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If You Can't Trust the Farmer, Who Can You Trust? The Effect of Certification Types on Purchases of Organic Produce[1]

Ruby Ward [a] ⓘ, Lynn Hunnicutt [b], John Keith [c]

[a] *Assistant Professor, Utah State University, Logan, UT*
[b] *Assistant Professor, Pacific Lutheran University, Tacoma, WA*
[c] *Professor, Utah State University, Logan, UT*

Abstract

An information asymmetry exists in the market for organic produce since consumers cannot determine whether produce is organically or conventionally grown. Various methods may solve this problem including signaling, reputation, and certification. Signaling and reputation may not work well, because signals are noisy, and reputation may be difficult for a producer to establish. Certification of the farm and its growing methods shows the most promise. A survey instrument testing the efficacy of certification is presented along with empirical analysis suggesting that no notable difference existed between independent certification methods, although independent certification had significantly different effects than self-certification.

Keywords: asymmetric information, certification, ordered probit, organic produce.

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ⓘ Corresponding author: Tel: + 1-(435) 797-2323
Fax: + 1-(435) 797-2701
Email: rward@econ.usu.edu

Introduction

How do consumers know whether the produce they buy is organic? Many stores have an organic produce section, and various claims regarding growing methods are made. Generally speaking, organic produce commands a premium price (Lohr), although absent labels, distinguishing between organically and conventionally grown fruit and vegetables is quite difficult. This may cause consumers to be suspicious about any claims regarding growing methods. The information asymmetry that causes this problem has aspects of both moral hazard (hidden actions) and adverse selection (hidden characteristics).

In this paper, we discuss the theory of asymmetric information and its application to the market for organic produce. The literature suggests certification resolves asymmetry, although only if certification is credible and believed. The USDA has recently established standards and instituted an inspection and certification program for organic produce (see the National Organic Program homepage, www.ams.usda.gov/nop). Additionally, individual producers, stores, some states and many third party organizations certify produce as "organic." To test the ability of these programs to resolve problems caused by information asymmetry, we analyze data from a recently administered survey asking questions about consumer response to various certifying organizations. This leads to preliminary conclusions regarding the efficacy of various types of certification, and their probable effect on purchases of organic produce.

Information Asymmetry and Organic Produce

A principal-agent model such as that presented in Akerlof may be used to describe the market for organic produce.[i] Organic produce is perceived by some consumers as higher quality than conventionally grown produce, but organic growing methods are more costly than conventional methods. Absent credible certification, buyers have limited means to verify whether the fruit and vegetables they purchase are organically or conventionally grown, since buyers are generally limited to visual inspection before purchase, and eating the produce after purchase. Because of this, growers are tempted to label all produce organic, whether or not it was organically produced. This is the problem of adverse selection (hidden characteristics). Even when buyers are willing to pay a large premium for organically grown produce, it is not likely to appear on the market. As long as consumers cannot verify the claims made for the produce, growers will be tempted to claim to have produced organically while actually using conventional methods, as this reduces their costs and increases their profits. This is the problem of moral hazard (hidden action). Asymmetric information means that organically grown produce is less available for consumers who are willing to pay for it.[ii]

There are several ways to resolve these problems. The first suggests that if consumers can observe some signal of product quality (e.g., number of blemishes, size of the fruit, variations in color), then they can assess the likelihood that organic methods were used. In theory, consumers could then set up a pricing scheme that involves higher payment for increasing likelihood of organic production methods. Under this pricing scheme, farmers are either rewarded for using organic growing methods or punished for using conventional methods. Grossman and Hart present the generally accepted methodology for using signals to set up such a pricing scheme, and demonstrate that noisier signals and smaller willingness-to-pay differentials make it harder to reduce moral hazard. Cosmetic appearance seems to be a noisy signal according to Thompson and Kidwell, who found that organic produce did not always have more cosmetic defects.

Problems caused by information asymmetry can also be overcome through the establishment of a reputation. Repeated interaction between the producer and the consumer allows for development of a reputation (Heal), because consumers are able to withhold future purchases from farmers caught using conventional methods. Even without repeat purchases, as long as new consumers are able to discover the farmer's reputation, information asymmetry may be eliminated. However, reputation works only if consumers can discover that conventional growing methods are being used, and only if consumers can punish the offending producer. Neither of these conditions is likely to be met, as organic produce is a credence good (McCluskey), and the food system is so complex that tracing products to an individual grower is nearly impossible.

Finally, problems of information asymmetry can be avoided if growers are able to make verifiable claims regarding production methods, through certification or licensing. A publicly available standard for what constitutes organic produce could make growers willing to use organic (more expensive) methods, as long as it leads to higher prices or sales. According to Lohr, certification removes asymmetric information by providing consumers assurances regarding the production methods used and ensuring producers that conventional growers will not be able to make claims to produce organically. As noted above, the USDA recently established national standards for organically grown products along with a system of inspections to support truth in labeling regulations. Other programs have also been created to certify organic produce, and while some are more stringent than the USDA standards, few are as well known or as widely applied.[iii]

In order for certification to reduce information asymmetry, however, consumers must believe the certifying organization. Consumer disbelief reduces willingness to pay, which makes covering the higher cost of organic methods difficult, and reduces the likelihood that producers will actually use them. The more trust the consumer places in the certifying organization, the more likely it is that she will be willing to

pay a higher price for certified organically grown produce, and the more effective the certification program will be in enlarging the market for organic produce.

Thompson reviews the literature on consumer demand for organic foods, and suggests that demand is positively related to household size, and has a mixed relationship to age (young and older middle-aged adults tend to buy the most organic produce). Education has an interesting effect in that it is positively related to demand unless post-graduate education is pursued in which case the opposite holds. While Thompson suggests that income may not be related to organic purchases, he notes that national studies generally suggest a positive relationship between income and organic consumption. In the studies he reviews, gender and marital status appear to have no significant effect on the propensity to purchase organic food. As for the propensity to purchase certified organic produce, we posit that price increases due to certification (shifting the supply curve) and consumer confidence in the certifying agency (shifting the demand curve) should also influence purchasing behavior.

While much theoretical literature exists on certification as a way to overcome information asymmetry, and several studies have examined the characteristics of organic produce, this paper considers the effects of certification of organic produce.[iv] Our goal is to examine the efficacy of certification as a way to increase credibility of claims about production methods and thereby increase the size of the market for organic produce.

The Study

To determine the efficacy of a certification program, a survey was designed using the telephone-based Questionnaire Programming Language survey language (United States General Accounting Office).[v] The survey was administered to a random digit dial sample of Utah residents via telephone from the end of May to early June 2001. Three thousand phone numbers were used, from which nine hundred thirty-three usable responses were obtained, for a raw response rate of 31.1%. The remaining numbers were disconnected telephone numbers and people that could not be reached (1,145), people who refused to participate (798), lost responses from a corrupted disk (fewer than 20), or unusable responses because respondents did not complete the survey, leading to an adjusted response rate of 50.3%.

Upon contact, the person most responsible for purchasing groceries was identified and interviewed. Depending on how they answered preliminary questions, they were asked a set of questions regarding how five types of certification would change their purchases of organic produce. Figure 1 illustrates the order of questioning, and gives the number of respondents to each set of questions.

Respondents were first asked whether or not they purchased organic produce. If they did, several questions regarding the amount and reasons for purchasing organic produce were asked. If the respondent did not purchase organic produce, they were asked if they thought that certification was important for organic produce, and if they would or would not purchase organic produce if it were certified.

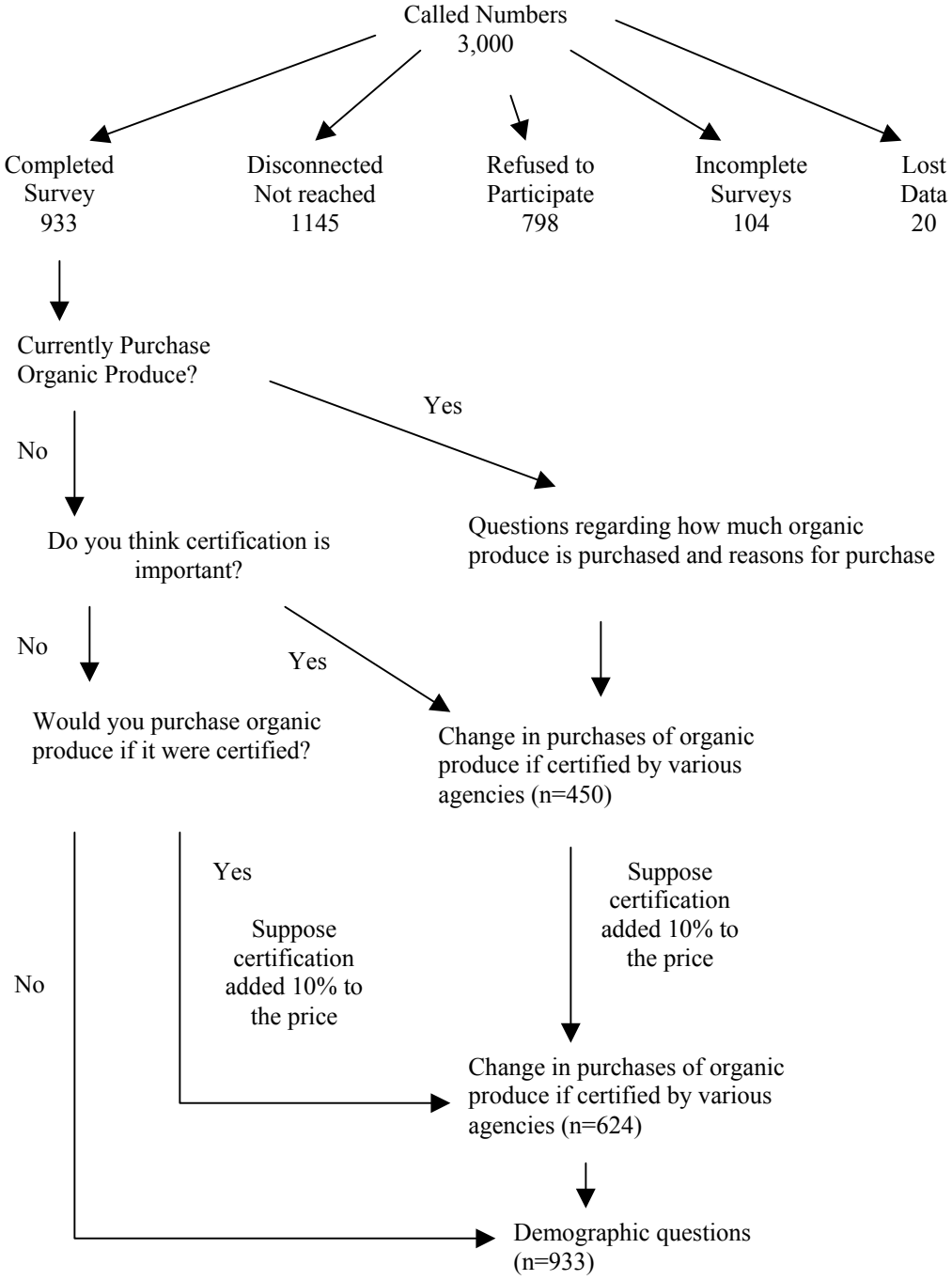

Figure 1: Diagram of Survey Including Order of Questions

Respondents who indicated that certification was important to them were then asked to indicate how certification by five different agents – the farmer, the retailer, an independent organization (such as Good Housekeeping), the Utah state government, or the federal government – would affect the quantity of organic produce they purchase. We used a 5-point categorical (Likert-type) response scale, including "greatly increase," "increase," "not change," "decrease" and "greatly decrease." Note that the responses "decrease" and "greatly decrease" would be unexpected for any certifying agency.

These respondents were then asked how certification would affect their purchase of organic produce if it added 10 percent to the current price, using the same response scale. For all respondents for whom certification was not important, but who might purchase organic produce, the question regarding the 10 percent price increase for certified organic produce was posed. All respondents were asked questions regarding socioeconomic characteristics of the household. Respondents who purchased organic produce or who indicated "appearance" or "other" as reasons for not purchasing organic produce were asked if appearance or labeling with respect to growth, care and shipping affected their purchase of organic produce.

The Model

We used the data to examine two issues - the effect of certification on purchases of organically grown produce, and the effect of a price increase (caused by certification) on purchases of certified produce. In the first model, an ordered probit regression is used to examine both the size and significance of the relationship between various demographic variables and the qualitative change in amount of organic produce purchased due to type of certification. As further discussed below, an ordered probit is appropriate for these data, as the responses are categorical, ranging from "greatly decrease" to "greatly increase". In short, this regression is an attempt to determine if certification shifts the demand curve. Recall that questions were asked about five types of certifying agencies. Thus, five observations of the dependent variable were obtained from each respondent. Repeated observations of the same household makes the data set a "panel", which influences the choice of regression techniques described below. A list of variable names and descriptions is given in Table 1.

Following the discussion in Thompson, which examined purchasing behavior for organic (certified or not) food, the following model was hypothesized:

$$(1)\quad \text{Purchase}_{ij} = \beta_0 + \beta_1 * \text{Buy Organic}_i + \beta_2 * \text{Household Income}_i + \beta_3 * \text{Household Size}_i + \beta_4 * \text{Gender}_i + \beta_5 * \text{Age}_i + \beta_6 * \text{Age}_i^2 + \beta_7 * \text{Education}_i + \beta_8 * \text{Education}_i^2 + \beta_9 * \text{Farm Certification} + \beta_{10} * \text{Store Certification} + \beta_{11} * \text{Independent Certification} + \beta_{12} * \text{State Government Certification} + \varepsilon_{ij}$$

where *i* indexes households (respondents) and *j* indexes certification type.

Table 1: Description of Regressors and Summary Statistics

Variable	Description	Frequency	Mean	Std. Dev.
$Purchase_{ij}$	Organic produce purchase response to certification, without price increase. 5=Greatly incr, 4=Increase, 3=No change, 2=Decrease, 1=Greatly Decr.			
$Purchase2_{ij}$	Same as Purchase but a price increase of 10 percent is included.			
Buy $Organic_i$ (n=933)	Does the respondent currently purchase organic produce?			
	1 = No	= 62.38%		
	2 = Don't know	= 6.54%		
	3 = Yes	= 31.08%	1.687	.915
Age_i (n=933)	Age of the respondent.			
	1 = 18-25 years	= 18.22%		
	2 = 26 - 35	= 19.51%		
	3 = 36 - 45	= 16.51%		
	4 = 46 - 55	= 16.18%		
	5 = 56 - 65	= 10.40%		
	6 = > 65 years of age	= 18.22%		
	no answer	= .97%	3.360	1.745
$Gender_i$ (n=933)	Male = 1, Female = 2		1.692	.462
$Education_i$ (n=933)	Highest level of education obtained.			
	1 = grade school	= 1.61%		
	2 = Some high school	= 2.04%		
	3 = high school	= 24.87%		
	4 = Some college	= 37.94%		
	5 = Bachelor's	= 25.62%		
	6 = Master's or PhD.	= 7.93%	4.077	1.021
Household $Size_i$ (n=933)	Number living in household.		3.109	1.866
Household $Income_i$ (n=933)	Household income level.			
	1 = < $15,000	= 9.00%		
	2 = $15 - 30 K	= 15.86%		
	3 = $30 - 50 K	= 23.04%		
	4 = $50 - 75K	= 17.58%		
	5= $75-100 K	= 7.61%		
	6 = $100 - 150 K	= 3.43%		
	7 = $150 - 250 K	= 1.39%		
	8 = > $250,000	= .32%		
	no answer	= 21.76%	3.210	1.420
Farm Certification	Dummy variable for farm level certification programs.			
Store Certification	Dummy variable for a store certification program.			
Independent Cert.	Dummy variable for an independent third party certifying agency.			
Utah Gov. Cert.	Dummy variable for Utah state government certification.			
Federal Certification	Dummy variable for federal government certification.			
Greatly Inc. Org. $Pur._{ij}$	Certification greatly increases organic produce purchase. ($Purchase_{ij}$ =5)			
Increase Org. $Purchase_{ij}$	Certification would increase organic purchases. ($Purchase_{ij}$ = 4)			
No Change Org. $Pur._{ij}$	Certification would not change organic produce purchases. ($Purchase_{ij}$ = 3)			
Decrease Org. $Pur._{ij}$	Certification would decrease organic produce purchases. ($Purchase_{ij}$ = 2)			
Grtly. Decrease Org. $Pur._{ij}$	Certification greatly decreases organic produce purchases. ($Purchase_{ij}$ = 1)			

Certification was expected to increase organic produce consumption for respondents with higher income levels, larger household sizes, and who currently buy organic produce, suggesting that $ß_1$, $ß_2$ and $ß_3$ should be positive. While certification and socio-economic variables may influence whether a respondent purchases organic produce, the variable "Buy Organic" is assumed exogenous, as it describes current behavior with or without certification, while our endogenous variable (Purchase) describes future behavior in response to certification. We expected that women would be more likely to purchase organic produce, so that $ß_4$ should also be positive (Thompson concluded insignificance). According to Thompson, the relationship between age, education and purchases of organic produce is non-linear, so that the expected signs of $ß_5$ through $ß_8$ are unclear. Household size and the presence of

children under 18 were highly correlated (over 80 percent correlation coefficient), so household size was used here. Thompson and Kidwell along with Loureiro, McCluskey and Mittelhammer found that the presence of children under 18 increased purchases of organic products. Thompson argued that the ages of children would be important and pointed to the size of the organic baby food market. While Thompson notes that the influence of children's ages on purchases of organic produce is not well understood (and therefore of interest in any study of organic produce), the contribution of this survey is the influence of certification on purchases of organic produce. Questions regarding the age of children in the household were not included in the survey described here.

Dummy variables for each of the certification programs were included in the above model with federal certification used as the base case. If federal certification is most credible, β_9 through β_{12} should be negative. If (as is hypothesized) self-certification, whether by the farmer or a retailer, is least credible, larger (absolute value) impacts should be observed for the farm and store certification methods.

The categorical responses regarding the effects of certification by various organizations on levels of consumption (greatly increase to greatly decrease) were analyzed using ordered probit estimations.[vi] Since each respondent gave answers for each of the five certification categories, the analysis had to account for the panel nature of the data. This was accomplished using a generalized estimating equation method to correct for the potential non-independence of observations. The estimations "grouped" the data so that demographic variables were held constant for each respondent, but response to each certification type was allowed to vary. Note that in an ordered probit model the effect of a given independent variable can only be interpreted relative to smallest (greatly decrease) and largest (greatly increase) categories, so that conclusions about intermediate responses cannot be made.

To address our second objective, examining the effects of a price increase due to certification on organic purchases, we asked how respondents would react to five different types of certification if the retail price increased by 10 percent. As before, the data set contains five observations for each respondent, a "panel", and regression analysis will have to control for this. From these questions, a new model was formulated where the independent variables include those indicating whether the respondent was currently buying organic produce, household income, household size, gender, age and education level of respondent, dummy variables for the type of certification, and dummy variables for the change in purchase of certified organic produce without a price increase. This regression is run using the same households as were used in the first regression, which ensures that household qualities not measured are held constant across regressions, so that the second regression captures the effect of an increase in price due to certification. Comparing this

model to the one above will allow us to examine the effects of a price increase on purchases of organic produce. See Table 1 for a description of the variables.

$$
\begin{aligned}
(2)\ \text{Purchase2}_{ij} = {} & \beta_0 + \beta_1 * \text{Buy Organic}_i + \beta_2 * \text{Household Income}_i + \beta_3 * \text{Household Size}_i \\
& + \beta_4 * \text{Gender}_i + \beta_5 * \text{Age}_i + \beta_6 * \text{Age}_i^{\,2} + \beta_7 * \text{Education}_i \\
& + \beta_8 * \text{Education}_i^{\,2} + \beta_9 * \text{Farm Certification} + \beta_{10} * \text{Store Certification} \\
& + \beta_{11} * \text{Independent Certification} + \beta_{12} * \text{State Government Certification} \\
& + \beta_{13} * \text{Increase Org. Pur.}_{ij} + \beta_{14} * \text{No Change Org. Purchase}_{ij} \\
& + \beta_{15} * \text{Decrease Org. Pur.}_{ij} + \beta_{16} * \text{Greatly Decrease Org. Pur.}_{ij} + \varepsilon_{ij}
\end{aligned}
$$

Dummy variables for purchase response to certification without a price increase were included as a proxy for belief in certification, with "greatly increase" serving as the base. The effect of the price increase was expected to be smallest in absolute terms for those who indicated certification would greatly increase their purchases, since these consumers are believed to value certification the most and be less sensitive to a change in price. Because "greatly increase" is the base, β_{13} through β_{16} are predicted to be negative, indicating that less responsive consumers were more sensitive to a 10 percent price increase. It is further expected that in absolute terms the coefficients should be ordered from β_{13} (smallest) through β_{16} (largest), suggesting a greater sensitivity to price increases for people who respond negatively to certification.

One might expect that the coefficients on demographic variables should behave similarly whether or not the price of organic produce increases, but the dummy variables from the first regression capture the effects of certification on organic purchases. Thus, the signs of β_1 through β_8 are more difficult to predict in this model. People who already purchase organic produce and those with higher incomes are likely to be less sensitive to a price increase, so β_1 and β_2 should be positive. The signs of β_3, through β_8 are not predicted here, as they give the effect of the respective variable on responsiveness to a price increase, rather than the effect of this variable on responsiveness to certification. As before, self-certification (farm and store) is not expected to be as believable as independent certification (independent, state, and federal government). This implies that β_9 and β_{10} should be negative. The coefficients on other certification methods should also be negative but smaller in absolute value.

Results

The sample was fairly representative of the Utah population as a whole. Table 2 compares the sample statistics with Utah census results from 2000 (Bureau of the Census). The sample included a larger percentage of females than in the general population. This is not surprising, as the survey asked for the person primarily responsible for purchasing groceries. Table 2 also gives a summary of the produce buying habits of respondents, as well as their knowledge and views of certification. While most respondents were aware that there were requirements for certification,

only 10% looked for it when purchasing organic produce. This was about a third of those who purchase organic produce.

Table 2: Sample Demographics and other Survey Data along with a Comparison with Utah Census Data

Item	Sample	Utah Census *
Household Size	3.11 persons	3.13 persons
Children Under 18 in Household	42 percent	45.8 percent
Gender (% female)	70 percent	49.9 percent
Aware of Certification Programs	47 percent	Na
Purchase Organic Produce	31 percent	Na
Look for Certification	10 percent	Na
Aware of Requirements for Certification	75 percent	Na
Uniform Standards Important	89 percent	Na

na=data not available

* Source: United States Bureau of the Census.

Table 3: Change in Organic Produce Consumption with Different Types of Certification

	No Price Increase % Respondents						
Certification Type	Greatly Increase (5)	Increase (4)	No Change (3)	Decrease (2)	Greatly Decrease (1)	Mean	Standard Deviation
Farm	9.3	30.0	51.2	8.5	0.8	3.38	0.804
Retailer	6.2	33.4	50.4	8.5	1.4	3.35	0.779
Indpdt. Third party	14.4	47.0	34.3	3.3	0.8	3.71	0.785
Utah State Gov.	11.6	50.7	31.7	5.4	0.6	3.67	0.772
Federal Government	16.1	44.2	31.7	5.9	2.0	3.67	0.886
	With a 10% Price Increase % Respondents						
Farm	6.5	15.9	47.9	26.1	3.7	2.95	0.910
Retailer	5.4	13.3	49.0	27.8	4.5	2.87	0.891
Indpdt. Third party	6.5	26.9	44.8	19.5	2.3	3.16	0.890
Utah State Gov.	8.2	27.8	40.5	20.1	3.4	3.17	0.957
Federal Government	10.2	26.3	38.5	19.8	5.1	3.17	1.024

All values calculated using only households included in the regression analysis below (n=353).

Distribution of Responses to Certification Types

Table 3 shows the effect of various certification methods on consumer purchases of organic produce.[vii] Note that the preponderance of responses for farm and store certification were "no change" or "increase," while those for the independent, state and federal certification programs were distributed more strongly toward "increase." The bottom of Table 3 reports the same information for the case where certification would raise the price by 10 percent. As was expected, the distribution of responses shifted markedly toward less consumption when certification raises the price of organic produce.

Even when certification does not increase the price, the mean is slightly above "no change," but has a large standard deviation. This tells us that most consumers will not adjust their purchases of organic produce simply because a certification program is implemented. However, as noted below in our regression results, certification will increase the purchases of some consumers who are already purchasing organic produce. As the organic portion of the produce market is small (Greene, 2000), the effects of certification on this segment of the market may be substantial, even as most consumers continue to purchase conventional produce.

Estimation Results

Results from the estimations are found in Tables 4 and 6. Recall that 450 households answered questions on purchase changes due to certification, both with and without a price increase. Unfortunately, 97 of these households did not answer questions regarding their income and had to be removed from the sample. Thus, both regressions are run using a final data set of 353 households.

Consider first the responses to certification without a price increase, reported in Table 4. Larger values for household size reduce the likelihood of the respondent greatly increasing organic purchases. Larger household size may reduce responsiveness because many households in Utah are quite large (Utah has the largest average household size of the 50 states according to the US Bureau of the Census), so that purchasing more expensive organic produce may not be economically feasible for most families. In contrast to Loureiro et al., number of children under 18 was not included in our regressions, as it is highly correlated with household size (correlation coefficient of 0.842).

Our data verify Thompson's result that education has a non-linear relationship with responsiveness to certification, with median education groups more responsive than both the highly educated and those with very little schooling. Surprisingly, higher income reduces the likelihood of greatly increasing organic purchases.[viii] Finally, the results show that self-certification (farm and store) compared to independent certification (federal, Utah and third party) significantly reduced the likelihood of a large response to certification.

Just over half (50.5%) of the responses were correctly predicted. Given that there were five potential categories of response, this result is quite good. As indicated in table 3, over 94% of responses were predicted within one level. Marginal effects for significant variables are reported in Table 5. Because all regressors are discrete, and many are categorical, reported effects give the change in the probability of response falling in each category when the variable listed changes from its smallest value to its largest value. Education appears to have the largest absolute effect on the purchase responsiveness to certification, followed more distantly by income, household size and the certifying agencies (farm or store).

Table 4: Ordered Probit: Dependent Variable = Change in Purchase of Certified Organic Produce, No Price Increase (n=353)

Variable	Coefficient	Std Error	P Value
Constant1	1.402***	0.432	0.001
Constant2	2.792***	0.439	0.000
Constant3	4.237***	0.451	0.000
Constant4	5.098***	0.458	0.000
Buy Organic	0.039	0.042	0.341
Age	0.102	0.124	0.409
Age^2	-0.027	0.018	0.134
Gender	0.118	0.083	0.155
Education	-1.22***	0.211	0.000
Education^2	0.139***	0.025	0.000
Household Size	-0.04*	0.023	0.084
Income	-0.054**	0.029	0.059
Farm Certification	-0.406***	0.085	0.000
Store Certification	-0.461***	0.077	0.000
Independent Certification	0.053	0.072	0.463
Utah State Gov. Cert.	0.002	0.043	0.961
Log Likelihood (constant only)		-2677.5525	
Log Likelihood (constant + regressors)		-2009.0219	
Correctly Predicted	50.5%		
Predicted Within 1 Level	94.4%		

*** significant at 1% ** significant at 5% * significant at 10%
While there were 2,250 observations (450 households) for the dependent variable, only 1,765 observations (353 households) were used due to non-responses to income question.
Dependent Variable: 1=greatly decrease purchases to 5=greatly increase purchases. Coefficients give change in probability that dependent variable has higher value.

Table 5: Ordered Probit, Effect of a Change from Lowest to Highest Category, Significant Regressors Only; Dependent Variable = Change in Purchase of Certified Organic Produce, No Price Increase

	Greatly Increase	Increase	No Change	Decrease	Greatly Decrease
Income	-.0551	-.0946	.0937	.0443	.0117
Education*	-.3952	.043	.3013	.0443	.0065
Household Size	-.0031	-.0134	-.0010	.0148	.0027
Farm Cert	-.0125	-.0199	.0211	.009	.0022
Store Cert	-.0143	-.0225	.0241	.0101	.0025

*This number represents total effect of education (accounting for both the linear and quadratic terms)

Table 6: Ordered Probit: Dependent Variable = Change in Purchase of Certified Organic Produce with Price Increase (n=353)

Variable	Coefficient	Std Error	P Value
Constant1	0.889	0.607	0.1432
Constant2	2.072***	0.614	0.0007
Constant3	3.409***	0.631	0.0000
Constant4	4.732***	0.68	0.0000
Buy Organic	0.028	0.053	0.6013
Age	0.132	0.143	0.3568
Age^2	-0.021	0.02	0.3018
Gender	-0.184*	0.099	0.063
Education	-0.621**	0.315	0.0485
Education^2	0.068*	0.037	0.0671
Household Size	-0.056*	0.032	0.0757
Income	0.029	0.039	0.4536
Farm Certification	-0.111*	0.061	0.0677
Store Certification	-0.18***	0.058	0.0017
Indep Certification	-0.038	0.049	0.4471
Utah State Gov. Cert.	0.009	0.033	0.7956
Increase Org. Purchase	-0.889***	0.177	0.0000
No Change Org. Pur.	-1.399***	0.187	0.0000
Decrease Org. Pur.	-2.171***	0.2375	0.0000
Greatly Decr. Org. Pur.	-3.561***	0.43	0.0000
Log Likelihood (constant only)		-3000.4059	
Log Likelihood (constant + regressors)		-2089.7296	
Correctly Predicted	49.2%		
Predicted within 1 level	94.3%		

*** significant at 1% ** significant at 5% * significant at 10%

While there were 3,120 observations (624 households) for the dependent variable, only 1,765 observations (353 households) were used due to non-responses to income and certification without a price increase questions.

Dependent Variable: 1=greatly decrease purchases to 5=greatly increase purchases. Coefficients give change in probability that dependent variable has higher value.

Next, the response to certification was analyzed for the case in which certification would raise the price by 10 percent. Results are reported in Table 6. In contrast to the earlier regression (where gender was not significant), the sign on gender is now negative, suggesting that women are more sensitive to price increases.

The coefficient on household size remains significant. As before, this suggests that a price increase places a greater burden on larger households, causing purchases of organic produce to decrease for larger households. The coefficients on education and education squared also remain highly significant, with the same signs as in the first regression. It appears that those with median education levels are least responsive to a price increase. Of the certification types, both farm and store certification are significant which implies that these (non-independent) certification types are least credible, and that the price increase has a similar effect on responses to all other types of certification.

The dummy variables on responses to certification without a price increase are all very significant and behave as was hypothesized. All groups have smaller purchases with the price increase, with the size of the reduction being smallest for those who would have increased organic purchases without the price increase. As expected, the largest decrease came from the group that responded most negatively to certification.

Just under half (49.2%) of responses were correctly predicted by this model. As with the earlier regression, this is quite good, considering that there are five possible categories. As before, over 94 percent (94.3%) of responses are predicted within one level. Marginal effects (Table 7) in this model are much smaller than in the previous model. The size of the marginal effects suggests that all groups are equally responsive to a price increase for certification.

Table 7: Ordered Probit, Effect of a Change from Lowest to Highest Category, Significant Regressors Only; Dependent variable = Change in Purchase of Certified Organic Produce with Price Increase

	Greatly Increase	Increase	No Change	Decrease	Greatly Decrease
Gender	1.92E-14	-7.76E-14	-5.09E-10	-6.96E-7	6.96E-7
Education*	-1.22E-15	-8.24E-12	-3.35E-8	-2.22E-5	2.23E-5
Household Size	0	-1.66E-15	-1.884E-11	-3.454E-8	3.456E-8
Farm Cert	0	-5.44E-15	-5.01E-11	-7.22E-8	7.23E-8
Store Cert	0	-9.44E-15	-8.54E-11	-1.22E-7	1.22E-7
Increase Org. Purch	-3E-15	-1.78E-11	-6.26E-8	-3.64E-5	3.65E-5
No Change Org. Purch	-1.51E-13	-4.96E-10	-9.03E-7	-2.77E-4	2.78E-4
Decrease Org. Purch	-3.44E-11	-4.65E-8	-3.12E-5	-3.64E-3	3.67E-3
Grtly Decr Org. Purch	-1.43E-7	-3.90E-5	-4.46E-3	-.0941	.0986

*This number represents total effect of education (accounting for both the linear and quadratic terms)

Conclusions

Information asymmetry exists and may cause problems in the organic produce market because of the difficulty consumers face in determining whether a product is truly organic. It may be eliminated through the use of signals, reputation, and certification or licensing. Signals based on appearance of organic versus conventional produce may not be effective, as there is some evidence that organic produce may appear quite similar to conventionally grown produce. Reputation is

difficult to apply in this case because the consumer often does not know whether the produce was indeed organically grown, or which farmer raised it. The usefulness of certification depends in large part upon the credibility it has with consumers. If consumers do not believe certification claims, information asymmetry problems remain.

The results of a survey of Utah consumers suggest that consumers do perceive a difference in certification methods. Self-certification, where an individual farmer or store certifies that produce is organically grown does not seem as effective as independent certification (i.e. third party or government). Not surprisingly, consumers seem to place more faith in an outside party certifying growing methods. However, it does not appear that there are large differences between the independent certification methods. This implies that a certification program established by the federal government would not influence consumer purchasing behavior differently than certification by the state of Utah, or by independent third parties. With a national certification program for organic produce in place, state governments need not devise their own certification procedures in order to increase consumer purchases of organic product. Of course this study is of Utah consumers only, and thus may not generalize to states with pre-existing independent and state-run certification programs such as California and Oregon.

The results here suggest that the only benefit to having a state government or third-party certification program would be differences in standards for organic produce. Such a program would have to educate consumers not only on the standards of their program and how they differ from the federal program, but would have to convince consumers that such differences in standards are valuable. Given that 75 percent of respondents were aware of certification programs but only 10 percent looked for them when purchasing organic produce (Table 2), this may be a difficult task. It may be that consumers in states such as California and Oregon, where pre-existing state and third-party programs have been in place for some time, may take a certification program that they recognise more seriously, so that a greater percentage would look for it when making organic produce purchases.

The respondents were sensitive to increases in price and the response was similar for all certification methods. Response to certification without a price increase (used as a proxy for belief in certification) was significant in explaining a response to certification with a price increase. While a 10 percent price increase always reduces the propensity to purchase, it does so most for those who would make little adjustments to their purchases even without the price increase. Those who are less likely to buy certified organic are most likely to reduce their purchases if certification increases the price. People who indicated certification would increase their purchases showed the least sensitivity to price.

It appears that consumers are sensitive to price when purchasing organic produce.

Given that even those who would greatly increase their purchases if produce were certified adjusted their responses downward in the face of a 10 percent price increase, it may be that certification, if it increases the price, would not have a very large effect on purchases of organic produce. However, organic produce is a small portion of the market, and a response large enough to have a significant effect on the organic produce market may exist, even as most people continue to consume conventional produce.

While it is difficult to generalize results of studies from a single state to the United States as a whole, our results on certification are consistent with other studies of organic produce (whether certified or not). This suggests that these results could be representative of other areas in the United States. However, Utah demographics are not completely representative of the United States (e.g. household sizes are largest of any of the 50 states in Utah). Also, Utah did not have an established state government certification program, as did other states. Thus, while these results are consistent with other studies on other areas of the United States, it would be necessary to examine the question of certification on a much broader sample before reaching hard and fast conclusions about a national response to the federal certification program.

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End Notes

[i] In addition to the theoretical literature, Akerlof's idea appears in several areas including information labeling on food (Caswell and Mojduszka), product safety (Kerton and Bodell), job markets (Ryoo) and yard sales (Cabral and Sakovics).

[ii] It is assumed that information asymmetry between the farmer and the wholesaler carries through to the final customer. Thus, while we discuss the consumer's beliefs regarding the farmer's production methods, we mean to imply the consumer's beliefs regarding the entire system from which she purchases.

[iii] Klonsky gives a good overview of what has happened in regards to certification, including the problems the USDA has faced in forming a standard for certification.

[iv] We focus on produce as it is something that most households purchase, organically produced versions are widely available, and conventionally grown and organically grown produce are generally sold in the same section of the store, and have similar packaging.

[v] A copy of the survey is available from the authors upon request.

[vi] Our regression specification is similar to a fixed-effects model. While this is not ideal, a random-effects ordered probit model (attempted using both LIMDEP (Greene, 2001) and SAS) failed to generate useable results, despite manipulations of both the models and the data. It is likely that the qualitative nature of almost all the independent variables led to a failure of the random-effects algorithms to converge.

[vii] These questions were posed to the 450 respondents who indicated that certification was important. However, results were calculated using the 353 respondents who were included in the regression analysis below. In pre-testing the survey, consumers who indicated certification was unimportant to them were also unable to respond to how certification would affect their purchases. Given that certification is unimportant, it is assumed that various types of certification would have no effect on purchases of organic produce.

[viii] When regressions are run with dummy variables for income levels, only level 1 (under $15,000) remains significant, while the signs and significance of all other variables remains as reported in Table 4.

