Journal of Agricultural and Resource Economics 34(3):483–497

Assessing the Returns from Organic Marketing Channels

Timothy A. Park

Organic farmers face heightened pressure in developing a portfolio of different marketing channels and in bargaining competitively with increasingly sophisticated marketing participants in the supply chain for organic products. This research assists producers by identifying specific farm and demographic factors that enhance earnings given the choice of marketing outlet. The two significant selectivity coefficients confirm that organic earnings when marketing through a single outlet are biased upward since farmers who are better suited to market through multiple outlets have already moved away from this marketing strategy. An accurate evaluation of the projected earnings from any marketing strategy must account for selectivity effects.

Key words: marketing outlets, multinomial logit, organic production, selectivity correction

Introduction

Continued growth in the market for organically grown foods in the United States has stimulated international, national, and private research initiatives to promote marketing of organic products. Dimitri and Greene (2007) report that growth rates of U.S. retail sales have equaled 20% or more annually since 1990. The identification of effective marketing strategies is essential to assist farmers in enhancing their marketing programs and maintaining a long-term commitment to organic production.

Three major trends are apparent in the marketing of organic products over the past decade. First, the major marketing outlets for organic foods have shifted. In the United States, health and natural products stores and direct markets (such as farmers markets) were the major outlets for organic food from 1990 to 1996. By 2000, conventional supermarkets and mainstream retailers represented the primary purchasing outlet for organic food products in both the United States and Europe. Within the retail channel, alternative strategies and new participants emerged. Major U.S. food retailers introduced private-label organic lines designed to sell at prices below those of brand organic products. Wal-Mart aims to become the leader in this product line (Warner, 2006) and intends to sell organic products for just 10% more than their conventional equivalents.

Second, organic farmers utilize a variety of marketing channels including direct-to-consumer sales and direct marketing to grocery retailers and restaurants, along with sales through packers, brokers, and food processors. Organic farmers have participated in the rejuvenation of farmers markets and innovative direct marketing outlets. Extension experts (Stephenson

---

Timothy A. Park is an economist with the Food Marketing Branch, Economic Research Service, USDA, Washington, DC. The cooperation of the Organic Farming Research Foundation in providing access to the data used in this analysis is gratefully acknowledged. The views and opinions expressed in this paper do not necessarily reflect those of the Economic Research Service, U.S. Department of Agriculture.

Review coordinated by George C. Davis.

and Lev, 2009) have noted that farmers diversify across multiple marketing channels, and a wide variety of direct marketing outlets and new outlets have developed in recent years. Direct marketing outlets include community-supported agriculture (CSA), farmers markets, u-pick farms, farm stands, restaurants, farm-to-schools and -institutions programs, agritourism, and online marketing.

The third trend is a shift in buying patterns of the chain supermarkets to create central procurement systems for purchasing perishables. In 2002, three of the largest U.S. food retailers (Safeway, Ahold, and Kroger) announced plans to centralize purchases of perishable products such as fruits and vegetables, with the goal of improving inventory control, guiding promotional and seasonal planning, and coordinating business activities across the operating divisions (*Progressive Grocer*, 2002). Independent regional produce buyers have reacted to this strategy by featuring high-quality perishables targeted for local markets and adapting pricing and promotional materials for specific consumer groups.

Organic farmers and marketing analysts will need information to assess the potential earnings from various marketing channels while bargaining with a diverse set of buyers. Marketing researchers (Iyer, 1998) recognize that sales managers frequently choose between using a single distribution channel or a mix of several types of channels, confirming the empirical relevance of the approach. As demonstrated by Chambolle and Villas-Boas (2007), the producer's profit share in a supply chain is higher when the producer deals with an expanded set of buyers. This suggests organic producers may benefit by diversifying their sales across sales outlets. But producers are also concerned with the returns from the sales outlets and will need accurate and unbiased measures of potential earnings from a given channel.

The primary purpose of this paper is to identify factors that influence the organic farmer's choice of distribution outlets and the income earned from the marketing decision. The empirical approach is based on a discrete choice model where producers select a set of marketing channels to sell organic products. McFadden (1986) developed the economic choice theory underlying the multinomial logit model and highlighted its value in linking discrete choice behavior (brands available to sell, choice of market outlet) with continuous decisions (quantity of brand sold, sales revenue in each outlet). Ofek and Srinivasan (2002) showed how market valuation of improved product attributes that account for competition from other brands, potential market expansion, and heterogeneous consumer preferences can be derived from the multinomial logit framework.

We account for selectivity bias in the observed earnings from a marketing outlet, recognizing that producers choose from a set of marketing options to obtain the highest returns. Trost and Lee (1984) initially extended the polychotomous choice model based on a multinomial logit specification with selectivity corrections to show returns to education are underestimated when selectivity is neglected. In the section below, which develops the econometric model, we apply a selectivity bias approach for the multinomial logit model from Bourguignon, Fournier, and Gurgand (BFG, 2007), highlighting its advantages over current methods.

The econometric model and empirical results represent an advance on previous work examining marketing choices of organic farmers (Park and Lohr, 2006) in three ways. First, the restrictive assumptions of Lee's (1983) selectivity model are relaxed. Producers' unobserved characteristics and attributes that influence the marketing decision may distort the earnings producers can expect when choosing a channel. We demonstrate the empirical relevance of the new BFG model by showing that organic earnings, when marketing through a single outlet, are biased upward. Second, the BFG approach provides a complete description of selectivity impacts on all the options considered by producers and identifies which specific

choices contribute to the bias. Third, the empirical work pools U.S. data from two surveys conducted by the Organic Farming Research Foundation (OFRF) and uses the most recent available information on the marketing strategies of organic producers.

Econometric Model of Market Outlets Used by Organic Producers

Organic producers choose their marketing plans and assess available outside options before participating in any marketing channel. The farm income earned from organic sales depends on the farmer's experience in producing and selling organic products, the farmer's comparative advantage in bargaining and marketing skills, combined with differences in the regional development and accessibility of outlets for organic farm products. Selectivity bias may be present in the econometric model explaining the choice of marketing outlets used by organic producers.

The OFRF surveys asked detailed questions about the marketing choices of organic farmers and income earned when producers choose different market outlets to sell organic commodities. Based on this information, a set of three marketing outlets were identified. The marketing outlets included (*a*) direct-to-consumer sales such as farmers markets, community-supported agriculture operations, and subscription farms; (*b*) retail outlets such as natural food stores or food cooperatives, local supermarkets, and restaurants; and (*c*) wholesale markets such as supermarket chains, processors or packers, and handlers, brokers, or distributors.

The producer's choice of a marketing strategy is based on utility maximization among M alternatives, where utility y_j^* depends on features of the outlets and the producer's marketing expertise. The marketing strategies include the choice to market through any one outlet, any two outlets, or all the outlets. The utility of the producer who chooses from M ($j = 1, 2, ..., M$) mutually exclusive marketing plans depends on a set of observable exogenous variables $\mathbf{Z}$, estimated parameters $\boldsymbol{\gamma}$, and an unobservable stochastic component η_j:

$$y_j^* = \mathbf{Z}\gamma_j + \eta_j, \qquad j = 1, \ldots, M. \tag{1}$$

We observe only whether a marketing plan is chosen so that $y_j = 1$ if plan j is selected and $y_j = 0$ otherwise.

Given the choice of marketing option 1 (the decision to use a single marketing channel), the organic income earned by the farmer is given by:

$$y_1 = \mathbf{X}\beta_1 + u_1, \tag{2}$$

where $\mathbf{X}$ is the set of exogenous variables affecting income earned from the marketing strategy and $\boldsymbol{\beta}$ is the set of estimated parameters. The idiosyncratic error term u_1 satisfies $E(u_1 | \mathbf{X}) = 0$ and $\text{Var}(u_1 | \mathbf{X}) = \sigma^2$. The estimation strategy accounts for correlation between the stochastic components η_j and u_1.

Following BFG, the Mth marketing strategy is observed only if $y_M^* > \max(y_j^*)$, where $j \neq M$. This condition is equivalent to $\mathbf{Z}\gamma_M > \varepsilon_M$, where

$$\varepsilon_M = \max(y_j^* - \eta_M), \qquad j \neq M. \tag{3}$$

When the η_j elements are independent and identically Gumbel distributed, the cumulative distribution function is $G(\eta) = \exp(-e^{-\eta})$ and the density function is $g(\eta) = \exp(-\eta - e^{-\eta})$, leading to the multinomial logit (MNL) model. The probability that the Mth alternative is preferred is expressed as:

$$P_M = \frac{\exp(\mathbf{Z}\gamma_M)}{\sum_j \exp(\mathbf{Z}\gamma_j)}. \tag{4}$$

The MNL model offers a framework for dealing with selectivity effects in discrete choice models and has distinct theoretical and empirical advantages. Basuroy and Nguyen (1998) show that the MNL framework is appropriate for establishing equilibrium in market shares and assessing the impact of optimal firm responses to entry and potential market expansion. Choice models based on the MNL formulation are commonly used in marketing science applications and yield optimal pricing policies, which align with observed sales and pricing strategies of firms (Cattani, Dahan, and Schmidt, 2007). The parameters of the MNL model can be estimated by maximum likelihood, but the estimation of the equation for income earned requires additional assumptions.

BFG define standard normal variables, η_j^*, as:

$$\eta_j^* = \Phi^{-1}\left[G(\eta_j)\right], \tag{5}$$

where Φ is the standard normal cumulative distribution function, and the expected values of u_1 and η_j^* are assumed to be linearly related for every j:

$$\mathrm{E}\left[u_1 \mid \eta_1, ..., \eta_M\right] = \sigma \sum_{j=1,...,M} r_j^* \eta_j^*. \tag{6}$$

The correlation coefficient between u_1 and η_j is represented by r_j, while σ is the standard deviation of the disturbance term from the earned organic income equation. For the multinomial logit model, BFG derive the conditional expectation of η_j^*. Given that the first marketing option is chosen ($j = 1$), the outcome equation for income earned, y_1, is constructed as:

$$y_1 = \mathbf{X}\beta_1 + \sigma\left[r_1^* m(P_1) + \sum_{j=2,...,M} r_j^* m(P_j)\frac{P_j}{P_j - 1}\right] + w_1. \tag{7}$$

In this equation, P_1 is the probability that the first alternative is preferred, $m(P_1)$ is the conditional expectation of η_j^*, $m(P_j)$ represents the conditional expectation of η_j^*, and

$$m(P_j) * \frac{P_j}{P_j - 1}$$

is the expectation of η_j^* for all $j \neq 1$. Each conditional expectation can be computed numerically. The residual error term is w_1, and is independent of the regressors. In the first stage, the discrete choice model from equation (4) is estimated by maximum-likelihood methods to obtain $\hat{\gamma}$. Given that marketing option 1 is chosen, the second stage as specified in equation (7) is estimated by OLS, recognizing the disturbances are heteroskedastic and correlated across the sample observations.

The BFG approach for dealing with selectivity has advantages over current methods. The method identifies not only the direction of the bias related to the choice of marketing plan, but also which marketing plan is the source of the bias. This is accomplished by estimating a different selectivity term for each marketing strategy, rather than following Lee's (1983) approach which estimates a single selectivity effect for all strategies together. The selectivity correction accounts for all the correlations between the disturbance terms of the earned income equations and the unobservable stochastic components driving the choice of marketing plan. Restrictive assumptions, which are required to implement commonly used selectivity methods, are relaxed.

As Schmertmann (1994) initially noted, Lee's (1983) approach implies a set of strong restrictions. First, unobservable factors that influence the choice of alternative 1 against any other alternative are correlated in the same direction with unobservable factors influencing the observed outcome y_1. Specifically, the correlations between u_i and $(\eta_j - \eta_1)$ are the same sign for all j. A second and more stringent restriction results when the selection model is based on the multinomial logit model and the residual terms $(\eta_j - \eta_1)$ are assumed to be identically distributed. In this case, the correlations are restricted to be identical. BFG present evidence from Monte Carlo experiments showing that Lee's method tends to perform poorly in comparison with the new approach.

Data and Description of Variables

Our analysis is based on production and marketing information from two national U.S. surveys that are representative of all organic farmers. We use data from the private not-for-profit OFRF surveys based on the entire U.S. certified organic farm population, as identified by organic certifiers. The data are from the third and fourth OFRF surveys (Walz, 1999, 2004) and represent all crops grown organically and all regions in which organic crops are produced.

Table 1 provides the descriptions and summary statistics for variables in the model. There are 113 farmers who market organic produce through all three of the available channels (wholesalers, retailers, and direct to consumers) and 601 who rely on a single marketing channel, while 422 use two of the available outlets. Differences in the gross organic income earned by producers are observed based on the marketing choices. Farmers utilizing a diversified set of outlets with sales to all three markets attained the highest income levels, with a mean income of about $73,217, followed by farmers who concentrated on one outlet with a mean income of about $58,286. The strategy of selling only to retailers yielded the lowest mean income level of $24,319. Natural logs of the variables reported in table 1 were used in estimation for all continuous variables. The logarithm of total gross income from organic farming is the dependent variable when estimating equation (7).

The explanatory variables appearing in the earnings equation are certified organic acreage and labor, assumed to be entirely under the control of the producer, and both can be adjusted annually depending on the planned output for that season. The mean farm size in the sample was 126 acres, with the largest farm in the sample at 7,500 acres. Organic farm size is most strongly related to production of field crops with a correlation coefficient of 0.49, followed by vegetable production at 0.29, and fruit, nut, and tree crop production at 0.21. Larger farms tend to incorporate both field crop production and vegetable production. The largest average farm size was reported by producers who use only one outlet (180 acres), followed by the producers using a diversified marketing plan of all three outlets (95 acres).

Table 1. Variable Descriptions and Summary Statistics (*N* = 1,136 producers)

Variable	Description	Mean / (Standard Deviation) Option 1	Option 2	Option 3
INC	Total gross organic farming income, in thousands of U.S. dollars (US$)	58.29 (85.40)	46.33 (74.13)	73.22 (103.75)
ACRES	Acreage farmed organically	180.18 (442.01)	56.47 (136.62)	94.52 (159.61)
LABR	Number of managers, full-time employees, and part-time employees	9.49 (24.61)	8.15 (17.66)	9.65 (10.04)
SOLEFAML	Sole proprietorship / family-owned farm (1 if yes)	0.85	0.88	0.88
COOPCORP	Farm is a cooperative or corporation (1 if yes)	0.07	0.05	0.03
TRANMIXD	Farmer originally a conventional producer, now farms organic and conventional acres (1 if yes)	0.23	0.06	0.12
YRCRTOR	Years certified as an organic farm	5.80 (5.09)	6.87 (4.92)	7.27 (4.61)
MALE	Farmer is male (1 if yes)	0.80	0.76	0.88
WEST	Farm is in SARE Region 1 (% of sample)	0.30	0.35	0.44
SOUTH	Farm is in SARE Region 3 (% of sample)	0.06	0.09	0.07
NOREAST	Farm is in SARE Region 4 (% of sample)	0.22	0.32	0.27
NORCENT	Farm is in SARE Region 2 (% of sample)	0.42	0.24	0.22
PCTRENT	Land leased for organic production, percent of total land farmed organically (%)	0.28 (0.38)	0.21 (0.36)	0.28 (0.39)
VALADD	Farmer sells organic value-added products (1 if yes)	0.67	0.77	0.93
SELLPROB	Index of organic selling problems, rating of 5 problems (ranges from 5–25)	9.17 (3.84)	9.16 (3.76)	11.07 (3.87)
FIBEPR	Difficulty in finding the best prices (ranges from 1–5)	2.30 (1.32)	2.24 (1.27)	2.79 (1.26)
RELPAYM	Reliability of payments from buyers (ranges from 1–5)	1.88 (1.18)	1.76 (1.10)	2.17 (1.22)
CERTACC	Nonacceptance of certification documentation (ranges from 1–5)	1.35 (0.79)	1.32 (0.78)	1.38 (0.82)
UNVERORG	Competition from unverified organic products (ranges from 1–5)	1.95 (1.25)	2.09 (1.31)	2.53 (1.38)
OVSUPPLY	Oversupply of organic products (ranges from 1–5)	1.70 (1.04)	1.75 (1.02)	2.20 (1.23)
No. of Observations		601	422	113

Notes: Values in parentheses are standard deviations of explanatory variables. Option 1 represents use of a single marketing channel (only retail, only wholesale, or only direct to consumer). Option 2 indicates use of two of the available outlets, and Option 3 represents use of all three available channels.

The labor input measure was defined as the sum of the number of managers, other full-time employees, and part-time employees. Farmers who use three marketing channels employ the most labor on average and the highest number of full-time employees. Farmers who specialize in a single marketing channel tend to rely more on part-time workers and have the fewest full-time managers. The average farm employed about four part-time employees and slightly more than four full-time employees.

Farm structure variables for sole proprietorships, family farms, and corporate organizations appear in the model. Sole proprietorships account for about 87% of farms, with corporations accounting for the smallest share (6%). Corporations report the largest mean organic income across the business structure categories (at $99,765), and sole proprietorships record the lowest organic farm income ($50,254). Alternative farm structures, including partnerships and property management firms, were grouped in the omitted category.

Two dimensions were combined to account for previous and current experience with organic production and marketing methods. Under U.S. regulations, farmers may certify as organic less acreage than they farm, leading to parallel organic and conventional systems being managed by the same operator. Only 24% of the OFRF respondents reported conducting this type of mixed farming. Farmers who were originally conventional producers but transitioned to organic production accounted for 42% of the OFRF respondents, compared with 58% who began farming as organic producers. The subset of farmers who transitioned to organic farming while maintaining mixed farming operations is highest among farmers specializing in a single marketing channel (23%) and considerably lower for farmers using diversified marketing outlets (12%). The producers who continue to use conventional production techniques, even while transitioning to organic production, were expected to have more familiarity with extension advisors for addressing any marketing problems that may arise.

Female farmers make up a significant share of organic farmers at 20% of U.S. organic farms and we use an indicator variable for gender. Data from the OFRF survey indicate male organic farmers tend to diversify their marketing outlets more frequently than females; approximately 11% of males use all three outlets, while only 6% of females pursue this strategy.

Producers who farm completely organic operations can focus time and resources to learn about the full complement of organic practices available and are more financially dependent on finding optimal organic systems for their conditions. Because the number of years the farm was certified as organic may influence production outcomes, this variable is included in the model. Farmers with certified organic status for most years may learn more about marketing opportunities for their products and are more likely to develop a diversified set of outlets. Farmers who sell through all three channels (wholesale, retail, and direct to consumer) have been certified for the longest time on average (over seven years). Producers who market through a single outlet report the lowest average number of years certified (slightly more than five years).

Farm and regional factors that influence the individual producer's effectiveness in adopting and applying organic methods, responding optimally to production and marketing constraints, and locating marketing channels are in the specification. To assess institutional support and information availability for organic production and marketing systems, we used the four USDA Sustainable Agriculture Research and Education (SARE) regions. These regions reflect the U.S. government's demarcation for sustainable agriculture extension-research support. A dichotomous variable was created for each region, equal to one if the respondent's farm was in that region, and zero otherwise. In the sample, farmers relying on one marketing outlet are concentrated most heavily in the North Central region (42%) and in the West region (30%). Farmers with a diversified marketing plan are more likely to be located in the West (44%) or the Northeast (27%).

The West region has historically received the strongest institutional support for organic agriculture and is home to two of the nation's oldest organic farm and certifying organizations, California Certified Organic Farmers, and Oregon Tilth. California enacted the first

state law to define organic foods in 1982. California and Washington were among the first extension services to conduct outreach and applied research on organic agricultural systems using teams of extension specialists rather than individuals. The locality-specific research needed for successful organic farming emerged earlier in the West than in the other regions. Estimation results are expected to show higher returns in the West region.

Given the choice of optimal marketing plan, producers develop marketing, pricing, and logistical skills while identifying constraints which influence sales of their products in the buying channels. Variables that have a direct effect on the earnings of organic producers while not directly influencing the choice of marketing outlets are part of the specification in order to identify the organic income equation. These variables are the percentage of land leased for organic production, an indicator that the producer is involved in value-added production, and an index of marketing problems identified by the producer. These variables enter only the income equation and are excluded from the discrete choice model of marketing outlets.

The farmer's commitment to sell into organic channels is represented by the percentage of land leased for organic production. Producers who lease land for organic production generate considerably higher farm incomes than producers who do not engage in leasing. The mean income for the farmers who rent is about $84,386 compared to $36,961 for farmers who do not rent additional acreage. The reported income premium does not vary significantly across the marketing options.

From the OFRF survey, we measure whether producers package or process value-added products made from their organic production. The survey lists a wide range of value-added products such as preserves, juices, and nut or fruit butters, along with grain products such as breads, pastas, cereals, and specialty meat products. Categories for value-added products from herbs and floriculture, vegetable, fruit, nut, and tree products, along with grains and livestock products are listed. The marketing of value-added products may be an indicator of entrepreneurial skill in evaluating and developing alternative marketing plans with the goal of increasing on-farm earnings. Organic earnings are about 17% higher for producers who develop value-added products, but this premium shows little relationship to the producer's choice of marketing outlets. The decision to market value-added products is not closely related to the crops produced on the organic operation. The correlations between the value-added indicator and acreage in each of the three aggregate production categories (field crops, vegetable, fruit, nut, and tree crops) are all below 0.20 in absolute value.

The OFRF survey elicited information on marketing problems faced by organic farmers that primarily influence the gross farm income earned by farmers. An index of marketing problems was constructed by summing the severity ratings evaluated from 1 to 5, with 5 being most serious. Five primary problems were identified in supplier bargaining relations with buyers: difficulty in finding the best prices, reliability of payments from buyers, non-acceptance of certification documentation, competition from unverified organic products, and oversupply of organic products. The variables created from these marketing problem ratings represent the transactions costs faced by suppliers when dealing with buyers.

The index of selling problems is consistent with the neoclassical approach to measuring transactions costs (Allen, 1991), defined as the costs of trading and coordinating resources through marketing arrangements. Food marketing consultants (such as Bishop and Tucker, 2003) note that each marketing channel has its unique requirements for suppliers—in distribution, slotting allowances, retail support, and packaging—implicitly outlining the kinds of transactions costs faced by producers across different channels.

Table 2. Marginal Effects for Choice of Marketing Options by Organic Producers

	Option 1		Option 3	
Variable [a]	Estimate	*t*-Ratio	Estimate	*t*-Ratio
ACRES	0.07*	6.97	−0.00	−0.79
LABR	−0.06*	−3.05	0.02*	3.50
SOLEFAML	−0.01	−0.17	−0.01	−0.54
COOPCORP	0.09	1.04	−0.05*	−3.50
TRANMIXD	0.29*	7.58	−0.02*	−1.68
YRCRTOR	−0.10*	−4.56	0.03*	3.82
MALE	−0.06	−1.53	0.03*	3.82
WEST	0.05	0.88	0.00	0.07
NOREAST	−0.00	−0.06	−0.00	−0.02
NORCENT	0.11	1.76	−0.03	−1.10

No. of Observations = 1,136
No. using Marketing Option 1 = 601
No. using Marketing Option 2 = 422
No. using Marketing Option 3 = 113

Notes: An asterisk (*) denotes asymptotic *t*-values with significance at $\alpha = 0.10$ level. Marketing Option 1 represents use of a single marketing channel (retail, wholesale, or direct to consumer). Option 2 is the use of any two outlets, and Option 3 represents use of all three available channels.

[a] Continuous variables are in natural logarithms.

The index potentially ranges from 5 to 25, with 25 indicating a maximum rating was given for each problem. Sellers using the complete set of marketing channels report an index of 11.07, while producers marketing through a single outlet have a score of 9.17. We examined the percentage of producers reporting the highest ratings for each element of the index, where the high rating indicates severity of the constraint (4 or 5 rating). The proportion of producers reporting a severe constraint is also very stable across the marketing options for each of the index elements.

Estimation Results for Marketing Choice Model

Marginal effects for continuous variables and discrete changes for dichotomous variables are reported in table 2. The marginal effects show the effect on the probability of using either marketing option 1 or 3, normalized with respect to the second marketing option. In the discrete choice model we focus on variables with significant marginal effects followed by an evaluation of the effects on organic incomes derived from the selectivity model.

Larger farms, as measured by acreage (*ACRES*), are more likely to rely on a single marketing channel and to choose a diversified portfolio of all three marketing channels. The amount of labor (*LABR*) used on the organic operation has a significant negative effect on the probability that the producer markets through a single channel (option 1). As farmers utilize higher levels of labor, they tend to market through all channels (option 3).

The OFRF surveys elicited information on the impact of labor constraints on production and marketing. Organic farmers using a single marketing outlet confirmed their operations did not experience significant constraints in hiring labor to produce and market their products.

Less than 7% of these farmers indicated that the availability of labor or high labor costs represented a severe constraint on their operations. This was the lowest level recorded by the organic farmers for the labor constraints variable across each of the marketing options. The implication is that adjustments in labor inputs are possible for organic farmers, and this flexibility enhances the ability of farmers to expand the set of marketing outlets used. Extension advisors consulting with these farmers with plans to expand their operations by hiring more workers could prepare materials with information on new marketing channels to feature organic produce.

The choice of a single marketing plan is positively related to whether the producer transitioned to organic methods while maintaining a mixed farm operation with conventional crops (*TRANMIXD*). Farms that are organized as a corporation or a cooperative show a lower probability that all three channels are used to market products (*COOPCORP*).

Producers who have achieved organic certification for longer time periods are less likely to use a single marketing outlet, while more experienced producers move to diversify their marketing strategies across all three channels (*YRCRTOR*). Stephenson (2009) commented that farmers tend to add direct marketing channels as the business grows, and the empirical results confirm the farmer's experience is associated with a more diversified marketing strategy. The coefficient for male organic farmers (*MALE*) is positive and significant in the decision to use all three channels. This finding implies males are more likely to simultaneously sell organic products through direct-to-consumer channels, through retail outlets, and in wholesale markets. Regional factors that may influence institutional support and technical information to provide organic production and marketing information do not play a significant role in the marketing choice of producers.

Model Implications for Organic Gross Farm Income

Before reporting the BFG model results, we first present the results one would obtain if Lee's model were applied (table 3). Our objective is to demonstrate how misleading and uninformative that model is relative to the BFG model, which provides deeper insight into the factors influencing earnings from the marketing strategies. The restrictions implicit in Lee's model are outlined above. Lee's model estimates a single selectivity effect and does not identify the marketing plan that is the source of bias. For the pooled OFRF data from the third and fourth surveys, Lee's selectivity model does not find any selectivity bias in the gross farm income model for producers choosing a single marketing channel. The model does not recognize that observed earnings have been influenced by farmers who do not perform well in a focused marketing strategy moving away from this strategy. The implication is that gross earnings from the single-outlet strategy are overestimated (biased upward) when the Lee model is employed. Organic farmers who are considering pursuing this strategy by looking at summary statistics of earnings could be misled by these artificially high returns.

The estimated coefficients from the BFG model were used to estimate the organic income equation, with the results presented in table 4. The BFG selectivity effects are represented by the $m(P_i)$ terms related to the alternative marketing strategies in the multinomial logit model. The three strategies generate three selectivity terms. The results reveal a set of consistent results across marketing options 1 and 3, along with some differential impacts. The implications for organic farmers who are deciding on marketing strategies are addressed and the coefficients from the BFG model are discussed.

Table 3. Estimated Coefficients for Organic Gross Farm Income of Producers: Lee Model

	Option 1		Option 3	
Variable	Estimate	*t*-Ratio	Estimate	*t*-Ratio
Constant	6.89*	23.39	4.01	1.59
ACRES	0.43*	11.11	0.39*	4.77
LABR	0.41*	9.07	0.83*	4.32
YRCRTOR	0.14*	2.00	0.55*	2.26
WEST	0.52*	2.84	0.19	0.45
NOREAST	0.41*	2.28	0.13	0.28
NORCENT	0.33*	1.81	−0.55	−1.18
PCTRENT	0.45*	4.28	0.32	1.44
VALADD	0.12	1.07	−0.54	−0.98
SELLPROB	−0.02	−0.34	−0.04	−0.24
$m(P)$	−0.42	−1.58	−1.22*	−1.66
No. of Observations	601		113	

Notes: An asterisk (*) denotes asymptotic *t*-values with significance at $\alpha = 0.10$ level. Selectivity effects from the Lee model are shown with only one selectivity effect for each marketing option. Marketing Option 1 represents use of a single marketing channel (retail, wholesale, or direct to consumer). Option 2 is the use of any two outlets, and Option 3 represents use of all three available channels.

The selectivity correction terms are significant in the choice of a single marketing outlet, indicating the presence of sample selection effects. Accounting for selectivity is essential to ensure the coefficients in the organic earnings equation are estimated consistently. For each earned income model, a positive selectivity coefficient for a given marketing option indicates higher earnings for the farmer relative to a randomly chosen producer (Dimova and Gang, 2007). This suggests farmers with unobserved characteristics linked to lower earnings shift to an alternative marketing strategy.

Note the positive selectivity effect [estimated value of 2.79 for the $m(P_3)$ coefficient] for the diversified marketing strategy in the earnings model for the single-market strategy. This result is due to higher than expected earnings for a focused marketing strategy (one outlet) because farmers with unobservable characteristics, which do not enhance earnings in the single-outlet strategy, have migrated toward the diversified strategy. The selectivity coefficient related to the second marketing option, $m(P_2)$, is also positive and significant in the single-market strategy. Earnings for organic products marketed through a single outlet are overestimated (biased upward) if the selectivity corrections are neglected. The two significant selectivity coefficients in the single-outlet model confirm the value of the BFG model in accounting for the impact of unobserved characteristics of organic farmers when estimating the returns to the chosen marketing strategy.

The less restrictive BFG model reveals an absence of significant selectivity effects for the diversified marketing option—indicating ordinary least squares (OLS) is the preferred estimation method for earnings from the diversified marketing plan. A negative selectivity effect from the Lee model suggests (incorrectly) that lower earnings accrue to organic producers who choose the diversified marketing option compared with producers using any other marketing plan. In this case, farmers may incorrectly opt out of diversifying into additional sales outlets. The less restrictive BFG model offers a more complete understanding of earnings from this marketing strategy.

Table 4. Estimated Coefficients for Organic Gross Farm Income of Producers: BFG Model

	Option 1		Option 3	
Variable	Estimate	*t*-Ratio	Estimate	*t*-Ratio
Constant	6.78*	16.18	0.44	0.09
ACRES	0.46*	9.83	0.35*	2.57
LABR	0.47*	8.18	0.78*	3.43
YRCRTOR	0.17*	2.14	0.54*	1.93
WEST	0.57*	2.83	0.17	0.37
NOREAST	0.41*	2.01	0.15	0.31
NORCENT	0.34*	1.67	−0.52	−1.00
PCTRENT	0.43*	4.06	0.31	1.39
VALADD	0.11	0.96	−0.50	−0.96
SELLPROB	−0.03	−0.45	−0.05	−0.26
$m(P_1)$	0.99	0.96	1.33	0.51
$m(P_2)$	1.56*	2.11	0.96	0.32
$m(P_3)$	2.79*	2.02	1.22	1.35
No. of Observations	601		113	
Wald Test [a] for elements of *SELLPROB*	10.29		2.27	

Notes: An asterisk (*) denotes asymptotic *t*-values with significance at $\alpha = 0.10$ level. Selectivity effects from the Bourguignon, Fournier, and Gurgand (BFG) model are represented by the $m(P_i)$ terms related to three marketing strategies in the multinomial logit model. Marketing Option 1 represents use of a single marketing channel (retail, wholesale, or direct to consumer). Option 2 is the use of any two outlets, and Option 3 represents use of all three available channels.

[a] A Wald test was unable to reject the null hypothesis that the coefficients of the selling problems index (*FIBEPR*, *RELPAYM*, *CERTACC*, *UNVERORG*, *OVSUPPLY*) are jointly equal to zero with a critical value for the Wald test of $\chi^2_{[5]} = 11.07$ at the 95% confidence level.

We also evaluate the coefficients from the BFG model. Acreage (*ACRES*) and labor (*LABR*) have significant positive impacts in each marketing channel, as expanded input levels are associated with higher incomes from organic production. In the log-linear model for farm income, the coefficients on acreage and labor represent elasticities. The output elasticities measure the change in the producer's income as the input changes. For producers marketing through a single outlet, the output elasticities indicate a 1% increase in labor used increases the value of organic production by 0.47%, while expanding the acreage farmed by 1% increases this value by 0.46%. The elasticities for producers who have developed a diversified marketing plan reveal a slightly different pattern because labor has a stronger impact in expanding organic income (0.78) than acreage (0.35). The number of years as a certified organic producer (*YRCRTOR*) has a positive effect on income earned from the choice of a single market and for producers who use all three marketing outlets.

The coefficient for the West region was significant for farmers choosing to market through a single channel. Farms located in the West, North Central, and Northeast regions have higher gross organic production values compared to farms in the South. However, farms in these regions do not achieve higher earnings relative to the Southern region when marketing through a diversity of outlets.

The percentage of land leased for organic production (*PCTRENT*) has a significant positive impact on earned income when marketing through one outlet, but does not influence

income when marketing through all the outlets. Compared with the other marketing options, the percentage of land leased by the single-outlet producers showed the highest positive correlation with producer's current portfolio of crops (field crops, vegetable, fruit, nut, and tree crops). This finding suggests these farmers represent the set of farmers who are most successful in integrating additional organic acreage with their current operations and perceived level of growing and marketing expertise.

Both the decision to sell value-added products (*VALADD*) and the index of marketing problems that sellers face from buyers (*SELLPROB*) were not statistically significant in either of the earned income models. Results from the models examining whether each marketing problem individually has a significant impact on the level of organic farm income are presented in table 4. A Wald test is unable to reject the null hypothesis that the coefficients (*FIBEPR*, *RELPAYM*, *CERTACC*, *UNVERORG*, and *OVSUPPLY*) are jointly equal to zero for producers using a single marketing channel or for producers using all the marketing outlets.

The only marketing problem indicator variable that was statistically significantly different from zero in the earnings equation for marketing through one channel was the difficulty in finding the best price (*FIBEPR*). The estimated coefficient suggests a difficulty in finding the best price is associated with reductions in earned income of about 9.74%, or an average decline in earnings of $5,393. Marketing problems associated with finding the best price may be the most severe constraint facing suppliers of organic products.

Both the index of marketing problems and the indicator of difficulty in finding the best price showed significant negative correlations with the producer's years of organic certification, confirming the role of farmer learning to reduce the impact of transactions costs. Extension experts could undertake case studies of the marketing plans implemented by these experienced producers to develop best marketing practices that could be transmitted to newer organic farmers.

Conclusions

Organic farmers face increasing pressure in developing a portfolio of different marketing channels and in bargaining competitively with increasingly sophisticated marketing participants in the supply chain for organic products. Food marketing analysts have emphasized that farm suppliers must diversify their customer portfolios. As Stephenson (2009) noted, organic farmers adjust their direct marketing strategies over time. Many organic farmers begin selling through a farmers market or a roadside stand and add direct sales channels such as a CSA, grocer, or restaurant outlet as their business grows.

This research assists producers by examining the marketing strategies of organic operations and identifies specific farm and demographic factors that enhance earnings given the choice of marketing outlet. The econometric model applies a more effective approach to correct for selectivity bias, more accurately identifying the returns to different marketing strategies used by organic farmers.

Results from the discrete choice model highlight variables that influence the choice of marketing outlets by organic producers. Extension agents, crop consultants, and marketing analysts can adapt this information to predict the type of market outlets a given farmer might use and provide better information for organic farmers. Family farms or sole proprietors or farmers who transitioned to organic production tend to utilize a single marketing channel, so these producers could be directed to develop these outlets. Farms employing more workers

gravitate toward marketing across a wider set of channels, while operations with a greater number of acres have a propensity to focus on a single outlet.

Producers with less experience showed a proclivity to use a single marketing outlet, while more experienced producers and male farmers diversify and market through all three channels. Information on the market channel a producer might initially consider and the optimal time to begin expanding the portfolio of outlets can be evaluated using the econometric model, which accounts for choice of marketing channel and the income attained given that choice.

The two significant selectivity coefficients in the single-outlet model confirm the BFG selectivity model is appropriate for the analysis of organic marketing choices. Organic earnings when marketing through a single outlet are biased upward since farmers who are better suited to market through multiple outlets have already moved away from this marketing strategy. An accurate evaluation of the projected earnings from this marketing strategy must account for selectivity effects. By contrast, the selectivity effects are absent for the diversified marketing option, indicating a simpler model (such as OLS) to explain earnings is appropriate.

Leading food marketing consultants (Bishop and Tucker, 2003) maintain that suppliers must develop a "portfolio of channel management strategies to connect with consumers across the marketplace," and tend to downplay the role of transactions costs as a constraint in choosing marketing outlets. The finding that the index of marketing problems faced by an organic seller was not statistically significant in either of the earned income models supports the conjecture.

From the organic income equation, we highlight difficulties in finding the best prices as a constraint on organic earnings. The presence or severity of these problems can be assessed in discussions with farmers, and programs can be implemented to overcome these constraints. Selling problems did not adversely impact organic earnings of farmers who develop a diversity of outlets, suggesting a positive role for information about alternative outlets. Experience in marketing organic products has a positive impact on organic farm incomes, even after accounting for selectivity effects.

The amount of labor on the organic operation has significant effects on both the choice of marketing outlets and the earnings in that outlet. The current format of the OFRF survey distinguishes between family and nonfamily labor, but does not specify how labor is allocated to specific tasks on the operation. Information on labor tasks such as production, planting, and harvesting could be differentiated from work requirements related to post-harvesting, processing, and marketing tasks in future surveys.

Additional research to identify the channel management techniques used by organic producers across different outlets to maximize their returns is warranted. Organic farmers may use contract and pricing arrangements that differ across outlets, such as spot market pricing, short-term forward contracts, or long-term forward contracts. Marketing channels may feature a variety of pricing strategies or service provision requirements. These elements should be investigated to assist organic farmers in monitoring channel performance and maximizing returns across market outlets.

[*Received July 2008; final revision received November 2009.*]

References

Allen, D. W. "What Are Transactions Costs?" In *Research in Law and Economics*, eds., R. Zerbe and V. Goldberg. Greenwich, CT: JAI Press, 1991.

Basuroy, S., and D. Nguyen. "Multinomial Logit Market Share Models: Equilibrium Characteristics and Strategic Implications." *Management Sci.* 44(1998):1396–1408.

Bishop, B., and K. Tucker. "Suppliers Must Diversify Customer Portfolios." *The Packer Online* (2 June 2003). Available at http://www.foodforesight.com/the_packer6_02_03.pdf.

Bourguignon, F., M. Fournier, and M. Gurgand. "Section Bias Corrections Based on the Multinomial Logit Model: Monte Carlo Comparisons." *J. Econ. Surveys* 21(2007):174–202.

Cattani, K. D., E. Dahan, and G. Schmidt. "Spackling: Smoothing Make-to-Order Production of Custom Products with Make-to-Stock Production of Standard Items." Marketing Paper No. 384, Anderson Graduate School of Management, University of California, Los Angeles, October 2007. Online. Available at http://repositories.cdlib.org/anderson/marketing/384.

Chambolle, C., and S. B. Villas-Boas. "Buyer Power Through Producer's Differentiation." Work. Paper No. 1042, Dept. of Agr. and Resour. Econ., University of California, Berkeley, 2007. Online. Available at http://ageconsearch.umn.edu/bitstream/6866/2/wp071042.pdf.

Dimitri, C., and C. Greene. "Recent Growth Patterns in the U.S. Organic Food Market." In *Organic Agriculture in the United States*, ed., A. J. Wellson. New York: Nova Science Publishers, 2007.

Dimova, R., and I. N. Gang. "Self-Selection and Wages During Volatile Transition." *J. Comparative Econ.* 35(2007):617–629.

Iyer, G. "Coordinating Channels Under Price and Nonprice Competition." *Marketing Sci.* 17(1998):338–355.

Lee, L.-F. "Generalized Econometric Models with Selectivity." *Econometrica* 51(1983):507–512.

McFadden, D. "The Choice Theory Approach to Market Research." *Marketing Sci.* 5(1986):275–297.

Ofek, E., and V. Srinivasan. "How Much Does the Market Value an Improvement in a Product Attribute?" *Marketing Sci.* 21(2002):398–411.

Park, T., and L. Lohr. "Choices of Marketing Outlets by Organic Producers: Accounting for Selectivity Effects." *J. Agr. and Food Industrial Org*. 4,1(2006): Article 4. DOI: 10.2202/1542-0485.1129. Online. Available at http://www.bepress.com.proxy-remote.galib.uga.edu/jafio/vol4/iss1/art4.

Progressive Grocer staff. "The Central Question." *Progressive Grocer* 81,5(1 May 2002):14–16.

Schmertmann, C. P. "Selectivity Bias Correction Methods in Polychotomous Sample Selection Models." *J. Econometrics* 60(1994):101–132.

Stephenson, G. "Direct Marketing Channels and Strategy for Organic Products−eXtension." Oregon State University, March 2009. Online. Available at http://www.extension.org/article/18381.

Stephenson, G., and L. Lev. "Direct Marketing Introduction for Organic Farms−eXtension." Oregon State University, March 2009. Online. Available at http://www.extension.org/article/18376.

Trost, R. P., and L. F. Lee. "Technical Training and Earnings: A Polychotomous Choice Model with Selectivity." *Rev. Econ. and Statis.* 66(1984):151–156.

Walz, E. *Final Results of the Third Biennial National Organic Farmers' Survey*. Organic Farming Research Foundation, Santa Cruz, CA, 1999. Online. Available at http://www.ofrf.org/publications/index.html.

———. *Final Results of the Fourth National Organic Farmers' Survey*. Organic Farming Research Foundation, Santa Cruz, CA, 2004. Online. Available at http://www.ofrf.org/publications/index.html.

Warner, M. "Wal-Mart Eyes Organic Foods." *New York Times* (12 May 2006). Online. Available at http://www.nytimes.com/2006/05/12/business/12organic.html.