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# Liberal land reform in Kazakhstan? The effect on land rental and credit markets



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## ABSTRACT

This study analyses the effect of Kazakhstan's 2003–2005 agricultural land reform on land rental and credit market participation. Although the reform declared an intention to facilitate efficient land allocation, we observe a major land concentration. We analyze whether new land relations stimulated land sales and rental markets and made credit more accessible. Utilizing data from two independent surveys before and after private land ownership was introduced, we demonstrate that the reform did not affect the land sales market but reorganized the land-rental market in a top-down fashion with the state remaining the principal landlord. The reform did not achieve the goal of providing access to land for the more skilled producers and did little to facilitate the use of owned land as collateral. The reform achievements are modest and bolder steps will be necessary to improve the functioning of Kazakhstan's agricultural land markets.

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## 1. Introduction

The literature has extensively considered agricultural land markets as mechanisms creating opportunities for land transfers from less to more productive farms (de Janvry, Platteau, Gordillo, & Sadoulet, 2001; Deininger, 2003; Deininger & Feder, 2001). Secure and meaningful property rights may improve incentives to invest in land and to maintain it better (Benjaminsen, Holden, Lund, & Sjaastad, 2009; Besley, 1995; Li, Rozelle, & Brandt, 1998). Because farmers can use land as collateral, access to credit may be improved (Binswanger & Rosenzweig, 1986; Eswaran & Kotwal, 1986). As a result, aggregate productivity improvements and rural economy diversification associated with better access to land can substantially reduce poverty rates (Sadoulet, Murgai, & Janvry, 2001). These arguments played a major role when the successor countries of the Soviet Union engaged in the restructuring of agriculture a quarter of a century ago. However, despite the efforts to reorganize state-dominated land relations, the land-rich post-Soviet countries are still struggling to organize the distribution of this important production factor. Thus, Russia, Ukraine, and Kazakhstan all legally recognized private ownership of land but high transaction costs and legal uncertainties in land purchases along

with thin land markets often make land sales complicated and unattractive (Lerman, Csaki, & Feder, 2004). As a result, land purchasing transactions among the farmers in these countries have rarely occurred (Petrick, 2015; Swinnen & Vranken, 2007).

In the light of dysfunctional land sales markets, land rental may play an important role as a land allocation mechanism. Emerging literature argues that under certain conditions, land rental markets may facilitate a flow of land to more efficient producers (Sadoulet et al., 2001; Vranken & Swinnen, 2006). This may have implications for poverty alleviation and increasing aggregate production efficiency (Sadoulet et al., 2001). However, research on land rental markets in transition and post-socialist countries is still scarce.

This study addresses this literature gap assessing the effect of liberal reforms in post-Soviet Kazakhstan on the major types of agricultural producers, including individual farms and agricultural enterprises. We explore whether land rental markets can contribute to achieving the traditional goals of land market liberalization. Can land rental markets in a post-Soviet environment provide access to land for skilled farmers and, thus, generate a flow of land towards more efficient producers? How do transaction costs of land rental affect land allocation? Have new land relations facilitated the use of land as collateral for credit access?

To answer these questions, we evaluate the effect of Kazakhstan's 2003–2005 Land Reforms on land rental and credit markets. Kazakhstan represents an interesting case where property rights were reassigned and many impediments of land exchange

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lifted. With the adoption of a new land code in 2003, Kazakhstan introduced ownership rights and relatively liberal rules for land exchange hoping to stimulate land and credit markets and, as a result, improve the efficiency of agricultural production (Petrick, Wandel, & Karsten, 2011). We, first, outline a theoretical framework examining the individual participation decisions in land rental and credit markets. Among other factors, we focus on the incentives generated by agricultural ability, transaction costs, and land ownership. To test our hypotheses empirically, we utilize two waves of cross-sectional data collected in two major agricultural provinces of Kazakhstan: Akmola and Almaty. One wave refers to the production year 2003, i.e. before the land reforms took hold, and the other to 2011, several years after the reforms. In particular, we estimate the determinants of participation in the land rental market and examine the link between farms' agricultural ability and the probability of land rental. Furthermore, we investigate the role of land among other types of collateral in access to credit.

## 2. Theoretical framework

Well-functioning land markets potentially promote agricultural development for three reasons. First, land property rights are known to be an effort-inducing mechanism for the holders of the rights. In particular, the incentives to invest in farm's production factors are closely related to ownership of the key factor – land (Benjaminsen et al., 2009; Besley, 1995; Li et al., 1998). In addition, private ownership is considered to enhance incentives for asset maintenance – e.g., natural resource conservation (Besley & Ghatak, 2001, 2009). Second, land transferability may improve agricultural production efficiency because land flows to more productive users will ensure that this resource is used more efficiently (Binswanger & Rosenzweig, 1986; Deininger & Feder, 2001). Appropriate institutions administering land exchange can facilitate these efficiency gains. And, finally, rural dwellers can use land as collateral in formal credit markets (Binswanger & Rosenzweig, 1986; Feder, Onchan, Chalamwong, & Hongladarom, 1988). However, Kazakhstan's post-Soviet context is characterized by a number of constraints that may substantially mitigate the positive effects of functioning land markets: unclearly defined property rights, land transaction costs, thin land markets, information asymmetries, and dysfunctional rural finance. Consequently, in the situations when land sales markets fail, land rental may facilitate effective land exchange.

### 2.1. Land rental markets

In general, land rental may be preferred in a context with undercapitalized farmers, thin sales markets, and high transaction costs (Lerman et al., 2004). Often farmers are simply too poor to buy land, especially if its price is drawn up by failures in other factor markets, such as for labor, credit, or insurance (Sadoulet et al., 2001). Land rental can represent a more flexible tool for producers to adjust their utilized areas to the short- and medium-term needs because transaction costs of rental markets are typically lower. Furthermore, insecurity of land ownership within the current Kazakhstani legislation may repel potential investors in favor of renting (Petrick, Wandel, & Karsten, 2011). As a result, in the context of imperfect factor markets, land rental may represent a way to lift disadvantaged small farmers out of low-income traps.

Land rental market participation is typically modeled with the marginal product of land playing a central role. In particular, a family of models examines producers' decision-making within a utility maximization framework and demonstrates that they rent in land if the marginal productivity of land is larger than land's

opportunity costs and marginal supervision costs (Deininger & Jin, 2005; Vranken & Swinnen, 2006; Yao, 2000). In other words, farmers that are more productive will tend to rent in more land. A counteracting incentive in these models is typically related to the stylized fact that supervision costs increase with large operational land holdings (Eastwood, Lipton, & Newell, 2010; Lipton, 2009; Petrick, 2017). Higher costs of supervising labor on large operational areas should discourage land rental and, as a result, we should observe land transfers from large and less productive producers to smaller farms (Zimmerman & Carter, 1999).

The post-Soviet context of Kazakhstan may be prone to transaction costs that discourage agricultural producers to rent land. For instance, USAID (2005) points out that the costs of land registration may be prohibitive for some producers. Moreover, local land commissions control land transactions and may be affected by a vested interest (Petrick & Oshakbaev, 2015). This can potentially make land rental more expensive.

### 2.2. Credit markets

Credit constraints determine farmer's access to capital and, thus, her/his ability to undertake income-generating entrepreneurial activities. Due to these constraints, gains from trade are not exploited and this leads to inferior outcomes in rural economies. Less affluent farmers that have better skills and are potentially more efficient may be completely excluded from establishing their own enterprises and may find themselves in a perpetual low-income trap. As a result, foregone opportunities contribute to misallocation of land and other production factors which negatively affects aggregate agricultural production. A large chunk of literature supports the view that credit constraints determine economic vitality of a rural economy (Eswaran & Kotwal, 1986), ability of households to overcome poverty traps (Carter & Barrett, 2006), and the degree of income inequality (Aghion & Bolton, 1997; Banerjee & Newman, 1993).

Due to the need for collateral in most traditional lending operations, farmers' asset endowments should to a large extent determine their access to credit markets. A major asset in an agricultural economy is arable land. Larger land holdings should thus improve farmers' collateral portfolios (Besley & Ghatak, 2009; Binswanger & Rosenzweig, 1986). To be useful as collateral, a borrower needs to enjoy clear property rights with respect to available assets (Besley & Ghatak, 2009; de Soto, 2000). Accordingly, land ownership rights must be clearly articulated within existing legislation with the help of instruments like land registration and titling. A key question is then whether liberal land market reforms can bring about a clearer and more reliable property rights assignment and, as a result, better access to credit. The post-Soviet context is ridden with institutional failures undermining the collateral value of land: dysfunctional bureaucracies facilitating land exchange, thin land sales markets, undercapitalization of potential land buyers and legal uncertainty with respect to property rights (Lerman, Csaki, & Feder, 2004; Swinnen & Vranken, 2007).

The supply of credit may thus be limited because farmers' collateralized assets are simply not sufficient. In particular, there may be a certain value of assets required below which potential borrowers are not qualified for a loan. Transaction costs associated with the loan administration and a potential foreclosure in case of bankruptcy may prevent lender's positive decision (Boucher, Guiringer, & Trivelli, 2009). For instance, property rights for land are inadequately specified creating high uncertainties about the rights to exercise a claim. Such conditions may lead to credit rationing when the bank denies a loan to a farmer who is willing to borrow at the market interest rate but cannot provide sufficient collateral.

### 3. Land reform in Kazakhstan

Shortly after gaining independence in 1991, land reform in Kazakhstan became a highly politicized issue with two opposing groups: one lobbying for large-scale production that was believed to be more efficient and better able to weather risks, and another promoting the Western model of family farming raising concerns about the wellbeing of the rural population and its equitable access to productive resources. The former promoted consolidation of land in the hands of agricultural enterprises (commonly by Limited Liability Partnerships (LLPs)) that emerged on the foundation of former collective farms (USAID, 2005). Petrick, Wandel, & Karsten (2013) suggest that these enterprises are frequently characterized by the availability of modern agricultural machinery and large cultivated areas (average 10, ha per farm). On the other hand, despite being a relatively new phenomenon for Kazakhstani agriculture, individual farms represent an ever-increasing chunk of agricultural land use (Fig. 1). The total cultivated area per individual farm had been steadily increasing (in the Northern grain region it reached 560 ha on average, but it is much smaller in the South). Individual farms are regulated by a law adopted before independence that stipulates a simpler registration procedure and lower taxes in comparison to agricultural enterprises (Petrick, Wandel, & Karsten, 2011). Family membership was a prerequisite for establishing individual farms. Households represent a third category of land users, covering garden plots near residential buildings as well as country houses. According to Fig. 1, land use by households has been negligible in comparison to other farm types.

The reference period in our study is marked by the “Law on Land” passed in 1995. As in Russia and Ukraine, it stipulated that members of restructured agricultural enterprises, pensioners, and workers of cultural and social spheres were eligible to receive “land shares” (LS). Holders of these shares could contribute them towards establishment of an agricultural enterprise, withdraw a plot in kind to form an individual farm, or they could sublease the shares. These shares did not refer to any specific demarcated plots and were existing only on paper. This type of ownership is well-described by Lerman et al. (2004), p. 95: “a fractional ownership in a large tract of jointly owned land, which in reality is managed and controlled by somebody else”. As a result of this early reform, by 2002, 18% of the shares were contributed as a base capital of agricultural enterprises, 29% were diverted for individual farming, 28% were leased out by shareholders without agricultural experience, and the rest either remained unclaimed or was sold to agricultural enterprises (Dudwick, Fock, & Sedik, 2007; Petrick, Wandel, & Karsten, 2011). Apart from using LS, agricultural producers could rent in land either from the state or other producers. The law distinguished permanent and temporary land rental. Temporary land rental stipulated short-term (up to 3 years) and long-term (between 3 and 99 years) agreements. The temporary rental was widely preferred because it was cheaper than acquiring the right of permanent land use ridden with policy uncertainties.

The event of our interest is the Land Code adoption in 2003 (Parliament of Kazakhstan, 2003). It came into effect later on January 1, 2005, giving producers substantial time for adjustments. This is a very significant event because the government for the first time recognized individual ownership of land. The government also made subleasing of land shares illegal, affecting 28% of land shares. All the holders of the shares were expected to either cultivate the associated plots under a new rental agreement with the government, contribute them as shares to agricultural enterprises, purchase them or return the shares back to the government if none of the previous options were chosen. As a result of the 2003–2005

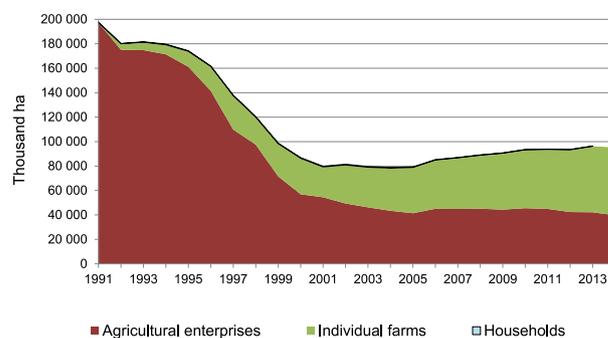


Fig. 1. Land use by farm type, Kazakhstan 1991–2014. Note: Agricultural land including arable land, pasture, hay land and other land. Source: Djanibekov & Petrick (2020), based on official statistics.

reforms, 40.5% of all agricultural land was turned into individual farms and almost 39% was contributed to the capital stock of agricultural enterprises (USAID, 2005). Large enterprises exploited the situation when they paid negligible dividends to share owners because of their advantageous bargaining position and widespread manipulations (USAID, 2005). As a result, larger farms disproportionately benefited from the 2003–2005 reforms.

Table 1 summarizes possible ways agricultural producers have been able to access land before and after the 2003–2005 reform. Even though the state was already an exclusive landlord before the reform, it started playing an even more important role because of outlawing not only the subleasing of land shares but also the plots that were rented from the state. Only private ownership (and having transferred permanent land rental contracts into private ownership) gave a right to rent out land. As a result, even though private ownership was legalized, through the new Land Code the state reaffirmed itself as a central stakeholder in land relations. Private ownership of agricultural land was growing very slowly and reached only 1.4% in 2019 (Ministry of Agriculture of Kazakhstan (2020)).

Despite the calls of international donor organizations to foster the growth of family farms, the new Land Code clearly discriminated against individual farms because they could not obtain land shares from local residents (Dudwick, Fock, & Sedik, 2007). Efficient agriculture was the government’s justification for favoring large farms (World Bank, 2007). USAID (2005), describing the government’s policy goal, used the term “merging small farms campaign”. Although land sublease was outlawed restricting small farms land accumulation, there are indications that informal land rental markets continue to provide access to land for smaller agricultural producers.

Although using land as collateral for credit access was legally allowed before and after the 2003–2005 reforms, rural and agricultural finance in Kazakhstan still appears to be rather dysfunctional. The “Law on Land” from 1995 stipulated using rental rights as collateral whereas the 2003 Land Code introduced owned land as a collateralizable asset. Despite these novelties, banks were facing comparatively higher default rates in the agricultural sector (Petrick & Oshakbaev, 2015). In an attempt to address this problem, the Kazakhstani government established the state-owned enterprise “Agrarian Credit Corporation” with the aim to provide subsidized credit (OECD, 2013). Farmers could apply for a subsidized credit by becoming members of credit associations called “Rural Credit Partnerships”. Even though interest rates offered by the partnerships were substantially lower than the market ones, only 2% of all agricultural enterprises were members as of 2012 (OECD, 2013). Lack of collateral appears to be one of the central hindrances in accessing credit (Petrick, Oshakbaev, & Wandel, 2017).

**Table 1**  
Legal ways to access land for agricultural producers.

Legal basis	Full ownership		Land shares (LS)		Permanent rental from the state		Temporary rental from the state	
	Not allowed	Allowed	Unlimited in time, renting allowed	Unlimited in time, subleasing allowed	Unlimited in time, subleasing allowed	Unlimited in time (possibility of ownership), subleasing allowed	Short-term	Long-term
Law on Land 1995	Not allowed	Allowed	Unlimited in time, renting allowed	Unlimited in time, subleasing allowed	Unlimited in time, subleasing allowed	Unlimited in time (possibility of ownership), subleasing allowed	Up to 3 years, subleasing allowed	Between 3 and 99 years, subleasing allowed
Land Code 2003	Allowed	Allowed	Unlimited in time, subleasing not allowed	Unlimited in time, subleasing not allowed	Unlimited in time (possibility of ownership), subleasing allowed	Unlimited in time (possibility of ownership), subleasing allowed	Up to 5 years, subleasing not allowed	Between 5 and 49 year, subleasing not allowed

Source: Parliament of Kazakhstan (2003) and President of Kazakhstan (1995).

#### 4. Econometric strategy

In the following analysis, we examine whether the new Kazakhstani legislation stimulated effective land exchange and, as a result, affected access to credit. We know that liberal land reforms have not changed the farming structure dramatically and favored large corporate farming in Russia (Shagayda & Lerman, 2017) and Ukraine (Keyzer et al., 2017). Was the situation in Kazakhstan different? Can Kazakhstan's individual farms compete with corporate farms for land despite obvious legal discrimination? Observing the land market before and after the reform, we can draw conclusions about the efficiency and equity implications of liberal reforms in transition contexts.

##### 4.1. Data

Because of the scarcity of reliable data on Kazakhstan's land relations, the strategy of our empirical analysis is driven to a large extent by data availability. Accordingly, we first present the data and then proceed with the methodological approach which should improve understanding of the methodological choices.

We utilize unique data from two rounds of surveys conducted in 2003 by the World Bank and in 2012 by the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) based in Halle, Germany. The data was collected in two regions where agriculture plays an important role: Akmola and Almaty. Akmola is situated in the North and focuses predominantly on grain production. Agricultural production in Almaty region is more mixed with livestock playing a substantial role. Selecting these regions, we also control for climatic and structural differences within the country. Respondents were households and farms of different sizes and legal forms.

Both survey waves followed the same sampling procedures (Petrick & Oshakbaev, 2015). Three types of main respondents were identified: households, individual farms, and agricultural enterprises. Because the 2012 survey asked agricultural enterprises whether they belonged to a parent organization, we could identify an additional producer type: agriholdings, i.e. vertically integrated farms with large operating areas and several subsidiary production units. In 2003, respondents were sampled randomly within pre-selected counties (one close and one far from the regional center). The 2012 survey targeted principally those villages that had already been surveyed in 2003 and proceeded using the same sampling technique. The survey of 2012 could not identify the farms that were surveyed in 2003 due to anonymity considerations. During both rounds, enumerators selected households using snowball sampling and the rest of the respondents were selected randomly based on the local company registries. Dudwick, Fock, & Sedik, 2007 documented the results of the 2003 survey. The sample in 2012 is substantially larger for all producer types except for households. It is also important to mention that the follow up survey's responses refer to the cropping year 2011. The data represents two independent cross-sections separated by an eight-year gap, covering nearly identical survey questions. Because adoption of the new Land Code was the only significant event in Kazakhstan's land relations during this decade, we argue that before-after analysis could identify the impact of the reforms that took several years to unroll.

The survey instruments covered various aspects of agricultural production and related information. In particular, the questionnaire dealt with land ownership, production and marketing of the produce, access to factor markets, and operational financial information. Respondents were confronted with a number of retrospective (year preceding each survey wave) questions about their

land and credit markets activities. Apart from this, it was also possible to obtain the individual characteristics of the producers.

Table 2 provides an overview of the data. We see very large differences in owned land holdings across the farm types as well as in the sizes of utilized areas. Households do not cultivate the land held in the form of land shares and use either owned land or rent in some part of their land holding. Interestingly, households' land holdings along with the shares had slightly decreased, while the other farm types grew in their land possessions. We consider this as a first indicator of increasing land concentration by the farms and enterprises that obtained de-facto land use rights from the households in the form of land shares.

#### 4.2. Methods

We use a range of econometric techniques to trace the trends in land rental and credit markets over a decade. First, we examine the descriptive statistics and analyze the changes in land rental market participation, credit uptake, and problems with the collateral using kernel-weighted polynomial regressions for all farm types (Fan & Gijbels, 1996). Second, following the theoretical framework outlined in Section 2, we explain commercial producers' participation in Kazakhstan's land rental and credit markets. We exclude households and focus on individual farms and agricultural enterprises because the former appears to cultivate predominantly owned land and their participation in rental markets is small. In particular, we want to see whether land rental markets can stimulate a flow of land towards more skilled agricultural producers and whether the 2003–2005 land reforms contributed to this flow. We also examine the link between land ownership introduced by the land reforms and the probability of access to credit. This will help our understanding whether financial institutions perceived owned land as collateral. The following general model pursues these goals:

$$Participate_i = \beta_0 + \beta_1 Reform_i + \beta_2 S_i + \beta_3 TC_i + \beta_4 T_i + \beta_5 X_i + \varepsilon_i$$

where  $Participate_i$  represents a vector of dependent variables reflecting farm's participation in the land rental or credit market;  $Reform_i$  is a dummy reflecting whether an observation is before (2003) or after (2011) the reforms. Importantly,  $S_i$  is a vector of proxies for farm's agricultural ability which we expect to be positively associated with land rental should our hypothesis find support. Furthermore,  $TC_i$  represents transaction costs of accessing land (used only for the specifications estimating rental market participation) and should hinder rental activity.  $T_i$  is a vector of variables for farms' non-rented land holdings (owned and in the form of shares). Following our theoretical framework, we expect  $T_i$  to be positively related to credit access outcomes and it should discourage land rental in our land rental specifications. Finally,  $X_i$  represents other farm's characteristics; and  $\varepsilon_i$  is an independent and normally distributed error term.

Table 3 provides an overview of the variables we utilize for the estimations. We use two dependent variables for participation in the land rental market: first, a simple dummy reflecting whether a farm was renting in land and second, the actual area rented in. Access to credit we proxy with the probability of investing using loans and with perceived problems with collateral. Both indicators are based on qualitative questions included in the survey questionnaire. We expect rental market participation to negatively depend on owned land and land share holdings. On the other hand, land holdings should positively affect access to credit outcomes should creditors perceive land as viable collateral.

A key explanatory variable in our analysis is the producers' agricultural ability that should be positively related to the land rental market participation. To obtain this variable, we follow Deiningger

and Jin (2005) and estimate a Cobb-Douglas production function and, then, subtract unobserved village-level fixed effects (soil quality, infrastructure, location, etc.) from the residuals. Land, labor, and material inputs appear to be highly significant predictors of the output and the high  $R^2$  (69.2%) of the simple OLS estimation points in the direction of a good fit. Land and labor appear to be the most important input factors with elasticities of 33% and 39% respectively. Material inputs account for ca. 18% of marginal output increase. Alternatively, we estimate the same production function using Stochastic frontier analysis (SFA) and obtain enterprises' technical efficiency. In addition to estimated agricultural ability, we include the education level of the individual farm's manager and a dummy for special education in agriculture. Appendix A reports the estimation results.

In the models with land rental and credit markets participation as dependent variables, we control for farm's non-land assets, the importance of livestock on the farm, and region dummies distinguishing between Akmola and Almaty regions. To proxy for the transaction costs in land rental, we construct a dummy reflecting whether a respondent perceived legal or monetary costs of the land rental to be a problem in land access.

We estimate the above regression model using two independent pooled cross sections from 2003 and 2011. It is important to note that we cannot use a difference-in-difference technique because we do not have control groups due to the setup of the reform. Because all the farms were subject to the same land reform, we essentially employ a "difference" technique using a reform dummy and interaction terms. For the regressions with binary dependent variables, we use Probit models whereas for the areas rented in we use left-censored Tobit models. Instead of reporting coefficients, we calculate and display the marginal effects because the latter is easier to interpret in the regressions with interaction terms (Norton, Wang, & Ai, 2004). Because simple coefficients of the interaction terms are not informative in nonlinear models (Cameron & Trivedi, 2010), we calculate the difference in marginal effects before and after the reforms following the logic of Williams (2012). Doing so, we observe changes in the effects of these variables over the period covered by the survey data.

It is important to note that our methodological approach may face potential endogeneity challenges. While we consider the reform dummy as strictly exogenous, our agricultural ability proxies are more likely to suffer from endogeneity. The problem is that larger farms may be likelier to attract more educated managers that have special education in agriculture. However, endogeneity is unlikely for our key independent variable – agricultural ability based on total factor productivity. Since we exclude the smallest producers (household farms), there are no clear reasons to believe that rental activity will affect the total factor productivity or technical efficiency.<sup>1</sup> On the other hand, perceived transaction costs of land rental are at higher risk of endogeneity because more rented land may increase the likelihood of facing transaction costs. To address these concerns, we utilize a two-stage estimation approach with instrumental variables (IVs). As IVs, we use a dummy whether a farm cooperates with others and perceived difficulty of obtaining advisory services (on a one to five scale). These variables should influence the outcomes only via the perceived transaction costs (cooperation and better advisory services should reduce transaction costs), thus satisfying the exclusion restriction. We do not find any signs of weak instruments because the first-stage F-statistics in all the cases are well above the level of 10 recommended by Stock & Yogo, 2005 and the overidentification test cannot reject the hypothesis that our instruments are valid. However, although not likely, we

<sup>1</sup> With endogeneity being difficult to completely rule out, correlations between land rental and agricultural ability will still give us a clue about allocative efficiency implications and thus allow our hypothesis testing.

**Table 2**  
Descriptive statistics by farm types and years.

	Households		Individual farms		Agricultural enterprises		Agriholdings	
	2003	2011	2003	2011	2003	2011	2003	2011
Land used (ha)	0.3 (1.7)	0.5 (5.1)	263.6* (359.9)	741.2* (2323.3)	7698.5 (11891.6)	15985.5 (14142.0)	-	25388.3 (10673.0)
Land owned (ha)	0.2 (1.1)	0.1 (0.3)	1.1 (5.7)	38.7 (264.0)	142.9 (534.5)	883.6 (3445.2)	-	0 (0)
Land shares (ha)	21.8*** (30.3)	15.3*** (29.9)	241.4 (347.0)	342.0 (2058.7)	7341.5 (11877.0)	6021.0 (10568.3)	-	21024.0 (18222.8)
Education of farm manager (1 to 8 scale) <sup>a</sup>	4.8* (1.8)	5.0* (1.6)	6.4 (1.4)	6.2 (1.5)	7.2 (1.4)	7.5 (0.9)	-	6.8 (1.6)
Agricultural revenue (Million 2011 KZT)	0.014 (0.101)	0.015 (0.023)	11.5 (4.5)	7.3 (29.1)	107.9 (234.5)	115.3 (242.8)	-	277.476 (296.012)
Labor input (FTE)	1.8*** (1.3)	3.3*** (2.7)	11.5 (4.5)	7.3 (29.1)	162.4 (240.7)	60.5 (119.4)	0	95.9 (73.0)
Number of observations	300	300	86	245	14	55	0	8

Notes: Standard deviations are given in brackets. Significance of the differences between 2003 and 2011 using the t-test for two independent samples: \*Significant at 0.1; \*\*Significant at 0.05; \*\*\*Significant at 0.01. The categories of agricultural producers are defined along the line of Petrick and Oshakbaev (2015). FTE = Full time equivalent. <sup>a</sup>Education index contains the following values: 1 – none; 2 – primary school; 3 – incomplete secondary; 4 – secondary general; 5 – secondary professional; 6 – secondary special; 7 – incomplete special; 8 – higher.

Source: Authors' calculations based on World Bank and IAMO surveys.

cannot rule out the possibility that the instruments are endogenous as well. With these challenges in mind, we present the models and run additional robustness checks.

## 5. Results

Before examining participation in land rental and credit markets in detail, let us demonstrate the general trends in Kazakhstan's land relations. The period of the 2003–2005 land reforms seems to be correlated with the establishment of all types of commercial farms. The reforms appear to have stirred a fresh enthusiasm in farming from the side of agricultural producers. Thus, out of all the enterprises in our sample, 30.91% of agricultural enterprises and 36.73% of individual farms were established or restructured between 2002 and 2005. Interestingly, up to 2011, 75.5% of the individual farms and 89.1% of agricultural enterprises did not go through restructuring after they were established. This may partially reflect the ultimatum that the government set to the land share holders as some of them have converted their shares into rented land establishing individual farms and some established new LLPs pooling everyone's shares together.

Land reforms appear to have a limited effect on the land ownership structure. Fig. 2 presents the dynamics of land ownership among different producer types. Nearly all the land that households owned was in the form of land shares, which they contributed as base capital to agricultural enterprises before and after the reforms. After the implementation of the Land Code in 2005, newly established individual farms turned their land shares into rental contracts with the state because the only way share holders could hold on to their shares was to contribute them towards the capital of agricultural enterprises. We observe a small share of privately owned land among individual farmers and agricultural enterprises after the reform, but it was still playing a minor role in their land portfolios.

### 5.1. Land rental market

Land rental activity intensified over the decade substantially and land ownership stayed negligible. The number of both, individual farms and agricultural enterprises that rent in the whole operational land increased drastically over the decade, starting virtually from zero. Although, according to Fig. 3, non-household producers heavily relied on land shares before and after the reforms, they increased the shares of rented land dramatically after the reforms. Interestingly, only 22% of the rental agreements were short-term (under 5 years) with the vast majority of 49-year rentals. Although land ownership went up slightly, it was still negligible and the majority of farms expanded their land holdings by renting land from the state (mostly from rural municipalities) in addition to the land shares contributed as base capital. Communal or other possibly unclear sources of land rental disappeared over time. This could be an indication of higher transparency in land relations after the reforms. We also see that cultivation of owned land increased but only 1.4% of all agricultural land was owned privately as of 2019 (Ministry of Agriculture of Kazakhstan (2020)). Although sub-renting was outlawed in 2005, we still observe a small share of respondents from each type reporting renting in land from non-state sources. This may be an indication of informal rental relations.

Fig. 4 demonstrates local polynomial smoothers of land used regressed on land owned for all agricultural producers including households (Cleveland, 1979). The logic of this figure draws on Boucher, Barham, and Carter (2005): the lines above the 45-degree line represent the farms that rent in land and below the ones that rent out. Distance from the 45-degree line represents

**Table 3**  
Descriptive statistics of the variables used in the estimations (individual farms and agricultural enterprises).

Variable	2003				2011			
	Med.	Mean	Min	Max	Med.	Mean	Min	Max
<i>Dependent variables</i>								
Farm rents in land (1 = yes, 0 = no)	0	0.09	0	1	0	0.34	0	1
Land rented in (ha)	0	34.06	0	2000	0	1857.58	0	80,000
Investments using loans (1 = yes, 0 = no)	0	0.06	0	1	0	0.13	0	1
Problems with collateral (1 = yes, 0 = no)	1	0.51	0	1	0	0.48	0	1
<i>Independent variables</i>								
Agricultural ability	-0.01	0	-1.83	1.96	0	0	-3.68	2.85
Agricultural ability (technical efficiency)	0.54	0.52	0.17	0.81	0.54	0.52	0.03	0.86
Age of farm manager (years)	45	45.16	26	65	50	49.47	22	77
Farm manager's education (1 to 8 scale)	6	6.5	3	8	6	6.45	3	8
Land area owned (ha)	0	21.54	0	2000	0	170.04	0	20,933
Land shares (ha)	165	1266.11	1	41,105	20	1783.25	0	48,000
Livestock index (EuroStat's livestock unit)	8.65	75.31	0	2204.8	0	109.98	0	4520
Non-land assets (bln. KZT)	0.3	356.12	0	4000	8.0	691.32	0	1628.60
Farm manager has special education in agriculture (1 = yes, 0 = no)	1	0.68	0	1	1	0.64	0	1
Farm's age (number of years since last reorganization)	13	13.51	9	21	10	10.60	0	22
Perceived transaction costs of land rental (1 = yes, 0 = no)	0	0.25	0	1	0	0.13	0	1
Individual farm (1 = yes, 0 = no)	0	0.22	0	1	0	0.41	0	1
Joint activity with other farms (1 = yes, 0 = no)	0	0.16	0	1	0	0.36	0	1
Difficulty of obtaining advisory services (1 to 5 scale)	3	2.8	1	5	4	3.60	1	5

Note: N = 100 in 2003 and N = 308 in 2011. Households are excluded from this table and estimations. Because of missing observations among some of our core variables, the sample in our estimations is smaller than the total sample presented here.

the extent of farms' renting activity. We see that households with owned land below one ha were more likely to rent out their land in 2011. The smoothers predict that the farms with land holdings between one and 10 ha (as we move along the x-axis) rented in more land after the reforms. These were typically newly established individual farms that tried to expand cultivated areas via land rental. Farms with owned land and land shares of at least ca. 300 ha appear to be likely to rent in land after the reforms. The curve for 2011 is longer because the average farm size grew substantially over a decade.

Estimation results of the participation in land rental markets are reported in Table 4. First, we do not find significant increases in rental activity after the reforms because our reform dummy is insignificant in most of the specifications. The exception is the Probit specification with the interaction terms where we find a negative and significant effect. The signs of the rest of the reform dummies are negative although they fail in gaining significance. This means that the reforms appear to have failed in stimulating more rental activity. A second important finding is that agricultural ability appears to exert a uniformly negative significant effect across the specifications. This means that farms with lower agricultural ability were more likely to rent in land. Importantly, the difference in marginal effects of ability before and after the reform is not significantly different from zero across all specifications, suggesting that the probability of renting in land by more able farmers did not change after the reforms. Thus, the evidence does not support our main hypothesis about land rental markets facilitating a flow of land towards more productive farms. On the contrary, we find farms with higher agricultural ability to rent in less land, which generates an unfavorable flow of land. However, we do find evidence that land was flowing to the farms with more educated managers. For example, a one-step increase in the level of education is associated with more than double the area of land rented.<sup>2</sup> This would typically represent a step on the scale from a secondary towards higher education.

We may get a more complete picture by examining our control variables. We find that availability of land contributed as shares discourages further land rental whereas it was not the case for owned land probably because of negligible amounts of owned land. However, we see that the difference in marginal effects of owned land before and after the reform is negative and significant suggesting that owned land started playing a more important role in renting decisions after the 2003–2005 reforms. Furthermore, the negative coefficient of the individual farm dummy is large and significant suggesting that individual farms were less likely to rent in land compared to agricultural enterprises. Interestingly, more livestock appears to be a significant predictor of land rental probably because farms involved in livestock production may require more land for pastures. For example, from models (4) and (8), an increase in the livestock herd by ten livestock units increased the likelihood of renting in land by two percentage points, and the area rented in by five percent. Finally, non-land assets appear to exert a small negative effect on the probability of renting land. This suggests that farms with more intensive agricultural production (involving machinery) are less likely to rent in land.

We ensure robustness of our estimations in a number of ways. First, we check whether the results are driven by agricultural enterprises. Since they represent some of the largest enterprises in the world, their large rented land areas may distort our results. To exclude this possibility, we run the same regressions on a subsample of individual farms only. Second, we drop potentially endogenous perceived transaction costs of land rental and re-

estimate our models using only strictly exogenous regressors.<sup>3</sup> Finally, we recalculated the models using mixed Probit and Tobit models to account for a three-level clustered structure of our data (farm type and rayon level). This estimation technique allows accounting for both fixed and random effects exploiting intra-cluster correlation. All these estimations look very similar to the ones presented in Table 4 preserving all the significant relationships of our interest.<sup>4</sup>

## 5.2. Credit market

We start with tracing the dynamics of the credit rationing reported by individual farms and agricultural enterprises. Access to credit may be crucial for the latter to commercialize their farming and to transform into individual farms. Fig. 5 presents survey responses inspired by the framework developed by Boucher, Guirking, & Trivelli, 2009; Petrick, Oshakbaev, & Wandel, 2017. The framework stipulated four major classes of credit rationing: 1) price rationing due to a high interest rate; 2) quantity rationing due to collateral or cash flows constraints; 3) risk rationing due to an excessive risk of returns; 4) transaction cost rationing due to the costs of bureaucratic procedures associated with issuing a credit. Farms were categorized according to a direct elicitation of their constraints via survey questions. First, the number of individual farms and agricultural enterprises that reported no problems in access to credit increased substantially over the decade. Interestingly, we see that the amount of quantity-rationed individual farms had almost doubled whereas agricultural enterprises report a small reduction of these types of obstacles. The larger production scale of agricultural enterprises may be associated with the availability of liquid and collateralizable assets and, as a result, banks may be more likely to give them credit.<sup>5</sup> Price rationing lost its importance for both types of agricultural producers but more so for the agricultural enterprises. Credit programs designed by KazAgro appear to have contributed to the reductions in price rationing. However, transaction costs and risk rationing appear to be another important barrier for both agricultural producers.

As was discussed in Section 2, one of the goals of liberal land reforms is to promote owned (and utilized) land as collateral to facilitate access to credit. We start examining this link by, first, presenting local polynomial smoothers of the probability of collateral problems versus land owned and land utilized. The dummy variable "collateral problem" assumes the value of one if the survey respondent asserted that he/she "cannot provide collateral" as a difficulty in obtaining loans. Fig. 6 suggests that there were very little significant changes over the decade for all sizes of agricultural producers. The only exception was household farms with very small owned and operational areas (below two ha): the probability of having problems with collateral significantly decreased after the reforms. The confidence intervals overlap substantially for farms larger than one ha. For used land, we observe more perceived problems with collateral for the farms with utilized land between one and 20 ha whereas for larger farms with 100–1000 ha the post-reform line appears to be below the 2003 line suggesting that larger farms were facing fewer problems with collateral for credit access.

To investigate the role of owned and utilized land in access to credit, we further run Probit regressions with control variables

<sup>3</sup> We also re-estimate the models by dropping the variable "special education in agriculture" with many missing observations which substantially reduced the sample used in the estimations.

<sup>4</sup> Respective tables are not reported due to space limitations and are available upon request.

<sup>5</sup> In hindsight, enterprises may have received too much credit, leading both banks and agriholdings into a solvency crisis in the aftermath of the 2008 global financial crisis (Petrick et al., 2018).

<sup>2</sup> Models (5) to (8) have a semi-log specification. A marginal effect of around 1.0 (such as for education index) implies a change in the dependent variable of about 100% from a one unit increase in the independent variable.

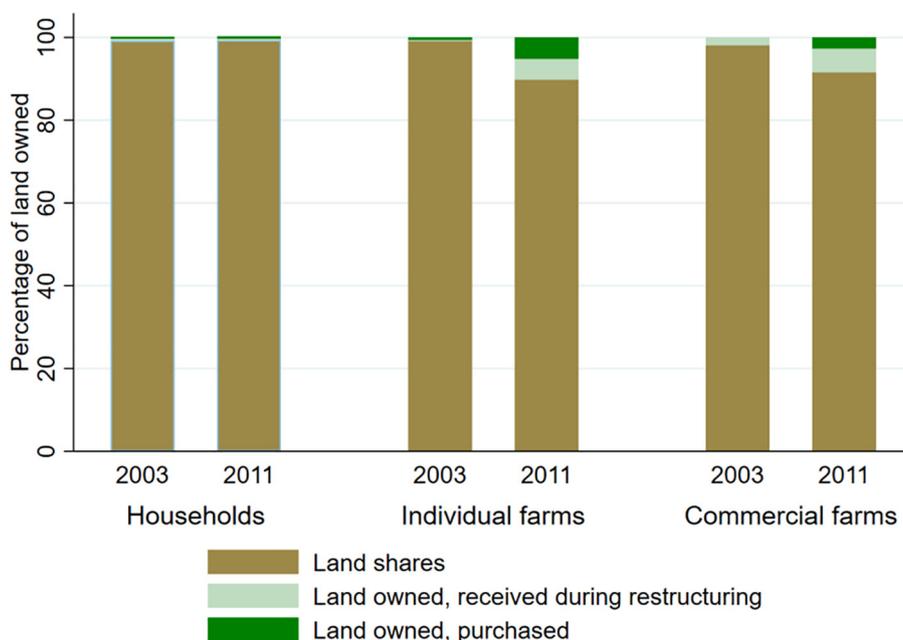


Fig. 2. Land ownership dynamics by farm type. Note: For individual farms in 2011 the brown bar indicates land shares that were transformed into rental contracts. Source: World Bank & IAMO surveys.

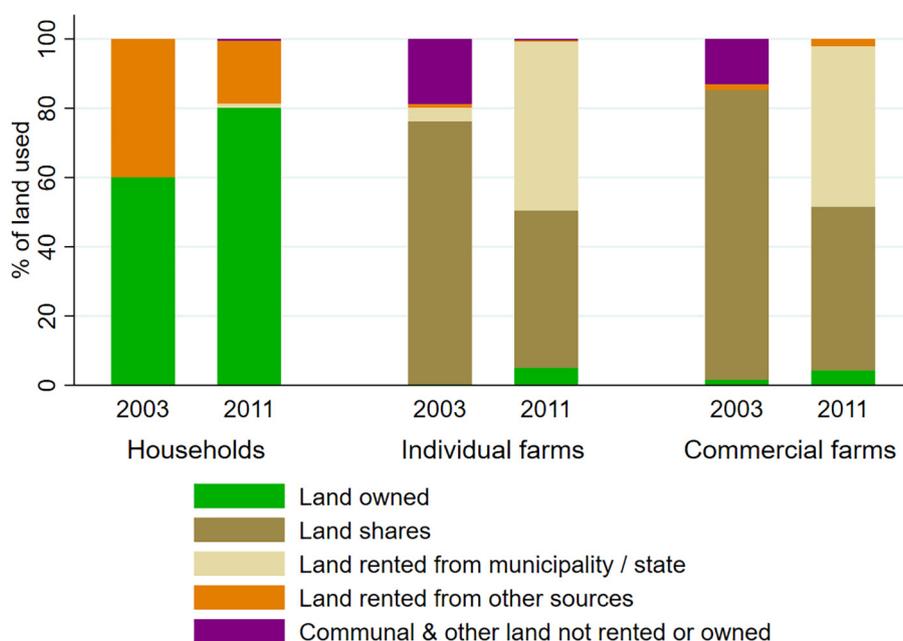


Fig. 3. Land use dynamics by farm type. Source: Authors based on World Bank and IAMO Surveys.

(Table 5). In addition to the reported problems with collateral, we use a dummy indicating that farmers undertook investments using borrowed capital as a dependent variable to proxy for the farm's success in obtaining credit. An immediate observation is that the reform dummy is insignificant in most of the specifications. One exception is the model (2) suggesting that farmers were 14% more likely to believe to face problems with collateral after the reforms. The second observation is that owned land appears to exert a positive significant effect on the probability of investments using loans. However, we do not find a significant difference in the marginal effects before and after the reform, suggesting that owned

land did not play a greater role for the probability of investments with loans after the reform. Land shares were not statistically associated with our dependent variables. Even though Kazakhstan's legislation stipulates the possibility of using land shares as collateral, there is no legal infrastructure for effective foreclosure procedures. As a result, actual credit access outcomes show that owned land mattered for investments using loans but not more so after the reforms. Moreover, we see that other assets mattered too. Livestock appears to be a well-collateralizable asset as the coefficient of the respective index exerts a negative effect on perceived problems with collateral and a positive effect on the probability of mak-

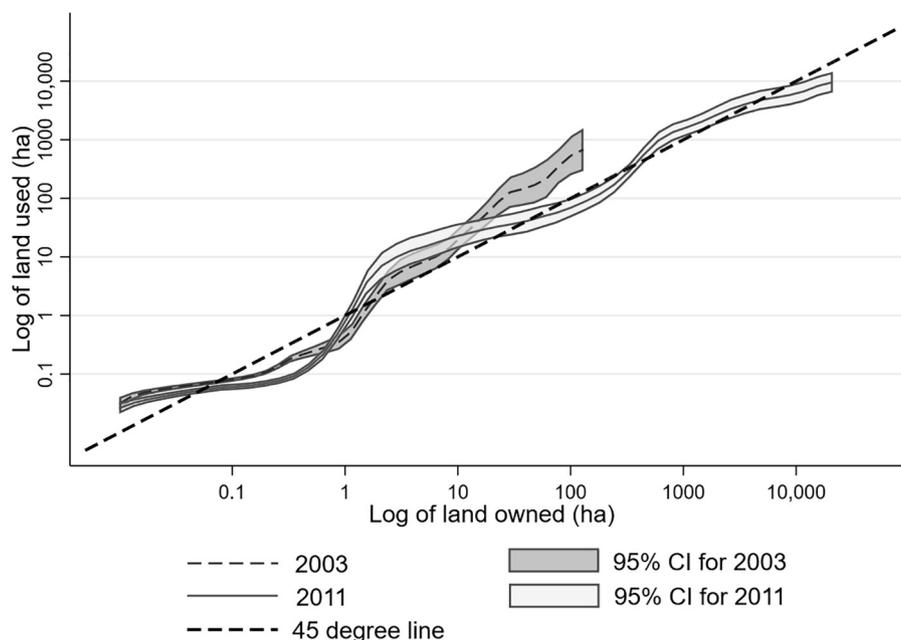


Fig. 4. Local polynomial smoothers of land used on land owned for all farm types. Source: Authors' elaboration based on World Bank and IAMO Surveys.

ing investments using loans. Finally, we find other non-land assets to play a role in the probability of making investments using loans. As a result, it appears that Kazakhstan's credit institutions cared about both land and non-land assets in their solvency evaluation but the reforms did not improve collateralizability of owned land.

Although agricultural ability was not a predictor of any of our outcome variables, newly reorganized farms with younger managers were more likely to invest using loans. Most of the reorganizations or establishments took place right around the time of the reforms and may have marked a move from state-supported descendants of collective farms to more market-oriented enterprises. Younger managers may have better access to information about credit application procedures due to better awareness of IT- and other communication technologies.

Similarly to the previous section, we check robustness of our results. First, re-estimating regressions on a sub-sample of individual farms generates very similar results. However, owned land as potential collateral is not a significant predictor of making loan-based investments anymore. Livestock and non-land assets appear to be better predictors of the outcome variable. As a result, this is another indication that the reforms were tailored for larger farms. Second, re-estimating the models using mixed Probit, the coefficients and p-values remain very similar to the estimations in Table 5.

## 6. Conclusions

This paper has analyzed the effects of Kazakhstan's liberal land reform on land and capital allocation. Similar to Ukraine and Russia, Kazakhstan's land market relations have been predominantly based on land rental despite some first steps towards land market liberalization. Although land ownership is recognized in Russia and has only recently been legislated in Ukraine, these countries demonstrate rather similar outcomes in terms of land concentration via land rental. We attempt to understand whether Kazakhstan has created its own path in land relations and its liberal land reforms have facilitated an efficient allocation of land and capital. Utilizing a unique dataset combining pre- and post-reform surveys, we examined the dynamics within land rental

and credit markets. This study is one of the first attempts in the post-Soviet countries to assess whether land rental markets helped achieving the stylized goals of liberal land reforms: more efficient land allocation, lowering transaction costs of land exchange, and better collateralizability of land as an asset. In general, it appears that Kazakhstan's 2003–2005 Land Code had a very limited effect on these goals skewing land distribution towards larger agricultural producers.

Although we observe land rental market activation over a decade, land exchange did not become easier. The new Land Code made the state the largest landlord because it incentivized land share owners to transfer a large number of their shares into rental agreements with the state as lessor. Since no land redistribution took place and the vast majority of land was owned by the state, land rental was by far the only economically viable way of accessing farming land. Outlawing the subleasing of shares and rented land reduced the number of potential lessors and reduced the competition on the land market.

The reforms appear to have had a very limited effect on the efficiency of land allocation among the producers. Contrary to our theoretical expectations informed by the liberal goals, we find that farms with the poorer agricultural ability and organized as corporate farms or enterprises were more likely to rent in land. In other words, larger and less efficient farms were more likely to rent in land which obviously undermines the goals of liberal land reforms—competitive and efficient land allocation among all types of agricultural producers. Moreover, the 2003–2005 land reforms appear to have failed to facilitate that relationship. This situation is likely to be a result of the policies applied to the share owners who were forced either to rent/purchase their plots or to contribute as a base capital of agricultural enterprises. These obviously discriminatory provisions of the 2003–2005 Land Code have led to inefficient land distribution and, as a result, to excessive land concentration.

The effect on credit markets, however, appears to be slightly more consistent with the liberal goals. We find that a lack of suitable collateral remained the major obstacle for a large share of agricultural producers. Owned land played a role in the probability of making investments using loans but the effect was not facilitated by the 2003–2005 reforms. Land appears to exert an effect similar to livestock that can also be used as collateral in the Kazakhstani context.

**Table 4**  
Estimations of the probability of renting in and of the area rented in for individual farms and agricultural enterprises.

	Probit		Probit with IVs		Tobit		Tobit with IVs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reform dummy (2003 = 0; 2011 = 1)	-0.066 (0.214)	-0.114*** (0.009)	-0.543 (0.126)	-0.664 (0.201)	-1.012 (0.564)	-1.670 (0.466)	-1.001 (0.568)	-0.893 (0.710)
Agricultural ability	-0.042** (0.049)	-0.043** (0.047)	-0.257* (0.071)	-0.281* (0.069)	-1.393** (0.023)	-1.612** (0.013)	-1.364** (0.027)	-1.567** (0.016)
Education index (1 to 8 scale)	0.022 (0.143)	0.024 (0.111)	0.142 (0.153)	0.162 (0.141)	0.944** (0.037)	1.052** (0.041)	1.007** (0.028)	1.088** (0.032)
Special education in agriculture (1 = yes, 0 = no)	-0.070* (0.074)	-0.073** (0.048)	-0.373* (0.093)	-0.449** (0.047)	-2.452** (0.015)	-2.418** (0.013)	-2.480** (0.013)	-2.626*** (0.008)
Log of land area owned (ha)	-0.001 (0.881)	0.001 (0.807)	-0.015 (0.749)	0.012 (0.814)	0.117 (0.556)	0.281* (0.098)	0.050 (0.816)	0.166 (0.392)
Log of area under land shares (ha)	-0.044*** (<0.001)	-0.047*** (<0.001)	-0.296*** (<0.001)	-0.321*** (<0.001)	-1.255*** (<0.001)	-1.364*** (<0.001)	-1.275*** (<0.001)	-1.341*** (<0.001)
Individual farm (1 = yes, 0 = no)	-0.321*** (<0.001)	-0.287** (<0.001)	-1.621** (<0.001)	-1.588** (<0.001)	-7.334** (<0.001)	-6.569** (<0.001)	-7.868** (<0.001)	-7.397** (<0.001)
Age of farm operator (years)	0.000 (0.816)	0.002 (0.253)	0.003 (0.841)	0.014 (0.274)	0.002 (0.978)	0.046 (0.464)	->0.001 (0.997)	0.040 (0.530)
Perceived transaction costs of land rental (1 = yes, 0 = no)	-0.105* (0.084)	-0.120* (0.054)	-1.107 (0.260)	-1.195 (0.291)	-3.696 (0.102)	-3.943* (0.068)	-1.385 (0.773)	0.307 (0.954)
Farm's age (years since last reorganization)	-0.007 (0.121)	-0.008* (0.056)	-0.056* (0.066)	-0.066** (0.044)	-0.100 (0.330)	-0.130 (0.191)	-0.065 (0.548)	-0.069 (0.531)
Non-land assets (bln. KZT)	>-0.001** (0.015)	>-0.001** (0.010)	>-0.001** (0.012)	>-0.001*** (0.006)	>-0.001* (0.056)	>-0.001* (0.064)	>-0.001* (0.052)	>-0.001* (0.065)
Livestock index (EuroStat's livestock unit)	<0.001*** (0.001)	<0.001*** (<0.000)	0.002*** (0.007)	0.002*** (<0.001)	0.005*** (<0.001)	0.005*** (<0.001)	0.005*** (<0.001)	0.005*** (<0.001)
<i>Differences in marginal effects before and after the reforms</i>								
Education index		-0.008 (0.831)		-0.042 (0.898)		-0.732 (0.678)		-0.885 (0.600)
Agricultural ability		0.051 (0.276)		0.348 (0.381)		2.665 (0.184)		2.609 (0.166)
Log of land area owned		-0.541*** (<0.001)		-0.452*** (0.002)		-1.922*** (<0.001)		-1.864*** (<0.001)
Log of area under land shares		0.011 (0.521)		0.048 (0.782)		0.712 (0.426)		0.349 (0.696)
Model contains interaction of education, agricultural ability, land area owned, land share area with reform	No	Yes	No	Yes	No	Yes	No	Yes
Observations	284	284	283	283	284	284	283	283
Wald test for exogeneity	-	-	0.710	0.7786	-	-	0.539	0.335
First-stage F statistic	-	-	15.469	13.616	-	-	15.469	13.616
Overidentification test	-	-	0.541	0.783	-	-	0.228	0.391
Pseudo-R2	0.534	0.572	-	-	0.245	0.262	-	-

Note: \*Significant at 0.1; \*\*Significant at 0.05; \*\*\*Significant at 0.01. p-values are reported in the brackets. Cells report marginal effects and p-values were calculated using the delta-method. Rayon-level control dummies included but not reported due to space limitations. IVs are the dummy for cooperation with other farms and perceived difficulty of obtaining advisory services.

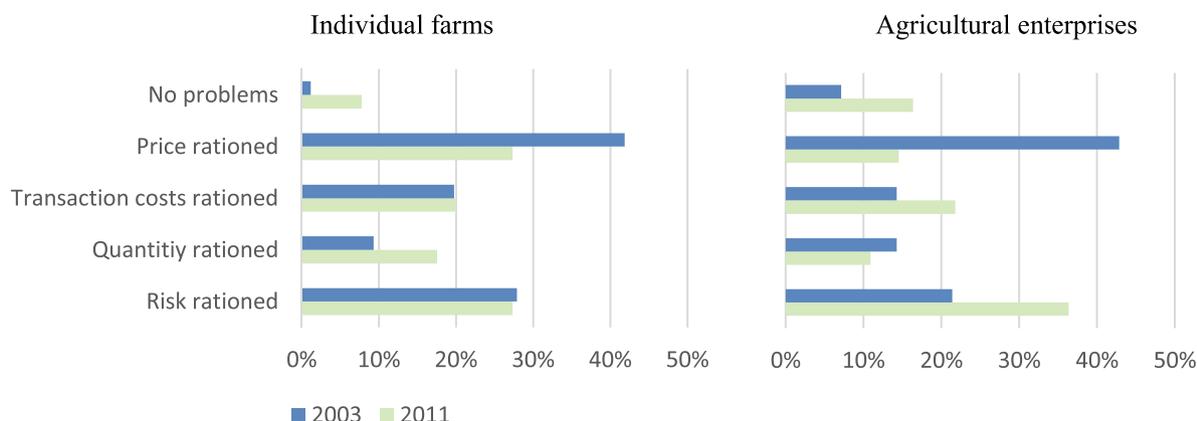


Fig. 5. Dynamics of reported credit rationing over a decade for individual farms and agricultural enterprises. Note: The respondents were asked to identify “the difficulties in obtaining a loan for an investment in agriculture” and were given multiple answer options. Source: Author’s elaboration based on World Bank and IAMO Surveys.

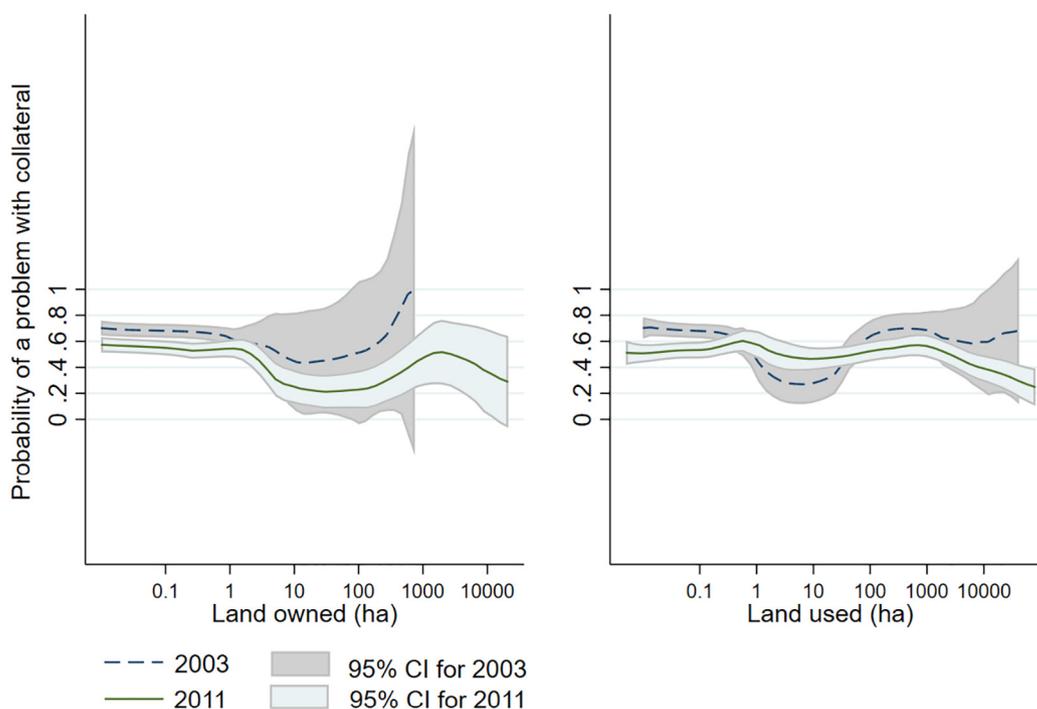


Fig. 6. Probability of facing a collateral constraint for all farm types. Note: N = 400 in 2003 and N = 600 in 2011. Source: Author’s elaboration based on World Bank and IAMO Surveys.

A couple of implications follow from the results. First, rental markets appear to have failed to facilitate an efficient land allocation among producers. Over the analyzed period, we observe substantial land transfers from the households and the state to large and less efficient agricultural enterprises. Although Petrick et al. (2013) show that large scale farming had been associated with general improvements in incomes and quality of life in Kazakhstan’s rural areas, improving allocative efficiency of land may increase aggregate productivity in the agricultural sector. Thus, to close the widely reported yield gap between the Western countries and Kazakhstan (Swinen, Burkitbayeva, Schierhorn, Prishchepov, & Müller, 2017), policies should focus on creating an institutional infrastructure that would facilitate more efficient land relations. Second, introducing land as an additional collateralizable asset in rural finance will surely help but the effect is

miniscule due to low rates of land ownership. Credit markets should be stimulated with policy instruments going beyond the standard prescription of international development agencies to organize a land sales market. For instance, Petrick and Oshakbaev (2015) suggest that farmers’ poor management skills and unsupportive local institutional environments may have diminished the involvement of Kazakhstani farmers in credit markets. As a result, improving institutional infrastructure for development of rural finance for all farm sizes may foster conditions for a more efficient capital allocation.

Kazakhstan appears to have been on a similar path of land relations as Russia and Ukraine where land ownership has been negligible and land rental is used to assemble large farms. Availability of relatively cheap rental land in these countries may disconnect the value of the marginal product of land from the rental decisions

**Table 5**  
Estimations of the determinants of access to credit for individual farms and agricultural enterprises.

	Problems with collateral		Investments using loans	
	(1)	(2)	(3)	(4)
Reform dummy (2003 = 0; 2011 = 1)	0.039 (0.594)	0.138*** (0.006)	0.022 (0.618)	0.044 (0.145)
Log of area owned (ha)	-0.003 (0.816)	-0.006 (0.649)	0.010* (0.089)	0.009* (0.085)
Log of area under land shares (ha)	-0.009 (0.314)	0.012 (0.145)	-0.002 (0.615)	0.002 (0.694)
Agricultural ability	-0.033 (0.358)	-0.035 (0.288)	0.023 (0.234)	0.021 (0.269)
Education index (1 to 8 scale)	-0.002 (0.931)	-0.015 (0.544)	0.018 (0.285)	0.020 (0.261)
Special education in agriculture (1 = yes, 0 = no)	-0.004 (0.947)	-0.045 (0.447)	0.032 (0.352)	0.033 (0.327)
Individual farm (1 = yes, 0 = no)	0.207** (0.015)	0.195** (0.019)	-0.017 (0.758)	-0.012 (0.816)
Age of farm operator (years)	-0.001 (0.732)	-0.002 (0.573)	-0.003* (0.094)	-0.004* (0.065)
Farm's age (years since last reorganization)	0.014* (0.062)	0.015** (0.036)	-0.009** (0.037)	-0.008* (0.054)
Livestock index (EuroStat's livestock unit)	>-0.001** (0.026)	->0.001*** (0.006)	<0.001** (0.040)	<0.001** (0.036)
Non-land assets (bln. KZT)	<0.001* (0.054)	<0.001** (0.039)	<0.001* (0.071)	<0.001 (0.124)
<i>Differences in marginal effects before and after the reforms</i>				
Education index		0.070* (0.096)		-0.024 (0.457)
Agricultural ability		0.077 (0.162)		0.040 (0.203)
Log of area owned		-0.032 (0.261)		0.003 (0.773)
Log of area under land shares		-0.102*** (<0.001)		-0.016* (0.055)
Model contains interaction of education, agricultural ability, land area owned, land share area with reform	No	Yes	No	Yes
Observations	284	284	284	284
Pseudo R2	0.105	0.168	0.227	0.246

Note: \*Significant at 0.1; \*\*Significant at 0.05; \*\*\*Significant at 0.01. p-values are reported in the brackets. Cells report marginal effects and p-values were calculated using the delta-method. Rayon-level control dummies included but not reported due to space limitations.

(Shagayda & Lerman, 2017; Kvartiuk & Herzfeld, 2019). The current farm structure in Kazakhstan may be economically unsustainable not only because of excessive reliance on cheap land but also due to the fact that many agriholdings were struggling financially in 2016 and heavily depended on state support (Petrick, Raitzer, & Burkitbayeva, 2018). Furthermore, progress towards liberal land relations has been constrained by the recent suspension of the state land sales, the restrictions of the foreigners' participation in the rental market, and low transparency of state land rental by local authorities. Bolder reforms will be necessary to improve the connection between productivity and land accumulation.

### CRedit authorship contribution statement

**Vasyl Kvartiuk:** Conceptualization, Methodology, Software, Formal analysis, Data curation, Writing - original draft, Visualization. **Martin Petrick:** Investigation, Resources, Data curation, Writing - review & editing, Visualization.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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

Variables	OLS	SFA
Utilized land (ha)	0.267*** (<0.001)	0.272*** (<0.001)
Labor input (days)	0.503*** (<0.001)	0.502*** (<0.001)
Real materials input (mln Tenge)	0.209*** (<0.001)	0.192*** (<0.001)
Real fixed capital (mln Tenge)	0.019 (0.316)	0.022 (0.240)
Manager's education (1–8 scale)	–0.027 (0.540)	–0.021 (0.600)
Livestock farm (1 – yes, 0 – no)	–0.416*** (0.001)	–0.402*** (<0.001)
Year dummy (1 – 2011, 0 – 2003)	0.507*** (0.001)	0.526*** (0.001)
Constant	1.775*** (<0.001)	2.543*** (<0.001)
Regional controls	Rayons	Rayons
N	342	342
R <sup>2</sup>	0.69	–

Note: \*Significant at 0.1; \*\*Significant at 0.05; \*\*\*Significant at 0.01. p-values are reported in the brackets.

### References

- Aghion, P., & Bolton, P. (1997). A theory of trickle down growth and development. *The Review of Economic Studies*, 64(2), 151–172. <https://doi.org/10.2307/2971707>.
- Banerjee, A. V., & Newman, A. F. (1993). Occupational choice and the process of development. *Journal of Political Economy*, 101(2), 274–298. <https://doi.org/10.1086/261876>.
- 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. <https://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. <https://doi.org/10.1086/262008>.
- Besley, T., & Ghatak, M. (2001). Government versus private ownership of public goods. *The Quarterly Journal of Economics*, 116(4), 1343–1372. <https://doi.org/10.1162/003355301753265598>.
- Besley, T., & Ghatak, M. (2009). Property rights and economic development. In D. Rodrik & M. Rosenzweig (Eds.), *Handbook of development economics*, Volume V (Vol. 5). Amsterdam: North-Holland.
- Binswanger, H. P., & Rosenzweig, M. R. (1986). Behavioural and material determinants of production relations in agriculture. *Journal of Development Studies*, 22(3), 503–539. <https://doi.org/10.1080/00220388608421994>.
- Boucher, S. R., Barham, B. L., & Carter, M. R. (2005). The impact of “market-friendly” reforms on credit and land markets in Honduras and Nicaragua. *World Development*, 33(1), 107–128. <https://doi.org/10.1016/j.worlddev.2004.09.004>.
- Boucher, S., Guirkinger, C., & Trivelli, C. (2009). Direct elicitation of credit constraints: conceptual and practical issues with an application to Peruvian agriculture. *Economic Development and Cultural Change*, 57(4), 609–640. <https://doi.org/10.1086/598763>.
- Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using Stata*. College Station, Texas: Stata Press.
- Carter, M. R., & Barrett, C. B. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. *Journal of Development Studies*, 42(2), 178–199. <https://doi.org/10.1080/00220380500405261>.
- Cleveland, W. S. (1979). Robust locally weighted regression and smoothing scatterplots. *Journal of the American Statistical Association*, 74(368), 829–836. <https://doi.org/10.1080/01621459.1979.10481038>.
- 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*. New York: World Bank.
- Deininger, K., & Feder, G. (2001). Land institutions and land markets. In B. Gardner & G. Rausser (Eds.), *Handbook of agricultural economics* (pp. 287–331). Amsterdam: Elsevier.
- 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(1), 241–270. <https://doi.org/10.1016/j.jdeveco.2004.08.002>.
- de Soto, H. (2000). *The mystery of capitalism: Why capitalism triumphs in the west and fails everywhere else*. New York: Basic Books.
- Djanibekov, N., & Petrick, M. (2020). Statistical data on farming structures, land use and agricultural output for provinces in five Central Asian countries 1992–2015 [database]. Cologne: GESIS Data Archive. <https://dx.doi.org/10.7802/2008>
- Dudwick, N., Fock, K., & Sedik, D. J. (2007). *Land reform and farm restructuring in transition countries: The experience of Bulgaria, Moldova, Azerbaijan, and Kazakhstan (World Bank Working Papers No. 104)*. Washington, DC: World Bank. <https://doi.org/0-8213-7088-X>.
- 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.
- Eswaran, M., & Kotwal, A. (1986). Access to capital and agrarian production organization. *The Economic Journal*, 96(382), 482–498.
- Fan, J., & Gijbels, I. (1996). *Local polynomial modelling and its applications*. London: Chapman & Hall.
- Feder, G., Onchan, T., Chalamwong, Y., & Hongladarom, C. (1988). *Land policies and farm productivity in Thailand*. Baltimore, MA: Johns Hopkins University Press.
- Keyzer, M.A., Merbis, M.D., Halsema, A., Heyets, V., Borodina, O., & Prokopa, I. (2017). Unlocking Ukraine's production potential. In Ciaian, P., y Paloma, S. G., Mary, S., & Langrell, S. (Eds.), *The Eurasian wheat belt and food security* (pp. 141–155). Cham: Springer.
- Kvartiuk, V., & Herzfeld, T. (2019). Welfare effects of land market liberalization scenarios in Ukraine: Evidence-based economic perspective (IAMO Discussion Papers No. 186). Halle (Saale): IAMO
- Lerman, Z., Csaki, C., & Feder, G. (2004). *Agriculture in transition: Land policies and evolving farm structures in post-Soviet countries*. Lanham, MD: Lexington Books.
- Li, G., Rozelle, S., & Brandt, L. (1998). Tenure, land rights, and farmer investment incentives in China. *Agricultural Economics*, 19(1–2), 63–71. <https://doi.org/10.1111/j.1574-0862.1998.tb00515.x>.

- Lipton, M. (2009). *Land reform in developing countries. Property rights and property wrongs*. London: Routledge.
- Ministry of Agriculture of Kazakhstan (2020). Svodnyy analiticheskiy otchet o sostoyanii i ispolzovanii zemel Respubliki Kazakhstan za 2019 god (Summary analytical report on the state and use of land in the Republic of Kazakhstan for 2019). Nur-Sultan: Ministry of Agriculture of Kazakhstan
- Norton, E. C., Wang, H., & Ai, C. (2004). Computing interaction effects and standard errors in logit and probit models. *Stata Journal*, 4(2), 154–167. [https://doi.org/10.1016/S0165-1765\(03\)00032-6](https://doi.org/10.1016/S0165-1765(03)00032-6).
- OECD (2013). *Review of agricultural policies: Kazakhstan 2013*. Paris: OECD.
- Parliament of Kazakhstan (2003). *Zemelnyy kodeks respubliky Kazakhstan (Land Code of the Republic of Kazakhstan)*. Astana: Parliament of Kazakhstan.
- Petrick, M. (2017). Incentive provision to farm workers in post-socialist settings: Evidence from East Germany and North Kazakhstan. *International Food and Agribusiness Management Review*, 20(2), 239–256 <https://doi.org/10.22434/IFAMR2016.0020>.
- Petrick, M., & Oshakbaev, D. (2015). Kazakhstan's agricultural development constraints: Evidence from the wheat, beef and dairy sectors. In A. Schmitz & W. Meyers (Eds.), *Transition of agricultural market economies - The future of Kazakhstan, Russia and Ukraine* (pp. 15–26). Wallingford, UK: CABI.
- Petrick, M., Raitzer, D., & Burkitbayeva, S. (2018). Policies to unlock Kazakhstan's agricultural potential. In K. Anderson, G. Capannelli, E. Ginting, & K. Taniguchi (Eds.), *Kazakhstan. Accelerating economic diversification* (pp. 21–72). Manila: Asian Development Bank.
- 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 the Agricultural and Food Sector in Transition Economies)* (pp. 117–139). Halle (Saale): IAMO.
- Petrick, M., Wandel, J., & Karsten, K. (2013). Rediscovering the Virgin Lands: Agricultural Investment and Rural Livelihoods in a Eurasian Frontier Area. *World Development*, 43, 164–179. <https://doi.org/10.1016/j.worlddev.2012.09.015>.
- Petrick, M., Oshakbaev, D., & Wandel, J. (2017). More than pouring money into an ailing sector? Farm-level financial constraints and Kazakhstan's 'Agribusiness 2020' Strategy. In y Paloma, S. G., Mary, S., Langrell, S., & Ciaian, P. (Eds.), *The Eurasian wheat belt and food security* (pp. 103–118). Cham: Springer International Publishing.
- Petrick, M., Wandel, J., & Karsten, K. (2011). Farm restructuring and agricultural recovery in Kazakhstan's grain region: An update (IAMO Discussion Papers No. 137). Halle (Saale): IAMO.
- President of Kazakhstan (1995). *Ukaz Prezidenta Respubliki Kazakhstan, imeyushchiy silu zakona "O zemle"*. Astana: President of Kazakhstan.
- Sadoulet, E., Murgai, R., & Janvry, A. D. (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.
- Swinnen, J., & Vranken, L. (2007). Patterns of land market developments in transition (LICOS Discussion Paper No.179) Leuven: LICOS Centre for Institutions and Economic Performance.
- Shagayda, N., & Lerman, Z. (2017). Land policy in Russia: New challenges. In P. Ciaian, S. G. y Paloma, S. Mary, & S. Langrell (Eds.), *The Eurasian wheat belt and food security* (pp. 33–50). Cham: Springer International Publishing.
- Stock, J., & Yogo, M. (2005). Testing for Weak Instruments in Linear IV Regression. In D. Andrews & J. Stock (Eds.), *Identification and inference for econometric models: Essays in honor of Thomas Rothenberg* (pp. 80–108). Cambridge: Cambridge University Press.
- Swinnen, J., Burkitbayeva, S., Schierhorn, F., Prishchepov, A. V., & Müller, D. (2017). Production potential in the "bread baskets" of Eastern Europe and Central Asia. *Global Food Security*, 14, 38–53. <https://doi.org/10.1016/j.gfs.2017.03.005>.
- USAID (2005). *Assessment of the interim provisions, Land Code in Kazakhstan: Final Report*. Washington DC: USAID.
- Vranken, L., & Swinnen, J. (2006). Land rental markets in transition: Theory and evidence from Hungary. *World Development*, 34(3), 481–500. <https://doi.org/10.1016/j.worlddev.2005.07.017>.
- Williams, R. (2012). Using the margins command to estimate and interpret adjusted predictions and marginal effect. *Stata Journal*, 12(2), 308–331. <https://doi.org/10.1016/j.worlddev.2005.07.017>.
- World Bank (2007). *Republic of Kazakhstan. Shaping agricultural policy in an oil-rich country. Joint Economic Research Program (JERP) – The World Bank and the Government of Kazakhstan - In collaboration with USAID and FAO*. Washington DC: World Bank.
- Yao, Y. (2000). The development of the land lease market in rural China. *Land Economics*, 76(2), 252–266. <https://doi.org/10.2307/3147227>.
- Zimmerman, F. J., & Carter, M. R. (1999). A dynamic option value for institutional change: marketable property rights in the Sahel. *American Journal of Agricultural Economics*, 81(2), 467–478. <https://doi.org/10.1016/j.cellimm.2015.01.011>.