Determining the farmer demand for olive oil premium support: The case of Izmir, Turkey

Determinace zájmu farmářů o prémiové dotace k produkci olivového oleje: případová studie z oblasti Izmir v Turecku

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Abstract: The contribution is aimed at the research testing the reflection of olive oil premium support on farmers on the case of Izmir, in Aegean Region which is an important production area. The findings point out that small farms benefit less from the premium applications. The Probit and Heckman analysis showed that new policies directed at the small farms are required. In this context, different levels of premium for small farms should be paid, some inputs should be provided, and small producers should be assisted in marketing especially by promoting the farmers through co-operatives. Extension works organized for small farmers may have an informative and incentive role on the premium applications. Tax exemptions and crop aids are also appropriate tools for the small farmers to get more premiums.

Key words: olive oil, premium support, support policy, agricultural policy

Abstrakt: Příspěvek je zaměřen na výzkum dopadů prémiových dotací na produkci olivového oleje v případové studii farmářů z oblasti Izmir v Egejském regionu, který je významnou oblastí pěstování oliv. Výsledky výzkumu poukazují na skutečnost, že majitelé menších farem profitují z těchto dotací výrazně méně. Analytické metody Probit a Heckmanova metoda ukazují potřebu nových typů ekonomických politik zaměřených právě na malé farmáře. V této souvislosti je zdůrazněno, že by pro malé farmáře měly být aplikovány jiné úrovně prémiových dotací, měly by být uplatněny dotace inputů. Pro malé farmáře je potřebná také podpora marketingu, a to především formou marketingových družstev. Poradenství pro tyto farmáře by se mělo zaměřit rovněž na informace a stimuly týkající se žádostí o dotace. Vhodným nástrojem pro malé farmáře jsou i daňové úlevy.

Klíčová slova: olivový olej, prémiové dotace, dotační politika, zemědělská politika

Turkey is one of the few olive oil producer and exporter countries in the world. In the periods 2004/2005 and 2005/2006, world olive oil production average was 2 806 000 tons, and Turkey's share is 4.63%. In the same period, world olive oil export was 625 750 tons, while the Turkey share is 13.30% (IOOC 2007). The principals of price and market policy are directed at the agricultural sector in Turkey; during the marketing process of the agro-products, the price policy support, namely the support buying was constituted.

The supports, which begun firstly in 1932 with the interference of the government for wheat and grape market, are converted to the premium support and direct income support recently. The premium support was applied to serve the purposes of keeping the agricultural records and inventory conservation of both producers and processors, and providing the processors it was connected with obtaining the raw materials at world prices.

This premium support system has been applied firstly on cotton and after that, its application has been expanded to olive oil, sunflower oil, soybean and canola.

In this research, we aimed at testing the reflection of olive oil premium support on farmers in the case of Izmir, in the Aegean Region, which is an important production area.

MATERIAL AND METHOD

Izmir is located in the West of Turkey. It is the third biggest city in Turkey in the terms of economic and social indicators. Izmir provides 20% of the total olive production of Aegean Region where the olive production is mass. The olive oil farms are divided into three groups according to the olive growing area. For each group, using the formula stated below, 10% standard error and 95% confidence interval, the sample size was calculated (Güneş, Arıkan 1988) (Table 1).

$$n = \frac{S^2 \times Z^2 \times N}{(N-1) \times E^2 + S^2 \times Z^2}$$

n = number of samples
S^2 = variance of the sample
Z = confidence interval (1.96 for 95%)
N = total number of farms
E = error level (10%)

In the econometric analysis of data, the Heckman method was used that is suitable for the circumstances where the sample selectivity problem might exist.

RESULTS

Socio-economics characteristics of the olive oil farms

The average cultivated area is 4.09 ha in the studied farms. The ratio of the olive plantation land in the total farm area is 49.63% in the 1st group, 59.42% in the 2nd group, 73.40 in the 3rd group and 67.80% in average.

The household size of the farms is approximately 4 people. The average age of the farmers is 56 years and the average education level is 5.15 years.. In the research area, the farmers are organized especially in the National Chamber of Agriculture and in cooperatives. 90.27% of the farmers are members of the National Chamber of Agriculture. 84.07% farmers are the shareholders of cooperatives. 33.68% of farmers who are cooperatives shareholders are members of the Olive and Olive Oil Agricultural Wholesale Cooperative (TARIS).

Olive oil production and marketing

In the farms, 92.59% of the total olive production was processed for oil production, 1.70% was used for home consumption and 5.71% sold.

There are four kinds of using olive oil in farms: self consumption, paid fee for processors, sold and kept for stock (Table 2). The farmers have chosen to stock olive oil because the premium payment was not announced and farmers were expecting the price to increase in future.

The effects of the olive oil premium support on farmers

The basic aim of the olive oil premium support can be summarized as to supply raw material for edible oil industry and to support the farmers.

Table 1. Distribution of the farms in the sample based on olive area

Groups	Farm size (daa)	Farms in population	Average	Standard deviation	Sample	
					farms	(%)
1	< 10	214	7.16	2.28	36	31.9
2	11–30	372	19.43	5.37	29	25.6
3	30 <	121	49.40	18.38	48	42.5
Total		707			113	100.0

Table 2. Olive oil usage in farms

Groups	Olive oil production (kg/farm)	Olive oil usage (%)			
		home consumption	processing fee	sold	stocks
1	387.03	23.99	12.16	26.69	37.16
2	581.53	12.20	11.22	22.15	54.43
3	1 308.67	9.85	7.47	43.58	39.10
Total	828.44	12.38	8.84	37.20	41.58

The first premium support on olive oil was given in 1999 on the level of 40 cents per 1 kilogram and it was 9 cents in 2007 (MARA 2007). The situation of the farmers regarding the premium is given in Table 3.

76.92% farmers who had the premium were very satisfied with it the rest of them (23.08%) were not fully satisfied with the premium system.

It is seen that the farmers have not gained enough benefit from this premium because the government announced the premium system too late in 1999 and the farmers were not able to provide the necessary documents.

The farmers stated that the premium system has two kinds of benefit for their production system. The first one is to determine the income- cost statement with the recorded data and secondly, farmers enhanced their cultivating operations such as soil treatment, disinfection, fertilizations and irrigation. Most of the farmers stated that their cultivation activities had been increased after the premium implementation. The trimming which is extremely important for the yield is done more often than the other cultivation treatments (Table 4).

It can be concluded that the large size farmers gave more importance to the cultivation treatments after the premium implementation.

Table 3. The situation of farmers regarding the premium (%)

Group	With premium	Without premium
1	44.44	55.56
2	65.52	34.48
3	89.58	10.42
Total	69.03	30.97

Model and estimation

Analyses of olive oil premium data obtained from cross-sectional surveys that involved the premium-producer relationships supply both measurable and binary responses because of the categorical nature of the decisions made by farmers. The traditional methods used in this type of analyses have been the OLS or Tobit analysis if a large proportion of farmers decided to take no premium. Because of the discrete nature of such decisions, however, the qualitative choice models are useful analytical tools. The models include the Probit model, the Logit model and the linear probability model (Falusi 1976). These models use different distributional assumptions to determine the probability that Y_i is 0 or 1. However, the linear probability model has three important weaknesses: the error term may exhibit the properties of heteroscedasticity; it may also possess the elements of non-normality; and the predicted value of the dependent variable may fall outside the unit interval. Jonas et al. (1989)show that while the generalized least squares (GLS) may circumvent the problem of heteroscedasticity, truncating the value of the dependent variable through the Logit analysis does not resolve the problem. Probit is used in this study for a number of reasons. First, Probit has the ability to generate the bounded probability estimates for each observation (Anim, Lyne 1994). Second, the Probit estimator assumes that the underlying error term follows a normal distribution which is the same distributional assumption typically made for continuous variables.

We conducted an analysis using a Heckman selection model since the selection bias was potentially an important problem in this study. Selection bias is an error in choosing individuals or groups included in a study. Ideally, the subjects in a study should be very similar to each other and to the larger population from which they are drawn (for example, all

Table 4. The difference between the cultivation activities before and after acquiring the premium in the studied farms (farmers in who had premium, in %)

Groups	Soil treatment		Disenfection		Fertilization		Trimming	
	inc.	n. c	inc.	n. c	inc.	n. c.	inc.	n. c
1	43.75	56.25	12.50	87.50	37.50	62.50	56.25	43.75
2	36.84	63.16	15.79	84.21	26.32	73.68	42.10	57.90
3	55.81	44.19	9.30	90.70	30.23	69.77	53.49	46.51
Total	48.72	51.28	11.54	88.46	30.77	69.23	51.28	48.72

inc. = increased, n. c. = not changed

individuals with the same preferences). If there are significant differences, the results of the study may not be valid, or biased. The Heckman selection model provides consistent, asymptotically efficient estimates for all parameters in the model and, for example, allows us to use information from the producers who received no premium to improve the estimates of the parameters in the regression model.

The basic idea of a sample selection Heckman model is that the outcome variable, y, is only observed if some criterion, defined with respect to a variable z, is met. The common form of the model has two stages:

$$\left.\begin{array}{l} z_i^* = w_i'\alpha + e_i \\ z_i = 0 \ \text{ if } \ z_i^* \le 0 \\ z_i = 1 \ \text{ if } \ z_i^* > 0 \end{array}\right\} \quad \text{Selection equation}$$

$$\left.\begin{array}{l} y_i^* = x_i'\beta + u_i \\ y_i = y_i^* \ \text{ if } \ z_i = 1 \\ y_i \ \text{ not observed } \ z_i = 0 \end{array}\right\} \quad \text{Outcome equation}$$

In the first stage, a dichotomous variable, *z*, determines whether or not *y* is observed, *y* being observed only if *z* = 1 (and we estimate a model with some matrix of independent variables, *w*, and get some coefficients, alpha, the model is estimated, of course, with an error term, ***e***); in the second stage, we model the expected value of *y*, conditional on its being observed. So we observe *z*, a dummy variable, which is a realization of an unobserved (or latent) continuous variable, *z**, having a normally distributed, independent error, ***e***, with zero mean and a constant variance sigma squared ***e***. For values of *z* = 1, we observe *y*, which is the observed realization of the second latent variable (and model that with some independent variables *X* and get a vector of coefficients beta), *y**, which has a normally distributed independent error *u*, with a zero mean and a constant variance, sigma squared ***u***. The two errors are assumed to have a correlation, rho. The joint distribution of *u* and ***e*** is bivariate normal.

The selection equation is estimated with the maximum likelihood as an independent Probit model to determine the situation to receive premium using information from the whole sample of members and non-members. A Probit model is an econometric model in which the dependent variable, y_i, can be only one or zero, and the continuous independent variable x_i is estimated in:

$$Pr\,(y_i = 1) = F\,(x_i'\beta)$$

where β is a parameter to be estimated, and *F* is the normal *cdf*. The vector of the inverse Mills ratios (estimated expected error) can be generated from the parameter estimates (Greene 2000). The level of the advance use *y* is observed only when the selection equation equals 1 (i.e. a farmer receives the premium) and it is then regressed on the explanatory variables *x* and the vector of the inverse Mills ratios from the selection equation by the ordinary least squares. Therefore, the second stage reruns the regression with the estimated expected error included as an extra explanatory variable, removing the part of the error term correlated with the explanatory variable and avoiding the bias. The sample selection bias has been corrected by the selection equation, which determines whether an observation makes it into the non-random sample. In simpler words, the Heckman method consists of a two-step estimating procedure. In step 1, we first estimate the probability of a farmer, for example, receiving the premium, which is done on the basis of the Probit model. In step 2, we estimate the model whose dependent variable is the received premium and independent variables are farm size, olive land etc plus a variable (called the inverse Mills ratio) that is derived from the Probit estimate. The Heckman model was estimated using Stata 7.0 econometric programme.

Table 5. Definition of the variables used in the Heckman model

Variable	Definition
Total premium	Total premium paid to farmer
Yield	Olive oil yield per decar
Farmland	Total farm land (decar)
Olivepro	Share of olive land in total farm land (%)
Numberofplot	Number of plot
Ownership	Land ownership dummy (1 for own land)
Premiumdum	Premium dummy (1 if premium received)
Oliveland	Olive land (decar)
Farmerexperience	Farmer experience in olive (year)
Farmereducation	Farmer education (year)
Farmerage	Farmer's age (year)
Creditdum	Credit dummy (1 if farmer got credit)
Waiting	Waiting period before processing olive
Memberofchamber	Dummy for membership to chamber of agriculture (1 if farmer is member)
Memberofcoop	Dummy for membership to cooperative (1 if farmer is member)

In the literature, the Heckman procedure has been used in a wide area such as education (Fersterer, Winter-Ebner 1999; Caponi, Plesca 2000; Holmes 2003), employment (Gray 2000; Tanseli 1995), woman labour supply (Nawata 2004), contribution of married women to labour force (Mroz 1987; Serumaga-Zaka, Kotze 2003), immigration (LeClere, Mclaughlin 1997), agricultural production function (Heshmati 1994), human capital (Erdogan 1999), demand for agricultural products (Tambi 2001) and wages (Tansel 1998).

Estimation results for the Probit analysis on the probability of a farmer tendency for receiving the olive oil premium are given in Table 6. The model has been found statistically significant at $\alpha < 0.05$ ($LR\ \chi^2(9) = 32.95$). According to the Probit model:

The larger the olive land, the more premium the farmer receives. These farms have wide and strong information sources. Consequently, they have more information about the premium application and have the power to be able to cope with the necessary procedure for it. This points out that the small olive farms tend to be farther from receiving the premium.

Table 6. Probit results on the farmer premium: The dependent variable is the Premium Dummy

Variable	Coefficient (Std. Err.)
Oliveland	0.01346*** (0.007331)
Farmerexperience	0.014439 (0.029601)
Farmereducation	0.00946 (0.096967)
Farmerage	–0.00876 (0.029991)
Ownership	0.800316 (0.516104)
Creditdum	0.34338 (0.320581)
Waiting	–0.04384*** (0.022926)
Memberofchamber	1.865723* (0.606059)
Memberofcoop	-0.2707 (0.429658)
Constant	–1.86676 (1.222739)
LR χ^2(9)	***32.95****
R^2	***0.24***

***statistically significant at the 10% level, *statistically significant at the 1% level

Therefore, policies are needed to encourage the small farmers to receive the olive oil premium. Farmers whose olives are longer waiting before processing receive fewer premiums. Waiting refers to the waiting time period before the olives are taken to the press process. The more waiting at the press process, the less premium the farmer receives. This is an expected result since the waiting process causes a decrease in the olive oil quality.

If the farmer is a member of the Farmers' Chamber, he/she can receive a higher premium than the others. The member farmers may receive new information on the policy applications faster and may get more details on how to apply for receiving the premium via the assistance from the Chamber. Therefore, farmers who want to get more premiums should become members of the Chamber.

Table 7 displays the estimation results of the Heckman model for the olive oil premium. This model was estimated for the purpose of distinguishing the variables which are affecting the demand for the olive oil premium. More importantly, it defines if it is necessary for a premium policy to take into account only the olive oil premium receivers or both olive oil premium receivers and non-receivers together.

The estimated Heckman model is statistically significant with $Wald\chi^2$ (6) = 283.38 at $\alpha = 0.01$. The λ parameter in the model was found statistically significant what means the olive oil premium policy should take all the olive oil farmers, receiving or

Table 7. The Heckman selection model: The dependent variable is ln (Total premium)

Variables	Coefficient (Std. Err.)
Yield	0.900214* (0.07247)
Farmland	0.914438* (0.070923)
Olivepro	0.797169* (0.100334)
Numberofplot	0.001602 (0.003565)
Ownership	-0.02511 (0.219753)
Constant	-0.15783 (0.561486)
Lambda (λ)	-0.4414065* (0.2113872)
Wald χ^2 (6)	***283.38****
R^2	***0.92***

*statistically significant at the 1% level

non-receiving, to create an efficient policy for the olive oil premium.

Both yield and farm size of the olive oil farms positively affect the premium demand. Furthermore, the more weighted olive land in the farm land, the more premium the farmer demands. This confirms the result from the Probit model. The smaller farmers benefit less from the premium policy than the larger ones. Policy makers should take certain measures to support the interests of smaller farmers regarding the policy application. In this context, different levels of premium for small farms should be paid, some inputs should be provided, small producers should be assisted in marketing especially by promoting the farmers interests through co-operatives. Extension works organized for small farmers may have an informative and incentive role on the premium applications. Tax exemptions and crop aids are also important tools for the small farmers to get more premiums.

Agricultural policies are expected to be disseminated all over the related farmers. From this standpoint, the olive oil premium policy was not successful due to the insufficient participation of small olive farmers.

CONCLUSION

Olive oil is one of the few crops that are included in the support premium system in Turkey. This policy aims at taking farmers into the farmer database, orienting the production, encouraging the farmers to produce olive oil for closing the gap in the vegetable oil production and providing the EU harmonization. The policy showed its effects in the first year. The olive producers applied more cultivation activities and it eased determining the olive oil costs. However, this study indicates that there are some shortcomings in the premium policy. Particularly the fact that smaller farmers get fewer premiums is the main lack of the policy. These points out that smaller farmer focused policies are needed. By establishing new press houses or increasing the capacity of the available press houses, the decrease of the waiting period at the press process will increase the success of the policy. Another important point in increasing the performance of such policies is to influence the farmers to become members of farmer organizations.

Olive oil is an important healthy food in human nutrition. Therefore, it should be promoted to the level it deserves. The way to a successful policy for olive oil leads through a wider contribution of the farmers to the policy.

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