options on the part of entrepreneurs. For an outside observer who perceives risks more realistically, it therefore may appear that entrepreneurs have a greater propensity to engage in risky ventures. However, when differences in risk perception are factored out, entrepreneurs—just as other managers—have demonstrated a preference for tasks in which the risks are only moderate (Brockhaus 1982).

An understanding of the reasons *why* members of different groups (for example, different cultures) differ in preference or willingness-to-pay for risky options is crucial if one wants to leverage these differences into creative integrative bargaining solutions in inter-group negotiations. Assume that party *A* holds risky option *X* with payoffs that are distributed symmetrically around the mean and have high variance. Party *B* holds risky option *Y* that is equal in expected value to *X*, but has smaller variance and is negatively skewed. Under Scenario 1, both parties are equally perceived-risk averse (i.e., have the same negative risk-return tradeoff coefficients *b*), but differ in risk perception. In particular, party *A* perceives the riskiness of options to be proportional to their variance (i.e.,  $R_A(X) = f\{\text{Var}(X)\}$ ) whereas party *B* perceives it to be proportional to the options' downside potential or maximum loss (i.e.,  $R_B(X) = f\{\max \text{loss}(X)\}$ ). In this case, both parties would be better off by trading their options. Due to the difference in the way they define and perceive risk, a trade results in a reduction in perceived riskiness for both parties ( $R_A(Y) < R_A(X)$ ;  $R_B(X) < R_B(Y)$ ) without any change in return ( $V(X) = V(Y)$ ), for a net increase in willingness-to-pay for both parties.

Under Scenarios 2 and 3, assume that both parties perceive risk in the same way, equating it with variance (i.e.,  $R_A(X) = R_B(X) = f\{\text{Var}(X)\}$ ). Now there is no motivation to trade options unless the two parties have different attitudes towards perceived-risk. Under Scenario

2, assume that party *A* is perceived-risk averse (has a negative risk-return tradeoff parameter *b*), but party *B* is perceived-risk seeking (has a positive *b*). In this case, a trade of options—which would leave party *B* with the option perceived by both to have the greater risk—would leave both parties better off (i.e., would result in greater willingness-to-pay for both options after the trade), since *B* is willing to pay a premium for greater risk (positive *b*) and *A* for less risk (negative *b*). Scenario 3 also assumes the same risk perception for both parties (e.g.,  $R_A(X) = R_B(X) = f\{\text{Var}(X)\}$ ), and the following difference in perceived-risk attitude: party *B* is less perceived-risk averse than party *A* (i.e., has a smaller negative risk-value tradeoff parameter *b*). In this case, there would be opportunity for a joint gain by trading options. In particular,  $WTP_A(Y) > WTP_A(X)$ , since  $R_A(Y) < R_A(X)$ , and party *A* would thus readily agree to the trade. The increase in WTP for party *A* as the result of the trade is, of course, offset by a decrease in WTP for party *B*, i.e.,  $WTP_B(X) < WTP_B(Y)$ , since  $R_B(X) > R_B(Y)$ . This decrease in preference for party *B* is, however, smaller in absolute value than the increase in preference for party *A*, since party *B* has a smaller negative risk-value tradeoff coefficient *b*. Thus joint preference or willingness-to-pay is greater as the result of trading options, i.e.,  $\{WTP_A(Y) + WTP_B(X)\} > \{WTP_A(X) + WTP_B(Y)\}$ , and party *A* should be able to convince party *B* of the benefit of the trade by offering to offset *B*'s reduction in utility and to provide an additional share of the joint gain in the form of a side payment. These examples show that the path towards an integrative bargaining solution depends crucially on knowing whether and how the negotiating parties differ either on risk perception or perceived-risk attitudes.

#### 1.4. Cross-cultural Differences in Risk Preference

Do cross-cultural differences in risk preference exist? If so, we would like to know whether to attribute them to differences in risk perception, to differences in perceived-risk attitudes, or both. Is there any evidence of cross-cultural differences in either risk perception or attitude towards perceived-risk? What theory or theories would predict such differences? Hsee and Weber (1998) provided an answer to the first question by reporting consistent and reliable cross-cultural differences

in risk preference between respondents from the People's Republic of China (PRC) and the United States. They found that Chinese students were significantly less risk averse than Americans in their choices between risky options and sure outcomes, both when outcomes involved gains and when they involved losses. Hsee and Weber's post-hoc explanation of these results posulated cultural differences in what happens to Chinese vs. Americans when they encounter adverse outcomes after selecting a risky option. *Culture* is a term with a wide range of interpretations. When first used in anthropological work, it was defined as "that complex whole which includes knowledge, belief, art, morals, laws, customs and any other capabilities and habits acquired by man as a member of society [Tylor 1871]." A cultural explanation of cross-national differences in risk preference attributes differences in risky choice to long-standing cultural differences in customs or beliefs, as opposed to alternative explanations such as current cross-national differences in socio-economic circumstances or in ideal arousal level.

In searching for possible cultural explanations for differences in risk preference between Chinese and American respondents, Hsee and Weber focused on the strongest dimension of cultural variation identified by Hofstede (1980) in his study of employees of a multinational organization with operations in 53 countries, namely collectivism—individualism. Labeling their conjecture "cushion hypothesis," they argue that in socially-collectivist<sup>1</sup> cultures like China, family or other in-group members will step in to help out any group member who encounters a large and possibly catastrophic loss after selecting a risky option. In individualist cultures like the United States (Triandis 1989), on the other hand, a person making a risky decision will be expected to personally bear the (possibly adverse) consequences of their decisions. Collectivism thus acts as a cushion against possible losses, that is, as social diversification of the risks of risky options. In the same sense that the purchase of an insurance policy reduces risk, social diversification in paying for the downside of

risky options quite objectively reduces the risks of risky options for the members of a collectivist culture.

How would one test between the validity of the cushion hypothesis and other, competing, explanations of the observed differences in risk preference? Hsee and Weber (1998) did not attempt to relate the observed cross-cultural differences in risky choice to differences in either risk perception or perceived-risk attitude. However, their cushion hypothesis predicts that Chinese respondents should perceive the riskiness of risky options as smaller than American respondents, because risk is objectively reduced as the result of social diversification or cushioning of negative consequences. Is there any evidence of cross-cultural variation in risk perception?

Slovic and other investigators demonstrated cross-cultural differences in the perception of the riskiness of activities that pose threats to health and safety (e.g., Slovic et al. 1991, Kleinhesselink and Rosa 1991). Bontempo, Bottom, and Weber (1997) observed cross-cultural differences also in the perception of the riskiness of financial gambles, comparing students and security analysts from the U.S.A., the Netherlands, Hong Kong, and Taiwan. In their study, the cultural background of respondents was a stronger determinant of risk perception than occupation and corresponding income level. In particular, risk perception among respondents with Chinese cultural roots (Taiwan and Hong Kong) was different from that of respondents from the two Western countries, but there were no significant differences in risk perception between Taiwanese students vs. security analysts. None of these studies did, however, relate observed cross-cultural differences in risk perception to differences in risk preference or some other decision behavior.

In summary, previous research has demonstrated both cross-cultural differences in risky choice and in risk perception. This suggests that cross-cultural differences in risk perception may be at the source of differences in the way members of different cultures choose among risky options but does not rule out the possibility that cross-cultural differences in attitude towards perceived-risk, i.e., in the risk-value tradeoff coefficient  $b$  of Equation (1), may also exist. It is important to unconfound the role these two variables play in bringing about cross-cultural differences in risky choice (i.e., risk preference).

<sup>1</sup> Collectivism is, of course, not used here to describe any particular political system.

### 1.5. Motivation for Current Study

To test the cushion hypothesis of Hsee and Weber (1998) as an explanation for cultural differences in risk preference and to contrast it with other possible explanations, we decided to examine both the preference for risky options and perception of the options' riskiness in convenience samples of members of four different countries known to differ on the social individualism-to-collectivism continuum. Hofstede (1980) showed that young Western cultures with frontier mentalities (e.g., the United States) score extremely high on country individualism, that older European cultures (e.g., Germany and Poland) score lower, and that Asian cultures (e.g., China) score lower still (also see Triandis 1989). Individualism emphasizes personal freedom and responsibility; collectivism endorses social relatedness and interdependence with others in one's family or social group. Compared with those in an individualistic culture, people in a collectivist society may be more likely to receive help if they require it. Possible adverse outcomes of a risky option will thus impact them less, allowing them to perceive the risk of the option to be smaller. If collectivism acts essentially as implicit mutual insurance against catastrophic losses and thus causes its members to, quite accurately, perceive the risk of risky options to be smaller, then the rank order of country individualism should predict rank order differences in perceived riskiness, and cultural differences in risk perception should be associated with differences in risk preference, e.g., willingness-to-pay for risky options.

If risk preference, on the other hand, is not affected by cultural difference variables, such as the social individualism-collectivism continuum, but instead by situational variables (e.g., the extent to which risk-taking is rewarded in the day-to-day environment of members of each country), then one would expect national differences in risk preference to be associated with differences in perceived-risk attitude (i.e., in risk-return tradeoff coefficient, because risks may be habitually rewarded with greater returns in some economies than in others) rather than with differences in risk perception. Thus one might expect that the risk preferences of Polish and Chinese respondents to be similar to each other, because both countries are undergoing a transition from a planned to a market economy, and different from that

of American and German respondents, who—in turn—should have similar risk preferences, because both countries have a similar and stable capitalist market structure. Similarly, if risk preferences are driven by cross-national biological differences (e.g., in ideal arousal level), one would expect them to be reflected by corresponding differences in the risk-return tradeoff coefficient, but not by differences in risk perception.

## 2. Study

### 2.1. Research Participants

In all four countries, a convenience sample of students at major urban universities were recruited by campus posters and word of mouth to come to a survey lab where they filled out a series of questionnaires related to judgments and decisions under risk. Participants took less than an hour to answer all questions and were paid the local equivalent of \$8.

The United States sample contained 86 students and the Chinese sample 85 students, from a range of majors.<sup>2</sup> There were 81 students in the Polish sample, who majored in either education or business. Because of miscommunication between experimenters about sample size, the German sample contained only 31 students, all of whom were business majors. Average age ranged from 21 to 23 years in the four samples.

### 2.2. Questionnaires and Procedure

Respondents answered questions about their perceptions and reactions to risky financial investment options. Each option had three potential outcomes, with at least one possible gain and one possible loss of money. The probabilities of obtaining each outcome were shown both graphically and numerically. The options and the expected value and standard deviation of their outcomes are shown in Table 1. Respondents saw each of the 12 options twice, the first time in the order listed in Table 1, then in a different random order. They were told to assume that they were investing their own money and that they currently had \$20,000 available to make investments.

<sup>2</sup> Major of study did not explain any variation in any of the dependent measures we collected, and therefore will not be mentioned in the analyses reported below.

**Table 1** Description of Risky Investment Options in Terms of Their Outcomes and Associated Probability Levels (P1 through P3), and the Options' Expected Values (EV) and Standard Deviations (SD)

Investment Option	Outcome 1	P1	Outcome 2	P2	Outcome 3	P3	EV	SD
1	\$3,500	0.79	-\$5,300	0.20	-\$16,000	0.01	\$1,544	\$3,937
2	\$400	0.56	-\$150	0.38	-\$750	0.06	\$122	\$342
3	\$1,700	0.01	\$800	0.20	-\$50	0.79	\$137	\$374
4	\$1,250	0.56	-\$450	0.38	-\$2,200	0.06	\$397	\$1,073
5	\$2,600	0.11	\$950	0.44	-\$650	0.45	\$411	\$1,077
6	\$9,300	0.11	\$3,400	0.44	-\$2,400	0.45	\$1,439	\$4,022
7	\$4,700	0.01	\$2,300	0.20	-\$120	0.79	\$412	\$1,058
8	\$1,000	0.79	-\$1,400	0.20	-\$4,800	0.01	\$462	\$1,094
9	\$900	0.11	\$350	0.44	-\$200	0.45	\$163	\$367
10	\$350	0.79	-\$400	0.20	-\$1,600	0.01	\$180	\$349
11	\$4,600	0.56	-\$1,700	0.38	-\$8,100	0.06	\$1,444	\$3,847
12	\$17,200	0.01	\$8,300	0.20	-\$450	0.79	\$1,476	\$3,836

To translate instructions and stimuli, we followed the method known as back-translation with decentering (Brislin 1986). The questionnaire, originally written in English, was translated into the target language by bilinguals. Different bilinguals translated the instrument back into English. The two English versions were compared, and discrepant passages retranslated. The conversion of the monetary values of the gambles posed a different problem. In the case of the PRC and Poland, estimates of weekly living expenses of college students in each country were compared to those in the U.S. to give a rough approximation of the buying power, and hence the relative value, of each country's currency. In the case of Germany, translation of the dollar amounts into Deutsch Marks by this method resulted in the same conversion factor as the current market rate.

Respondents were instructed to examine each investment option separately, to consider the possible losses and gains, and to answer the following question: "What is the maximum amount you would be willing to pay to get a chance at this investment option? (If you wouldn't buy it at any price, say \$0.)" Willingness to pay (WTP) was expressed in U.S. dollars for the American sample, and in the respective national currency for the other three samples. WTP judgments in those currencies were converted back to U.S. dollars prior to analysis, using the same conversion factors used to equate the investment options across nationalities. They

were then asked: "How risky do you think this investment option is?" Perceived riskiness (*R*) of the option was expressed on a numerical rating scale that ranged from 0 (not at all risky) to 100 (extremely risky).

### 3. Results

#### 3.1. Risk Preference (WTP) and Risk Perception

Mean judgments of WTP and perceived riskiness for the four nationalities across investment options are shown in Table 2. Each respondent saw and judged the 12 investment options twice, which allowed us to examine the reliability of those judgments. On average, the correlation between a respondent's WTP for the twelve options upon their first presentation and his or her WTP for the same options upon their second presentation was 0.78, with a range from 0.33 to 0.97. For the risk judgments, reliability was somewhat lower, probably because the range of risk judgments (0 to 100) was more restricted than the range of price judgments (from 0 to several thousand dollars). The average correlation between a respondent's risk judgments for the twelve options on first vs. second presentation was 0.69, with a range from 0.14 to 0.98. The reliability of respondents' WTP and risk judgments did not differ significantly by nationality.

The magnitude of WTP and risk judgments, however, did differ significantly as a function of nationality, as ascertained by an analysis of variance with the 12 op-

**Table 2** Mean Judgments of Risk and Willingness-to-Pay as a Function of Nationality of Respondents

Nationality of Respondents	Risk	WTP
American	52.2 <sup>a</sup>	\$320 <sup>a</sup>
German	47.4 <sup>a,b</sup>	\$315 <sup>a</sup>
Polish	46.8 <sup>b</sup>	\$352 <sup>b</sup>
Chinese	41.9 <sup>c</sup>	\$487 <sup>c</sup>

*Note.* Different superscripts down each column indicate that two means are significantly different at the 0.05 level, by a Bonferroni *t*-test.

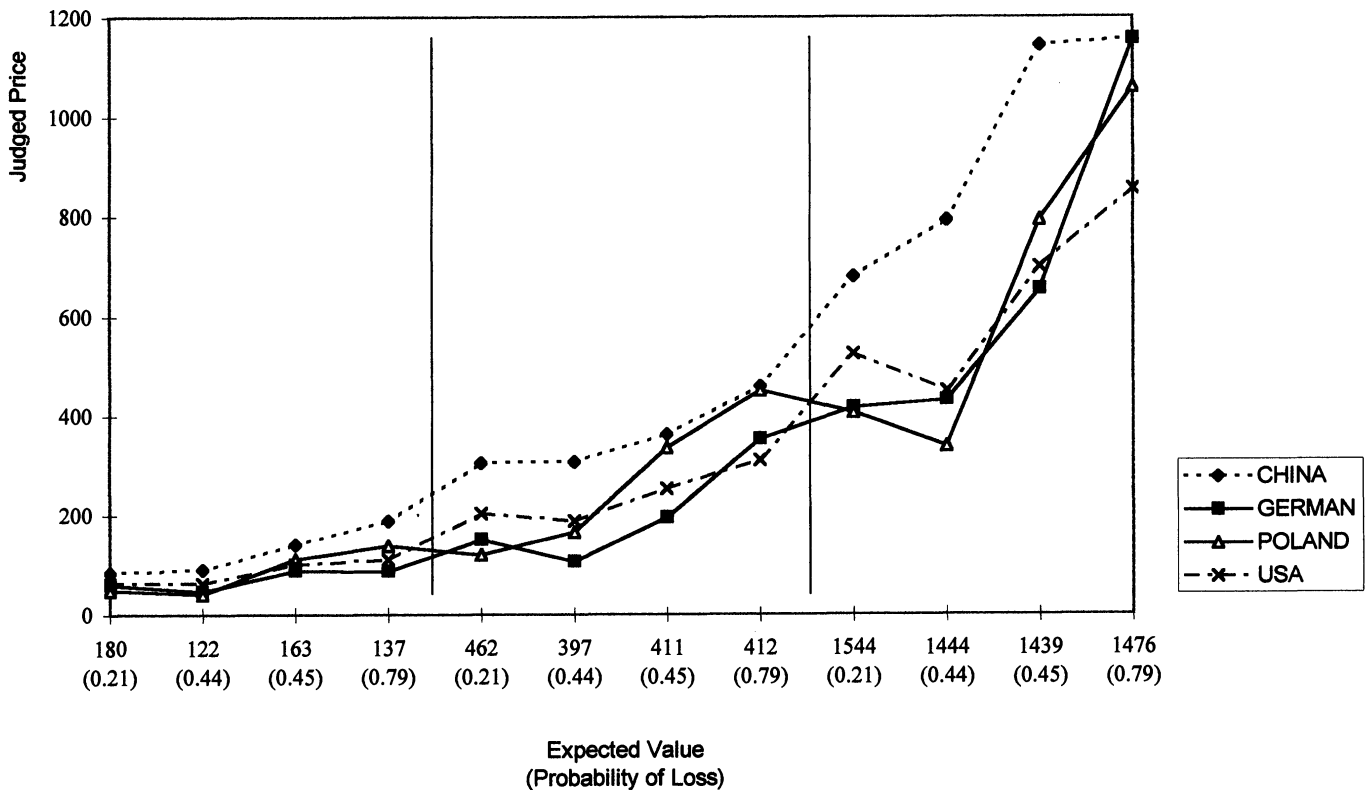
tions and 2 replications as repeated factors ( $F(3, 278) = 4.99$  and  $5.51$ , respectively; both  $p < 0.001$ ). Going down each column of Table 2, mean judgments with different superscripts were significantly different from each other at the 0.05 level, as indicated by a Bonferroni *t*-test. The WTP means show that respondents from all four cultures would be classified as risk-averse in the traditional expected-utility definition of the term because all offered to pay less on average than the options' average expected value (the average of the expected values listed in Table 1), namely \$682. Chinese respondents, however, were closer to risk neutrality than the other three groups; they offered to pay a significantly larger amount than the Polish respondents who, in turn, offered to pay more than the American and German respondents. This result is consistent with the results of Hsee and Weber (1998) who found Chinese respondents to be less risk-averse (in the expected-utility sense of the word) than Americans in their choices between risky options and certainty equivalents. Risk judgments also differed significantly among the four groups, with Chinese perceiving the riskiness of the investment options to be the lowest, Americans the highest, and Germans and Poles in between.

In addition to these main effects of nationality, the interaction between nationality and investment option was also significant for both judgments ( $F(33, 3058) = 1.84$  and  $1.99$ , respectively; both  $p < 0.01$ ), indicating that the nationality main effects were not simply the result of national differences in response-scale use, but the result of differences in the way different compo-

nents of the investment options were evaluated and combined when judging WTP and risk. Figures 1 and 2 show mean national judgments of WTP and risk, respectively, as a function of the investment options listed in Table 1. In Figure 1, the twelve options are placed along the abscissa in the order that makes the plot of the national average WTP judgments for them as monotonically-increasing as possible. The resulting order groups the options with approximately equal expected values (EV) together and shows that, for all four cultures, willingness-to-pay increased with EV. Within each EV group, WTP increased with the options' probability of a loss which (by the design of the option set) was positively correlated with the magnitude of gains. Thus, for options with approximately equal EV, WTP increased with the magnitude of possible gains for all four nationalities, but especially for the Poles and Chinese. This can be seen, for example, by looking at the difference in WTP between option 11 (with an EV of \$1,444) and option 6 (with an EV of \$1,439). Despite the options' similarity in EV, WTP is much greater for option 6, presumably because it offers the chance of a \$9,300 win, whereas only \$4,600 can be won with option 11. As another manifestation of the nationality-by-option interaction, national differences in WTP are more pronounced for options with larger expected values.

Keeping the order of options the same for the plot of the risk judgments in Figure 2, one sees that, overall, perceived risk also increased with EV. Within each EV group, however, risk judgments (unlike the WTP judgments of Figure 1) are not monotonically-increasing as a function of probability of a loss (or magnitude of a win, which was correlated). Looking at the difference in perceived risk between options 11 and 6, for example, option 11 is now judged to be riskier than option 6 by all four nationalities, despite their similarity in EV and in the probability of a loss. Presumably option 11 is judged to be riskier because it has a larger potential loss ( $-\$8,100$ ) than option 6 ( $-\$2,400$ ). If WTP judgments were influenced by potential gains, risk judgments seem to be more influenced by potential losses. In addition to the main effect of nationality on perceived risk described above, Figure 2 shows the nature of the nationality-by-option interaction. The risk judgments of Chinese respondents are not only smaller than those of

Figure 1 Price Judgments for 12 Risky Investment Options as a Function of Nationality of Respondents



the other three nationalities, but also have less of a slope within each EV group. This slope is much steeper for American and especially Polish respondents.

In summary, the data show significant cross-cultural differences in risk preference, as measured by WTP for risky options, with the Chinese offering significantly greater maximum buying prices than members of the other three cultures, and Poles offering significantly greater prices than the Germans and Americans. Without any additional evidence, this would be interpreted in the traditional expected-utility framework as a difference in risk preference, with the Chinese being the least risk-averse and the Americans and Germans being the most risk-averse of the four cultures. However, observed differences in risk preference were accompanied by differences in the perception of the riskiness of the investment options. In particular, the Chinese perceived these options to hold significantly less risk than the members of the other three cultures; the Americans perceived them to hold more risks than the Poles, with the

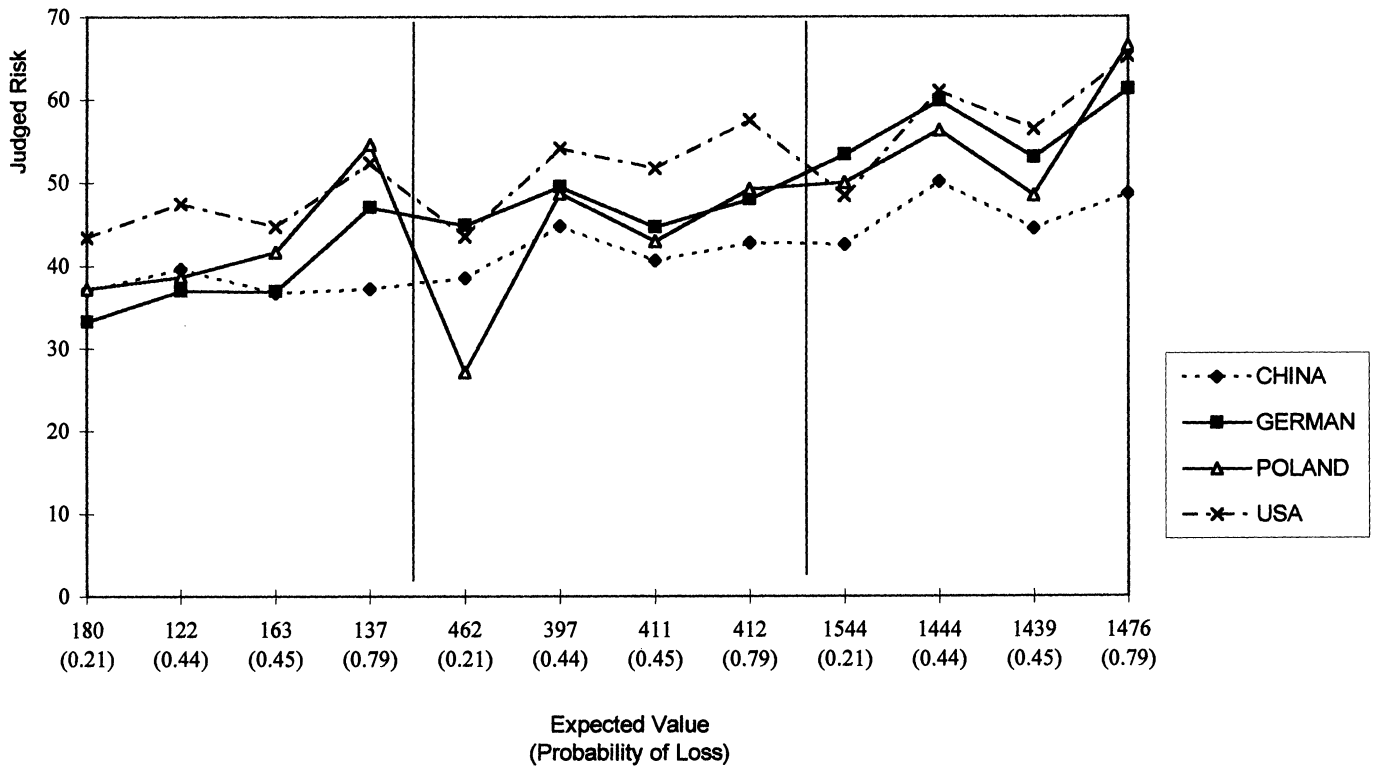
Germans in between. This correspondence between national differences in risk preference and national differences in risk perception allows for the possibility that, within a risk-return conceptualization of preference, the Chinese respondents did not offer higher prices than the members of the other three cultures because they are truly less averse to risk (corresponding to a smaller risk-return tradeoff parameter  $b$  in Equation 1) but because they perceived the risks to be smaller (corresponding to a smaller value of  $R(X)$ ).

### 3.2. Risk—Return Models of Price Judgments

To examine the extent to which judgments of perceived risk and WTP were associated at the individual-subject level, we fit the following two regressions to the WTP judgments of each respondent. The first model (Equation 2) regressed WTP on expected value and variance, for the following risk-return model that makes the traditional assumption that the risk and the return of risky options is perceived the same way by everybody, with



Figure 2 Risk Judgments for 12 Risky Investment Options as a Function of Nationality of Respondents



return being proportionate to the expected value and risk proportionate to the variance of outcomes:

$$WTP(X) = a + b_{EV}EV(X) + b_{VAR}VAR(X). \quad (2)$$

Individual differences in WTP are accounted for by differences in the intercept term  $a$  and in the regression weights  $b_{EV}$  and  $b_{VAR}$  which, in combination, reflect an individual's degree of risk aversion.

The other model (Equation 3) makes the same assumption about the evaluation of the return of risky options but allows for individual and cultural differences in the perception of the riskiness of the options (see Bontempo, Bottom, and Weber 1997, Jia and Dyer 1997). For this subjective-risk-return model, we regressed WTP on the expected value of the option and on the perceived riskiness judgment provided by each respondent for each option:

$$WTP(X) = a + b_{EV}EV(X) + b_RR(X). \quad (3)$$

The two models have the same number of predictor

variables and their  $R^2$ -values as measures of model fit can therefore be compared directly. Each model was fit to each respondent's 24 WTP judgments. The traditional EV-VAR model (Equation 2) accounted for an average of 28% of the variance in WTP across all 285 respondents, with a range from 9% to 97%. The EV-subjective-risk model (Equation 3), on the other hand, accounted for an average of 38% of the variance in WTP across respondents, with a range from 12% to 99%. The average improvement in goodness of fit in favor of the EV-subjective-risk model was 10%, and 80% of all respondents reported fits for Equation 3 that were greater than or equal to their fits for Equation 2. Furthermore, the proportion of respondents who reported better fits for the EV-subjective risk model than for the EV-VAR model did not differ by nationality ( $\chi^2(6) = 1.79, p > .10$ ).

The regression coefficients of the two models, averaged across respondents within each culture, are shown in Table 3. None of the regression coefficients of the

**Table 3** Mean Regression Coefficients for Equations 2 and 3 as a Function of Nationality of Respondent

Nationality of Respondents	Model					
	EV-VAR			EV-Subjective Risk		
	<i>a</i>	<i>b<sub>EV</sub></i>	<i>b<sub>VAR</sub></i>	<i>a</i>	<i>b<sub>EV</sub></i>	<i>b<sub>R</sub></i>
American	0.42	0.57	-0.16	1.89	3.05	-1.59
German	0.60	0.48	0.09	1.54	3.54	-1.18
Polish	0.54	0.53	-0.31	2.03	2.58	-1.22
Chinese	0.76	0.46	-0.03	1.46	3.07	-0.66

EV-VAR model were significantly different as a function of nationality, a result that might be due partly to large estimation errors as the result of multicollinearity between EV and VAR for our option set. Multicollinearity was not a concern for the EV-subjective-risk model. The average correlation between the EV and the perceived risk of investment options was 0.15, 0.30, 0.20, and 0.13 for American, German, Polish, and Chinese respondents, respectively. Table 3 shows that, for the EV-subjective-risk model, American respondents had the largest negative average risk coefficient  $b_R$ , Chinese the smallest, and German and Polish respondents values in between. This is the largest difference in regression coefficients as a function of nationality but reached only marginal statistical significance ( $F(3, 278) = 2.27, p < .10$ ).

### 3.3. Perceived-Risk Attitudes

Classifying respondents in the four different cultures with respect to their perceived-risk attitudes allows us to see whether the distribution of perceived-risk attitudes is different in the four cultures. Perceived-risk attitude is conceptualized as an individual-difference or trait variable (Weber and Milliman 1997) and thus may well be subject to variation (either of cultural or biological origin), similar to other personality variables.

The logic of inferring perceived-risk attitude is similar to the logic behind Dyer and Sarin's (1982) measure of relative risk attitude, which was to remove differences in marginal value functions from utility functions to see whether any remaining curvature (the relative risk attitude which reflected solely one's attitude towards un-

certainty) was more consistent for a given individual across domains (unfortunately, it was not; see Keller 1985). Instead of factoring differences in marginal value out of choice, the perceived-risk attitude measure factors differences in perceived risk out of choice. Using the results of the regression analysis of each respondent's WTP judgment on EV and perceived risk (Equation 3), we computed two proxies for each individual's perceived-risk attitude, which were then analyzed for significant differences as a function of culture. Our first proxy was a continuous measure, in particular the value of the regression coefficient for perceived risk  $b_R$ . This measure differed only marginally as a function of culture, as discussed in the previous section.<sup>3</sup> Our second proxy was a discrete classification of perceived-risk attitude into the three categories of averse, neutral, and seeking. A person was classified as *perceived-risk neutral* when his or her value of  $b_R$  was not significantly different from zero, at the 0.05 level. This was the case for 18% of respondents across cultures. For the vast majority of respondents, perceived risk ( $R(X)$ ) was a significant predictor of WTP. Those with significant negative coefficients  $b_R$  (73% of respondents across cultures) were classified as *perceived-risk averse*; for them, greater perceived risk was associated with lower WTP. Those with significant positive coefficients  $b_R$  (11% of respondents across cultures) were classified as *perceived-risk*

<sup>3</sup> An analysis of the ratio of the values of regression coefficients for EV and perceived risk, i.e.,  $b_{EV}/b_R$ , also did not show any significant difference as a function of nationality ( $F(3, 276) = 1.55, p > .10$ ).

seeking; for them, greater perceived risk was associated with greater WTP. The distribution of perceived-risk attitudes for each nationality is shown in Table 4. There was no association between nationality and perceived-risk attitude ( $\chi^2(6) = 1.78, p > 0.10$ ), when perceived-risk attitude was classified in this tripartite fashion.

## 4. Discussion

### 4.1. Main Result

Our study showed that reliable cultural differences in the pricing of risky options exist, in the sense that between-culture variation in WTP was significantly larger than within-culture variation. It also showed that this cross-cultural difference in WTP was predictable almost entirely by differences in the way respondents from these cultures perceived the risk of these options. Thus, Chinese respondents were closest to risk neutrality in their pricing of the financial options and judged the risk of these options to be the lowest, but were *not* significantly less perceived-risk averse. American and Germans offered the lowest prices and also perceived the risk of the options to be highest, but were *not* significantly more perceived-risk averse. The distribution of attitudes towards perceived-risk was essentially the same in all four cultures. The majority of respondents in all four cultures was perceived-risk averse. Even though there was a tendency for American respondents to have the greatest degree and for Chinese respondents to have the smallest degree of perceived-risk aversion, this trend was only marginally significant.

### 4.2. Reasons for Differences in Risk Perception

Given that differences in risky choice seem to be associated with observed differences in risk perception that, in turn, are the result of individual differences (Brockhaus 1982; Cooper, Woo, and Dunkelberg 1988; Mellers, Schwartz, and Weber 1997), situational differences (e.g., gain vs. loss frame, Weber and Milliman 1997), or cultural differences (this study; Weber, Hsee, and Sokolowska 1998), one may ask how individual, situational, or cultural differences might give rise to differences in risk perception. Risk perception is influenced by a variety of factors, including outcome feedback from previous risky decisions, aspiration levels, trust, expecta-

**Table 4** Percentage of Respondents in Each Nationality with Indicated Perceived-risk Attitude

Nationality of Respondents	Perceived-Risk Averse	Perceived-Risk Neutral	Perceived-Risk Seeking
American	76	14	10
German	71	14	9
Polish	70	19	11
Chinese	67	21	12

tions, and loss functions for outcomes that deviate from expectations. (For a more extensive treatment of risk perception and its determinants see Brachinger and M. Weber 1997, Slovic 1997, Weber 1997).

In this study, we focused on only one of those determinants of risk perception, and in particular one that we hypothesized to vary between cultures, namely the consequences associated with encountering a large negative outcome as the result of selecting a risky option. Our cushion hypothesis predicted that a culture's position on the individualism-collectivism continuum will affect the objective risk to which members of that culture are exposed (because collectivism cushions in-group members against the consequences of negative outcomes), and thus should, quite accurately, affect their subjective perceptions of the riskiness of risky options. The pattern of cross-cultural differences in risk perception that we observed in our study was consistent with this prediction. The rank order in degree of country collectivism of the four cultures precisely predicted the rank order in the magnitude of risk perceived by different nationalities to be inherent in risky financial options.

### 4.3. Caveats and Implications

The present study replicated Hsee and Weber's (1998) result of differences in risk preference between American and Chinese respondents and was designed to test the plausibility of one theoretical explanation for those results, the cushion hypothesis. Clearly, many factors other than culture (and, in particular, degree of collectivism) affect risk preference, and the present study simply suggests that a culture's position on the individualism-collectivism continuum seems to contribute to the risk preferences of its members. We tested the

cushion hypothesis by extending the earlier work in the following two ways. First, in addition to assessing respondents' risk preference (via WTP), we also measured their perception of the riskiness of the choice options. The cushion hypothesis predicts that the two should negatively covary across cultures, which is the result we obtained. Many other explanations of cultural differences in risk preference do not predict any differences in risk perception. Second, we included respondents from two other countries, whom the cushion hypothesis predicted to have risk preferences and risk perceptions intermediate to those of Americans and Chinese by virtue of their country scores on the individualism-collectivism continuum. This prediction was also born out by the data.

Additional work is clearly needed to confirm the existence and direction of cultural differences in risk preference and risk perception in different domains and contexts, in different cultures, and with different groups of respondents (e.g., managers or diplomats). While it is encouraging that we obtained similar or consistent results about American-Chinese (PRC) and Western-Chinese (Hong Kong, Taiwan) on several occasions (this study, Hsee and Weber 1998; Bontempo, Bottom, and Weber 1997), those samples came mostly (but not exclusively) from (graduate) student populations at universities in large cities. Given the variability of knowledge, beliefs, customs, and habits *within* any culture, it is a gross oversimplification to describe a difference found between two samples drawn from two different cultures as a difference between "Americans" and "Chinese" in general. The generalizability of our results with different subject populations thus remains a challenge for future research.

Further investigations of cross-national differences in risk preference, especially for contexts other than financial gambles, will need to consider a broader set of factors that affect risk preference. Cultures vary on many dimensions other than the collectivism-individualism continuum. When it comes to risky decision making, differences in achievement motivation and locus of control might also be expected to play a role and could, potentially, predict complex interactions in cross-national differences in risk preference as a function of the risky choice domain (e.g., depending on whether the

uncertainty in the outcomes of choice alternative is due to chance, as in our study, or due to skill or lack of skill).

In summary, the present study is only an opening chapter in the story on cross-cultural differences in risk preference. Its main importance lies in its demonstration of the fact that cross-cultural differences in risk preference, when they exist, can be unpacked into differences in risk perception on the one hand and differences in perceived-risk attitude on the other. We hope to have shown that the risk-return conceptualization of risk preference in combination with negotiation theory suggest different paths towards integrative bargaining solutions and joint gains, depending on the origin of existing differences in risk preference. Drawing the wrong inference from observed cultural differences in preference among a set of risky options (e.g., assuming that a negotiation partner from a different culture is risk-seeking when, in fact, she simply perceives the associated risks to be smaller) can lead to wrong predictions of her preferences in subsequent situations with different option sets. If both negotiating parties are open to the possibility that cultural differences in risk perception might exist above and beyond differences in attitude towards risk, they will approach the information gathering and negotiation process with a broader attentional focus. Our results suggest, at least tentatively, that the assumption of intercultural similarity seems more appropriate for perceived-risk attitude (the majority attitude was perceived-risk averse in all four cultures) than for perceptions of the riskiness of choice alternatives.

Given that the cross-national differences in risk perception and preference observed in this and other studies have been sufficiently large to result in a significant effect of nationality above and beyond the variability within each culture, one might predict that the potential for integrative bargaining solutions may be greater in cross-cultural negotiations than in intra-cultural negotiations. This suggests that international traders and cross-cultural negotiators ought to be alerted to existing and ongoing work about the nature and direction of differences in risk perception and risk preference between members of their own culture and members of the culture of their negotiation or trading partners. Knowledge about reliable differences would allow negotiators to structure and restructure choice options in such a way to maximally capitalize on existing differ-

ences in the evaluation of risk. Information about the sources of cross-cultural differences in decision making under risk or uncertainty has the potential to become a valuable component of courses on negotiations in international business or law and diplomacy curricula.<sup>4</sup>

<sup>4</sup> This research was supported through NSF grant SBR-9631860. The authors thank Joanna Sokolowska for arranging the translation of scenarios and data collection in Poland.

## References

- Bell, D. E. 1995. Risk, return and utility. *Management Sci.* **41** 23–30.
- Bontempo, R. N., W. P. Bottom, E. U. Weber. 1997. Cross-cultural differences in risk perception: A model-based approach. *Risk Analysis* **17** 479–488.
- Brachinger, H. W., M. Weber. 1997. Risk as a primitive: A survey of measures of perceived risk. *OR Spektrum* **19**, 235–250.
- Brislin, R. 1986. The wording and translation of research instruments. W. J. Lonner and J. W. Berry, eds. *Field Methods in Cross-Cultural Research and Methodology Series*. Sage Publications, Beverly Hills, CA, **8**, 137–164.
- Brockhaus, R. H. 1982. The psychology of the entrepreneur. C. A. Kent, D. L. Sexton, and K. G. Vesper, eds. *The Encyclopedia of Entrepreneurship*. Prentice Hall, Englewood Cliffs, NJ.
- Cooper, A. C., C. Y. Woo, W. C. Dunkelberg. 1988. Entrepreneurs' perceived chances for success. *J. Business Venturing* **3** 97–108.
- Dyer, J. S., R. K. Sarin. 1982. Relative risk aversion. *Management Sci.* **28** 8.
- Deutsch, M. 1973. *The Resolution of Conflict: Constructive and Destructive Processes*. Yale University Press, New Haven, CT.
- Hofstede, G. 1980. *Culture's Consequences*. Sage Publications, Beverly Hills, CA.
- Hsee, C. R., E. U. Weber. 1998, in press. Cross-cultural differences in risk preference and lay predictions. *J. Behavioral Decision Making*.
- Jia, J., J. S. Dyer. 1996. A standard measure of risk and risk-value models. *Management Sci.* **42** 1691–1705.
- Keller, L. R. 1985. An empirical investigation of relative risk aversion. *IEEE Transactions on Systems, Man, and Cybernetics*, SMC-15 475–482.
- Kleinheselink, R. R., E. A. Rosa. 1994. Cognitive representation of risk perceptions: A comparison of Japan and the United States. *J. Cross-Cultural Psychology* **22** 11–28.
- Levy, H., H. Markowitz. 1979. Approximating expected utility by a function of mean and variance. *American Econom. Rev.* **69** 308–317.
- Markowitz, H. M. 1959. *Portfolio Selection*. Wiley, New York.
- Mellers, B. A., A. Schwartz, E. U. Weber. 1997. Do risk attitudes reflect in the eye of the beholder? A. A. J. Marley, ed. *Choice, Decision, and Measurement: Essays in Honor of R. Duncan Luce*. Erlbaum, Mahwah, NJ, 59–73.
- Pruitt, D. G. 1981. *Negotiation Behavior*. Academic Press, New York.
- Sarin, R. K., M. Weber. 1993. Risk-value models. *European J. Oper. Res.* **70** 135–149.
- Slovic, P. 1964. Assessment of risk taking behavior. *Psychological Bulletin* **61** 330–333.
- . 1997. Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. M. Baserman, D. Messick, A. Tenbrunsel, and K. Wade Benzoni, eds. *Psychological Perspectives to Environmental and Ethical Issues in Management*. Jossey-Bass, San Francisco, CA, 277–313.
- , N. N. Kraus, H. Lappe, M. Majors. 1991. Risk perception of prescription drugs: Report on a survey in Canada. *Canadian J. Public Health*. **82** S15–S20.
- Tylor, E. B. 1871. *Primitive Culture* (two vols.). Murray, London.
- Triandis, H. C. 1989. Cross-cultural studies of individualism and collectivism. J. Berman, ed. *Nebraska Symposium on Motivation*. University of Nebraska Press, Lincoln, NE, 41–133.
- Warner, J. 1995. The world is not always your oyster: Why cross-border mergers so often come to grief. *Business Week*, October 30, 132–134.
- Weber, E. U. 1997. The utility of measuring and modeling perceived risk. A. A. J. Marley, ed. *Choice, Decision, and Measurement: Essays in Honor of R. Duncan Luce*. Erlbaum, Mahwah, NJ, 45–57.
- , C. Anderson, M. H. Birnbaum. 1992. A theory of perceived risk and attractiveness. *Organizational Behavior and Human Decision Processes* **52** 492–523.
- , R. Milliman. 1997. Perceived risk attitudes: relating risk perception to risky choice. *Management Sci.* **43** 122–143.
- , C. K. Hsee, J. Sokolowska. 1998. What folklore tells us about risk and risk taking: Cross-cultural comparisons of American, German, and Chinese proverbs. *Organizational Behavior and Human Decision Processes*, **75**.

Accepted by L. Robin Keller; received July 14, 1996. This paper has been with the authors 7½ months for 2 revisions.