

The determinants of vinegrowers employment and policy implications: the case of a Greek island

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Abstract

This study investigates the employment of vinegrowers on a Greek island (Samos) where there exist attractive alternative employment opportunities, particularly in the tourist sector. The recent dramatic decline in the number of vinegrowers has been of great concern particularly to wine producers, policy makers, and local authorities because such a pattern has had, and most importantly will have, serious economic, social, and environmental implications. The focus of this paper is on two issues. First, some descriptive statistics on the demographics of vinegrowers and characteristics of vineyards are presented and second, a probit model is developed to identify the demographic and other determinants of the probability of off-farm and off-vineyard work participation. The most important source of data information is primary data collected by the authors, using a questionnaire, which was completed by a representative sample of vinegrowers from the island of Samos. The empirical findings suggest that the promotion of vinegrowing requires policies that will enlarge the size of vineyards, promote investments in human and physical capital, and improve the public infrastructure.

JEL classification: L66, Q12, Q13

Keywords: Farm employment; Vinegrowers; Wine producers; Agricultural policy; Agricultural cooperatives

1. Introduction

This study investigates labor supply decisions of vinegrowers on a small Greek island (Samos) given the demand for on-farm and off-farm labor. Farmers' labor supply decisions have attracted considerable interest for a number of reasons. First, there is an interest in improving the theoretical and empirical understanding of how economic units (farm households) behave and reallocate their scarce resources

(labor time). Second, there is an interest in examining farming as a business sector where issues of economic efficiency and competitiveness become very important. Third, wine producers are interested because the recent dramatic decline in the number of vinegrowers has raised their concerns over the future supply of grapes to produce wine. Fourth, this decline has also been of concern to policy makers and local authorities because such a pattern has had, and most importantly will have, serious economic, social, and environmental implications. Finally, there is an interest in the well-being of farmers because their employment alternatives relate to poverty, underemployment, and of course to policy effectiveness to improve their conditions.

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The modeling of time-allocation aims at deriving labor supply equations for both spouses of a farm household. The critical decision is whether to work on the farm full time or to find alternative complementary employment in the off-farm sector. A number of variables affect such a decision, and both husbands and wives take this decision jointly. Similarly, the decision to allocate time in more than one farm activity is also jointly determined. Thus, a representative household of vinegrowers has three alternatives. First, to allocate all its time in the vinegrowing sector. Second, to work only in the farm sector, including vinegrowing, and third to work on the farm and the off-farm sector. In the case of Samos, the third alternative is more popular. A number of variables affect the decision to work off-farm. For the purpose of this paper, these variables are grouped into four categories: demographic variables, attitudinal variables, variables that describe the characteristics of vineyards, and regional characteristics variables.

Four reduced-form equations are estimated. Two are estimated to examine the determinants of the off-farm supply decisions of husbands and wives in a farm household. Two more equations are estimated to examine the decision to work off-vineyard. The four equations are fitted to data from a random sample of Samos vinegrowers households. However, to examine interdependence between the male and female off-farm work participation, each variable is made a function of the other. For example, the decision of the husband to supply labor in the off-farm labor market is assumed to depend on the wife's decision to work off-farm as well. The econometric evidence shows that off-farm and off-vineyard work participation is strongly influenced by demographic variables such as age and family size, the size of the vineyard, and the unemployment rate. There is also a positive relation between the two spouses decisions to work off-farm.

Including this introduction, this paper is organized into six sections. Section 2 presents a theoretical framework of the determinants of off-farm labor supply and reviews some relevant empirical studies. Section 3 describes the sources of data and summarizes the descriptive properties of the data in terms of endogenous variables and the four types of explanatory variables. Section 4 develops and estimates an empirical model using various specifications. Section 5 looks at the policy implications of the empirical findings and the last section concludes.

2. A theoretical model

The model presented here was developed by Huffman (1980), Sumner (1982), and more recently by Kimhi and Lee (1996). Households maximize a utility function over a composite consumption good (C), leisure time (T_L) and a vector of other variables (\mathbf{Z}) specified in the next section. The latter affect the position of the utility function.

$$U = U(C, T_L, \mathbf{Z}). \quad (1)$$

The utility function is assumed to be ordinal and strictly concave. It is maximized subject to two constraints: a time and a budget constraint. First, households allocate their total time (T) into four types of activities: work on the vineyard (T_v), other farm work (T_a), off-farm work (T_m), and leisure (T_L)

$$T = T_v + T_a + T_m + T_L. \quad (2)$$

T_m and T_a are nonnegative, while T_v and T_L are positive.¹

Second, it is assumed that household's total income is equal to household's total consumption (C). In this case, there are four sources of income: income from vineyard (Y_v), income from farm work (Y_a), income from off-farm work (Y_m), and other income (Y_o), e.g., income from property

$$C = Y_v + Y_a + Y_m + Y_o. \quad (3)$$

In this framework, there is no need to specify separate functions for husbands and wives. It is assumed that all decisions are taken jointly by all family members. Income depends upon a number of variables that characterize the labor market and the personal characteristics of each individual household, including preferences for leisure and work. Other important characteristics that condition the time devoted to farming and vinegrowing are the size of the farm (Q_a) and vineyard (Q_v) and the degree of mechanization. All other characteristics are included in the vector \mathbf{Z} .

$$Y_v = Y_v(Q_v, \mathbf{Z}) \quad (4)$$

¹ In this case, the time devoted to vinegrowing is always positive since only vinegrowers were surveyed and not the population at large.

$$Y_a = Y_a(Q_a, \mathbf{Z}) \quad (5)$$

$$Y_m = Y_m(T_m, \mathbf{Z}). \quad (6)$$

The solution of the above household optimization problem can be found by maximizing the following function over C and the various labor supply activities (T_v , T_a , T_m , and T_L):

$$\begin{aligned} L = & U(C, T_L, \mathbf{Z}) + \lambda[Y_v(Q_v, \mathbf{Z}) + Y_a(Q_a, \mathbf{Z}) \\ & + Y_m(T_m, \mathbf{Z}) + Y_o - C] \\ & + \mu[T - (T_v + T_a + T_m + T_L)]. \end{aligned} \quad (7)$$

The first-order conditions of Eq. (7) will give a reduced-form optimal solution in such a way that each endogenous variable will be expressed as a function of all explanatory variables. If the participation in off-farm and off-vineyard work activities is represented by a dummy variable, then this can be expressed as a function of all explanatory variables. Hence, from the optimal condition, a dummy variable representing participation in off-farm work (S_m) is obtained as a function of all the shift variables included in the vector (\mathbf{Z}):

$$S_m = S_m(\mathbf{Z}, Q_a, Q_v, Y_o). \quad (8)$$

An empirical specification of this equation is estimated using the data described in the next section. Also, in the same section, all variables that are included in vector (\mathbf{Z}) are specified by presenting descriptive statistics of all endogenous and explanatory variables.

3. The data

The model is fitted to data for a random sample of vinegrowers households of the island of Samos (the definition of variables is given in the Appendix). In Samos, all vinegrowers belong to one producers' cooperative with local branches in almost all villages. Our statistical population consisted of all cooperative members. The total number was 4,000. Our sample size target was 400 taken from 11 villages. Three types of villages or areas were included: villages that attract a lot of tourists, average tourists, and few tourists. For a number of reasons, absenteeism, death, refusal, etc.,

less than 400 households were surveyed (335) or 85%. It should be emphasized that the actual percentage of households is greater than 10% because in many cases more than one member of a family belongs to the cooperative. However, not all questions of the survey were answered. For each variable or estimated equation, the number of observations included is reported. Regional data were obtained from the Greek National Statistical Authorities (ESYE).

In the empirical specification, four endogenous binary variables are used: off-farm labor supply of males, off-farm labor supply of females, off-vineyard labor supply of males, and off-vineyard labor supply of females. Table 1 reports descriptive statistics for the four endogenous variables. The great majority of vinegrowers, 95%, work outside the vineyard, including other farm and nonfarm activities.² This is true for both males and females. However, there is a significant difference between males and females when it comes to supplying labor in the off-farm labor market. Almost two-third of males, 64%, work outside the farm sector. The corresponding number for females is less than half the percentage of males. Only 29% of females participate in off-farm work activities.³

The explanatory variables, variables that belong to vector \mathbf{Z} , are grouped into four types: demographic (family size, age, education, and migration), farm-related characteristics (size of vineyard, size of other farmland, years in farming and vinegrowing, analysis of soil, use of machinery, years of managing the farm, the existence of building infrastructure on the farm, the use of fertilizers, and average age of vineyard), attitudinal variables (attitude toward modernization, being elected in the executive of the cooperative, the extent of television watching, and the reading of newspapers), and a set of variables that describe regional (village) characteristics (how attractive to tourism is the area, total employment and employment by sector, labor force, labor force under 25, and the unemployment rate). Descriptive statistics for each group are presented in the next four tables.

Table 2 presents data on the demographic characteristics of the vinegrowing households. The size of

² The on-vineyard employment only is a subset of the on-farm employment only.

³ The number might be an underestimation of the actual situation because of moonlighting, particularly in the tourist sector.

Table 1
Descriptive statistics of work participation

Variable*	Mean	Median	Maximum	Minimum	SD	Skewness	Kurtosis	Obs.
EMPLM	0.64	1	1	0	0.48	−0.56	1.31	239
EMPLF	0.29	0	1	0	0.46	−0.91	1.82	225
EMPLMV	0.95	1	1	0	0.22	−3.99	16.94	322
EMPLFV	0.95	1	1	0	0.21	−4.29	19.36	278

*Definitions of variables are provided in the Appendix.

the average family of vinegrowers is slightly above 3, which is below the national average of almost two children per family. The average age of males is 59 years, of females 54 years, with a very wide range for both. Similar is the average age of their children. There is no difference in the years of education between husbands and wives, but children have on average 50% more years of education than both their parents. These findings are similar to the data obtained from the national survey and show the problem of the very high average age of the farm labor force. Finally, 16% of the households of vinegrowers had at least one family member working in a foreign country.

Table 3 reports the survey data on farm-related characteristics. The size of the vineyard is much smaller than the size of other farmland, mainly olive oil trees. The average size of the vineyard is 8 stremmata (2 acres), with a minimum of 1 and a maximum of 45. What is more important is the average age of the vine, which is 27 years with a very large range. The fact that the average number of years in farming is 36 years, of which an average of 28 years have been spent responsible to the operation reflects the problem of the aging farm labor force. Almost half of the vineyards, 46%, used some sort of machinery (small tractors) and

39% had some sort of infrastructure (buildings) in the vineyard. All of them used significant quantities of fertilizers, with an average of 664 kg per farm, with a minimum of 15 and a maximum of 4,000.

Four variables, reported in Table 4, describe the attitude of the vinegrowing households. The first variable on a scale from 1 to 4 captures the attitude of the vinegrowing household in terms of adopting new methods of farming. Not surprisingly, given the age of the vinegrowing households, the attitude of the average household is not progressive. Only 13% of the households have been elected to the cooperative's executive. However, most of the households showed a great interest in following issues related to farming, either covered by the television or newspapers. The former is more popular since the issues in television score 3.1 and in newspapers 2.8.

Table 5 presents descriptive statistics of variables that describe the 11 villages that were used in the survey. In terms of total labor force, all villages are relatively small (219–1,724 people). Most individuals are employed in the tertiary sector and very few are under the age of 25. There is also a variability in the unemployed rate from 1% to 22%, but these figures are not very reliable.

Table 2
Demographic characteristics

Variable*	Mean	Median	Maximum	Minimum	SD	Skewness	Kurtosis	Obs.
FAMSIZE	3.17	4	10	1	1.36	0.30	4.25	335
AGEM	59	60	94	22	14	−0.24	2.47	325
AGEF	54	55	85	18	14	−0.24	2.42	290
AGEC	26	25	60	2	11	0.06	2.8	228
EDUCM	7.82	6	18	0	3.30	1.19	3.64	313
EDUCF	7.52	6	18	0	3.02	1.33	4.10	286
EDUCC	11.33	12	18	1	3.15	−0.44	3.42	181
MIGR	0.16	0	1	0	0.37	1.81	4.27	335

*Variable definitions are provided in the Appendix.

Table 3
Characteristics of vineyards

Variable*	Mean	Median	Maximum	Minimum	SD	Skewness	Kurtosis	Obs.
FARMVS	8.05	6	45	1	7.17	2.13	8.72	330
FARMS	14.13	10	70	1	12.71	1.58	5.45	304
FARMY	36.14	38	77	1	17.12	0.18	2.08	335
FARMVY	36.04	38	77	1	17.10	-0.16	2.08	335
AGEVINE	27.25	25	100	1	16.39	1.44	6.51	327
ANAL	0.057	0	1	0	0.23	3.8	15.5	333
MACH	0.46	0	1	0	0.5	0.15	1.02	335
BUILD	0.39	0	1	0	0.48	0.45	1.2	328
FERT	664	500	4,000	15	621	2.35	10.4	318
RESP	27.83	27	72	1	15.10	0.22	2.30	332

*Definitions of variables are provided in the Appendix.

Table 4
Attitudinal variables

Variable*	Mean	Median	Maximum	Minimum	SD	Skewness	Kurtosis	Obs.
ATTIT	1.34	1	4	1	0.93	2.41	6.90	335
UNION	0.13	0	1	0	0.33	2.26	6.10	335
TVATT	3.10	3	4	1	0.90	-0.72	2.67	334
PAPER	2.80	3	4	1	1.06	-0.36	1.87	333

*Definitions of variables are provided in the Appendix.

Finally, it is of great interest to compare some personal characteristics of those who work exclusively on the farm with those who participate in off-farm work activities as well, since these characteristics play an important role in determining on-farm and off-farm labor supply. Table 6 presents some characteristics that can be used to compare the profile of the vinegrowing individual that engages in farm activities only with the one that performs some off-farm activity as well.

On average, the members of households with off-farm employment are younger with an average age of 53 years compared to 72 for members of households

that are not employed in off-farm activities. The average education of the members of households with off-farm employment is higher by 3 years. These households are larger, have younger children, and smaller farms.

4. Empirical results

Four models were estimated using different specifications. Table 7 reports the probit results of two equations: off-farm and off-vineyard work participation of

Table 5
Regional characteristics

Variable*	Mean	Median	Maximum	Minimum	SD	Skewness	Kurtosis	Obs.
TOURISM	2.05	2	3	1	0.85	-0.09	1.38	335
EMPLR	348.44	210	1,623	50	395.83	2.36	7.62	335
EMPLRP	93.00	87	211	29	46.28	0.87	3.72	335
EMPLRS	86.33	41	481	7	124.20	2.32	7.32	335
EMPLRT	164.73	53	982	12	248.78	2.49	8.2	335
LFR	374.76	219	1,724	53	421.93	2.30	7.42	335
LFR25	61.00	30	340	9	85.24	2.47	8.08	335
URR	6	6	22	0.68	4	3	10	335

*Definitions of variables are provided in the Appendix.

Table 6
Descriptive statistics of farm and off-farm employment

Variable*	Farm employment					Off-farm employment				
	Mean	Max	Min	SD	OBS	Mean	Max	Min	SD	Obs
AGEM	72	94	22	9.6	87	52.6	85	30	12.1	152
EDUCM	6.2	12	0	1.8	82	9.2	18	6	3.8	149
FAMSIZE	2.7	6	1	1.3	87	3.5	7	1	1.1	152
AGEC	36.7	60	25	7.6	41	21.2	48	2	10.1	125
EDUCC	12.3	18	6	3.6	39	11.5	18	5	2.6	86
FARMVS	6.81	40	1	6.4	87	7.1	45	1	6.5	148
FARMS	17	63	1	14.6	75	12.8	70	1	11.3	140
FARMY	51.4	77	4	12.3	87	29.3	67	2	14.1	152
FARMVY	51.1	77	4	12.5	87	29.3	67	2	14.1	152

*Definitions of variables are provided in the Appendix.

Table 7
Participation in off-farm and in off-vineyard work (males)

Explanatory variables	EMPLM I	EMPLM II	EMPLM III	EMPLMV I	EMPLMV II	EMPLMV III
EMPLF	1.25 (3.3)	1.3 (3.4)	1.25 (3.4)	0.50 (2.1)	0.50 (2.2)	0.42 (1.9)
AGEM	0.11 (5.4)	0.12 (6.6)	0.11 (6.6)	0.05 (2.2)	0.08 (5.2)	0.06 (4.9)
AGEMSQ	-0.001 (-6.0)	-0.002 (-6.8)	-0.002 (-7.6)	-0.0005 (-2.3)	-0.0009 (-4.9)	-0.0007 (-4.3)
FAMSIZE	0.17 (2.8)	0.16 (3.4)	0.18 (3.18)	-0.14 (-2.5)	-0.15 (-2.8)	-0.15 (-2.8)
MIGR	-0.77 (-2.5)	-0.75 (-2.4)				
FARMVS (in logs)	-0.32 (-2.5)	-0.32 (-2.6)	-0.34 (-2.9)	-0.33 (-2.8)	-0.39 (-3.6)	-0.33 (-3.1)
RESP	-0.02 (-2.2)	-0.02 (-2.1)		0.02 (2.8)	0.03 (3.7)	0.03 (3.8)
TVATT	0.1 (0.9)			0.16 (1.8)		
UR	-0.06 (-2.4)	-0.06 (-2.2)	-0.07 (-3.0)	0.08 (2.0)		
TOURISM				-0.25 (-2.3)	-0.26 (-2.4)	
Log likelihood	-104	-105	-113	-134	-140	-143
Number of observations	288	289	292	303	304	304

Note: *t*-statistics are in brackets.

males.⁴ The corresponding equations for females are reported in Table 8. The inclusion of a particular explanatory variable was determined by the four types of variables presented in the previous section. An attempt was made to include at least one variable from each

category in accordance with the relevant theoretical considerations. The second criterion was the statistical significance of the coefficient. All explanatory variables were tested, but only the statistical variables are presented.⁵

⁴ The probit method is explained in Goldberger (1964).

⁵ A list of all explanatory variables is presented in the Appendix.

Table 8
Participation in off-farm and in off-vineyard work (females)

Explanatory variables	EMPLF I	EMPLF II	EMPLFV I	EMPLFV II	EMPLFV III
EMPLM	1.18 (3.3)	1.18 (3.4)	-0.22 (-0.8)		
AGEF	0.08 (1.8)	0.05 (1.7)	0.10 (3.5)	0.10 (4.3)	0.10 (4.8)
AGEFSQ	-0.0009 (-2.0)	-0.0007 (-2.1)	-0.0009 (-3.0)	-0.0009 (-3.7)	-0.0009 (-4.1)
FAMSIZE	-0.17 (-1.9)	-0.17 (-1.9)	-0.09 (-1.2)	-0.11 (-1.8)	-0.12 (-1.9)
FARMVS (in logs)	-0.22 (-1.8)	-0.21 (-1.8)	-0.40 (-3.2)	-0.33 (-2.9)	-0.38 (-3.4)
ATTIT	0.12 (1.3)		0.01 (0.1)	-0.05 (-0.6)	
TOURISM	-0.17 (-1.1)		-0.21 (-1.5)	-0.23 (-1.8)	-0.18 (-1.5)
MOUNTAIN	-0.017 (-3.3)	-0.01 (-3.5)	-0.009 (-2.5)	-0.006 (-1.9)	-0.006 (-2.1)
MOUNTAIN (squared)	0.00004 (3.2)	0.00004 (3.3)	-0.00002 (2.7)	0.00002 (2.3)	0.00002 (2.4)
UR	-0.14 (-1.7)	-0.11 (-1.6)	0.06 (1.6)	0.04 (1.5)	
Log likelihood	-115	-117	-109	-132	-133
Number of observations	289	292	250	330	330

Note: *t*-statistics are in brackets.

The first empirical question relates to the interdependency of the decision to work outside the vinegrowing and the farm sector. How does the male decision affect the female decision and *vice versa*? By looking at Tables 7 and 8, it is observed first that there is a positive effect of female off-farm work participation on the probability of the work off-farm and off-vineyard by males. Second, the effect on off-farm work participation is much stronger than the effect on off-vineyard work participation.⁶

The impact of male's decision to work outside the farm has a positive effect on the probability of female off-farm work participation, but it does not have a statistically significant impact on the probability of females to work off-vineyard. The first impact is as strong as the corresponding impact of females on the off-farm work participation of males.

Demographic variables play an important role in the decision to work off-farm and off-vineyard. The effect

of age on off-farm and off-vineyard participation of males is similar to other empirical studies.⁷ Participation increases with age, but it declines after a certain age is reached (the coefficient of age squared has a negative sign). Education does not play a statistically significant role, but there is a strong correlation with age. Other empirical studies have found mixed results for the education variable.⁸ In general, more years of schooling increase individual's income from off-farm work. These variables have similar impacts for both males and females.

Family size has a different impact on males and females. A larger family increases the probability that a male will work off-farm. This might be interpreted as a need to supplement farm income from other sources. It, however, decreases the probability that a male will work off-vineyard, which is puzzling. The effect of a larger family on the probability of female work off-farm and off-vineyard is negative. This is not

⁶ Off-vineyard work participation was highly correlated with the other variables for both male and female work participation functions. Better statistical results are obtained using off-farm work participation in all models.

⁷ A survey of these empirical studies is presented in Hallberg et al. (1991).

⁸ See Bollman (1979), Huffman (1980), Huffman and Lange (1989), and Sumner (1982).

at all surprising. A larger family increases the time required for home-related activities and therefore reduces the time available for off-farm work. Migration has a negative impact but only for male off-farm work participation.

The size of the vineyard has a consistent negative impact on off-farm and off-vineyard work participation for both males and females. The effect is stronger for males. A 10% increase in the size of the vineyard reduces the probability that males will work off-farm by about 3.4%. On the other hand, a 10% increase in the size of the vineyard reduces the probability that females will work off-farm and off-vineyard by about 2% and 4%, respectively. This negative impact can be the result of two effects. First, a larger vineyard demands more time. Second, the size of the vineyard can be used as a proxy for income from holding assets. Higher asset income increases the demand for leisure time and thus reduces the supply of off-farm and off-vineyard work activities.

Another farm characteristic variable that is statistically significant is the number of years that a vinegrower has had full responsibility for his farm. However, the sign of this effect is negative for off-farm and positive for off-vineyard work participation. The negative impact can be interpreted using a human capital approach. The higher the number of years that someone has been working on the farm, the higher his productivity and, therefore, the lower his supply of labor to off-farm work. The positive impact on the probability of off-vineyard work participation can be interpreted as an indication of work diversification within the farm sector and presumably benefit from his long experience in farm-related activities.

Attitudinal variables do not have a statistically significant impact on off-farm or off-vineyard work participation for both males and females. Only the interest in farm-related television programs has a positive impact on the first specification of the equation that describes male off-vineyard work participation. However, one should expect a negative impact. A high interest for farm related issues should decrease the probability to work off-vineyard. However, the estimate positive effect is not strong and the variable was dropped in the other specifications.

The last group of variables relates to the regional characteristics. The variable mountain measures the altitude of the village. Since mountainous villages are

located far away from the areas where alternative employment opportunities exist, this variable can be used as a proxy for the cost of transportation. Similar to other empirical findings, an increase in the cost of transportation lowers the probability of off-farm employment. In our model, this was the case for the female work participation, but no impact on the probability of off-farm and off-vineyard work participation by males is measured.

The unemployment rate measures the ease of finding a job. High unemployment rates reduce this ease. Off-farm work is conditioned by the unemployment rate. Higher unemployment rates can be expected to reduce off-farm employment. The empirical evidence supports this theoretical explanation. The unemployment rate has a negative impact on the probability of both male and female off-farm work participation.⁹ From a statistical point of view, the impact is stronger for males, but the magnitude of the effect is larger for females. The unemployment rate did not have a statistical significant impact on off-vineyard work.

The last variable is tourism. To the extent that tourism measures the existence of employment alternatives, a positive impact is expected. This is true only in the case that the tourism-related work activities do not come into conflict with the farm-related activities. If this is the case then a negative impact is expected, but the causality runs the other way. This might be the case with vinegrowing, but not with other farm activities such as olive trees. Most vineyard activities coincide with the peak of the tourist season. Thus, off-vineyard work activities and tourism related work activities are negatively related. The empirical evidence supports this view. Tourism does not affect off-farm work activity but it negatively affects off-vineyard work participation.

In conclusion, the empirical evidence shows that off-farm and off-vineyard work participation is strongly affected by demographic variables, particularly age and family size. The size of the vineyard has also a statistical significant impact on off-farm employment. The other variables that have a significant impact are those that describe regional characteristics such as village altitude and the unemployment rate. Finally, there

⁹ Notice that the negative effect is for off-farm work participation and not for off-vineyard since the latter includes employment in other farm activities.

exists a significant positive interdependence between the two spouses' decisions to participate in off-farm work activities.

5. Discussion and policy implications

What are the policy implications of the empirical findings? To answer this question one must first examine some economic and noneconomic indicators of the island of Samos. The focus is on vinegrowing, but the recommendations can be applied to other farm activities as well. Samos is a small island with 42,000 people according to the census of 1991. The population has remained relative stable at 42,000 in 1971 and 41,000 in 1981. More than half of the population is rural (25,000 in 1991). The total cultivated area is 185,000 stremmata (46,000 acres), of which 15,000 are devoted to vineyards with an annual production of 9,000 tons of grapes. The great majority of wine production is exported (70%), mostly to France, other European Countries, and to North America. Samos is also an attractive tourist area with a high rate of growth in the last decade. During the 1987–1995 period, the number of tourists doubled from 450,000 overnight in 1987 to 810,000 in 1995. The supply of hotel rooms also doubled from 5,500 in 1987 to 11,300 in 1995.

The descriptive evidence of this paper has shown that vinegrowing is facing serious problems. The most important are the following:

- Most of the vinegrowers are old. The average age of males is 59 and of females is 54. This picture changes dramatically when the sample is separated into farm and off-farm work participation. The average age of males that are exclusively employed in farm-related activities is 72 years while those that participate in off-farm activities is 53. Age plays a role in determining off-farm work participation.
- The average age of vineyards is 27 years with a median of 25. This implies that there is an urgent need for replanting.
- Only 5.7% of the farm households have done analysis of the soil of their vineyards and only 46% use some sort of machinery.
- The size of the vineyards is small. The average vineyard is 8 stremmata (2 acres) with a maximum of 45 and a minimum of 1. This is important because the empirical evidence shows that there is a negative

relation between size of the vineyard and the probability of off-farm work participation.

- A very small proportion of farmers have followed seminars that relate to farming. There is a need to increase the number of seminars and make them more relevant to the real needs of the farm population.
- There is a need for infrastructure and improvement of labor market conditions. The empirical evidence shows that there is a negative relation between the existence of infrastructure such as rural roads and the probability of off-farm work participation. The promotion of employment that is complementary to farming requires better infrastructure.

It is important to emphasize that there is a significant difference between rural development policy and farm policy.¹⁰ The latter should be an integral part of the former. In the case of the island of Samos, rural development policy makers have made it a priority to ensure that a certain level of farm household income is obtained from farm and off-farm employment.¹¹ According to these policy makers, vinegrowing on the island can be sustained if vinegrowers' income is supplemented by other sources, including off-farm work. However, rural development policy cannot be insulated from national and global developments. Within this context, Deavers (1991) offers a number of policy alternatives that can promote rural development:

1. Facilitate capital and labor movement to industries that have a competitive advantage.
2. Support those industries that become more competitive.
3. Improve the human capital endowments of rural youth.
4. Invest in rural infrastructure in order to promote economies of scale and increase the size of the labor market.
5. Facilitate the development of new rural enterprises by supplying capital and information.

¹⁰ Deavers (1991) offers a discussion of rural development policies. He makes a distinction between territorial policy and human resource policy. A big part of these programs is the "importance of off-farm employment to the well-being of farm households."

¹¹ In the process of the research, the authors have interviewed the prefecture of the island and the general secretary of the region who are responsible for constructing the development plan of the area and allocating public funds from national and EU sources.

6. Support local institutions such as cooperatives to access their comparative economic advantage, identify new opportunities, and secure all necessary resources to exploit these opportunities.

Johnson (1991) has also suggested a number of policies that will strengthen rural labor markets. These include:

1. Support the creation of jobs in rural areas, emphasizing employment creation in sectors that are complementary to farm employment.
2. Promote the development of entrepreneurship among farm households.
3. Encourage public education programs.
4. Improve rural infrastructure to promote rural business and make the rural labor markets more accessible.
5. Offer more job training programs.
6. Promote part-time farming by eliminating institutional barriers such as tax laws, inheritance laws, social security, financing, etc.

The empirical evidence of Samos support some elements of the rural development programs suggested by Deavers and Johnson. A number of specific policy recommendations result from the above analysis. First, given the extent of off-farm work participation, the only way that vinegrowing can be sustained is by encouraging the pluriactivity of vinegrowers. Policies should not discriminate between full-time farmers and part-time farmers. All those who are engaged in farm production in one way or another should be considered farmers. The demographics show that very soon there will be no people employed exclusively on the farm.

Second, there is a need for investments in human and physical capital. These could include a number of policies. To start, a detailed analysis of the climatic and soil characteristics of the island is needed. As the descriptive evidence has shown, this is lacking because it is not worthwhile for individual owners of small vineyards to bear the cost. As local policy makers consider that there are social benefits from vinegrowing, then part of this cost should be covered by public funds.

Third, policies to promote economies of scale in farm production. The empirical evidence has shown that the size of the vineyard is small. This is a big issue and requires fundamental changes in the inheritance

law, the forest code, and financial support. It also requires a change in the attitudes of the young generation who consider the vineyard as a family heirloom, and for this reason they are not willing either to sell it or to exchange it as part of a policy program for land reallocation.

6. Conclusions

This study investigated off-farm and off-vineyard work participation of vinegrowers on a small Greek island (Samos) for both males and females. Using cross-sectional observations on individual vinegrowers and a probit model, the probability of participating in off-farm and off-vineyard work activities was investigated. Four models were estimated using different specifications. Most of the findings are in accordance with the evidence reported by other empirical studies. Four types of explanatory variables were used: demographic, farm-related characteristics, attitudinal, and regional.

The participation of the spouse in off-farm employment has a positive impact on the decision of the other spouse to participate in off-farm work. Demographic variables such as age, family size, and migration have a significant impact. Education does not play a statistically significant role, but this is probably due to its high correlation with age.

The size of the vineyard is an important determinant of the probability of off-farm work participation. An increase in the size of the vineyard reduces the probability of off-farm work participation by both males and females.

Variables that describe regional characteristics were also important, particularly the unemployment rate and the altitude of the village. Tourism does not play a statistically significant role.

The descriptive and econometric evidence has been used to suggest a number of policies that will promote work on the farm, but at the same time supplementary income from off-farm work. An important distinction was made between rural development programs and farm policy. Policies that support farming should not be independent from the overall rural development policies and are affected by developments at the national and global level. A number of policies that aim at sustaining vinegrowing on the island are proposed.

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Appendix. Definition of variables

Name	Source	Description
FAMSIZE	E2.1	Number of family members
AGEM	E2.2	Age of vinegrower—male
AGEF	E2.2	Age of vinegrower—female
AGEC	E2.2	Average age of children
EDUCM	E2.2	Years of education—male
EDUCF	E2.2	Years of education—female
EDUCC	E2.2	Years of education—children
EMPLM	E2.2	0 = employment of male in farm only 1 = employment of male off-farm, including pensioners, but no other gainful activity
EMPLMV	E2.2	0 = Employment of male in vinegrowing only 1 = Employment of male in off vinegrowing (including pensioners, but no other gainful activity)
EMPLF	E2.2	Similar to EMPLM but for females
EMPLFV	E2.2	Similar to EMPLMV but for females
EMPLCV	E2.2	0 = Employment of at least one child in vinegrowing only 1 = Off vinegrowing employment
EMPLCT	E2.2	1 = Employment in tourist related activities 0 = Otherwise
FAMABS	E2.3	Number of family members that do not live in the same home
FAMSUB	E2.4	0: Family members who do not live in the same home and they do not help with vinegrowing 1: Family members who do not live in the same home but they do help with vinegrowing
SEMINARS	E2.5	Number of attended seminars that relate to vinegrowing
MIGR	E2.6	0: No family member migrated 1: Yes at least one family member has migrated to a foreign country to work
MIGRFIN	E2.6	0: No migration money was used for agricultural purposes 1: Yes
INHER	E2.7	0: No, I don't want my children to inherit my vinegrowing activities 1: Yes, I want
INHERB	E2.8	0: I don't believe my children will continue with vinegrowing 1: Yes, at least one child will continue
FARMVS	E3.1	Size of vineyard in stremmata (1/4 of an acre)
FARMS	E3.2	Size of other nonvineyard in stremmata
FARMY	E3.3	Years in farming
FARMVY	E3.3	Years in vinegrowing
AGEVINE	E3.3	Average age of vinefarm
ANAL	E3.4	0: No analysis of the soil 1: Yes
MACH	E3.5	0: No machines (tractors, etc) 1: Yes
BUILD	E3.6	0: No buildings (storage, etc) 1: Yes
LEASE	E3.9	Number of stremmata leased
BUY	E3.11	Number of stremmata bought

(Continued)

Appendix. (Continued)

Name	Source	Description
LABOR	E3.12	Number of workdays of labor used
HELP	E3.13	0: No help from friends 1: Yes
FERT	E3.15	Quantity of fertilizers used
RESP	E4.1	Number of years person has had the main responsibility of vinegrowing
ACCOUNT	E4.2	0: No accounts kept 1: Yes
ATTIT	E4.4	4: Learn, try, and apply 3: Wait and see 2: Be established 1: Continue with the old method
UNION	E4.7 (2)	0: Never elected to cooperative executive 1: Elected
LOAN	E4.11	Number of times that a loan was drawn
TVATT	E4.15	1: Never watch television 2: Rare 3: Often 4: Regularly
PAPER	E4.16	1: Never read newspapers 2: Rare 3: Often 4: Regularly
TRIPS	E4.17	Number of trips
TOURISM	Subjective estimation by local authorities	1: Not very touristic 2: Middle 3: Very touristic
EMPLR	ESYE	Total employment
EMPLRP	ESYE	Employment in primary sector
EMPLRS	ESYE	Employment in secondary sector
EMPLRT	ESYE	Employment in tertiary sector
LFR	ESYE	Labor force
LFR25	ESYE	Labor force under 25 years old
MOUNTAIN	ESYE	Altitude of village
UR	CALCULATED	Unemployment rate

Note: E# refers to the question in the survey questionnaire. OGA includes “activities” that earn income, such as owning and renting apartments or buildings.

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