

Does land rental market facilitate efficient land distribution in Ukraine?

-Draft-

February, 2019

Halle (Saale), Germany

Vasyl Kvartiuk¹, Eduard Bukin¹, Thomas Herzfeld¹

¹*Leibniz-Institute of Agricultural Development in Transition Economies (IAMO),*

Theodor-Lieser-Str. 1, 06120, Halle (Saale)

Abstract

This study analyses how agricultural land rental market contributes to the efficient land allocation in Ukrainian agriculture. For the last two decades, Ukraine has been struggling to introduce land sales market. Nevertheless, agricultural production has grown substantially in the recent years. We assess how current land relations in Ukraine have contributed to agricultural growth. In particular, we examine whether agricultural land tends to flow towards better skilled agricultural producers, thus, improving agricultural efficiency. Utilizing a rich panel of the Ukrainian commercial agricultural producers for 2007-2012, we examine the determinants of participation in the land rental market. The evidence suggests that the proclivity of renting in more land is negatively associated with the total factor productivity implying that large farms use land ineffectively. In addition, the incentives and strategies to rent in land appear to depend on the farms business model, legal form and regional land inequality. The results call for aligning land rental prices with the value of marginal product of land and for improving institutional infrastructure of the land rental market.

Keywords: land rental market, productivity, land allocation, land reform, Ukraine.

Introduction

Although optimal agricultural organization and respective land policies have long puzzled scholars and still present one of the actively debated issues, relatively little attention has been paid to a post-socialist transition context. Literature has extensively considered land markets as a mechanism creating opportunities for land transfers from less to more productive farms and as a poverty reducing tool (de Janvry, Platteau, Gordillo, & Sadoulet, 2001; Klaus Deininger, 2003). One argument suggests that farms' productivity goes down with larger sizes predominantly due to rising supervision costs (Eastwood, Lipton, & Newell, 2010). This argument has been instrumental in the discussion of land reforms in developing countries where proponents argue that distributing land to small farms or landless will raise societal welfare (Lipton, 2009). However, because many transition economies are known for high transaction costs in land purchases, thin land sales markets and credit constraints for farms persist (Z. Lerman, Csaki, & Feder, 2004), land rental is the main way of transferring land use rights. In these environments land rental markets may play an important role in enhancing agricultural efficiency as they enable land to flow towards more efficient producers (Sadoulet, Murgai, & Janvry, 2001) and provide access to land for the poor (Klaus Deininger & Binswanger, 2001). An emerging literature suggests that land rental markets may play an important role in improving the flow of land towards more efficient producers (de Janvry et al., 2001; Klaus Deininger & Jin, 2005; Vranken & Swinnen, 2006). Although land rental has been by far the most dominant way of accessing land for nearly three decades in Ukraine and despite a very active public debate about land sales market, very little systematic research has examined how Ukrainian land relations contribute to efficient land distribution. This study addresses this literature gap assessing the contribution of land rental market to efficient land distribution in agricultural production.

Ukraine represents an interesting case because land rental has been nearly an exclusive way to access agricultural land since the introduction of the private property right on land in 1996 and moratorium forbidding the land sales in 2001. Land-intensive agricultural production with relatively poor rural population and diversity of organizational forms puts Ukraine in one group with similar in natural and environment conditions countries such as Russia or Kazakhstan. The main difference is that Ukraine lacks land sales market and agricultural producers can only rely on land rent. Land rental market as it is now has been in place for over a decade and has led to substantial land concentration giving rise to large farms operating on areas of several hundreds of thousands of ha (Pugachov & Pugachov, 2017). Land concentration is commonly believed to exacerbate rural poverty traps and generate inequality (Mamonova, 2012; Spoor, 2012). Ironically, this undesired outcome is precisely the main political argument against launching the land sales market in Ukraine. In an attempt to understand economic justification of agricultural land concentration in Ukraine, recent work of Deininger, Nizalov, & Singh (2017) has not found larger agricultural producers to be more productive and, as a result, no economies of scale. This raises a question whether or not current agricultural land relations facilitate efficient land distribution.

The main objective of the paper is to analyze whether current Ukrainian land rental market facilitates land transfers towards more efficient agricultural producers. First, we provide a

theoretical overview of the factors that may affect farmer's decision to rent in land following the logic of Sadoulet et al., (2001) and Yao (2000). The theory suggests that land rental market participation should depend on marginal products of land and labor, farm efficiency, marginal cost of labor supervision, credit constraints and transaction costs. Second, we use our unique farm-level panel from Ukraine to trace the developments of the land rental market between 2005-2016 classifying agricultural producers according to land ownership and land rental activity. Then, based on the theoretical model, we estimate determinants of participation in the land market for all agricultural producers explicitly considering connection between farms' productivity and the likelihood of renting in land. Based on the results, we discuss implications of the current land relations for the growth in Ukrainian agricultural sector.

We find that current land relations do not facilitate a land flow towards more productive agricultural producers. Evidence suggests that more productive farms are less likely to rent in large areas of agricultural land. In addition, initial rayon-level land inequality appears to be associated with land consolidation. Prohibition to sell land generates incentives for short-term business models focusing on large-scale cultivation of cash crops with low added value per hectare. Finally, we find that farms of a different legal form chose different strategies in accessing rental land.

Theoretical framework

Land sales markets with low transaction costs are widely recognized as a first-best approach to organize land relations. First, more productive farmers with consequently higher willingness to pay for land are more likely to obtain access to land within liberal land relations (Binswanger & Rosenzweig, 1986; Klaus Deininger & Feder, 2001). These market-generated incentives ensure flow of land from the agricultural producers with lower agricultural abilities to the ones that are more productive. As a result, land transferability based on price signals should improve aggregate allocative efficiency of land distribution. Second, property rights on land are an effort-inducing mechanism in agricultural production. In particular, land ownership may incentivize investments into production factors (Benjaminsen, Holden, Lund, & Sjaastad, 2009; Besley, 1995; Li, Rozelle, & Brandt, 1998). Finally, well-defined property rights on land may introduce a possibility of using it as a collateral in rural credit markets (Binswanger & Rosenzweig, 1986; Feder, Onchan, Chalamwong, & Hongladarom, 1988).

Unfortunately, well-functioning land markets can be rarely found in a post-Soviet context. In such countries as Russia or Kazakhstan, where land sales markets are supported by respective legislation, dysfunctional institutions make effective land exchange virtually impossible. As a result, only 1 percent of land was privately owned in 2010 in Kazakhstan (OECD, 2013). In Ukraine, land sales markets are currently prohibited by law making market-based exchange very difficult. As a result, Ukraine is representative country where land rental markets represent virtually the only viable way of land exchange.

There is an emerging literature suggesting that land rental may be a suitable land exchange system in the contexts with imperfect institutions. Vaguely defined property rights may discourage

farmers from purchasing land. For instance, Petrick, Wandel, & Karsten (2011) argue that frequently changing Land Code generates disincentives among Kazakh farmers to purchase land. Moreover, undercapitalization within constrained access to credit may also be a considerable barrier for functioning land markets (de Janvry et al., 2001). Thin markets that result to these institutional failures can further discourage land sales within the sector (Z. Lerman et al., 2004). Consequently, land rental markets may represent a second-best option for land relations organization in the settings with imperfect institutions.

In an attempt to model farm's decision to rent-in more land we follow a family of models introduced by Deininger & Jin (2005) and Yao (2000). The logic is based on a utility maximization framework where farmers rent-in if the marginal productivity of land is larger than its opportunity costs and marginal costs of labor supervision. In other words, farmer's low agricultural ability may increase opportunity cost of holding land incentivize her/him to rent less land. Thus, the most important driving force within these models is agricultural ability of an agricultural producer. We would expect a farm with higher agricultural ability to rent in more land in a functioning land rental market. On the other hand, following the conventional wisdom in the literature that larger operational land is associated with higher supervision costs (Eastwood et al., 2010; Lipton, 2009), we would expect a disincentive to rent more land associated with the supervision costs. However, the discussion about whether this stylized fact holds has been revitalized by Deininger & Byerlee (2012). They argue that modern technologies in agricultural sector and improving managerial practices may reduce supervision costs substantially. As a result, the effect associated with the supervision costs may generate less disincentives to rent in as initially thought.

Initial land distribution within a region may affect the incentives and possibilities of land rental. Since basic land distribution took place in the 90s in Ukraine, there is some land in private property. Obviously, large areas of owned land should discourage additional rental. On the other hand, competition for land may create large barriers for small farmers in the environments with dysfunctional institutions. Because larger farms typically have better administrative capacity, they may have an advantage in negotiating with local land owners. As a result, smaller farmers may face additional costs attempting to access land for rent.

Land relations in Ukraine

After the collapse of the Soviet Union, Ukraine set the course for liberal land reforms in early 1990s. The first notable document that launched the land reform was the 1995 Presidential Decree¹ that described that process of distribution of "*pais*" – land stakes in the former collective farms. This document also stipulated that the recipients had to be former collective farms or public sector employees. However, the rights to use *pais* as well as the procedures of exiting from the former collective farms were clarified only by the 1999 Presidential Decree.² Exit of individual

¹ Decree of the President of Ukraine 720/95 from 08.08.2015 "On the distribution of *pais* that were transferred into ownership by agricultural enterprises and organizations".

² Decree of the President of Ukraine 1529/99 from 03.12.1999 On immediate measures for acceleration of reforms in the agricultural sector".

shareholders was, however, problematic because related procedures were developed in detail a decade later (Zvi Lerman, Sedik, Pugachov, & Goncharuk, 2007). Although many collective farms were converted into commercial agricultural enterprises, they essentially did not change. Moreover, the 1999 Presidential Decree gave a chance for the holders of CLS to convert them into physical plots subsequently creating ca. 7 million land owners (Klaus Deininger et al., 2017; Zvi Lerman et al., 2007).

The 2002 Land Code paved a way for new land relations in Ukraine. A major breakthrough was that it clearly defined property rights related to agricultural land. Furthermore, it had an important provision prohibiting contribution of the *pais* towards the equity capital of agricultural enterprises. This reduced the pressure from the managers on the landowners to contribute their *pais* to their farms and precluded this widespread phenomenon, as it was the case in Kazakhstan. However, the 2002 Moratorium on land sales took away a basic right of the landowners reducing the value from holding land as an asset. Initially thought of as a temporary measure, the Moratorium has been prolonged eight times since its adoption.

Figure 1 presents three main types of agricultural producers in Ukraine: agricultural enterprises (including state enterprises), individual farms and households. Households have existed since the Soviet times and mainly represented subsistence farming. Nevertheless, they have stayed a major player in Ukrainian agriculture. The 2002 Land Code enabled them to use own *pais* for crop production without a need to be a legal entity. Interestingly, households cultivated 30.11% of agricultural land and accounted for 38.7% of the value of agricultural crops produced in 2016 (according to the Figure 3). In order to facilitate commercialization of some households that rented land in addition to their *pais*, individual farms were introduced as a legal form in the mid-90th. This type of agricultural producers has been gaining in importance and reached 7.5% in total land use. Finally, agricultural enterprises represents legal entities typically run by hired managers and often owned by individuals not directly involved in agriculture. Many of these enterprises were formed on the basis of former collective farms. The share of the land they operated declined after restructuring but stabilized in the mid-2000s and they accounted for roughly one third of agricultural land in 2016. Importantly, the land that is cultivated by both, agricultural enterprises and individual farms, has been rather small accounting for under 2% of total agricultural land. As a result, non-household agriculture is conducted almost exclusively on rented land in Ukraine. In the analysis below, we focus on these types of agricultural producers.

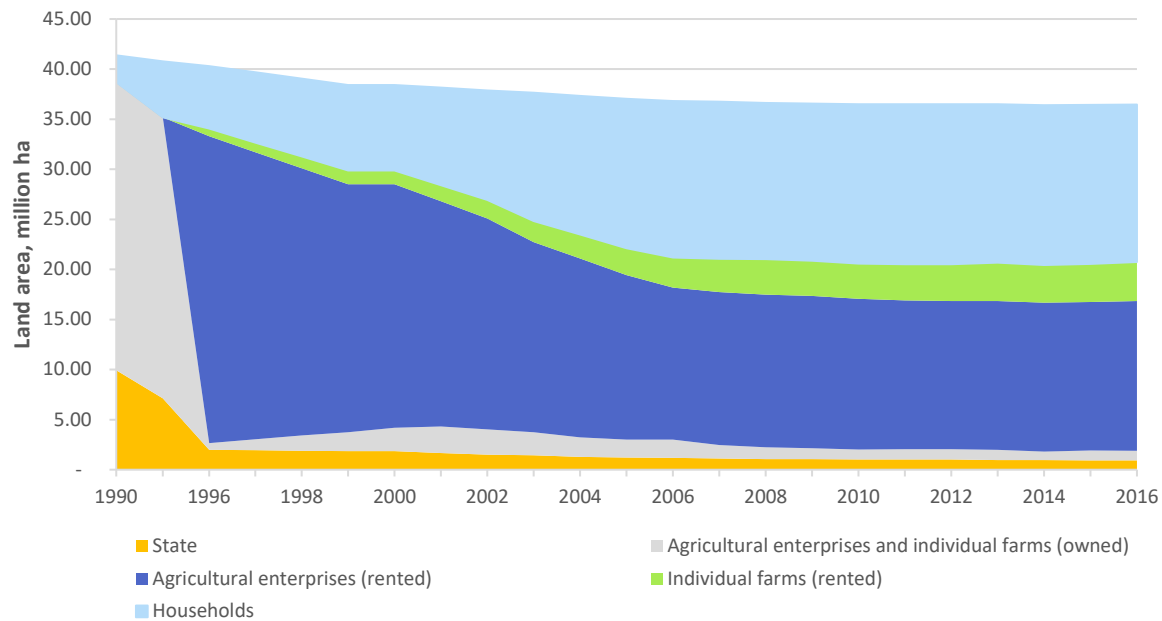


Figure 1. Distribution of land by farm types over the course of the land reform. Source: SSCU, (2017).

Ukrainian agriculture is characterized by relatively large operational land areas in comparison to the rest of the world. Figure 2 demonstrates the distribution of the number of agricultural enterprises and individual farms along with their utilized land in 2016. We see that a small number of large agricultural producers utilizes large areas of land but producers with small utilized area are much more numerous. A substantial share of land is used by the farms between 500 ha and 4000 ha, which likely represent enterprises organized around former collective farms. Ukraine hosts some of the largest agricultural enterprises in the world with average utilized land of 460 ha with land holdings spanning up to 500000 ha (Klaus Deininger et al., 2017). Thus, 17.6% of land was cultivated by the enterprises with operational areas more than 10k ha. These cultivators with large utilized land and vertically integrated management systems are often referred to as “agroholdings”. Large-scale farming modes contribute to substantial inequalities in land distribution in Ukrainian regions. Thus, the rayon-level Gini coefficient with respect to the land distribution increased from 0.461 in 2007 to 0.531 in 2012. Large-scale agriculture typically dominates in central and northern regions.

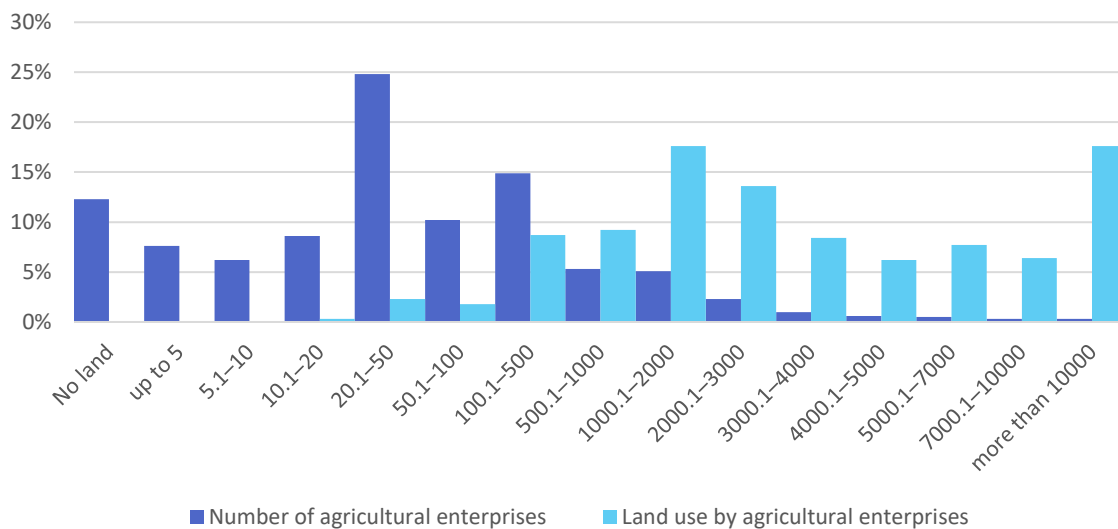


Figure 2. Distribution of non-household producers by number of enterprises and land use in 2016. Source: SSCU, (2017).

Moratorium on land sales has created favorable conditions for the large-scale farming with short-term business models. Land rental from the pool of 31 million ha of privately owned land is the main way of accessing land for agricultural enterprises within current legislation. Low awareness and poor negotiation capacity of the rural landowners facilitated large-scale land rentals during the 2000s. Rental payments have been very low during that period and often were paid in a form of the agricultural produce (Kuns, 2017). The widespread short-term business model contributed to the emergence of Ukraine as one of the leading producers and exporters of grains and oilseeds in the world. According to the UN’s COMTRADE, Ukraine’s top three export items in 2016 were oilseeds (9.6%), wheat (7.1%), and corn (6.7%). Figure 2 demonstrates the evolution of crop production by different types of producers. We see that agricultural enterprises slowly increase their share of produced crops mostly at the expense of households. These trends have resulted in a situation when nearly half of the production value of crops was generated by agricultural enterprises in 2016. Moreover, based on the statistics of ProAgro³, the largest 10 agricultural enterprises accounted for 39.9% of wheat, 52.3% of barley and 39.8% of corn exports. As a result, large-scale farming has been flourishing in the last decade.

³ ProAgro is a private company providing statistics and analytics on Ukrainian agriculture (<http://www.proagro.com.ua>).

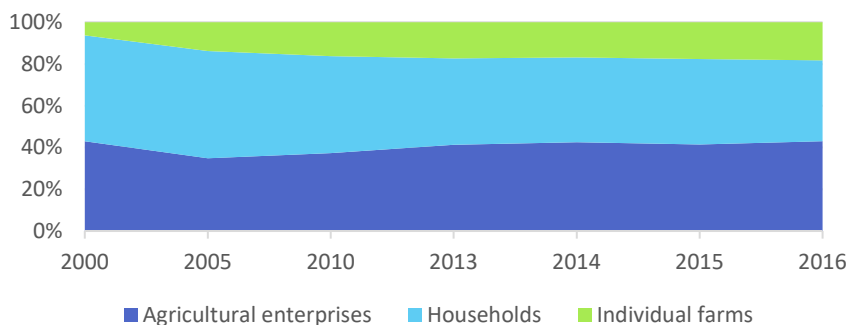


Figure 3. Evolution of the production value of crops by categories of farms. Source: SSCU, (2017).

Lack of transparency in public agricultural lands management has contributed to a revival of another considerable type of land users that are rooted in the Soviet past – state-owned enterprises. These farms are widely criticized for their inefficiency and lack of transparency. Even Ukrainian Ministry of Agriculture recognizes the need to reform state-owned enterprises (Ministry of Agriculture of Ukraine, 2016). According to Accounts Chamber of Ukraine (2018), 1.08 million ha of the state-owned land (10.2% of the total state-owned agricultural land) were cultivated by state-owned agricultural enterprises. Interestingly, 51.5% of the total state-owned land is utilized based on the rental contracts dating back before 1991. Lack of regulation and non-transparent land management by state-owned agricultural enterprises contributes to the risk of misuse.

Data and methods

a. Data

We employ triangulation of methods within this study. First, we utilize a qualitative data collected in early 2018. We conducted 12 face-to-face semi-structured interviews in Kyiv with the representatives of the key stakeholders directly related to land relations in Ukraine: Ministry of Agriculture, State GeoCadaster, associations of different agricultural producers and representatives of landowners. The interviews dealt with the current land sales moratorium, access to land for different types of producers, land inequality, land collateralizability, and the prospects for reforms in the near future. Second, we use a unique data from the State Statistics Committee of Ukraine (SSCU) representing a farm-level panel for 2007-2012 that includes major part of the legal entities producing agricultural commodities⁴ implying that approximately eight thousand farms each year are covered in the analysis. The dataset covers 6 years between 2007 and 2012 and includes 9200 unique agricultural enterprises (7 to 8 thousand farms per year). They were located in 619 rayon (districts) of Ukraine operating on 22 million hectare and producing a half of domestic cash crops.

⁴ SSCU's standard reporting form 50SG covers all agricultural enterprises (state and private) as well as registered individual farms. The sample considers producers that either generate annual revenue of at least 150 thousand UAH (5560 USD), or permanently employ more than 20 persons.

Data allows to track separate inputs used for crop production of crops along with the volumes and values of crops produced and sold by every farm. Inputs data distinguishes between land area and expenditures on land rent, hired labor, seeds, fertilizers, energy and petrol, services and machinery⁵ and details their allocation by crop. As all expenditures are expressed in thousands of Ukrainian Hryvna (UAH) in the original 50SG form, we convert current values into 2010 UAH using official Consumers Price Index (CPI) index.

We restrict the dataset in a number of way to ensure data consistency and a narrow scope of the analysis. First, we follow Deininger et al. (2017) in dealing with the potential affect of transfer pricing of crop output at the farms with integrated crop-livestock production. In particular, we focus on nine cash crops: wheat (winter and summer), barley, rye, corn, oat, sunflower, rapeseed, soybeans and sugar beet, discarding those farms where crop production contribute to less than 25% of total output. We also discard observations, where operational land size is below 5 ha. This cut-off value was chosen because cultivation of cash crops below this size is widely considered unprofitable and including smaller farms may introduce additional disturbances in the data. Finally, we exclude all the farms that appeared only once within our panel (those which existed one only year or qualified with the size restriction to be covered by the survey only once). Such cleaning leaves us with 9832 unique farms and a total of 43200 observations for analysis.

Table 1 presents the descriptive statistics. The first observation is that the amount of owned land decreased substantially for all types of producers over the period between 2007 and 2012. Average amount of rented land increased only for agricultural enterprises as these farms expanded substantially during this period. Moreover, we observe signs of land concentration. In particular, land inequality increased among all types of producers both, locally and on rayon level. All types of agricultural producers improved their revenue performance and increased diversification of their crops as we observe a shift from high shares of wheat and barley to other crop types (especially re-orientation towards corn production).

Table 1. Descriptive statistics

	Private agricultural enterprises		Individual farms		Stata enterprises		Total	
	2007	2012	2007	2012	2007	2012	2007	2012
Total land, ha	2300.7 (4419.2)	2386 (4924)	2655.5 (1763.7)	2097.4 (1794.2)	3005 (2292.8)	2399.5 (2402.8)	2329 (4315)	2355.6 (4635.4)
Owned land, ha	81.9 (1575.8)	47.1 (941.3)	51.8 (172.1)	32 (105.1)	2894.2 (2295.3)	2319.5 (2380.4)	140.2 (1616.3)	109.3 (1033.1)
Rented land, ha	2209.1 (4015.8)	2327.4 (4838.7)	2603.7 (1783.2)	2060 (1782.6)	109.9 (407.9)	79.5 (317.2)	2179.5 (3924.1)	2235.7 (4554.3)
Gini of land distribution at the district level	0.417 (0.141)	0.495 (0.147)	0.35 (0.091)	0.421 (0.092)	0.376 (0.101)	0.437 (0.11)	0.413 (0.139)	0.487 (0.144)
Gini of land distribution at the rayon level	0.462 (0.082)	0.535 (0.069)	0.433 (0.056)	0.501 (0.061)	0.446 (0.065)	0.522 (0.066)	0.461 (0.081)	0.531 (0.069)
Area of main crops, ha	985.9 (3147.1)	1343.7 (3563.2)	1167.8 (912.4)	1119 (1030.5)	793.7 (795.7)	822.5 (1035)	988.7 (3060.6)	1305.1 (3337.8)

⁵ As there is not information on capital and machinery per se, we assume machinery costs being approximated by the annual amortization expenditure recorded for each crop type.

Amortisation costs per ha, 2010 UAH*	212.4 (273.8)	311.8 (328.3)	271.1 (273.3)	417.8 (367)	226.1 (304.5)	167.3 (218.8)	215.3 (274.6)	318.9 (332.4)
Fertilizers costs per ha, 2010 UAH*	627.6 (608.6)	1102.3 (792)	625.8 (506.5)	1034.3 (827.7)	321.2 (344.3)	509.4 (568.6)	622.3 (602.2)	1085.6 (796)
Labour costs per ha, 2010 UAH*	420.2 (372.9)	493 (402)	386.2 (318.3)	404.6 (329.4)	560.2 (511)	620.6 (564.8)	421.1 (373.9)	487.2 (400.7)
Oil and energy costs per ha, 2010 UAH*	1046.9 (760.6)	1544.9 (945.9)	1135.4 (807.5)	1505.2 (892.9)	1092.7 (857.9)	1222.9 (945.5)	1051.6 (764.7)	1535.6 (942.2)
Seeds costs per ha, 2010 UAH*	498.6 (453.9)	783.9 (418)	525.9 (311.7)	788.7 (428.2)	462.6 (320.9)	534.4 (401.4)	499.2 (446.7)	780 (420)
Services costs per ha, 2010 UAH*	384.4 (589.8)	663.2 (960)	235.2 (422.8)	350 (833.4)	452.6 (431.7)	942.8 (1150.9)	378.9 (581.9)	639.5 (958)
Total costs per ha, 2010 UAH*	2685.9 (1602)	4766.6 (2098.4)	2539.5 (1208.4)	4052.4 (1899.2)	2145.3 (946)	3236.8 (1520.7)	2670.1 (1579.4)	4674.2 (2091.1)
Revenue calculated using median rayon prices per ha, 2010 UAH*	4064.8 (2204.7)	6417.4 (2937)	3889.6 (1772)	5461.7 (2598.8)	3149.1 (1295.3)	4339.8 (2184.7)	4041.4 (2178.3)	6293.3 (2920.8)
Share of wheat in total area, %*	17.5 (23.4)	7.2 (14.7)	13.2 (21.7)	6.9 (16)	21.7 (28.7)	15.2 (20.2)	17.4 (23.4)	7.3 (14.9)
Share of corn in total area, %*	18.2 (22.8)	31.2 (25.2)	15.7 (17.1)	22.6 (19.2)	9.1 (14.9)	13.7 (15.9)	17.9 (22.5)	30.1 (24.8)
Share of barley in total area, %*	9.1 (16.9)	5.5 (12)	11.2 (18.2)	7.9 (14.9)	16.5 (23.6)	11.2 (17.5)	9.3 (17.1)	5.8 (12.4)
Share of oats in total area, %*	2.4 (7.3)	1.2 (5.1)	2 (5.1)	1.1 (3.6)	6.2 (9.9)	3.8 (7.4)	2.4 (7.3)	1.2 (5)
Share of rye in total area, %*	2.7 (9.8)	1.7 (7.4)	2.7 (9.4)	1.3 (5.6)	3.5 (9.5)	3.8 (10.8)	2.7 (9.8)	1.7 (7.3)
Share of oil seeds in total area, %*	37.5 (30.4)	37.9 (29.3)	46.6 (28.6)	50.8 (28.1)	36.1 (29.6)	39.1 (30.6)	37.9 (30.4)	39.1 (29.4)
Share of soybeans in total area, %*	6.3 (13.6)	11.4 (16.4)	3 (6.8)	7.5 (14)	5 (9.9)	11 (17.9)	6.2 (13.3)	11 (16.3)
Share of sugar beet in total area, %*	6.4 (13.7)	4 (10.2)	5.6 (10.6)	2 (6.5)	1.8 (7.6)	2.1 (7.3)	6.3 (13.5)	3.8 (9.9)
Number of observations	5944	6283	238	774	134	204	6316	7261

Notes: * corresponds to the mean and standard deviation weighted by the area size. Standard deviations are given in brackets.
Source: Authors' calculations based on the SSCU data.

b. Methodology

Following our theoretical framework, we explain agricultural producers' participation in the Ukrainian land rental markets. In particular, our goal is to test whether producers with better agricultural skills tend to rent in more land. This will help understanding whether current land relations stimulate the flow of land towards more productive farms. To achieve this, we, first, model $Rental_i$, which is the amount of land rented by each farm i in the last period, where the farm is observed in the sample, as a function of initial owned land area ($Owned\ init_i$), time invariant farms' agricultural ability α_i , other farm-specific characteristics as controls vector X_i (ε_i is an error term):

$$Rental\ final_i = \beta_0 + \beta_1 Owned\ init_i + \beta_2 \alpha_i + \beta_3 X_i + \varepsilon_i$$

As the rented area in the end of observation period for each farm ranges from 0 to infinity, we utilize Tobit estimation method. We expect that higher agricultural ability will to be associated with more land rented in in the case when current land relation system facilitate the flow of land towards more productive farms.

Alternatively, we also analyze the land use change pattern over the course of the farms; appearance in the data sample. First, we calculate how utilized land area changed for each farm over the observed period in the sample as $\Delta Area_i = Area_{final_i} - Area_{initial_i}$. Second, we split the sample of all farms into three groups: 1 – farms, where $\Delta Area_i$ decreased for more than 10% of initial land area ($\Delta Area_i / Area_{initial_i} \leq -0.1$); 2 – farms, where $\Delta Area_i$ increased for more than 10% of initial land area ($\Delta Area_i / Area_{initial_i} \geq 0.1$); and 3 – farms, where $\Delta Area_i$ remained in the autarky

To add another dimension of specificity, we also examining the subsamples of farms that exited, entered and stayed in farming over the course of the observed panel. Accordingly, we define the observation belonging to the exit subsample if the farm exited farming during the period of 2008-2011. Entrants are those who entered the sample during the same period. Finally, stayers are the farms for which we have observations for each year.

The key to this analysis is obviously to estimate agricultural ability α_i . With this goal in mind, we estimate a classical Cobb-Douglas production function of the following form:

$$Y_{it} = \gamma + \beta X_{imt} + \delta Z_{int} + \alpha_{ijo} + \varepsilon_{it}$$

where Y_{it} – is the value of crops output at the farm i in time t ; X_{imt} – is the vector of m inputs used by farm i in time t ; Z_{int} – is the vector of the n control variables such as reverse dummy variables, linear trend and crop composition relevant to the farm; α_{ijo} – is a fixed effect of a farm i , located in rayon i of the oblast o , which is estimated along with the coefficients γ, β, δ .

We use estimated farm-specific fixed effect ($\hat{\alpha}_{ijo}$) as an approximation of farm-specific agricultural abilities. In particular, we obtained it using the within-transformation of our fixed-effect panel model. This effect consist of $\hat{\alpha}_i$ – pure farm specific effect, $\hat{\alpha}_j$ and $\hat{\alpha}_o$ fixed effects of rayon (j) and oblast (o) where the farm is located physically. We argue that fixed effects of rayon and oblast could be seen as proxies for local quality of institutions and farming infrastructure. Fixed effects can be decomposed into combined ones for a rayon and oblast: $\hat{\alpha}_{jo} = \sum_i \hat{\alpha}_{ijo} / n_{jo}$, oblast $\hat{\alpha}_o = \sum_j \hat{\alpha}_{jo} / n_j$, for a rayon $\hat{\alpha}_j = \hat{\alpha}_{jo} - \hat{\alpha}_o$ and for an individual farm $\hat{\alpha}_i = \hat{\alpha}_{ijo} - \hat{\alpha}_j - \hat{\alpha}_o$. As an alternative approach to estimating farm specific abilities we also use efficiency scores based on stochastic frontier analysis (SFA)⁶.

There are two issues with the dependent variable in our production function (Y_{it}). First, as the share of “agroholdings” has considerably increased in Ukraine, there is a higher chance of underreporting actual production values because of the vertically integrated value chain. Second, volumes of crops sold in each specific year are rarely the same as the production levels because farms may not be capable of selling produce in the period when they report production and input use. Consequently, the amount of sold output may be higher or lower compared to the actual

⁶ Estimation results could be consulted in Appendix A.

production. To account for that, we calculate hypothetical value of the produced crops based on the median prices of crops at the rayon level and production volumes expressed in physical mass.

Main results

Before estimating the model with the determinants of land rental, it is informative to examine the results of the production function estimation. All the inputs are highly significant predictors of the output with the FE model's R^2 of 0.518. Operational land appears to be the most important production factor with an elasticity of 72%. Interestingly, labor has a very low contribution to the output and in the SFA specification even fails to obtain significance. This suggests that business models focusing on cash crops cultivations heavily rely on non-labor production factors. Finally, various material inputs have a substantial contribution to output. All three estimations (OLS, FE and SFA) have similar coefficients. Obtained proxies for agricultural abilities are also close to each other. Thus, the correlation coefficients range from 0.90 to 0.97. As a result, we believe this provides a suitable foundation for our further analysis.

Table 2 presents the estimations of the determinants of land rental. First, owned land appears to be positively associated with the land rented contrary to our expectation. Owned land was most typically held in the form of the CLS, which represents negligible amounts in comparison to the rented areas. Consequently, we may observe this complementary effect. Most importantly, we find the coefficient of the agricultural ability to be negative and significant. This implies that more productive farms tend to rent in less land. Or in other words: those farms that rent in more land appear to be less productive. Our finding is precisely the opposite of what we expect in a well-functioning land rental market. Current land relations appear to facilitate a flow of land towards less efficient agricultural producers. A related important finding is that initial regional land distribution matters for further farming modes. Thus, farms in the rayons with more unequally distributed land, were more likely to rent in more land. Large enterprises may have an advantage in negotiating for more rental land. As a result, regions with high initial Gini coefficients end up even with even more unequal land distributions. Importantly, the coefficient of the interaction term between rayon land inequality and agricultural ability is negative and significant implying that the negative effect of agricultural ability is exacerbated in the rayons with unequal land distribution. This finding underscores the negative impact of land inequality on favorable land distribution outcomes.

Legal form appears to play significant a role in the farms' decision-making about how much land to rent in. We find the coefficients of the dummy for individual farms to be insignificant but the one for state farms appears to exert a persistent negative effect throughout the specifications. This implies that state enterprises tend to rent in less land than their private counterparts. However, the positive and significant coefficients of the interaction terms between both of the dummies and agricultural ability suggests that more skilled state enterprises and individual farms tend to rent in more land. Larger and more significant coefficient of the interaction term between the agricultural

ability and the state farm dummy suggests that more productive state farms may have a better access to rented land.

Our evidence suggests that farm size expansion is closely associated with the focus on cash crops cultivation. Most of the variables reflecting the percentage of each type of cash crops is positively and significantly related to the dependent variable. This means that agricultural enterprises cultivating exclusively these crops are more likely to rent in more land. This is in line with short-term business models of many Ukrainian large vertically-integrated farms that grow annual crops with the aim of export.

Table 2. Tobit estimations of the determinants of land rented.

	Tobit (1)	Tobit (2)	Tobit (3)
Log of area owned (ha)	1.041*** (33.862)	1.05*** (34.123)	0.969*** (31.485)
Agricultural ability	-2364.891*** (-20.18)	-2481.034*** (-20.424)	-4688.234*** (-5.644)
Rayon-level institutions	-424.615 (-1.011)	-383.509 (-0.914)	-565.967 (-1.363)
Oblast-level institutions	-458.638 (-1.068)	-452.84 (-1.056)	-646.885 (-1.523)
Land inequality within rayon in 2007 (Gini)	3549.118*** (9.353)	3506.63*** (9.253)	23199.902*** (14.516)
Land inequality within oblast in 2007 (Gini)	1516.747* (2.281)	1546.291* (2.328)	4732.972. (1.712)
Shares of cash crops production in total output ¹ (%)	+***	+***	+***
Individual farm (1 – yes, 0 – no)	9.936 (0.073)	-1191.482. (-1.702)	6.321 (0.047)
State farm (1 – yes, 0 – no)	-8970.9*** (-23.763)	-15903.309*** (-10.64)	-6102.028*** (-14.869)
Individual farm*Agricultural ability		823.227. (1.745)	
State farm*Agricultural ability		4733.125*** (4.932)	
Land inequality within rayon in 2007 (Gini)*Agricultural ability			-13393.027*** (-12.647)
Land inequality within oblast in 2007 (Gini)*Agricultural ability			-2105.958 (-1.167)
Intercept	3405.102*** (3.438)	3567.061*** (3.602)	-6575.026*** (-4.253)
Observations			

Note: .Significant at 0.1; *Significant at 0.05; **Significant at 0.01; ***Significant at 0.001. Please, note that t-statistics are reported in the brackets.

¹We use a separate variable for each crop and do not report each of them due to space limitations.

We now divide the sample into those farms that stayed during the period of 2007-2012 in the sample, entered farming and exited during 2008-2011. As described in the previous section, we use log of land area increase and log of land area reduction as dependent variables. Table 3 presents the results. First, similar to the Tobit models, we find that *pai* holdings are positively and significantly associated with all the dependent variables. This suggests that nearly all the farms possess a small number of *pais* irrespective of the dynamics with their land. Then, an important finding is that the farms that increased operational land and either stayed throughout the sample or entered during the period of 2008-2011 appear to be less productive. Within the small sample (N=175) of the farms that increased their land and exited farming we do not observe a significant relationship between agricultural ability and rented land. We observe a different dynamics among the farms that decreased their land holdings. Thus, agricultural ability is insignificant among the stayers (N=1911). New more productive entrants tend to rent in less land whereas the more productive farms that exited rented in more land. The exit of the farms may be explained by competitive pressures from larger agricultural enterprises. The fact that we found opposite effects of productivity on operational land for the entrants and exiteers points in the direction of an optimal farm size for cash crops production in Ukrainian settings. In sum, the evidence suggests that the farms that manage to achieve higher productivity and tend to rent in less land are more likely to avoid bankruptcies and exiting the farming sector. Operational land expansion due to availability of easily accessible and cheap land may be an unsustainable business strategy in the long-term.

We can obtain a more precise picture of the determinants of renting decision by taking a look at some of the control variables. Interestingly, rayon-level land distribution inequality appears to play a significant role in renting in more land among the agricultural producers that exited farming sector. This may imply a competition for land among large enterprises. Second, both individual and state farms that entered agricultural sector seem to have more modest rented land increases. These entrants may be cautious about expanding their operational land or be constrained by a competition for land. In addition, we see that individual farms have been avoiding decreases in operational land irrespective whether a farm stayed, entered or exited the sample. This finding suggests that individual farms manage to some extent to compete for rented land with larger commercial farms. On the other hand, state farms seem to be enjoy an easier access to land possibly due to informal connections with local administrations as suggested by Accounting Chamber of Ukraine (2018).

Table 3. Estimations of determinants of land rental among the farms that stayed, entered and exited the sample.

Variable	Land area increased			Land area decreased		
	Stayed	Entered	Exited	Stayed	Entered	Exited
Initial area in 2007 (ha)	0.525*** (7.407)	0.62*** (10.899)	0.469*** (3.833)	0.986*** (49.368)	1.046*** (25.691)	1.105*** (39.863)
Agricultural ability	-0.823*** (-5.014)	-0.214. (-1.906)	-0.218 (-0.981)	0.02 (0.351)	-0.213* (-2.571)	0.156** (2.767)
Rayon-level institutions	-0.336 (-1.017)	-0.964** (-2.711)	-1.471 (-1.606)	-0.309* (-2.053)	0.119 (0.395)	-0.203 (-1.117)
Oblast-level institutions	-0.071 (-0.211)	-0.507 (-1.375)	-0.031 (-0.046)	-0.19 (-1.151)	0.151 (0.488)	0.01 (0.044)
Land inequality within rayon in 2007 (Gini)	0.216 (0.777)	-0.291 (-0.779)	2.17** (2.909)	0.02 (0.128)	-0.34 (-1.1)	-0.155 (-0.849)
Land inequality within oblast in 2007 (Gini)	0.377 (0.709)	1.781** (3.153)	-0.21 (-0.175)	0.852** (3.048)	0.907 (1.634)	-0.302 (-0.758)
Shares of wheat in total production (%)	-0.666* (-2.565)	-0.675* (-2.247)	-0.401 (-1.141)	-0.091 (-0.801)	-0.456* (-2.233)	0.298* (2.344)
Share of rye in total production (%)	-0.166 (-0.516)	-0.367 (-0.954)	-0.228 (-0.534)	0.253* (2.104)	-0.127 (-0.579)	0.256. (1.891)
Share of barley in total production (%)	-0.868*** (-3.51)	-0.782*** (-3.679)	0.427 (0.842)	-0.143 (-1.187)	-0.345* (-2.051)	-0.062 (-0.353)
Share of corn in total production (%)	0.007 (0.022)	0.07 (0.298)	0.12 (0.358)	-0.216. (-1.668)	-0.401** (-2.689)	0.077 (0.465)
Share of oat in total production (%)	-0.718* (-2.224)	-0.293 (-0.998)	-0.847 (-1.297)	0.138 (0.982)	0.107 (0.534)	0.273. (1.866)
Share of oilseeds in total production (%)	-0.741** (-3.164)	-0.413* (-2.16)	-0.352 (-1.209)	-0.234* (-2.404)	-0.435*** (-3.798)	0.019 (0.161)
Share of soybeans in total production	-0.459 (-1.506)	-0.24 (-1)	0.124 (0.275)	-0.326* (-2.083)	-0.72*** (-3.861)	0.17 (1.018)
Share of sugar beet in total production (%)	0.323 (0.952)	0.087 (0.186)	0.336 (0.624)	-0.482** (-2.711)	-0.315 (-0.974)	-0.242 (-0.955)
Individual farm (1 – yes, 0 – no)	0 (-0.004)	-0.378*** (-4.625)	-0.023 (-0.085)	-0.194* (-2.279)	-0.407*** (-4.743)	-0.461*** (-4.31)
State farm (1 – yes, 0 – no)	-0.228 (-1.194)	-0.562** (-2.85)	0.263 (0.377)	-0.199 (-1.53)	0 (0.002)	-0.155 (-0.842)
Intercept	4.262*** (3.873)	2.923** (3.212)	2.298 (1.29)	-0.989* (-2.352)	-1.513. (-1.94)	-1.551** (-2.653)
R ²	0.32	0.306	0.314	0.594	0.718	0.672
N	1225	833	175	1911	368	971

Note: .Significant at 0.1; *Significant at 0.05; **Significant at 0.01; ***Significant at 0.001. Please, note that t-statistics are reported in the brackets.

Source: Authors' calculations based on the SSCU data.

Discussion and conclusion

This paper has addressed an important question whether current land relations in Ukraine facilitate a flow of land towards more efficient producers increasing overall allocative efficiency. The fact that land relations in Ukraine are based almost exclusively on rented land and substantial land concentration makes it comparable to Russia and Kazakhstan. Despite the fact that land sales are prohibited by the moratorium in Ukraine, land relations are still comparable to the ex-Soviet countries because high transaction costs in Russia and Kazakhstan minimize sales transactions and almost exclusively push farms to rely on rental markets (Petrick, 2015; Petrick et al., 2011; Uzun & Lerman, 2017). Ukraine differs from these countries by an active debate about the institutional design of the land sales market when the moratorium is lifted. Institutions may determine distributional outcomes of the land reform. Before proceeding with the reforms, it is vital to understand how the current system of land relations performs and what the drivers of the current land concentration are. To achieve this, we utilize a unique panel farm-level data from Ukraine and test the link between farms' productivity and the likelihood of renting in land. In general, it appears that the Ukrainian land rental market does not facilitate a flow of land towards more agricultural producers with better agricultural abilities.

We observe the trends of substantial land concentration. Despite the fact that households still produce roughly a third of all crops and individual farms are gaining in importance, commercial farms have been steadily gaining importance in crop production. Almost a fifth of all agricultural land is cultivated by agricultural enterprises with land holdings more than 10 thousand ha. An important question is whether these enterprises strive due their scale advantage as suggested by Deininger & Byerlee (2012) or due to institutional failures that grant these farms access to cheap land.

The evidence suggests that current land relations fail in generating opportunities for more productive farmers to participate in land rental market. In particular, we find enterprises that rent in more land to be less productive. In other words, larger and less efficient farms are more likely to rent in more land or expand their rented land. These findings challenge the idea of Sadoulet et al. (2001) that rental markets may be a good option of land relations in the setting with imperfect institutions. In particular, Ukrainian land rental market appears to fail to generate flows of land towards agricultural producers with better agricultural abilities. The negative relationship between the farm size and productivity seems to be persistent among the older farms as well the new entrants. As a result, we do not find evidence that the incentives generated by higher productivity guide farms' decision-making process with respect to the renting land. What drives average farm expansion then?

Regional context appears to be an important factor affecting farms' propensity to rent in land. First, initial regional inequality in land distribution facilitates farm growth. Large farms may outcompete small enterprises in their ability to negotiate for rental contracts. As a result, relatively large agricultural producers may further exacerbate land inequality in a given rayon or oblast. Second, farms specializing on cash crops cultivation are more likely to rent in larger areas of land.

These enterprises have short-term business models oriented at cultivating annual crops with the final aim of export. Relatively cheap access to land via the rental markets generates incentives to expand operational land and not invest in land use intensification. Although yields have improved substantially in the last decade (Deininger et al., 2017), they are still far below their counterparts in the western countries with functioning land sales markets. As a result, we argue that current land relations give agricultural producers incentives that are detached from the true marginal contribution of land. Finally, state-owned farms appear to have an advantage in accessing land available for rent. Because these farms may be better in dealing with local bureaucracies and enjoy a preferential treatment in renting state-owned land (Accounting Chamber of Ukraine, 2018), more productive ones may be incentivized to grow via operational land expansion. Despite the unfavorable institutional context, individual farms appear to effectively compete for land with large agricultural enterprises. Thus, individual farms appear to strive even in relatively unfavorable situation with land access.

Our findings have general policy implications. First, current land relations may lock Ukrainian agriculture in a trap of low value added per ha. Although land rental price has increased in the recent years, it is not formed based on the market value of land as an asset. This incentivizes business models based on large cultivated areas and low value added per ha. Land sales market would introduce incentives among the agricultural producers aligned with the marginal contribution of land in the production process. This obviously calls for lifting the moratorium for land sales. Second, the institutional setting regulating land rental market needs to be improved. Ukrainian regulating authorities should ensure that all types of agricultural producers have equal access to the land rental market. In addition, in the absence of the asset-based price formation because of land sales moratorium, the authorities should align rental price closer to the value of marginal product of land.

References:

- Accounting Chamber of Ukraine. (2018). *ЗВІТ про результати аудиту ефективності використання коштів державного бюджету, спрямованих на управління у сфері використання та охорони земель сільськогосподарського призначення державної власності, та розпорядження ними*. Київ.
- Benjaminsen, T. A., Holden, S., Lund, C., & Sjaastad, E. (2009). Formalisation of land rights: Some empirical evidence from Mali, Niger and South Africa. *Land Use Policy*, 26(1), 28–35. <http://doi.org/10.1016/j.landusepol.2008.07.003>
- Besley, T. (1995). Property rights and investment incentives: Theory and evidence from Ghana. *Journal of Political Economy*, 103(5), 903–937. <http://doi.org/10.1086/262008>
- Binswanger, H., & Rosenzweig, M. R. (1986). Behavioural and material determinants of production relations in agriculture. *The Journal of Developing Studies*, 22(3), 503–539. <http://doi.org/10.1080/00220388608421994>
- de Janvry, A., Platteau, J. P., Gordillo, G., & Sadoulet, E. (2001). Access to land and policy reforms. In A. de Janvry, G. Gordillo, J. P. Platteau, & E. Sadoulet (Eds.), *Access to land, rural poverty, and public action* (pp. 1–26). New York: Oxford University Press.
- Deininger, K. (2003). *Land policies for growth and poverty reduction. A World Bank Research Report*. New York.
- Deininger, K., & Binswanger, H. (2001). The evolution of The World Bank's land policy. In & E. S. De Janvry, G. Gordillo, J.-P. Platteau (Ed.), *Access to land, rural poverty, and public action* (pp. 406–440). New York: Oxford University Press.
- Deininger, K., & Byerlee, D. (2012). The rise of large farms in land abundant countries: Do they have a future? *World Development*, 40(4), 701–714. <http://doi.org/10.1016/j.worlddev.2011.04.030>
- Deininger, K., & Feder, G. (2001). Land institutions and land markets. In *Handbook of agricultural economics* (Vol. 1, pp. 287–331). Washington DC.
- Deininger, K., & Jin, S. (2005). The potential of land rental markets in the process of economic development: Evidence from China. *Journal of Development Economics*, 78, 241–270. <http://doi.org/10.1016/j.jdeveco.2004.08.002>
- Deininger, K., Nizalov, D., & Singh, S. K. (2017). Determinants of productivity and structural change in a large commercial farm environment: Evidence from Ukraine. *The World Bank Economic Review*, (February), 1–25. <http://doi.org/10.1093/wber/lhw063>
- Eastwood, R., Lipton, M., & Newell, A. (2010). Farm size. In P. Pingali & R. E. Evenson (Eds.), *Handbook of agricultural economics* (pp. 3323–3397). Amsterdam: North-Holland.
- Feder, G., Onchan, T., Chalamwong, Y., & Hongladarom, C. (1988). *Land policies and farm productivity in Thailand*. Baltimore, MA: John Hopkins University Press.
- Kuns, B. (2017). Beyond Coping: Smallholder Intensification in Southern Ukraine. *Sociologia Ruralis*, 57(4), 481–506. <http://doi.org/10.1111/soru.12123>
- Lerman, Z., Csaki, C., & Feder, G. (2004). *Agriculture in transition: Land policies and evolving farm structures in post-Soviet countries*. Lanham, MD: Lexington Books.
- Lerman, Z., Sedik, D. J., Pugachov, N., & Goncharuk, A. (2007). *Rethinking agricultural reform*

- in Ukraine*. Halle (Saale).
- Li, G., Rozelle, S., & Brandt, L. (1998). Tenure, land rights, and farmer investment incentives in China. *Agricultural Economics*, 19, 63–71.
- Lipton, M. (2009). *Land reform in developing countries. Property rights and property wrongs*. London: Routledge.
- Mamonova, N. (2012). Challenging the Dominant Assumptions About Peasants' Responses to Land Grabbing: A Study of Diverse Political Reactions from Below on the Example of. ... *Conference on Global Land Grabbing II*, 1–20. Retrieved from <http://www.cornell-landproject.org/download/landgrab2012papers/mamonova.pdf>
- Ministry of Agriculture of Ukraine. (2016). 3+5 Strategy of prosperous country. Kyiv: Ministry of Agriculture of Ukraine.
- OECD. (2013). *Review of agricultural policies: Kazakhstan 2013*. Paris: OECD.
- Petrick, M. (2015). Competition for land and labor among individual farms and agricultural enterprises: evidence from Kazakhstan's grain region. In A. Kimhi & Z. Lerman (Eds.), *Agricultural transition in Post-Soviet Europe and Central Asia after 25 years* (Studies on, pp. 117–139). Halle (Saale): IAMO.
- Petrick, M., Wandel, J., & Karsten, K. (2011). *Farm restructuring and agricultural recovery in Kazakhstan's grain region: An update* (No. 137). Halle (Saale).
- Pugachov, V., & Pugachov, N. (2017). Agrarian reform in Ukraine. In S. G. y Paloma, S. Mary, S. Langrell, & P. Ciaian (Eds.), *The Eurasian wheat belt and food security* (pp. 67–81). Switzerland: Springer International Publishing.
- Sadoulet, E., Murgai, R., & Janvry, A. De. (2001). Access to land via land rental markets. In A. de Janvry, G. Gordillo, J. P. Platteau, & E. Sadoulet (Eds.), *Access to Land, Rural Poverty, and Public Action* (pp. 196–229). New York: Oxford University Press.
- Spoor, M. (2012). Agrarian reform and transition: What can we learn from “the east”? *Journal of Peasant Studies*, 39(1), 175–194. <http://doi.org/10.1080/03066150.2011.652949>
- SSCU. (2017). *Agriculture of Ukraine: Statistical Yearbook*. Kyiv.
- Uzun, V., & Lerman, Z. (2017). Outcomes of Agrarian Reform in Russia. In S. Paloma, S. Mary, S. Langrell, & P. Ciaian (Eds.), *The Eurasian wheat belt and food security* (pp. 81–102). Switzerland: Springer International Publishing.
- Vranken, L., & Swinnen, J. (2006). Land rental markets in transition: Theory and evidence from Hungary. *World Development*, 34(3), 481–500. <http://doi.org/10.1016/j.worlddev.2005.07.017>
- Yao, Y. (2000). The development of the land lease market in rural China. *Land Economics*, 76(2), 252–266. <http://doi.org/10.2307/3147227>

Appendix A. Estimated coefficients of the Cobb-Douglas production function and SFA.

Variables	OLS	FE	SFA
Utilized land (ha)	0.656*** (112.571)	0.724*** (80.154)	0.642*** (130.452)
Labor input (days)	0.007* (2.391)	0.028*** (4.988)	-0.001 (-0.208)
Seeds (thousand UAH)	0.099*** (20.346)	0.116*** (17.922)	0.118*** (28.634)
Fertilizers (thousand UAH)	0.112*** (41.342)	0.08*** (21.772)	0.102*** (38.936)
Oil and energy (thousand UAH)	0.13*** (26.813)	0.163*** (23.97)	0.146*** (37.298)
Services (thousand UAH)	0.055*** (29.712)	0.061*** (22.807)	0.065*** (35.069)
Machinery (thousand UAH)	0.027*** (13.873)	0.026*** (7.983)	0.027*** (12.433)
Other costs (thousand UAH)	0.056*** (22.825)	0.077*** (21.814)	0.071*** (29.925)
Constant	4.168*** (115.562)		4.157*** (108.611)
N	41812	32342	
R ²	0.887	0.518	-

Note: Significant at 0.1; *Significant at 0.05; **Significant at 0.01; ***Significant at 0.001. t-statistics are reported in the brackets. Reverse dummy variables for zero input use and linear trend are used but not reported.

Source: Authors' calculations based on the SSCU data.