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RISK AND SOCIAL POSITION IN EXPLAINING THE ADOPTION OF SOIL CONSERVATION PRACTICES: AN APPLICATION OF CANCIAN'S THESIS

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Introduction

Attitudes, values, and beliefs have always played a central role in explaining why individuals adopt or reject new ideas (Rogers and Shoemaker, 1971). Of these many attitudinal predispositions, risk orientation has been prominent in both sociological and economic research (Menezes and Hanson, 1972; Roumasset et al., 1978; Dillon and Scandizzo, 1978; Binswanger, 1980). Because there is a significant amount of uncertainty related to the returns on investments in soil conservation, it seems logical to relate risk orientation to the adoption of conservation practices. In turn, this information could be valuable in designing or implementing policy intended to facilitate conservation behavior. However, before promoting a wide-scale acceptance of attitudinal research as the panacea to our current dilemmas in conservation policy, a precautionary note is in order.

Attitudes, specifically risk orientation, are not independent entities. Rather, they are strongly influenced by the socioeconomic context in which they are found. Relative to risk orientation, this context frequently has been interpreted as the individual's socioeconomic rank where research has established a direct relationship between these factors (Rogers and Shoemaker, 1971). Thus, those individuals of a higher economic rank would be more likely to adopt those conservation practices which are characterized by uncertainty.

Yet another interpretation of this socioeconomic context is provided by Cancian (1967; 1972) who challenges the frequently assumed positive monotonic relationship between economic rank and inclination to adopt agricultural innovations. The central thrust of the thesis is that the lower middle rank is more likely than the upper middle rank to adopt in the early stages of the diffusion process. On the basis of a distinction between uncertainty and risk (Cancian, 1980), he argues that the lower middle rank stands to gain more and to lose less by following such an adoption pattern. This paper tests the applicability of Cancian's thesis to a situation in which a reduced tillage system is treated as an innovation.

Cancian's Thesis

Cancian's thesis has been presented formally in two places (Cancian, 1967; 1972) and has been subjected to thorough comment and criticism elsewhere (Gartrell et al., 1973; Morrison, 1973; Morrison et al., 1973; Gartrell, 1977; Frey et al., 1979; Gartrell, 1981; Wagener and Nowak, 1981). There have also been efforts to acknowledge and rebut these criticisms (Cancian, 1976; 1979; 1980). The result of this rather substantial airing of the thesis has been some modification of the original statement, yet the core elements have been retained and defended. It is these core elements that constitute the underpinnings of the present theoretical background.

Cancian's thesis is an attempt to construct a general theory relating rank to risk-taking behavior. It posits that economic rank is an important explanatory variable affecting the propensity to adopt innovations. Economic rank, as a structural representation of the individual's situation within a community of reference, is viewed as more important than any psychological predispositions of the individual.

Cancian specifies three important assumptions that are essential to the argument that he presents. First, it is assumed that persons prefer high rank to low rank in any stratification system. Emerging from this idea is a second assumption that the motivation for risk taking or risk aversion rests with the desire for either achieving or maintaining high rank. Insofar as persons are of lower economic rank, they are expected to act to improve it. Those who are of higher economic rank are expected to act to preserve that rank. Third, based on a distinction between uncertainty and risk, it is assumed that the early adoption of an agricultural innovation involves more uncertainty than risk. Because this uncertainty and risk are not shared equally by all members of the stratification system, it becomes important to understand who will act under such circumstances.

It is typically posited that there will be a positive, linear relationship between economic rank and the early adoption of an innovation. The following is a summarization of the rationale for this proposition relative to those individuals of high rank. First, economically, they are "more able to afford fixed (indivisible) costs involved in any innovation, and more likely to be able to survive anticipatable fluctuations in output" (Cancian, 1980: 167). Second, and sociologically, "they are secure in their positions and take risks out of what amounts to boredom (as contrasted with economic motivation)" (Cancian, 1972:15). Third, and again sociologically, "they realize that their distinctiveness is based on leadership in economic techniques, and they take self-conscious risks in order to maintain this distinctiveness" (Cancian, 1972:15). On the other end of the rank continuum, it is often explained that low ranking individuals are not innovators because "1) they are so poor that any risk threatens 'total economic extinction';

therefore they are unusually conservative; and 2) they refuse to compete in the economic system because past failures have made it seem like an inefficient way to seek rewards" (Cancian, 1972:15).

Cancian's thesis develops from the argument that the logic used in explaining the behavior at the ends of the rank-continuum, as just illustrated, may not be applicable to explaining behavior in the middle of the continuum. Indeed, Cancian predicts an initial curvilinear effect across rank which proceeds from the combination of two tendencies. The first of these is identified as the <u>facilitating effect</u> of economic rank. The tendency noted here is the well established one in which more affluent persons are able to adopt in proportion to their wealth. Persons in higher economic ranks are more likely to have the economic resources enabling them to invest in an innovation. Consequently, a positive and linear relationship should ensue between economic rank and early adoption (Cancian, 1967:914).

The second tendency contributing to the curvilinear effect is the <u>inhibiting effect</u> of rank. When little or nothing is known about a new practice, it is rational for persons of high rank to seek to maintain their position by avoiding the uncertain outcome associated with adopting the innovation. Contrariwise, lower ranking people are expected to adopt the innovation in this situation in an attempt to improve their rank. Random change in rank, which may be associated with innovative behavior in the early stages of the diffusion process, offers a greater probability of net benefit in status for those of lower rank than it does for those of higher rank. Thus, "the poor farmer may be more willing than the rich farmer to adopt when there is uncertainty because, whatever the potential loss, he cannot sink much lower in the socioeconomic structure. Since starvation is unlikely for social reasons, the uncertainty is less of a threat to him than it is to the rich farmer" (Cancian, 1980:167). With other factors remaining constant, a negative and linear relationship is predicted between economic rank and adoption from the inhibiting effect.

All factors are not, however, constant. Neither the facilitating nor the inhibiting effects of rank are deemed adequate by themselves to account for innovative behavior. Rather, a combination of these effects reveals an overall curvilinear relationship between rank and adoption behavior. Centering attention on the middle of the rank continuum, wherein the inhibiting and facilitating effects confront one another most sharply, Cancian's thesis predicts that the inhibiting effect of high rank will predominate in the early stages of the diffusion process when uncertainty is high. In the latter stages of the diffusion process, however, when uncertainty has been reduced to risk, the facilitating effect of high rank is expected to predominate. The result is an upper middle class conservatism relative to adoption behavior in the early stages of the diffusion process.

The Problem

A considerable effort has been spent on outlining the tenets of Cancian's thesis because of its potential implications for public policy on soil conservation and water quality. A wide range of alternative policy formats are available (Seitz et al., 1978), but all may not be equally applicable to the adoption process. That is, policy designed to facilitate the implementation of conservation practices will be most effective when it complements the processes known to occur in the adoption and diffusion of any new agricultural practice. Therefore, the extent to which Cancian's thesis mediates the traditional adoption/diffusion model becomes a critical question in the formulation or evaluation of conservation policy.

The Research Setting

The study is part of a larger interdisciplinary effort exploring the effect of agricultural land-use practices on stream water quality. For the sociological component, three watersheds in the Iowa-Cedar River Basin in east-central Iowa were selected on the basis of matched soil, topographic, and climatic conditions as well as on the crop production techniques and socioeconomic characteristics of the farm firms. A total of 193 farm operators within these watersheds agreed to participate in the initial interviews conducted in February 1980. The same farmers were surveyed by telephone in June 1980, resulting in 183 completed surveys. A final interview was conducted in March 1981, yielding a total of 154 respondents for which complete sets of data are available.

It was determined that reduced tillage systems, a generic name for the different types of conservation tillage, was promoted as such in this area beginning in approximately 1965. All respondents who became operators after 1965 were excluded from the analysis. Finally, Cancian's theory has been presented and debated by using an ordinal level of measurement. To remain compatible with the format of Cancian's work, all ratio or interval variables used in this analysis were reduced to the ordinal level and presented as histograms.

Research Procedures

The key concepts of the thesis -- economic rank and innovation -- are operationalized as follows. Economic rank is measured in two different ways; one based upon the total area of land operated (owned and rented), and the other on an average gross income (both farm and nonfarm) for a 3-year period. Following Cancian (1979:43-46), it is assumed that these measures are relevant in the local communities of reference; that is, it is assumed that these measures are accurate portrayals of the ranking system within the matched watersheds.

Consistent with Cancian's statement that his thesis requires specification of at least four economic ranks, the array of acres operated and gross income were divided into four categories by using two techniques. First, following Cancian's original procedures, the respondent's land area and income were divided into quartiles representing low, low middle, high middle, and high ranks. However, following criticism that the quartiling procedure is not representative of many stratification systems (Morrison, 1973), rank also was operationalized by using a 30/30/20/20 ratio. Again, these respectively represent low, low middle, high middle, and high economic ranks.

The dependent variable was the respondent's reported usage of a reduced tillage system. Yet, critical to Cancian's thesis is when this adoption behavior took place relative to others' adoption behavior in the community of reference; that is, what the uncertainty and risk were relative to this innovation when adoption occurred. Respondents were asked in what year they first began using this conservation practice. Responses to this variable also were categorized according to two different techniques. In the first technique, which is consistent with Cancian's work, the first 25 percent to adopt the innovation, among all those who ultimately adopted the practice by the time of our survey, were placed in stage 1. The second 25 percent to adopt, again, among all those who ultimately adopted, were placed in stage 2. The second technique, based on the traditional adoption/diffusion model, has the first 2.5 percent innovators, the 13.5 percent early adoptors, and the next 34 percent the early majority. For purposes of this study the innovators and early adoptors were collapsed into one category so that the first 16 percent to adopt were placed in stage 1, and the next 34 percent to adopt were considered to be in stage 2 of the diffusion process. In both cases, the remaining 50 percent of the sample who adopted the reduced tillage system are not considered in the analysis inasmuch as they are not critical in testing Cancian's thesis.

Research on the diffusion and adoption of innovations is frequently criticized for its focus on the individual innovator (Goss, 1977; Cancian, 1979). In response to this criticism, the basic orientation of Cancian's thesis places stress on the innovator's situation over and above individual characteristics. In accounting for the adoption of new agricultural practices, personal factors such as age, education, ethnicity, religious preference, etc., are not viewed as primary explanatory variables. Rather, it is the variance in situational factors (e.g., economic rank and level of uncertainty) that ultimately explains variance in people's adoption behavior. This use of situational factors as variables in the explanation of behavior is verily a sociological approach. As noted by Merton and Rossi, "...men act in a social frame of reference yielded by groups of which they are a part. [Sociology] has always been centered on the group determination of behavior" (1957:234).

Hypotheses

Cancian (1972) proposes two hypotheses to test his thesis. The hypotheses are:

H_1: During the first stage in the diffusion of an innovation, low-middle-rank individuals are more likely to adopt it than high-middle-rank individuals.

Stage 1: $LM_1 > HM_1$.

H_2: During the second stage in the diffusion of an innovation, the adoption rate of high-middle-rank individuals will increase relative to the adoption rate of low-middle-rank individuals.

Stage 2: $HM_2 - HM_1 > LM_2 - LM_1$.

Hypothesis 1 simply states that during stage 1, when uncertainty is high, the inhibiting effect of rank will dominate the adoption process. During this stage the low-middle rank should adopt the reduced tillage system at a faster rate than those of high-middle rank. Hypothesis 2 states that, during stage 2, when the probabilities of different risks can be calculated, the facilitating effect of rank will begin to dominate the adoption process. Accordingly, the increase in the adoption rate for the high-middle rank during stage 2 of the adoption process should be greater than the corresponding adoption rate for the low-middle rank.

Results

In Figure 1, where income distribution is based on quartiles, Cancian's thesis is supported by both hypotheses. According to this graph, 35 percent of the low-middle rank had adopted a reduced tillage system by the end of stage 1, whereas only 24 percent of the high-middle rank had done likewise.

Figure 1 about here

By the end of stage 2, 52 percent of the low-middle rank had adopted, and 39 percent of the high-middle rank now use some form of a reduced tillage system. The percentage increase, however, after those farmers who had already adopted in stage 1 are eliminated, was greater for the high-middle rank. Thus, the second hypothesis also is confirmed by the analysis.

The figures to the right of each graph indicate the total percentage adopting by the end of each stage. Approximately 24 percent of all those who are going to adopt had adopted by the end of stage 1, and 42 percent had adopted by the end of stage 2.

When income distribution is divided into ranks based on a 30/30/20/20 ratio as portrayed by the graph in the upper right corner of Figure 1, only the first hypothesis is confirmed. By the end of stage 1, 31 percent of the low-middle rank had adopted as compared with 30 percent of the high-middle rank.

Although not specified as part of Cancian's thesis, the graphs in Figure 1 representing income distribution also indicate that there is a high-rank "conservatism" at work. In both graphs, the high-rank individuals adopted at a slower rate than all lower ranks through stage 1 of the adoption process. In stage 2, however, they begin to adopt at a much faster rate, and by the end of the stage, have caught up with the other ranks. This result might have something to do with the noncommercial nature of the innovation.

When economic rank is based on land distribution, the lower two graphs in Figure 1, there is little support for Cancian's thesis. Overall, four of the eight hypotheses represented in Figure 1 are supported by the data.

Figure 2 presents the results when the adoption stages are defined according to the traditional model (i.e., 16/34/50). The results are very

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Figure 2 about here

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similar to those presented in Figure 1, with the exception that there is now more support for Cancian's thesis when using land distribution to establish the economic ranks. Five of the eight hypotheses represented on Figure 2 receive support from the data.

Discussion

The premise of this paper has been that attitudes can be important in formulating and evaluating conservation policy only if they are interpreted within their corresponding socioeconomic context. Specifically, we have examined the notion that the risk-taking orientation associated with the early adoption of an innovation is influenced by both economic rank and when the individual acts on this orientation, i.e., when this adoption behavior occurs. High economic rank often is viewed as facilitating a risk-taking orientation and behavior. This seems to be true <u>except</u> during the initial stage of the diffusion process when uncertainty is high and information is low. This is consistent with Simon's (1979) assertion that uncertainty and limited information render the rationality assumptions of economics virtually useless. It is this uncertainty, in conjunction with the status-seeking behavior of individuals lower in rank, that explains the inhibiting effect of high rank associated with early adoption of a reduced tillage system. Overall, the data support Cancian's thesis of an upper-middle-class conservatism in agricultural communities.

There are a number of factors that will influence the adoption or rejection of soil conservation practices (Nowak and Korsching, 1981). To be effective and efficient, conservation policy must begin to designate and rank the efficacy of these different factors (Nowak, 1981). These findings question the traditional use of economic rank in conservation policy where rank is assumed to have a constant effect throughout the diffusion process.

It has been assumed that the upper status individuals in any farming community are among the first to adopt new agricultural practices. Program efforts in conservation as well as in other areas often are directed toward these individuals with the intent that their adoption of the recommended practices will then "trickle down" to the rest of the farming community. However, it now appears that lower-middle-rank individuals, in an effort to generate status, are among the first to adopt these practices. This could have several tentative implications in the design of future conservation policy.

Possible recommendations could be expressed as a sequence of stages in the implementation of conservation policy. First, because lower-middle-rank individuals are proportionately among the first to adopt in an effort to generate status, then the initial educational efforts should attempt to present an image of prestige and status associated with the recommended practice. Inasmuch as uncertainty prevails at this stage, which limits the applicability of models assuming economic rationality, then one should reinforce the image of a potential social reward with the adoption of the recommended practice.

The second stage in the education program would be based on the distinction between risk and uncertainty in the adoption process. Because higher-status individuals are better able to deal with risk, both from an economic and a managerial sense, then the dissemination of information to these individuals becomes important. This information would allow them to calculate risk by assigning probabilities to the various factors associated with the conservation practice. Thus, in this second stage, the educational program shifts from presenting a prestigious image of the conservation practice(s) to one of presenting technical, detailed information.

The third stage would be based on the assumption that many of the risks have been calculated in the previous stage. Once risk is known, then the appropriate economic incentive programs can be used to offset these conditions.

In conclusion, knowing an individual's risk orientation is important, but only when we also know that individual's position within a community of reference. Cancian's thesis, a modification of the traditional adoption-diffusion model, is based on this distinction. This thesis can be applied to conservation policy with the realization that an individual's rationality is not a fixed, constant sum. Rather, it varies by the stage of the adoption process and the amount of information available. As Cancian (1980:174-175) states, "(W)e seem to believe that people generally act on knowledge -- that they use this knowledge to calculate, and having calculated, act. The fact of the matter is that they very often are called on to act before they can know."

FIGURE 1: LEVELS OF ADOPTION BY ECONOMIC RANK---25/25/50 ADOPTION STAGES

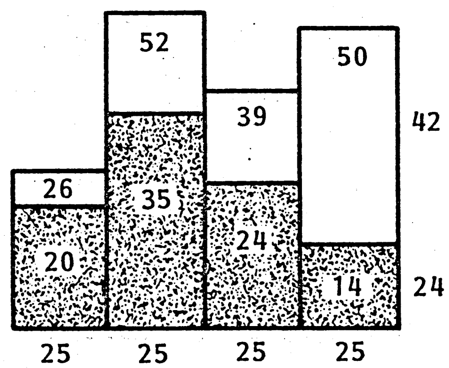
Stage 2 = Second 25% to adopt a reduced tillage system

Stage 1 = First 25% to adopt a reduced tillage system

H_1: $LM_1 > HM_1$ ***

H_2: $HM_2 - HM_1 > LM_2 - LM_1$ ***

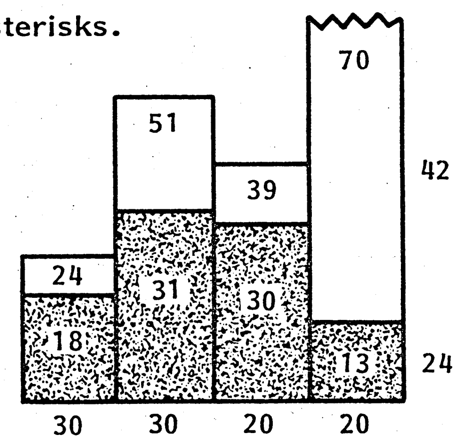
*** Those hypotheses corroborated by the data are noted with 3 asterisks.



INCOME, % DISTRIBUTION

H_1: $35 > 24$ ***

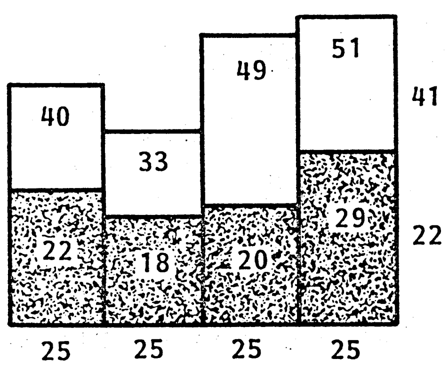
H_2: $19 - 24 > 26 - 35$ ***



INCOME, % DISTRIBUTION

H_1: $31 > 30$ ***

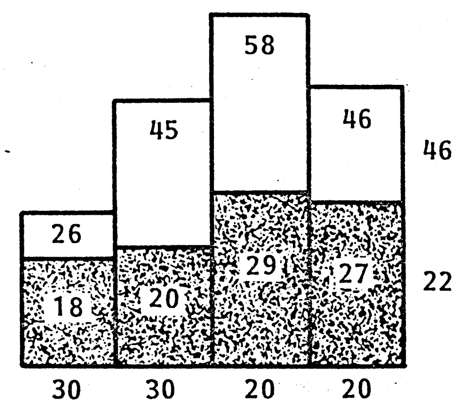
H_2: $13 - 30 > 29 - 30$



LAND, % DISTRIBUTION

H_1: $18 > 20$

H_2: $36 - 20 > 19 - 18$ ***

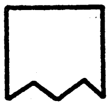


LAND, % DISTRIBUTION

H_1: $20 > 29$

H_2: $41 - 29 > 32 - 20$

FIGURE 2: LEVELS OF ADOPTION BY ECONOMIC RANK---16/34/50 ADOPTION STAGES

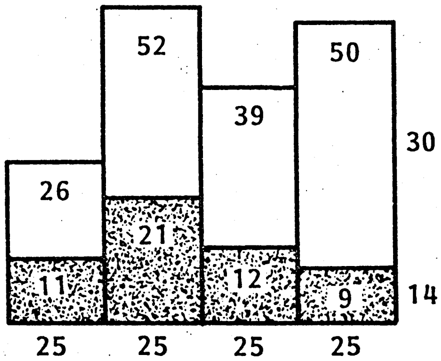

Stage 2 = Next 34% to adopt a reduced tillage system


Stage 1 = First 16% to adopt a reduced tillage system

H_1: $LM_1 > HM_1$***

H_2: $HM_2 - HM_1 > LM_2 - LM_1$***

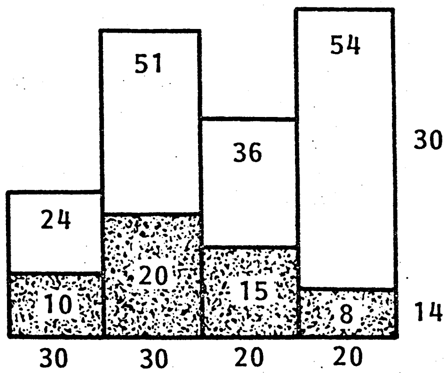
*** Those hypotheses corroborated by the data are noted with 3 asterisks.



INCOME, % DISTRIBUTION

H_1: 21 > 12 ***

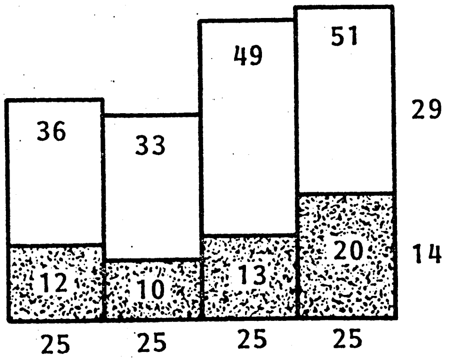
H_2: 31 − 12 > 39 − 21 ***



INCOME, % DISTRIBUTION

H_1: 20 > 15 ***

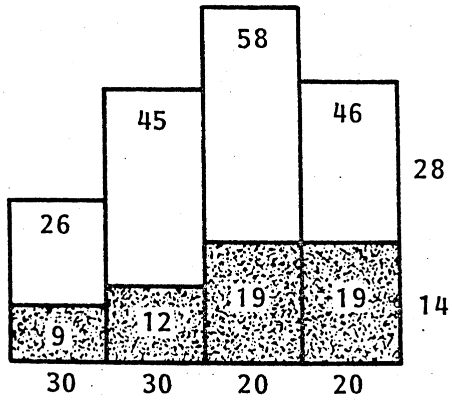
H_2: 29 − 15 > 39 − 20



LAND, % DISTRIBUTION

H_1: 10 > 13

H_2: 41 − 13 > 27 − 9 ***



LAND, % DISTRIBUTION

H_1: 12 > 19

H_2: 48 − 19 > 38 − 12 ***

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