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Property Rights Imperfections, Asset Allocation, and Welfare:

Co-Ownership in Bulgaria

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Abstract

This paper analyzes how imperfections of property rights affect allocation of assets and welfare, using micro-survey data from Bulgaria. Co-ownership of assets is widespread in many countries due to inheritance. Central and Eastern Europe offers an interesting natural experiment to assess the effects of such rights imperfections because of the asset restitution process in the 1990s. Bulgaria is particularly interesting because of the prominence of the co-ownership problem (about half of all land plots are co-owned), because of the strong fragmentation of land, and because of legislation providing an instrument to separate out chosen (endogenous) versus forced (exogenous) forms of co-ownership. We find that land in co-ownership is much more likely to be used by less efficient farm organizations or to be left abandoned, and that it leads to significant welfare losses.

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The Impact of Property Rights Imperfections on Resource Allocation: Co-Ownership of Land in Bulgaria

1. Introduction

The recent empirical growth literature emphasizes property rights as the prime example of how institutions can affect growth (e.g. Acemoglu, Johnson, and Robinson, 2001; Acemoglu and Johnson, 2005). The micro-literature on property rights has attempted to disentangle some of the underlying mechanisms by focusing on the impact of property rights on credit and investment (e.g. Besley, 1995; Field, 2005; Galiani and Schargrodsky, 2005) and on land allocation (e.g. Lanjouw and Levy, 2002). While some argue that secure and complete private property rights are important for economic development and poverty reduction (e.g. De Soto, 2000; Olson, 2000), others have pointed out that substantial growth has often occurred without perfect rights (Rozelle and Swinnen, 2004). In China, rapid growth took off after a fundamental reform transferred land property rights from collective to private ownership under the rural household responsibility system (Lin, 1992). However, the resulting land rights, which stimulated this dramatic growth and poverty reduction, were far from complete and not perfectly secure (Jacobi et al, 2002; Qian, 2003).

In contrast to China, land privatization in Eastern Europe and much of the Former Soviet Union focused on establishing full ownership rights (Macours and Swinnen, 2002). More generally, reforms in these transition countries include some of the most radical and swift changes in property rights in recent history, and caused fundamental changes in ownership structure. As such they provide a unique opportunity to analyze the impact of property rights. The conclusions drawn from this experiment also provide a mixed and nuanced picture. Rapid privatization did not always lead to an optimal initial allocation of assets, as local elites often were quick to take advantage of these reforms (Roland, 2002; Glaeser, Johnson and Shleifer, 2001). Yet, studies also show that privatization allowed the emergence of new companies that generally have outperformed both the transformed and the remaining state-owned companies **(**Bilsen and Konings, 1998; Konings et al., 2005; Nickel, 1996;).

In this paper we contribute to this literature by analyzing how, after privatization, remaining imperfections of property rights have affected allocation of assets and welfare, using

micro-evidence from Bulgaria. Johnson, McMillan and Woodruff (2002) have analyzed the effects of property rights insecurity on investment using firm-level data from 5 post-communist countries, but overall the empirical micro-evidence on property rights in transition countries is limited. Post-privatization imperfections of property rights often arose as assets were restituted to pre-collectivization ("former") owners. Property rights restitution to former owners often led to co-ownership of assets by the children or grandchildren of former owners. This form of co-ownership is widespread in Central and Eastern Europe (OECD, 1997; Dale and Baldwin, 2000), but has received relatively little attention.

Bulgaria offers an interesting natural experiment to analyze these issues, because of the prominence of the co-ownership problem (about half of all land plots are co-owned), the strong fragmentation of the land, and because of legislation providing an instrument to separate out chosen (endogenous) versus forced (exogenous) forms of co-ownership. Land privatization in Bulgaria occurred through restitution of physical plots of land to the families that had owned land prior to the post-WWII collectivization processes. Hence, in the beginning of the 1990s, households, many of whom had long ago moved out of the rural areas, obtained ownership of agricultural land. This was typically land that had historically belonged to their parents or grandparents, but had been de facto expropriated during collectivization. All legal heirs were entitled by descent to part of the each plot.[1] To avoid land fragmentation, a law imposed a minimum plot size of 0.3 hectares. The law resulted in forced co-ownership of land for many households.

The theoretical literature on joint ownership suggests that it might lead to suboptimal investment levels (e.g. Hart, 1995) and impede optimal allocation of assets (Holderness, 2003; Deaton 2006) as transaction costs in decision-making and exercising their rights constrain owners in making optimal decisions. Based on these insights, we hypothesize that co-ownership makes it more likely that assets are allocated to traditional (and often inefficient) users, or are left abandoned, and thus negatively affect efficiency and welfare.

[1] While similar inheritance laws exist in several Western-European countries, co-ownership is less widely observed because land gets divided among heirs immediately after inheritance and parcels generally do not stay fragmented but are often consolidated through land swaps or rental and sales after the division. Given the absence of any type of land market during Central Planning, such adjustments where not possible in Bulgaria and the privatization process in the 1990s suddenly "revealed" this massive co-ownership situation.

To identify the effect of co-ownership, we will exploit the non-linearity caused by the minimum plot size legislation. In particular, we take advantage of the fact that it implies forced co-ownership for plots that would be below the minimum size if they were to be divided among all the legal co-owners. The artificial cut-off of 0.3 hectares allows identifying the effect of forced joint ownership through a regression discontinuity analysis. We estimate whether the probability of certain types of plot allocations change discontinuously at the cut-off plot size, while accounting for the fact that the plot allocation may differ by plot size even if no minimum plot size law exists. Methodologically, this paper hence relates to work that uses regression discontinuity design to identify causal relationships (e.g. Pitt and Khankher, 1988; Angrist and Levy, 1998; Van der Klaauw, 2002).[2] The identification further relies on the fact that households' land ownership in Bulgaria was determined through the restitution process in the beginning of the 1990s, as land sales markets are still very small. In addition, we use household fixed effects in our plot level analysis to control for potential political power and influence that might have played a role during the restitution process and for other household unobservables. The method used in this paper therefore also relates to Goldstein and Udry (2005) who use variation across plots from the same household to shed light on property rights insecurity in Ghana.

This paper contributes to the literature on property rights by providing micro-evidence of the possible negative effects of imperfect rights. The specific imperfection analyzed in this paper, co-ownership of rights, is important beyond transition countries. Co-ownership of assets is common in many developing countries, and even in the US, mainly after inheritance (Mitchell, 2001; Shoemaker, 2003). By analyzing the effect of legislation that de facto restricts property rights, this paper also relates to research indicating that gains from formal property rights might be limited in the presence of other market imperfections (Carter and Olinto, 2003; Boucher et al., 2005) or weak enforcement institutions (Conning and Robinson, 2007; Macours et al., 2005). Finally, the analysis relates to Blarel et al. (1992) and Mearns (1999) who analyze policy interventions and legislation targeted at preventing land fragmentation in other settings.

[2] Buddelmeyer and Skoufias (2004) recently compared regression discontinuity results with the results obtained from the randomized evaluation and found an overall good performance of the regression discontinuity estimators.

The paper is organized as follows. We first explain the property rights reforms and legislation in Bulgaria, describe our data and discuss the identification strategy. We then analyze the land allocation choices households face. We estimate a multinomial logit to account for all the different choices, and show that land in co-ownership is much more likely to be used by large-scale cooperatives or to be left abandoned, while it is less likely to be used by individual household farms or de novo agricultural companies. We also estimate a model with household fixed effects and show that our results are robust. The effect of co-ownership on land allocation is identified using a regression discontinuity design. Using a semi-parametric estimator we further illustrate the effect of the law on perceptions of property rights. After establishing the effects of co-ownership on land allocation, we focus on the efficiency and welfare implications of our findings. We find in particular that co-ownership leads to significant welfare losses.

2. Background on the land restitution and minimum plotsize legislation in Bulgaria

From the late 1940s through the 1980s, agricultural production in Bulgaria was collectivized. The large majority of all agricultural land was used by collective and state farms, while private household plots only accounted for 13% of agricultural land (table 1). All this changed dramatically in the 1990s. Former communist co-operatives were liquidated 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. By 2001, the share of arable land used by restructured cooperatives and state farms had fallen to 51% of the agricultural land, while individual farms and companies each cultivated approximately one quarter of agricultural land (table 2).[3]

The effective property rights on the land were restituted to the former landowners, based on the land records of 1946. Given that a large part of the original owners were no longer alive, land was transferred by descent to their heirs. According to the Bulgarian Inheritance Law, every heir gets an equal share of the property when the owner dies. If during the land reform process X parcels had to be divided among Y owners, each owner received 1/Y share of each of these X parcels.

[3] Less than 2% of the agricultural land is used by state farms. They rely on state owned land for their cultivation instead of privately owned land and therefore do not enter our analysis.

At the end of the 1990s, more than 80% of agricultural land titles had been restituted to individuals. The land restitution process resulted in a strong fragmentation of land ownership (figure 1). In several regions of the country, households owned, on average, more than five plots, with an average plot size of only 0.7 hectares. Moreover, after restitution, a large share of the parcels was co-owned by more than one owner (table 3). Land "co-ownership" results from a combination of 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; and (e) difficulties in identifying and locating all the entitled heirs during the restitution process and in reaching an agreement on the division among all of them.

This type of co-ownership situations also exists in many other transition countries. However, in Bulgaria, it is further enhanced by legislation that sets a legal minimum size for a land parcel. To prevent excessive fragmentation of land, a law was introduced which states that a plot cannot get a separate ownership title if it is smaller than 0.3 ha.[4] Vineyards and pastures need to have a minimum size of respectively 0.1 ha and 0.2 ha. Hence, a parcel cannot be divided among heirs if the size of the newly created plots would fall below these levels, a situation which we refer to as "forced" co-ownership.

The officially stated reason for the minimum plot size legislation is 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. E.g., before somebody can sell the land to somebody else, they have to agree with all owners. Hence, 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).

This paper hypothesizes in particular that these additional decision-making costs will make it more likely that the "default option" will prevail. In the context of post-restitution Bulgaria, the default option is either to leave land with the traditional users of the land, which are

[4] This legislation was part of the Law for Agricultural Land Ownership and Use (LALOU) and the Regulation for Application of the Law for Agricultural Land Ownership and Use (RALALOU), both introduced in 1991. These laws have been changed many times since then (in fact more than 30 times for the LALOU), but the rules regarding the minimum plot size were not affected by these changes.

the former collective farms that are now mostly organized as cooperative farms, or, not using the land at all. If co-ownership significantly increases the transaction costs in (re-) allocating land, we should expect co-owned land plots to be left more abandoned and to be used more by cooperatives, ceteris paribus.

Anecdotal evidence from our field interviews suggests that this is indeed often the outcome. To illustrate this, we describe two cases that are typical for the situations that we encountered in the field. The first case is a household that received 32 hectares of land through the restitution process, located in two plots of equal size. The first plot of 16 hectares is co-owned by three absentee relatives. The second plot is co-owned by another 25 people, of which 24 have migrated and are now living in Turkey and only one is living in the same village. The first plot is legally rented out to a farming enterprise based on a contract with the 3 co-owners. The second one falls into a field cultivated by a co-operative from the neighbouring city and is cultivated by the co-operative without any contract or written permission given from any of the co-owners. The absence of the co-owners prevents not only the division of the land, but also its withdrawal from the co-operative as the management of the latter refuses to leave the plot, gaining from the unsolved co-ownership issue. In the second case, in another of the surveyed villages, two companies wanted to rent two plots of, respectively, 6 hectares and 7 hectares for a period of 15 years while simultaneously investing in a processing facility in the village. It took the two companies 8 months using the efforts of 3 people - including the mayor of the village - to locate all the co-owners. Costs related to locating co-owners (approximately 90), obtaining their agreement, and registration of the rental contract in the notary, the court and the land commission, had to be covered by the companies.

These examples suggest that co-ownership, whether it is because of legal limits (e.g. case 2) or because of other constraints (e.g. case 1) might be a serious problem, with negative implications for efficiency and welfare. A household's return to its land asset is expected to be lower when the land is in co-ownership because the probability of land being allocated to a low-return default allocation increases a plot cannot be divided among co-owners and/or decision-making is difficult. The examples also suggest that efficient allocation might be more difficult the larger the number of co-owners and the further away they live. In the rest of this paper we

will econometrically assess and quantify how co-ownership affects the allocation of land and households' welfare.

3. Data

Our analysis is based on household and plot level data collected in 2003 in 18 communities, randomly sampled in three Bulgarian regions. The regions were selected to reflect important variations in the rural economy, agricultural structure, and geographical conditions. Detailed household and plot level information was gathered from 700 households through interviews with key informants and household members. The households were selected using a stratified random sampling frame, with stratification based on whether they rented land from other household members.[5]

Table 3 illustrates the co-ownership issue. 50% of all parcels owned by the sampled households are in "co-ownership". One-fifth of the parcels are owned by two households, another 14% have three co-owners and around 16% of the parcels are owned by at least 4 co-owners (figure 2). More than 40% of the parcels owned by rural households (or 79% of all co-owned plots) are in forced co-ownership and cannot be divided among the owners by law.[6] Interestingly, owners declare to have effective decision power over 67% of non co-owned plots, but only for 32% of the co-owned plots. The descriptive statistics also show that land fragmentation is quite strong. Households own an average of 5.8 plots, while average plot size is about 0.7 hectares.

The land sales market in rural Bulgaria is not well developed. Selling of agricultural land is very limited. Our survey data show that by 2003 only 3% of rural households own land that they had bought since the start of transition. Hence, the amount of land owned is largely determined by pre-collectivization land ownership. 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

[5] This stratification was followed because the data was originally collected to shed light on households' participation on both sides of the rental markets. As households decisions to rent land from others and decisions about the allocation of their own land are clearly related, we account for the sampling frame in the empirical analysis (see section 5).

[6] Field interviews revealed that informal arrangements that circumvent the law are rare.

20% of the land cultivating households are renting in land. Around 40% of the parcels that are owned by the surveyed households are rented out to a cooperative and 16% is rented out to a farming company (table 3). At the household level, 50% of all land owning households are renting out some land to a cooperative and 29% to a farming company. Further, 9% of the landowning households are renting out land to another household, but only two percent of the parcels owned by rural households are exchanged with other households. 18% of the parcels are cultivated by the owners.

Land abandonment is remarkably widespread. More than 40% of all land owning households in our 2003 survey leave some land abandoned, and 23% of the total number of plots owned by rural households are left abandoned. This high level of land abandonment is remarkable given that leaving land fallow for soil recovery is not a common practice in Bulgaria.

4. Identification

This paper uses the legal minimum plot size cut-off level to analyze the effect of property rights imperfections under the form of co-ownership on the land allocation decision. In particular, we analyze whether the allocation of, and the returns to, land differ depending on whether plots are in co-ownership. We expect co-ownership to lead to decision-making problems, which increases the costs of both using the land and of changing the land allocation. Given that these problems are likely to increase with the number of co-owners, we also analyze the effects of the number of co-owners.

The plot size legislation allows addressing the concern that co-ownership of land could potentially be endogenous. Certain types of households might chose to keep their land in co-ownership, while others might chose to split it up, and as such there could be a potential omitted variable bias problem. There is however a large share of all co-owned plots that is in forced co-ownership, i.e., all the plots that cannot be divided up among the different owners because such division would violate the minimum plot size legislation. The identification strategy in this paper relies on this exogenous source of co-ownership.

Bulgaria is a particularly interesting case to study these issues since the characteristics of the land market and regulations allow addressing other potential problems regarding the

identification of the property rights effects. A first concern is the source of ownership, and in particular whether ownership comes from restitution or from land purchase/sale. In Bulgaria, land ownership is largely determined through the restitution process and the amount of land reflects historical ownership. Indeed, land purchases are very rare in rural Bulgaria. A World Bank survey in 2004 found that only 3.5% of all rural households sold land and only 1% bought land since the start of transition. This is consistent with our survey data (see above).

It should further be noted that in reality land was regularly not restituted in historical boundaries but instead in comparable boundaries. Households with local political power or influence often received consolidated parcels of land which were easily accessible from the main road or located in the most fertile areas of the territory belonging to the settlement, while people without influence on the restitution decision received fragmented parcels with inferior location or quality. We will therefore control for plot size and other plot characteristics in the analysis. We also present a set of results that explicitly controls for all household unobservables, and as such explicitly accounts for potential household influence during the restitution process.

5. Plot allocation choice and forced co-ownership

There are 5 possible allocations for land owned by individual households: 1) owner-cultivation; 2) renting out to another farming household; 3) renting out to a cooperative, which is typically a successor organisation of a former collective farm; 4) renting out to a company; and 5) abandoning. For each plot, the household decides among these 5 allocations. To analyze the effect of forced co-ownership on land allocation, we estimate a multinomial logit model and use two alternative measures of forced co-ownership. The first specification includes 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, and zero otherwise. Given that the decision-making problems are likely to increase with the number of co-owners, the second specification uses the number of co-owners in case of forced co-ownership.

In addition to the variables capturing the imperfection of the property rights on the plot, we control for regional fixed effects and a number of household characteristics that are likely to affect household's land allocation. In particular, we include the total amount of land owned by a

household and two indicators of managerial capacity of the household: age and education of the household head. We also include the square terms, as other studies (e.g. Rizov, et al., 2001) typically show a non-linear effect of these human capital variables in a transition context. Standard errors are clustered at the household level to account for correlation of choices between plots from the same household. In a third specification, we allow for possible correlation at the community level, instead of the household level. In specification 4, we include community fixed effects, and in specification 5 we add control variables at the plot level. In particular, we include a variable measuring land quality, which is based on the Bulgarian land classification system that assigns to each plot a score between 1 and 10, with 1 being the highest quality; a variable measuring the distance in kilometres of the plot to the house of the owner, and a variable measuring the plotsize itself. All regressions also account for sampling weights.[7]

Table 4 shows the results of the different specifications. The regression coefficients show the likelihood of the different allocations, relative to owner-cultivation (the base category in the multinomial regression). The results of the first specification show that plots that cannot be divided by law are much more likely to be either rented out to a cooperative, or to be abandoned. Similarly, the results of the second specification show that the higher the number of forced co-owners, the more likely the plot is to be rented out to a cooperative, or to be abandoned. These results are robust to allowing for clustering or fixed effects at the community level, and for the inclusion of plot-level control variables.[8] Hence, the results show that plots in forced co-ownership are much more likely to be left in the default option. If a plot cannot be divided among co-owners because of legal impediments, it becomes more likely that the plot owner is either not using the land, i.e. leaving land abandoned, or leaving land with the traditional user of the land, which is the former collective, now mostly organized as a cooperative farm. These results are consistent with the possible role of high transaction costs and costly decision making for plots in forced co-ownership.

To further explore the importance of transaction costs and coordination costs among co-owners, we distinguish between co-owners living in the same village, versus co-owners living

[7] We use a weighted multinomial regression because the dependent variable of interest is related to the variable that determined sampling weights. The results are however very robust to non-inclusion of the sampling weights.

[8] The results are also robust to exclusion of pastures and vineyards (11% of plots in the sample), which have a lower minimum plot size.

outside of the village. In particular, in a 6th specification we distinguish between the number of forced co-owners living in the village and the number of forced co-owners not living in the village. Coordination problems are likely to be larger when co-owners do not live in the same village, for example because interaction is more complicated, less frequent and monitoring is more costly. We would expect therefore to find more land to be abandoned or left with cooperatives the larger the number of co-owners not living in the village.[9]

Before discussing these results it is useful to note that the results will be more tentative than the earlier findings. There could be a potential endogeneity problem if co-ownership 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. Nevertheless, our data indicate, that endogeneity concerns related to migration might be limited. Emigration out of the rural areas is rare in the sampled villages, as less than 5% of the households that inhabited the rural areas at the start of the reforms had emigrated at the time of the survey. 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.

The regression results for specification 6 in table 4 suggest that the impact of the number of co-owners does depend on whether they are living in or outside the village. The probability of renting to a cooperative or leaving 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 significantly affect the probability of the default options. The results are consistent with the hypothesis that co-ordination problems are larger when co-owners do not live in the same village because interaction is more complicated and less frequent, and monitoring by co-owners is more costly. This could imply that imperfections of property rights may have little effect on asset allocation if coordination and monitoring costs to address the imperfections are low.

[9] This would be true as long as there is no strong informal rules that guide decision making in case of co-ownership, such as e.g. a rule that gives the oldest co-owner decision-making power. Such rules seem to exist in other countries (e.g. Canada). More generally, the impact of absentee relatives is likely to depend on informal decision-making rules. Absentee co-ownership may have the opposite effect if existing informal rules re-enforce the influence of the local co-owner, instead of weakening it as in our case.

6. The effect of co-ownership on default plot allocation: partial linear estimator and results with household fixed effects

As discussed in section 4, household characteristics such as entrepreneurship and social relations might have affected what type of land a former owner received during the restitution process. If these same characteristics affect the post-restitution plot allocation, there is a potential omitted variable bias. We therefore turn to estimations with household fixed-effects. In particular, we estimate the probability of the default option, i.e., of a plot being rented out to a cooperative or being abandoned versus all other allocations.[10] The first column of table 5 shows the results of a logit regression with household fixed effects and controlling for plot level characteristics. To check the robustness of the results, we show the logit regression results without household fixed effects in column 2. Similar regression results without controlling for plot level characteristics are presented in column 3 and 4. [11] The estimations with household fixed effects confirm our earlier findings. Plots in forced co-ownership are more likely to be rented out to cooperatives or left abandoned, even after controlling for household unobservables.

Both the results of the multinomial logit and the results of the household-fixed effect models are robust to inclusion of plot size itself, in addition to the variable measuring forced co-ownership. This is important given that the forced co-ownership is directly tied to plot size. Finding the effect of forced co-ownership after controlling for general plot size effects, suggests that decision making on plots affected by the minimum-size law is different than decision making on other plots.

To further test for changes in the probability of leaving land abandoned or renting it out to a cooperative at plot sizes for which legally division among co-owners is not allowed, we now use the partially linear estimator developed by Porter (1999). Let y be the outcome variable indicating the probability of leaving the plot abandoned or renting it out to a cooperative, x gives

[10] We cannot estimate the multinomial logit with household fixed effects for lack of sufficient intra-household variation, i.e. there are only few households with all the different possible allocations for different plots. The point estimates of the coefficients of the two default options (renting to cooperative and land abandonment) in the multinomial regression are also very similar, further motivating this regrouping.

[11] The estimations only include those households that have at least 2 plots with a different value for the default option and that could therefore be included in the household fixed effects logit model. The results of the estimation without fixed effects but on the full sample are very similar to the ones presented in column 2 and 4.

the plot size divided by the number of co-owners, and *m( )* is continuous in *x*. The indicator *d* equals 1 if a plot is not in co-ownership or, if co-owned, could legally be divided among co-owners. *d* equals 0 if the plot cannot be legally divided. The known discontinuity point of 0.3 hectare is represented by $\bar{x}$.[12]

$$y = m(x) + d\alpha + \varepsilon \text{ where } E(\varepsilon|x,d) = 0 \text{ and } d = 1\{x \geq \bar{x}\}$$

By subtracting the conditional expectation with respect to *x* from both sides, we get

$$y - E(y|x) = \alpha(d - E(d|x)) + \varepsilon$$

We use locally weighted regressions to estimate the conditional expectations of *y* and *d* and calculate *y-E(y|x)* and *d-E(d|x)*. We then apply least squares to these differences to obtain an estimate of α, i.e., the magnitude of the jump in the relationship between land allocation and plot size per owner at the cut-off criteria and bootstrap to obtain the standard errors. Figure 3 shows that there is a large and significant discontinuity in the relationship at the minimum plot size of 0.3 ha. Interestingly, we find an even larger and very significant discontinuity if we use the perception of property rights as the left hand side variable (figure 4). People with plots in forced co-ownership report to have significantly lower decision-making power on those plots.

So far, we have focused on the issue of forced co-ownership per se. The frequency of this type of forced co-ownership also allows us to identify the effect of co-ownership more broadly. We can use the exogenous variation in co-ownership that results from the minimum plot size legislation as an instrument for co-ownership. Column 2 and 4 in table 6 show results of the IV estimation, with the number of forced co-owners being used as the instrument for the actual number of owners. For comparison, column 1 and 3 show the reduced-form results of the linear probability model. The model is estimated with household fixed effects, both with and without additional plot-level control variables. Not surprisingly, the number of forced co-owners is a strong instrument for the actual number of co-owners. The second stage results show that the

[12] Vineyards and pastures are excluded in this estimation, because of the different minimum plot size.

number of co-owners has a significant impact on plot allocation. In particular, increasing the number of co-owners with 1 increases the probability of the default option with 5 to 6 percentage points.[13]

Table 7 shows results by region to show that these results are not driven by the variation across regions. We find very similar and significant effects in the North-Central and the South-Central region. The point estimates for the North-East region are similar but not significant, probably because of an insufficient number of observations. Households in this region own less plots on average and therefore there are relatively few observations with within-household variation for that region. Overall, the results by region confirm the earlier findings and the magnitude of the coefficients is remarkably similar across regions. This further strengthens our results, as other papers (e.g. Besley 1995) have shown that results on property rights are often region-specific.

7. Effect of co-ownership on welfare

The results in sections 5 and 6 establish that land in co-ownership is more likely to be either left in the cooperative or abandoned. Given that fallowing of land for the purpose of restoring the productive potential of land is not a common practice in Bulgaria, land abandonment is likely to be an inefficient allocation of the land. One could however hypothesize that renting out to a cooperative is not necessarily an inefficient default option. While our data do not allow calculating efficiency directly, we can look at the existing evidence related to the efficiency of different types of farm organizations in Eastern Europe to shed light on this point. Gorton and Davidova (2004) reviewed the evidence for a wide set of transition countries. Their results suggest that cooperatives tend to be the least efficient users of agricultural land.[14] Interpreting our results in light of the findings in the literature hence suggests that co-ownership, and in particular forced co-ownership because of the minimum plot size legislation, decreases efficiency. This is particularly striking given that the minimum farm size legislation was motivated by a desire to prevent land fragmentation because of hypothetical diseconomies of

[13] We tested for non-linearity of this effect but did not find a significant effect.

[14] A potential reason is the organizational structure of the cooperative, where each member has one vote, which does not facilitate possible efficiency-enhancing employment reductions. Moreover, the management functions of the cooperatives are very often still occupied by the former managers of the collectives (Mathijs and Vranken, 2001).

scale. Our results indicate, however, that co-ownership leads to an under-allocation of land to both households and de novo agricultural companies. These agricultural companies are often of similar size as the cooperatives (see table 2), and hence should have similar economies (or dis-economies) of scale. At the same time, their incentive structure and decision-making process is generally more conducive to profit-maximizing production and efficient asset allocation, compared to cooperatives (Mathijs and Swinnen, 2001).

In addition to potential efficiency trade-offs, there are several reasons to believe that misallocation of land to cooperatives and abandonment could substantially affect household welfare. First, land abandonment implies that a household is not receiving any returns to that land asset. Second, households' returns from renting to cooperatives might be limited because large farm organizations have substantial market power in local or regional land markets. Indeed, evidence from a number of transition countries suggest that cooperatives often offer lower prices and worse contract terms than individual farms (Vranken and Swinnen, 2006). For example, in the Czech Republic and Slovakia land rents paid by cooperative farms were only between 20% to 50% of the rents paid by family farms in the past years (Ciaian and Swinnen, 2006). Further, surveys show that cooperative farms generally paid their rents in kind, while family farms were much more likely to pay cash or mixed cash/in-kind, both in Bulgaria and in other Eastern European countries (World Bank, 2006).

We hence turn to analyzing the welfare implications of land co-ownership. Following Finan et al. (2005) we use a principal component analysis and construct a welfare index based on the ownership of key assets.[15] To analyze the effect of co-ownership on welfare, we include, besides the total amount of land owned by the household, a separate variable indicating the amount of land co-owned. For land that is in co-ownership, we divide plot size by the number of co-owners to calculate the amount of land owned by the household.

The first column of table 8 shows the OLS regression results, while column 2 and 3 show IV results that account for the endogeneity of co-ownership. In particular, in column 2 we

[15] The analysis was based on ownership of a house, car, color TV, black and white TV, video, personal computer, telephone, and cell phone. We use the first component, which captures more than 33% of the total variance and has an Eigen value that is twice as high as the second, as the welfare index. The index has mean zero and a standard deviation of 1.63.

instrument the co-owned area with a dummy variable that equals one if the household owns some land that cannot be divided according to the minimum plot size law. In column 3, we use the area that is in legally forced co-ownership as instrument for the total co-owned area. Column 4 to 6 show a second set of results focusing directly on the relationship between welfare and the area that is rented out to a cooperative or left abandoned, which is instrumented with the same variables as before. We add control variables for household's human capital (education and age of the household head) and regional fixed effects. [16] These results indicate that land co-ownership is negatively related to household welfare, holding total land ownership and other household characteristics constant. Adding the coefficients of total land ownership and of the area in co-ownership, we note that the estimated returns to land for land in co-ownership are in fact not significantly different from zero in the IV estimates.[17] Furthermore, the results in column 5 and 6 suggest that one mechanism through which this works is that the household's returns to land in cooperatives or left abandoned are much lower than the returns to other land. The coefficients obtained in the IV are very similar for the two definitions of the instrument, and are in fact very different from the OLS results. This indicates the importance of correcting for the endogeneity of land allocation. The IV results suggest that the return to land that is left in the default option because of forced co-ownership is not significantly different from zero.

8. Conclusion

This paper analyzes the impact of land property rights imperfections on asset allocation and household welfare by studying co-ownership of land using micro-evidence from Bulgaria. 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 or joint ownership. Household's land ownership in Bulgaria is determined by the restitution process from the beginning of the 1990s, and by a law on minimum plot size. The law implies forced co-ownership for plots that would be below the minimum size if they were to be divided among all the legal co-owners. This paper takes advantage of the artificial cut-off

[16] Plot level characteristics are not included because welfare is analyzed at the household level.

[17] The estimated sum is in fact negative, but t-tests confirm that the sum is not significantly different from zero (P-value equals 0.45 for specification in column 2 and 0.83 for column 3).

resulting from the law on minimum plot size to identify the effect of co-ownership on land allocation decisions and household welfare.

Using plot-level information from a recent household survey in Bulgaria, we show that plots that are in co-ownership are much more likely to be left abandoned or used by large-scale cooperatives, which are generally considered less efficient farm organizations. Vice versa, they are less likely to be used by individual household farms or de novo agricultural companies. Inefficient allocations are more likely for plots with a larger number of co-owners, suggesting larger transaction costs and decision-making problems as the number of co-owners increases. Our results also suggest that the negative allocation effects can be mitigated when monitoring and coordination costs are low – e.g. when co-owners live in the same village. Finally, the analysis in this paper indicates that land co-ownership translates in substantial household welfare losses.

The evidence in this paper suggests that property rights imperfections can remain a serious constraint, even after a massive land privatization process aimed at restituting complete property rights. As such, it sheds new light on the different dimensions of property rights that can be important for economic growth and development. In particular, historical ownership and legal constraints can increase transaction costs and affect effective decision-making. This can result in sub-optimal land allocation, even after complete land titles have been established.

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Figure 1: Number of plots owned per household – regional variations

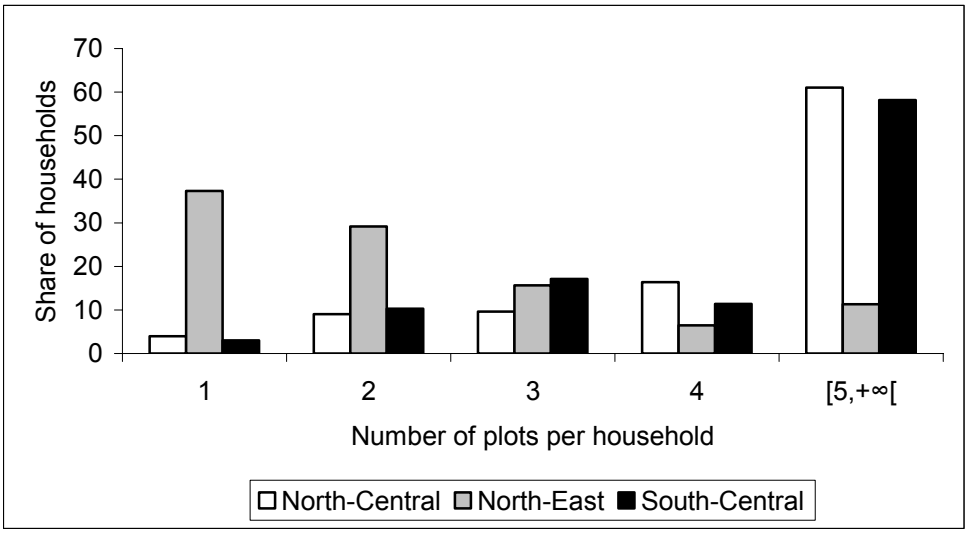


Figure 2: Number of owners per parcel-regional variations

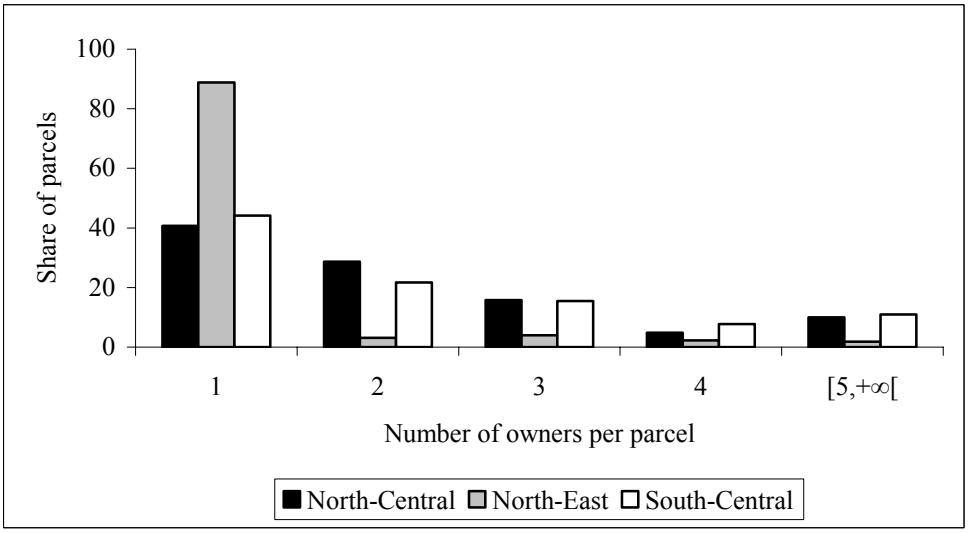
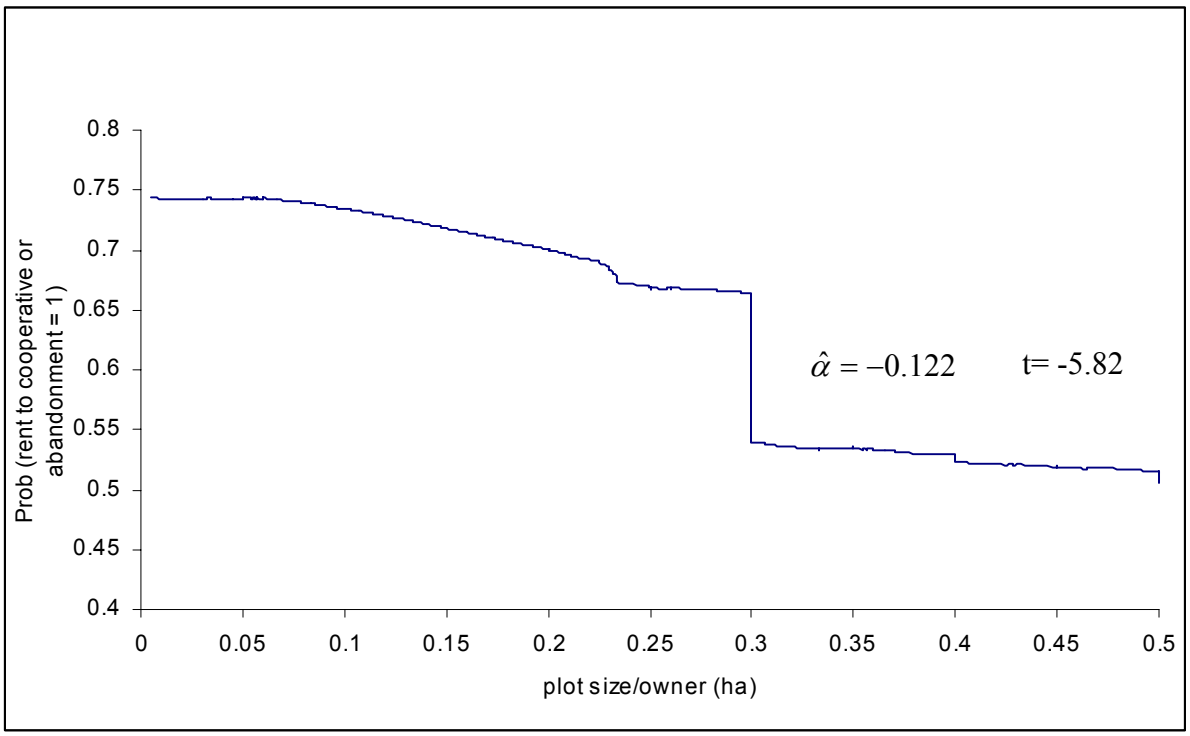
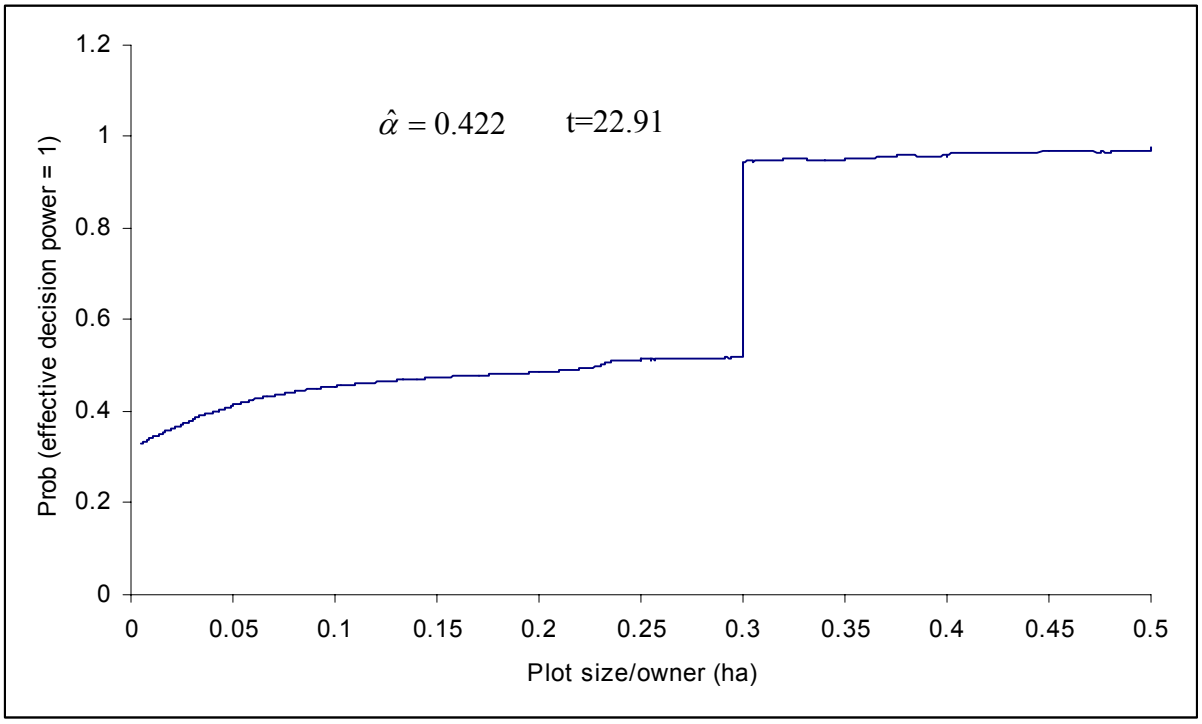


Figure 3: Probability that a plot is rented out to a cooperative or left abandoned by plot size



Estimations with bandwidth = 0.99. t-statistic calculated based on bootstrapped standard error with 100 replications

Figure 4: Probability that the owner has effective decision power on the plot by plot size



Estimations with bandwidth = 0.99. t-statistic calculated based on bootstrapped standard error with 100 replications

Table 1: Pre-reform agricultural structures in Bulgaria, 1985

	Share of arable land (%)	Average size (ha)
Agro-industrial complexes comprising of	80.7	12 600
Collective farms	58.3	4 000
State farms	8.8	2 100
Brigades	13.6	na
Other agricultural organisations	6.2	1 215
Private plots	13.1	0.38
Total	100	

Source: NSI, 1994

Table 2: Post-reform agricultural structures in Bulgaria, 1995-1999

	1995		1999	
	Share of arable land (%)	Average size (ha)	Share of arable land (%)	Average size (ha)
State farms	6.5	310.9	1.6	241.2
Municipality farms	-	-	2.0	n.a.
Organisations under liquidation	-	-	0	0
Co-operatives	40.8	815.3	36.8	482.5
Household farms	52.5	1.4	56.0	2.6*
Farming companies	0.7	283.5	3.6	378.6
Total	100.0		100.0	

Source: NSI, 1997 & 2001

Table 3: Descriptive statistics

	Non co-owned plots		Co-owned plots		
Nr of observations	1800		1775		Significance
	mean	sd	mean	sd	difference
PLOT LEVEL					
Plot-level data on co-ownership					
Share of total sample	50		50		
% Non-divisable by law			79		
Number of coowners			3.4	2	
From the same village			1.9	2.2	
Not from the same village			1.5	1.1	
Number of forced coowners			3.1	1.8	
From the same village			1.8	1.1	
Not from the same village			1.3	1.8	
Other plot-level variables					
Plot size	0.8	1.3	0.6	2.6	**
Quality (1-10)	4.8	2	5.3	2	***
Distance	3	12	3.1	8.9	
Plot allocation					
% Used by the owner	26		15		***
% Rented out to an other household	5		2		***
% Rented out to a cooperative	30		49		***
% Rented out to a company	19		13		***
% Abandoned	21		22		
% plots over which the owner declares to have effective decision power	67		32		***
HOUSEHOLD LEVEL	mean	sd			
Land ownership and use					
Area in co-ownership	0.5	0.9			
Area owned solely by one household	1.9	2.5			
Total area owned per household	2.4	2.4			
Number of plots owned per household	5.6	5.4			
Area in owner-cultivation	0.4	1.2			
% households that cultivated land	61.6				
Area cultivated by the household	1	3.8			
Number of plots cultivated per household	1.5	2.1			
% households that bought land	2.8				
For those who bought land: Area bought (ha)	2.1	2.8			
For those who bought land: Number of plots bought	1.5	0.8			
Other household characteristics					
Age household head	64.8	12			
Years of education household head	8.9	3.1			
% households that immigrated	9				
Of which: % land cultivating	49				
% household that emigrated	4				
% of households with some land:					
used by the owner	44.5				
rented out to an other household	9				
rented out to a cooperative	48.6				
rented out to a company	28.8				
abandoned	43.7				

Table 4: Plot allocation decision: multinomial regression with owner-cultivation

	Specification 1				Specification 2				Specification 3			
	Rent to other hh	Rent to coop	Rent to comp	Abandon	Rent to other hh	Rent to coop	Rent to comp	Abandon	Rent to hh	Rent to coop	Rent to comp	Abandon
Non-divisible by law	-0.353	0.947***	0.399	1.054***								
	(0.763)	(4.241)	(1.016)	(4.322)								
# forced co-owners					-0.235	0.418***	0.200*	0.377***	-0.235	0.418***	0.200	0.377***
					(1.060)	(5.968)	(1.680)	(4.649)	(0.742)	(4.477)	(0.737)	(3.232)
Land owned (ha)	-0.007	0.001	0.001	0.002***	-0.006	0.001	0.001	0.002***	-0.006*	0.001	0.001	0.002***
	(0.922)	(1.381)	(1.204)	(2.627)	(0.882)	(1.447)	(1.235)	(2.988)	(1.826)	(1.240)	(1.123)	(3.458)
Age hh head	0.120	-0.011	-0.061	-0.213**	0.125	0.062	-0.032	-0.156**	0.125	0.062	-0.032	-0.156***
	(0.708)	(0.156)	(0.395)	(2.564)	(0.719)	(0.848)	(0.200)	(2.122)	(0.652)	(0.871)	(0.210)	(2.990)
(Age hh head)^2	-0.001	0.000	0.001	0.002***	-0.001	-0.000	0.001	0.002***	-0.001	-0.000	0.001	0.002***
	(0.551)	(0.607)	(0.687)	(3.094)	(0.564)	(0.331)	(0.480)	(2.747)	(0.546)	(0.325)	(0.544)	(3.999)
Education hh head	-0.625**	-0.011	0.169	0.080	-0.615**	-0.010	0.180	0.081	-0.615***	-0.010	0.180	0.081
	(2.567)	(0.056)	(0.622)	(0.368)	(2.566)	(0.053)	(0.677)	(0.391)	(3.445)	(0.059)	(1.289)	(0.425)
Education hh head^2	0.034***	-0.000	-0.002	-0.001	0.034***	-0.000	-0.003	-0.001	0.034***	-0.000	-0.003	-0.001
	(2.762)	(0.015)	(0.160)	(0.098)	(2.758)	(0.031)	(0.200)	(0.144)	(3.421)	(0.034)	(0.311)	(0.138)
region==NE	0.839*	0.381	-0.061	-2.801***	0.868*	0.409	-0.045	-2.862***	0.868	0.409	-0.045	-2.862***
	(1.662)	(1.111)	(0.179)	(4.951)	(1.724)	(1.181)	(0.134)	(5.085)	(1.496)	(0.383)	(0.053)	(3.127)
region==SC	-0.310	-0.013	-2.649***	-0.475**	-0.292	-0.009	-2.645***	-0.459**	-0.292	-0.009	-2.645***	-0.459
	(0.775)	(0.054)	(8.185)	(2.351)	(0.724)	(0.037)	(8.115)	(2.304)	(0.371)	(0.009)	(2.830)	(1.390)
Constant	-3.556	-0.445	-0.122	3.931	-3.802	-2.751	-1.071	2.239	-3.802	-2.751	-1.071	2.239
	(0.670)	(0.200)	(0.023)	(1.451)	(0.695)	(1.158)	(0.193)	(0.907)	(0.619)	(1.418)	(0.207)	(1.425)
Clustering on household	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Clustering on community	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Community fixed effect	No	No	No	No	No	No	No	No	No	No	No	No
Observations	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575

Regression results account for sampling weights.
Absolute value of t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Multinomial regression results (continued)

	Specification 4				Specification 5				Specification 6			
	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
# forced co-owners	0.013	0.201***	0.081	0.298***	0.039	0.206***	0.079	0.237***				
	(0.100)	(3.484)	(1.020)	(3.748)	(0.302)	(3.278)	(0.949)	(3.191)				
From the same village									-0.066	0.076	0.418*	0.194
									(0.222)	(0.549)	(1.736)	(1.340)
Not from the same village									0.044	0.229***	-0.085	0.320***
									(0.249)	(3.144)	(0.562)	(3.345)
Plot quality (1-10)					-0.055	-0.001	-0.212**	0.609***				
					(0.412)	(0.022)	(2.225)	(7.692)				
Distance to plot (km)					0.139***	0.143***	0.115***	0.163***				
					(3.277)	(3.921)	(2.594)	(4.491)				
Plotsize (ha)					0.014*	-0.002	-0.002	-0.087***				
					(1.739)	(0.883)	(0.979)	(3.732)				
Land owned (ha)	-0.008	0.001	0.001	0.001	-0.014*	0.001	0.001	0.001	-0.008	0.001	0.001	0.001*
	(0.819)	(0.718)	(1.525)	(1.642)	(1.722)	(0.739)	(1.575)	(1.585)	(0.819)	(0.888)	(1.112)	(1.803)
Age hh head	0.074	0.043	-0.356*	-0.169**	0.054	0.035	-0.346*	-0.182**	0.074	0.046	-0.371*	-0.164**
	(0.433)	(0.588)	(1.899)	(2.238)	(0.351)	(0.472)	(1.915)	(2.300)	(0.437)	(0.636)	(1.887)	(2.149)
(Age hh head)^2	-0.000	-0.000	0.003**	0.002***	0.000	0.000	0.003**	0.002***	-0.000	-0.000	0.003**	0.002***
	(0.060)	(0.137)	(2.132)	(2.693)	(0.074)	(0.020)	(2.132)	(2.749)	(0.061)	(0.172)	(2.105)	(2.617)
Education hh head	-0.861***	-0.057	0.244	0.145	-0.854***	-0.015	0.226	0.099	-0.861***	-0.055	0.233	0.147
	(2.777)	(0.274)	(0.883)	(0.697)	(2.810)	(0.069)	(0.783)	(0.486)	(2.759)	(0.265)	(0.866)	(0.710)
(Education hh head)^2	0.049***	0.002	-0.007	-0.005	0.049***	-0.000	-0.006	-0.002	0.049***	0.001	-0.006	-0.005
	(3.361)	(0.156)	(0.495)	(0.480)	(3.477)	(0.043)	(0.436)	(0.159)	(3.341)	(0.146)	(0.466)	(0.496)
Clustering on household	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering on community	No	No	No	No	No	No	No	No	No	No	No	No
Community fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575	3575

Regression results account for sampling weights.
Absolute value of t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Plot allocation decision: logit regression of the probability of renting to cooperatives or leaving plot abandoned

	(1)	(2)	(3)	(4)
Number of forced co-owners	0.369***	0.237***	0.379***	0.212***
	(6.409)	(7.330)	(6.393)	(6.687)
Plot quality (1-10)			0.391***	0.362***
			(7.372)	(10.824)
Distance to plot (km)			0.218***	0.079***
			(5.304)	(3.282)
Plotsize (decares)			-0.005***	-0.004***
			(2.815)	(2.671)
Household fixed effects	Yes	No	Yes	No
Observations	2198	2198	2198	2198

Regression results account for sampling weights.
Absolute values of t-statistics in parentheses: * significant at 10%, ** significant at 5% and *** significant at 1%

Table 6: Plot allocation decision: linear probability of renting to cooperatives or leaving plot abandoned

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Number forced co-owners	0.056		0.054	
	(7.22)***		(6.96)***	
Number co-owners IV		0.063		0.061
		(7.17)***		(6.95)***
Plot quality (1-10)			0.056	0.056
			(7.30)***	(7.32)***
Distance to plot (km)			0.008	0.008
			(3.47)***	(3.48)***
Plotsize (decares)			-0.001	-0.001
			(-1.79)*	(-2.43)**
Household fixed effect	Yes	Yes	Yes	Yes
R^2	0.2872		0.2449	
Observations	2198	2198	2198	2198
First Stage Regression Dependent variable		Number co-owners		Number co-owners
Number forced co-owners		0.889		0.894
		(60.00)***		(62.70)***
Plot quality (1-10)				-0.004
				(-1.15)
Distance to plot (km)				0.005
				(2.21)**
Plotsize (decares)				0.003
				(4.11)***
Household fixed effect	Yes	Yes	Yes	Yes
R^2		0.9707		0.9724
Observations		2198		2198

Regression results account for sampling weights
Absolute value of t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Plot allocation: linear probability of renting to cooperatives or leaving plot abandoned by region

	North-Central		North-East		South-Central	
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Number forced co-owners	0.041*		0.081		0.056***	
	(1.83)		(0.48)		(6.81)	
Number co-owners		0.057*		0.080		0.061***
		(1.86)		(0.48)		(6.78)
Plot quality (1-10)	0.098***	0.098***	0.095	0.128	0.045***	0.045***
	(10.59)	(10.57)	(0.48)	(0.57)	(4.89)	(4.89)
Distance to plot (km)	0.040***	0.040***	0.001	0.001	0.016***	0.015***
	(4.93)	(5.04)	(0.59)	(0.40)	(4.05)	(3.90)
Plotsize (decares)	0.002	-0.000	0.003	0.002	-0.001**	-0.001***
	(0.62)	(0.15)	(0.96)	(0.43)	(2.26)	(2.85)
Household fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	745	745	74	74	1379	1379
R^2	0.45	0.45	0.18	0.15	0.31	0.31

First Stage Regression Dependent variable	Number co-owners	Number co-owners	Number co-owners
Number forced co-owners	0.716***	1.012***	0.917***
	(19.40)	(20.23)	(61.42)
Plot quality (1-10)	0.003	-0.409	-0.000
	(0.48)	(0.80)	(0.12)
Distance to plot (km)	-0.005	0.004	0.011***
	(0.92)	(0.71)	(5.54)
Plotsize (decares)	0.046***	0.016*	0.002***
	(9.54)	(1.85)	(7.33)
Household fixed effect	0.996**	1.079	0.228***
Observations	745	74	1379
R^2	0.95	0.78	0.98

Regression results account for sampling weights

Absolute value of t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: OLS and IV regressions of household welfare[#]

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV	IV	OLS	IV	IV
Total land ownership°	0.018***	0.019***	0.019***	0.022***	0.061***	0.056***
	(4.69)	(6.29)	(6.12)	(5.66)	(3.12)	(3.29)
Area in co-ownership°	-0.012	-0.030**	-0.022*			
	(1.24)	(2.28)	(1.88)			
Area rented to cooperative or abandoned°				-0.010	-0.112*	-0.099*
				(1.11)	(1.88)	(1.98)
Age household head	-0.052***	-0.050***	-0.051***	-0.050***	-0.032**	-0.035***
	(4.86)	(5.75)	(5.68)	(6.06)	(2.47)	(3.09)
Education household head	0.077**	0.061*	0.063**	0.065**	0.041	0.044
	(2.41)	(2.08)	(2.17)	(2.29)	(1.30)	(1.39)
Regional fixed effects	yes	yes	yes	yes	yes	yes
P-value of testing H_0: total land ownership+ area in co-ownership=0		0.44	0.83			
P-value of testing H_0: total land ownership + area rented to cooperative or abandoned=0					0.24	0.23
Observations	697	697	697	697	697	697
R-squared	0.22			0.24		
First stage regression dependent variable		area in coownership			area rented to coop. or abandoned	
Total land ownership°		0.065***	0.043**		0.388***	0.381***
		(3.33)	(2.43)		(4.91)	(4.89)
Owns plot that cannot be divided by law		14.175***			3.766**	
		(13.56)			(2.44)	
Area in forced co-ownership°			1.425***			0.310**
			(21.47)			(2.58)
Age household head		0.016	-0.023		0.164**	0.157**
		(0.67)	(1.23)		(2.26)	(2.16)
Education household head		-0.102	-0.128		-0.204	-0.216
		(1.10)	(1.51)		(0.76)	(0.81)
Regional fixed effects		yes	yes		yes	yes
R-squared		0.49	0.51		0.30	0.30

[#] Dependent variable: welfare index based on ownerhsip of key assets (first principal component).

°Area expressed in decares. 10 decares = 1 hectare

Regression results account for sampling weights. Standard errors are corrected for clustering at the community level

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