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Land Fragmentation, Cropland Abandonment, and Land Market Operation in Albania

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Abstract

Albania's radical farmland distribution is credited with averting an economic crisis and social unrest during the transition. But many believe it led to a holding structure too fragmented to be efficient, and that public efforts to consolidate plots are needed to lay the foundation for greater rural productivity. This paper uses farm-level data from the 2005 Albania Living Standards Measurement Survey to explore this quantitatively. The analysis finds no support for the argument that fragmentation reduces productivity. However, producers fail to utilize about 10 percent of the country's productive land, and, in the majority of cases, this land has been idle for at least five years. Farmers quote inefficiently-small plots as the reason for this in few cases, casting doubt on the scope for land consolidation to solve this issue. Instead, the data are consistent with the notion of land market imperfections, which can be traced to gaps in the legal and policy framework, as well as inefficiencies in registry operations, leading to land abandonment on a large scale. To maintain the productive potential of Albania's rural economy and, if and when needed, the ability to conduct consolidation in a cost-effective and sustainable manner, it will be critical to complement the emphasis on consolidation with an effort to address those gaps and inefficiencies on a priority basis.

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Land fragmentation, cropland abandonment,

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1. Introduction

Over the past decades, many countries in Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS) have undergone tremendous structural and policy changes. Large collectives and state farms, the building blocks of socialist agriculture, were transformed into more market-oriented structures but the process and result of doing so varied widely across countries. In a massive, quick, and equitable process of distributing plots to private households, Albania implemented what is arguably the region's most radical program in this respect. While the reform is acknowledged to have been critical to averting a food crisis in the early 1990s, it is also widely believed to have saddled the rural sector with three disadvantages. First, dismantling of communal infrastructure is seen to have led to neglect and deterioration of key public assets such as irrigation systems. Second, high levels of out-migration made the rural economy dependent on transfers and remittances but rarely translated into productive investment, given the lack of attractiveness of the agricultural sector, which is often viewed as a refuge for the sick, old, and poor (Miluka et al, 2010). Third, the notion of Albania's land ownership structure being too fragmented to allow realization of the country's full productive potential led experts to recommend government-sponsored programs to consolidate holdings.[1] An alternative perspective on the second and third issues is that these problems may be due to inadequacies in the land tenure arrangements.

This paper uses information from the 2005 Albania Living Standards Survey (LSMS) to explore the impact of fragmentation on productivity of land use and, in doing so, help advance the debate and derive policy-relevant conclusions. We focus on three issues that could be associated with fragmentation: First, cultivating many fragmented plots may reduce efficiency on land currently cultivated through, for example, higher transport- and setup-cost, or the inability to use machinery. To explore whether this is relevant in practice, we estimate a stochastic production frontier that includes the number of fragments as a determinant of the technical efficiency of production. This provides interesting insights about the dynamics of Albanian agriculture, but does not support the hypothesis that the number of fragments -the only measure to be readily constructed from the data- affects efficiency of agricultural production. This is consistent with the fact that the number of plots cultivated often corresponds to the number of types of land available. In this case, meaningful consolidation may entail a loss of diversification-related benefits from the simultaneous use of different types of land and would be desirable only if accompanied by higher levels of specialization, integration into value chains, and access to other means of insurance. In

[1] In the context of this paper, consolidation is understood to imply a reduction in the number of plots for any given size of land ownership and fragmentation is the exact opposite, i.e. an increase in the number of plots for a given size of land owned. Both are distinct from increases or decreases in farm size or land ownership.

Albania, limited attractiveness of agriculture as evidenced by high rates of out-migration, low investment, and constraints on credit suggest that the prospect for such specialization in the medium term may be low.

Even if it does not affect productivity on cultivated plots, fragmentation may lead to crop abandonment if plots are be too small for economically viable cultivation, their distance from the owner's homestead makes transport costs prohibitively high or if limited access to capital makes it uneconomical for owners to use their plots. One-time interventions to consolidate land holdings may be well suited to address the first constraint: if land is idle because holding sizes are too small, publicly supported programs to overcome the collective action problems that normally impede assembly of large contiguous tracts of land. If, on the other hand, owners' failure to cultivate land originates not in structural impediments (such as size) but imperfections to the functioning of land markets, efforts to identify and, as much as possible, address land market failures may have larger effects on productivity.

Is cropland abandonment important in practice? Data suggest that large parts of Albania's productive land are left idle, often for long periods of time. Some 10% of productive land (by 18% of producers) was uncultivated for reasons other than crop rotation at the time of our survey; most of it had been abandoned for at least 5 years.[2] In the vast majority of cases, ill-functioning land markets rather than uneconomically small plot sizes seem to be at the root of this phenomenon: less than 0.5% of respondents indicate that they leave land fallow because plot sizes are too small. Instead, lack of capital and inconvenient plot locations -both of about equal importance- are cited as reasons for non-use of productive crop land. Land is more likely to be abandoned in areas with generally favorable conditions and by households who, as a result of relying on non-agricultural income, are more affluent than the average. Market-based transfers of such land would thus appear to offer considerable unexploited scope for gains in efficiency and equity.

Comparing the magnitude of cropland abandonment to what is being transferred through land markets is instructive. Land rental markets transfer land to more efficient producers but the volume of these transfers is limited, amounting to less than one-third of the area left idle in 2005. Also, most of them are for a short duration only, pointing towards market imperfections that could be due to high transaction costs of dealing with land. The literature points towards three factors that may underlie this failure to fully realize the potential for efficiency-enhancing land transfers (World Bank 2006). First, weak land governance increases the cost of transferring land up to a point where such transactions are no longer desirable. Key reasons include (i) the fact that first registration, a precondition for formal land transfers, remains incomplete; (ii) the high transaction cost arising from the fragmented and ill-coordinated nature of land administration institutions and high levels of operational inefficiency in the land registry; (iii) a lack of standard forms and procedures; and (iv) a complex and ill-understood legal framework with at times

[2] We arrive at the 10% figure by subtracting land that is unused because of low soil quality, from the 12% of land that remained unused overall.

contradictory provisions.[3] These factors are less likely to be an impediment to short-term transfers of annual cropland which, in many rural economies, is based on oral agreements. But transfer of land that is under orchards or that requires investment to become fully productive will require longer-term and ideally standardized contracts with a higher level of formality.

Albania's broader policy environment is also inimical to well-functioning land markets. A failure to resolve restitution issues, together with provisions for extraordinarily high compensation imply continued fear about surfacing of claims by pre-1945 owners. This has become an issue involving EU institutions (Frangakis *et al.* 2008). Owners might leave land fallow hoping to demonstrate low productive potential, thus signaling to potential claimants that it will not be worth the effort of launching a claim for it.

We also find clear differences in *modus operandi* between rentals and sales markets; while the former contribute to structural change by transferring land to younger and more productive farmers, the latter are less liquid and fail to move land to those who use it most efficiently. Capital market imperfections and speculative land transfers, where benefits are expected to arise not from productive use but from future appreciation of land values, could underlie such behavior.

Taken together, our results suggest that land fragmentation has far-reaching economic consequences. Yet, most of the effects seem to arise not because a large number of fragments are too small to be viable economically but because, as a result of defects in the land tenure regime, productive land is left idle. If owners abandon productive land because they do not consider cultivation to be worthwhile or because costs of transferring land to more productive users, even on a temporary basis through rental, are perceived to outweigh the gains from doing so, measures to improve functioning of land markets by reducing the associated transaction costs could result in large efficiency gains. Such measures would include making registration easier and less costly, improving the institutional setup and the level of tenure security, helping to adopt standardized contracts, narrowing the scope for restitution, and limiting the tendency towards speculative land acquisition through a land tax, possibly together with effective ways of taxing capital gains arising from land appreciation.

With an ageing rural population and secular movement of workers out of the agricultural sector, mechanisms to ensure that land owned by those moving out of agriculture continues to be used effectively will be critical to maintain the productive potential of the country's rural economy, prevent emergence of a structure that is entirely dependent on remittances and ensure availability of opportunities for local entrepreneurs well beyond the agricultural sector. Finding ways to improve land market functioning will be essential for Albania's ability to effectively address the challenges of structural transformation and

[3] A recent World Bank study notes that the Albania's immoveable property rights and hypothec registries (IPRS) is "characterized by serious flaws in terms of design, operation, legal basis, and public outreach" (World Bank 2006, 67) which leads to a level of performance well below that of registries in comparable Eastern European countries, low levels of customer satisfaction, and a generally low image.

may be a more immediate priority than land consolidation. This is particularly so as consolidation efforts -which may be desirable in specific situations or needed in the future- can be carried out cost-effectively and sustainably only if they complement existing markets rather than trying to substitute for them.

The paper is structured as follows. Section two places Albania in a regional context by describing the nature and challenges of its transition and by using LSMS data to illustrate salient characteristics of its rural economy. Section three introduces the key questions to be explored by discussing relevant methodologies and evidence from the literature. Section four provides evidence on levels of technical efficiency in the agricultural sector and underlying determinants, the extent, nature, and proximate causes of cropland not being used productively, and the extent to which markets for rental and sale help to transfer land to more productive producers. Section five concludes by drawing out relevant policy implications.

2. Data and context

To place Albania in regional and global context, we review the circumstances that led to one of the most radical land redistributions in Eastern Europe's post-communist transformation and characterize the emerging farm structure and the challenges associated with it. Data from the 2005 LSMS then help to illustrate inter-regional differences in farm structure and productivity, income sources, operation of factor markets, and migration as well as plot fragmentation.

2.1 Albanian history of collectivization and reform

At independence in 1912, Albania inherited a *latifundia* system that had land ownership concentrated in few hands. The 1945 Agrarian Law eliminated private property and transferred land use rights to small farmers who were then organized in production cooperatives which often formed the basis for state farms. Private ownership of land, even for house plots, was eliminated with the nationalization of all land in 1976 (Cungu and Swinnen 1999). Agricultural policy thereafter focused on achieving food self-sufficiency. However, productivity declined, resulting in food shortages and a severe drop in welfare. In the late 1980s, reforms under the "new economic mechanism" aimed to address this via (i) distribution of house plots in private ownership; (ii) decentralization and liberalization of enterprise management; and (iii) opening of private marketing channels for most agricultural produce. A failure of these measures to prevent a sharp drop in food production made Albania dependent on food aid and resulted in stagnation, political instability, and social disorder that contributed to radical changes including the adoption of private property rights in 1991.

Land privatization initially entailed giving rights to workers of former production cooperatives and state farms under the guidance of district and village land commissions. Reforms were implemented rapidly

and by the end of 1992 all cooperatives had been dismantled with their land and assets distributed. The physical break-of up farms, which distinguishes Albania from transition countries in the CIS, created a production structure based on small farmers (Csaki *et al.* 2004). It helped to avert economic collapse in the immediate post-reform period; agricultural value added in 2001 was one third above that in 1989 (Macours and Swinnen 2000). Land use certificates (*tapi*) were issued quickly but demarcation and registration was left for later and remains incomplete, creating impediments to land transfers through rental as well as sales markets, both of which were allowed and regulated during the 1990s. Ownership claims predating the 1945 collectivization were declared void although a failure to address restitution did not prevent the issue form surfacing vehemently in political debates.

A number of factors are commonly believed to have contributed to levels of agricultural growth in Albania remaining well below those achieved by China or Vietnam immediately post-reform (Lin 1992, Pingali and Xuan 1992).[4] Although massive irrigation and drainage investments had been made between 1950 and 1975, these fell into disrepair due to lack of effective institutional arrangements for maintenance (World Bank 2007). Rural areas are also reshaped by migration, with 30% of rural households estimated to have at least one member living overseas and almost 90% having a migrant relative (McCarthy *et al.* 2009). As more than 60% of Albanian migrants remit part of their income, transfers have become a mainstay of Albania's rural economy. Although migration could help generate investment to regions of origin, such impacts seem limited as most remittances support consumption rather than productive investment (Miluka *et al.* 2010). Catalytic effects of migration on educational investments (Dabalen and Miluka 2010), female empowerment, (Stecklov *et al.* 2010), and occupational mobility (Carletto and Kilic 2011) also seem to have been limited. At the same time, migration networks create options for the skilled to leave, possibly draining rural areas of talent and entrepreneurial skills. Finally, although the number of plots per farm in Albania remains low in comparison to China or Vietnam (Deininger and Jin 2005, Deininger and Jin 2008), concerns about inefficiencies due to an overly fragmented land ownership structure have been raised (Lusho and Dhimiter 1998). Fragmentation has also been linked to abandonment of potentially productive plots (Lemel 2000) through a number of channels (Sabates-Wheeler 2002) including broader social change and low agricultural profitability (Sikor *et al.* 2009). Whether fragmentation is to blame or some other issue is at the root of the problem is an important issue that will have implications for the policy options pursued to deal with the problem.

2.2 Characteristics of Albania's rural economy

Data from the 2005 Albania LSMS, administered from April to November 2005 by the Institute of Statistics (INSTAT) in collaboration with the World Bank, to 3,640 households in 480 enumeration areas

[4] Certificates include a basic sketch and description of the parcel and its boundaries, the name of the household head, and the issuing authority.

provide us with an opportunity to gain empirical insight on these issues.[5] To do so, we focus on the sub-sample of 1,796 agricultural cultivators. Table 1, which illustrates household characteristics for the country's coastal, central, and mountain regions as well as a small number of households with agricultural land in Tirana, points towards significant inter-regional differences in production structure.

We note marked geographical differences in wealth with household size, the dependency ratio, housing characteristics such as access to an indoor toilet, ownership of key household goods such as TVs and per capita income highest (and poverty lowest) in the coastal region, followed by the center and the mountains. For example, while the poverty rate is 18% overall, it is 23% in the mountain region, double the level registered in the coast (11.5%). Remittances make up about 30% of income throughout, pointing to the importance of migration, much of it international rather than internal. Income from local self- and wage-employment accounts for slightly less than one quarter of total income on average, leaving about 45% for agriculture overall. In our sample, agriculture is most important in the mountains (51%), followed by the coast (42%), the center (40%), and Tirana (12%). By comparison, educational differences across regions are less pronounced and tended to equalize over time.

The amount of land owned per household is small (0.85 ha) and fragmented (3 parcels on average). Mean plot size vary across regions, from 1.25 ha at the coast to 0.53 ha in the mountains (and 0.28 ha among cultivators in Tirana). The owned area is largest at the coast, followed by the center and the mountains. Limited land endowments and possibly lower land quality in the mountains imply that in this region, a larger share of agricultural income comes from livestock rather than crops. In fact, 91% and 44% of households in this region own cattle or horses, compared to 55% and 28% at the coast, bringing the total value of animals in the mountains to $ 1,161 vs. a national average of $ 860.

Clear regional variations are also visible regarding modes of land acquisition and land tenure; while some 70% of agricultural households received land through privatization nation-wide, this figure is only 45% in the mountains -where 58% had inherited their current plots- but 93% at the coast. Even larger variation is visible concerning the share of land that was purchased, a figure that ranges from 1% in the mountains and 11% in the central region to 75% in Tirana. 74% of owners have a document that was issued after 1991, though this is unlikely to be a formal registration certificate that would allow transfers or offer protection against potential restitution claims by pre-1945 land owners. This measure, as well as the share of households with a document after 1945, varies across regions. Moreover, the fact that less than 30% of households in Tirana, most of whom acquired land through purchase, have a document, points towards

[5] Questionnaires as well as other documentation for the data is available at http://go.worldbank.org/JBV0V2BDZ0. The sample is representative of farm households rather than agricultural establishments in the country. Given the family farming structure, this is unlikely to be a problem.

high levels of informality where the majority of land transactions remains off the register, in line with what is found by recent studies (World Bank 2006).

In many instances of post-communist transition, a key reason for land holdings to be fragmented is that households received different types of land (cropland, pastures, orchards, vineyards) or land with different levels of quality or associated infrastructure (Tanaka 2007). Data on land use suggests that this may be the case in Albania as well; land holdings are made up of irrigated and rainfed fields for annuals (close to 0.3 ha each), rainfed and irrigated orchards (520 and 180 m^2, respectively), and pastures (900 m^2 on average). Not all the available area is cultivated or transferred through markets; indeed some 18% of households, most of them in the country's coastal and central parts, leave land fallow for reasons unrelated to productivity.[6] With some 12% of the total (from 0.16 ha in coastal to 0.04 ha in mountain areas), the area affected is not negligible. Some two thirds of this has been fallow for 5 years or more, pointing towards potentially far-reaching implications for agricultural incomes overall. Most notably, the amount of land left idle is about three times what has been transferred through land rental markets in 2005.

In line with what was discussed earlier, the value of agricultural output, from crops and livestock together, amounts to approximately $1,000 per household, slightly less than half (48%) of which comes from livestock production. Magnitude and composition of agricultural income vary across regions, with the highest levels ($ 1,318, about two-thirds of which from crop agriculture) in the coast and the lowest ($ 850, some two-thirds of which from livestock) in the mountains. About 21% of producers have access to crop extension and about 28% to veterinary services. At the community level, some 35% of households accessed credit and about 20% had a migrant member. While the latter figure varies surprisingly little across regions, there are considerable differences in the implications in terms of labor availability; more than 50% of communities in the coast, compared to 23% in the mountains, indicate that seasonal labor shortages constrain agricultural activity.

3. Analytical issues and empirical approach

As a basis for our empirical analysis, we discuss the institutional analysis of land fragmentation and design, justification, and potential benefits from consolidation programs. We introduce the empirical specification to analyze the impact of fragmentation on technical efficiency through a stochastic frontier and a friction model for participation in land rental and sales markets.

3.1 Does land fragmentation reduce efficiency of agricultural production?

Determinants and productivity impacts of fragmentation have long been discussed in the literature. Key disadvantages of fragmentation include the need for higher physical inputs due to increased labor and travel

[6] The survey includes information about the reason for leaving land idle and the figures in the text exclude any fallowing related to crop rotation.

time, transportation costs, and limitations on access; operational problems such as an inability to use certain equipment, greater difficulty with pest control and supervision; and social externalities associated with the need for extensive road networks and associated land loss (Simons 1987). However, at low levels of mechanization or if credit and insurance are difficult to access, the benefits in terms of risk diversification of having a portfolio of plots with different attributes and in various locations or smoothing out of seasonal labor requirements (Fenoaltea 1976) may outweigh these costs(McCloskey 1975) . Indeed, early studies assessing impacts of land fragmentation in developing countries such as India (Heston and Kumar 1983) or Ghana and Rwanda (Blarel *et al.* 1992) suggest that productivity losses may be modest and benefits substantial.[7] This is consistent with the notion that fragmentation will become a constraint to productivity only if it impedes the ability to use machinery in areas with decreasing agricultural population (Bentley 1987). If this is the case, intervention to overcome the associated collective action problem may indeed become desirable.

Evidence from developed countries where publicly sponsored consolidation programs, often linked to a range of other environmental or developmental initiatives, were found to have been associated with high economic returns, e.g., some 40 percent in France (Simons 1987), supports this notion. More recent evidence of consolidation providing significant benefits is also available from Turkey and the Czech Republic where the size of land holdings and the number of parcels were, with more than 10 ha and up to 50 plots owner, large (Sklenicka 2006). For land consolidation initiatives to be sustainable, the conditions that gave rise to fragmentation in the first instance, e.g. high population growth with equal shares of different land types given to all heirs, are either no longer in place, e.g. because workers are joining the non-farm sector in large numbers (Platteau and Baland 2001). Alternatively, institutional arrangements such as land markets -possibly with a right of first refusal by neighbors- will need to be in place to deal with them (van Dijk and Kopeva 2006). Where this was not the case, consolidation programs -in some cases implemented at considerable cost- were unsustainable and the situation soon reverted to what had been in place previously. Recent pilot consolidation efforts in Eastern Europe hold a number of additional lessons. First, achievements in terms of the number of land transactions triggered by such programs remained below expectations, partly because part of fragmentation had been voluntary and the programs did not deal with broader land policy issues.[8] Second, efforts need to include all relevant stakeholders and ideally be integrated into a broader plan for territorial development.[9] Finally, to ensure sustainability and continued adjustment through subsequent

[7] More recent evidence from India shows that plot sizes too small to allow mechanized cultivation significantly reduce agricultural productivity (Foster and Rosenzweig 2010), although this is less an issue of fragmentation than of a general decline in farm sizes.

[8] In a consolidation pilot undertaken in 2007 to 2009 in 6 Moldovan villages with 11,500 ha and 27,000 parcels, participation was about 40%. Partly because it involved a systematic review of the land registry, this led to a reduction in the number of parcels per owner from 3.74 to 3.23, an increase in average parcel size from 0.45 to 0.59 ha, and an increase in the mean area per holding from 2.21 to 2.93 ha, largely by owners selling plots that were too small or inconveniently located (AGREX 2011).

[9] In the Moldova case referred to above, an inability to touch both small paths between parcels which were located in public land and would have required a formal auction and to resolve inheritance issues significantly reduced the project's impact.

land transfers in response to changed circumstances or competitiveness (Deininger and Byerlee 2011), key aspects of the legal and institutional framework such as the cost of registering transfers and roles of notaries need to be addressed as well (AGREX 2011).

While Eastern Europe's experience provides institutional lessons, it gives little guidance on the productivity effects of land fragmentation, an issue that has been explored in great detail in China, a country where the number of plots is well above the levels commonly encountered in Eastern Europe. Most studies use stochastic frontier production functions with the number of plots as a proxy for fragmentation. Results are ambiguous, though: some find a negative impact (Wan and Cheng 2001), others a relationship that is insignificant (Tan *et al.* 2008, Wu *et al.* 2005), or that follows an inverted U-shape (Chen *et al.* 2009). One reason may be that existing arrangements to transfer land at the local level, through market and non-market mechanisms, appear relatively effective in reducing fragmentation over time: the number of plots per household decreased in all of the country's regions, from a national average of almost 9 in 1986 to 6 in 1999 (Tan *et al.* 2006). This suggests that, despite a large number of plots, the operation of land markets implies that land fragmentation in China does not pose critical constraints for productivity.

To see whether fragmentation, proxied by the number of plots, affects agricultural production efficiency, we use LSMS data to estimate stochastic frontier production functions for crop, livestock, and total output. In line with the literature (Coelli 1998), let production follow a Cobb-Douglas functional form

$$\ln(y_i) = \beta \ln(x_i) + v_i - u_i(z_i) \qquad i = 1,2,...N \qquad (1)$$

where, i indexes households, $\ln(y_i)$ is the value of output in logs, x_i a vector of conventional inputs, β a vector of parameters to be estimated, v_i is a two-sided white noise error term assumed to be normally distributed with mean 0 and variance σ_v^2 and u_i a one-sided non-negative error term with unknown mean m_i and variance σ_v^2 that proxies for technical (in)efficiency. Assuming u is half-normally distributed, maximum likelihood methods can be used to jointly estimate the frontier production function and determinants of (in)efficiency. Explanatory variables for the former include standard factors of production such as amount of land (of different types) cultivated, purchased inputs (including fertilizer, machinery, and pesticides), expenses on hired labor and the number of family workers as well as their education. Efficiency, in turn, is assumed to be affected by the area of land owned (which can serve as collateral for credit), the number of plots (as a measure of potential fragmentation-induced inefficiency); the head's age level of education (as a proxy for farm-specific experience), access to crop extension and veterinary services (to proxy for access to new technology), the share of non-agricultural income (which could either alleviate capital constraints or divert attention away from farming), whether land was inherited (as a

proxy for long experience) and whether the household had a 1991 title. Before discussing results, we describe how we can use the results of this estimation to characterize the functioning of land markets.

3.2 Land rental market functioning

In situations characterized by structural change, land rental markets can help move towards a less sub-optimal distribution of operational farm sizes through efficiency-enhancing transfers from producers with low levels of productivity and no comparative advantage in agriculture to more efficient ones (Deininger and Jin 2009). As this does not require any change in land ownership, land owners, even if they give up self-cultivation, will not have to forsake key benefits from land ownership, e.g. the ability to use land as collateral for loans that might enable them to start non-agricultural enterprises (Deininger and Feder 2001, Swinnen *et al.* 2006). On the contrary, leasing provides access to regular income streams in the form of rents (Deininger 2003) which, if land is transferred to more productive producers and markets are competitive, will be higher than what owners could obtain from self-cultivation (Deininger *et al.* 2011). Land rental markets, though mostly for the short-term, have become more active in Eastern Europe as well (Vranken and Swinnen 2006).

To formulate hypotheses that can be tested with our data, we draw on a model developed in greater detail elsewhere (Deininger and Jin 2009) and reproduced in the Appendix. We let households be endowed with fixed amounts of labor and land and an exogenous level of agricultural ability. With land relatively scarce, the cost of supervising labor (Frisvold 1994) makes wage-labor-based cultivation uncompetitive (Binswanger *et al.* 1995) so that households will either farm their own land or rent it out at the given rental rate to pursue off-farm employment at an exogenous wage. However, land rental incurs transaction costs, e.g. to get information on market conditions, negotiate and enforce payments, and the risk that the lessee will not return the land or will irreversibly damage it. Formal certificates can reduce these costs.[10] Solving the household's decision problem allows us to recover the demand for cultivated land as a function of endowments as well as transaction costs and to derive three propositions that can be tested empirically.

First, we expect the amount of land rented in (out) to increase (decrease) in the ability of the average household farming land. In other words, by transferring land to producers with a comparative advantage and higher levels of productivity, rental markets will contribute to better land use and productivity. Second, transaction costs define two ability levels such that households with ability between these will not engage in land rental transactions. Any increase in transaction costs will expand the autarky range, reducing the share of producers participating in rental markets as well as the number of efficiency-enhancing land transactions. Compared to a situation with no transaction cost, this will decrease

[10] A formal certificate can lower search cost, reduces the danger of land loss, and make it easier to enforce payments.

productivity and social welfare. Finally increases of the exogenous off-farm wage will imply that higher amounts of land are transacted in rental markets as households with low agricultural ability will supply more land and join the off-farm labor market.

To empirically test these predictions, we use an ordered probit model where transaction costs create upper and lower thresholds. The model implies that producers' rental decisions are affected by their marginal productivity in autarky (which will depend on their ability as well as their endowment with land, labor, and capital), the opportunity cost of labor (affected by their level of education and presence of local off-farm opportunities), and effective rental rates (including or net of transaction costs).

3.3 Operation of land sales markets

Markets for land sales have recently attracted great policy interest in Eastern European contexts, e.g. the animated debate on whether or not to lift a sales moratorium in Ukraine (Lissitsa 2010). If households could fully insure against risks, had access to full information, and could transfer land at no cost, land sales markets would not be different from those for land rental. Demand for land would be determined by producers' ability to make best use of the land in farming and relative factor endowments. Sales would enhance productivity and social welfare by allowing producers with higher productivity to bid land away less productive ones and land prices would equal the net present value of the profits from the best land use, and potential buyers would be indifferent between renting land and purchasing it.

Deviations from this ideal situation will in practice lead to outcomes that may be quite different. First, subsistence constraints and imperfections in markets for credit and insurance will affect decisions on whether or not to participate in land sales markets. Second, transaction costs will vary with producers' access to information. Finally, land speculation may imply that land is acquired in anticipation of future appreciation in its value that may be unrelated to its value in use for agricultural production. The considerations guiding households' decisions on land sales or purchases in the context of their choice of an optimal asset portfolio over their lifetime horizon can be illustrated by considering the option of holding two assets, one, for example land, with high returns but that is also risky and illiquid, and another one, for example grain, with lower returns but less risk and higher liquidity.

While an analytical solution to this problem requires more structure, numerical simulations show that with credit market imperfections and risk, households' need to satisfy basic subsistence requirements can result in land being sold by producers who are forced to sell under duress in bad years, often to individuals with access to non-covariate income streams outside the local rural economy or large amounts of assets. In high-risk environments this may lead the poor to rationally prefer assets that offer lower but more stable returns to land even if transaction costs were modest and credit access was not a problem.

With imperfect credit markets, some households will be able to buy and accumulate land not because they would be more productive but due to their ability to better overcome such market imperfections (Carter and Salgado 2001, Zimmerman and Carter 2003). Similarly, others may be forced to sell land in exchange for less risky assets to minimize their exposure to risk even though they would be able to make more productive use of the land than those who acquire it (Rosenzweig and Binswanger 1993). Thus, in addition to productivity, macroeconomic conditions, expectations of future land price movements, lack of sufficiently attractive alternative assets, and policies, are all factors that can compound, and possibly overwhelm, the impact of innate productivity on households' land sales market participation and is that the productivity- and equity impact of land sales market operation will depend on the extent to which other markets function and net effects of land sales markets are ambiguous *a priori*.

To estimate the model empirically in a way that allows drawing comparisons, we use the maximum likelihood model introduced earlier for land rental markets. Latent demand for land is assumed to depend on long-term productivity which can be expressed as a reduced form equation and thresholds for the transition between sales and autarky and autarky and purchase are defined in a similar way to the land rental market model. Factors affecting the extent of participation in the main equation are the level of ability and the household's endowment of land, labor, and other assets. We expect high levels of ability to increase producers' marginal product and their competitiveness in land markets while standard assumptions for the production function imply a negative relationship between the land endowment and its marginal product. Higher agricultural ability or lower land endowments will make it more (less) likely for a household to shift from autarky to being net purchaser (seller) of land. In addition, imperfections in credit and labor markets imply that higher levels of wealth or family labor will affect a household's marginal productivity.[11]

4. Empirical evidence

The frontier production function provides interesting insights, but does not support the notion that fragmentation reduces the level of productive efficiency on land currently cultivated. However, the survey points towards a significant share of land having remained idle for a sustained period of time because of land market imperfections. Descriptive and analytical evidence on land market functioning suggests that lease but not sales markets transfer land to younger and more productive farmers. Eliminating impediments to their functioning would appear to offer an opportunity to increase the level of economic activity and welfare in Albania's rural areas.

4.1 Determinants of technical efficiency in agricultural production

[11] As the survey includes data on land sales for the last 5 years, the number of observations is comparable to what is available for rental markets.

Table 2 reports estimation results separately for total output, crop, and livestock in columns 1, 2, and 3 with parameters for the production frontier in the top and for determinants of technical efficiency in the bottom panel.[12] 41% of the observed variation in output can be attributed to technical inefficiency. Estimates of the frontier point towards a significant contribution of land, with a coefficient of 0.39 for annual land and 0.89 for orchards. Expenses on other conventional inputs such as fertilizer, chemicals, etc. are highly significant, with a coefficient of 0.36. The point estimate for spending on hired labor is positive and significant, though with 0.04 rather small. The stock of family workers is negative and significant for the frontier, possibly signaling structural unemployment although family members are seen to contribute very positively to technical efficiency. Finally, the total value of animals is highly significant, with an elasticity of 0.26 overall. The coefficient on the intercept dummy suggests that the marginal product starts becoming positive above a value of about US $ 100.

Turning to determinants of technical efficiency, we note that technical efficiency increases significantly with size of land owned for rainfed and irrigated crops, something that could be through a wealth-effect and associated better credit access or because of the ability to use machinery. Yet, the number of plots, our proxy for fragmentation, is positive (though with a small coefficient of 0.08), failing to support the notion that dispersion of production sites among many fields undermines efficiency. The head's age, which proxies for farming experience, is estimated to increase technical efficiency; education is concave and reaches its maximum impact at about 4.3 years. The same is true for the number of family workers on the farm, suggesting that even if they do not directly contribute to farm output, family workers may provide input into farm management or monitor developments. Access to veterinary services and, in the case of crop production extension for crops is estimated to greatly increase farmers' efficiency levels. Inherited land -rather than plots received via privatization or purchase- also contributes to higher levels of efficiency, either as households are more familiar with specific attributes such as soil quality that enables them to better manage production or due to a tenure security effect whereby land received through other means still suffers from a residual risk of expropriation that makes farmers reluctant to undergo unobserved investments that can greatly enhance productivity. At the same time, rather than facilitating more on-farm investment, a higher share of income from local off-farm activity or remittances is associated with significantly lower efficiency of agricultural production. Instead of alleviating capital constraints on the farm, non-agricultural activities thus appear to detract attention from farming and may in fact serve as a stepping stone to leaving the agricultural sector. This would again imply a role for land markets to transfer land from those exiting the sector to more efficient producers.

4.2 Extent, nature, and causes of cropland abandonment

[12] To ease interpretation, all coefficients have been multiplied by -1 so that they refer to efficiency rather than inefficiency.

While the frontier production function does not substantiate the notion of fragmentation negatively affecting overall output fragmented land plots may have a higher probability of being left idle. Table 3 uses survey weights to provide evidence on the approximate magnitudes involved based on the LSMS survey. The total amount of cropland not used for non-productivity related reasons is estimated at 173,885 ha or about 12% of the total. Some two thirds of this land has not been cultivated for at least 5 years. Interestingly, idling of land does not seem to be concentrated in areas that are marginal; in fact 54% is in the coast and 31% in the central part of the region, with only 13% in the mountains. Also, while about 20% of the affected area remains fallow due to poor soil quality, the remainder is about equally split between economic factors, i.e., the lack of resources to access variable inputs or machinery and location of the plot being too far from the homestead.

Reasons for cropland to be abandoned are of interest in two respects. First, with less than half a percent, the share of area where plot sizes are judged to be uneconomically small is negligible, suggesting that publicly supported consolidation efforts that predominantly target this type of plots are unlikely to fully address the issue. Second, transfer of the roughly 80% of idle plots that are neither unproductive nor too small through rental markets could make owners better off and same time improve efficiency of land use.

Table 4 characterizes households who leave land idle by the reason for doing so and the length of time for which land has been idle.[13] Columns 1 and 2 suggest that households leaving land idle own larger amounts of land (1.28 ha vs. 0.76 by 'full land users')[14] and are less poor (12% vs. 19%). They enjoy better access to infrastructure and extension and -somewhat paradoxically given that a lack of resources is a key reason for leaving land idle- live in places with much better credit access. At the same time, they are smaller and have lower levels of agricultural assets. They rely on non-agricultural sources of income more heavily than the mean farmer; in fact the share of their agricultural income is 10 points below the national average. Their level of productivity, in terms of total output or profit per ha, is half or less of the national average. Both the size of area affected -with the amount of idle land more than three times what is currently transferred through leases- and characteristics of households with fallow land thus suggest that land leasing could significantly improve productivity in rural areas. Exploring the reasons for the apparent failure of land rental markets on such a massive scale will thus be of great policy relevance.

4.3 Descriptive evidence on land markets

As a first step towards such analysis, table 5 displays descriptive statistics for households depending on whether they remained in autarky, demanded, or supplied land to rental (col. 1-3) and sales (col. 4-6)

[13]. We report figures for land left uncultivated because of lack of resources (economic reason) and inappropriate location (structural reason).
[14]. The fact that that households leaving land idle have slightly larger plots on average than those cultivating all of their land (0.31 vs. 0.28 ha) casts doubt on potential of consolidation programs to effectively address the causes underlying abandonment of productive land.

markets.[15] Subject to the usual caveats with this type of data,[16] rental markets seem to equalize factor ratios whereas sales markets often appear to work in the opposite direction.

We note significant differences between lessors and lessees in the share of income (15% vs. 52%), the ownership of agricultural assets (10% vs. 83% with any cattle), asset- and consumer-good endowments, and the level of poverty (4.%% vs. 16.5%). This is consistent with the notion that those supplying land to the rental market are moving out of agriculture. Interestingly, lessee households own more land, are larger and headed by younger individuals (by an average of 10 years) highlighting that rental markets contribute to a growth in average farm size and can be critical for transferring land across generations and creating opportunities for rural youth.[17] Levels of education do not differ significantly by status of rental market participation. Similarly, rental appears to have little impact on land consolidation; in fact the number of plots tenants own is slightly larger than that of landlord- or autarkic households. Community characteristics also suggest that land rental markets are active under conditions (e.g. limited access to credit and labor shortages) that would normally be considered quite unfavorable. The value of output per hectare (2,150 US$/ha) for tenants is significantly larger than that for the entire sample (1800 US$/ha) and almost an order of magnitude above what is achieved by landlords ($ 275/ha). Part of the difference is due to the fact that tenants have more irrigated land (0.86 against 0.27 for autarkic and 0.07 for landlord households). Unfortunately, the survey did not collect information on the prices paid for leasing land, thus preventing us from making inferences on the associated welfare effects. With tenants' profits per hectare more than double those by autarkic households or landlords, descriptive data suggest that rental transfers land to more productive production, something to be explored econometrically below.

At a descriptive level, comparing land rental to sales markets points to a number of differences. First, both output and profits per hectare by land purchasers are significantly lower than for those in autarky, suggesting that land sales may be motivated by factors other than a desire to increase productivity of land use. Also, while those renting in land receive the lion's share (52%) of their income from agriculture, those purchasing land obtain some 80% of their income from non-agricultural sources. Operation and impact of land sales markets may thus be structurally quite different from those for rental.

4.4 Econometric evidence on land market operation

Results from the ordered probit regression for land rental and sales market participation are reported in col. 1 and 2 as well as 3 and 4 of table 4, with and without ability respectively. To interpret coefficients,

[15] T-tests suggest that most of the differences in means for those on the supply- and the demand side and autarkic households are significant at conventional levels but are omitted here to reduce clutter. They are available from the authors upon request.

[16] If sellers or lessors have left rural communities, descriptive statistics may be biased. Even if they remained in rural areas, land owners who no longer engage in agricultural production may not e captured in the LSMS survey where questions on participation in agricultural land markets appear in the agricultural module that is administered only to those who currently cultivate agricultural land (Deininger and Jin 2008).

[17] A number of countries have initiated promising efforts to foster structural change and transfer of land to young producers by allowing those who transfer their entire land on a long-term basis (12 years or longer) to access pensions early, akin to early retirement schemes in other sectors.

note that the dependent variables takes values of 1 for renting out, 2 for autarky, and 3 for households renting in land (see the Appendix). A positive coefficient in the lower bound equation implies more renting out or sales and a narrower band of autarky whereas a positive coefficient on the upper bound equation implies more renting-in or purchases.

The main equation points to three results of interest. First, while in some other settings rentals tend to transfer land from large to small producers, in the Albanian context of very egalitarian land ownership, rental markets help to consolidate holdings by providing opportunities for larger land owners to get additional land, in line with descriptive evidence. Rental markets also transfer land to younger households with larger family labor endowments. The total value of animals, a proxy for agricultural assets, is a significant and quantitatively important predictor of higher demand for land in rental markets. Second, consistent with the notion that migration opportunities are a key determinant of land rental market decisions, households who receive a greater share of their income from remittances are estimated to be more likely to rent out. A higher share of outmigration at the community level has a similar, though smaller effect. Finally, column 2 illustrates that higher levels of agricultural ability, as estimated earlier, significantly increase demand for land rental, supporting the notion that rental transfers land to more productive producers and promotes structural transformation in rural areas. Results from threshold equations suggest that possession of a formal document is a key determinant of supply for land in the rental market, consistent with the notion that, by heightening the risk of losing land that has been leased out, lack of such documentation would increase the transaction cost for land rental. The mode of land acquisition, by contrast, seems insignificant. Also, households in remote communities, as defined by their distance to banks, are more likely to remain in autarky, possibly as a result of credit access being more difficult.

Equivalent ordered probit estimates for sale markets, in columns 3 and 4 of table 6, highlight a key difference between land sales and rentals. Agricultural ability does not emerge as a significant predictor of land sales participation and higher levels of agricultural assets (animals) significantly reduce the likelihood of purchasing land. Obtaining higher shares of income from remittances is estimated to marginally increase the propensity to buy land, possibly for speculative purposes. Land taxes to increase the opportunity cost of holding land are normally viewed as the most effective way of avoiding this. Also, sales are estimated to transfer land to smaller owners and the coefficient on the head's age is much smaller. In terms of determinants of the cut-points for the autarky band, the lack of tenure details for land that has been sold forces us to use the community share of land with a 1991 document and inherited, two variables that remain insignificant. Distance to a bank at community level emerges as marginally

increasing the range of households who remain in autarky, again likely because of more limited credit supply.

5. Conclusions and policy implication

An emerging literature has identified high levels of land holding fragmentation as an important constraint to higher productivity in Eastern European countries that radically restructured their agricultural sector. While consistent with *prima facie* evidence, detailed study to assess productivity impacts as well as the channels through which they materialize has been limited. This makes it difficult to derive more specific policy recommendations regarding conditions that need to be in place for consolidation to be cost-effective and sustainable, as well as the magnitude of expected benefits which would in turn be relevant for justifiable levels of program costs and performance indicators.

Although it is not based on a special survey explicitly designed for this purpose, our analysis allows better understanding of constraints to higher rural productivity. We find little effect of fragmentation on productivity of currently cultivated land. At the same time, with some 10% of potentially productive land lying idle, patterns of land holding affect economic outcomes. One-off consolidation programs will be appropriate if a structure with many uneconomically small plots is an impediment to productive land use and land market operation. However, if other barriers prevent land markets from transferring land to more efficient producers, such programs may be ineffective and/or unsustainable. In the case of Albania, 99% of the area where land remains uncultivated can be attributed to ill-functioning land markets rather than reasons that would be amenable to systematic consolidation efforts. While the generic nature of the LSMS data limits the ability to explore obstacles to land market functioning in more detail, it allows formulation of hypotheses and identification of proxy indicators that could be used to test these. Having data on transactions in markets (land type, intensity of use, potential productivity, contract terms, level of formality, length, price, transaction cost incurred etc.) would allow for doing so easily and at modest cost.

Land fragmentation and abandonment in the context of apparent economic decline and ageing of rural areas are key issues for policy makers in most countries of the region. Vast cross-country differences in farm structure, productivity, and history caution against premature generalization of the results obtained here. Still, the main insight that in a setting where large land areas remain unutilized or have been abandoned consolidation may only be part of the answer that needs to be viewed in a broader context of potential institutional and land governance impediments to land market operation, is of broader applicability. Such a focus will be important not only to ensure economic attractiveness and viability of rural areas, but also to provide the basis for supply to respond to broader changes in commodity prices.

Appendix: Description of the friction model for land markets

Let household *i* be endowed with fixed amounts of labor ($\overline{L}_i$) and land ($\overline{A}_i$), and an exogenously given level of agricultural ability (α_i).In an environment of relative land scarcity, the cost of supervising labor implies that wage-labor-based cultivation will not occur in equilibrium, implying that households allocate their labor endowment between farming their own land ($l_{i,a}$) and off-farm employment ($l_{i,o}$) at an exogenous wage (w_i). We also assume that the need to obtain information on market conditions, the negotiation and enforcement of payments, and the implicit or explicit restrictions on transferability for certain contract types that need to be overcome imply that renting of land incurs transaction costs TC^{in} for renting-in and TC^{out} for renting-out. These transaction costs, which are expected to be reduced if a household has a formal title, are assumed to be proportional to the size of land transferred. We also assume that households can structure rental contracts in a way that allows those lacking liquidity to enter into arrangements in order to defer rental payments until after the harvest. With this, household *i*'s decision problem is to choose A_i, $l_{i,a}$ and $l_{i,o}$ to solve

$$\underset{l_{i,a},l_{i,o},A_i}{Max}\ pf(\alpha_i,l_{i,a},A_i)+wl_{i,o}-I^{in}[(A_i-\overline{A}_i)(r+TC^{in})]+I^{out}[(\overline{A}-A_i)(r-TC^{out})] \qquad (2)$$

s.t. $$l_{i,a}+l_{i,o}\leq\overline{L} \qquad (2a)$$

$$l_{i,a},\ l_{i,o},\ A_i\geq 0 \qquad (2b)$$

where p is the price of agricultural goods, r is the rental rate, A_i is the operational land size, I^{in} is a indicator variable for rent-in (=1 for rent-in, 0 otherwise), I^{out} is an indicator for rent-out (=1 for rent-out, and 0 otherwise), TC^{in} and TC^{out} are transaction costs, and all other variables are as defined above. Assuming that the restrictions in (2a) hold with equality, the optimal choices of $l_{i,a}^*$, $l_{i,o}^*$ and A_i^* will solve the first order conditions (FOC) of problem (2), that is

$$pf_{l_i,a}(\alpha_i,l_{i,a},A_i)=w \qquad (3)$$

and for households who rent in ($A^* > \overline{A}_i$), $$pf_{A_i}(\alpha_i,l_{i,a},A_i)=r+TC^{in} \qquad (4)$$

and for households who rent out ($A^* < \overline{A}_i$), $$pf_{A_i}(\alpha_i,l_{i,a},A_i)=r-TC^{out} \qquad (5)$$

and for autarkic households ($A^* = \overline{A}_i$), $$r-TC^{out}<pf_{A_i}(\alpha_i,l_{i,a},A_i)<r+TC^{in} \qquad (6)$$

Derivation and solution of the first order conditions allows us to obtain demand functions for labor and land and provides a basis for three main propositions. First, the amount of land rented in (out) will be

strictly increasing (decreasing) in households' ability, α_i, and strictly decreasing (increasing) in the land endowment $\overline{A}_i$. This leads to the well-known factor equalization effect of land rental whereby rental markets will transfer land to efficient but land-poor producers, thereby contributing to higher levels of productivity and better factor use in the economy. Second, presence of transaction costs defines two critical ability levels $\alpha_l(TC^{out}, ..)$ and $\alpha_u(TC^{in}, ..)$ such that households with ability $\alpha_i \in [\alpha_l, \alpha_u]$ will remain in autarky. Any increase in transaction costs will expand the autarky range, thus reducing the number of producers participating in rental markets and the number of efficiency-enhancing land transactions. Compared to a situation with no transaction cost, this will decrease productivity and social welfare. Finally increases of the exogenously given wage for off-farm employment will imply that higher amounts of land are transacted in rental markets as households with low agricultural ability who join the off-farm labor market will supply more land.

To empirically test these predictions, we use an ordered probit model with upper and lower thresholds that includes variables to represent transaction costs. Equations (3) to (6) imply that producers' decision to enter land rental markets depends on their marginal productivity in autarky, $MP(\overline{A})$ as compared to the rental rate to be paid $r^{in}(T)$ or received $r^{out}(T)$ which again is a function of transaction costs. Formally, the three regimes are defined by

$$\left.\begin{array}{ll} \text{I. Rent-out regime}(A_i^* > \overline{A}_i): & MP(\overline{A}) + \varepsilon_i < r(TC^{out}) \\ \text{II. Autarky regime}(A_i^* = \overline{A}_i): & r(TC^{out}) < MP(\overline{A}) + {}_i < r(TC^{in}) \\ \text{III. Rent-in regime}(A_i^* < \overline{A}_i): & MP(\overline{A}) + \varepsilon_i > r(TC^{in}) \end{array}\right\} \qquad (7)$$

A producer's marginal product $MP(\overline{A})$, will depend on his or her ability (α) as derived from the frontier production function as well as endowments of land ($\overline{A}$), family labor ($\overline{L}$), assets (K), and the opportunity cost of labor which in turn will be affected by the level of education (E) and local off-farm opportunities (O). Defining a well-behaved net earning function $g(\alpha, \overline{A}, \overline{L}, K, E, O)$ with first derivative $g'(.)$, we can linearize to obtain

$$MP(\overline{A}) = g'(\alpha, \overline{A}, \overline{L}, K, E, O) = \beta_0 + \beta_1\alpha + \beta_2\overline{A} + \beta_3\overline{L} + \beta_4 K + \beta_5 E + \beta_6 O. \qquad (8)$$

Defining an index variable y_i such that $y_i = 1$ if $A^* < \overline{A}$; $y_i = 2$ if $A^* = \overline{A}$; and $y_i = 3$ if $A^* > \overline{A}$, we can rewrite (8) as an ordered probit model to be estimated using maximum likelihood methods. Supply of credit will reduce transaction costs of land rental, thus narrowing the range of producers staying in autarky.

We thus can formulate predictions regarding individual coefficients' sign. The factor equalization implied in proposition 1 suggests that rental markets will transfer land to more productive producers ($\beta_1 > 0$) with

lower levels of land endowments (β_2<0) and more family labor (β_3>0). Labor market imperfections imply that households with more family labor will be more willing to expand cultivated area. The hypothesis of wealth bias in rental markets, possibly due to credit market imperfections, translates into β_4>0. To the extent that education drives towards better off-farm opportunities, we expect that higher household with better level of education will be less likely to rent in (β_5<0) and that higher levels of non-agricultural wages, proxied by O, will make renting in less likely (β_6<0).

Because we do not have detailed information on non-agriculture wages and given the importance of remittances in total household income, we introduce the average share of household in community who migrated to assess as a proxy for the presence of off-farm labor markets. We complement the analysis with additional household characteristics, such as the age of the household head which we expect to be negatively (and possibly in a non-linear way) related to the probability of renting in more land.

Table 1: Key household characteristics by macro-region

	All farmers	By region			
		Coastal	Central	Mountain	Tirana
Household characteristics					
Household size	4.646	4.265	4.400	5.201	5.394
Members 14-60 years old	2.721	2.469	2.722	2.928	3.394
Dependency ratio	0.419	0.428	0.390	0.439	0.380
Head's age	52.272	53.467	51.522	51.912	50.152
Head's education (years)	7.874	8.258	8.016	7.327	8.697
Max. educ. In household	9.817	9.995	9.853	9.575	10.485
Toilet	0.508	0.555	0.570	0.387	0.849
TV	0.083	0.147	0.077	0.028	0.061
Share of poverty	0.179	0.115	0.190	0.232	0.182
Cons. per capita (US $)	915	1049	888	802	1044
Income composition (%)					
from agric. (crop & livestock)	0.437	0.419	0.398	0.508	0.121
from non-ag. Wage	0.181	0.182	0.201	0.151	0.402
from non-ag. Self	0.063	0.078	0.063	0.039	0.228
from remittances	0.316	0.318	0.333	0.301	0.248
Asset ownership					
Area of land owned (ha)	0.848	1.252	0.804	0.526	0.283
Area cultivated (ha)	0.629	0.895	0.620	0.409	0.071
No. of plots owned	2.998	3.172	3.380	2.574	1.303
Any plough	0.130	0.019	0.140	0.235	0.000
Any cattle	0.690	0.551	0.620	0.912	0.242
Any horse	0.333	0.277	0.296	0.440	0.000
Value of all animals (US $)	859	720	715	1161	171
Land tenure					
Any privatized land	0.697	0.934	0.747	0.448	0.179
Any inherited land	0.306	0.113	0.222	0.578	0.121
Any purchased land	0.069	0.056	0.114	0.010	0.750
Deed from 1991	0.743	0.904	0.755	0.608	0.152
Deed from 1946	0.213	0.080	0.139	0.411	0.143
Land use					
Any irrigation	0.644	0.528	0.631	0.799	0.061
Area irrigated	0.298	0.338	0.284	0.287	0.001
Annual cropland rainfed (ha)	0.282	0.460	0.289	0.116	0.027
Annual cropland irrig. (ha)	0.279	0.312	0.261	0.279	0.001
Perennial land rainfed (ha)	0.052	0.097	0.051	0.007	0.104
Perennial land irrig. (ha)	0.018	0.026	0.023	0.008	0.000
Pasture land (ha)	0.090	0.127	0.072	0.076	0.015
Ag. output&productivity					
Total value of ag. output (US $)	1004.4	1318.3	888.8	849.7	184.9
… share from livestock	0.484	0.348	0.445	0.642	0.344
Total profit/ha (US $)	1269.2	768.7	1008.8	2049.1	203.2
Used crop extension	0.210	0.322	0.106	0.196	0.212
Used vet service	0.282	0.393	0.228	0.229	0.212
Community characteristics					
Distance to nearest bank (km)	3.964	4.678	3.815	3.621	0.000
Migration share in comm. (%)	20.386	22.695	17.042	21.096	22.182
Shortage of labor in comm.	0.368	0.516	0.384	0.230	0.000
Share of hhs with credit	0.347	0.418	0.385	0.245	0.303
Fallowing					
Any land idle?	0.176	0.241	0.233	0.064	0.121
Size of idle land (ha)	0.098	0.162	0.096	0.037	0.116
,,,, less than 5 years	0.364	0.357	0.362	0.410	0.250
,,,, 5 years or more	0.661	0.657	0.685	0.590	0.750
Rented out land (ha)	0.029	0.069	0.013	0.005	0.020
No. of obs.	1796	593	558	612	33

Source: Own computation from 2005 Albania LSMS

Table 2: Estimates of stochastic frontier production function and technical efficiency

	Total output	Crop production only	Livestock only
Frontier production function			
Rainfed arable area (log)	0.3856***	1.0508***	0.3134***
	(0.1308)	(0.2660)	(0.1167)
Irrigated arable area (log)	0.2249*	1.6946***	0.2075
	(0.1207)	(0.2728)	(0.1263)
Rainfed orchard area (log)	0.8972***	1.8292***	0.4648*
	(0.2825)	(0.4856)	(0.2632)
Irrigated orchard area (log)	0.5424	0.8880	0.3428
	(0.4618)	(0.8485)	(0.4356)
Pasture area (log)	0.1291	0.5538	0.0891
	(0.1629)	(0.3582)	(0.1533)
Head's education (log)	-0.0000	0.1625	-0.0190
	(0.0429)	(0.0999)	(0.0397)
Value of hired labor (log)	0.0416*	-0.0149	0.0300
	(0.0253)	(0.0473)	(0.0216)
No. of family workers on farm	-0.1331**	-0.0475	-0.0440
	(0.0638)	(0.1335)	(0.0614)
Value of other inputs (log)	0.3561***	0.1725***	0.1977***
	(0.0252)	(0.0463)	(0.0244)
Total value of animals (log)	0.2630***		-5.1026***
	(0.0311)		(0.4023)
Any animals	-3.0831***		0.3973***
	(0.4168)		(0.0294)
Technical efficiency			
Total land area owned (log)	0.2678***	-0.2507	-0.1229
	(0.0636)	(0.2151)	(0.1430)
Total irrigated area owned (log)	0.9756**	-0.5961	-0.0712
	(0.4007)	(0.5043)	(0.3869)
Dummy: any irrigated area	0.3719**	0.0694	0.0808
	(0.1581)	(0.4356)	(0.2789)
# plots owned	0.0885**	-0.0560	-0.0115
	(0.0429)	(0.0899)	(0.0695)
Head's education (log)	0.7430***	-2.5842**	1.2583***
	(0.2501)	(1.0508)	(0.4092)
Head's education square (log)	-0.2555***	0.7946***	-0.5323***
	(0.0902)	(0.2806)	(0.1486)
Head's age (log)	0.6440***	1.1383*	-0.1701
	(0.2220)	(0.5924)	(0.3831)
No. of family workers on farm	0.3236**	0.4260	-0.1966
	(0.1259)	(0.3377)	(0.2576)
Received extension advice for crops	0.2281	0.6836**	0.2236
	(0.1658)	(0.3417)	(0.2491)
Received veterinary advice	0.8679***	-0.9138***	0.4505**
	(0.1473)	(0.3301)	(0.2194)
Income share from local non-farm	-1.8847***	0.2491	-1.8947***
	(0.1904)	(0.4620)	(0.3662)
Income share from transfer/remit.	-2.5877***	-0.7431	-3.0338***
	(0.2131)	(0.5407)	(0.4344)
Land was inherited	0.4898***	-0.0457	0.1133
	(0.1224)	(0.3129)	(0.2082)
No. of observations	1,788	682	1,280
Log likelihood	-3256.65	-4000.37	-3741.99

Note: Constants as well as (insignificant) dummies on whether the farm had a particular type of land are omitted.
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Temporal and regional elements of land abandonment

By reason for fallowing	Total area		Length of fallow period in years			
	1000 ha	%	<3	3-5	6-10	>11
Plot too far from house	69.729	40.10	6.38	30.79	30.03	32.81
Soil of poor quality	34.926	20.09	9.74	24.37	18.62	47.27
Plot too small to bother with	0.590	0.34	7.62	80.35	0.00	12.03
Seeds, fertilizer, too expensive	32.704	18.81	11.33	43.28	15.35	30.04
Machinery too expensive	35.935	20.67	24.52	27.90	21.26	26.32
Total (1000 ha)	173.885		20.41	54.63	40.10	58.74
Col. %			11.73	31.42	23.06	33.78
By region			**Length of fallow period in years**			
	Fallow	**% of tot**	**<3**	**3-5**	**6-10**	**>11**
Coastal	11.52	54.18	14.74	31.36	18.29	35.62
of which economic	42.9		56.8	44.7	37.2	38.6
Central	11.27	30.63	14.98	30.20	24.98	29.84
of which economic	50.0		86.8	56.7	40.3	33.0
Mountain	5.44	12.97	8.73	41.94	34.24	15.09
of which economic	24.0		53.8	21.5	10.5	44.5

Source: Own computation from 2005 Albania LSMS

Table 4: Key characteristics of households leaving land fallow

	Left land fallow?		If fallow, reason?		If fallow, length?	
	No	**Yes**	**Economic**	**Structural**	**< 5 years**	**>= 5 years**
Household characteristics						
Household size	4.757	4.127	4.134	4.087	3.827	4.232
Members 14-60 years old	2.773	2.478	2.426	2.539	2.115	2.632
Head's education (years)	7.780	8.310	8.177	8.530	8.209	8.688
Max. educ. In household	9.787	9.956	9.876	10.078	9.633	10.280
Toilet	0.498	0.554	0.584	0.504	0.583	0.640
Running water	0.310	0.380	0.392	0.339	0.403	0.440
Telephone	0.077	0.120	0.129	0.096	0.108	0.176
TV	0.078	0.108	0.096	0.122	0.094	0.112
Poverty (%)	0.192	0.120	0.129	0.113	0.144	0.104
Cons. per capita (US $)	8914	10235	10210	10167	9923	10885
Asset ownership						
Area of land owned (ha)	0.755	1.281	1.296	1.273	1.146	1.382
No. of plots owned	2.766	4.085	3.986	4.313	3.907	3.800
Any cattle	0.732	0.491	0.493	0.478	0.417	0.440
Value of all animals (US $)	914a	603	580	632	510	577
Land tenure						
Any privatized land	0.646	0.939	0.918	0.982	0.942	0.952
Any inherited land	0.341	0.142	0.158	0.104	0.151	0.128
Any purchased land	0.077	0.035	0.043	0.018	0.029	0.048
Deed from 1991	0.706	0.915	0.914	0.922	0.914	0.904
Deed from 1946	0.243	0.070	0.082	0.044	0.051	0.073
Ag. Output &productivity						
Total value of ag. output/ha	1061.4	737.4	662.9	847.3	647.8	764.2
… share from livestock	0.507	0.352	0.329	0.373	0.351	0.315
Total profit/ha (US $)	1467.0	342.8	277.3	454.3	342.8	328.5
Income composition (%)						
…from agric.	0.457	0.346	0.292	0.433	0.339	0.330
…from non-ag. wage	0.175	0.213	0.219	0.199	0.189	0.267
…from non-ag. self	0.058	0.087	0.096	0.062	0.055	0.137
…from remittances	0.309	0.348	0.387	0.299	0.412	0.256
Community char.						
Dist. to nearest bank (km)	4.009	3.753	3.914	4.070	5.201	2.784
Access to extension	0.203	0.241	0.206	0.313	0.216	0.200
Access to vet service	0.280	0.291	0.263	0.339	0.223	0.272
Migration share in comm.	19.948	22.437	22.231	22.974	22.492	21.984
Shortage of labor in comm.	0.352	0.443	0.373	0.583	0.489	0.352
Share of hhs with credit	0.319	0.478	0.397	0.617	0.511	0.424
No. of obs.	1480	316	201	115	177	139

Source: Own computation from 2005 Albania LSMS

Table 5: Descriptive statistics by status of households' land market participation

	Rental markets (2005)			Sales markets (2000-2005)		
	Rented out	**Autarky**	**Rented in**	**Sold**	**Autarky**	**Purchased**
Household characteristics						
Household size	3.508	4.661	5.104	5.214	4.641	4.585
Female head	0.149	0.072	0.026	0.071	0.074	0.049
Members 14-60 years old	1.955	2.745	2.826	2.929	2.703	2.919
Dependency ratio	0.502	0.415	0.430	0.433	0.423	0.366
Head's age	56.493	52.426	47.652	54.786	52.328	50.951
Head's education (years)	8.299	7.809	8.539	7.750	7.859	8.098
Max. educ. In household	9.791	9.789	10.217	10.250	9.801	9.927
Toilet	0.687	0.503	0.470	0.786	0.484	0.764
Running water	0.537	0.317	0.261	0.500	0.309	0.455
Telephone	0.194	0.086	0.009	0.107	0.080	0.146
TV	0.134	0.081	0.078	0.071	0.084	0.073
Poverty (%)	0.045	0.186	0.165	0.143	0.183	0.138
Asset ownership						
Area of land owned (ha)	1.061	0.779	1.688	0.928	0.888	0.297
No. of plots owned	3.224	2.929	3.835	3.250	3.083	1.805
Value of all animals	160	866	1173	568	904	322
Any cattle	0.105	0.705	0.826	0.500	0.720	0.325
Any horse	0.045	0.333	0.504	0.036	0.359	0.049
Any minor animal	0.358	0.744	0.861	0.714	0.760	0.439
Any plough	0.030	0.125	0.261	0.071	0.138	0.033
Land use						
Any irrigation	0.284	0.658	0.652	0.607	0.654	0.520
Area irrigated	0.065	0.268	0.857	0.145	0.318	0.064
Annual cropland rainf. (ha)	0.141	0.269	0.540	0.354	0.294	0.098
Annual cropland irrig. (ha)	0.053	0.249	0.841	0.132	0.298	0.059
Perennial land rainfed (ha)	0.077	0.050	0.065	0.097	0.053	0.030
Perennial land irrig. (ha)	0.012	0.019	0.016	0.012	0.019	0.005
Pasture land (ha)	0.017	0.091	0.125	0.044	0.097	0.006
Rented out land (ha)	0.695	0.003	0.000	0.039	0.028	0.038
Ag. output&productivity						
Total value of ag. output	335.8	943.2	2252.2	498.8	1042.1	615.0
… share from livestock	0.251	0.493	0.430	0.291	0.491	0.391
Total profit/ha (US $)	176.2	1310.5	1327.0	229.3	1314.7	897.2
Income composition (%)						
…from agric.	0.145	0.443	0.520	0.267	0.458	0.201
…from non-ag. wage	0.185	0.183	0.158	0.194	0.169	0.337
…from non-ag. self	0.129	0.060	0.056	0.210	0.056	0.124
…from remittances	0.540	0.310	0.267	0.328	0.314	0.339
Community char.						
Dist. to nearest bank (km)	1.508	4.222	1.774	1.143	4.262	0.613
Access to extension	0.149	0.214	0.183	0.214	0.218	0.106
Access to vet service	0.105	0.284	0.357	0.179	0.290	0.203
Migration share in comm.	23.985	20.268	19.946	18.357	20.685	16.825
Shortage of labor in comm.	0.463	0.362	0.400	0.250	0.384	0.187
Share of hhs with credit	0.418	0.341	0.383	0.429	0.340	0.415
No. of obs.	67	1614	115	28	1645	123

Source: Own computation from 2005 Albania LSMS

Table 6: Ordered probit regression for land rental market participation

	Rental markets		Sales markets	
	1	**2**	**3**	**4**
Total land owned	0.1150***	0.1060***	-0.1074***	-0.1091***
	(0.0360)	(0.0375)	(0.0334)	(0.0337)
Agricultural ability		0.5882***		0.0630
		(0.1911)		(0.2056)
No. of family members on farm	0.1322***	0.1356***	-0.0299	-0.0313
	(0.0398)	(0.0391)	(0.0496)	(0.0501)
Head's age (years)	-0.0118***	-0.0136***	-0.0065*	-0.0066*
	(0.0039)	(0.0039)	(0.0037)	(0.0038)
Head's education (years)	-0.0077	-0.0115	-0.0116	-0.0119
	(0.0140)	(0.0139)	(0.0138)	(0.0137)
Total value of animals	0.0571***	0.0492***	-0.0304***	-0.0315***
	(0.0121)	(0.0126)	(0.0109)	(0.0112)
Non-farm income share	-0.2478	-0.0696	0.1351	0.1494
	(0.1798)	(0.1838)	(0.1869)	(0.1983)
Income share from remittances	-0.5650***	-0.3805*	0.3125*	0.3313*
	(0.1983)	(0.2089)	(0.1822)	(0.1992)
Community-level migration share	-0.0193***	-0.0169**	-0.0092	-0.0089
	(0.0071)	(0.0073)	(0.0073)	(0.0073)
Lower Bound (rent out/sale to autarky)				
Deed from 1991	0.9418***	1.0119***	0.4458	0.4292
(comm.. share for sale)	(0.3435)	(0.3476)	(0.5890)	(0.5926)
Land inherited	-0.1290	-0.0913	0.0013	0.0043
	(0.1998)	(0.1964)	(0.2739)	(0.2756)
Community distance to bank	-0.0098	-0.0103	-0.0173*	-0.0173*
	(0.0086)	(0.0085)	(0.0101)	(0.0101)
Upper Bound (autarky to rent in/purchase)				
Share of land with '91 deed	-0.3162	-0.2684	-0.4278	-0.4478
in the community	(0.4446)	(0.4455)	(0.7159)	(0.7166)
Distance to bank	0.0106**	0.0105**	0.0162	0.0161
	(0.0046)	(0.0048)	(0.0106)	(0.0106)
No. of observations	1796	1796	1796	1796

Note: Constants as well as district dummies are not reported. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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