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SOCIAL CAPITAL AND RISK RESPONSES

Abstract

24 pages

The economic well-being of economic agents is assumed to be interpersonally dependent. The extent of this interpersonal dependency varies according to the strength of relationships, values, and social bonds and is measured using social capital coefficients in a neoclassical model in which agents with stable preferences maximize utility. The model's predictions are tested empirically by asking agents how their willingness to bear a risk is altered when their refusal to accept the risk increases the risk faced by others.

Key Words: *altruism, risk, risk subsidies, social capital*

SOCIAL CAPITAL AND RISK RESPONSES

Most risk studies characterize an agent's decision problem as finding the preferred tradeoff between the risk and return of the decision maker's own income (Robison and Barry). The decision problem becomes more complex, however, if the decision maker's preference function includes the well-being of other agents. If the agent's response to risk changes the risk faced by others, then incorporating the well-being of others into the decision maker's preference function may significantly affect the decision maker's risk response.

When facing risk, decision makers must determine their options for altering either the risk's likelihood or its outcome. When alternatives exist for altering either the likelihood or the outcome of a risky situation, decision makers must determine if the benefits of altering the risk are worth the cost. Alternatively, if decision makers will be compensated for bearing the risk, they must determine the risk subsidy required for them to assume the increased risk and still be as well off as they were before absorbing the additional risk.¹

The difficulty of calculating risk subsidies are increased if the well-beings of economic agents are interpersonally dependent and further complicated if an agent's response to risk alters the risk faced by others. To illustrate a more complicated risk problem, consider the decision to purchase life insurance by the principle income earner in a family. The decision to purchase life insurance depends in part on the strength of the insured's relationship to family members.

A second illustration of interpersonally dependent preferences and risks is the decision to apply herbicides and pesticides. The application of herbicides and pesticides may reduce a producer's risk of crop failure but increase the health risk of his or her neighbors. If the producer's well-being is interpersonally linked to his or her neighbors, then the neighbors' increased health risk is an important cost consideration in the producer's herbicide and pesticide application decision. One implication of the relationship is that the health costs imposed on the decision maker's neighbor are internalized and may lead to improved efficiency of resource allocation without imposing external controls on the decision maker.

Economists have long recognized the importance of relationships. Yet, attempts to model the impact of relationships on resource allocation have for the most part analyzed the problem under conditions of certainty.

Because risk and the influence of relationships are present in so many practical decision settings, this paper attempts to integrate them into one study.

The purpose of this study is to examine changes in an agent's response to risk when the agent's choices alter the well-being of others. If relationships are unimportant, then external risk effects resulting from an agent's response to risk can be ignored. Under these conditions, the traditional expected utility (EU) model that emphasizes selfishness of preferences is acceptable. If, however, relationships are important, then modeling interpersonally dependent risks should improve our ability to predict and/or explain behavior in risky settings.

In what follows, the literature is reviewed that supports economists' emphasis on self-interest. Next, the literature is reviewed that supports the view that relationships modify agents' pursuit of self-interest. This review includes a discussion of how social capital can be used to model the influence of relationships on resource allocation decisions. After the review of literature, relationships are introduced into the EU model using social capital coefficients. The resulting neoclassical model with social capital coefficients modifying preferences is then tested empirically. The survey asked respondents how their willingness to bear risk is changed when their choice alters the risk exposure of another person. After reporting the results of the study, this paper concludes with a discussion of the relevance of risk and social capital research and the need to include social capital in agricultural and natural resource related research.

The Assumption of Self-Interest

The literature supporting neoclassical economists' emphasis on self-interest is well-known. Edgeworth, a famous 19th century economist, wrote that: "The first principle of Economics is that every agent is actuated only by self-interest" (Rescher). Mueller added that only the assumption of egoism was essential to a descriptive and predictive science of human behavior. Adam Smith (1776) declared: "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest" (p. 25). Summarizing the focus on self-interest, Etzioni wrote:

"The neoclassical paradigm, we have seen, attempts to show not merely that there is an element of pleasure (self-interest) in all seemingly altruistic behavior, but that self-interest can explain it all."

Evidence That Relationships Matter

Few would argue that economic agents often act selfishly. On the other hand, an increasing amount of evidence supports the view that what an agent considers to be in his or her self-interest is modified by relationships, social bonds, and values (Swedberg). As a result, economic agents may be influenced in their choices by how their choices affect others. If the influence of relationships exerts a significant effect on an agent's resource allocation decisions, then there is a need to adjust our traditional economic models to describe the role of relationship to more realistically describe the decision making process.

Everyday events support the view that relationships alter economic behavior (Schmid and Robison, Robison and Hanson). Realtors recognize that the sale price of a particular parcel of land depends on the relationship between the seller and buyer. Only "arms-length" sales between unrelated individuals can be used to reflect the market value of land (Gilliland). Nepotism laws impose restrictions on close relatives being hired by the government in the same agency. These laws recognize the tendency of government employers to grant advantages to their relatives. Civil rights laws prevent employment being denied when the basis of the discrimination is race. These laws recognize that race, a special kind of relationship, sometimes influences employment decisions.

Many persons make significant efforts to return lost items even though they belong to a stranger. The reason for such action may be based on a relationship to oneself that requires actions consistent with an internalized set of values. This internalized relationship is sometimes referred to as one's conscience.

Those who frequent restaurants nearly always leave tips even when they do not expect to be waited on by the same server in the future. One explanation may be that a relationship developed between the customer and the server during the meal which the customer wishes to strengthen. Alternatively, the customer may have an internalized value that requires fairness even when not externally enforced.

Other groups of people who fail to fit the selfish preference profile include those who vote even when the outcome is not in doubt and individuals who buy life insurance for beneficiaries from whom no reciprocal action is expected. Other individuals frequently exchange gifts without any enforceable contract for a repayment in kind. The explanation for the gift giving is most often that there exists a special relationship between the gift provider and the gift recipient, often a neighbor (Webley).

Reviews of articles submitted to many professional journals are conducted anonymously. Unless relationships influenced reviews, anonymity in the review process would be unnecessary. Anonymity, however, is justified since the evidence indicates relationships do influence the outcomes of the review process (Blank).

Relationships are crucial in the job market. According to a U.S. Bureau of Labor study, 63.4 percent of the jobs are a result of informal contacts where the job seekers exercise their own initiative in building on personal contacts.

Families represent an organization in which special relationships exist. This special relationship appears to manifest itself in the formation of business agreements. Gwilliams found that 89 percent of Michigan farmland leases were between friends or family. Between related individuals, farm land leases tend to be oral and more successful than leases between unrelated lessees and lessors (Johnson et.al.). Nelton noted that family businesses account for 76 percent of Oregon's small companies. Finally, Calonius wrote that 75 percent of U.S. companies are family-owned or controlled.

Relationships between individuals and causes account for large amounts of voluntary donations. Despite a sluggish economy, philanthropic giving across the nation increased in 1991 over 1990 by 6.2 percent to \$124.7 billion. According to the Trust for Philanthropy, the American Association of Fund-Raising Counsel's research arm, 89 percent of the amount contributed was by individuals. Largest recipients included religious organizations, \$67.6 billion, and education, \$13.3 billion. Other recipients included environmental groups, the arts, health organizations, and other nonprofit groups providing human services (Tetsch).

Finally, according to a U.S. Census study, 80 million Americans volunteered an average of 4.7 hours per week in 1987 or 19.5 billion hours. Unless there can be found a taste for giving away one's money and time,

billions of dollars worth of economic activity in the U.S. economy is largely unaccounted for by the selfishness of preference assumption which focuses on promoting one's selfish interests through two-way exchanges.

Frank summarizes the conflict between the assumption of selfish preferences in economics and observed preferences:

"...Economists, for their part, point with pride to the power of self-interest to explain and predict behavior, not only in the world of commerce but in networks of personal relationships as well. And yet, the plain fact is that many people do not fit the me-first caricature. They give anonymously to public television stations and private charities. They donate bone marrow to strangers with leukemia. They endure great trouble and expense to see justice done, even when it will not undo the original injury. At great risk to themselves, they pull people from burning buildings, and jump into icy rivers to rescue people who are about to drown. Soldiers throw their bodies atop live grenades to save their comrades. Seen through the lens of modern self-interest theory, such behavior is the human equivalent of planets traveling in square orbits."

Evidence also supports the view that relationships matter in the aggregate as well as at the individual level. For example, special trading patterns often develop between nations that share common cultural, language, geographic, or other characteristics. Finally, nations often act to restrict trade when unfavorable relationships exist.

In response to evidence that relationships matter, some economists concede that relationships matter, but not in important ways. These economists believe that we can continue business as usual with selfish preferences as the foundation for our models. (Hirshliefer, Gardner).

It is acknowledged that many important economic transactions may not be affected by relationships. For example, in perfectly competitive markets in which many buyers and sellers unknown to each other trade a standardized good, relationships may not be important. On the other hand, strong evidence suggests when the buyer and seller are known to each other, their relationship alters the terms of trade.

The Altruism Literature

A review of the neoclassical model extensions to account for relationships can be found in Andreoni. One extension of the neoclassical model assumes an altruistic agent has a taste for philanthropy. Characteristic of this work is Schwartz and Feldstein and Taylor. A second extension of the self-interested neoclassical model treats the i^{th} person's utility as dependent on own consumption of good x_i and the j^{th} person's utility function U_j . Hence, the i^{th} person maximizes $U_i=f(x_i, U_j)$. In this model, the utility of the j^{th} person is treated as a consumer good that person i consumes to increase his or her self-interest (Bernheim and Stark). Recent work by Andreoni combines this approach with the pure altruism model and develops an "impure altruism" model that accounts for interdependence of preferences. A third extension of selfishness of preference approach is the club model. At the heart of this approach is the assumption that the desire to belong to the club leads to behavior consistent with the goals of the club. Other extensions of the neoclassical model recognize that relationships among family members influence economic behavior. Becker's (1981) famous work formalizes some interesting conclusions for family members whose preferences are interdependent and whose actions have external consequences. Consistent with the focus on the family are studies linking altruism to genetic fitness (Samuelson; Dawkins; and Becker (1976)).

Social Capital and the Neoclassical Model

Central to the neoclassical paradigm is the assumption that rational economic agents with stable preferences maximize their own utility usually defined over their own consumption bundles. In addition, most applications of the neoclassical model assume selfishness of preferences (Quirk and Saposnik). In this paper, the assumptions that decision makers are rational and maximize their own utility are maintained. However, in the model to be defined, utility depends on the income or consumption levels of others whose significance in the utility function depends on relationships measured by social capital coefficients. Thus, in the model to be defined, relationships between agents matter. This assumption is in the tradition of the altruism work cited earlier but extends this work by imposing more specific structure on the nature of these relationships.

The intellectual foundation for the social capital approach adopted in this study can be traced to Adam Smith (1759). He recognized the interdependence of preferences when he wrote:

"How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it" (p. 3).

Smith (1759) not only noted that preferences were interpersonally dependent, but that they varied according to the strength of the relationship. He wrote:

"Every man feels his own pleasures and his own pains more sensibly than those of other people...After himself, the members of his own family, those who usually live in the same house with him, his parents, his children, his brothers and sisters, are naturally the objects of his warmest affection" (p. 321).

To model Smith's insight about the varying strengths of relationships we introduce the concept of social capital. Agent i has social capital toward j if a change in j 's well-being as perceived by i alters i 's well-being. The importance for agent i of a change in j 's well-being increases with an increase in i 's social capital toward agent j .

Social capital has been introduced to agricultural economists by Robison and Schmid (1991, 1994), Robison and Hanson, and Schmid and Robison. Coleman has emphasized the importance of social capital in sociology and Hyden discussed it in a political science setting. Putnam suggested recently that its supply in the United States has decreased.

The underlying assumptions of "social capital theory" are: (1) that the relationships between persons i and j influence economic choices; and (2) that the strength of relationships vary. Sociologists have long recognized that the strength of relationships between individuals varies. Park considers the concept of "distance" to mean the grades and degrees of understanding and intimacy that characterize personal and social relations. Park's social distance concept appears to combine elements of both relationships and awareness and is included in what we refer to as social capital.

Social capital coefficients K_{ij} are used to model the degree to which person i 's well-being is influenced by the well-being of person j . Person i may develop a relationship towards j of sympathy ($K_{ij}>0$), antipathy ($K_{ij}<0$), or neutrality ($K_{ij}=0$) (Bogardus).

The i^{th} person is assumed to maximize the following utility function:³

$$\text{Max}_x U_i = U_i [\pi_i(x), K_{ii}(x), K_{ij}(x), K_{ji}(x), \pi_j(x)] \quad (1)$$

subject to an upper limit on i 's time and resource x . Variables π_i and π_j in equation (1) represent i and j 's income or other measures of well-being. It is assumed that marginal utility is positive for K_{ii} , K_{ij} , K_{ji} , and π_i , and from the definition of social capital that $\left(\frac{\partial U_i}{\partial \pi_j} \right) \gtrless 0$ for $K_{ij} \gtrless 0$. The first-order condition for the utility maximization problem now becomes:

$$\frac{\partial U_i}{\partial x} = \frac{\partial U}{\partial \pi_i} \frac{\partial \pi_i}{\partial x} + \frac{\partial U}{\partial K_{ii}} \frac{\partial K_{ii}}{\partial x} + \frac{\partial U}{\partial K_{ij}} \frac{\partial K_{ij}}{\partial x} + \frac{\partial U}{\partial K_{ji}} \frac{\partial K_{ji}}{\partial x} + \frac{\partial U}{\partial \pi_j} \frac{\partial \pi_j}{\partial x} = 0 \quad (2)$$

Agent i chooses x to maximize the sum of the marginal utilities of own income, the social capital coefficients, and j 's income. The first term, $\frac{\partial U}{\partial \pi_i} \frac{\partial \pi_i}{\partial x}$, is the marginal utility of own income and is also the first-order condition in the neoclassical model. The second term, $\frac{\partial U}{\partial K_{ii}} \frac{\partial K_{ii}}{\partial x}$, is the marginal utility of an increase in social capital toward one's self. The third term, $\frac{\partial U}{\partial K_{ij}} \frac{\partial K_{ij}}{\partial x}$, is the marginal utility of an increase in social capital toward j . The fourth term, $\frac{\partial U}{\partial K_{ji}} \frac{\partial K_{ji}}{\partial x}$, is the marginal utility of an increase in social capital of j toward agent i . The final term, $\frac{\partial U}{\partial \pi_j} \frac{\partial \pi_j}{\partial x}$, is the marginal utility from j 's income, the sign of which depends on the sign of social capital coefficient K_{ij} .

The model described in equation (1) suggests several utility-maximizing opportunities that are ignored in most neoclassical models. For example, consider the case where i cannot influence π_j significantly. This may be the case when j is wealthy compared to i . Such a wealth relationship might exist between a fan and a famous entertainer, an alum and the alum's alma mater, or a listener and a public radio station. In these examples, person i may still contribute some of his or her resources to j because it increases K_{ij} and thus increases i 's utility. In other cases agent i may be able to make significant changes in π_j and receives vicarious satisfaction in the process.

Examples include donations to victims of floods, wars, natural disasters, and members of one's own family who may be in need.

In other cases, efforts to increase π_i may reduce K_{ii} and K_{ij} . Examples of social capital reducing activities include engaging in illegal activities or aggressive personalized competition. In such cases, an activity that maintains or increases K_{ii} and K_{ij} may be preferred to one that earns a higher level of π_i but lowers K_{ii} and K_{ij} . When increasing revenue conflicts with maintaining or increasing social capital, trade-offs are required. (Robison and Schmid (1994)).

In summary, social capital theory views individuals as capable of vicariously sensing the well-being of others. Social capital theory also recognizes that individuals do not experience the well-being of others equally. This ordering of relationships leaves individuals most sensitive to the well-being of others with whom they are most alike, with whom they have made commitments and assumed responsibility, or with those with whom they have significant emotional and social ties. Finally, social capital theory recognizes that one's relationship to oneself is important and is positively maintained through actions consistent with an internalized set of values.

Social Capital and the Expected Utility Model (EU)

Implicit in most applications of the EU model is the assumption that only the decision maker's own income matters. Moreover, risk coefficient estimation studies typically measure how individuals respond to changes in the level and likelihood of having their own income altered (Young). The focus on own income makes the EU model consistent with the assumption most often applied in the neoclassical economic paradigm; namely, that the identity of participants in an economic exchange does not affect the outcome (Telser and Higenbotham).

In this section, the EU model is modified to allow relationships to alter an agent's choices when facing risk. To describe the modified EU model, let π_i and π_j represent the i^{th} and j^{th} agents' deterministic wealth (material and physical capital), and let K_{ij} measure the social capital agent i has developed towards agent j . To simplify the analysis, K_{ii} and K_{ji} are assumed constant in our utility expression allowing us to write utility for agent i as $U_i(\pi_i, K_{ij}, \pi_j)$ which is assumed to satisfy the necessary conditions for utility maximization.

Consider a risk represented by the random variable \tilde{y} and whose expected value is less than or equal to zero, $E(\tilde{y}) \leq 0$. Faced with such a risk, stochastic income for i and j can be expressed as $\tilde{\pi}_i = \pi_i + \tilde{y}$ and $\tilde{\pi}_j = \pi_j + \tilde{y}$ such that $E(\tilde{\pi}_i) \leq \pi_i$ and $E(\tilde{\pi}_j) \leq \pi_j$. Since the risk is, at best, actuarially fair, agent i could only be induced to accept the risk if his/her salary were subsidized by a deterministic amount $\theta\pi_i$ so that expected utility evaluated over the risky outcomes was equal to the utility of his/her previously certain income. This indifference is described in equation (3):

$$U_i(\pi_i, K_{ij}, \pi_j) = E_i U_i(\tilde{\pi}_i + \theta\pi_i, K_{ij}, \pi_j) \quad (3)$$

In equation (3), E_i is the expectations operator given i 's perceptions of the probability of risky outcomes; and θ is the proportion of certain income π_i added to i 's risky outcome, a risk subsidy that leaves i indifferent between the compensated risky income and the safe income. If agent i is risk averse, $\theta > 0$ because the risky income $\tilde{\pi}_i$ has an expected value equal to or lower than the certain income π_i . Meanwhile, the magnitude of θ depends on i 's risk attitudes, the distribution of random variable \tilde{y} , deterministic income levels π_i and π_j , and social capital coefficient K_{ij} .

The model described thus far is applicable to general risk problems. However, a specific empirical test can be developed for a more focused application. Suppose that agent i may decline the risk or accept it plus a risk subsidy. Also, suppose that if agent i refuses to accept the risk, agent j will be required to absorb the risk without additional compensation. In this case, π_j on the left-hand side of equation (3) is replaced with $\tilde{\pi}_j$ reflecting j 's increased risk. Agent i would now be willing to accept the risk if δ is set at a level such that:

$$E_i U_i(\pi_i, K_{ij}, \tilde{\pi}_j) = E_i U_i(\tilde{\pi}_i + \delta\pi_i, K_{ij}, \pi_j) \quad (4)$$

Because agent j is being subjected to a risky income level $\tilde{\pi}_j$ which has a smaller expected value than the certain income π_j , θ , in equation (3) is less than (equal to) (greater than) δ in equation (4) when $K_{ij} > (=) (<) 0$. This result leads to the following testable hypothesis applied to equation (4):

$$H_0: \delta \{K_{ij} > 0\} < \delta \{K_{ij} = 0\} \quad H_a: \delta \{K_{ij} > 0\} = \delta \{K_{ij} = 0\} \quad (5a)$$

$$H_0: \delta \{K_{ij} > 0\} < \delta \{K_{ij} < 0\} \quad H_a: \delta \{K_{ij} > 0\} = \delta \{K_{ij} < 0\} \quad (5b)$$

$$H_0: \delta \{K_{ij} = 0\} < \delta \{K_{ij} < 0\} \quad H_a: \delta \{K_{ij} = 0\} = \delta \{K_{ij} < 0\} \quad (5c)$$

where the $\delta \{.\}$ indicates the value of δ conditional upon the term in parentheses. The implication is that the level of compensation required by agent i to accept the risk will be less (more) when agent j is a friend (enemy) than when there is no relationship between agent i and agent j .

One might infer that increasing K_{ij} must lead to increases in δ . Totally differentiating equation (4) with respect to K_{ij} and δ results in the expression:

$$\frac{d\delta}{dK_{ij}} = \frac{\frac{\partial E_i U_i(\pi_i, K_{ij}, \tilde{\pi}_j)}{\partial K_{ij}} - \frac{\partial E U_i(\tilde{\pi}_i + \delta \pi_i, K_{ij}, \pi_j)}{\partial K_{ij}}}{\frac{\pi_i \partial E U_i(\tilde{\pi}_i + \delta \pi_i, K_{ij}, \pi_j)}{\partial \delta}} \quad (6)$$

The denominator in equation (6) is positive because of positive marginal utility. Unfortunately, the numerator cannot be signed without specifying how increasing K_{ij} changes the risk attitudes of agent i . Thus, unambiguous changes in δ described in equation (4) occur only when K_{ij} changes sign; i.e., δ increases when K_{ij} changes from negative or zero to positive.

The Survey

To test the statistical significance of the social capital dependent hypotheses developed in this paper, a survey was sent to 95 graduate students enrolled in the Department of Agricultural Economics at Michigan State University. Sixty-six of the students returned usable surveys. The survey was designed to measure how relationships affected the students willingness to bear a catastrophic risk.

A catastrophic risk is an event with significant downside risk which is sometimes irreversible. Examples of catastrophic risks faced by those employed in agriculture include: farm accidents, fires, destruction of crops as a result of extreme weather or insect infestation, or loss of livestock from extreme weather or disease. Other catastrophic risks may include long-term illness or disability of the farm operator, costly litigation, death of important farm organization members, and hostility resulting from divorce with farm families.

The catastrophic risk the respondents were asked to consider was the possibility of a car accident. The respondents were asked to consider an existing work environment in which driving was not required. Then they were asked to consider a request from their employer to assume duties that required them to drive and which increased their likelihood of being involved in a car accident. Most of the respondents surveyed had work experience in which a driving assignment was a possibility.

Respondents were asked: what percentage increase in base salary, a risk subsidy, would be required for them to be as well off with the driving assignment as they were without the assignment? Then the respondents were informed that if they refused the driving assignment that j , defined as either a close friend, a stranger, or an unpleasant co-worker, would be required to accept the assignment and without additional compensation. The intent of this question was to test the hypothesis that varying the sign of K_{ij} would produce changes in δ consistent with hypotheses (5a), (5b), and (5c).⁴

The results of the survey are summarized in Table 1. Columns (1) and (2) report average values of δ for the survey respondents. The difference between columns (1) and (2) reflects differences in the probability of being involved in a fatal accident. Column (1) reflects the response to risk when the probability of a fatal accident was .01 percent. Column (2) reflects the response to risk when the probability of a fatal accident was .001 percent.

Table 1. Percentage Increases in Salary Required for Respondents to Accept Risks with Alternative External Risk Consequences.

Risk Choices	Probability of Risk for All Respondents	
	.01%	.001%
	(1)	(2)
Refusal leaves uncompensated risk to close friend ($\delta \{K_{ij} > 0\}$)	8.4	7.5
Refusal leaves uncompensated risk to stranger ($\delta \{K_{ij} = 0\}$)	11.7	11.1
Refusal leaves uncompensated risk to unpleasant co-worker ($\delta \{K_{ij} < 0\}$)	13.2	13.0

If refusal to accept the driving assignment meant that a stranger must accept the risk, the average level of risk subsidy required was 11.7 percent and 11.1 percent of certain income for the 0.01 percent and 0.001 percent risk levels, respectively. If refusal meant a close friend must accept the driving assignment, the average risk subsidy required dropped to 8.4 percent and 7.5 percent of certain income for the 0.01 percent and 0.001 percent risk levels respectively. Finally, if refusal meant that an unpleasant co-worker would be required to accept the risk, the average risk subsidy increased to 13.2 percent and 13.0 percent of certain income depending on the probability of an accident.

The direction of change in the risk subsidy levels is consistent with hypotheses (5a), (5b), and (5c). When refusal means a close friend (unpleasant co-worker) will be required to accept the risky assignment, the level of compensation required to accept risk is lower (higher) than if refusal means a stranger will be required to accept the assignment.

To test for the statistical significance of the differences in the average risk subsidy levels, a small sample t-test was conducted for each pair of means for each risk level (McClave and Benson). The results confirm hypothesis (5b) that $\delta \{K_{ij} > 0\} < \delta \{K_{ij} < 0\}$, suggesting that when refusing the driving assignment meant that a close friend would be required to accept the assignment the risk subsidy was less than when refusal meant that an

unpleasant co-worker must take the assignment. The results provide some support for the notion that external consequences impact the compensation level required for accepting the risk.

The remaining tests found no statistically significant differences between the mean levels as suggested by hypotheses (5a) and (5c). The inability to detect statistically significant results in support of hypotheses (5a) and (5c) may be the result of respondent differences in factors such as driving experience, or perhaps the respondent's gender. To help eliminate these sources of variability and isolate the differences in compensation levels required to transfer risk, the survey asked the respondents' about their driving skills, miles normally driven per year, the amount of life insurance carried, and gender.

The impact of respondent characteristics on compensation levels was analyzed using tobit regression, a procedure that allows for the analysis of bounded continuous variables (Green). Tobit was the appropriate analysis since compensation level responses (δ) were bounded below by zero and above by 25 percent. The model regressed the level of risk subsidy on respondents' driving experience, amount of life insurance, gender, risk level, and the relationship with the person to whom the risk would be transferred. The results of the tobit regression are reported in Table 2.

The constant term in Table 2 measures the amount of compensation a respondent would require to accept the driving assignment and be indifferent to employment without the assignment under the following conditions: (1) if the risk of a fatal accident were .01 percent; (2) if a stranger were required to absorb the risk if the respondent refused; (3) if the respondent carries zero to small amounts of life insurance; and (4) if the respondent were female.

The other coefficients in Table 2 measured adjustments to the constant term or base case. For example, the risk coefficient in Table 2 indicates that the compensation level recorded by the constant term will fall by .86 percent if risk is reduced from .01 to .001 percent, although the statistical significance of the estimate is questionable.

Table 2. Tobit Analysis of Characteristics Explaining Respondents' Responses to Risk.

Variable	Coefficient	T-Statistic	2-Tail Sign.
Constant	11.62	15.51	.00
Risk (.001=1)	-0.86	-1.48	.14
Miles driven per year	-0.0002	-5.51	.00
Sex (male=1)	-3.20	-5.19	.00
Large amount of life insurance	-6.03	-3.66	.00
Close friend	-3.11	-4.19	.00
Unpleasant coworker	0.66	0.85	.39

The close friend coefficient measured the change in compensation required for indifference if the risk were passed on to a close friend instead of a stranger. Under this assumption, the compensation required for indifference decreases by 3.11 percent from that required if the stranger were to assume the risk. If an unpleasant co-worker, instead of a stranger, were required to assume the risk if refused by the respondent, the required compensation increases an average of .66 percent over the base case. However, the unpleasant coworker coefficient is not statistically significant. These results support both hypotheses (5a) and (5b). Hypothesis (5c) is not supported by the data, perhaps because of the possible reduction in K_{ii} associated with increasing the risk for another individual even if he/she is unpleasant at work.

Other statistically significant variables that help explain the level of compensation required for indifference include miles driven per year, life insurance coverage, and the respondent's gender. The more miles driven per year, the less compensation was required. This result suggests that persons who drive more view the risk of driving as less significant than those who drive fewer miles. Those who carried small or zero amounts of life insurance required greater levels of compensation than those who carried large amounts of life insurance. Finally, males required on average 3.20 percent lower percentage increases in salary than did females.

Conclusions

In this study the impacts of relationships on risk responses have been examined. To test the importance of relationships, the neoclassical model was extended by introducing relationships into the model using social capital coefficients. Allowing relationships into the model produced additional behavioral motivations beyond those included in the traditional neoclassical model which focuses solely on own income. A simplified version of the model was then used to generate several hypotheses describing how relationships influence the willingness of economic agents to accept risk.

Empirical results generated from survey data provide support for the hypothesis that relationships alter risk responses; an individual's willingness to bear risk and to impose risk costs on others does appear to depend on relationships. The agricultural economic implications of this study are significant. The results suggest that the use of potentially harmful pesticides will be reduced if those affected are related to or have friendly relations with the producer. The results suggest that the willingness to bear unpleasant odors increases if the odors originate from a family member's farm. The results also suggest that monitoring costs are influenced by the consistency between the regulation to be enforced and the values of the person expected to obey the regulation. Finally, the results of this study suggest that responses to risk must be examined in a broader context than has been used in the past; one in which relationships and external consequences are included in the decision model.

Most of our agricultural policies are designed as though economic agents act independently and selfishly. This assumption leads to the view that farmers and others can be motivated to alter the use of potentially harmful herbicides, pesticides, and hormone growth stimulators or other activities that may increase risks for others only by threat of litigation or income incentives. Social capital theory suggests there may be other important motives to which farmers respond. In addition, citizens may have social capital developed toward farmland and other natural resources that leads to socially desirable behavior without any external threats or subsidies. These social capital ties may lead some farmers to act as responsible stewards of their resources without outside intervention. Understanding the interdependence of social relationships and economic decision making may help in explaining economic behavior and lead to more enlightened policy decisions especially related to the management of risk.

ENDNOTES

1. In contrast to a risk subsidy, a risk premium is that dollar amount subtracted from the decision maker's mean income which, if received with certainty, is equal to the expected utility of the risky outcome.
2. Although not emphasized in this paper, social capital can develop between an individual and impersonal objects such as animals, pictures, one's alma mater, and the environment. Social capital that develops between individuals and impersonal objects may result from personal relationships that endow impersonal objects with social capital qualities. Social capital is often symmetrically held between persons but is not symmetric when the object of social capital is not a person.
3. The model can be extended to social capital toward more than one other person by adding the appropriate social capital coefficients and well-being attributes.
4. The reliability of survey responses to hypothetical questions continues to be debated with no clear resolution. Social psychologists argue that hypothetical choices predict behavior best when the choice context is familiar and specific (Ajzen and Fishbein).

Perhaps the most extensive test of hypothetical versus actual choices is that reported in Fox et al. They first elicited hypothetical responses to various choices involving food safety. They compared these hypothetical responses to choices in which subjects realized their choices. They found after repeated trials that actual and hypothetical responses were nearly equal or that bias in hypothetical responses could be calibrated. Their work supports the view that under certain conditions hypothetical responses can be trusted to reflect actual behavior.

In the study reported in this paper, survey questions were designed to match those conditions required for hypothetical response reliability. The respondents were asked to give responses to specific risks with which they were familiar.

There is, however, another defense of the contingent valuation approach that utilizes responses to hypothetical questions. It is that even when actual outcomes occur in response to an agent's choice, the choice is still made under hypothetical conditions. What the subject is required to do is to imagine the conditions that will result from his or her choice and decide on an action before the actual outcomes resulting from the choice. Thus, for both hypothetical and actual choice settings, the decision is made without the subject experiencing the actual outcome.

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