# Economic Perceptions and Agricultural Policy Preferences

**Jayachandran N. Variyam and Jeffrey L. Jordan**

Previous research indicates that policy perceptions are important in explaining individual preferences for government expenditures. In this article we study agricultural policy preferences using national survey data containing several policy perception measurements. A model linking preferences to perceptions through an underlying unobservable variable is estimated and assessed using the bootstrap. The perception that farmers receive too much government assistance is dominant, affecting preferences negatively. Perceptions concerning the importance of agriculture to the economy, financial stress and profitability, and farming as an occupation are also important. Some selective preference for family farm support is indicated with implications for efforts to promote such support.

*Key words:* bootstrap method, reduced-rank regression.

During the 1980s, the U.S. agricultural sector underwent an economic crisis to a degree not experienced since the Great Depression. The sector was plagued by record levels of debt, rapidly declining asset values, and an accelerated rate of farm failures (Melichar). An extensive literature examines the causes, consequences, and policy implications of this event (e.g., Murdock and Leistritz; McKinzie, Baker, and Tyner). While there is general agreement that policies should be designed to ease the burden of transition to a more efficient sector, substantial disagreement on the nature of specific policies remains (Dobson; Calomiris, Hubbard, and Stock).

The cost of U.S. farm programs rose rapidly in the mid-eighties, and although the cost has fallen in recent years, much of the structure of the farm programs remains unchanged. Since protective measures represent significant costs to consumers and taxpayers, it is of interest to examine public support for the programs. While surveys indicate public support for policies to protect agriculture, opposition may increase when costs of protection are revealed (Dobson; Rausser and Irwin).

The objective of this article is to examine how public perceptions of farming and farm policies influence preferences for government involvement. The detractors of farm subsidies argue that disproportionate amounts of federal aid have been channeled to large farms with relatively stable financial conditions rather than to financially stressed small farms (Kramer). Voter perceptions of such "policy failures" can affect political support for farm programs. Supporters of farm programs point to the social costs of financial stress, the disappearance of small farms, and the implications for the future structure of the agricultural sector (e.g., Comstock). If such costs are not taken into account due to information problems, public support for the programs may decline. Public support or opposition may be especially important at a time of rising budgetary pressures. A better understanding of these issues can be obtained by examining how individual judgments and perceptions of the policy environment affect preferences for farm support.

## Background, Model, and Methods

Variables capturing attitudes and perceptions are increasingly being used in the economic

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analysis of consumer choice for private goods (e.g., Train, McFadden, and Goett), preferences for various government expenditure categories (e.g., Lankford), as well as business and farmer decision making (e.g., Nitsche and Poser; Gould, Saupe, and Klemme). This is particularly relevant with regard to government spending since perceptions indicate how informed the citizens are about various aspects of the policies under consideration. As Fisher points out, to the extent that individual perceptions govern behavioral responses to taxes and expenditures, public perceptions would be at least as important as predictions derived from economic theory.

Empirical choice behavior models are often estimated under the assumption that citizens have complete knowledge of benefits and costs associated with various public expenditure categories. However, as Lankford notes, a decision-making environment with incomplete or incorrect information is more likely to reflect reality. This is borne out by studies which show that tax and fiscal knowledge of citizens may be limited (e.g., Lewis and Cullis). In such an environment, perceptions about the impact and efficacy of government policies in relation to their stated objectives, and their perceived costs and benefits, are likely to be significant determinants of preferences for these policies. For instance, Lankford found that beliefs about the effectiveness of public expenditures in improving education quality, and about whether funds are spent wisely, had an important impact on citizens' preferences for education expenditures. In a different context, Gould, Saupe, and Klemme found the perception of soil erosion to be an important factor in the adoption of conservation tillage by farmers. This led them to recommend an information gathering and dissemination system to promote adoption.

In the model considered here, perceptions are assumed to be generated from information about the issues and objectives driving the policy process. A similar approach to informational impacts on perception formation underlies studies on environmental risk perceptions (e.g., Smith and Johnson) and product quality perceptions in marketing (e.g., Bagozzi). The perceptual variates act as intervening variables that reflect an individual's interpretation of the decision-making environment (Nitsche and Poser). As Graziano (p. 804) argues, the internal representations that an individual's cognitive apparatus builds from information are likely to be more important to the policy process than the information itself.

The farm crisis of the 1980s generated considerable public discussion on the effectiveness and the future direction of farm policies. Much of the debate focused on the merits of government protection for agriculture and policies to preserve the family farm (e.g., Comstock; Tweeten). The data used in this study were collected toward the end of the crisis period and, therefore, should capture public perceptions of the costs and merits of the policies.

A complete behavioral model of preference determination will involve relationships capturing perception formation including information costs and socioeconomic factors affecting both perceptions and preferences. The present model can be considered as a reduced-form relationship that predicts preferences as a function of perceptions. Such a framework is widely used in marketing studies where perceptions of product attributes, as affected through advertisements, are linked to consumer preferences and buying intentions (e.g., Bagozzi). Similarly, in business survey studies, market perceptions are related to the firm's production plans (e.g., Carlson and Dunkelberg).

Preference measurement in this study is based on a survey, and the stated preferences are taken as indicators of actual choice similar to several other studies (e.g., Hewitt). While survey responses are prone to measurement errors, the accuracy of this approximation can be increased by the use of multiple questions to measure preferences (Kalton and Schuman).

Suppose $y_i$ is a $(p \times 1)$ vector of preference measurements and $x_i$ is a $(q \times 1)$ vector of perception measurements for the $i$th individual. Following the perception-preference linkage model, let $y_i$ depend on $x_i$ linearly:

$$(1) \qquad y_i = Cx_i + e_i, \qquad i = 1, 2, \ldots, N,$$

where $y_i$ and $x_i$ have been transformed to have zero mean and unit variance, $C$ is a $(p \times q)$ coefficient matrix, and $e_i$ is a $(p \times 1)$ vector of i.i.d. error terms uncorrelated with $x_i$ and having mean zero and covariance matrix $\Sigma_{ee}$. When $C$ has full rank, (1) is the usual multiple regression model. However, when the variables are indicators of related concepts as in the present case, one may suspect an underlying structure relating these variables. Specifically, the observed indicators may be related by a small

number of underlying unobservables so that $C$ has a reduced rank. For example, Train, McFadden, and Goett used factor analysis to recover variates underlying attitudinal measurements to predict consumer choice among optimal rate schedules offered by a public utility. In the present case, the objective is to extract the perception structure in $x_i$ that best predicts multiple preference measurements in $y_i$.

Suppose there exist $r \leq \min(p, q)$ perceptual variates formed as a linear combination of $x_i$ that best predict $y_i$. This implies a rank restriction on $C$ so that $C$ may be written as $C = AB$ where $A$ and $B$ are rank $r$ matrices of order $(p \times r)$ and $(r \times q)$, respectively. Thus, (1) becomes

$$y_i = A(Bx_i) + e_i, \tag{2}$$

where $Bx_i$ gives the $(r \times 1)$ vector of perceptual variates. Matrix $B$ holds the loadings of $x_i$ on the perceptual variates and matrix $A$ contains the regression coefficients of $y_i$ on the perceptual variates. Model (2) is called the reduced-rank regression model and its estimation has been considered by Izenman.

Collecting measurements for the $N$ individuals in matrix form, equation (2) may be written as

$$Y = A(BX) + e,$$

where $Y = (y_1, y_2, \ldots, y_N)$, $X = (x_1, x_2, \ldots, x_N)$ and $e = (e_1, e_2, \ldots, e_N)$, respectively. The problem then is to estimate $A$ and $B$ that minimizes

$$\text{tr}[E\{\Gamma^{1/2}(Y - ABX)(Y - ABX)'\Gamma^{1/2}\}],$$

where tr stands for trace, $E$ is the expectations operator, and $\Gamma$ is a positive definite symmetric matrix. The solution proposed by Izenman gives

$$A = \Gamma^{-1/2}[V_1, \ldots, V_r] \tag{3a}$$

and

$$B = [V_1', \ldots, V_r']\Gamma^{1/2}\Sigma_{yx}\Sigma_{xx}^{-1}, \tag{3b}$$

where $\Sigma_{yx} = E(YX')$, $\Sigma_{xx} = E(XX')$, and $V_j$ is the $j$th eigenvector corresponding to the $j$th largest eigenvalue, $\lambda_j^2$, of the matrix $\Gamma^{1/2}\Sigma_{yx}\Sigma_{xx}^{-1}\Sigma_{xy}\Gamma^{1/2}$, $j = 1, \ldots, r$. For standardized variables, the choice for $\Gamma$ is $I$, a $(p \times p)$ identity matrix (Israels). Solution (3) ensures the uniqueness of the parameters by the normalization $A'\Gamma A = I$ and $B\Sigma_{xx}B' = \Lambda^2$ where $\Lambda^2$ is a $(p \times p)$ diagonal matrix containing the eigenvalues, $\lambda_j^2$, arranged in descending order.[1]

Versions of the reduced-rank model have been previously employed, for example, by Whittle and Adelman to study agrarian development and by Avery to study monetary policy. Discussion of several related models can be found in Aigner and Goldberger.[2]

The stability of parameter estimates from (3) can be assessed using the bootstrap method (Efron and Tibshirani).[3] The method is implemented by sampling with replacement from the original sample to obtain $b$ independent bootstrap samples. The size of each bootstrap sample equals $N$, the original sample size. Since the perception variables are as random as the preference variables, resampling involves the entire set $(Y', X')$. The required statistics are calculated from each sample so that $b$ estimates of each statistic are obtained. For sufficiently large $b$, the resulting bootstrap distribution of the estimates approximates the true but unknown distribution of the statistic. The mean and the standard deviation of the bootstrap distribution can be used to estimate the bias and the standard error of the parameter estimates.

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[1] The estimation is carried out by replacing the population moments by their empirical counterparts. The measurement scale of the variables is an issue in the present case where the variables are measured on a 1–5 scale. Given the large number of variables and the nonlinearity of the model, taking the ordinal nature of the variables explicitly into account is difficult. However, there are major reasons why treating the variables as continuous may not have much empirical effect. In previous single-equation analyses, estimates obtained using a qualitative choice framework were found to be similar to those based on integer scores. Further, estimates from correlation matrices calculated using an ordinal probit framework were found to be close to the estimates from correlation matrices based on integer scores (see Olsson for a discussion of this methodology).

[2] There is an extensive literature on reduced-rank regression in psychometrics under the rubric redundancy analysis (see Israels, Chapter 8, for a review). Here, the property of reduced-rank regression in forming orthogonal lower dimensional variates from the $X$ variables that maximizes the mean-squared multiple correlation of the $Y$ variables (the so called "redundancy index") is stressed so as to distinguish it from canonical correlation analysis. Canonical correlation analysis forms linear combinations of the $Y$ and $X$ variables that are maximally correlated without seeking to maximize the predictability of the $Y$ set by the $X$ set. The former property is important in the present case where the focus is on the perception structure that best predicts multiple preference measurements.

[3] Conditional on the regressors being fixed, standard errors of the estimates can be obtained under the assumption of normally distributed errors (Israels, pp. 227–79). Since both the preference and perception variables are survey responses measured on a 1–5 scale, this assumption seems untenable. The nonparametric bootstrap method is employed to avoid this assumption.

## Data and Variables

This study uses data from a nationwide mail survey conducted in 1986 to determine public views of changes taking place in the structure of U.S. agriculture. Pretested questionnaires containing over 150 questions including those to determine support for farmers and farm issues were mailed to a stratified sample of 9,250 persons representing the U.S. population. The population from which the sample was drawn consisted of a computer-merged list of residential telephone subscribers and automobile owners. In 1986 the proportions of U.S. households with telephone and automobile ownership were 92% and 90%, respectively (U.S. Bureau of the Census). Thus, the population is well representative of the households in the United States. The number of usable questionnaires returned was 3,239, giving a return rate of 46% adjusting for incorrect addresses and deceased. The survey had a stratified sampling design with oversampling in seven states. All calculations were done after weighting the observations to restore equal representation. A detailed discussion on the development and administration of the questionnaire, data processing, and response rate can be found in Molnar.

The questions selected for analysis and their response patterns are summarized in table 1. The sample size available after deleting all missing observations was 2,720. The respondents registered their preferences and perceptions on a 1–5 scale ranging from strongly agree to strongly disagree. In table 1, frequencies under scores 1 and 2 and 4 and 5 have been merged to give "agree" and "disagree," respectively. The estimation uses measurements on the full 1–5 scale.

Part A of table 1 lists 11 preference questions considered in the analysis.[4] Overall, the response pattern indicates support for government involvement. However, there is also a notable diversity in response pattern across questions. In particular, there is a decline in preference for support policies when willingness to pay higher prices is mentioned. Such differences have been noted in other public expenditure studies (Hewitt; Lewis and Cullis).

The survey included a wide range of questions to capture the respondents' policy perceptions. All perceptual and attitudinal questions related to the policy issues considered here have been selected for analysis. These 26 questions are listed in part B of table 1. Broadly, the questions capture economic perceptions relating to the financial health of farms (items 1 and 2), profitability of farming (items 3 to 5), level of government involvement and assistance to farmers (items 6 to 10), importance of agriculture to the general and local economy (items 15 to 18), as well as attitudes toward small and large farms (items 11 to 14) and farming as an occupation (items 19 to 26). The structure underlying these perception variables as it relates to the preference variables is extracted using reduced-rank regression.

## Results and Discussion

Based on the set of preference variables included, three versions of the model were estimated. For each model, the standard errors of the parameter estimates were obtained by the bootstrap method. The bootstrap was employed by drawing 300 samples, each of size 2,720, with replacement from the original sample (Efron and Tibshirani). Parameter estimates were computed from each bootstrap sample, and the mean and standard deviation of the resulting distribution for each parameter were used to estimate its bias and standard error, respectively.

The main results are presented in tables 2 and 3. Model (1) includes the complete set of 11 preference variables and 26 perception variables and forms the basis for discussing the major statistical results. The first empirical question addressed is the rank of $C$, or the number of underlying perceptual variates in the model. This is akin to determining the number of factors in factor analysis, and, in the absence of prior information, a frequently employed procedure is to choose only those variates that explain at least $1/\mathrm{tr}\Sigma_{yy}$ of the total $Y$ variance, $\mathrm{tr}\Sigma_{yy}$ (Train, McFadden, and Goett, p. 388).

The proportion of variance explained by successive perceptual variates is given by the ratio of corresponding eigenvalues to the total

[4] The distinction between preferences and perception questions is based on their wording and the type of information sought (see Kalton and Schuman). By this norm however, items 2 and 4 in part A of table 1 cannot be strictly viewed as preference questions. They are included nevertheless due to their explicit reference to preserving the family farm and the fact that they were placed near other preference questions on the questionnaire. Their exclusion did not change the results appreciably.

**Table 1. Summary of Responses to Preference and Perception Questions**

| Statement | Variable Name | Frequency and Percent | | |
|---|---|---|---|---|
| | | Agree | Undecided | Disagree |
| A. Preferences | | | | |
| 1. The family farm must be preserved because it is a vital part of our heritage. | *HERITAGE* | 2,056 (75.6) | 293 (10.8) | 371 (13.6) |
| 2. Obtaining greater efficiency in food production is more important than preserving the family farm. | *GREFF* | 706 (26.0) | 592 (21.8) | 1,422 (52.3) |
| 3. Government should have a special policy to ensure that family farms survive. | *SPOLICY* | 1,606 (59.0) | 504 (18.5) | 610 (22.4) |
| 4. Most consumers would be willing to have food prices raised to help preserve the family farm. | *HPRICE1* | 610 (22.4) | 545 (20.0) | 1,565 (57.5) |
| 5. Family farms should be supported even if it means higher food prices. | *HPRICE2* | 987 (36.3) | 718 (26.4) | 1,015 (37.3) |
| 6. Government should guarantee a minimum price to farmers for their products. | *MINPRICE* | 1,150 (42.3) | 542 (19.9) | 1,028 (37.8) |
| 7. The government should treat farms just like other businesses. | *BUSINESS* | 1,476 (54.3) | 443 (16.3) | 801 (29.4) |
| 8. Farmers should compete in a free market without government support. | *FREEMKT* | 1,204 (44.3) | 744 (27.4) | 722 (28.4) |
| 9. The government should not be involved in agriculture at all. | *NOINVOL* | 486 (17.9) | 612 (22.5) | 1,622 (59.6) |
| 10. Government should help as many farmers as possible to own their farmland. | *OWNLAND* | 1,399 (51.4) | 461 (16.9) | 860 (31.6) |
| 11. Government programs should help young people get started in farming. | *STARTFM* | 1,662 (61.1) | 463 (17.0) | 595 (21.9) |
| B. Perceptions | | | | |
| 1. Most farmers are wealthy. | *WEALTHY* | 135 (5.0) | 184 (6.8) | 2,401 (88.3) |
| 2. Today, most farmers are in financial trouble. | *FINTRB* | 1,788 (65.7) | 434 (16.0) | 498 (18.3) |
| 3. Most of the time, farmers make reasonable profits when they sell their products. | *PROFIT1* | 804 (29.6) | 622 (22.9) | 1,294 (47.6) |
| 4. Most profits in the food business go to processors and distributors, not to farmers. | *PROFIT2* | 2,463 (90.6) | 171 (6.3) | 86 (3.2) |
| 5. Most of the money consumers spend on food goes to the farmer. | *PROFIT3* | 57 (2.1) | 69 (2.5) | 2,594 (95.4) |
| 6. Farmers get too much money from government programs. | *TOOMUCH* | 734 (27.0) | 768 (28.2) | 1,218 (44.8) |
| 7. Farmers get more than their fair share of government benefits. | *SHARE* | 684 (25.1) | 794 (29.2) | 1,242 (45.7) |
| 8. Government involvement in agriculture has been about right. | *GINVOL1* | 367 (13.5) | 1,076 (39.6) | 1,277 (46.9) |
| 9. Government involvement in agriculture has helped consumers. | *GINVOL2* | 956 (35.1) | 945 (34.7) | 819 (30.1) |
| 10. Government involvement in agriculture has hurt farmers. | *GINVOL3* | 1,177 (43.3) | 893 (32.8) | 650 (23.9) |
| 11. Most farms today are too large. | *TOOLAR* | 510 (18.8) | 755 (27.8) | 1,455 (53.5) |
| 12. Large farms get too many government benefits. | *BENEFIT* | 1,292 (47.5) | 1,023 (37.6) | 405 (14.9) |
| 13. Small farms generally produce better quality food products than large farms. | *SMAFM1* | 1,063 (39.1) | 943 (34.7) | 714 (26.3) |
| 14. Small farmers are farming because they failed to develop or acquire other skills. | *SMAFM2* | 238 (8.8) | 271 (10.0) | 2,211 (81.3) |
| 15. Agriculture is the most basic occupation in our society, and almost all other occupations depend on it. | *BASIC* | 2,128 (78.2) | 276 (10.1) | 316 (11.6) |
| 16. A depression in agriculture is likely to cause a depression in the entire country. | *AGDEPR* | 1,899 (69.8) | 460 (16.9) | 361 (13.3) |
| 17. Most of the food consumed in this state is produced outside the state. | *STATE* | 1,332 (49.0) | 557 (20.5) | 831 (30.6) |
| 18. Farming is a big source of jobs in my state. | *JOBS* | 1,383 (50.8) | 408 (15.0) | 929 (34.2) |

**Table 1. Continued**

| Statement | Variable Name | Frequency and Percent | | |
|---|---|---|---|---|
| | | Agree | Undecided | Disagree |
| 19. Anybody can farm, no special training is required. | *NOTRAIN* | 99 (3.6) | 47 (1.7) | 2,574 (94.6) |
| 20. I would be happy if my son or daughter chose farming as an occupation. | *SONFM* | 1,012 (37.2) | 801 (29.4) | 970 (33.3) |
| 21. Farmers complain too much about their problems. | *COMPLAIN* | 582 (21.4) | 490 (18.0) | 1,648 (60.6) |
| 22. Farming involves understanding and working with nature; therefore, it is a much more satisfying occupation than others. | *NATURE* | 1,398 (51.4) | 638 (23.5) | 684 (25.1) |
| 23. Farming should be an occupation where farmers can make their economic decisions independently. | *INDEP* | 2,115 (77.8) | 443 (16.2) | 162 (6.0) |
| 24. A farmer should be proud if he can say that he owes money to no one. | *PROUD* | 2,302 (84.6) | 184 (6.8) | 234 (8.6) |
| 25. Farmers ought to appreciate farming as a good way of life and be less concerned about their cash income. | *LIFE* | 321 (11.8) | 333 (12.2) | 2,066 (76.0) |
| 26. Farmers should raise all of the crops and livestock possible as long as there are hungry people. | *HUNGRY* | 1,320 (48.5) | 618 (22.7) | 782 (28.8) |

Note: Figures are based on 2,720 observations obtained after deleting all observations with missing values. Percentages may not add up to 100 because of rounding error.

$Y$ variance (i.e., $\lambda_j^2/\mathrm{tr}\Sigma_{yy}$). Since the variables are standardized to unit variance, the total $Y$ variance is 11. Table 2 shows that for model (1), the first perceptual variate accounts for 20% of total $Y$ variance. The contribution of the second and higher variates was less than 9% suggested by the $1/\mathrm{tr}\Sigma_{yy}$ criterion. The sum of all the eigenvalues, $\mathrm{tr}\Lambda^2$, is 2.89 so that the maximum $Y$ variance that can be explained (i.e., $\mathrm{tr}\Lambda^2/\mathrm{tr}\Sigma_{yy}$) is 26%. Thus, a rank-1 model seems to provide the best fit to the data. This conclusion is supported by the bootstrap results.

The bootstrap standard error estimates showed that none of the parameter estimates for the second or higher perceptual variates were statistically significant. Further, while for $r = 1$ the parameter estimates were close to their bootstrap means (bias less than 2% for all significant parameter estimates), for the sec-

**Table 2. *A* Coefficients of Preference Variables, Bootstrap Standard Errors, and Model Statistics**

| Variable | | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|---|
| No. | Name | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| 1 | *HERITAGE* | −0.287 | 0.016 | −0.466 | 0.016 | | |
| 2 | *GREFF* | 0.230 | 0.016 | 0.390 | 0.020 | | |
| 3 | *SPOLICY* | −0.370 | 0.011 | −0.542 | 0.015 | | |
| 4 | *HPRICE*1 | −0.172 | 0.017 | −0.297 | 0.025 | | |
| 5 | *HPRICE*2 | −0.313 | 0.013 | −0.498 | 0.014 | | |
| 6 | *MINPRICE* | −0.364 | 0.013 | | | −0.455 | 0.014 |
| 7 | *BUSINESS* | 0.260 | 0.016 | | | 0.337 | 0.018 |
| 8 | *FREEMKT* | 0.339 | 0.014 | | | 0.469 | 0.014 |
| 9 | *NOINVOL* | 0.234 | 0.021 | | | 0.353 | 0.022 |
| 10 | *OWNLAND* | −0.363 | 0.010 | | | −0.436 | 0.015 |
| 11 | *STARTFM* | −0.315 | 0.012 | | | −0.381 | 0.016 |
| Eigenvalue ($\lambda_1^2$) | | 2.216 | | 1.043 | | 1.442 | |
| Percentage of total $Y$ variance ($\lambda_1^2/\mathrm{tr}\Sigma_{yy}$) | | 20.145 | | 20.860 | | 24.033 | |
| Percentage of explained variance ($\lambda_1^2/\mathrm{tr}\Lambda^2$) | | 76.811 | | 91.147 | | 82.835 | |

Note: SE stands for standard error. For definitions of the variables, see table 1.

ond and higher perceptual variates the parameter estimates had relatively high bias (bias above 25% for all parameter estimates). Thus, useful information in the data for the model considered can be recovered by extracting a single perceptual variate. Ignoring higher variates does not affect the interpretation of the rank-1 model since the solutions are nested. This implies considerable parameter reduction since a full rank model has 286 parameters. With a rank of one, the number of parameters reduces to 37. Thus, for each of the models estimated, tables 2 and 3 report the rank-1 solution.[5]

The *B* coefficients are the loadings of perception variables on the underlying perceptual variate, and the *A* coefficients are the regression coefficients of each preference variable on the perceptual variate. The perceptual variate itself is a priori unsigned, and its interpretation depends on the coefficient signs as well as the scale of the observed variables (see Avery, pp. 300–01). The variables are measured on a 1–5 scale with 1 for strong agreement and 5 for strong disagreement. Therefore, looking at the coefficient signs with the scale of the variables in mind, it can be seen that a rise in the value of the perceptual variate indicates stronger support for government involvement in agriculture. For example, the positive *B* coefficient for *TOOMUCH* (table 3) indicates that the value of the perceptual variate rises when there is greater disagreement with the view that farmers get too much money from government programs. The negative *A* coefficient for *SPOLICY* (table 2) indicates that as the value of the perceptual variate rises, there is greater preference for special government policies to ensure family farm survival. Thus, those who do not perceive government payments to farmers as excessive tend to support special policies to protect family farms.

As can be seen from table 2, all the *A* coefficients are statistically significant and of similar magnitude indicating that the first perceptual variate predicts the 11 preference variables to a relatively similar degree. This lends more confidence to the interpretation of results since it is not based on response to any single preference question. Rather, preferences for government involvement under different contexts are explained. The smallest coefficients are for *HPRICE*1 and *GREFF*, which may be due to the difference in the wording of these questions (see footnote 4).

The *B* coefficients reported in table 3 are grouped by the subject classification given in the Data section. The coefficients differ considerably in size indicating the relative role of the perception variables and their groupings in predicting policy preferences. *TOOMUCH* has the largest estimated loading and is highly significant. Its positive sign, as discussed earlier, indicates that scoring high on its scale (i.e., tend to disagree) increases the value of the variate. This, in turn, implies agreement with pro-support statements such as *HERITAGE* and *SPOLICY* (since these have negative *A* coefficients) and disagreement with opposing statements such as *BUSINESS* and *FREEMKT* (since these have positive *A* coefficients). Thus, the perception that farmers get too much money from government programs strongly predicts opposition to government involvement.

The relative size and significance of coefficients for *SHARE*, *GINVOL*1, and *GINVOL*2 give additional evidence in this regard. The perception that farmers get more than their fair share of government benefits affects preferences negatively while the views that government involvement has been about right and that it has in fact helped the consumers have

[5] The impact of not including individual characteristics such as gender, age, and income in the model is a concern. These variables would enter a structural model of preference formation as indicators of access to and cost of information and the cost-benefit calculations of individuals. Since they are also likely to be correlated with the perception variables, excluding them might bias the results. Further, the bootstrap results will be erroneous since they are calculated under the assumption that the original model is correctly specified. These issues can be examined by considering an augmented model where the omitted variables are added. Suppose there are $k$ variables measuring individual characteristics collected in a $(k \times N)$ matrix, $Z$. Adding these variables, equation (2) may be modified and written in matrix form,

$$(2') \qquad Y = A(BX) + DZ + u,$$

where $D$ is a $(p \times k)$ matrix of coefficients and $u$ is a $(p \times N)$ matrix of error terms with zero mean and covariance matrix $\Sigma_{uu}$. Similar to the treatment of individual characteristics in other preference studies, $D$ can be taken to be of full rank. Estimation of $A$ and $B$ under (2′) is discussed by Goldberger (pp. 203–04). In the present case, the procedure involves applying the eigenvalue decomposition suggested by Izenman to the partial correlations between $Y$ and $X$ controlling for $Z$. To examine if the reported results are affected, equation (2′) was estimated with $Y$ and $X$ consisting of the 11 preference and the 26 perception variables and $Z$ consisting of variables measuring residential location, employment, political preference, frequency of church attendance, gender, race, education, income, farm income, age, and geographical location. Except income and age, all the rest were dummy variables. The estimates obtained were similar to those under model (1) in tables 2 and 3 in terms of both magnitude and sign. In fact, the rank-1 solution accounted for about 77% of the explained variance in $Y$, the same as for the rank-1 solution for model (1). Thus, the reported results are robust to the exclusion of individual-specific characteristics.

**Table 3. *B* Coefficients of Perception Variables and Bootstrap Standard Errors**

| Variable | | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|---|
| No. | Name | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| Financial Health and Farm Profitability | | | | | | | |
| 1 | *WEALTHY* | −.028 | .048 | −.011 | .042 | −.025 | .041 |
| 2 | *FINTRB* | −.187* | .041 | −.179* | .039 | −.091* | .035 |
| 3 | *PROFIT*1 | .068 | .040 | .047 | .039 | .052 | .041 |
| 4 | *PROFIT*2 | −.162* | .041 | −.146* | .039 | −.089* | .034 |
| 5 | *PROFIT*3 | .040 | .038 | .000 | .042 | .050 | .035 |
| Level of Government Involvement | | | | | | | |
| 6 | *TOOMUCH* | .712* | .065 | .338* | .054 | .637* | .055 |
| 7 | *SHARE* | .247* | .059 | .138* | .053 | .210* | .054 |
| 8 | *GINVOL*1 | −.186* | .043 | −.072 | .040 | −.180* | .043 |
| 9 | *GINVOL*2 | −.209* | .045 | −.158* | .039 | −.148* | .042 |
| 10 | *GINVOL*3 | .067 | .044 | −.125* | .038 | .200* | .039 |
| Farm Size | | | | | | | |
| 11 | *TOOLAR* | −.076 | .043 | −.104* | .040 | −.013 | .037 |
| 12 | *BENEFIT* | −.099 | .051 | −.166* | .045 | .008 | .044 |
| 13 | *SMAFM*1 | −.148* | .042 | −.158* | .036 | −.061 | .034 |
| 14 | *SMAFM*2 | .030 | .042 | .048 | .036 | .004 | .035 |
| Importance of Agriculture | | | | | | | |
| 15 | *BASIC* | −.041 | .048 | −.095* | .047 | .022 | .044 |
| 16 | *AGDEPR* | −.284* | .052 | −.191* | .048 | −.205* | .045 |
| 17 | *STATE* | .024 | .039 | .090* | .037 | −.040 | .036 |
| 18 | *JOBS* | .040 | .038 | .050 | .037 | .007 | .033 |
| Farming as an Occupation | | | | | | | |
| 19 | *NOTRAIN* | .063 | .038 | .090* | .034 | .011 | .034 |
| 20 | *SONFM* | −.114* | .043 | −.085* | .038 | −.074 | .038 |
| 21 | *COMPLAIN* | .246* | .052 | .211* | .043 | .144* | .046 |
| 22 | *NATURE* | −.216* | .043 | −.245* | .041 | −.077* | .038 |
| 23 | *INDEP* | .167* | .045 | .051 | .039 | .182* | .035 |
| 24 | *PROUD* | −.019 | .039 | −.025 | .040 | .000 | .032 |
| 25 | *LIFE* | −.014 | .043 | −.069 | .040 | .040 | .039 |
| 26 | *HUNGRY* | −.123* | .040 | −.051 | .037 | −.113* | .035 |

Note: SE stands for standard error. Asterisks indicate coefficient estimates are at least twice their standard errors. For definitions of the variables, see table 1.

a positive impact. Given that agricultural programs transfer income with costs to consumers, the latter effect may indicate the lack of visibility of the costs.

The relatively large loading for *AGDEPR* shows that support is preferred by respondents concerned about the effects of a farm crisis on the general economy. This result seems surprising given that the agricultural sector is small relative to the general economy. On the other hand, coefficients for *STATE* and *JOBS* which measure the perceived importance of agriculture to the local economy are not significant. Given that stress in the agricultural sector has a relatively greater impact on many local economies, these results seem contradictory. A possible explanation is that *AGDEPR* captures the perceived effects of agriculture-related stress at both the local and the national levels, as well as more general concerns about issues such as food security.

Among perceptions of financial health and farm profitability, *FINTRB* and *PROFIT*2 have significant loadings. Thus, preference for farm support is related to the perception that most farmers face financial problems and that most profits in the food business go to processors and distributors, not to farmers.

Among variables measuring views on farmers and farming as an occupation, *SONFM, COMPLAIN, NATURE, INDEP,* and *HUNGRY* have significant loadings on the perceptual variate. The view that farmers complain too much predicts opposition, indicating that the wide discussion of farm problems may be having a negative side effect. Favorable views

of farming indicated by agreement with a son or daughter in choosing farming as an occupation and the perception of farming as a more satisfying occupation than others predicts support. This, together with the significance of *HUNGRY*, indicates that preference for greater support may be related to the perceived need to protect farming as a way of life. At the same time, the view that farming should involve independent economic decisions has a negative impact on preferences.

With regard to farm size, the significance of the coefficient for *SMAFM*1 indicates that a favorable perception of small farms has a positive impact on preferences. Such a favorable perception is indicated by the view that small farms produce better quality food than large farms. Estimated coefficients for *TOOLAR* and *BENEFIT* are not significant. The implication that concerns about farm size are not important in determining preferences is surprising given that diversion of benefits to large farms is a major issue in the farm policy debate.

A notable feature of the above results is the differences in the estimated loadings of perception variables within each subject group. For example, under farm financial health and profitability, only *FINTRB* and *PROFIT*2 are significant. Among variables pertaining to farm size, only *SMAFM*1 is significant. Part of this could be due to measurement error inherent in surveys where a question may convey different meaning to different respondents. However, part of this could also be due to the joint use of variables measuring family farm support (items 1 to 5) with variables measuring more general support for agriculture (items 6 to 11) as dependent variables in model (1). If certain perceived factors affect family farm support selectively, these effects may not be captured in model (1). To examine this, the analysis including the estimation of parameter standard errors was repeated separately on the two sets of variables. The results are reported in tables 2 and 3 under model (2) for family farm support and model (3) for general agricultural support.

Examining the parameter estimates and their standard errors, it can be seen that many of the results under model (1) hold under model (2) and model (3) as well. The signs of all significant *A* and *B* coefficients in model (1) remain the same in models (2) and (3). However, table 3 shows some striking differences with respect to the loadings of perception variables that point to selective preferences for family farm support. A notable change is that *TOOLAR*, *BENEFIT*, and *SMAFM*1 are significant in model (2) but not in model (3). Thus, the perception that most farms are too large and that large farms get too many benefits triggers support for family farms but not for general agriculture. In addition, favorable views of small farms also have the same effect. These results indicate that concerns about the trend toward larger farms is an important factor determining a respondent's preference for policies specifically aimed at protecting the family farms. Respondents favoring protection seem to be identifying family farms with small farms.

The coefficients for *TOOMUCH* and *SHARE* are larger within model (3) compared to model (2). Thus, the perception that farmers receive too much government assistance exerts a relatively greater negative effect on preferences for general government support than on the support for family farms. As a group, concerns about the level of government involvement continue to exert the largest effect on policy preferences in models (2) and (3), as in model (1).

Interestingly, *GINVOL*3 which was insignificant in model (1), is significant in model (2) and model (3) but with opposite signs. Thus, the view that government involvement in agriculture has hurt farmers has a positive effect on preferences for family farm support but a negative effect on preferences for more general agricultural support. This result could arise due to the belief that past government programs have not been properly targeted to help family farms.

The significance and the relatively larger loading for *NOTRAIN* and *COMPLAIN* in model (2) could be an indication that the publicity about the plight of the family farms may be perceived negatively, causing some erosion in support. Another notable result is that *STATE* has a significant positive coefficient in model (2) implying that respondents of predominantly nonagricultural states are relatively less supportive of special policies to protect family farms.

## Conclusions

Previous research has indicated that perceptions and attitudes have an important influence on individual preferences for various gov-

ernment policies. Such variables capture individual judgments about the costs and benefits of the policies and hence enter into a preference formation model. In this article, the question of agricultural policy preferences was examined using national survey data.

To uncover the structure of perceptions as predictors of policy preferences, a reduced-rank regression approach was employed. The stability of the estimated parameters was studied using the bootstrap method. A single, statistically stable, perceptual variate was uncovered that, depending on the set of preference variables considered, accounted for between 20% to 25% of the total variance in the stated preferences.

The dominant perception, affecting preferences negatively, was the view that farmers get too much money and a larger than desired share from government programs. Favorable views of farming as an occupation as well as the perception of financial stress also had significant influence on preferences. While such perceptions continued to dominate models where questions on family farm support and general agricultural support were analyzed separately, the effect was relatively weaker on preferences for family farm support especially with respect to the perceptions on the excessiveness of government payments. This could be an indication that policy costs are given a lesser weight when the objective is to save the family farm. Two additional results also point to a selective preference for family farm support. First, the perception that government involvement has hurt farmers had a positive impact on family farm support but a negative impact on more general government support. This latter effect could arise due to the notion that many of the problems are the product of improper distribution of government benefits. Second, favorable views of small farms and concern about too many large farms had a positive impact on preferences for family farm support but not on general agricultural support.

The results have implications for groups and policy advocates interested in protecting small and family farms from financial stress and failure. To the extent that such protection requires subsidies and income transfer policies, public support is essential, especially in an era of high budget deficits. By supplying accurate information about the social costs of financial stress and the disappearance of small farms, and the past benefits from government assistance, wider support for the policies can be promoted. This may be important since there is evidence that some of the existing support may be because the policy costs are not transparent.

As with all survey-based studies it is essential to be cautious in generalizing these results beyond the sample. The trend of the results however seems to confirm some of the generalizations concerning public support made in the farm policy literature. Thus, while the concern about an unfair share of government assistance going to agriculture is the major factor triggering opposition, concerns about larger farm size and a perceived need to preserve family farming as a way of life promote support. At the same time, some surprising results are revealed, such as the lack of influence of concerns about farm size and the importance of agriculture to the local economy, on preferences for general agricultural support. Overall, the results indicate that policies that better target assistance to small and financially stressed family farms are likely to receive wider public support. Factors such as environmental protection and food safety could not be considered in this study but are likely to be important in the future.

Finally, on a methodological note, the results show the need for using multiple measurements in studies using preference and perception variables. In situations where multiple measurements are available, the study shows how the unobservable variable framework can be effectively utilized for parsimonious parametrization and clear interpretation of the underlying relationships.

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