Diversification of the marketing chains among organic producers

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Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009

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Abstract

Diversification of consumers' demand and environmental concerns are at the origin of a trend towards short marketing chains and towards direct links between consumers and farmers in developed countries. This paper explores farmers' motivations for choosing these types of marketing chains and/or the "traditional" ones. To this purpose, a theoretical model of marketing chain choice is developed, and a multivariate probit model of organic farmers' choice of the marketing chain is estimated from a unique data set of organic farms in an Italian region.

Keywords: marketing chain, short chain, organic farms, multivariate probit

J.E.L.: Q12, D21, C25

Introduction

As a reaction to the growing environmental concerns, and to a more diversified consumers' demand, new models of agricultural production are growing. Farmers' markets are increasing in the USA and in Europe, and food miles labels are increasingly used for agricultural products. While there is a wide interest on consumers' preferences in these issues, little research is devoted to farmers' interest in using new marketing channels.

There is a widespread notion that these new marketing chains are particularly fit for small farms and for environmentally friendly and organic products, but to the best of our knowledge this notion has not been submitted to empirical scrutiny so far.

Also, the literature on farmers' choice of marketing alternatives is rather scanty. Some work concerns the choice of sale mechanism, like forward contracts vs. cash sale (Fletcher and Terza, 1986; Fu et al., 1988; McLeay and Zwart, 1988) in developed countries. Research concerning developing countries focuses on farm households' choices to sell or to buy (Goetz, 1992; Key, Sadoulet and de Janvry, 2000). A paper dealing with an issue similar to ours is the one by Fafchamps and Vargas Hill (2005), who examine the choice of coffee producers to sell at the farmgate or to travel to the market. They model the choice to travel to the market as a dichotomous variable, and as the distance travelled. Multiple choices are not considered.

The goal of this paper is to analyze the choices of marketing chains by organic farmers, and to identify the determinants of their choices. To this purpose, we exploit an unique dataset, providing data on quantities and prices of the different marketing chains used by organic producers in Piedmont Region, Italy (Regions in Italy are administrative bodies similar to states in the USA).

In the following paragraph the theoretical model and the econometric strategy are presented. The data used are then briefly discussed, and the results of the estimates are presented. Some considerations conclude.

Theoretical model and econometric approach

To simplify the presentation, assume there are only two marketing chains available to farmers, the traditional one (indicated by subscript t) and the new one (subscript n). Extension to multiple chains is straightforward. The marketing chains are characterized by different marketing costs, but by no quality difference in the product, since production technique is identical. The farmer is assumed to maximize profits:

$$\text{Max } \Pi = p_n y_n - C(y_n) + p_t y_t - C(y_t), \quad y_n \geq 0, y_t \geq 0, \tag{1}$$

where y_n and y_t, p_n and p_t are the quantities and the prices in the new and the traditional marketing channels, respectively, and C(.) indicate costs. The usual assumptions $dC/dy>0$ and $d^2C/dy^2>0$ hold. First-order conditions yield the usual conditions for internal and corner solutions:

$$p_n = C'(y_n) \text{ if } y_n > 0, \quad p_n < C'(y_n) \text{ if } y_n = 0 \tag{2}$$

$$p_t = C'(y_t) \text{ if } y_t > 0, \quad p_t < C'(y_t) \text{ if } y_t = 0 \tag{3}$$

where C' are marginal costs. Marginal costs have two components: production costs and marketing costs. While the latter differ between the two chains, production costs are independent from the channel. Therefore, at the internal solution equilibrium, marginal production costs need to be equal in (2) and (3), since they only depend on total production, not on the chosen marketing chain. The above equations for internal solutions can therefore be written:

$$p_n = C'(y_{nm}) + C'(y_p) \tag{4}$$

$$p_t = C'(y_{tm}) + C'(y_p) \tag{5}$$

where y_p is the total produced and marketed quantity and $C'(y_p)$ the relevant marginal production cost, which is equal in (4) and (5), $C'(y_{nm})$ and $C'(y_{tm})$ are marginal marketing costs in the new and the traditional marketing chain, respectively.

The conditions for the farmer to exploit a particular marketing chain are therefore:

$$p_n > C'(y_{nm}) + C'(y_p) \quad (6)$$

$$p_t > C'(y_{tm}) + C'(y_p) \quad (7)$$

For the empirical analysis, marginal costs are assumed to be a function of a set of explanatory variables and of a random error term. Therefore, the condition for using marketing chain *i* is:

$$P_i > \beta_i X_i + \varepsilon_i \quad (8)$$

or:

$$P_i - \beta_i X_i > \varepsilon_i \quad (9)$$

where *i* indicates the different marketing chains, p_i the relevant price, X_i are variables influencing marketing and production costs, and β_i are parameters to be estimated. Assuming the error terms are normally distributed, probit models follow. Given that unobserved variables may be common to the equations of the different marketing chains, a general correlation structure among the equations can be assumed. Therefore, error terms are assumed to be distributed according to a multivariate normal distribution. Joint estimation of the equations through a multivariate probit model exploits all available information and provides efficient estimators.

Data

The research concerns choices of the marketing chains by organic farmers. In the EU, organic farming is regulated by the European Council Regulations (EC) EC 2092/1991, 1804/1999 and 834/2007. No plant or animal product in Europe has the right to be labelled as "organic" if not complying with these regulations, and organic farms are listed officially. Data are drawn from a total survey, funded by Regione Piemonte, of all organic farms enrolled in the regional official list. More details on the survey can be found in Corsi (2007). At the time of the survey (2006), organic farms operating in Piedmont Region represented 1.4 percent of the total number of farms recorded

at the last Agricultural Census, kept in 2000. The questionnaire included data on the farm and on the farmer, and data on plant and livestock production (area or number, yields, price by destination), including products processed on the farm. In more detail, for conventional products, quantities and average price were surveyed. For organic ones, prices and quantities were surveyed by destination, namely: sold as conventional, sold on the farm, on farmers' markets, on the Internet, through home delivery, to co-operatives, to wholesalers, to supermarkets, to specialized organic shops, to restaurants.

The data for this analysis have been obtained by selecting those farms that had the registered office in Piedmont Region, could be classified according to the European Union typology[1], sold their products as organic, and had a total revenue larger than 1,000 euro. After dropping observations with problematic data[2], a total of 774 farms resulted.

The dependent variables are the dichotomous variables indicating whether sales are made through the relevant marketing chain. The chains have been aggregated into three groups: direct, i.e., sale on the farm; short, including farmers' markets, specialized organic shops, home delivery, restaurants; traditional, including co-operatives, wholesalers, supermarkets. Each farm can use one or more marketing chains, as shown in Table 1. While roughly one half of the farms sell through the traditional chain only, the other half uses other chains only, or several combinations of different chains. Overall, about 42 percent of the farms sell on the farm, 22.4 percent on the short chain, and 75 percent on the traditional chain. There is therefore some overlapping, and many farms sell on more than one marketing chain.

Table 2 presents the descriptive statistics of the variables used in the estimation.

Explanatory variables comprise variables affecting production and marketing costs. Production costs are affected by structural characteristics of the farms, and by the operator's human capital. Marketing costs include all transaction costs implied by the different marketing chains. Apart from search costs, marketing costs in the different chains may differ according to transport costs and labour costs. Transport costs depend on location, differently according to the specific marketing chain (for instance, sale to specialized shops imply higher transport cost as compared to wholesale).

[1] Commission Decision 85/377/EEC of 7 June 1985

[2] The price calculations (see below) for the different chains were problematic with aromatic plants, that included products with much different prices. For this reason, aromatic plants were not considered in calculating prices, and those farms only producing aromatic plants were dropped.

Most of labour is family labour in these farms, and its unit cost depends on family members opportunity wage. Opportunity wage is affected by their human capital endowment.

Structural characteristics of farm are assumed to affect production costs because of scale effects. We used Standard Gross Margin[3] as a measure of farm size, affecting production costs. At the same time, the size of farm production can also affect marketing costs, if small production discourages or favours some specific marketing chain. For instance, selling to restaurants and to specialised shops implies limited quantities of products. There is a wide variation in farm economic size, as shown by the standard deviation. Altimetry too (represented by dummy variables, the reference is the plain) refers both to production costs and to marketing costs. Mountain and hill areas are usually less productive than plain areas; they are also farther from main outlets. 27.5 percent of the farms are located in the mountains, 44 percent in the hills, the rest in the plains. Farms are classified by farm types according to a customized protocol adapted from the European Union typology. Seven farm types refer to crops: 38 farms belong to the typology specialist cereals, oilseed and protein crops, other than rice; 63 are specialized in rice; 48 farms produce general field crops; 26 are specialist horticulture farms; 65 are specialist vineyard farms; 167 are specialized in fresh fruit and 58 are specialist nut farms. The livestock farms are specialized in granivores (17), in bovine stock raising (24) and in sheep and goats (30). There is also a mixed crops and livestock farm type that includes 238 farms. All farm typologies are represented by dummy variables (the reference is mixed crops and livestock). Farm types obviously affect production costs, but the nature of the output also makes it more or less fit for particular chains. For instance, a priori one would say that horticulture products lend themselves to direct sale more than, say, cereals.

Farmers' characteristics refer to their human capital. They may affect production costs, but also marketing costs. Age is an indicator of skills acquired through experience. The average age in the sample is 49. Education was recorded as the maximum degree attained, and was translated into years of schooling, assuming the regular number of years were followed; the mean is 10.1 years. A dummy variable indicates if high school diploma and university degree were in the agricultural field; about 8 percent of operators are in this group. A further dummy variable indicates whether the farm operator followed a professional agricultural course in the last three years (the mean is about 3 percent). Operators are female in 35 percent of the cases, a much higher proportion than overall

[3] The Standard Gross Margin of a crop or a livestock item is defined as the value of output from one hectare or from one animal less the cost of variable inputs required to produce the output. It is a measure based on standard values defined at area levels , so using it as an explanatory variable does not suffer from endogeneity problems.

farms. All these characteristics are assumed to affect production and marketing costs, though the direction may be a priori unclear: education and experience imply higher efficiency and, hence, a higher implicit labour cost, which has different effects on the marketing costs, depending on their being more or less labour-intensive. On the other hand, skills acquired through working experience or formal education may translate into higher efficiency in finding the appropriate marketing chain and in exploiting it efficiently, so that they might reduce transaction costs.

Since farms usually produce more than one crop or animal product, we had to create an average price for each marketing chain. We used as a reference the traditional chain, and created relative prices for the other chains as follows: the quantities of each organic product sold by the farm were multiplied by the average price of that product on that chain, and summed up; the result was divided by the corresponding sum calculated over the traditional chain. The results are ratios between the prices of each chain and the price of the traditional chain. Using average prices for the calculation implicitly assumes that when farmers made their choices they had in view the average price that they could get from the different chains, and the difference with the actual prices they get is included in the random error. Accordingly with the theoretical model, the coefficients of the prices are forced to be 1 in the estimation; the price variable is dropped in the traditional chain equation, since it is used as the reference.

Results

Table 3 presents the results of the multivariate probit model. The model as a whole is highly significant. We also note that the correlation coefficients among the equations are highly significant too, which means that the multivariate probit model is superior to the individual probit models. Also, a likelihood ratio test rejects the restrictions implied by separate probit models for the three chains. The correlation is positive between the direct and the short chain, and is negative between both the direct and the short chains and the traditional one. This suggests that farmers who start using an alternative chain to the traditional one are more prone to using another one.

In general, the signs of the parameters too confirm that the traditional chain is alternative both to the direct and to the short chain, while direct and short chains are to a large extent influenced in the same way by the variables. Starting with the human capital variables, education levels and having attended professional training both negatively affect the choice of the traditional chain. By contrast, the signs for these variables are positive for both the direct and the short chain. A priori, one would

expect two contrasting effects of these variables. From one side, higher education implies a higher opportunity wage, and hence, higher labour cost. Since short and direct chains are more labour intensive than traditional chains, the effect of higher labour costs would push towards traditional chain. Also, professional training should raise the efficiency of agricultural labour, and hence, again, raise the opportunity cost of time devoted to marketing. On the other hand, higher education and more professional training can make farmers more open-minded in exploring new marketing chains and can provide higher skills in this field. The results of our estimates suggest that the latter effect overcomes the former.

By contrast, agricultural education has no significant effect. Probably, it does not provide any specific skill in marketing. Among the other human capital variables, age is significant, and positive, only for the direct chain. Gender is never significant.

Larger farms are more likely to use the traditional chain, as indicated by the significant and positive relevant parameter. The corresponding parameters are significant and negative for the direct and the short chain. There is therefore evidence that these chains are actually more fit for small farms.

Location also play a certain role in determining the marketing chain. The choice of the direct and short chains is significantly more likely in mountain and hilly areas. By contrast, traditional chains are significantly less likely in hilly areas, and the relevant sign for mountain is negative too, though not significant. Location is an indicator of distance from consumers and from selling points. From one side, then, direct and short chains are not easy to implement in these areas. Farming in mountain and hilly areas usually also implies higher production costs. These may push farmers to look for more profitable outlets for their products. Overall, the results suggests that the latter effect is prevailing.

Finally, the type of farming is relevant for the choice of the marketing chain. Cereals, rice, and field crops significantly and positively affect the choice of the traditional chain. The effects for the other chains are consistently negative. Cereals, rice and field crops typically undergo some processing before being consumed; though some organic farms do such processing on the farm, this is quite rare for these products. There is therefore little room for on-the-farm sales and for short chains. Also the parameters for fresh fruits and nuts types of farming are significant and positive for the traditional chain, and the relevant signs are negative and significant (with the exception of nuts for the direct chain) for the other chains. In this case, it is probably the seasonal concentration of the production, and the necessity of refrigerating plants to dilute the sales during the year, that play in

favour of traditional chains. By contrast, horticulture products, that are generally available across the years and can be sold in small quantities, favour the direct and short chains. The same applies to vineyards, that in Piedmont are for wine. Among animal productions, the effect of sheep and goats type of farming on the choice of the traditional chains is negative and significant. These are typically small farms, often making cheese out of milk, and these products hardly lend themselves to the traditional chains, that typically deal with large quantities. But also the short chain is negatively affected by this type of farming, while the effect is positive, but not significant, for the direct chain. Bovine stock raising significantly decreases the likelihood of the short chain. Finally, granivores (including hens and pigs) favour direct and short chains, and discourage the traditional chain.

Summary and conclusions

In this paper a multivariate probit model of organic farmers' choice of the marketing chains has been presented.

The results suggest that farmers' personal characteristics influence their choice, and that more educated and skilled farmers are less likely to choose traditional marketing chains and more likely to engage in the new marketing chains. Also, there is evidence that large farms rather choose traditional chains rather than the direct and the short chains. The other main determinant of the choice is the type of farming, with some types more fit for the traditional chains, and other for the direct and short ones.

References

Corsi A. (2007) *L'agricoltura biologica Piemontese. Un'analisi delle strutture e delle forme di commercializzazione*, Supplemento al n. 56 di "Quaderni della Regione Piemonte – Agricoltura", novembre 2007

Fafchamps M., Vargas Hill R. (2005) Selling at the Farmgate or Travelling to market, *American Journal of agricultural Economics*, 87: 717-734

Fletcher, S.M., Terza J.V. (1986) Analyzing Farmers' selection of Available Marketing Alternatives Using the Multivariate probit Model, *Canadian Journal of Agricultural economics*, 34: 243-252

Fu T., Epperson J.E., Terza J.V., Fletcher S.M. (1988) Producer Attitudes Toward Peanut Market Alternatives: An Application of Multivariate Probit Joint Estimation, *American Journal of agricultural Economics*, 70: 910-918

Goetz S.J. (1992) A Selectivity Model of Household Food Marketing Behavior in Sub-Saharan Africa, *American Journal of agricultural Economics*, 74: 444-452

Key N., Sadoulet E., de Janvry A. (2000) Transaction Costs and agricultural Household Supply Response, *American Journal of agricultural Economics*, 82: 245-259

McLeay F., Zwart T. (1998), Factors Affecting Choice of Cash Sales Versus Forward Marketing Contracts, *Agribusiness*, 14: 299-309

Table 1. Distribution by marketing chain

	Chain		
Farms	Direct	Short	Traditional
57	x	x	x
57	x	x	
101	x		x
28		x	x
109	x		
31		x	
391			x
774			

Table 2. Descriptive statistics of the variables

	Mean	Std.Dev.
Direct	0.419	0.494
Short	0.224	0.417
Traditional	0.745	0.436
Age	49.2	12.5
Gender	0.353	0.478
Years of education	10.1	3.8
Agricultural education	0.081	0.274
Professional training	0.028	0.166
Mountain	0.275	0.447
Hills	0.421	0.494
Gross Standard Margin (Euro)	95870	575820
Driving time to nearest town	29.7	16.7
Cereals	0.049	0.216
Rice	0.081	0.274
Field crops	0.062	0.241
Horticulture	0.034	0.180
Vineyards	0.084	0.278
Fresh fruits	0.216	0.412
Nuts	0.075	0.263
Granivores	0.022	0.147
Bovine stock raising	0.031	0.173
Sheep and goats	0.039	0.193
Mixed	0.307	0.462
Price direct/traditional	1.879	1.325
Price short/traditional	1.915	1.370

Table 3. Results of the multivariate probit

	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
	Direct		Short		Traditional	
Constant	-0.650	-1.187	-2.024***	-3.377	-2.603***	-3.492
Age	0.008**	2.086	0.006	1.318	0.004	0.731
Gender	0.334	3.602	-0.083	-0.864	-0.115	-0.944
Years of education	0.067***	5.117	0.0859***	5.773	-0.051***	-2.751
Agricultural education	-0.054	-0.259	0.284	1.538	-0.110	-0.463
Professional training	0.568***	2.703	1.354***	6.189	-0.943***	-3.181
Mountain	0.287*	1.956	0.330**	2.367	0.116	0.593
Hills	0.238*	1.811	0.206*	1.655	-0.287*	-1.651
Log Gross Standard Margin	-0.230***	-5.112	-0.162***	-3.719	0.367***	6.027
Cereals	-1.747***	-4.783	-2.863***	-8.628	2.285***	2.340
Rice	-4.665***	-11.290	-4.052***	-12.907	2.007*	1.871
Field crops	-0.538***	-3.289	-0.312*	-1.723	1.664**	5.427
Horticulture	0.298	1.234	0.919***	3.809	-0.685**	-2.349
Vineyards	0.591***	3.702	0.755***	4.588	-0.115	-0.604
Fresh fruits	-0.701***	-5.658	-0.630***	-4.888	0.620***	3.660
Nuts	-0.260	-1.330	-0.406**	-2.129	0.679***	2.726
Granivores	0.601*	1.824	0.805***	2.646	-0.964**	-2.240
Bovines	-0.107	-0.210	-2.669***	-14.740	-0.306	-0.679
Sheep and goats	0.417	1.416	-0.339**	-2.074	-0.831***	-3.188
R(direct, short)	0.465***	11.126				
R(direct, traditional)	-0.605***	-10.876				
R(short, traditional)	-0.382***	-6.511				
LL = -1356.779	Obs= 774					

***,**,*: significant at 1%, 5%, 10%, respectively