A Comparative Evaluation of Organic Produce Consumers in New Jersey to New York and Pennsylvania

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This comparative study seeks to distinguish the organic consumers of New Jersey from those of New York and Pennsylvania. The objective of the study is to document the characteristics of New Jersey organic produce consumers and compare the profile to New York and Pennsylvania consumers. Econometric methods will be used to model behavior and characteristics of consumers who frequently buy organic produce, and of consumers who are willing to pay 10 percent or more extra for organic produce than for conventional produce. Comparing models for New Jersey to those for New York and Pennsylvania will provide a framework for determining the significant characteristics unique to New Jersey's organic produce consumers.

Organic production has been practiced in the U.S. since the late 1940s. Organic farming differs from conventional farming because of the absence of synthetic compounded fertilizers, pesticides, growth regulators, and livestock feed additives (Jansen 2000). The USDA guidelines for organic produce permit growing with a maximum of five percent synthetic pesticide residues, and no prohibited substance can be used on the land for three years prior to growing organic produce (USDA 2001). These strict regulations for organic produce generate higher production costs. Therefore, organic produce is sold at a premium compared to conventional produce.

The growth in the organic industry can be partly attributed to the popularity in natural food stores, direct marketing from producers to consumers, and the publicity from media. There has also been more integration of organic products in the conventional supermarkets since the 1990s (USDA 2001).

Though the growth is encouraging, the organic market is still small relative to the food industry. One may assume the world's population cares little about organic produce and perhaps even less about its premium cost. In spite of this assumption, the organic industry remains significant. It is worthy to note that "the organic consumer is willing to pay the premium price for produce on the grounds of taste, health, safety and the protection of the environment" (Tate 1994).

This paper evaluates the consumer side of the organic market sector. So far, little work has been done in New Jersey to evaluate the consumer demand for organic produce. With the growth of the organic industry, there is a need for optimizing the information obtained from the buyers of organic food in order to keep the market growing. This benefits both producers and consumers by working to improve the marketing channels for the organic industry.

In this study, New Jersey data was extracted from surveys conducted in the spring of 2000 by the Rutgers Cooperative Extension. This valuable information is the data source for performing statistical and economic analysis. Econometric methods were used for analyzing New Jersey consumer data. The objectives of the analysis are to document the characteristics of frequent buyers of organic food and to document the characteristics of consumers who are willing to pay 10 percent or more for organic food compared to conventional produce in New Jersey (Govindasamy et al. 2001).

This study focuses on analyzing the data compiled from New Jersey because of the state's median income, population density, and diversity. According to the U.S. Census Bureau, New Jersey has a higher income than the national average; the Bureau estimates New Jersey median household income at $47,903, compared to the national average of $37,005. New York median income in 1997 was $36,369, slightly below the national average. Median income for Pennsylvania was $39,116 (U.S. Census Bureau 1997). New Jersey's higher income is an important variable in the project. The effects of income will be examined by comparing the New Jersey data to New York and Pennsylvania data.

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Methodology

Since the variables in the analysis are mostly categorical variables, a logistic model will be selected for the regressions in this analysis. Using the logit framework, its asymptotic characteristic constrains the predicted probabilities to a range of zero to one. The categorical, or dummy, variables indicate the presence or absence of an attribute (Gujarati 1988). For example, the variable for gender may take on the value of 0 or 1; 1 may indicate that the person is female, and 0 may designate that the person is male. The logit model is favored for its mathematical simplicity, and serves as a flexible tool that is capable of handling problems encountered in empirical studies (Gujarati 1988). As the survey used in this analysis provided individual rather than grouped observations, the common estimation method of choice was the maximum-likelihood estimation (MLE) (Gujarati 1992).

The following model was developed to predict the likelihood that a New Jersey consumer would buy organic produce more frequently. The model was used on respondents from New York and Pennsylvania for comparison purposes. This model was again used to predict the likelihood that a New Jersey consumer would be willing to pay a 10-percent premium for organically grown produce; for the state comparison, the model was used on respondents from New York and Pennsylvania.

The logit model is specified as

$$\text{FREQ\_ORG and PAY\_10} = \beta_0 + \beta_1\text{LABEL12} + \beta_2\text{ADNEWS12} + \beta_3\text{FM5} + \beta_4\text{COUNTRY12} + \beta_5\text{PESTRES12} + \beta_6\text{PRICE12} + \beta_7\text{SWITCH} + \beta_8\text{HIGH\_QUAL} + \beta_9\text{HIGHVARI} + \beta_{10}\text{LOWPRIC} + \beta_{11}\text{FLRESPES1} + \beta_{12}\text{FLARTFE1} + \beta_{13}\text{IPM} + \beta_{14}\text{DOSHOP} + \beta_{15}\text{LIVEMORE} + \beta_{16}\text{SUBURB} + \beta_{17}\text{GENDER} + \beta_{18}\text{OLDER} + \beta_{19}\text{COLLS} + \beta_{20}\text{INCOMEH} + \beta_{21}\text{MARRIED}$$

where

FREQ_ORG = 1 for those who frequently buy organic produce and 0 otherwise;

PAY_10 = 1 for those who are willing to pay 10 percent or more for organic produce and 0 otherwise;

LABEL12 = 1 for those who check ingredient labels on food purchased and 0 otherwise;

ADNEWS12 = 1 for those who use food advertisements to determine which foods to purchase and 0 otherwise;

FM5 = 1 for those who visit farmers' market less than once a month and 0 otherwise;

COUNTRY12 = 1 for those who think country of origin is important when purchasing and 0 otherwise;

PESTRES12 = 1 for those who think absence of pesticide residue is important and 0 otherwise;

PRICE12 = 1 for those who think food price is important when purchasing and 0 otherwise;

SWITCH = 1 for those who would switch supermarkets to be able to purchase organic produce and 0 otherwise;

HIGH_QUAL = 1 for those who thinks organic produce has a higher quality than conventional produce and 0 otherwise;

HIGHVARI = 1 for those who thinks organic produce has a higher variety than conventional produce and 0 otherwise;

FLRESPES1 = 1 for those who feel that residues from pesticides or herbicides are a serious hazard and 0 otherwise;

FLARTFE1 = 1 for those who feel artificial fertilizer is a serious hazard and 0 otherwise;

IPM = 1 for those who have heard or read about integrated pest management (IPM) and 0 otherwise;

DOSHOP = 1 for those who say quality of fresh produce affects where they shop and 0 otherwise;

LIVEMORE = 1 for households with 4 or more members and 0 otherwise;

SUBURB = 1 for those who describe their neighborhood as suburban and 0 otherwise;

GENDER = 1 for female and 0 otherwise;

OLDER = 1 if the respondent is 51 years old

	or older and 0 otherwise;
COLLS	= 1 for those with at least some college education or further education and 0 otherwise;
INCOMEH	= 1 for households with income of $60,000 or more per year and 0 otherwise;
MARRIED	= 1 for those who are married and 0 otherwise.

Empirical Results

New Jersey Consumers Who Buy Organic Produce Frequently

The maximum-likelihood estimates for New Jersey consumers who frequently purchase organic produce are displayed in Table 1. The dependent variable FREQ_ORG was coded 1 for those consumers who purchase organic produce at least "usually" or "always" and 0 otherwise. Table 2 displays the predicted success of the New Jersey model. The model correctly predicted 90 percent of the observations. The chi-square statistic rejected the null hypothesis that all the coefficients of the explanatory variables were 0 at the 0.0001 level, and the McFadden's R^2 value is recorded at 0.44.

The higher-income variable was significant at the 0.10 level. As in previous studies, there would appear to be a direct relationship between the amount of disposable income and the level of purchasing organic food (Davies 1995; Tregear 1994). In this analysis, New Jersey consumers with an income greater than $60,000 are 3.67 percent more likely to buy organic produce frequently than are consumers who earn less than $60,000.

The age variable was significant at the 0.05 level. According to the model estimate, consumers who are older than 50 are 2.93 percent more likely to buy organic produce frequently.

Respondents who believe that organic produce has a higher quality are four percent more likely to purchase frequently than are consumers who see no difference in quality. The variable for high quality was significant at the 95-percent level.

An unexpected result was that households with more than 4 members are 3.34 percent more likely to purchase organic produce frequently than are households with fewer members. This variable is significant variable at the 95-percent level. A previous study contrastingly found that larger households typically have less money to spend per person on fresh produce (Govindasamy 2001). The disparity may lie in the fact that New Jersey households have higher median incomes than the national average, and perhaps more members in the household means there are more preferences for fresh produce.

Respondents who think organic produce has more variety than conventional produce are 2.82 percent less likely to purchase organic produce more frequently. The variable was significant at the 95-percent level.

Respondents who "usually" or "always" check the ingredient label on food are 2.53 percent more likely to buy organic more frequently. The variable was significant at the 0.10 level.

Respondents with some knowledge of Integrated Pest Management, or IPM, were six percent more likely to purchase organic produce frequently. Respondents who would switch supermarkets to be able to buy organic produce are 18 percent more likely to frequently buy organic than are those who would not switch supermarkets. Both of these variables were significant at the 99-percent level, indicating a strong influence on more-frequent organic produce purchasing. From the high significance levels, these two variables seem to suggest a consumer interest in healthy produce, which would make purchases of organic produce more frequent.

New York And Pennsylvania Consumers Who Buy Organic Produce Frequently

The maximum-likelihood estimates for New York and Pennsylvania consumers who frequently purchase organic produce are displayed in Table 3. Again, the dependent variable FREQ_ORG was coded 1 for consumers who purchase organic produce at least "usually" or "always" and 0 otherwise. Table 4 displays the predicted success of the New York and Pennsylvania model. The model correctly predicted 85 percent of the observations. The chi-square statistic rejected the null hypothesis that all coefficients of the explanatory variables were 0 at the 0.0001 level, and the McFadden's R^2 value is recorded at 0.54.

The New York and Pennsylvania model has a total of three significant variables, all at the 0.01 level. Respondents who stated that they visit a farm-

Table 1: Characteristics Of Consumers In New Jersey Who Frequently Buy Organic Produce.

Variable Name	Parameter Estimate	Standard Error	Change in Probability
INTERCEPT	7.0527	1.2657	
LABEL12*	0.8974	0.5107	0.0253
ADNEWS12	-0.0664	0.5216	
FM5	0.4682	0.9809	
COUNTRY12	0.6596	0.4528	
PESTRES12	0.5707	0.5886	
PRICE12	-0.5187	0.4558	
SWITCH***	2.5935	0.4970	0.1810
HIGH_QUAL**	1.0867	0.4490	0.0407
HIGHVARI**	-1.7877	0.7910	-0.0282
FLRESPES1	-0.1841	0.5096	
FLARTFE1	0.2106	0.4611	
IPM***	1.3325	0.4734	0.0618
DOSHOP	0.7624	0.6509	
LIVEMORE**	1.0487	0.4975	0.0334
SUBURB	-0.0722	0.5098	
GENDER	0.8383	0.5615	
OLDER**	0.9405	0.5264	0.0293
COLLS	-0.0225	0.5651	
INCOMEH*	0.9285	0.5670	0.0367
MARRIED	-0.5683	0.5021	
McFadden's R^2: 0.44			

* significant at the .10 level.
** significant at the .05 level.
*** significant at the .01 level.

Table 2: Prediction Success for Model.

		Predicted	
		0	1
Actual	0	358	28
	1	14	18

Number of correct predictions: 376
Percent of correct predictions: 90.0

Table 3: Characteristics Of Consumers In New York & Pennsylvania Who Frequently Buy Organic Produce.

Variable Name	Parameter Estimate	Standard Error	Change in Probability
INTERCEPT	-9.8954	3.7421	
LABEL12	-1.0128	1.1531	
ADNEWS12	-1.1650	1.4255	
FM5***	2.8664	1.3549	0.0520
COUNTRY12	0.4688	0.9504	
PESTRES12	-0.5244	1.2243	
PRICE12	-1.3048	1.0851	
SWITCH***	5.4850	1.7140	0.3788
HIGH_QUAL	0.1291	1.1584	
HIGHVARI	-1.3438	0.7163	
FLRESPES1	0.9004	1.2613	
FLARTFE1	-0.1206	1.1431	
IPM	1.3608	1.2801	
DOSHOP	0.5204	1.1177	
LIVEMORE***	4.2749	1.9618	0.0773
SUBURB	0.2268	0.9770	
GENDER	0.9059	0.0358	
OLDER	1.1873	1.3737	
COLLS	1.8650	1.3858	
INCOMEH	0.7930	1.3360	
MARRIED	-1.1310	1.2470	
McFadden's R^2: 0.54			

* significant at the .10 level.
** significant at the .05 level.
*** significant at the .01 level.

Table 4: Prediction Success for Model.

		Predicted	
		0	1
Actual	0	107	10
	1	10	6

Number of correct predictions: 113
Percent of correct predictions: 85.0

ers' market less frequently are five percent more likely to buy organic produce. Reasons for this may be that consumers may prefer to purchase their produce in a nice, clean supermarket. Some of the respondents may also feel that a farmers' market is too out of the way compared to the convenience of the supermarket.

New York and Pennsylvania respondents who would switch supermarkets to be able to buy organic produce are 38 percent more likely to frequently buy organic than are those who do not switch supermarkets. Also, households with more than four members are eight percent more likely to buy organic produce frequently. Again, the reason may rest in the greater number of preferences for fresh produce from the members of the household.

New Jersey Consumers Who Are Willing To Pay 10 percent More for Organic Produce

This model predicts the likelihood that a consumer would be willing to pay ten percent or more for organic produce over the cost of conventional produce. The dependent variable PAY_10 was coded 1 for those consumers who are willing to pay at least a 10-percent premium for organic food and 0 otherwise. The model correctly predicted 81.7 percent of the observations. The chi-square statistic rejected the null hypothesis that all coefficients of the explanatory variables were 0 at the 0.0001 level, and the McFadden's R^2 value is recorded at 0.28. The results of the New Jersey consumer model appear in the maximum-likelihood estimates in Table 5. The prediction success for the model is displayed in Table 6.

Out of the eight significant variables of the model, six of them were significant at the 99-percent level. New Jersey respondents who switch supermarkets for organic food are 18 percent more likely to be willing to pay a 10-percent premium than are those who do not switch supermarkets. Also, respondents who feel organic produce has a higher quality than conventional produce are 16 percent more likely to exhibit a higher willingness to pay. These results seem to indicate that organic produce carries a "luxury status" compared to the conventional produce.

Similarly, New Jersey respondents who feel that residues from pesticides are a serious hazard are 13 percent more likely to be willing to pay at least 10 percent more on organic produce compared to those consumers who see no hazard. This seems to coincide with the premium status of organic produce, where consumers are willing to pay more due to the perceived notion of safety.

New Jersey respondents who believe food price is important are 20 percent less likely to be willing to pay a premium for organic produce than are consumers who do not feel that price is important. Also, consumers who use food advertisements to determine food purchases are 12 percent less likely to be willing to pay a 10-percent premium for organic produce.

An unexpected finding was that respondents who feel organic produce has a higher variety than conventional produce are 14 percent less likely to be willing to pay at least 10 percent more for organic produce. A possible explanation behind this finding may be that those consumers who believe that organic produce has more variety may not be interested in the variety of produce.

Respondents who say the quality of fresh produce affect where they shop are 10 percent more likely to be willing to pay 10 percent more for organic produce. This variable is significant at the 95-percent level. The age variable was also significant at the 95-percent level. The results showed that consumers over the age of 50 are 12 percent less likely to pay a premium for organic food. This seems to indicate some reluctance from older consumers to pay a premium for produce.

New York And Pennsylvania Consumers Who Are Willing To Pay 10 Percent More for Organic Produce

The maximum-likelihood estimates for New York and Pennsylvania consumers who are willing to pay more than 10 percent on organic produce are shown in Table 7. The model correctly predicted 77 percent of the observations. The chi-square statistic rejected the null hypothesis that all coefficients of the explanatory variables were 0 at the 0.0001 level, and the McFadden's R^2 value is recorded at 0.39. The prediction success for the model is displayed in Table 8.

The findings show that New York and Pennsylvania respondents who are willing to switch supermarkets to be able to purchase organic produce are 21 percent more likely to pay a 10-percent pre-

Table 5: Characteristics Of Consumers In New Jersey Who Are Willing To Pay a 10-Percent Premium for Organic Produce.

Variable Name	Parameter Estimate	Standard Error	Change in Probability
INTERCEPT	1.7055	0.6634	
LABEL12	0.4475	0.2984	
ADNEWS12***	-1.0543	0.4062	-0.1189
FM5	0.0000	0.3039	
COUNTRY12	-0.3376	0.3438	
PESTRES12	0.3421	0.3365	
PRICE12***	-1.3774	0.2922	-0.2064
SWITCH***	1.0700	0.3540	0.1765
HIGH_QUAL***	1.0414	0.3084	0.1608
HIGHVARI***	-1.9142	0.6632	-0.1469
FLRESPES1***	0.9836	0.3388	0.1348
FLARTFE1	0.1046	0.3272	
IPM	1.3893	0.3707	
DOSHOP**	0.8430	0.3393	0.1022
LIVEMORE	-0.5160	0.3613	
SUBURB	0.0556	0.3692	
GENDER	-0.3232	0.3199	
OLDER**	-0.8996	0.3649	-0.1203
COLLS	-0.1821	0.3795	
INCOMEH	-0.3073	0.4475	
MARRIED	0.3295	0.3455	
McFadden's R^2: 0.28			

* significant at the .10 level.
** significant at the .05 level.
*** significant at the .01 level.

Table 6: Prediction Success for Model.

		Predicted	
		0	1
Actual	0	300	56
	1	21	44

Number of correct predictions: 344
Percent of correct predictions: 81.7

Table 7: Characteristics Of Consumers In New York & Pennsylvania Who Are Willing To Pay a 10-Percent Premium for Organic Produce.

Variable Name	Parameter Estimate	Standard Error	Change in Probability
INTERCEPT	-4.0032	1.5091	
LABEL12	0.0098	0.6424	
ADNEWS12	-0.3909	0.6824	
FM5	0.0975	0.7437	
COUNTRY12	-0.1335	0.6705	
PESTRES12	0.6359	0.7078	
PRICE12	-0.8737	0.7311	
SWITCH**	1.5168	0.7328	0.2151
HIGH_QUAL**	1.5542	0.6643	0.1935
HIGHVARI	-2.0170	1.3722	
FLRESPES1	1.2031	0.7341	
FLARTFE1	0.5431	0.7390	
IPM	1.2852	0.8338	
DOSHOP**	1.6607	0.7941	0.1327
LIVEMORE	0.8149	0.8508	
SUBURB	-0.4416	0.6365	
GENDER	-0.6898	0.6507	
OLDER	-0.7966	0.8072	
COLLS	0.5457	0.7228	
INCOMEH	0.3982	0.7867	
MARRIED	-0.3561	0.7408	
McFadden's R^2: 0.39			

* significant at the .10 level.
** significant at the .05 level.
*** significant at the .01 level.

Table 8: Prediction Success for Model.

		Predicted	
		0	1
Actual	0	107	10
	1	10	6

Number of correct predictions: 133
Percent of correct predictions: 77.0

mium than are consumers who would not switch supermarkets. This variable was significant at the 95-percent level.

Respondents who believe that organic produce has a higher quality than conventional produce are 19 percent more likely to pay 10 percent more for organic than are consumers who do not see a quality difference. The variable is significant at the 0.05 level. Furthermore, respondents who say the quality of fresh produce affects where they shop are 13 percent more likely to be willing to pay 10 percent more for organic produce. This variable is also significant at the 0.05 level.

Discussions

This comparative study uses a variety of methods to distinguish New Jersey organic consumers from those of New York and Pennsylvania. Characteristics of consumers from New Jersey, New York, and Pennsylvania were documented. The findings show that differences between the states certainly exist.

About 10 percent of New Jersey respondents purchase organic produce on a frequent basis. The results suggest that those who buy organic produce frequently are concerned with food safety. Specifically, these respondents are most likely to be willing to switch supermarkets to buy organic and to have some knowledge of IPM. The findings also indicate a premium status exists for organic produce. The household-income variable higher-quality variables are significant in the New Jersey model. Consistent with other studies, a relationship appears to exist between household income available and the purchasing of organic produce.

Different variables are significant for New York and Pennsylvania respondents compared to the New Jersey respondents. The New York and Pennsylvania consumers who purchase organic food frequently are more likely to prefer the conveniences of a supermarket instead of a farmers' market. These consumers are likely to switch supermarkets to be able to purchase organic produce and have four or more members in the household. The larger number of members in the household seems to increase the preferences for the produce.

New Jersey consumers willing to pay a 10-percent or higher premium for organic produce are concerned about pesticides and the higher quality and safety of organic produce. These concerns are found in three variables significant at the 99-percent level. The variables include New Jersey consumers who are willing to switch supermarkets, think that organic produce has a higher quality, and feel that residues from pesticides are a serious hazard. These consumers would be more likely to exhibit a higher willingness-to-pay for organic produce. These findings indicate a premium status of the organic produce; therefore these consumers are likely to pay a 10-percent premium for organic produce compared to conventional produce.

New York and Pennsylvania respondents willing to pay a 10-percent or higher premium for organic produce are concerned with quality and freshness. These respondents are most likely to say the quality of fresh produce affects where they shop, to think organic food has a higher quality than conventional produce, and to be willing to switch supermarkets to be able to purchase organic produce. These variables are significant at the 95-percent level, indicating that these consumers have a higher willingness-to-pay for organic produce because of better freshness and quality.

The comparison of New Jersey to New York and Pennsylvania was aimed at identifying the significant characteristics unique to New Jersey's organic produce consumers. Though there are limitations to this study—e.g., in the initial data-collection method—it is reasonable to conduct an analysis to build a framework for organic produce consumers. The market for organic produce is growing rapidly. Continued research on organic produce is highly valuable to members in the food industry. Documenting consumers who buy organic produce provides a current picture of a rapidly changing agriculture sector in a region with one of the highest income levels and population densities in the country.

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