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DISCUSSION PAPER

Leibniz Institute of Agricultural Development in Central and Eastern Europe

Competition for land and labour among individual farms and agricultural enterprises: Evidence from Kazakhstan's grain region

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LEIBNIZ-INSTITUTE OF AGRICULTURAL DEVELOPMENT
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ABSTRACT

This article evaluates the recent evolution of farm structure in Kazakhstan's grain region against the reform objectives of the 1990s and the family farm theory that underpinned the latter. In the study region, super-large agroholdings, large-scale enterprises and smaller individual farms emerged side-by-side and now compete for resources in a homogenous production environment. Drawing on two survey rounds of farm-level data, we find that the agroholdings display the highest factor productivity and are the most competitive on land and labour markets among all farms. However, we also find constant technical returns to scale across farm types and a layer of smaller family farms that is highly competitive on land markets. It is thus too early to conclude that large corporate farms are economically superior to individual (family) farms. But the present analysis clearly calls into question that family farms are a per-se desirable or even the only viable way of organising agricultural production. A revision of the received family farm theory may thus be due.

JEL: O13; P32; Q12; Q15

Keywords: Family farms, agroholdings, land market, labour market, Kazakhstan.

ZUSAMMENFASSUNG

DER WETTBEWERB ZWISCHEN EINZELBETRIEBEN UND AGRARUNTERNEHMEN UM BODEN UND ARBEIT: EINSICHTEN AUS KASACHSTANS GETREIDEREGION

Dieser Aufsatz untersucht die Entwicklung der Betriebsstrukturen in Kasachstans Getreideregion im Lichte der Reformziele der 1990er Jahre und der Theorie des landwirtschaftlichen Familienbetriebs, die diese Ziele untermauerte. In dieser Region entstanden riesige Agroholdings, landwirtschaftliche Großbetriebe und bäuerliche Einzelwirtschaften nebeneinander. In einer homogenen Produktionsumgebung stehen sie nun im Wettbewerb um Produktionsfaktoren. Basierend auf zwei Befragungsrunden ergeben unsere Analysen, dass unter allen Betriebsformen die Agroholdings die höchste Faktorproduktivität und die größte Wettbewerbsfähigkeit auf Boden- und Arbeitsmärkten aufweisen. Allerdings belegen die Untersuchungen auch konstante Skalenerträge und die Existenz einer Gruppe kleinerer Einzelbetriebe, die ebenfalls eine hohe Zahlungsbereitschaft für Boden haben. Es erscheint daher verfrüht zu schlussfolgern, dass die juristischen Personen den Einzelbetrieben wirtschaftlich überlegen sind. Jedoch stellt die vorliegende Analyse die Sichtweise in Frage, der zufolge Familienbetriebe eine an sich wünschenswerte oder sogar die einzig lebensfähige Form der Betriebsorganisation in der Landwirtschaft seien. Eine Überprüfung der Theorie des landwirtschaftlichen Familienbetriebs scheint daher angebracht.

JEL: O13; P32; Q12; Q15

Schlüsselwörter: Familienbetriebe, Agroholdings, Bodenmarkt, Arbeitsmarkt, Kasachstan.

Аннотация

Конкуренция за землю и трудовые ресурсы между индивидуальными фермерскими хозяйствами и сельскохозяйственными предприятиями: Данные по зерновому региону Казахстана

Данная статья представляет оценку недавних изменений в структуре хозяйств в зерновом регионе Казахстана согласно задачам экономических реформ 1990-х гг., используя для этого теорию семейного фермерского хозяйства. В исследуемом регионе произошло возникновение бок о бок огромных агрохолдингов, крупных сельскохозяйственных предприятий и небольших индивидуальных фермерских хозяйств, которые в настоящем конкурируют за ресурсы в однородной производственной среде. Исследование опирается на данные по хозяйствам, полученные в результате двух раундов анкетного опроса. Было выявлено, что агрохолдинги демонстрируют наивысшую производительность факторов производства, а также являются наиболее конкурентоспособными на рынках земли и труда среди всех типов хозяйств. Тем не менее, результаты анализа указывают на наличие у всех типов хозяйств постоянной технической отдачи от масштаба производства, а также на высокую конкурентоспособность небольших семейных фермерских хозяйств на рынке земли. Таким образом, вывод об экономическом превосходстве крупных корпоративных хозяйств над индивидуальными (семейными) фермерскими хозяйствами является преждевременным. Наряду с этим результаты исследования также подвергают сомнению то, что семейные фермерские хозяйства, по сути, являются наиболее желательным или даже единственным подходящим способом организации сельскохозяйственного производства. Таким образом, возникает необходимость пересмотреть теорию семейного фермерского хозяйства.

JEL: O13; P32; Q12; Q15

Ключевые слова: Семейное фермерское хозяйство, агрохолдинги, рынок земли, рынок труда, Казахстан.

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1 Introduction

Until recently, there existed a widespread consensus among agricultural economists concerning the desirable model of farming organisation. The two maintained hypotheses of this "family farm theory" were that (1) technological scale economies are typically exhausted before farm size exceeds the labour capacity of a family and that (2) further growth of the labour force is inhibited by rising supervision costs (see Eastwood et al. 2010 for a recent review). These hypotheses imply the existence of a surplus maximising, optimal farm size. They were supported by a large body of empirical literature from developed and developing countries, which showed that smaller farms were not less efficient than bigger ones (Hallam 1991) or that land productivity was actually higher on smaller farms (a stylized fact called the "inverse relationship (IR)": Berry and Cline 1979). Even so, there were many deviations from this model observed in reality. But they were supposed to be due to political influence and asymmetric power relations in favour of those benefiting from estate farming operations and the concessionary policies protecting them from fair competition with other farm types (Binswanger et al. 1995). The model thus served as a justification for land reforms in developing countries (Lipton 2009) and protective agricultural policies in the developed world (Schmitt 1984; Gardner 2002). Still in the late 1990s, it represented a cornerstone in the World Bank's land policy documents (Deininger and Binswanger 1999).

It is no surprise that policy advisors to the governments in Central and Eastern Europe and the Former Soviet Union (FSU) also strongly endorsed this family farm model. Radical restructuring and downsizing of collective farms was supposed to be an essential precondition for a post-socialist "farmer's road" to agricultural development (see Sarris et al. 1999 and Lerman 2010 for articulations of this view and Lerman 1998 discussing it in the light of lacking reform progress). The following quote illustrates the vision behind this reform strategy (Lerman et al. 2004, p. 50):

"[I]t is progress on the sectoral microlevel … that had the potential for a significant impact on the agrarian rural population. As theory suggests, individual responsibility and direct accountability would cure free riding, shirking, and moral hazard that make collective organizations generally inefficient. Smaller farm sizes would be more manageable and less wasteful, reducing the level of monitoring and other transaction costs between managers and workers that are typically high in large organizations. Property rights associated with private ownership of land (or with secure tenure) would induce farmers to put a greater effort into production. Finally, transferability of use rights would facilitate the flow of land from less efficient to more efficient producers …".

By the late 1990s, actual reform progress was at best mixed, despite some formal advances in asset redistribution. The supposed reform beneficiaries in the land-rich countries of the FSU displayed a persistent disinclination to break up the former collective production structures. This disappointing outcome was noted by the Western observers as follows (Lerman et al. 2004, p. 123):

"The new land owners are not particularly willing to leave the supportive umbrella of the collective structure and risk everything in independent farming. The overwhelming majority of farm workers in Russia, Ukraine, and Moldova prefer to keep their land and asset shares in the former collective, which in the meantime has reregistered as a corporate farm with a new market-sounding name. They waive their right of exit, at least for the time being, and pool their resources to create a corporate structure."

Another ten years later, the global boom in food prices, a (despite the turmoil of the financial crisis) generally improved macroeconomic environment for agriculture in the countries now labelled as RUK (Russia, Ukraine, Kazakhstan), and slow but perceptible changes in farm organisation call for an update of this bleak assessment. Based on recently collected farm-level data, the current paper engages into such an update for the major grain producing region of Kazakhstan.

At the outset of reforms, the situation of the farming sector in Kazakhstan's grain region was an extreme version of the typical Soviet model. In the late 1950s, in a quasi-overnight

campaign, almost 500 sovkhozy (state farms) had been established in an attempt to make the "Virgin Lands" of the Kazakh steppe amenable to grain production. Each sovkhoz had a size of several 10,000 ha. Given this legacy, reform implementation in the late 1990s led to the downsizing of former state farms, which were reorganised as agricultural enterprises (*sel'skokhoziaistvennie predpriiatiia*). Furthermore, a significant layer of individual farms emerged in the process (called "peasant farms" in Kazakh terminology, *krest'ianskie (fermerskie) khoziaistva*). More recently, some of the former state farms were taken over by outside investors and put under the umbrella of horizontally and vertically integrated holding structures, so-called agroholdings (this is not an officially recognised legal form, see Petrick et al. 2011 and 2013 for details). Today, the typical agroholding encompasses several enterprises and cultivates up to 100,000 ha of cropland, occasionally even more. What makes the case of Kazakhstan particularly interesting is that nowadays super-large agroholdings, large-scale enterprises and smaller individual farms co-exist side-by-side and compete for resources in a homogenous production environment. If there is indeed a level playing field, the economically optimal type of organisation should emerge and drive out the inferior competitors in an evolutionary process. Kazakhstan is hence a potentially fertile study object not only for an assessment of the transition progress but for deeper issues concerning the desirable model of farm organisation worldwide.

With the adoption of the new land code in 2003, Kazakhstan introduced the legal basis for fully private ownership of agricultural land and market-based land transactions. We thus ask whether a land market has actually emerged and whether land transactions help to shift land to the more efficient user. We evaluate and compare the economic performance of agroholdings, agricultural enterprises and individual farms, highlighting a number of key characteristics of these dominating farm types in grain production. Next to land, we focus on labour as a second important production factor. Due to massive rural outmigration (primarily of Russians and other ethnic minorities) during the 1990s, labour has become a scarce factor in rural areas of northern Kazakhstan. The use of labour also sheds light on the social structure of the different farm types. Its analysis helps to assess how "family-based" the individual farms actually are and how relevant supervision problems in labour management are likely to be. This in turn will possibly shed a new light on the validity of the maintained family farm theory, at least for conditions of post-socialist agriculture.

2 Data sources

The data for this analysis comes from two rounds of farm surveys conducted in 2003 by the World Bank and in 2012 by IAMO. It was collected in Akmola (in 2003 and 2012) and Pavlodar (only in 2003) provinces, both part of the "Virgin Lands" region in north Kazakhstan. There are many questions that were included in an identical fashion in both survey rounds. Furthermore, in Akmola province, both rounds were carried out in the same counties and in mostly the same villages. In Akmola, 50% of the observed farms were located in Ereymentausky county (rayon), and 44.5% in Esilsky county. Both rounds were administered by the same data collection firm BISAM with headquarters in Almaty, Kazakhstan. However, the identification of specific farms across the two survey rounds was not possible due to anonymity restrictions. In each of the provinces, the survey administrators of the 2003 round had pre-selected two counties, one close and one distant to the provincial capital, which were visited again in 2012 (in Akmola province). Within the given counties, farms were selected randomly on the basis of company registers provided by the local government administration in each of the two survey years. Enumerators then arranged standardised face-to-face interviews with the farm managers. The 2012 survey targeted principally those villages that had already been surveyed in 2003 and otherwise proceeded in the same fashion. In 2012, data collection was carried out during summer and fall, often before the crop was fully harvested and marketed. In this survey round, all economic

performance indicators therefore refer to the cropping year 2011. Results of the 2003 survey were published separately by Dudwick et al. (2007).

The data includes information about the legal status of the farms (see Petrick et al. 2011 on relevant background legislation in Kazakhstan). In 2012, there was a quota set that at least 50 entities registered as an agricultural enterprise were to be included in the sample. Furthermore, the 2012 survey instrument asked whether the enterprise belonged to a parent organisation such as an agroholding. In this way, it is possible to distinguish the three farm types mentioned before, whereby agroholdings were only observed in 2012. In the following, the category "agroholding" denotes a single enterprise location, not the entire holding company. Agroholding companies are sometimes active in several provinces or even countries (Petrick et al. 2013).

Table 1 displays the descriptive statistics of variables important for the following analysis, by farm type and year. The bottom row shows the sizes of the five subsamples. There are two very small groups, agricultural enterprises in 2003 (N=9) and agroholdings in 2012 (N=8), which should be kept in mind when generalising from the following analysis.

Table 1: Descriptive statistics by farm types and years

	Individual farms						Agricultural enterprises						Agroholdings		
	2003			2011			2003			2011			2011		
	Mean	*Min*	*Max*	***Mean***	*Min*	*Max*	***Mean***	*Min*	*Max*	***Mean***	*Min*	*Max*	***Mean***	*Min*	*Max*
Utilised area (thousand ha)	**0.514**	0.003	5.600	**1.369**	0.010	10.968	**9.396**	0.040	41.105	**15.577**	1.123	80.0	**25.388**	11.112	40.454
Labour input (FTE) [a]	**17.1**	2.1	248.9	**4.0**	0.5	32.9	**89.5**	8.4	282.6	**51.2**	2.5	540.5	**95.9**	18.4	234.7
Expenditures on working capital (million 2011 KZT) [a]	**2.1**	0.0	12.7	**4.9**	0.0	135.7	**25.0**	0.0	209.7	**17.4**	0.4	138.0	**78.7**	23.2	223.0
Education of farm manager (1..8) [b]	**6.3**	3	8	**6.4**	4	8	**7.6**	6	8	**7.4**	6	8	**7.8**	6	8
Farm revenue (million 2011 KZT) [a]	**5.4**	0.1	32.7	**5.6**	0.0	42.3	**126.6**	1.0	895.4	**126.7**	0.0	1142.0	**277.5**	56.9	938.2
Grain yield (dt/ha) [a]	**5.1**	0.1	9.0	**4.9**	0.0	17.4	**2.6**	0.1	8.0	**4.4**	0.0	16.3	**4.8**	3.3	6.5
No. of observations		91			100			9			42			8	

Notes: FTE = Full Time Equivalent based on 242 working days per year. [a] Statistics based on non-missing values. [b] Index based on 1=no formal education, 2=primary school, 3=incomplete secondary school, 4=secondary general, 5=vocational school, 6=college, 7=incomplete higher education, 8=university degree. Working capital for 2003 inflated by the purchase price index of productive & technical produce (2011/2003=2.54), farm revenue inflated by grain price index (2011/2003=1.57), based on indices published by the Kazakh Statistical Agency. Data covers Akmola and Pavlodar provinces in 2003 and Akmola province in 2011. 200 Kazakh tenge (KZT) are approximately equal to 1 EUR.

Source: Author based on World Bank & IAMO farm surveys.

As this overview shows, the levels of input use as well as output generation differ by order of magnitudes between the three farm types. In terms of land and labour use, very roughly speaking, the ratio is about 1:10:20 for individual farms vs. enterprises vs. holdings in 2011. On the revenue side, the ratio is approximately 1:25:50, so much less favourable for individual farms. At the same time, there is tremendous variation in the farm-specific levels, ranging from a 3 ha individual farm in 2003 to a 80 thousand ha enterprise in 2011. Comparing the sample means in 2003 and 2011, it is also clear that both individual farms and enterprises increased their land endowment but considerably downsized in terms of labour use. Neither the managers' educational level nor the recorded grain yields per hectare follow a clear trend.

3 Competition for land

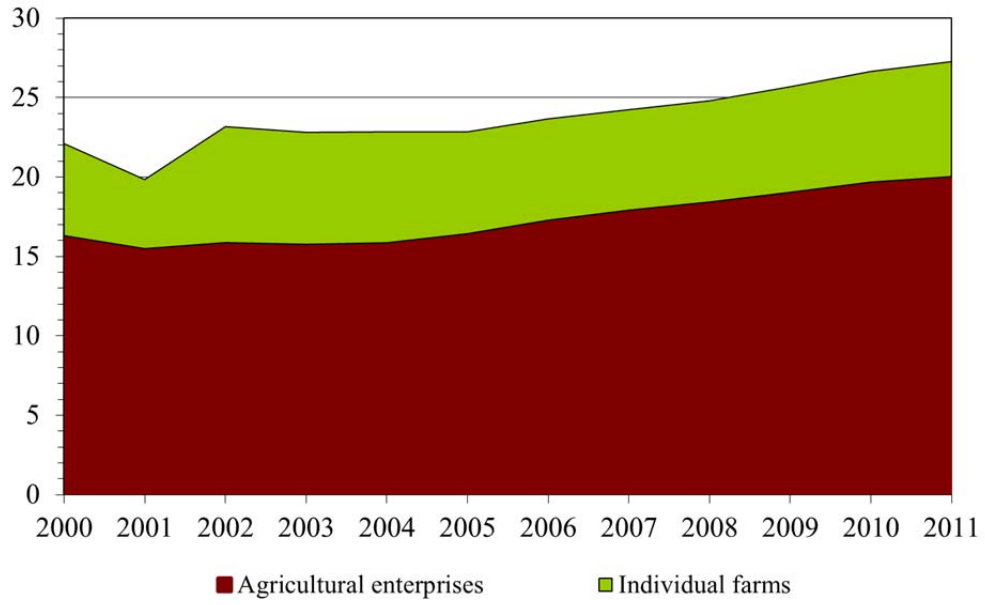
To understand the current situation on the land market, it is useful to briefly review the legal conditions for land transactions in Kazakhstan. Since national independence, land legislation in Kazakhstan has been subject to on-going reform and it underwent a major paradigm shift in the early 2000s (for details see Petrick et al. 2011, pp. 13-20). In the 1990s, the paradigm was that all land remained in state ownership. Nevertheless, major private property rights were introduced – the right to temporary or permanent use of land leased from the government, to extract benefit from it and transfer it via sublease. So-called "conditional land shares" in the form of paper certificates of entitlement were distributed among rural citizens. However, no specific, physical land plot was assigned to the share, so that the holders of the certificates were not aware of the location and shape of the land to which they were issued the rights. For most beneficiaries of land share redistribution, renting their land to the enterprises was the only way to make productive use of their land shares. Even so, the creation of individual farms also accelerated, so that among the registered farms a significant number of both corporate and individual farms began to co-exist.

Towards the turn of the millennium, the paradigm shifted to the recognition of full private ownership of farmland. A new land code was adopted in 2003 and came into force in 2005, allowing private ownership of agricultural land with all property rights, including the free sale and purchase of land plots. At the same time, subleasing of land shares or demarcated land plots received under previous privatisation steps was outlawed. Subleased land shares as well as land plots could be contributed as a share to the capital stock of an agricultural enterprise, they could be used to form an individual farm, or they could be purchased from the government.

While land purchases have been increasing recently, the vast majority of land is still rented from the government at a normatively set low price – it is almost given for free. Data published by the Ministry of Agriculture show that, in 2010, only one percent of all agricultural land were in full private ownership, while 15 per cent were cultivated by the state. The remaining 84 per cent were in private use, based on long-term lease (Issayeva 2012; see also OECD 2013, p. 108). As secondary rentals of land leased from the state are prohibited, short- and medium-term adjustments in land use outside the land sales market are difficult. Interviews with farmers and local experts evaluated in Petrick et al. (2011) revealed that they mostly occur when existing farms change ownership, due to liquidations or mergers, and the land shares are transferred to the new owner. Land transactions are largely controlled by local land commissions, in which directors of existing farms and local officials are represented. Agricultural enterprises benefitted from the new legislation more than individual farms, as the latter could not acquire land shares from rural residents.

Figure 1 shows the total land resources used by agricultural enterprises and individual farms, the two categories of farm businesses listed in the official statistics.[1] The figure includes the three provinces of Akmola, Kostanay and North Kazakhstan. These are regarded as the grain region of Kazakhstan today and contribute about 80% of total grain production of the country. In official documents, Pavlodar is no longer regarded as part of the grain region, as its grain output is actually small. Total agricultural land (re-)expanded notably after 2000, and of the 27 million hectare used in 2011, 27% were cultivated by individual farms. In 2003, the land share of individual farms had been 31%.

Figure 1: Land use by enterprises and farms in Kazakh grain region (million ha)

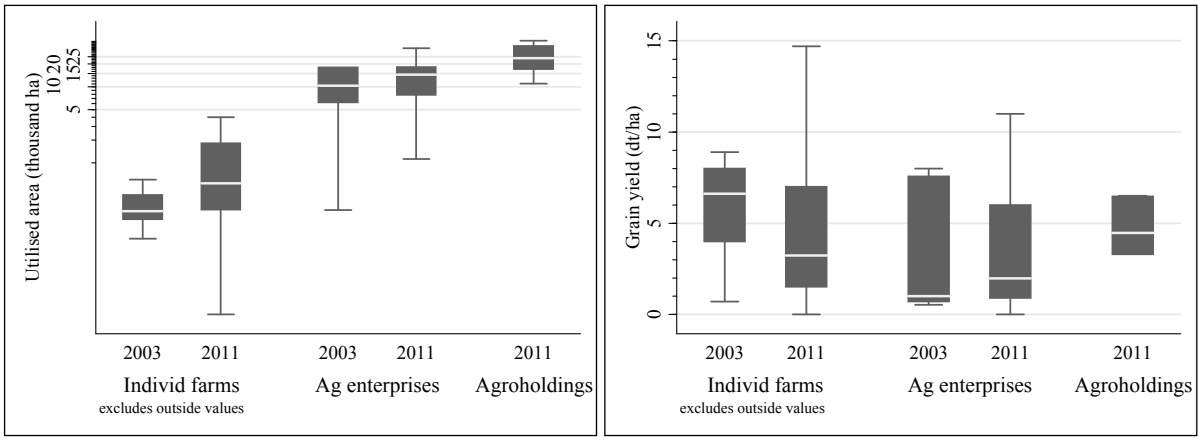


Notes: Figure includes Akmola, Kostanay and North Kazakhstan provinces.
Sources: Author's calculations based on Statistical Yearbooks of Agriculture, Forestry and Fishery in Kazakhstan.

Of the total land covered by the farms in the survey sample, the share in individual farms was 36% in 2003 and 18% in 2011. So in terms of land use, peasant farms are slightly overrepresented in the 2003 sample, while they are underrepresented in 2011.

[1] A third category of producers are the rural household plots (*khoziaistva naseleniia*). They are very important in fruits and vegetables production as well as livestock and contribute a considerable share to gross agricultural output (Petrick et al. 2011). However, they are typically run as a side business to wage employment and their utilisation of land, compared to the other two types of producers, is minimal. We therefore concentrate on the other categories in the following.

Figure 2: Farm size & land productivity (Akmola province)

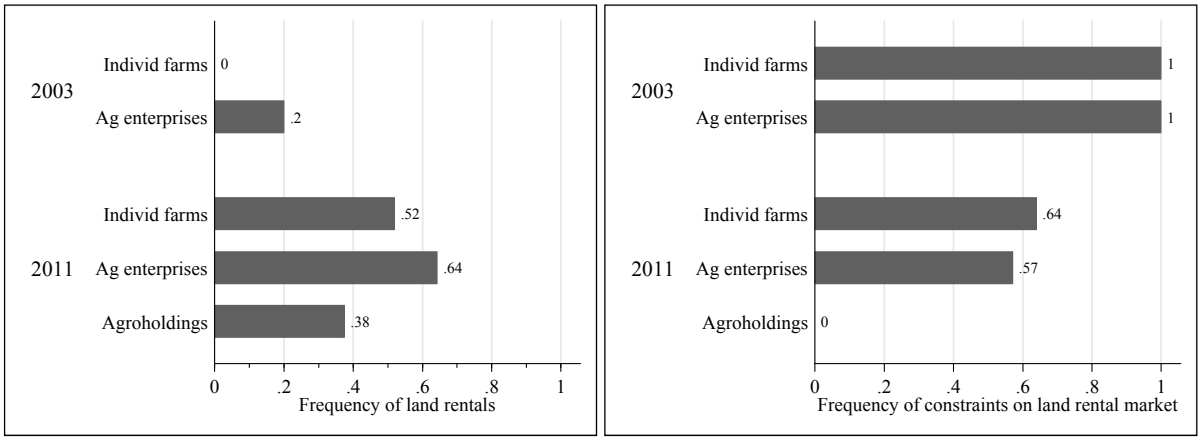


Source: Author based on World Bank & IAMO farm surveys.

The distribution of farm sizes in terms of utilised area and the distribution of grain yields per ha across the categories are illustrated for Akmola province in Figure 2. In the box plots, the line dividing the box represents the median, whereas the lower and upper limits of the box represent the first and third quartiles of the distribution. Lower and upper whiskers delimit the most extreme data point within first (third) quartiles minus (plus) 1.5 times the inter quartile range. The figure thus gives a more differentiated picture than the mean values in Table 1. While the overall tendency of a generally increasing land endowment over time is supported, the enormous variation in farm sizes is now visualised. It is interesting to note that the total number of individual farms active in Akmola province has gone up from 2,780 in 2003 to 3,719 in 2011. Likewise, the number of agricultural enterprises has increased from 481 in 2003 to 768 in 2011 (based on data in the Statistical Yearbooks of Agriculture). Therefore the mass liquidation of operating farms and subsequent merger of farmland is unlikely to be an explanation for the growth in average farm sizes, even if some of these farms only exist on paper. It must rather have come from the re-activation of land that had been laying fallow, which is consistent with Figure 1. There is no polarisation observable in the data indicating a separation into a few very large and many very small individual farms.

The right chart on grain yields suggests no clear trend, except perhaps that yields on agricultural enterprises are typically lower than on farms and agroholdings. By international standards, grain yields are low, but not untypical for the very low-intensity production system prevailing in the Kazakh steppe.

Figure 3: Land rentals & constraints in land access (Akmola province)

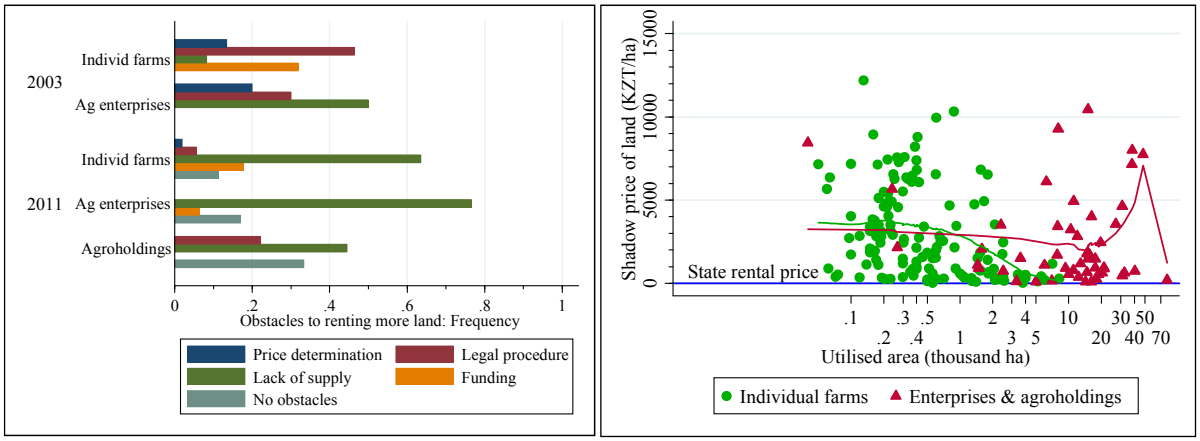


Notes: Only rentals from outsiders (non-shareholders) or the government considered.
Source: Author based on World Bank & IAMO farm surveys.

The survey data confirms that land purchases are a very recent and rare phenomon. There were no reports of land purchases by any of the farm entities surveyed in 2003. This is of course not surprising, given that it was not legally possible to do so at that time. But also the 2011 survey round documents only four land purchases among all individual farms surveyed, and one among the enterprises. As Figure 3, left chart, shows, there was more activity on the land rental market, and it has been increasing considerably. We consider only rentals from non-shareholders or from the government that occurred after the legal constitution of the farm or enterprise. While none of the individual farms rented any land in 2003, 20% of enterprises did so at that time. By 2011, however, 52% of individual farms rented extra land, as did even 64% of the enterprises and three out of the eight agroholdings.

The right chart of Figure 3 counts the negative responses to the question whether the farm could rent in (more) land if it wanted. It thus measures the perceived constraints on the land rental market. Not a single manager said he/she could rent in more land in 2003. Consistent with the left chart, this pessimistic assessment was much less frequent in 2011, when it was held by only 64% of the farm and 57% of the enterprise managers. It is remarkable that none of the agroholding managers regarded the land rental market as being supply constrained.

Figure 4: Obstacles to land access & excess demand for land



Notes: Left chart based on Akmola data. Multiple answers possible, total number of responses was 270. Right chart based on Cobb Douglas production function estimates for Akmola & Pavlodar provinces reported in Table 2. Curved lines represent lowess smoothers based on the two farm type subsamples. Figure excludes outside values for shadow price of land.

Source: Author's calculations.

Both survey rounds also contained questions about the nature of the constraints on the land rental market (Figure 4, left chart). It is instructive to note how the relative importance shifted over time and among farm types. In 2003, problems with the legal procedure of land renting and funding problems were salient among individual farms. The legal procedure was also an obstacle for many enterprises, although lacking supply was the most frequently noted difficulty among them. Both farm types also reported price determination, i.e. how to find an appropriate price, as a relevant problem. In 2011, the constraints were clearly shifting to the supply side. A lack of supply was by far the most frequent response. From the survey data, we know that the overwhelming majority of existing rentals (98%) were from the government. So apparently most available land from the government is now rented out. Problems with price determination played no longer a role in 2011. There was rather an increasing number of managers who stated that they did not see any obstacles to land access, most frequently among the agroholdings. So it seems fair to conclude that the land rental market has become much more active over time, but that it is mostly limited to transactions in which the government is the lessor of the land. As the land rental price is fixed at a low level by law, it

is not particular surprising that there is now an excess demand and widely perceived rationing on the supply side.

To obtain a deeper insight into the willingness to pay for land and other production factors among different farm types, we estimated a production function that allows calculating the shadow prices of the factors in the presence of input rationing (see Carter and Wiebe 1990 for an earlier application). If π is the profit, x an input level to be chosen by the farmer, p the given output price, f a given production technology, and w the input price, the simple profit maximising calculus of the farmer under an input constraint $\bar{x}$ is given by:

$$\max_x \pi = pf(x) - w'x \text{ s.t. } \bar{x} - x \geq 0. \quad (1)$$

If f is concave in x, the unique solution for the input x under supply rationing is defined by:

$$p\frac{\partial f}{\partial x} = w + \lambda \equiv w^*, \quad (2)$$

with λ the marginal value of the rationing constraint in the optimisation calculus and w^* the shadow price of the input. It holds that $w^* \geq w$.

In the following, we estimated f for the pooled sample of all farms and enterprises incl. agroholdings in Akmola and Pavlodar provinces, assuming that – given their variation in input levels – they operate under the same production technology. Knowing f, the first term of eq. (2) allows us to compute the farm-individual values of the shadow price for all inputs included in the estimation, and hence a measure of the severity of the rationing constraint. We assumed a Cobb Douglas specification for the production technology and included the utilised area, the number of workers, working capital, and the education of the manager as regressors (see Table 1 and Table 2 for descriptive statistics). Furthermore, dummy variables for the year 2003 as well as for the main two counties covered were added. Total farm revenue was used as the dependent variable. 12 observations with a revenue of zero were excluded from the sample. Closer inspection showed that these were all on the verge of bankruptcy. Farms with a capital input of zero were treated as if this was equal to one thousand KZT, so to allow the log transformation. The results from an ordinary least squares (OLS) regression are presented in Table 2.[2]

All coefficients (and hence production elasticities) of the three material factors are significantly positive and in a plausible order of magnitude. Educational level varies relatively little in the sample and has no significant influence on revenue. The negative year dummy appears reasonable as well, as climatic conditions in 2011 were exceptionally good for wheat production. Furthermore, the dummy has probably captured some technical progress. One of the county dummies is also significant, this is the county distant to any urban centre. The estimated elasticity of scale is slightly above one, but a constant elasticity of scale cannot be rejected statistically.

[2] The analysis is based on the assumption that the data identifies the coefficients of interest. Given the widespread supply rationing on input markets discussed in this paper, this assumption is possibly not too far from the truth.

Table 2: Cobb Douglas production function estimates

Variable	*Coefficient*		*p-value*	*Sample mean*	*Sample min*	*Sample max*
Utilised area (thousand ha)	0.326	*	0.001	4.712	0.010	80.000
Workers (FTE)	0.551	*	<0.001	5.94	0.12	130.80
Working capital (million 2011 KZT)	0.190	*	<0.001	8.27	0.001	223.00
Education (1..8)	0.315		0.287	6.62	3	8
Year 2003 (0/1)	-0.381		0.163	0.38	0	1
Esilsky rayon (0/1)	1.215	*	<0.001	0.31	0	1
Ereymentausky rayon (0/1)	0.309		0.139	0.44	0	1
Constant	0.276		0.654			
				Elast. of scale 95% confidence interval		
Elasticity of scale	1.067	*	<0.001	0.946		1.188
F (7, 199)	101.61	*	<0.001			
R^2	0.681					
N	207					

Notes: Dependent variable is log farm revenue. Utilised area, workers, working capital and education enter regression in log form. * significant at the 1% level. *p*-values based on robust standard errors. Sample mean (min, max) of farm revenue: 41.670 (0.037; 1142.0) million 2011 KZT.
Source: Author's calculations.

In a further step, we use these estimates for calculating farm-specific shadow prices. Given the Cobb Douglas specification, this can be done by multiplying the estimated coefficients with the inverse of the farm-specific average factor productivity. The distribution of the shadow prices of land along the farm size continuum is shown in the right chart of Figure 4. The shadow price is given in KZT/ha, separately for individual farms and enterprises/holdings. Lowess smoothers were added to illustrate the general tendency in the distribution. It indicates that shadow prices (and hence the annual willingness to pay) are highest for individual farms in a size range of 100 to 500 ha, as well as for enterprises of about 50,000 ha size. Note that the horizontal line is in logarithmic scale, so that the bigger farm sizes are squeezed together. In any case, it is remarkable that relatively bigger individual farms and smaller enterprises tend to display lower shadow prices. To compare it with actual rental rates observed, we added a horizontal line indicating the order of magnitude of the fixed state rental price. In Kazakhstan, land use payment for state land and land tax are typically lumped together in a single payment. This varies across regions in a range between 0.50 and 200 KZT/ha (0.0025 to 1 EUR/ha), depending on the soil fertility (OECD 2013, pp. 151-54). Under a special regime of tax concessions, most enterprises and farms pay even less. In our sample, the median land use payment was at approximately 10 KZT/ha (0.05 EUR/ha) in 2011. The right chart of Figure 4 thus makes quite clear that, in good years like 2011, the majority of both individual farms and enterprises could afford higher rental prices, at least up to a level of 3,000 KZT/ha (15 EUR/ha) for individual farms and up to 5,000 KZT/ha (25 EUR/ha) for enterprises.

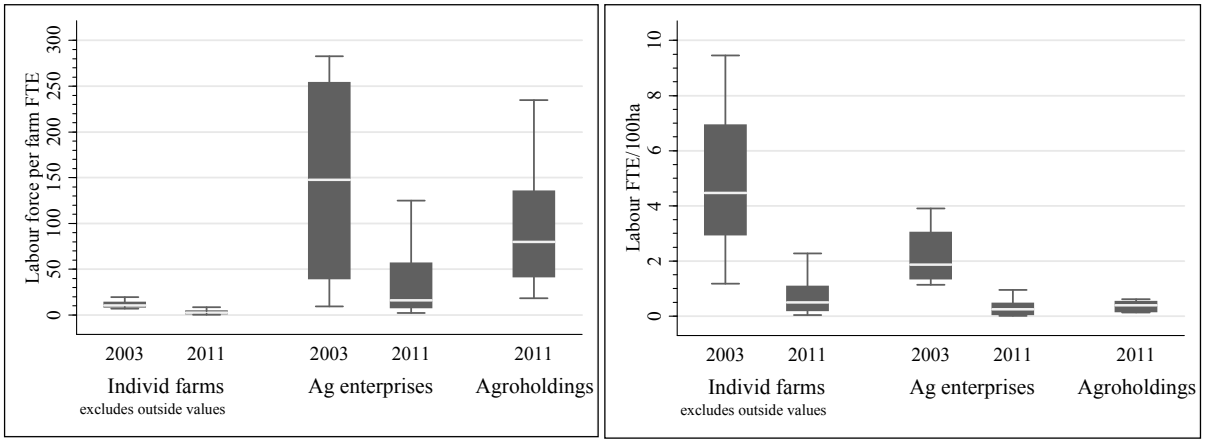
We conclude that the land market in Kazakhstan's grain region was freed from legal constraints recently and that farmers have learned how to deal with land market transactions. In response, activity on the land rental market has increased significantly, whereas there are still very few sales transactions. As a consequence of little sales market development and government ownership as the default situation, rental transactions are almost exclusively with the government, i.e. rentals of state and municipality land. In 2011, every second farm entity

in our sample had rented outside land in addition to its founding resources, irrespective of its organizational type. This led to a significant growth in average farm sizes between 2003 and 2011: the median individual farm in our Akmola sample doubled its land resources, while the median enterprise grew by one half. Given a normatively set land rental price close to zero and limited state land resources, there is now widely perceived supply rationing in the land market. Our shadow price estimations reveal that the majority of individual farms and farm enterprises could afford to pay higher rental rates. The so-defined willingness to pay for land is highest among individual farms in the size range of 100 to 500 ha. It is even higher for enterprises or agroholdings of around 50,000 ha.

4 Competition for labour

Figure 5 displays total labour input by farm type and year, per farm and per 100 hectare. Data on labour use was recorded in days for both permanent and seasonal workers and then transformed into Full Time Equivalents (FTE), using the ratio of 242 days/FTE. This was the most common ratio stated by the surveyed managers.

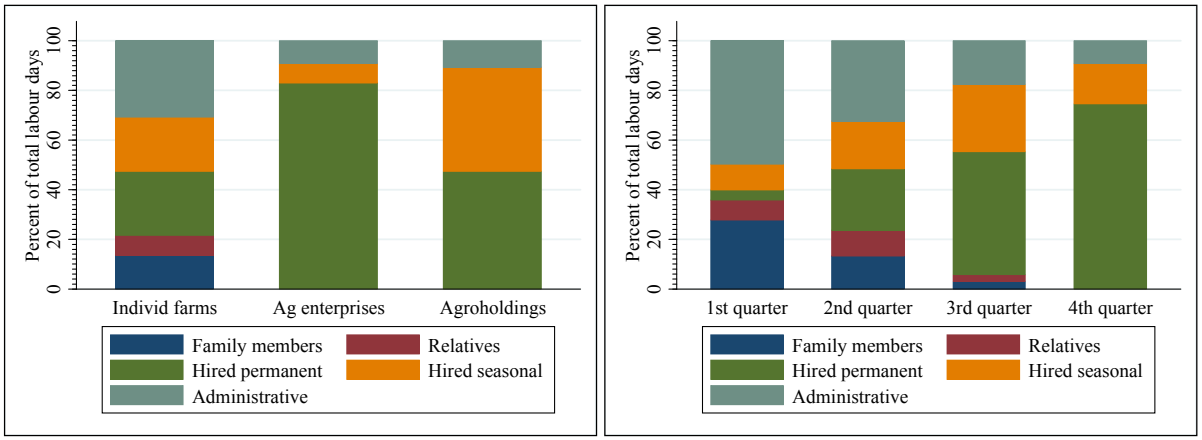
Figure 5: Labour force & labour intensity (Akmola province)



Notes: FTE = Full Time Equivalent based on 242 working days per year.
Source: Author based on World Bank & IAMO farm surveys.

Interestingly, the trends in labour use are quite different from those in land use. Both individual farms and enterprises used much less labour in 2011 than in 2003. The downsizing of the labour force is particularly evident for enterprises. While this type of farm typically employed 150 and more workers in 2003, the figure is now lower than 50 in most enterprises. The median enterprise had a labour input of 16 FTE in 2011. In the same year, the median individual farm employed approximately 3 FTE. As all farm types commonly expanded their land resources, labour intensity went down considerably between 2003 and 2011. It is now at 0.5 FTE/100 ha on individual farms, at 0.3 for enterprises and at 0.4 for agroholdings.

Figure 6: Labour composition (2011, Akmola province)

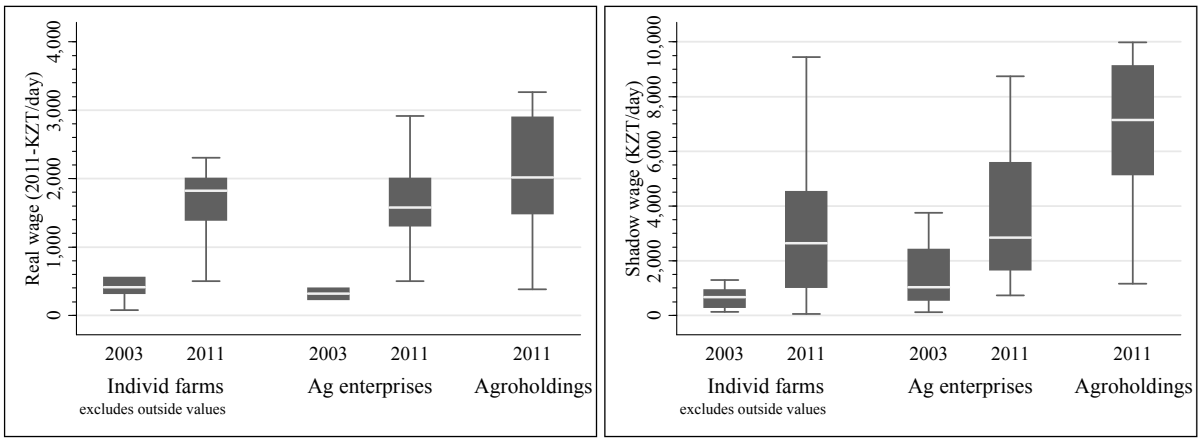


Notes: "Administrative" group includes farm manager as well as (potentially) other administrative personnel such as accountants and human resource managers. Right chart shows labour composition according to size subgroups (all farm types) defined by 2011 Akmola farm size quartiles: Q1=364 ha; Q2=1,514 ha; Q3=9,350 ha.
Source: Author's calculations.

In the 2011 survey, labour days were recorded separately for the five groups of workers listed in Figure 6. The left chart displays the relative composition of the total labour force according to farm types. The right chart pools all farm types and gives the composition according to farm size quartiles. The figures show that family labour plays a certain role in smaller and individual farms, whereas enterprises and bigger farms mostly rely on hired labour. Note that the farm manager is counted as administrative staff. On individual farms, the manager is typically the owner and thus the residual claimant. In 2011, only on 10% of the individual farms was there any hired management. (Other) family members and relatives are commonly employed in practical tasks of crop or livestock production.

The average composition of labour force for the individual farms in the left chart of Figure 6 is a bit misleading. It suggests that the typical farm using 3 FTE employs approximately one permanently hired worker in addition to the manager, plus a mix of seasonal and family workers. In reality, two different models prevail. Either the individual farm is mostly run by family members alone (manager plus relatives) or by the owner-manager and a (sometimes larger number) of permanently hired workers who are not family members. Having said this, it is typically the case under both regimes that farmers hire additional seasonal workers during the peak season. On agroholdings, typically half of the work is done by seasonal workers, the highest share among all farm types. 98% of seasonal workers are recruited locally from the area; there is no reported case of seasonal labour immigration from abroad.

Figure 7: Real wage & shadow wage level (Akmola province)



Source: Author's calculations.

Given the renaissance of agriculture in the Kazakhstan grain region and the fact that the region lost almost one third of its population due to emigration during the 1990s, rural labour is now becoming a scarce factor. In the 2012 data collection round, 66% of individual farm managers said it is "very problematic" or "problematic" to find skilled workers. The same was true for 40% of the enterprises and 75% of the agroholdings. This finding is in contrast to the perceived stereotype that post-Soviet areas are crowded by rural unemployed who were left behind by the harsh transition process. It is, however, consistent with a significant rise in real rural wages, as shown in the left chart of Figure 7. According to these figures, the median wage for hired workers on individual farms in 2011 prices went up from 470 to 1820 KZT/day (2.35 to 9.10 EUR/day). This measure represents an average of permanent and hired workers. Wages on enterprises were somewhat lower, but increased in a similar order of magnitude. Agroholdings pay the highest wages, namely 2000 KZT/day (10 EUR/day) and more.

Using the production elasticities estimated in Table 2, we also calculated the shadow wage or marginal value product of labour (Figure 7, right chart). Not only did the shadow wage rise over time, in 2011 it was also typically higher than the real wage paid. Individual farms and enterprises could afford to pay 2500 KZT/day and more in 2011, agroholdings even 7000 KZT/day.

Compared to land, labour is a mobile factor and the labour market is less regulated than the land market. It is true that there was significant labour shedding on agricultural enterprises between 2003 and 2011, so that rising wages could simply be the result of a change in the labour force composition. Even so, it has become difficult for agricultural operators to find skilled workers more recently and competition on agricultural labour markets has increased. While a considerable share of labour is supplied by family members on individual farms, enterprises and agroholdings have to rely entirely on hired workers. Among the latter two groups, enterprises belonging to an agroholding use less labour per hectare, display a higher marginal labour productivity and pay higher wages. Agroholdings thus tend to be the most competitive bidders on the rural labour market. At the same time, their managers expressed the most vigorous concern about finding good workers.

5 Conclusions

More than twenty years after the end of socialism, large and super-large corporate farms in Kazakhstan's grain region appear alive and well. They emerged from the liquidation of the former collective farms, but with less fundamental restructuring than expected initially. Based overwhelmingly on rented state land and hired labour, they represent an extreme counter-

model to the received family farm of the West. Our farm-level analysis shows that the biggest among them, the enterprises belonging to an agroholding parent organisation, have been those with the highest factor productivity and the strongest competitiveness on land and labour markets recently.

But this is only half of the story. What makes Kazakhstan so interesting is that individual farms emerged in parallel and now cultivate a little more than one quarter of the agricultural land resources in the grain region. Individual farms have access to state land as well, so that the median farm size in our sample doubled between 2003 and 2011. They are much closer to the Western family farm model, as many of them rely mostly on family labour. Their factor productivity is comparable to the bulk of agricultural enterprises. Furthermore, our estimation of technical returns to scale revealed that these are approximately constant. In other words, there is no technical advantage from a bigger scale of operation.

It is possible that the higher share of enterprises in total land use reflects political preferences for this type of farm organisation. During most reform steps of the previous two decades, large corporate farm enterprises were the explicit or implicit template endorsed by the political administration (Petrick et al. 2013). But to what extent this really meant a handicap for individual farms is difficult to assess. Given their growth record, the disadvantage was unlikely to be severe.

There is still very little knowledge about the relevance of supervision costs in hierarchical farming organisations. Neither do we know whether there are really systematic differences between enterprises and individual farms at all (such as, e.g., suggested by Carter and Zimmerman 2000), nor is it evident how different farm types try to curb the problems associated with labour shirking (e.g. by performance pay or satellite-based control systems). Fortunately, there is more information available on this topic from the survey data which has yet to be analysed. Further analysis is also required on the causes of productivity differences across farm types and sizes. Surely, different management abilities and access to outside funding will be among the factors that are central to such an analysis.

It is thus too early to conclude that large corporate farms are economically superior to individual (family) farms. The shadow prices for land in our Kazakhstan data rather tend to predict a polarised farm structure for the future, with (in their respective groups) smaller family farms and bigger enterprises or agroholdings being the most competitive farm entities. Given the quantitatively exhausted state land resources and the pending government plans to raise the normative land rent, competition for land will further increase in the future. However, the present analysis clearly calls into question that family farms are a per-se desirable or even the only viable way of organising agricultural production. This in turn suggests that a revision of the perceived family farm theory should be considered.

One of the implications of such a revised theory may be that policymakers should avoid favouring specific farm types or forms of agricultural organisations. On the grounds of productive factor use and competitive labour remuneration, the case of Kazakhstan provides no arguments that help denouncing large-scale agroinvestment as “land grabbing” on the back of the rural population.

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