Assessing the Impact of Direct Marketing in Overall Business Strategy: A Double Hurdle Approach

Problem Statement

As farms continue to increase acreage, an increasing emphasis on different management strategies has influenced farm operators and managers to employ various production and marketing strategies. One such marketing strategy that has gained significant importance as a management tool for managers is direct marketing. According to Govindasamy and Nayga (1997), two key drivers of the increase in the implementation of direct marketing are: 1) producers can receive a better price directly from consumers and 2) consumers receive a fresher product compared to that provided by traditional sources. The direct marketing strategy has been employed in a wide range of crops and livestock products (e.g. farmers markets and locally branded meats (Kohls and Uhl, 1998; Buhr, 2004)). Finally, direct marketing creates markets where people can buy produce from local farmers and growers reduces the distance that food travels between producers and consumers, which in turn decreases global environmental pollution.

The primary goal of implementing a direct marketing strategy is to capture a larger share of the consumers' dollar. Several studies have shown that farm managers are increasingly using direct marketing as a method to increase farm income (Cartier 1994; Govindasamy 1996; and Nayga Jr. et al. 1995). Increasing farm income from the implementation of direct marketing can have indirect impacts on the communities because as a farmer's income rises it stimulates the local economy and rural development (Darby et. al., 2008; Gale, 1997). Lastly, a recent trend to increase access to healthy foods, including organic foods, state governments have implemented direct marketing assistance programs to entities and farmers. These programs can include farm to institution programs such as schools, hospitals, prisons or other state agencies, farmers' markets, roadside stands, direct delivery, agri-tourism (such as pick-your-own farms) and subscription farming, and community supported agriculture (CSA). These are all examples of programs that provide small- and medium-size farmers an opportunity to develop new markets with often higher returns for their goods.

Objectives

This paper builds on the works of Govindasamy and Nayga Jr. (1997) and Govindasamy, Hossain, and Adelaja (1999) by using the Agricultural Resource Management Survey (ARMS), a national farm level survey. Our study is different with those mentioned above, by studying the producer side of the agricultural market. Specifically, we examine the characteristics of farm operators and mangers and not the consumer. First, we investigate factors such as operator and household characteristics, financial and production attributes, and regional location and proximity to metro areas that affect farm operators and managers decision to implement direct marketing in their overall marketing strategy. The second objective of this study is to assess the impact of direct marketing on farm income of farm households, once they have implemented direct marketing strategy. Our study is different than those found in the literature. First, in contrast, the majority of the literature on direct marketing focuses on the characteristics of consumers purchasing goods and services directly from producers. Second, we use a national farm level survey.

Govindasamy, Hossain, and Adelaja (1999) only use a survey conducted for New Jersey. This study is conducted at the farm level nationwide with the unique feature of a larger sample than previously reported in the literature, comprising farms of different economic sizes and in different regions of the United States. Finally, in the previous literature many papers have investigated whether or not the implementation of direct marketing has had a positive impact on income. However, none of these studies has linked the implantation of direct marketing and its contribution to income from farming. .

Data and Procedures

Most of the previous studies focus on factors influencing consumers buying directly from producers. For the purpose of this study the underlying assumption of the Double-Hurdle model is that farm households make two decisions with respect to direct buying in an effort to maximize utility; whether to participate in direct marketing (participation decision), and how much income they receive from participation in this activity. The participation and amount earned is determined by the same set of independent variables (Cragg, 1971). Therefore, in order to observe a positive level of income, two separate hurdles must be passed. Two separate latent variables are used to model each decision process with a binary choice model determining participation and a censored model determining the income level (Blundell and Meghir, 1987).

$$y_{i1}^{*} = \mathrm{w}_i'\alpha + \nu_i \qquad \textit{Participation decision} \quad (1)$$

$$y_{i2}^{*} = x_i'\beta + \mu_i \qquad \textit{Income level or outcome equation} \quad (2)$$

The decision to participate in direct marketing relates to income level (Blundell and Meghir, 1987)[1].

$$\begin{aligned} y_i &= x_i'\beta + \mu_i \qquad \textit{if } y_{i1}^{*} > 0 \textit{ and } y_{i2}^{*} > 0 \\ y_i &= 0 \qquad\qquad \textit{otherwise} \end{aligned} \qquad (3)$$

where y_{i1}^{*} is a latent variable describing the household's decision to participate in direct marketing; y_{i2}^{*} is the observed level of farm household income from this activity; w_i is a vector of explanatory variables accounting for the participation decision; x_i is a vector of explanatory variables accounting for the income, and ν_i, and μ_i are respective error terms assumed to be independent and distributed as $\nu_i \sim \mathrm{N}(0,1)$ and $\mu_i \sim N\left(0,\sigma^2\right)$.[2] The model assumes that both participation and income equations are linear in their parameters α and β. Consistent estimates of the Double-Hurdle model can be obtained by estimating (maximizing) the following likelihood equation.

$$L\left(\beta,\alpha,\sigma^2\right) = \prod_{0}\left[1 - F\left(w'\alpha\right)F\left(\frac{x'\beta}{\sigma}\right)\right]\prod_{1}\left[F\left(w'\alpha\right)\sigma^{-1}f\left(\frac{y - x'\beta}{\sigma}\right)\right] \qquad (4)$$

[1] This model in the literature is also referred as infrequence of purchase model.

[2] We assume these two error terms are independent, since this assumption is commonly utilized in the double hurdle model (e.g. Su and Yen 1996) and there is an evidence that the Double Hurdle model contains too little statistical information to support the estimation of dependency (Smith, 2003).

where *F(.)* and *f(.)* are, respectively, the standard normal cumulative and density functions and σ is the standard error. If the restriction $F(w_i'\alpha)=1$ is imposed, the likelihood equation for the Double-Hurdle model reduces to that of the Tobit model.

The estimation of equation (4) using the Maximum Likelihood Estimation (MLE) provides consistent estimates of the Double Hurdle model, it might not be efficient if the error term (σ^2) is homogenous across observations. However, this problem can be further improved by accounting for the heteroskedasticity of the error term. In this paper, we specify the standard deviation as an exponential distribution:[3]

$$\sigma = \exp(y'r). \quad (5)$$

where y is a vector of explanatory variables, also elements of x_i (Mihalopoulos and Demoussis 2001), determining the standard deviation and *r* is a column of parameter vector.

Data for this analysis is drawn from the 2002 Agricultural Resources Management Survey (ARMS). ARMS is conducted annually by the Economic Research Service and the National Agricultural Statistics Service. The survey collects data to measure the financial condition (farm income, expenses, assets, and debt) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households.

The target population of the survey is operators associated with farm businesses representing agricultural production in the 48 contiguous states. A farm is defined as an establishment that sold or normally would have sold at least $1,000 of agricultural products during the year. Farms can be organized as sole proprietorships, partnerships, family corporations, non-family corporations, or cooperatives. Data are collected from one operator per farm, the senior farm operator. A senior farm operator is the operator who makes the majority of the day-to-day management decisions. For the purpose of this study, operator households organized as nonfamily corporations or cooperatives and farms run by hired managers were excluded.

The 2002 ARMS survey collected information on farm households in addition to farm economic data collected through the regular survey. It contains detailed information on off-farm hours worked by spouses and farm operators, the amount of income received from off-farm work, net cash income from operating another farm/ranch, net cash income from operating another business, and net income from share renting. Furthermore, income received from other sources such as disability, social security, and unemployment payments, and gross income from interest and dividends are also counted. Additionally, the 2002 ARMS survey queried farmers on if the farm grew crops, livestock, poultry or their products that were sold directly to individual consumers for human consumption? The survey then queried farm operators on the gross income received from direct marketing.

Results

It is interesting to note that the double-hurdle model fits the data well since fifteen (out of the 22 variables specified in the model) are statistically significant in the participation decision equation. In addition, heteroscedasticity parameters of the continuous variables

[3] Although there is no general role to specify the functional form of the standard deviation, the exponential distribution is chosen for convenience to ensure the positive value of the standard deviation (Su and Yen 1996).

are statistically significant, implying the presence of heteroscedastic errors terms. Thus, the results are adjusted to account for heteroscedasticity.

Preliminary results from this study, shows that farms located in the South, Northeast and West are more likely to participate in direct marketing strategy. This is consistent with the facts that that these regions, dominated by small and medium sized farms are likely to participate in direct marketing and higher farm income and often venture into niche markets. The size of the nearby metro areas is also expected to have a positive impact on the use of direct marketing. This higher earning income base is an incentive for operators to employ direct marketing methods either though farmers markets or pick-your-own type strategies. Younger operators' and operators with off-farm income are expected to have a positive impact on the implantation of direct marketing. Further, Mishra and Goodwin (1997) and Mishra et al, (2002) point out that off-farm work is often a choice of farm operators and their spouses who reside near a metro area and have small and medium sized farms. Finally, as noted by Mishra et al., (2002) farm operators and spouses who work off the farm have higher level of education and are more aware of news and market information and keep up with new trends and habit formation in consumers.

Finally, farm's leverage is another important factor affecting implementation of direct marketing by the farming operation. Results indicate that lower to debt-to-asset ratio farming operations are more likely to adopt direct marketing strategy. This finding is consistent with the fact that about 80 percent of small and medium sized farms have low debt.

Conclusions

In the ever-changing environment of American agriculture, farm operators and managers are always looking for non-traditional marketing methods to employ in an effort to increase farm income. Direct marketing is just one strategy that farm operators could consider and extract a higher share of the consumers' budget and increase the income of the farming operation. Overall, we want to determine the characteristics of operators that are implementing this strategy and how it impacts their income from farming. Increasing the income of the farming operation can have indirect effect on the local community where the operation is located and help spur rural development in the area.

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