Attitudes of College Students towards Agriculture,

Food and the Role of Government

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Abstract:

In 2002 and 2007 we surveyed Agribusiness students' attitudes about agriculture, farming, food and agricultural policies. Responses were analyzed by year and student characteristics including farm background, citizenship and gender. Citizenship was a significant variable explaining differences in agreement with statements. Year and interactions with year were not significant.

Key Words: agricultural policy, farming, logistic regression, student attitudes

INTRODUCTION AND OBJECTIVE

The attitudes of young college students are changing (Harvard Institute of Politics (HIP), 2006). Students have tended to be opinionated regarding different policies but this is not usually reflected in their level of participation in the political process. However, survey results indicate that there were substantial participation rate increases between 2000 and 2006 (ibid.). Students even use recently developed social networking websites, such as Facebook or MySpace, to vocalize their support for certain politicians (ibid.). The Harvard study showed that students were more concerned about international issues than the average American, namely about the Iraq war and U.S. foreign policy.

Food safety scares, the debate about genetically modified organisms in the food supply, the survival of family farms, and environmental concerns related to agricultural practices are some of the agricultural topics that frequently make newspaper headlines. U.S. foreign agricultural policy is routinely criticized by the media and international agencies as being too protective and distorting the comparative advantages of developing nations (Becker and Benson, 2004; Johnson, 1957).

Although U.S. agriculture is a relatively small sector of the economy in terms of employment, accounting for less than half a million workers out of a total 130.3 million in May 2005 (Hajiha, 2005), it has a widespread impact not just on the U.S. but also on the rest of the world. U.S. agriculture is one of the largest exporters and importers of agricultural products and thereby has large country effects on world prices. Students that take agricultural policy classes, many of whom Agribusiness majors, may not always end up working directly in agriculture but they may influence its future by pursuing careers in banking, research, marketing, management, etc. that specialize in agricultural inputs and outputs. Current literature lacks information on how

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these students perceive farming, farmers, and agricultural policy, not to mention whether they even have an opinion. From a normative point of view, it would be desirable to understand these students' attitudes and determine if there is any predictability of these attitudes based on demographic characteristics.

The goal of this study is to identify which factors determine the attitudes of students towards agriculture, food, farming and farmers. The demographic characteristics of respondents investigated in the analysis were having a farm background, U.S. citizenship, and gender; we also investigated year as a qualitative variable and any possible interactions between year and the demographic variables. The null hypothesis tested for each statement is that none of the factors explain differences in attitudes toward each of the statements posed in the opinion questionnaire. Our initial hypotheses were that having farming experience, being a U.S. citizen and gender do affect attitudes. We also expected to find differences between the attitudes of students in 2002 and 2007, namely that 2007 students were less supportive of agriculture, farming, and policies that support U.S. agriculture, since in between there have been several food safety recalls, a fossil fuel crisis, and the role of American agriculture in international trade in the Doha WTO round has been much publicized in the media.

Agriculture is under increased scrutiny because of environmental, energy and food safety concerns. On one hand, there is outcry about possible environmental degradation caused by intensive agricultural practices (Feenstra, 1992) but on the other hand, agriculture is viewed as a key sector for the creation of alternative fuels since corn is the main feedstock in the production of ethanol. Agriculture (farming, fishing, and forestry) is also the sector with the smallest employment levels in the U.S., with most workers earning an average wage of $10.10/hour, higher only than the $8.58/hour earned by those employed in the food preparation and serving

related sectors (Hajiha, 2005). Tweeten (2002) proposes that farmers' economic salvations should not be dependent on expansion of exports, value added enterprises, non-farm use of food output or rapid technology advancement but rather on their ability to adjust inevitably to the changing environment, technological, social, political and economic milieu. Does this mean that certain types of farming should cease to exist? Do individuals' perceptions of agricultural policy agree with this stance?

LITERATURE REVIEW

Previous evidence shows that students enrolled in traditional agricultural majors feel ignored within the college setting (Dyer, Lacey and Osborne, 1996), which may indicate that schools do not adequately meet student needs. If we learn more about how current and past students perceive agricultural policy then we will be better equipped to develop programs that better educate and prepare those students. The HIP's study focused on general political and public service issues but did not specifically contain information on college student attitudes toward agricultural policy. Dyer, Lacey and Osborne's 1996 study of college of agriculture freshmen attitudes toward agriculture was specifically geared to improve college graduation with an agriculture degree.

There is evidence that having some involvement with agriculture, even in a class setting, does make someone more likely to be pro-agriculture. Balschweid's studied high school students' attitudes toward science and agriculture after completing a yearlong biology course in which biology was taught within the context of animal agriculture. Less than 3% of the high school students in that study indicated having a farm background. After completing the biology

course, on average, students more than agreed that they were more appreciative of those who work in agriculture and of the importance of agriculture.

Biotechnology is one of the hottest topics in agriculture because the European Union consistently denies the use of genetically modified organisms (GMOs) in food items entering the human food chain; conversely, the United States is more tolerant of the use of GMOs. Shanahan, Scheufele, and Lee (2001) looked at public opinion polls on consumers' attitudes towards agriculture biotechnology and GMOs over a period of more than ten years. They concluded that while during the 1980s the public was somewhat confused about biotechnology, the 1990s brought about a new attitude where people thought that the risks of biotechnology exceeded its benefits. This attitude was in no way absolute, as depending on how the questions were worded, the opposite result could also be found. Consumers were quite sensitive about the negative aspects of GMOs emphasized in media coverage. Shanahan, Scheufele, and Lee cite an Angus Reid survey that indicated that the majority of the public knew little about and/or was not aware of genetically modified foods; while another survey by Louis, Harris & Associate found that the majority of citizens knew or heard or did think that genetic engineering was going to make quality of life better for people.

THEORETICAL MODEL

The simple logistic model has a dependent variable Y_i^S that is discrete and binary (also called a Bernoulli random variable) with possible outcomes $Y_i^S = 1$ to indicate the event in which student i agrees with statement S and $Y_i^S = 0$ otherwise. The event in which $Y_i^S = 1$, occurs with a probability of p_i^S, while $Y_i^S = 0$ with a probability of $1 - p_i^S$. The probability mass function for Y_i^S for the data sampling process is

(1) $\quad f(Y_i^S) = \left(p_i^S\right)^{y_i^S} \left(1 - p_i^S\right)^{1 - y_i^S}$

with $E\left[Y_i^S\right] = p_i^S$ and $\text{var}(Y_i^S) = p_i^S(1 - p_i^S)$. Assuming that the each student's opinions are independent from one another, the log-likelihood function based on the observations of n individuals's attitudes toward policy S can be written as

(2) $\quad \ln L(\boldsymbol{\beta}^S; \boldsymbol{y}^S) = \sum_{i=1}^{n} \left[y_i^S \ln\left(p_i^S\right) + \left(1 - y_i^S\right)\ln\left(1 - p_i^S\right) \right]$

as Mittelhammer, Judge, and Miller (2000) describe. Thus in the logit model,

(3) $\quad \ln\left(p_i^S / 1 - p_i^S\right) = \boldsymbol{x}_i^S \boldsymbol{\beta}^S$,

where $\boldsymbol{x}_i^S$ is a vector of k independent variables for the ith individual regarding policy S and $\boldsymbol{\beta}^S$ is the vector of k parameters that we would like to estimate. The left-hand side expression is the logarithm of the odds, also referred to as log-odds. Note that the odds are the ratio of the probabilities of two complementary events, that is,

(4) $\quad o_i = p_i / 1 - p_i$.

Conversely, if one has the odds, one can compute the probabilities by solving equation (4) for p_i. Odds are rather friendly because they allow us to compute odds-ratios, which can be easily interpreted for two distinct and complementary categories. Suppose we wish to compare the

attitudes of American (A) versus non-American ($\overline{A}$) students regarding a certain policy issue (S) and we know that American students agree with statement S with a probability of

$p_A^S = \Pr\left(Y^S = 1 \mid A\right)$ and non-American students agree with the same statement with a probability

of $p_{\overline{A}}^S = \Pr\left(Y^S = 1 \mid \overline{A}\right)$. Then one defines the odds-ratio between Americans and non-Americans

for policy S, $OR_{A/\overline{A}}^S$, as

(5) $\qquad OR_{A/\overline{A}}^S = o_A^S / o_{\overline{A}}^S = \left[p_A^S / \left(1 - p_A^S\right) \right] / \left[p_{\overline{A}}^S / \left(1 - p_{\overline{A}}^S\right) \right].$

Thus we now can see how much more likely one group is to agree with the policy than the other

complementary group.

In equation (3), a positive (negative) coefficient (β_k^S) in the logit analysis implies that

higher values of the corresponding explanatory variables are linked to an increase (decrease) in

the likelihood of a student agreeing with the statement. Maximum likelihood estimation of the

logit model yields an estimator that is consistent, asymptotically efficient and asymptotically

normal and it is the standard method used with individual-level data (Allison, 1999).

The slope of the logistic curve, i.e. the effect of a change in one of the explanatory

variables on the probability of event $Y_i^S = 1$ is

(6) $\qquad \partial p_i^S / \partial x_{ik}^S = \beta_k^S p_i^S \left(1 - p_i^S\right),$

where x_{ik}^S is the value of the kth variable for the ith individual regarding policy S. The advantages

of using a logit analysis, as indicated by Allison (1999), are: (*i*) simple interpretation of the

coefficients; (*ii*) desirable sampling properties, most notably, disproportionate stratified random

sampling of the dependent variable does not bias the parameter estimates; and (*iii*) the ability to

generalize the model to allow for several unordered categories for the dependent variable.

DATA

Students enrolled in the 2002 and the 2007 Domestic and International Agricultural Policy, a senior level class taught at the University of Arkansas, were asked to fill out a survey containing 17 statements concerning agriculture, food, farming and farmers and some questions regarding their demographic characteristics. Sixteen of these questions come from a 1986 nation-wide questionnaire "Farming in American Life," (see Jordan and Tweeten, 1987; Variyam, Jordan, and Epperson, 1990; and Variyam and Jordan, 1991). A statement about biotechnology was added for our study. Data were analyzed for differences in opinions across time and across the different demographic characteristics.

EMPIRICAL RESULTS

Summary of Attitudes and Demographic Characteristics

Table 1 reports the different statements investigated and the level of agreement with each statement among all 2002 and 2007 students. The first statement, "Agriculture is the most basic occupation in our society, and almost all other occupations depend on it", garnered the highest level of agreement from the students at 83.13%, which is along the lines of what Jordan and Tweeten (1987) observed and what they characterized as Jeffersonian farm fundamentalism. Other statements related to the notion of farm fundamentalism, including statements 2 (satisfying occupation), 3 (less crime and corruption), 4 (economic independence), and 5 (trading satisfaction for way of life against cash income), received low levels of agreement. However, the use of the emotive phrase "family farm" in statements 6 (preservation) and 7 (government policy to ensure family farm survival) received significantly strong agreement; and statement 8 (greater

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efficiency is more important than preserving the family farm) received significantly low agreement. While students strongly supported the need for public policy to preserve family farms, they strongly disagreed with the use of the market, i.e. that consumers would be willing to pay higher food prices to preserve family farms (statement 9). This statement in fact received the lowest level of agreement (9.64%). Students do not appear to recognize that using government policies to ensure family farm survival involves a clear trade-off between preserving the family farm and enjoying low food prices and taxes. Similar attitudes were reported by Jordan and Tweeten (1987) and Variyam, Jordan and Epperson (1990). One of the issues that small farms contend with is the low prices of agricultural commodities that dampen their ability to compete with larger, more productive farms. Larger farms can spread the fixed cost of machinery and better technologies over more acreage, thus they are able to exploit economies of size and accept lower product prices. Preserving smaller farms, traditionally less cost-efficient, without increasing food prices, could mean subsidizing them directly which is consistent with the students' response to statement 7. Students were ambivalent (52.81% agreement) regarding the use of public policy (higher taxes on corporate farms relative to family farms), indicating a lack of support to penalize larger, more efficient farms as a way to preserve smaller family farms.

The last seven statements surveyed cover attitudes regarding some of the hottest topics in agriculture today. The need for laws to regulate soil erosion and conservation were environmental concerns shared by only half of the students surveyed. Even fewer students (45.78%) agreed that farmers who fail to adopt needed soil conservation practices should be financially penalized. Three out of four students felt that government intervention was needed to protect prime farmland from urban sprawl. In terms of confidence in the current food supply, less than half of the students felt that the food supply was the safest it has ever been; however only

16.87% agreed that the use of antibiotics in animal feed was a threat to human health. This is much lower than Jordan and Tweeten (1987) reported for the general population—half of the 1986 survey respondents indicated they had concerns with antibiotic use. However, in the scientific community there are increasing concerns that the continued use of antibiotics to treat animals could cause antibiotic resistance in bacteria that attack humans (Iovine and Blaser, 2004; Wegener, 2003).

Nearly three-fourths of the students agreed that biotechnology would benefit them within the next five years. The International Food Information Council (IFIC) surveys indicated that acceptance rates of GM foods were 78% in 1997, 75% in February 1999, 63% in October 1999, and only 59% in May 2000. In 2007, IFIC survey results showed that while most consumers are not sure about the future potential of biotech food, only 33 percent believe applied food biotechnology will provide benefits to them and their family within five years, particularly in the areas of nutrition and health. Finally, only one-fourth of the students felt that agricultural products should be used as a political weapon and be sold only to those countries that support U.S. policy in world affairs. This reflects a strong repudiation of current U.S. foreign policy where food exports are typically a front-line weapon used against unfriendly nations.

Table 2 reports the demographic characteristics of the students surveyed. Sixty-five percent of the students had a farm background, 73% were male and most students were American (87%). The sample was almost equally divided between the two years surveyed with 47% in 2002 and the rest in 2007.

Logistic Regression Model Results

As reported in Table 3, only 11 of the 17 attitude statements surveyed could be explained by the explanatory variables investigated in this study. Recall that in the logistic regression, a positive (negative) parameter estimate indicates a positive (negative) effect on the dependent variable, that is, on an individual tending toward agreement with the statement. When multiple independent variables are simultaneously statistically significant, each parameter estimate gives the effect of the respective independent variable on the dependent variable while controlling for the other independent variables (that is, *ceteris paribus*). The sign of the intercept estimate has no meaning. The model estimations were implemented with the Fisher Score algorithm available in SAS Proc Logistic using stepwise selection with the significance level entry criterion set at 20% and the significance level stay criterion set at 25%. With these criteria, some of the models have parameter estimates that are not individually significant at the traditional 5 or 10% levels. The explanatory variable that most often was selected was citizenship (eight times), followed by farm background (four times), year (three times) and gender (twice). For six of the statements (note that only 11 statements had statistically significant models), citizenship was the only source of differences in agreement.

Those individuals who had a farm background were 7.5 times more likely to agree that farming was more satisfying than other activities than respondents without a farm background; males were 2.6 times more likely to agree with this statement versus females. There were no significant differences in agreement in terms of year or citizenship as these variables were not selected to enter the final model. Citizenship was the only significant source of differences in agreement with the third statement that urbanization was a cause of crime and corruption. U.S. students were nearly eight times more likely to agree with that statement; but they were more

than six times less likely[†] than non-U.S.students to agree that farmers ought to appreciate farming as a way of life and be less preoccupied with cash income.

Non-U.S. students were four times more likely than U.S. students to agree that government should have a role ensuring the preservation of the family farm and those without a farm background were 3.25 times more likely than those with a farm background to have this opinion. Citizenship was the only factor influencing agreement with the eighth and ninth statements. Non-U.S. students were more than six times more likely than U.S. students to agree that increasing farm efficiency is more important than preserving the family farm and they were almost ten times more likely to agree that consumers would be willing to pay higher prices to preserve the family farm.

Year, farm background and gender were all characteristics that were individually and jointly statistically significant at a level of at least 10% when modeling the likelihood of agreeing that corporate farms should pay more taxes than small family farms. Those students without a farm background were more than seven times more likely than those with a farm background to agree with the statement; males were three times more likely to agree than females, and students in 2002 were 2.5 times more likely to agree than 2007 students.

Students without a farm background were over 13 times more likely than those with a farm background to agree that using antibiotics in animal feed posed a threat to human health. Non-U.S. students agreed over six times more frequently than U.S. students and students in 2002 agreed 4.6 times more frequently than 2007 students.

[†] An adjusted odds-ratio between zero and one, not inclusive, corresponds to a parameter estimate that is negative and indicates that the individual of the characteristic being modeled (in this case U.S. citizen) is less likely to agree. with the statement than the individual of the omitted category (in this case non-U.S. citizen). To see how less likely, one inverts the adjusted odds-ratio.

The more recent students were more than three times less likely to agree on imposing financial penalties on farmers who fail to adopt conservation practices. U.S. students were three times more likely than foreign students to agree that government should intervene to protect prime farmland from urbanization and they were also 4.75 more likely than foreign students to think that today's food was the safest it has ever been.

DISCUSSION, CONCLUSIONS, AND LIMITATIONS

Our results strongly indicate that there is strong support for family farming and farmers among Agribusiness students. Students are also in favor of protecting farming from urbanization forces. Having foreign students in the classroom diversifies the body of opinion and could generate useful classroom discussions. Foreign students seem to be more aware that preserving the family farm implies making sacrifices in terms of prices (or also in taxes). U.S. students, much like the U.S. population in general, tend to favor cheap food prices. There were no demographic differences significant enough to explain the strong sentiment to protect the family farm as a vital part of the heritage or the sentiment that agriculture is the most vital of activities for society, thus students from the different backgrounds were equally supportive of these two aspects.

Although we had investigated differences due to the interaction of year with the other explanatory variables, none were found. A larger sample that includes more years would have made our analysis more robust and possibly would have yielded significant year interactions.

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APPENDIX: Tables

Table 1. Agriculture Policy Statements Investigated in Survey and Percent Responses

Dependent Variable Statements	Agree (%)	N
S1. Agriculture is the most basic occupation in our society, and almost all other occupations depend on it	83.13*	83
S2. Farming involves understanding and working with nature; therefore, it's a much more satisfying occupation than others	41.46	82
S3. We hear so much about crime and corruption today because our nation is becoming so urbanized	39.02**	82
S4. Farming should be an occupation where farmers can make their economic decisions independently	38.55*	83
S5. Farmers ought to appreciate farming as a good way of life and be less concerned about their cash income	12.05*	83
S6. The family farm must be preserved because it is a vital part or our heritage	77.11*	83
S7. Government should have a special policy to ensure that family farms survive	72.29*	83
S8. Obtaining greater efficiency in food production is more important than preserving the family farm	20.48*	83
S9. Most consumers would be willing to have food prices raised to help preserve the family farm	9.64*	83
S10. Corporate farms should pay more taxes than family farms	51.81	83
S11. Use of antibiotics in animals' feed is a threat to human health	16.87*	83
S12. Laws regulating excess soil erosion are badly needed	50.60	83
S13. Farmers who fail to adopt needed soil conservation practices should be financially penalized	45.78	83
S14. There should be government policy to protect prime farmland from urban growth	75.90*	83
S15. Farm products should be sold only to countries that support the United States in world affairs	26.51*	83
S16. Today's food is safer than it has ever been	46.99	83
S17. Biotechnology will provide benefits for you within the next 5 years	72.29*	83

Note: * statistically different from 50% at $\alpha = 5\%$; ** statistically different from 50% at $\alpha = 10\%$.

Table 2. Independent Variables Investigated in the Study

Variable	Definition	%	N
FB	Farm background variable, Yes $\Rightarrow X_{i,k=FB} = 1$	65.06*	83
CT	Citizenship variable, U.S. $\Rightarrow X_{i,k=CT} = 1$	86.75*	83
GD	Gender variable, Male $\Rightarrow X_{i,k=GD} = 1$	73.49*	83
YR	Year variable, 2002 $\Rightarrow X_{i,k=YR} = 1$	46.99	83

Note: Index i refers to individual and k to explanatory variable. * statistically different from 50% at $\alpha = 5\%$.

Table 3. SAS Proc Logistic MLEs of Coefficients of Select Models of Agreement with Agricultural Policy Statement

Dependent Variable	Estimates	Independent Variables					Model LR χ^2
		Intercept	YR	FB	CT	GD	
S2	Parameters	-2.5051*		2.0115*		0.9620	
	Pr > χ^2	0.0005		0.0010		0.1175	0.0001
	Adj. Odds Ratio	--		7.4750		2.6170	
S3	Parameters	-2.3026*			2.0477*		
	Pr > χ^2	0.0281			0.0570		0.0169
	Adj. Odds Ratio	--			7.7500		
S5	Parameters	-0.5596			-1.8383*		
	Pr > χ^2	0.3719			0.0153		0.0208
	Adj. Odds Ratio	--			0.1590		
S7	Parameters	3.0843*		-1.1851**	-1.4078		
	Pr > χ^2	0.0079		0.0539	0.1977		0.0318
	Adj. Odds Ratio	--		0.3060	0.245		
S8	Parameters	0.1823			-1.8952*		
	Pr > χ^2	0.7634			0.0059		0.0064
	Adj. Odds Ratio	--			0.150		
S9	Parameters	-0.5596			-2.2736*		
	Pr > χ^2	0.3719			0.0051		0.0068
	Adj. Odds Ratio	--			0.103		
S10	Parameters	0.1106	0.9442**	-1.9630*		1.1211**	
	Pr > χ^2	0.8393	0.0717	0.0012		0.0565	0.0020
	Adj. Odds Ratio	--	2.5710	0.1400		3.0680	
S11	Parameters	0.3775	1.5280**	-2.6055*	-1.8528*		
	Pr > χ^2	0.6316	0.0543	0.0017	0.0189		0.0003
	Adj. Odds Ratio	--	4.6090	0.0740	0.1570		
S13	Parameters	-0.762 *	1.2320*				
	Pr > χ^2	0.0186	0.0076				0.0063
	Adj. Odds Ratio	--	3.4280				
S14	Parameters	0.1823			1.1527**		
	Pr > χ^2	0.7633			0.0860		0.0934
	Adj. Odds Ratio	--			3.1670		
S16	Parameters	1.5040**			1.5596**		0.0325
	Pr > χ^2	0.0544			0.0561		
	Adj. Odds Ratio	--			4.7570		

Note: Refer to Tables 1 and 2 for variable descriptions. Model estimations implemented with the Fisher Score algorithm using stepwise selection with the significance level entry criterion set at 20% and the significance level stay criterion set at 25%. Only the above statements had statistically significant models. * indicates a statistically significant parameter at $\alpha = 5\%$; ** indicates a statistically significant parameter at $\alpha = 10\%$.