JOURNAL OF AGRICULTURAL ECONOMICS, EXTENSION & SCIENCE ISSN (Print) 2545-5179, ISSN (Online) 2714-5018
Official Journal of the College of Agricultural Economics, Extension & Science JAEES Vol. 7 No. 2 2021, Pages 86 - 96
www.jaees.org

EFFECT OF HOUSEHOLD ENDOWMENT AND SOCIO-ECONOMIC CHARACTERISTICS ON LAND USE DECISIONS- A DATA TRANSFORMATION TECHNIQUE

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Abstract

The study explains what drives the farm household decision to leave land fallow. Agricultural Household survey data carried out by the Statistical Office of Kosovo (SOK) and comprising of 4187 agricultural house holds were used for the study. To achieve the specific objectives the socio-economic characteristics, capital endowment as well as institutional factors were examined. The data were transformed in order to meet the objective of the study. The transformation of these selected variables was carried out to explore non –linear relationships. Findings showed that arable land, access to credit/liquidity, irrigated area of land as well as labour and capital availability decrease the probability of leaving land to fallow while larger distance from market, transaction cost, small size of plots, number of plots as well as household characteristics like age of farm household head, rented plots from private individual and share of rented plots from state were associated with increase in the probability of leaving land to fallow reflecting a sign of imperfect market. It is recommended that institutions concerned with land tenure arrangement should be strengthened, and education of rural household on potential factors affecting land use as well as mitigating measures should be encouraged for proper utilization of household endowments for agricultural transformation particularly in ECOWAS.

Keywords: land use, socio-economic, transformation and endowment

Introduction

Land is the base for producing raw material for the manufacturing industry. Most of today's farmers are involved in the cultivation of crops and rearing of animals on few plots of land and farming basically forms part of their livelihood. IN KOSOVO, more than three

quarters of agricultural land is privately owned and is operated by family farms, while producer cooperatives and Socially-Owned Enterprises accounts for 1 % and 13% respectively (Latruffe, Davidova, and Desjeux. 2009). Agriculture accounts for 25% of GDP and 30% on average of all employment (World Bank and SOK, 2007). Despite the comparatively large share of the GDP coming from the agricultural sector, the country is said to rely heavily on imports of agricultural commodities and processed food, (Sauer, Davidova and Latruffe 2011). It is believed that the main reasons for this scenario is that agriculture production is still at the subsistence level as most of the farms produce are for self-consumption.

In general, this study examines what drives the farm household decision not to utilise their land holding. Land fallow is considered in this study as unutilised area of land or simply abandoned land. Several studies (e.g. Grisley and Mwesigwa, 1995; Mmopelwa, 1998; Sauer, Davidova and Latruffe 2011) have been carried out and studies found mixed results. Economic and institutional structure, alongside general feeling of insecurity have been found by Sauer, Davidova and Latruffe (2011) as the factors that influence decisions to leave land fallow. However, according to Hamer (2008) land fallow periods were traditionally used by farmers to maintain the natural productivity of their land and,Latruffe*et al.* (2008) argued that the main barriers for full integration of household in the market, influencing land use, are related to transaction costs and imperfections in land and labour markets but other relevant variables worth discussing are the effects of liquidity constraint associated with land use decisionas well as the socioeconomic characteristics of farmers. This study is aimedestablishing the effect of liquidity constraint on land fallow and the effect of household socioeconomic characteristics on decision to leave land fallow in an imperfect market conditions.

Methodology

This study used primary data from a survey carried out by the Statistical Office of Kosovo (SOK)- Agricultural Household survey, 2005. The data contain land utilization and output data and agricultural households' perceptions of barriers to land use with sample size of 4187 agricultural households. The data contain information on demographic characteristics of agricultural households; land use and farm structure variable inputs; machinery, labour and tenure arrangement. Data were analyzed using descriptive statistics such as frequency distribution, percentages to describe the distribution of farm household characteristics in the study area.

Theoretical expectation of sign of explanatory variables

Based on the theoretical framework the expected sign of coefficient of the variables are as indicated in Table 2. The sign as shown in The table2 represents a decrease if negative (-) and an increase if positive (+) in the coefficient of parameter estimates . Locational characteristics are considered as distance and transaction cost. As for distance the proxy is dummy equal to one if a household is located outside municipality that is crossed by a major road and equal 0 otherwise. We assume that plots located close to the road will likely be utilised and less likely to be left fallowed. Similarly transaction costs (plot fragmentation) associated with the number of plots and smallest size of plots that affect labour and transport costs will influence the decision to leave land fallow. it is hypothesized that the larger the distance to markets and plot fragmentation, on the one hand, the larger the land area left fallowed, on the other.

Household assets/endowment is seen as household size, labour and capital availability, number of plots own, total arable land and farm income. The capital inputs market as reflected in value of farm equipment per hectare can encourage farmers to use more land because it can help in the use of more land and probably more returns on investment making farming(more use of land) a viable economic activity. So, use of machinery reflected in value of equipment is hypothesis to be negatively related to fallow. Household characteristics include age, education and household size. If age is considered as the level of experience, older farmers with more experience may have had more opportunity to dispose of unwanted plots or have accumulated more wealth so as to avoid land fallow. On the other hand, they may have acquired many plots and found that they cannot adjust their land holdings as quickly as other factors like labor or capital have changed. So, the aprior expectation is not certain. On the other hand, household size is hypothesized to have a negative relationship with fallow land. In summary the following variables are consider to affect decision to leave land fallow: distance, transaction costs reflected in land fragmentation (proxied by number of plots owned and smallest size of plot) total arable land, farm income, Irrigated area of land, total labor, rented plots from private individual, age of farm household head ,number of plots and share of rented plots from state

Transformation of data

The data were transformed in order to meet the objective of the study firstly, farm income per hectare and value of equipment were log transformed. The transformation of these

selected variables was done in order to explore non –linear relationships. The data were not very reach in variables for instance there is no information on distance and transaction costs. Following Sauer Davidova and Latruffe (2011), transaction costs associated with land fragmentation proxy are: number of plots owned, and size of smallest plots. A proxy was also used for the distance variable. As a proxy for distance road –axis is used approximated by dummy equal to one if a household is located outside the municipality with a main North-South Road axis and equal 0 otherwise. This definition was done (using stata recode command) to ease interpretation having in mind the objective of the study does not change the originality of the data, since the data was not observationally censored but only defined between values [0,1]. The original data define dummy=1 if Municipalities crossed by the main North-South Road axis and equal 0 otherwise). However, in other to meet the objective of the study the Stata recode command was used to recode it. The idea here is that, farmers not linked by major roads are expected to cover more distance (transporting costs) than those linked by major roads. If this variable is positive then it means distance increase land fallow as earlier discussed.

The age of the household head is taken from the average age of five oldest adults. This is because the head of house is usually among the elderly ones in a particular household. Additionally, following Holden, Shiferaw and Penda (2001) the variable Labour per unit land area cultivated. The creation of this variables sometimes result in missing values and in other instances, it result in outliers but this was adequately taken care of by using the STATA command to replace missing values. This explains why most observation(continuous variables) take the minimum values of zero as seen Table 2. *lor_hs* was generated by dividing the number of house member working within the working age(16-64) by the mean land area. If this variable created is significant then it is a sign of market imperfection and significant transaction cost (Holden, Shiferaw and Penda 2001).

Furthermore, using the stata recode command, the categorical variable level of education as defined by the original data vis-a vis 1 No education; 2 Some primary school; 3 Primary school completed; 4 Some secondary school; 5 Secondary school completed; 6 Some high school; 7 High school completed; 8 Some study towards university degree; 9 University degree completed was aggregated from nine different values to just five values as shown in summary statistics (Table 2). This was to simplify analysis and enhance discussion of results. It is important to note that, the categorical variable *educ2* was used as reference

category because it contains the highest observation within this group (Stata was informed ahead using the command char[omit]2. If this is not done Stata automatically omit the first variable in the group). After the estimation a diagnostic test of misspecification, robustness/ heteroscedasticty were carried out to assess the validity of the empirical model.

What is more, some of these variables might be endogenous. According to Baum (2007) explanatory variables are said to be endogenous when they are correlated with the disturbance term which may result in inconsistent estimate when not corrected. However, this could not be accounted for in the empirical estimations largely due lack of suitable instruments and potential loss of efficiency that instrumental variable estimation is associated with. This is compounded by space and time limit in this study.

Results and Discussion

The summary of descriptive statistics of the sample used as shown in Table 1 indicates that Kosovo has large households size with an average of 9 members, where a group of individuals live under the same roof, and share income and meals. The average number of plots owned by a household is about 0.038ha out of which an average of 1.26ha is arable. This is an indication that the plots are largely fragmented. The summary statistics of the dependent variable (Table 7 in appendix) revealed that some farmers leave their land fallow while others do not. The table shows that out of 4187 observations 3,405 leave some of their land fallow while only 782 farmers do not leave their land fallow

Table 1: Descriptive statistics of explanatory variables

Variables	Definition	mean	std dev.	Min	Max
falw	Dichotomous dependent variable fallow=1, otherwise=0	0.186	0.39	0	1
h_se	Household size	8.94	5.39	1	44
age	Age of farm household head in years	36.38	10.99	11.33	89.5
n_plt	Number of plots	6.58	3.15	1	28
sm_sz	Size of the smallest plot in (ha)	0.038	0.19	0.002	1
t_arl	total arable land in hectares (ha)	1.26	2.04	0.01	62
lfmi_ha	Log of farm income per hectare	3.54	3.3	0	11.34
l_vfequip	Log of value of equipment per hectare	4.9	4.12	0	10.87
irrg_lnd	Irrigated area of land in(ha)	0.43	1.08	0	17.38
t_lbor	Total labour (number of workers age16-64)	1.96	1.4	0	13.5
R_LNDI	Rented plots from private individual %	0.1	0.75	0	25
R_LNDs	Rented plots from private state %	0.06	1.16	0	55
distance	Dummy=1 if municipality farther from high way	0.25	0.43	0	1
Lab_hs	Labour per unit land area cultivated	17.32	16.85	0	205
educ0	No education (dummy)	0.004	0.07	0	1
educ1	Primary school education (dummy)	0.11	0.31	0	1
educ2	Secondary school education (dummy)	0.59	0.49	0	1
educ3	High school education (dummy)	0.09	0.29	0	1
educ4	University education (dummy)	0.2	0.4	0	1

Source: Kosovo Household Data 2005

This represents approximately 81% and 19% of the total observations respectively. The distribution of the data set suggests that farmers who leave their land fallow are few compared to those that use all their land that is, the distribution may be skewed to the left.

Interpretation of Marginal effects after Probit

The marginal effects after probit estimates are presented in Table 2. The estimates from linear probability and probit models are not directly comparable but the marginal effects are comparable.Available farm equipment (l_vfequip), total labour available(t_lbor), are negatively related to land fallow. The explanation for this is that firstly, increase in total arable land (*t_arl*) decreases the probability of land left fallow ceteris paribus. Secondly, an additional worker for farm household decreases the probability of land left fallow. This is an indication that household employ their own resource endowment. An increase in capital availability reflected in farm equipment decreases the probability of land fallow ceteris paribus. This goes further to show that as farm households employ their own resources (land and labour) integration into factor markets may be low. This could affect rent thereby affecting land fallow decisions. In the same vein, the coefficient of irrigated

area of land (irrg_lnd) is associated with a decrease in the probability of land fallow but it is not statistically significant.

Table 2: Probit Estimate of land fallow Decision

Dependent variable *falw*			
Independent variables	Parameter Estimates	Robust Standard error	P>|Z|
h_se	-0.002	0.006	0.752
Age	0.006	0.002	0.009
n_plt	0.135	0.009	0.000
sm_sz	0.378	0.121	0.002
t_arl	- 0.158	0.033	0.000
lfmi_ha	- 0.029	0.008	0.000
l_vfequip	- 0.012	0.007	0.074
irrg_lnd	- 0.025	0.033	0.444
t_lbor	- 0.112	0.028	0.000
R_LNDI	0.075	0.053	0.155
R_LNDs	0.055	0.091	0.542
distance	0.157	0.054	0.004
Lab_w	0.0017	0.0006	0.003
educ0	- 0.105	0.306	0.732
[1]*educ1*	- 0.071	0.081	0.382
educ3	0.130	0.080	0.104
educ4	- 0.018	0.063	0.772
Constant	- 1.564	0.099	0.000
Number of observation=		4187	
Percentage correctly predicted=		81.49%	
Log-likelihood value=		-1827.90	
Hosmer lemes-show=		P=0.000	
Psuedo-R-squared=		0.093	

dy/dx is for discrete change of dummy variable from 0 to 1, The probability of $>_{\chi}$ 2=0.000

[1]The variable secondary school education (educ2)was excluded in the result estimates because it was used as reference category. Stata does this automatically, if not stated but the stata command char educ [omit]2 was used to inform stata ahead to drop this as reference catergory because it contains the highest number of observation within the group

This is an indication that plots of land that are irrigated are less likely to be fallow compared to the land without irrigation ceteris paribus. The negative significance of these household endowment combined with the effect of transaction costs appear to suggest that interventions aimed at reducing the transaction costs especially at improving access to improved technologies and productive assets could stimulate productivity (Barret 2008) which can result in less fallowed land.

Furthermore, the coefficient for age of farm household head (age) is positive which means that an increase in age is associated with the probability of land fallow. This is rather surprising because older farmers with more experience would be expected to be better managers of land use thus, making larger investments in farm activities. However, one possible explanation for this could be that if land resources become depleted, potential future profits will be reduced until ultimately the plot is fallowed or put to some other land use option. Additionally, the result may suggests that older farmers acquired many plots and found that they cannot adjust their land holdings as quickly as other factors like labor or capital have changed thereby leaving land fallow. This is supported by the positive significance of number of plots (*n_plt*). Although, the size of farm household is negatively related to fallow land , it is not significant. From the discussion, there is an indication that socioeconomic characteristics of farm household is equally important.
Concerning the household endowment, the coefficient for gross income per hectare is negative; this means a unit increase in farm income of farm household is associated with a decreased in the probability of land fallow ceteris paribus. It is expected that increase in liquidity or farmers' income should decrease the probability of land fallow indicating that increase income (resulting from high output) gives farmers the incentive to use more land as they can, with more income, make more investment in farm activities. These results are in agreement with previous studies from the region. According to Sauer Davidova and Latruffe (2011) where 'there is insufficient income along with costly access to farm inputs and outputs, the incentive to use more land would be lacking' thereby hindering farmers from fully utilizing agricultural land.

Additionally, available farm equipment (l_vfequip), total labour available(t_lbor), are negatively related to land fallow. The explanation for this is that firstly, increase in total arable land (*t_arl*) decreases the probability of land left fallowed ceteris paribus. Secondly, an additional worker for farm household decreases the probability of land left fallowed. This is an indication that household employ their own resource endowment. An increase in capital availability reflected in farm equipment decreases the probability of land fallow ceteris paribus. This goes further to show that as farm households employ their own resources (land and labour) integration into factor markets may be low.

Table 3: Marginal effects after probit

Dependent variable *falw*

Independent variables	Marginal effects	Standard error	P>|Z|
h_se	- 0.0005	0.0016	0.752
Age	0.001	0.0006	0.009
n_plt	0.033	0.002	0.000
sm_sz	0.109	0.040	0.006
t_arl	- 0.039	0.008	0.000
lfmi_ha	- 0.007	0.002	0.000
l_vfequip	- 0.003	0.002	0.075
irrg_lnd	- 0.006	0.008	0.443
t_lbor	- 0.028	0.007	0.000
R_LNDI	0.019	0.013	0.154
R_LNDs	0.014	0.022	0.543
distance	0.040	0.014	0.005
Lab_w	0.004	0.0001	0.003
educ0	- 0.025	0.068	0.717
educ1	- 0.017	0.019	0.368
educ3	0.034	0.022	0.121
educ4	-0.004	0.015	0.770
Number of observations=		4187	

Note on catergorical variable[1]; * dy/dx is for discrete change of dummy variables from 0 to 1, The probability of $>_{\chi}$ 2=0.000

The variable s econdary school education (*educ2)*was excluded in the result estimates because it was used as reference category. *Stata* does this automatically , if not stated but the *stata* command char educ [omit]2 was used to inform *stata* ahead to drop this as reference catergory because it contains the highest number of observation within the group.

This could affect rent thereby affecting land fallow decisions. In the same vein, the coefficient of Irrigated area of land (irrg_lnd) was associated with a decrease in the probability of land fallow but it was not statistically significant. This is an indication that plots of land that are irrigated are less likely to be fallow compared to the land without irrigation ceteris paribus. The negative significance of these household endowment appear to suggest that interventions aimed at accessing improved technologies and productive assets could stimulate productivity (Barret 2008) which could result in less fallowed land. Household assets, house characteristics as well as institutional factors are significant. This may be an indication that access to input and output varies between household, the benefits for a particular household may be below or above cost, with the result that some households will use their land while others will not. Concerning the institutional factors, the influence may be due to bureaucrats' bottle necks in large tenure arrangement. This

process may have led to farm land being rented out to households who do not intend to use it for farming there by resulting in land fallow. In addition to the above, it appears that there are imperfect markets in the study area. This is corroborated with the significance of labour per unit of household. (Holden; Shiferaw and Penda 2001). From the discussions so far, we can deduce socioeconomic characteristics and institutional related factors appear to play a central role in making decisions on land.

Conclusion and Recommendations

The study utilized a data transformation technique to examine what drives the farm household decision to leave land fallow. In pursuit of the objective household endowment, socio-economic characteristics as well institutional factors were examined. The study found that farm households were driven by the influence of income, age, education as well as other socioeconomic variables to leave their land fallow in Kosovo. Based on the findings, the decision of whether land is fallowed or not is premised upon the interplay among three levels of determination, the household endowment, and socioeconomic characteristics of farm household. The transformation techniques applied fits very well and could be use even when the dependent variable is binary. Since, the probit model passed almost all the diagnostics tests performed. Thus, probit model works well with transform data with useful insight. The combination of statistical significance with relatively low fit is typical for models explaining individual behaviour. The signs of the coefficient are positive and statistically significant in each model. It is recommended that institutions concerned with land tenure arrangement should be strengthen, and credit programmes should be encouraged to increase liquidity.

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