The Impact of Property Rights Imperfections on Resource Allocation and welfare:

Co-ownership of Land in Bulgaria

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Introduction

There is a large literature on the impact of property rights on efficient resource use and the development of markets. One of the most dramatic examples of property rights reforms to enhance efficiency are the land reform processes which have been implemented 'from Prague to Beijing' and which have radically changed the rural areas of the transition world – and the livelihoods of hundreds of millions of poor households (Deininger, 2003; Rozelle and Swinnen, 2004). However, the effect of these land rights reforms has been mixed (Lerman *et al.*, 2004). The negative experiences in some countries, such as Russia in the 1990s, have caused a debate with some arguing that the reforms went too fast, while others argued that they did not go fast enough and that the lack of clear and well defined property rights is a key impediment to growth and recovery.

While perfect property rights are ultimately desirable, moving towards better but still imperfect property rights may yield important gains in efficiency of resource use and market development (see eg McMillan, 2002). In the case of China, where land rights reforms induced enormous gains in efficiency and reductions in poverty, it is argued that dramatic effects have resulted from more efficient, but still imperfect, property rights of land (Li *et al*., 1998). Similarly, studies on land use and investment incentives in Africa, Asia and Europe indicate that secure land use rights may be sufficient conditions for efficient land use and investments by farmers (Brasselle *et al.*, 2002; Feder and Feeny, 1991; Swinnen, 2002).

In this paper we use data from a recent survey on land use and allocation in Bulgaria to analyse the development of land markets and how imperfections in land rights affect both the allocation and exchange of land. The development of land markets is not only important from

an efficiency point of view, but also for equity reasons (Deininger and Feder, 2002; Swinnen, 2001).

Land sales have generally been disappointing in transition countries. This is also the case in Bulgaria where very little land was sold in the first decade of transition. In contrast, land rental markets have developed fast and extensively. In an environment with large uncertainties and high transaction costs, where credit markets and insurance markets are imperfect, land rental markets can play an important role in improving efficiency and possibly equity in land use and access (Deininger and Jin, 2003; Sadoulet et al., 2001; Vranken and Swinnen, 2003).

However, relatively little is known about the behaviour of rental markets in these economies either theoretically or empirically. There is an extensive literature on land rights and how transaction costs affect land use and property rights and farm organizations more generally (Allen and Lueck, 1998; Barzel, 1997; Coase, 1960; Demsetz, 1976; Hyami and Otsuka, 1993; Schmitt, 1991). However in order to understand the functioning of land markets in transition it is essential to integrate transition specific features. In the previous chapter we have developed a theoretical model of land markets in transition. Here, we use empirical evidence to get a better understanding of the development and functioning of land rental and sales markets in transition by studying the development of land markets in Bulgaria, using a unique survey dataset.

The paper is organized as follows. The next sections discuss the data, the land reform processes in Bulgaria, and the changes in land use and exchange during transition. Then we identify several problems with the land market, and we assess quantitatively which factors are affecting land use and the development of the land markets. The final section concludes.

Data

Our analysis is based on survey data collected in 2003 in three Bulgarian regions. The regions were selected to reflect important variations in the rural economy, agricultural structure, property rights (if important) and geographical conditions. We gathered general information on all households (1,956) living in and plots (6,199) located in 18 geographically closed areas. This information was then used as a sampling frame for gathering more detailed plot level and household level information. We draw a stratified sample in order to oversample the households renting in land. Due to this stratification, we gathered sufficient observations on the variables of interest as renting in land is less widespread. All households renting in were selected, complemented by a random sample of all other households in the community. Detailed household and plot level data were collected on 700 households and 4,134 plots.

A brief history of land reform, use, and ownership in Bulgaria

The collectivisation of Bulgarian agriculture started in the late 1940s. Initially, three types of farm structures were created: collective farms, state farms and machinery and tractor stations. In the early 1970s these were unified into a small number of Agro-Industrial Complexes (AICs). Within the AICs there were four main forms, Labour agricultural co-operatives (TKZSs), State agricultural farms (SAFs), Machine and tractor stations (MTS) and brigades (Davidova et al., 1997). Two thirds of the AICs land was farmed in TKZSs and SAFs. Brigades were sub-units within AICs with their own balance sheets, who specialised on a single crop or livestock production. Machine and tractor services had no land and provided mechanisation services to TKZSs and SAFs. The second group of pre-reform farm structures were private household plots. A third group, ‘other organisations’, includes farms

attached to research stations, schools and forest enterprises, and also auxiliary farms which were part of industrial enterprises and the armed forces.

Under the central planning system, the majority of land remained in private ownership, but the owners could not decide how to allocate their land. This means that they were still owners 'on paper', but that they had no decision power over their land .

All this changed dramatically after 1989. First, former communist co-operatives (TKZS) were liquidated in the early 1990s and their assets were transferred to a variety of new farm organisations, including limited liability companies, share holding companies, joint stock companies and new agricultural cooperatives .

Second, land reforms restituted effective land property rights to former landowners. In the first transition years, farm restructuring and land reform were subject to intense political debate, which had a strong impact on the reforms (Swinnen, 1997).

Land restitution lasted on average 4-5 years, although the speed of the restitution process differed throughout the country. Land restitution was slowed by poor evidence on former land ownership. In many villages, former registers with land ownership information of the pre- collectivisation period were missing (burned, disappeared, etc.).

At the end of the 1990s, more than 80% of agricultural land titles were restituted to individuals. The land restitution process resulted in a strong fragmentation of land ownership. On average, land owning households own 3.9 ha of land which are divided into 6 plots with each an average size of 0.6 hectares.

The post-transition land market in Bulgaria

The existence of such a highly fragmented ownership situation increases the need for an efficient exchange of land between owners and users of land. Land is *used* by four types of farms: co-operatives, state farms, farming companies and individual farms. The share of

arable land used by cooperatives and their average size declined since the start of transition. In 2001, their share had fallen to 51% of the agricultural land. Household farms and farming companies grew in importance. In 2001, both individual farmes and companies cultivated approximately one quarter of agricultural land.

The land sales market in rural Bulgaria is not well developed. Selling of agricultural land is very limited. The main form of land exchange in Bulgaria is through the rental market. 78% of all land owning households in our survey rent out land and 35% of the land cultivating households are renting in land. Around 40% of the parcels which are owned by the surveyed households are rented out to a cooperative and 16% is rented out to a farming company[1]. This means that more than half of the parcels owned by rural households are rented out to a farm enterprise. Exchanging land among households occurs less frequently. Only two percent of the parcels owned by rural households are exchanged with other households. 18% of the parcels are cultivated by the owner.

Land abandonment is widespread and leaving land fallow for fertility reasons is not common in Bulgaria. More than 40% of all land owning households in our 2003 survey leave land abandoned, and 23% of the total number of plots owned by rural households are left abandoned.

Co-ownership and property rights

Besides land fragmentation and abandonment, the Bulgarian land market is affected by another problem which is that half of the parcels are co-owned by more than one owner. Land "co-ownership" results from a combination of four factors: (a) the way land was restituted; (b) the current inheritance law; (c) the fragmented 1946 ownership structure; (d) the absence of a land market during communism. During the land restitution process, land

[1] We see that, at household level, 50% of all land owning households is renting out land to a cooperative and 29% to a farming company. Further, 9% of the land owning households are renting out land to another household

was normally given back to owners prior to 1946. A large part of these owners are no longer alive so that the land was given to their heirs. According to the Bulgarian Inheritance Law, every heir gets an equal share of the property when the owner dies. If the pre-1946 land owner had died, land was divided among the heirs (sometimes even the second generation). If during the land reform process X parcels had to be divided among Y owners, then each owner received 1/Y share of each of these X parcels. In this way, an equal treatment of heirs was assured.

So far, the issue has received very little attention. However, the magnitude of the problem seems to have been vastly underestimated. Our survey shows that rural areas of Bulgaria are burdened with co-ownership problems. According to our survey, 51% of all parcels owned by the sampled households are in "co-ownership". One-fifth of the parcels are owned by two persons, another 14% has three co-owners and around 16% of the parcels are owned by at least 4 persons.

Paradoxically, the official reason for the land legislation which causes co-ownership was to prevent inefficient land use by avoiding excessive land ownership fragmentation. However, the impact may well have been opposite, i.e. that it has constrained efficient land use and market development. Before somebody can rent out or sell the land to somebody else, they have to agree with all owners. Obviously, this increases transaction costs in land allocation, which is likely to hamper exchange and efficient use of land.

Co-ownership is likely to increase the transaction costs in land decision-making and allocation, and therefore lead to imperfect property rights, which may result in suboptimal land allocation, use and exchange (Barzel, 1997).

Decision-making with co-owners is likely to be more costly than without co-ownership, depending on the relationship of the various co-owners and their intensity of interacting. For example, if there are few co-owners that are close family members living in the same village,

co-ownership may not have much additional decision-making costs. However, if there are more co-owners and/or if they are living far apart with few interactions, additional costs of coordination, supervision and enforcing agreements may be substantial. The dataset includes a variety of relationships between co-owners.

If decision-making on land use is too costly, relative to the potential benefits of land use or land renting out, these additional decision-making costs will make it more likely that the "default option" will prevail. This default option may be either not using the land, hence leaving land abandoned, or leaving land with the traditional users of the land, which are the former collective or state farm that are now mostly organized as cooperative farms. Hence, if co-ownership significantly increases the transaction costs in (re-) allocating land, then we should expect co-owned land plots to be left more abandoned and to be used more by cooperatives, ceteris paribus.

In the rest of the paper we will use the survey data to estimate how these property right imperfections affect land use and land rental activities. Finally, we link land allocation decisions to the household's welfare.

Empirical Model

Our model incorporates 5 different allocations of owned land: 1) owner-cultivation; 2) renting out to another farming household; 3) renting out to a cooperative (which are mostly successor organisation of a former collective farm); 4) renting out to a company; 5) abandoning. We apply an empirical model which is based on an unordered choice model where the household has to make a single decision among several alternatives.

We use indicator variables to test the impact of property rights imperfections on the land allocation decision, while controlling for a variety of differences in plot, household, and regional characteristics which may also affect the land allocation decision. The choice of the

control variables is based on a model of household land rental decision-making in transition countries, developed in Vranken and Swinnen (2003).

We run a multinomial logit with cluster effects which specifies that the observations are independent across households but not necessarily within households. Plot characteristics are endogenous since entrepreneurship and social relations might effect what type of land (quality, location, plotsize) a former owner received during the restitution process. Hence, we ran a similar multinomial regression without the plot variables with potential endogeneity problems to check the robustness of our results. The coefficients of this regression as well as their significance hardly differ from the results discussed below.

Property right imperfections

The variable NONDIV is a dummy variable that equals one if a plot is in co-ownership and cannot be divided among owners due to the legal imposed minimum size. We expect co-ownership to lead to decision-making problems, which increase the costs of both *using* the land and of *changing* the land allocation. Since land was initially used by collective and state farms, in many cases the default allocation of land for households was to rent the land to cooperative farms and farm companies which emerged from the restructuring of the collective and state farms or to leave it abandoned when the farm enterprise ended the rental agreement. If a plot cannot be divided among co-owners because of legal impediments, decision making becomes more costly. Hence, the probability of the default option increases. It becomes more likely that the plot owner is either not using the land, hence leaving land abandoned, or leaving land with the traditional user of the land, which is the former collective or state farm, now mostly organized as a cooperative farm.

The variable NRCOOWN measures the number of co-owners per plot that cannot be divided among owners due to the legal imposed minimum size. Problems of endogeneity rise

if the co-owners are unwilling to divide their land either because none of them is interested in cultivating it themselves or because they judge that division of the land does not provide any benefits if they are renting it out. Hence, we focus on legally forced co-ownership which reduces problems of endogeneity. We expect that the decision-problems and inherent transaction costs increase with the number of co-owners. We would therefore expect that the number of co-owners is positively related with land renting to cooperative farms and with abandoning of land.

Some of the co-owners live in the village, while others live outside the village, sometimes far away. The co-ordination problems are likely to be larger when co-owners live outside the village because interaction is, on average, more complicated and less frequent, and monitoring by co-owners is more costly. Therefore we would expect the impact of the previous effects to be stronger when co-owners do not live in the village, compared to when they do. To estimate whether the location of the co-owners matters, we distinguish for the plots which can not be divided by law between the number of co-owners living in the village (NRCOOWNIN) and the number of co-owners not living in the village (NRCOOWNOUT). Endogeneity problems may result from the fact that co-ownership (and hence difficulties in allocating their land) has induced some of the co-owners to emigrate out of the village, while other households might have immigrated into the sampled communities because they owned land which was not in co-ownership and which they could easily start cultivating. However, our data indicate that emigration out of the rural areas is rare: in the sampled communities less than 5% of the households inhabiting the rural areas at the start of the reforms have emigrated at the time of the survey and less than 10% of the households that are currently living in the villages are immigrants. Household who immigrated into the villages are mainly pensioners and, compared to the non-immigrant households, significantly less of those immigrated

households are cultivating land. Apparently, access to land for cultivation did not affect their migration decision.

Plot characteristics

The variable QUALITY is an indicator of land quality based on the Bulgarian land classification system and assigns to each plot a score between 1 and 10. A high quality parcel gets value one, a low quality parcel gets value ten. A high quality land plot is more likely to be used by either a household farm or a farm enterprise, and we expect it to be negatively correlated with abandonment.

The cost of using a parcel of land increases with the distance of the plot. The variable DISTANCE measures the distance in kilometres of the plot to the house of the owner, and we expect a negative impact on owner-cultivation.

We include the variable PLOTSIZE which equals the size of the plot. We expect that larger plots are more suitable for cultivation and expect that this variable is negatively correlated with the probability of not using the land. Further, large farming enterprises are often relying on more mechanized production techniques so that they are particularly keen in cultivated larger plots.

Household and Regional Characteristics

The variable LANDOWN gives the total amount of land owned by a household. The effect of this variable is ambiguous ex ante. In the presence of credit market imperfections, owned land, as collateral, can affect access to credit for households. In such circumstances, we expect that the variable LANDOWN will have a positive impact on the probability of owner-cultivation. On the other hand, a household with more land, ceteris paribus, is more

likely is to have an excess of land compared to its other production factors and hence to rent out land.

We include two sets of indicators of managerial capacity of the household: age (AGEHH) and education (EDUHH) of the household head. Other studies (e.g. Rizov *et al*., 2001) typically show a non-linear effect of these variables. Therefore, we also include the square terms, AGEHH2 and EDUHH2. The impact of both variables is not obvious ex ante. Concerning age, the older a household head, the more experience he has to farm, but younger persons may be less risk averse and therefore more likely to use the land themselves. More educated household heads may be better managers, but are also likely to have more off-farm opportunities.

Labour market imperfections in the form of moral hazard problems with hired workers affect the household land allocation decision. Family members maximize family welfare rather than individual welfare and have therefore fewer incentives to shirk which makes family labour less expensive than hired labour. Hence, it is more likely that a household will cultivate its own land if more household labour is available. We take this into account by including a variable measuring the household size. However, endogeneity concerns rise because the decision to leave the household might be correlated with the income that can be generated from cultivating the land owned by the household. Therefore, we instrumented for the actual household size by looking at the *natural household*, which equals all current household members augmented with those sons and daughters who moved out. Since this instrument does not entirely solve the endogeneity problem, we here only show regressions were this variable is not taken into account. However, inclusion of the actual or adjusted household size did hardly change the regression results (see appendix).

Finally, we control for regional differences by including the variable NORTH-EAST and SOUTH-EAST, two dummy variables that equal one if the plot is located respectively in

Dobrich and Varna, or in Veliko Tarnovo. The default region is the South-Central region which holds Plovdiv and Stara Zagora.

Results

The multinomial regression results with owner-cultivation as base category are given in table 1. Table 2 gives the regression results with renting out to a cooperative as base category. Since our prime interest in this paper is the impact of property rights imperfections, we focus mostly on these findings.

First, the estimation results show that property right imperfections under the form of co-ownership have a strong impact on the allocation of land in Bulgaria. Land is more likely to be rented out to a cooperative or left abandoned relative to owner-cultivation if the parcel is in co-ownership and undividable by law, i.e. if the parcel is in "forced" co-ownership.

Second, the multinomial logit regression indicate that the probability to rent out land to a cooperative or leaving land abandoned relative to owner-cultivation increases with the number of owners. An increase in the number of coowners decreases the likelihood of owner-cultivation, renting out to a company or households, and abandonment relative to renting out to a cooperative. The strong positive impact of "forced" co-ownership on renting out to a cooperative and negative impact on owner-cultivation indicates that the law concerning the minimum plot size strongly favours large scale farming organisations at the disadvantage of household farms.

Third, our estimations further show that the impact of the number of co-owners does depend on whether they are living in or outside the village. The probability to leave the plot abandoned relative to owner-cultivation increases with the number of co-owners that are living outside the village, but the number of co-owners living inside the village does not affect the probability of abandonment. While the coefficient is consistent with the hypothesis that

co-ordination problems are higher when co-owners are living farther away, alternative explanations can not be ruled out. If for example more co-owners are living outside the village, their social connectedness can be lower so that they received parcels of lower quality during the land reform process. Further, the likelihood that one of the owners is interested to cultivate the land will be decrease with the number of owners living outside the village.

Other plot characteristics have an important impact on the allocation decision: land quality, distance and plot size all have a significant impact on the likelihood of abandoning the plot, and the impacts are as hypothesized. As expected, increased distance of the plot to the house decreases the likelihood of owner-cultivation and increases the likelihood of land abandonment. Further, larger plots are less likely to be left abandoned.

Characteristics of the household also have an impact. There is a significant impact of the variable AGEHH. The probability that a land owner leaves its plot abandoned first decreases with age. However, at the pension entitled age, the relation reverses and the likelihood of land abandonment increases.

Welfare implications

An important question related to imperfect property rights relates to the impact on household welfare. Since welfare is multidimensional, an income presentation of poverty can be restrictive as a measure of household welfare. Therefore, we define for each household an alternative welfare index based on the ownership of certain assets/items. [2] We aggregated these various indicators using principal component analysis (Finan et al., 2003).[3] To analyse the impact of land and land property rights imperfections on the household's welfare, we run an ordinary least square regression with the welfare index as dependent variable and land and

[2] We looked whether the household owned a house, car, color TV, black and white TV, video, personal computer, telephone, mobile phone.

[3] When calculating the principal components, the first Eigen value captures more than 33% of the total variance and is twice as high as the next Eigen value. We therefore use this first component as our welfare index.

human capital characteristics as regressors. Plot level characteristics are excluded because welfare is analysed at household level.

Several studies documented the positive association between land and income. Hence, it reasonable to assume that land ownership is affecting the household's welfare. Since wealthier households are more likely to buy land for investment purposes, inclusion of land endowment in our regression might result in endogeneity problems. However, land purchases are very rare in rural Bulgaria. Less than 3% of the surveyed households bought land since the start of transition. A more recent WB survey in 2004 confirms that only 3.5% of all rural households sold land and only 1% bought land since the start of transition. Consequently, land ownership depends on the amount of land over which the household always kept title (even thought they had no effective use rights during communism) augmented with amount received through the land reform process and we can assume that it is an exogenous factor.

In our welfare regression, we distinguish between the amount of land owned solely by the household (OWNSOLE) and the amount of land owned by the household but as a part of larger co-owned plot (COOWNED). Thus, this variable equals the size of the co-owned parcel divided by the number of co-owners. To look at the impact of land fragmentation, we also include the number of plots which are not in co-ownership (NROWNSOLE) and the number of plots (NRCOOWN) which are in co-ownership. Next, we look at the impact of land ownership without making a distinction between co-owned and not co-owned land. The total amount of land owned by the household is captured by the variable OWN and the variable NROWN gives the number of different plots owned by the household. We hyposthesize that fragmentation of land ownership is negatively affecting the household's welfare as it increases transaction costs in allocating the plots. Nevertheless, fragmentation of land ownership can persist because the non-production value of land and the inaccurate land rights records might result in thin land sales market (Mearns, 1999).

Further, we split the amount of land owned according to its allocation to analyse whether this has an impact on the household's welfare. We distinguish between the amount of land used by the owner (AREAOWNER), the amount rented out to an other household (AREATOHH), to a farming company (AREATOCOMP or to a cooperative (AREATOCOOP) and the amount of land left abandoned (AREAABANDON).

Finally, we want to know to what extent the possibility to cultivate land is related to the household's welfare. We include the variable CULT that equals the amount of land cultivated by the households. The correlation between welfare and the fragmentation of land use (NRCULT) is not clear *ex ante.* On the one hand, there might be a negative correlation as fragmentation of land use increases travel time between fields resulting in lower labour productivity and higher transportation costs and it raises the potential for disputes. On the other hand, land fragmentation can have some advantages since it can ease seasonal labor-bottlenecks, reduce risk and enhance household-level food security. These advantages are particularly important if land quality is not homogeneous, when no alternative risk mechanisms are available or when commodity market failures are significant (Blarel et al., 1992).

As human capital variables, we include age and education level of the household head (AGEHH and EDUHH). Finally, we take regional fixed effects into account by including regional dummy variables.

Concerns might rise about the correlation between land ownership and other key variables as age and education of the household head. However, the correlation matrix indicates that there is no important correlation between land ownership (nor amount of land owned solely by one household, nor coowned land, nor the total amount of owned land) and the age or education level of the household head. The correlation coefficients are very small and in most cases not significantly different from zero.

Our results confirm that there is positive and significant correlation between the amount of land owned solely by one household and its welfare (table 6). The correlation between amount of land in co-ownership and the household's welfare is positive as well. The coefficient of the variable OWNEDSOLE is not significantly different from the coefficient of the variable COOWN. This indicates that land ownership is positively correlated with welfare irrespective the fact that it is in co-ownership.

The household's welfare is, as we expected, negatively correlated with land ownership fragmentation. However, the correlation with the fragmentation of land use is significantly positive suggesting that land use fragmentation is not disadvantageous for the household's welfare as it allows the household to spread their risk and relax seasonal labour bottlenecks.

If we split the amount of land owned according to the allocation, we see that, *ceteris paribus*, the welfare level is significantly positively correlated with the amount of land used by the owner as well as with the area rented out to an other household or company, while there is no correlation between the amount of land rented to a cooperative or left abandoned and the welfare level of the household. Moreover, the coefficient of the amount of land used by the owner is significantly different from the coefficient of the amount of land rented out to a cooperative or left abandoned. The latter insinuates that the household's welfare is not improved when it owns land which is left abandoned or which it rents out to a cooperative, two allocations which are more likely for land which is in legally forced co-ownership.

Conclusion

This study used a unique 2003 survey dataset to analyse the developments in land use and exchange in Bulgaria. The survey analysis yields several results.

Land is highly fragmented in Bulgaria. Rural households own on average 6 plots of land. Such a highly fragmented ownership structure increases the need for an efficient exchange of land between owners and users of land.

However, the land sales market is not well developed. Land sales are very rare. As in many other transition countries, a variety of factors have constrained the development of the land sales market.

In contrast, land rental agreements are very widespread. Land rental is widely used to exchange land between owners and users of the land. The users include a variety of farm types, including cooperatives, farming companies, and individual farms.

While land titles are distributed and land plots clearly defined and delineated, an important property rights problem that affects land allocation exists under the form of so-called "co-ownership". Due to a combination of historical factors, many plots have more than one owner and in some cases many more. By law, certain plots are undividable among heirs because the plot size after division would fall under the imposed minimum plot size. Co-ownership on agricultural land is widespread in Bulgaria: half of the plots in our sample are owned by more than one person.

Our estimation results show that co-ownership has a major impact on land use and allocation. Land under co-ownership and which is undividable by law, is more likely to be left abandoned or to be used by large enterprises – the default users of land given the history of land use in Bulgaria – compared to owner-cultivation or renting out to an other household.

Paradoxically, these effects result from a legislation that was intended to prevent fragmentation of land and inefficient land use. The legislation is a prime cause of the co-ownership situation and strongly affects efficient land use and allocation.

Our analysis shows that solving co-ownership problems would not only stimulate efficient land allocation and that this in turn affects the household's welfare level. Land that is

cultivated by the household or rented to an other household contributes more to its welfare than land that is rented to a cooperative or left abandoned.

Table 1: Multinomial regression result with owner-cultivation as base category and cluster effects

	Rent to other hh	Rent to coop	Rent to comp	Abandon	Rent to other hh	Rent to coop	Rent to comp	Abandon	Rent to other hh	Rent to coop	Rent to comp	Abandon
NONDIV	-0.019	0.977***	0.148	0.412**								
	(0.056)	(5.333)	(0.450)	(2.218)								
NRCOOWNER					-0.065	0.401***	0.141	0.204***				
					(0.508)	(6.825)	(1.426)	(3.166)				
NRCOOWNERIN									0.121	0.489***	0.227	0.105
									(0.563)	(4.500)	(1.245)	(0.922)
NRCOOWNEROUT									-0.171	0.363***	0.087	0.240***
									(1.041)	(4.560)	(0.636)	(2.907)
QUALITY	-0.145	0.093**	-0.436***	0.452***	-0.143	0.092**	-0.445***	0.450***	-0.141	0.094**	-0.442***	0.449***
	(1.266)	(2.208)	(5.458)	(10.217)	(1.251)	(2.206)	(5.412)	(10.275)	(1.236)	(2.255)	(5.379)	(10.255)
DISTANCE	0.337***	0.337***	0.314***	0.359***	0.323***	0.322***	0.301***	0.345***	0.322***	0.321***	0.301***	0.344***
	(4.748)	(4.942)	(4.501)	(5.250)	(4.609)	(4.768)	(4.376)	(5.104)	(4.587)	(4.747)	(4.353)	(5.071)
PLOTSIZE	0.009	-0.002	0.000	-0.085***	0.008	-0.002	0.001	-0.080***	0.008	-0.002	0.001	-0.081***
	(1.015)	(0.265)	(0.038)	(4.238)	(1.044)	(0.360)	(0.158)	(4.298)	(1.094)	(0.324)	(0.178)	(4.335)
LANDOWN	-0.010**	0.003*	0.003	0.003*	-0.009**	0.002**	0.002	0.002**	-0.010**	0.002*	0.002	0.002**
	(2.407)	(1.855)	(1.629)	(1.928)	(2.374)	(2.044)	(1.614)	(1.983)	(2.459)	(1.952)	(1.575)	(2.147)
AGEHH	0.056	-0.017	0.077	-0.200***	0.064	0.034	0.096	-0.182***	0.070	0.037	0.102	-0.191***
	(0.452)	(0.270)	(0.754)	(3.483)	(0.513)	(0.535)	(0.929)	(3.123)	(0.569)	(0.586)	(0.950)	(3.380)
AGEHH2	0.000	0.000	0.000	0.002***	0.000	0.000	0.000	0.002***	0.000	0.000	0.000	0.002***
	(0.284)	(0.667)	(0.352)	(4.164)	(0.342)	(0.076)	(0.524)	(3.834)	(0.400)	(0.116)	(0.561)	(4.074)
EDUHH	-0.383	0.133	0.067	-0.040	-0.372	0.142	0.081	-0.036	-0.383	0.134	0.073	-0.024
	(1.581)	(0.721)	(0.305)	(0.238)	(1.576)	(0.801)	(0.389)	(0.219)	(1.622)	(0.758)	(0.347)	(0.149)
EDUHH2	0.023*	-0.009	0.002	0.005	0.022*	-0.009	0.002	0.005	0.023*	-0.009	0.002	0.004
	(1.841)	(1.002)	(0.190)	(0.573)	(1.833)	(1.102)	(0.147)	(0.570)	(1.875)	(1.056)	(0.190)	(0.498)
North-East	0.992**	0.946***	0.263	-2.172***	0.986**	0.944***	0.300	-2.244***	1.011**	0.982***	0.317	-2.260***
	(2.111)	(2.865)	(0.792)	(2.833)	(2.123)	(2.879)	(0.936)	(2.826)	(2.170)	(2.978)	(0.982)	(2.947)
South-Central	-0.454	-0.101	-1.626***	-1.194***	-0.454	-0.113	-1.617***	-1.195***	-0.427	-0.072	-1.599***	-1.253***
	(1.029)	(0.449)	(4.905)	(6.643)	(1.023)	(0.504)	(5.023)	(6.708)	(0.953)	(0.315)	(4.850)	(6.956)
Constant	-2.501	-1.791	-3.264	2.251	-2.775	-3.415	-3.956	1.694	-2.928	-3.494*	-4.092	1.985
	(0.611)	(0.878)	(0.911)	(1.176)	(0.672)	(1.617)	(1.086)	(0.864)	(0.715)	(1.687)	(1.099)	(1.042)
Observations	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575

t- statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2: Multinomial logit with renting out to a cooperative as base category and cluster effects

	Owner-cultivation	Rent to hh	Rent to comp	Abandon	Owner-cultivation	Rent to hh	Rent to coop	Abandon	Owner-cultivation	Rent to hh	Rent to coop	Abandon
NONDIV	-0.977***	-0.996***	-0.829**	-0.566***								
	(5.333	(2.967)	(2.553)	(3.132)								
NRCOOWNER					-0.401***	-0.466***	-0.260***	-0.197***				
					(6.825)	(3.813)	(2.643)	(4.007)				
NRCOOWNERIN									-0.489***	-0.367*	-0.261	-0.384***
									(4.500)	(1.780)	(1.380)	(4.349)
NRCOOWNEROUT									-0.363***	-0.533***	-0.276**	-0.123**
									(4.560)	(3.300)	(2.320)	(2.099)
QUALITY	-0.093**	-0.238**	-0.529***	0.359***	-0.092**	-0.235**	-0.538***	0.358***	-0.094**	-0.235**	-0.536***	0.355***
	(2.208	(2.128)	(7.103)	(8.377)	(2.206)	(2.104)	(6.899)	(8.380)	(2.255)	(2.115)	(6.879)	(8.305)
DISTANCE	-0.337***	0.000	-0.023	0.022***	-0.322***	0.001	-0.021	0.024***	-0.321***	0.001	-0.021	0.023***
	(4.942	(0.008)	(1.376)	(3.204)	(4.768)	(0.069)	(1.264)	(2.932)	(4.747)	(0.040)	(1.277)	(3.215)
PLOTSIZE	0.002	0.010	0.002	-0.083***	0.002	0.010	0.002	-0.078***	0.002	0.010	0.002	-0.079***
	(0.265	(1.521)	(0.955)	(4.306)	(0.360)	(1.505)	(1.233)	(4.302)	(0.324)	(1.566)	(1.220)	(4.348)
LANDOWN	-0.003*	-0.013***	0.000	0.000	-0.002**	-0.012***	0.000	0.000	-0.002*	-0.012***	0.000	0.000
	(1.855	(3.223)	(0.175)	(0.185)	(2.044)	(3.064)	(0.001)	(0.248)	(1.952)	(3.118)	(0.029)	(0.159)
AGEHH	0.017	0.073	0.094	-0.183***	-0.034	0.030	0.062	-0.217***	-0.037	0.033	0.065	-0.228***
	(0.270	(0.593)	(0.902)	(2.654)	(0.535)	(0.239)	(0.588)	(3.082)	(0.586)	(0.273)	(0.591)	(3.578)
AGEHH2	0.000	-0.001	-0.001	0.002***	0.000	0.000	0.000	0.002***	0.000	0.000	0.000	0.002***
	(0.667	(0.642)	(0.773)	(2.853)	(0.076)	(0.306)	(0.468)	(3.259)	(0.116)	(0.344)	(0.478)	(3.701)
EDUHH	-0.133	-0.516***	-0.066	-0.173	-0.142	-0.514***	-0.061	-0.178	-0.134	-0.517***	-0.061	-0.158
	(0.721	(2.805)	(0.377)	(1.036)	(0.801)	(2.773)	(0.337)	(1.063)	(0.758)	(2.759)	(0.337)	(0.963)
EDUHH2	0.009	0.032***	0.011	0.014	0.009	0.032***	0.011	0.014	0.009	0.032***	0.011	0.013
	(1.002	(3.209)	(1.269)	(1.566)	(1.102)	(3.183)	(1.204)	(1.614)	(1.056)	(3.163)	(1.196)	(1.524)
North-East	-0.946***	0.046	-0.683**	-3.118***	-0.944***	0.042	-0.644*	-3.188***	-0.982***	0.028	-0.665*	-3.242***
	(2.865	(0.106)	(1.985)	(4.070)	(2.879)	(0.096)	(1.947)	(4.014)	(2.978)	(0.065)	(1.954)	(4.222)
South-Central	0.101	-0.353	-1.524***	-1.093***	0.113	-0.341	-1.504***	-1.082***	0.072	-0.355	-1.527***	-1.180***
	(0.449	(0.805)	(4.119)	(4.964)	(0.504)	(0.771)	(4.117)	(4.937)	(0.315)	(0.790)	(3.982)	(5.229)
Constant	1.791	-0.710	-1.473	4.042*	3.415	0.640	-0.541	5.109**	3.494*	0.566	-0.598	5.479***
	(0.878	(0.174)	(0.398)	(1.838)	(1.617)	(0.156)	(0.144)	(2.279)	(1.687)	(0.139)	(0.155)	(2.700)
Observations	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575

t- statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: OLS regression with the welfare index as dependent variable, excluding household size

	Welfare Index					
AGEHH	-0.040***	-0.039***	-0.040***	-0.039***	-0.035***	-0.033***
	(8.129)	(7.862)	(8.239)	(7.859)	(6.987)	(6.612)
EDUHH	0.071***	0.073***	0.072***	0.072***	0.084***	0.077***
	(3.649)	(3.714)	(3.723)	(3.729)	(4.397)	(4.041)
OWNEDSOLE	0.013***	0.013***				
	(5.913)	(5.192)				
NROWNSOLE		-0.012				
		(0.607)				
COOWN	0.011**	0.018***				
	(2.437)	(3.254)				
NR COOWN		-0.031**				
		(2.320)				
OWN			0.013***	0.014***		0.012***
			(6.121)	(6.357)		(5.637)
NROWN				-0.023**		-0.030***
				(2.085)		(2.616)
AREA USED BY OWNER					0.016***	
					(4.200)	
AREA RENT TO OTHER HH					0.023***	
					(4.598)	
AREA RENT TO COMP					0.007***	
					(2.911)	
AREARENT TO COOP					0.005***	
					(2.962)	
AREA ABANDONED					-0.008	
					(1.347)	
CULTIV						0.003*
						(1.808)
NRCULT						0.090***
						(2.927)
NORTH-EAST	0.053	-0.022	0.060	-0.042	0.093	-0.014
	(0.346)	(0.138)	(0.402)	(0.262)	(0.622)	(0.086)
SOUTH-CENTRAL	0.504***	0.525***	0.506***	0.520***	0.488***	0.451***
	(3.849)	(4.006)	(3.907)	(4.005)	(3.635)	(3.495)
Constant	1.386***	1.420***	1.375***	1.417***	1.002**	0.942**
	(3.167)	(3.247)	(3.185)	(3.263)	(2.326)	(2.144)
Observations	700	700	700	700	700	700
R-squared	0.211	0.217	0.216	0.215	0.225	0.241

t- statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%