Colonization and changing social structure: Kazakhstan, 1896-1910[1]

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Abstract

This paper investigates how, under increasing land pressure during Russian settlement in Kazakh steppes in the late-XIXth century, family-based institutions and social structure of Kazakhs evolved to adapt to new economic conditions. Using a rich dataset constructed from Russian colonial expedition materials, we find that during the transition from nomadic pastoralism to a semi-sedentary pastoralist-agriculture system, the size of Kazakh extended families increased, those of communes and clans decreased, and that Kazakhs identified stronger with lower levels of genealogical clan system. Within families, property rights on land became more individualized, households became less likely to pool labor to farm, and wage labor contracts in agriculture became common. We discuss theoretical explanations for the observed patterns.

1. Introduction

Both development economists and economic historians have recently been debating about the role families, kinship networks and clan play in shaping individual incentives and

determining aggregate economic outcomes and development trajectories. Researchers have documented the importance of such institutions for migration decisions, occupational choice, credit, public good provision, and numerous other aspects of economic life (see, for instance, Leunig et al., 2011; Gupta, 2014; Wegge, 1998; LaFerrara, 2003; and Greif and Tabellini, 2015).[2] The importance of these customary institutions have been shown in highly diverse contexts, spanning all areas of the developing world (for India, see Platteau, 1995, Munshi and Rosenzweig, 2006, and Gupta, 2014; for China, see Freedman, 1958, and Greif and Tabellini, 2015; for Mexico, see Munshi, 2003; for Sub-Saharan Africa, see Platteau, 2000, and LaFerrara, 2003, etc.).

Institutions, however, are not fixed in time and tend to evolve in response to changes in the socio-economic environment. Historians and anthropologists have long been concerned with the evolution of family institutions and the role of economic factors behind such evolution (see, for instance, Goody, 1983; Todd, 2011). Similarly, the study of institutional change has been for long time an active area of research in economic history (see, for instance, Davis and North, 1971; North, 1990; Greif, 2006, for classic contributions). Development economists, however, tend to ignore changes in family institutions when examining the impacts of policies or changes in resource endowments, making the assumption that these institutions (such as co-residence patterns, inheritance practices, or marriage patterns) change very slowly, so that taking them as given is not problematic (see Fafchamps and Quisumbing, 2007, and Cox and Fafchamps, 2007, for reviews). Recent contributions challenge this assumption and study how household composition (and, in some cases, pre-mortem inheritance practices) change in response to

[2] Excellent surveys of this literature are provided by Cox and Fafchamps (2007), LaFerrara (2007), and Munshi (2014).

technological change (Foster and Rosenzweig, 2002), raising land pressure (Guirkinger and Platteau, 2015), land policies (Bardhan et al., 2014), or programs of public transfers (Hamoudi and Thomas, 2014). The latter two studies indicate that ignoring impacts of policy on household divisions may lead to substantial biases in the evaluation of policies.

One of the difficulties in studying change in family institutions in general is limited data availability. Ideally, one needs a panel data including both the measures of institutions and behavior (preferably, at micro-level), with sufficiently large time frame. Moreover, such data should come from episodes or periods of relatively large-scale changes in the economic environment of the society under study. Clearly, such a combination of circumstances and data is rare.

In this paper, we exploit one such dataset that we have constructed using Russian colonial statistical expedition materials in Central Asia. More specifically, we focus on the extended-family and clan-network institutions of Kazakh nomadic pastoralists in the late 19th – early 20th century. This was a period of massive Russian peasant in-migration into Central Asia, a migration that implied a sharp increase in land pressure in Northern, Western, and Central Kazakhstan. We document how the traditional institutions of Kazakhs changed in response to rising land pressure and new agricultural technologies that Russian colonization brought about. In particular, we document changes in co-residence patterns (i.e. the size of extended families sharing the same winter stop and communes sharing summer pastures) and in production relations within extended families (the individualization of property rights on land and the development of labor markets). We also explore how the observed changes in family organization can be understood theoretically as rational responses to the new economic environment. Our main findings can be summarized as follows. Russian peasant in-migration

increased land pressure and contributed to transfer of agricultural technology of sedentary peasants to Kazakh pastoralists. These factors induced Kazakhs to switch from nomadic pastoralism to semi-sedentary mixed economy. In the process accompanying this economic transition, the size of Kazakh groups of kin-related households residing together (the "extended family") increased, while household size remained roughly constant. Contrarily, communes and clan groups became smaller, property rights on most valuable land plots became more individualized within the extended families and common organization of production at the extended family level gave way to household-based production. Simultaneously, households increased their reliance on hired labor (with wages paid largely in cash) for crop and hay production and part of these labor contracts were likely to be established within extended families (rich households hiring their poor relatives. Given that the institutions governing land and labor allocation within families are typically considered as being "slow moving" (Roland, 2004), the changes we document here are remarkably fast. Our panel of provinces indicate for example that over a 7-10 years period, about 10% of extended families abandoned collective hay making (at the level of the extended family) and distributed hay plots to individual households composing the extended family. The same proportion of families stopped to organize crop production at the level of the extended family (making it each household responsibility instead) and increased their reliance on hired labor.

2. Data and historical background

2.1.Data sources

For our main source of data we rely on the quantitative materials collected by the Russian colonial expeditions into Kazakhstan, in two waves (F.A. Shcherbina, 1898, 1902a, 1902b,

1903a, 1903b, 1907, 1908; V.K. Kuznetsov 1909, 1910a, 1910b, 1910c, 1910d; P.P. Hvorostanskii 1912a, 1912b). The first-wave expedition, headed by Fedor Shcherbina, lasted from 1896 to 1903 and covered 12 provinces in 3 regions in Western, Northern, and Central Kazakhstan.[3] Virtually all Kazakh households that had their winter stop in these 12 provinces were included in the survey. Guirkinger and Aldashev (2016) provide the details of the history of the expedition, its objectives, the type of materials that were collected, as well as a summary of the analyses by historians of the reliability of the data collected by the expeditions. In brief, this data constitutes highly reliable and detailed agricultural censuses: The results for each province were published as a separate volume, each containing a descriptive part and a series of annexes (including the original variables recorded and aggregated at various levels). The annexes (from which we extracted most of the information used in our analyses) contain tables with demographic (age and gender structure), economic (livestock wealth, cultivation, labor relations), technological (techniques of agriculture, tools used), and institutional (land-use and land-ownership institutions) variables.

The major goal of the Shcherbina expedition was to calculate the approximate number of Russian settlers that these provinces could accommodate. The expedition built its conclusions regarding the amount of land that could be used for Russian peasant settlers on the basis of the explicit assumption that (most of) Kazakh population would maintain its nomadic economic lifestyle. However, the General Department was disappointed with the conclusions of the study

[3] As in Guirkinger and Aldashev (2016), we adopt the following convention in translating the names of administrative levels created by the Russian administration in the Kazakh steppes: the large administrative area (*oblast*) corresponds to a *region*, its sub-division (*uezd*) to a *province*, and the smaller administrative area (*volost*) to a *district*.

(Petrova 1979) and considered that the rapid sedentarization of Kazakhs that was under way implied that substantially more land could be freed up for peasant settlement. It subsequently decided to finance another wave of expeditions. This second wave took place between 1907 and 1913 and consisted of 5 separate smaller expeditions. Three expeditions (the one headed by Kuznetsov and covering the entire Akmolinsk region, the second headed by Perepletchikov and covering 3 of 5 provinces of the Semipalatinsk region, and the third headed by Hvorostanskii and covering the entire Turgay region and 3 of 4 provinces of Ural'sk region) allowed to obtain repeated observations for 10 of 12 provinces analyzed in the first wave. In addition, two expeditions (Skryplev expedition covering the entire Syr-Darya region and Rumyantsev expedition covering the entire Semirechie region) collected data from the Southern part of Kazakhstan that was not reached by the first-wave expedition.

In this paper, we use aggregate data at the province level from the two waves of expeditions for 7 provinces of Northern and Central Kazakhstan (Aktuybinsk, Kustanay, and the entire Akmolinsk region with its 5 provinces), as well as extended family level data from the first wave for the same provinces (approximatively 11300 observations). In addition, for one province (Petropavl) we were able to match the extended-family questionnaires across the two waves of expeditions and constructed a panel dataset with 1335 extended families. Figure 1 shows the geographic location of these provinces.

2.2.Kazakh nomadic-pastoralist economy

Nomadic pastoralism became the dominant economic form in Kazakhstan around 1000 BCE (essentially because the climatic conditions for agriculture worsened around that period) and remained so until the middle of the 19th century, when Russian in-migration into the Kazakh steppes took off. The nomadic pastoralist system relied on herding, and thus livestock represented

the main stock of wealth, as well as the key production input and the principal source of food. In terms of livestock composition, Kazakhs mainly held and bred horses and sheep; once the shortening of nomadic trajectories started, as described below, cattle also became an important category of livestock. The nomadic pastoralism in Kazakhstan consisted of seasonal transhumance, i.e. of changing physical location of households and its livestock between two and four times during the calendar year. These transhumance between summer and winter pastures (with relatively shorter stays on intermediate autumn and spring stops) was necessary because livestock under this system lived throughout the year on natural grass cover as fodder; thus, remaining permanently on the same place would have rapidly become unsustainable.[4]

Kazakh nomadic pastoralism was a carefully balanced system developed through centuries of adaptation to the geography and the climate of the area. Summer pastures provided abundant fodder during the warmer months; however, these areas became inhabitable in winter. Distances between the winter and summer pastures were large, often exceeding 200 kilometers one way (Matskevich 1929; Ferret 2014). The scarcity of good winter pastures (areas close to rivers, lakes, and hills) implied the need to preserve the fodder of the winter pasture for the next year. This need, coupled with the relatively flat landscape in most of the Central and Western Kazakhstan, resulted in long-distance seasonal transhumance of Kazakhs. A contemporary observer described the logic of this system as follows:

"For livestock to survive on natural pasture through the winter, it has to grow enough fat during the summer; this is obtained if summer pastures are sufficiently rich in grass… If summer pastures are constrained, the livestock is unable to accumulate fat, and thus to avoid that it loses

[4] Ferret (2014) provides a detailed classification of main forms of nomadic pastoralism in Central Asia at the end of the 19th century.

weight even further, it becomes necessary to move earlier to the [intermediate] autumn pastures… The lack at any of these three pastures [summer, autumn, and winter] cannot be compensated even by excellent quality of the other two; for instance, lack of grass at natural winter pastures, no matter how abundant are the summer ones, will break the equilibrium of the nomadic economy and lead to the destitution of Kazakhs…" (Dzhanturin 1883: 16-17)

The harsh climatic conditions of the steppe and the reliance of natural grass cover (rather than producing and stocking fodder) implied that the nomadic pastoralist system was vulnerable to climatic shocks. *Jut*, the Kazakh word for a particularly dry summer (during which animals were unable to accumulate enough fat) followed by a harsher-than-normal winter, implied huge generalized losses of livestock. For instance, Tolybekov (1971, p. 541-542) reports that approximately 59 per cent of total livestock was lost during the *jut*-year winter of 1879/80 in Irghiz and Turgay provinces. The frequency of such shocks was high: the winters of 1850/51, 1855/56, 1879/80 and 1891/92 were *jut* years leading to large-scale losses of livestock (Tolybekov 1971, p. 542).[5]

Interestingly, this vulnerability to climatic shocks was substantially mitigated by some of the technological changes in livestock management that Russian migrants brought into the Steppe during the 19th century. Contemporary accounts attest that hay-making started in the Kazakh

[5] The management of climatic risk to livestock is one of the main problems faces by Mongolia that currently features the society and economic organization most similar to Kazakhs of the period under study (see Benson, 2011, and World Bank, 2015). The Mongolian word for such climatic shock, *dzud*, is clearly of the same origin as the Kazakh *jut*.

steppes around 1840s-1850s. For instance, Daulbayev (1881), describing the economic organization of the Kazakhs of Kustanay province between 1830 and 1880, writes:

"[Around 1830] they moved regularly during the winter along those rivers from one place to another, with their livestock and families, seeking forage for their animals, given that no one among them prepared hay for winter and did not do any cultivation… After [the administrative] changes [of 1835-1840s], first the Kazakhs living closest to the Russian settlements, and later also others, taking their Russian neighbors as examples, started to prepare hay for their livestock for winter and to build winter enclosures for their animals" (Daulbaev 1881: 99, 113).

Several other authors indicate that this technique was learnt by Kazakhs from their Russian neighbors (Katanaev, 1904; Shcherbina 1908: 202-208; Kurylev 1998: 34-35). Crucially, these changes implied that the period of the winter stop could be lengthened, as livestock no longer depended solely on the natural grass cover available at the winter pasture. The positive effect of this innovation was that the animals could survive even during the *jut* years.

2.3.Family and clan institutions of Kazakhs

The nomadic-pastoralist society of the Steppe was structured around the clan system, which consisted of complex networks of blood-related lineages. A strict exogamy rule banned marriages within the same clan: more precisely, relatives up to the seventh degree could not marry each other. The clan identity was transmitted from fathers to sons, whereas women integrated their husband's clan. This social organization was structured in several layers (see Figure 2), each with a specific economic and social role.

The smallest unit was a household consisting of a married couple with several children and, sometimes, other close relatives. A household held private property on livestock but not on land: the smallest unit with claims on land was the extended family (called *aul-q'stau* in Kazakh

and *khozyajstvenniy aul* in Russian). This was a small community of several nuclear households (around 9-10 households in our data) that were typically closely related by kin. The extended family spent the whole year together, its households living at a short distance from each other during winter at the winter stop and migrating – together with other extended families of the same clan – to the summer pasture.

Several extended families jointly constituted a clan (*ata-balasy* or "descendants of the same grandfather" in Kazakh), whereas several clans composed a tribe (*ru* in Kazakh).[6] Land on winter stops was closed-access common property resources of extended families, whereas summer stops were common property resources at the clan level. Access to pastures was carefully regulated within the clan.

There was a substantial degree of inequality within extended families, mostly because livestock ownership was on the basis of nuclear households. This meant that an average extended family included one or two wealthy households ("*bay*") as well as their poorer relatives, which were often economically dependent on *bay*'s household. Tolybekov (1971) writes: "From the outside, [an *aul*] looked like a certain amount of temporarily built *yurt*s [wooden-structure houses covered with felt]… There was no common ownership of belongings. Households represented economic units having livestock as their private property… Wealth inequality existed between them" (Tolybekov 1971: 500).

[6] Tribes themselves entered into one of the three larger confederations or hordes: Senior, Middle, and Junior (*juz* in Kazakh). These upper layers of the social structure (*ru* and *juz*) played the role of regulating inter-clan conflicts and managing diplomatic relations with the neighboring countries.

The main role of the extended family (headed by a patriarch called xxxx, which stands for white beard) was the management of land on winter pastures – the main asset for nomadic pastoralists in the arid steppes of Central Asia. The economic environment related to land on such pastures could substantially affect the composition and size of extended families: "The *aul*s of nomadic pastoralists varied in size, and changed even within a year, which occurred under the influence of social and natural conditions, such as the wealth of households, quality of grass cover, etc." (Tolybekov 1971: 500-501).

The next level of social structure – the clan – fulfilled several other key functions. It played a central role in nomadic production through its coordination of joint transhumance, to and from the summer pasture, and the regulation of access to land on the summer pastures. Towards the end of winter, the heads of extended families belonging to the same clan sent messengers to each other, to agree on the timing of migration to the summer pasture that they jointly exploited (Chormanov 1906). The coordinated move to the summer pastures helped organize the defense against possible raids of livestock thieves during the move, facilitated the appropriation of summer pastures (as land rights on summer pastures were relatively loosely defined and inter-clan conflicts over their boundaries were common), and enabled a clan to exploit economies of scale in caring after the herds (Masanov, 2011: 408).

Second, the clan provided insurance against shocks to its members. For instance, if a family lost livestock to predators or a particularly harsh winter, other members of the clan provided the family with some livestock (Vladimirtsov, 1934). The geographic spread between winter pastures of the members of the same clan often was quite large; thus, in case of a climatic

shock (a particularly harsh winter) in one area, the members of the clan having winter stops in other areas contributed to partially cover the livestock losses of the former.[7]

2.4.Russian resettlement and colonization

In the first half of the 18th century, facing extended wars with their Eastern neighbors from China (Oirats), Kazakh tribes officially requested to become a protectorate of the Russian Empire in the first half of the 18th century. The Kazakhs of the Junior Horde were the first to request this status in 1731, followed by the Middle and Senior Hordes in 1735 and 1748. Through the 19th century, the Russian emperors gradually transformed the protectorate status of the Kazakh Steppes into that of a colony through a series of political and administrative reforms and military interventions. These reforms started in 1822 with the abolition of the khanate of the Middle Horde and terminated in 1868 with the declaration that the entire territory of Kazakhstan was under the control of the Russian Empire (Abuseitova et al., 2001, pp. 353-359).

The migration of Russians into Kazakhstan that started in the 17th century was initially small but accelerated in to the last quarter of the 19th century, reaching its peak in the 1910s. It developed in two phases (Cossack military and poor Russian peasant); it was the second and largest phase that led to fundamental structural changes in the Kazakh nomadic economy. This phase started in 1861 (Galiev, 2009: 223; Demko 1969: 52), after the abolition of serfdom. Between 1861 and 1889, the first wave of peasant settlers started to arrive into the Steppe. This in-migration was limited and somewhat chaotic. Although these peasants migrated without State encouragement and planning, the Czarist administration tolerated this migration because it eased

[7] For a discussion of other roles played by clans, see pp. 88-90 of Guirkinger and Aldashev (2016).

land pressure in the European part of Russia. The year 1889 marked the adoption of the First Resettlement Bill: the State started to actively encourage peasant in-migration into the Kazakh Steppes and tried to regulate it. This bill offered the Russian landless peasants land "for free", in the amount of 15 desyatinas (approximately 16.4 hectares) per household, in the Asian part of the Russian Empire (Olcott, 1995: 87). The Resettlement Administration (*Pereselencheskoe upravlenie*) was created, and in 1895 the Czarist government organized and financed the statistical expeditions into the Steppe (we use the materials of these expeditions in this paper). Finally, after 1906 (the year of the start of Stolypin agrarian reforms), peasant resettlement became an imperial priority and turned into the fully-fledged colonization, aiming at maximizing the use of land resources throughout the Russian empire.

As reported by Demko (1969), in 1897 the Russian-speaking population of the four Kazakh regions directly bordering with Russia (Uralsk, Turgay, Akmolinsk, and Semipalatinsk) comprised 496 thousand people, corresponding to 20.6 per cent of the total population of these regions. By 1905 this figure increased to 844 thousand people, corresponding to 28.9 per cent of the total population.

This massive in-migration both discouraged nomadic pastoralism and encouraged sedentary agriculture at winter stops (soil and climatic conditions at summer pastures did not allow crop cultivation). On the one hand, the large-scale occupation of pasture lands and transhumance routes made nomadic pastoralism more costly, because, as Sedelnikov (1907) noted:

> "Reduction in pastures led to an increasing death of livestock in winter... and this forced weaker and poorer tribes to re-consider their future: given that the previous form of the economy could not provide their subsistence, they had to look for another one that better

corresponds to the new situation... And now these tribes sedentize in the north to live there for the entire year, close to and partially under the protection of Russian villages" (p. 23).

In addition, there was knowledge transfer concerning crop cultivation and the relevant agricultural tools. Demko (1969) mentions that the example of settlers influenced numerous poor Kazakhs, particularly those with relatively small herds, to attempt crop cultivation. Such transfer occurred to a large extent through direct observation:

> "[Some Kazakhs] have been stopping by the Russian towns and observing how the Russian ploughed. At first they hired Russian peasants for agricultural work, but when they saw how profitable the agriculture could be, they started to plough themselves. Thus, according to the testimony of the Kazakhs themselves, they started laboring the soil and even now it is practiced under the influence and with the direct participation of the Russian population, [...] mostly peasants" (Tikhonov 1903, p. 69)

Russian colonization also substantially modified the property rights on land. Until 1891, the land legally belonged to Kazakh tribes. In that year, the Rulings Concerning the Administration of Akmola, Semipalatinsk, Semirechinsk, Ural, and Turgay Regions stated (Article 119) declared that the land occupied by nomads was the property of the State (Zimanov 2005: 500-518). This regulation did grant Kazakh nomads usufruct rights on the land that they occupied for pastures; however even these rights could be revoked (Article 120). The ruling officially gave the Kazakhs rights equivalent to those of Russian peasants (Article 11). One should note, however, that the formal land titles introduced by the Tsarist administration were regularly trampled by colonial settlers; thus, the equality of rights applied only to Kazakhs who conducted cultivation and only to those plots that served agriculture (Martin, 2001).

As the above descriptions show, the family and social and organization Kazakh nomads was intimately related to their production system. Each layer of this organization played a well-defined role in the allocation of productive resources (e.g. clans as manager of summer pastures, whereas extended families as managers of winter pastures). We now proceed to exploring how clan and family institutions adjusted to the large-scale changes in the production system triggered by Russian peasant colonization We start by documenting the transformations in the production system, in particular, in families relatively close to Russian settlements. We then investigate changes in family and clan institutions per se. More specifically, we focus on three dimensions of these institutions: co-residence rules at the winter stops and summer pastures, property rights over land within the extended families, and labor allocation within the families. For each of these dimensions, we describe changes over time (using our panel of provinces) and the correlation between the institutions and the geographic proximity to Russian settlements (using the extended-family dataset from the first wave). We then proceed to a discussion of the economic mechanisms driving these changes.

3. Changes in the production system

The massive Russian in-migration triggered deep changes in the production system of Kazakhs, towards more intensive uses of land. First, introduction and massive diffusion of the practice of haymaking (consisting in cutting natural grass, drying and storing it to feed livestock during the cold season) enabled to sustain more animals on a given land area during the winter. This resulted in longer stays at the winter stops and shorter transhumance distances. Second, crop cultivation – also implying a more intensive use of land – gradually became an increasingly important source of supplementary nutrition for Kazakhs.

To document these changes, we first present the correlation between the reliance on more land-intensive techniques and the geographical closeness of Kazakh winter stops to Russian settlements, using the large cross-section of extended families surveyed by the first expedition. We then show changes over time in the same variables at the more aggregate level, by using the panel of provinces.

Around 1900 the concentration of Russian settlements was greatest in areas close to province capitals. Over time, the density of settlements increased almost everywhere, however it still remained highest in the vicinity of the province capitals. This can be seen from the comparison of Panels A and B of Figure 3. We thus expect that both the increase in land pressure and diffusion of more modern agricultural technologies are stronger in areas closer to the province capitals, and that the distance from the winter stop to the province capital is negatively correlated with the adoption of more land-intensive production techniques. Relatedly, in terms of the timing of adoption, we expect that these transformations must have occurred earlier in such closer areas

These expectations are confirmed in our data. Table 1 breaks down the sample by decile of distance to the province capital and reports, for each decile, the share of extended families that cultivate crops (column 1), the number of years since they started cultivating (column 2), and the share of extended families that produce hay (column 3). We observe a monotonic decrease in the fraction of cultivating families, from 0.85 in the first decile to 0.45 in the last one. Similarly, the experience of cultivation is longer in areas closer to the province capital. Finally, production of hay is nearly universal in the first 6 deciles, whereas it is present in only about 80% of families in the last two deciles. Definitions and descriptive statistics for all the variables are presented in Table 2.

Regression analysis confirms these findings. Table 3 reports the results of OLS regressions at the extended-family level forthe propensity to cultivate (columns 1 and 2) and the propensity to produce hay (columns 5 and 6). Columns 3 and 4 report the marginal effects of Tobit regression; the dependent variable is the number of years that the extended family has been cultivating. The distance to the province capital has a large and significant impact on all the three variables, even after controlling for the size of the extended family (measured by the number of nuclear households it contains) and adding province fixed effects. Similar results obtain when we replace the distance to capital (in *verstas*) by log distance. The results in columns 2, 4, and 6, for example, suggest that one standard deviation increase in the distance to the province capital (154 *verstas*) reduces the propensity of a Kazakh extended family to cultivate by about 15 percentage points, the average number of years of cultivation by about 7 years, and the propensity to produce hay by about 15 percentage points.

Turning to the panel of provinces (in Akmolinsk region), the comparison between first wave and second wave's production patterns confirms that a transformation of the production system was clearly under way. Table 4 indicates that in nearly all the provinces the total number of haystacks produced increased substantially over the ten-year time period between the two waves, increasing by 60% for the whole region. Crop production (measured by the total area devoted to cultivation) also increased substantially (area cultivated increased by 54% for the whole region) and almost in all provinces, with the exception of Kokchetav province. In this province also (as well as in Atbasar) the share of households cultivating somewhat declined. Kuznetsov (1909, 1910c) explains that in these two provinces there was a large heterogeneity in the change of share of households that cultivated, over the ten-year period between the two waves. In districts where land was more suitable for agriculture, Kazakhs intensified the cultivation of crops. Contrarily, in areas with poor land suitability, the "early starter" households

realized that crop cultivation was not profitable and thus gave up cultivation. On average, these two tendencies amounted to aggregate decrease in the share of cultivating households.

4. Changes in family institutions

4.1.Change in co-residence patterns

We know turn to the analysis of the changes in family institutions that occurred over the same period. We start with a description of co-residence patterns, first at the winter stop and then at the summer pasture. Recall that the households composing extended families share the same winter stop and migrate jointly to the summer pasture where they meet other families of their clans and form one large commune. As the production systems adapt to the new environment (growing land pressure, availability of techniques and tools), the size of extended families increases while the size of communes decreases. This is visible in our data and confirmed by contemporary observers.

Starting with the correlation between distance to the province capital and extended family size, Table 5 reports the average number of households in extended families by decile of distance to the province capital. It indicates a clear decrease in family size as the distance grows: in the first decile extended families count on average more than 2 additional households as compared to the last decile. Contrarily, the average household size is remarkably similar across deciles (see the last three columns of Table 5). Table 6 reports the result of simple regressions where the dependent variable is either the size of the family or of the household and the key variable of interest the distance to the province capital or its logarithm. It suggests (column 1) that a one standard-deviation increase in the distance to the province capital is associated with a decrease in the size of the extended family of 1.08 units (therefore about 6.42 individuals). The size of the

household also appears to be negatively (and significantly) correlated with the distance to the province capital, but the size of the coefficient is small: a one standard-deviation increase in the distance to province capital is associated with a decrease in the average size of the household equal to barely 0.046 individuals (column 3).

Turning to the temporal changes captured by the panel of provinces, Table 7 reports the distribution of extended families by size ranges (1 to 5 units, 6 to 10, 11 to 15, 16 to 20, 21 to 30, 41 to 50 and more than 50)[8] and by provinces over time. Comparing the results of the first and the second wave of data suggests a rightward shift in the distribution, whereby the total number of households in the first (and sometimes second) category strictly decreases over time while the number of households in the larger size category increases over time. For instance, in Petropavl province, an average extended family in 1901 contained 8.6 households and 50.4 individuals, whereas 7 years later, these measures went up to 9.2 households and 53.9 individuals. This rightward shift in the size distribution of families can also be seen on Figure 4, which depicts the 1901 and 1908 cumulative distributions for this province. Notice instead, on Figure 5, that there is no change in the size of nuclear households, suggesting that the observed change in extended family size is not a demographic (i.e. fertility-driven) one.

The data from Petropavl province also allows us to investigate the mechanism behind the increase in the size of extended families. Specifically for this province, we can match extended families in the data from the two waves of the expeditions.[9] Table 8 reports the result of this matching. Column (1) and (2) presents the break-down of the first year sample into a) extended

[8] These categories are the ones recorded in the expedition originals in the aggregate data.

[9] The volumes of the second expedition report for each extended family the corresponding family ID in the volume of the first expedition.

families that neither marge nor split across waves; b) extended families that merge; c) extended families that split; d) extended families that are not found in the first wave sample. Columns (4) and (5) reports the break-down of the second year sample into the same categories a), b) and c) and into e) families that are only in the second wave sample and f) families for which we could not find the counterpart in the first wave. The table indicates that the majority of families falls in the first category (68% of the first year sample) and that there are relatively few merges (7% of the first year sample). Furthermore, while extended families that have disappeared in the second wave are slightly smaller, this selection effect cannot account for the overall increase in family size over time. In fact the average number of households in an extended family in the first wave remains very similar if we ignore this category (it increases from 8.6 to 8.7 units). Thus the increase in the size of extended families (that we find on average and in the aggregate) does not appear to be the result of large-scale merging of extended families or of a selection process whereby smaller families are the ones that migrate out. The most plausible explanation for the increase in the number of households composing an extended family must then be that family splits become less frequent.

Turning to the size of communes, an opposite pattern emerges: the size of communes decreases over time. Table 9 reports the average number of extended families by commune in each province of Akmolinsk region for the two years of data. In all provinces the average commune size decreases substantially and on average the decrease represents 1.7 extended families (10.1 individuals on average) in less than 10 years. This decrease is driven by an increase of the number of communes in each province (increase of 13% to 47% depending on the province).

Communes typically consist of several extended families from the same clan. In line with the decrease in the size of communes, we also find that the size of clans decreased substantially. Table 10 compares the clan size distribution between the two waves of expeditions, for 5 provinces of Akmolinsk region. We see that the total number of clans increased substantially across the two waves: in the second wave, depending on the province, 40 to 90 per cent more clans are enumerated by expedition interviewers. Looking across the size distribution, we observe that small clans (containing only 1 extended family) increase dramatically as a share of total clans, whereas large clans (federating 5 or more extended families) command a much small share. While there is substantial heterogeneity across provinces in the levels, the trends are quite similar. How can clan identity have changed so drastically over a decade? To understand this dynamics, it is crucial to remember that Kazakh clans are not disconnected units, but rather elements of a vast interconnected genealogical tree. Figure 6 presents an example of a section of such tree for one of the largest Kazakh tribes (Argyn). It is plausible to conjecture that when asked about his clan, an extended family head declares the branch/level of the genealogical tree with which the extended family members identify most strongly. If so, one explanation for the above pattern is that over the decade under study the extended families became more likely to identify with more recent ancestors in their clan genealogical trees. This conjecture is confirmed by the head of second-wave expedition in Akmolinsk region; he writes: "The clan system is getting substantially weaker and a huge mass of *aul*s [extended families] separate away from old clans into a separate, independent existence… The fall of the importance of the clan system that affects the restructuring of the economic and daily-life organization of Kazakhs is, in turn, clearly determined by various influences of the new living conditions [i.e. sedentarization] of Kazakh population" (Kuznetsov 1910: 56).

4.2.*Change in property rights over land*

The statistical expeditions collected detailed data regarding the level of individualization of land holdings within the extended family. Specifically, our dataset possesses information on the rules regulating access of individual households (within the extended family) to plots used for haymaking. Three main types of rules were used. First, hay plots sometimes were the property of the extended family as a whole, and all households composing the family jointly exploited this land. At the other extreme, in some other families, the hay making plots were owned by individual households. Finally, in certain extended families, households were allocated individual hay plots on yearly basis (every year the extended family re-allocated plots among its member households). Sometimes, within the same extended family, a subset of households adopted one rule (e.g. individual ownership of hay plots), whereas another subset exploited their hay plots jointly.[10]

Table 11 reports the relative frequency of extended families with individualized hay plots and extended families with collective plots by deciles of distance to the provincial capital. Individualized rights are more prevalent close to the provincial capital, with prevalence rate above 65% in the first two deciles and lower than 45% in the last two deciles. Table 12 confirms this correlation in a regression framework, controlling for province fixed effects and the size of the extended family. Column 1, for instance, indicates that a one standard-deviation increase in the distance to the provincial capital (154 *verstas*) is associated with a decrease of 12 percentage points in the prevalence of individualized hay plots.

[10] There was substantial diversity in the way in which the reallocation of hay plots occurred. Enumerators describe cases where the plots were allocated by a lottery, as well as cases when the extended family head had a final say on the allocation (Shcherbina 1902a: IX-X).

Table 13 presents the statistics on the organization of haymaking in the six provinces for which we have comparable data. Two facts emerge. First, there is a lot of heterogeneity in haymaking institutions across provinces: some rely massively on fully individualized plot allocation between households, whereas in other provinces the common-ownership forms seem to dominate. Second, for three provinces for which we have data in both waves, there is a clear tendency towards the reduction of the common-ownership form and an increase in individualization of haymaking production. Thus, the above increase in family size is accompanied by an individualization of property rights within families.

This trends towards individualized production of hay is also confirmed by contemporary observes' accounts. Kuznetsov (1910) writes: "Joint production of hay can be considered as a more perfect form of common use, under which one precludes the randomness in the allocation of quantity and quality of hay associated with the yearly re-allocation arrangement… [In several cases] we have registered the transition from common use of hay-making plots to the individual form in the last 7-8 years. The opposite cases of switching from the individual to the common-use form are extremely rare… Currently, one observes the strengthening of the tendency of some *aul*s and households to better consolidate the ownership of hay-making plots. These Kazakhs say: "The absence of boundaries is bad: lots of arguments and fights emerge during re-allocations, thus it is better that each one has his own plot'…" (Kuznetsov 1910: 114-115)

4.3.Changes in family labor allocation patterns

Another dimension of family institutions we can investigate is how the labor of individual households is allocated across collective tasks at the level of the extended families and individual tasks. In particular our dataset contains information about whether households jointly cultivated crops or not and about their participation to the labor market. The institution of joint cultivation is

referred to as *supryaga* and is different from the collective ownership of hay plots introduced above. In the latter case, the information explicitly refers to individual / collective ownership of *land*, while in the former case, the information concerns *labor* allocation. The two are clearly related, as collective hay plots implied that households worked on them jointly (as described in the published volumes of the expeditions). The reverse, however, is not necessarily true and in fact, the description of the joint crop cultivation suggests that, at least in some case, crop fields were the individual property of households.

Regarding the participation in the labor market, our dataset contains information on whether households within the extended families hired workers for various tasks and whether some household members worked outside their household. In this category we cannot distinguish between wage employment (for agriculture and livestock) and other activities (small businesses). Table 14 reports the average of these variables for each decile of distance to the provincial capital. Joint crop cultivation (column 1) is more common in the last deciles than in the first ones (although the increase is not monotonous throughout): in the first decile households joined their efforts to cultivate crops in 54% of extended families, while in the last decile this figure stood at 86%. Labor hiring for crop cultivation (column 2) follows an opposite trend: it was more common in families closer to the capital (50% in the first decile) than in those further away (36% in the last decile). Labor hiring for haymaking was also more common in the first deciles than in the last ones (although the decrease is neither very steep nor monotonous everywhere; see column 3). In the case of husbandry, our dataset contains information about whether some households of the extended families were hiring workers on a yearly basis. This variable is reported in column 4 and shows again a greater level of development of the labor market closer to the province capitals and a clear gradient as we move away: in the first decile 50% of extended families include households who rely on these contracts, while in the last decile this figure is

38%. Finally, the supply of labor follows a similar trend with 70% of extended families including members who work for a wage (or have a small business) in the first decile and 58% in the last decile (column 5). Comparing the figures reported in columns 2 to 4 to those in column 5 shows that some extended families both demanded and supplied labor (for instance, summing the share of families hiring for haymaking to the share of families supplying labor exceeds 100%).

Table 15 confirms in a regression framework that labor markets were more active closer to the provincial capitals while the joint cultivation of crops by households of the same extended families was more widespread further away from the capital (controlling for province fixed effects and family size). Thus, the prevalence of joint crop cultivation in extended families increase by 5 percentage point on average when the distance to the province capital increases by one standard deviation (column 1), while the prevalence of hiring for cropping simultaneously decreases by 17 percentage points.

For changes over time, in the case of joint cultivation and labor market outcomes the information we have is less systematic than for the other dimensions we analyze in the previous sections. Specifically we have consistent information across time only for two provinces (Kustanay and Aktyubinsk). Table 16 presents the statistics on joint cultivation and the development of labor contract institutions in the period under study, for the two provinces, at the household level.[11] The first column indicates that the share of households engaged in joint cultivation with other households of their extended family decrease over time from 61% to 42% in Kustanay and from 57% to 50% in Aktyubinsk. Simultaneously, the share of households hiring

[11] Although the unit of observation is the extended family, the dataset contains information on the number of households within the extended family that use the various types of labor contracts. We could thus construct the descriptive statistics at the household level.

labor for cultivation increase in Kustanay from 16% to 26% (the information is not available for Aktyubinsk in the second wave). Hiring labor for haymaking also became more prevalent in Kustanay province (and did not change over time in Aktyubinsk). Finally, the share of households hiring labor for husbandry activities decreased in Kustanay and increased in Aktyubinsk but, interestingly, the share of long-term contracts grows: among households hiring workers, the share of those offering yearly contracts increases from 48 to 84% in the first province and from 40 to 73% in the other province (and the average number of yearly employees also increased substantially). Finally, the share of households with members working for a wage or having a small business increased from 31 to 47% in one province and from 32 to 37% in the other province.

An analysis of labor market participation at the extended family level (using the second wave of data) suggests that some labor contracts may have been established within the extended family. Indeed, 72% of extended families include both households who supply hired labor and households who hired workers (not shown in the table). Typically, richer households employ individuals from poorer households to work on the farms of the former. Figure 7 indicates a clear wealth gradient in the participation to agricultural labor market: rich households (as measured by livestock ownership) tend to hire workers while poorer households tend to supply workers. As extended families usually contained both poor and rich households, it is not surprising that they consist of both labor-supplying and employing units. However, wealth heterogeneity within extended families was clearly larger than that across extended families, as Figure 8 illustrates. This figure compares the distribution of household by wealth categories (measured in equivalent horses) to the distribution of average family wealth (in equivalent horses by household) and indicates that the former distribution is substantially wider than the latter one.

Importantly, although the questionnaire did not record whether the workers hired originate from the same extended family, a closer look at labor market participation at the extended family level indicates that although a part of the labor contracts were likely established between households of the same extended families, some labor contracts must have stretched beyond extended family boundaries. In fact, in the two Western provinces (Aktyubinsk and Kustanay) 18% of extended families include only households who hire workers and 10% include only households who supply workers. Furthermore, in about 25% of extended families, the number of workers hired exceeds the number of men who are either working for a wage or are having an independent small business. This implies that more than 25% of extended families did (also) employ workers from other extended families.

What kind of labor contracts were these? Table 17 presents the examples of contract details, on the basis of descriptions collected by the expedition members. Two interesting facts emerge. First, the contracts implied a substantial part of the compensation paid in cash (Russian rubles). The in-kind part of the payment mostly involved working clothes provided to the worker, but sometimes also dairy and meat products. Second, the compensation of labor mostly employed in agriculture and livestock herding was definitely lower than that of wholesale traders, but higher than that of shuttle traders. Thus, labor hired in agriculture was not necessarily the lowest paid occupation, which argues against the idea (often proposed in Soviet literature) of severe exploitation of hired workers by rich livestock owners.

5. Discussion

Our findings described above document important changes in social structures in the Kazakh population during Russian colonization whereby the size of extended families increased,

while clans and communes became smaller and fewer extended families shared common summer pastures over time. Individual households within extended families enjoyed increasingly individualized user rights over land (in particular for hay making) and became less likely to engage in collective crop cultivation with other households of the same extended family.

Some of these observed changes may be the "mechanical" consequences of the increase in land pressure following the multiplication of Russian peasant settlements: the creation of new winter stops through splitting of extended families is severely constrained and the pressure on summer pastures precludes the gathering of multiple extended families. Other changes, notably in property rights and the labor market, are better interpreted as the endogenous response of the traditional institutions governing production to the changes in the economic environment. In fact, we find no indication in writings of contemporaries and historians that the individualization of property rights and of production within extended family was actively promoted by Russian authorities.

Economic theory proposes several mechanisms suggesting that the observed individualization of production may be a direct response to the increase in land pressure and the development of agriculture following the expansion of Russian peasant settlements. First, as the size of the group (here, extended family) rises, problems of free-riding in collective production worsen, raising the relative benefits of having well-defined and individualized property rights (Chamberlin, 1974; Platteau, 2000; Guirkinger and Platteau, 2015). Second, as the technology becomes more labor- and care-intensive, the above-mentioned inefficiencies associated with collective production may more costly. Thus under a technology with sufficiently simple labor tasks, the monitoring that limits the under-provision of effort is relatively cheap. Once the labor tasks start to become more complex or the cost of workers' effort increases (which probably was

the case under the transition from extensive herding to sedentary agriculture), the cost of monitoring rises. This again increases the scope of free-riding in collective production, and thus the benefit of individualization grows (Boserup 1965; Binswanger and Rosenzweig, 1986).

Recent literature in development economics analyzes the determinants of individualization of agricultural production within the family (through family splits or distribution of individual plots to specific members). Foster and Rosenzweig (2002) develop a model to account for the increase in family-farm splits following the Green Revolution in India. In their collective-household model, technological change exacerbates intra-family heterogeneity in productivity leading to stronger disagreements over consumption allocations. Ceteris paribus, this increases the propensity of a family farm to split into smaller units, leading to more individualized form of land use. Bardhan et al. (2014) and Guirkinger and Platteau (2015) focus instead on the free-riding problem in family production. Guirkinger and Platteau (2015) argue that land scarcity leads to the individualization of family farms, as it exacerbates the cost of inefficiency associated with free-riding of individual family members. Bardhan et al. (2014) study the effects of land reforms on family-farms divisions. In contrast with Foster and Rosenzweig (2002), they predict that technological change would reduce the tendency for free-riding in joint production and, therefore, the rate of family-farm divisions. They do not account, however, for the possibility that technical progress would also raise the importance of the quality of labor, as described above, and thereby increase the benefit of more individualized forms of land-use

In our context, the decreasing importance of collective production is accompanied by an increased reliance on hired labor. In fact, the picture emerging from the description of the labor market is that of a very active one. The contrast with the contemporary situation in rural areas of

Russia is striking. Chayanov (1925) reports that more than 90% of farm households in pre-1917 Russia relied exclusively on family labor (i.e. household labor) for farming and neither hired nor supplied laborers for working on other peasants' farms.[12] This difference is even more puzzling, given that in the nomadic Kazakh system, households' access to land resources was based on collective holdings and thus, intuitively, more egalitarian.[13] We can only speculate about the reasons behind this remarkable difference between Russian and Kazakh peasants, but the pre-existence of labor exchange in the form of patron-client institutions in the traditional nomadic economy may have contributed to the rapid development of agricultural labor market. One such institution in Kazakhstan was called *sau'n* and consisted of rich households giving/leasing their livestock (for a given period of time) to poor households inside the extended family. The members of the poor households had to take care of the livestock leased, and could in exchange

[12] Interestingly, in his work, Chayanov (1925) used the so-called *zemstvo* statistics that were based on surveys that F.A. Shcherbina contributed to designing.

[13] Notably, Chayanov reports very large differences in labor-to-land ratios across Russian household farms.

consume its dairy products.).[14] [15] This institution is equivalent to labor-exchange institutions among African pastoralists as reported, for example, by Hill (1970).

Platteau (1995)'s investigation of the transformations of the patron-client relationships in Asia in the 20th century suggests that, in several contexts, the existence of outside opportunities for clients contributed to dissolving the patronage institution and its replacement by hired labor. The increase in the bargaining power of the client forces the patron to change their labor strategies, possibly towards shorter and monetized labor contracts. An agricultural wage labor market then develops. In our case, the Russian settlers may have provided these new outside opportunities. In some instances they have been reported to hire Kazakh workers for example (Sedelnikov, 1907). Interestingly, Platteau (1995) reports that the new labor contracts were more

[14] Historians have mixed view on the exact role that *sau'n* played: some consider it to be essentially motivated by solidarity considerations, whereas others (mostly of historians with Marxist views) see it as a mechanism for creating economic dependence of the poor and thus political control by the class of rich households. Markov (1976) writes: "Sometimes shepherds and workers were simply hired, with payment in kind or in cash. But sometimes these shepherds and workers were the poor relatives of the well-to-do livestock owner, and they migrated and lived together. In that case the relationships were usually veiled by kinship links. Giving livestock for pasture [i.e. the institution of *sau'n*] could take many forms: from the genuine solidarity and mutually beneficial agreement to some of the harshest exploitation of the person receiving the livestock" (Markov 1976: 301-302).

[15] Our data indicates that the share of households that took livestock for *sau'n* was already relatively small around the time of the first-wave expedition. In fact, even among the poorest households, at most around 10 per cent used *sau'n*.

likely to take the form of "regular farm labor contracts" (similar to the yearly contracts observed here) in the technologically advanced Indian villages of the "Green revolution belt". This also provides an alternative channel for the individualization process whereby poorer households with increased outside opportunities may negotiate an individualization of the extended family landholding and may be ready to work for a wage for the richer households of the extended family. This mechanism is actually present in the model of Guirkinger and Platteau (2014, 2015), where the patriarch of the family is forced to individualize the farm when household members have increased outside opportunities.

6. Conclusion

Large-scale colonial settlements often implied sharp changes in the constraints faced by indigenous populations. On the basis of evidence from the late 19th – early 20th century Kazakhstan, in earlier papers (Aldashev and Guirkinger, 2012; Guirkinger and Aldashev, 2015)) we have studied the effect of increased resource scarcity during the Russian settlement in Kazakhstan on excess female mortality and the resulting gender bias in the Kazakh population, and on the role played by traditional clan-based institutions in determining the adaptation to such changes. In this paper, we focus on the changes in the traditional social structure and institutions of Kazakhs, document the extent and speed of such changes, and explore theoretical explanations behind them.

Our study complements the work of economic historians on Czarist Russia. Most of the studies (for example, Nafziger, 2010; Dennison, 2011; Chernina, Dower, and Markevich, 2014; Markevich and Zhuravskaya, 2015) focus on the institutional changes in the early 20th-century

Russia. Despite the fact that Russia was one of the largest colonial empires, scarce attention has been paid to the economic history of Russian colonization (one exception is Natkhov, 2015).

Our findings have interesting implications concerning our understanding of the role of social structure and "slow-moving institutions" (Roland, 2004) in developing countries. The informal traditional institutions have usually been considered as changing quite slowly: in fact, most papers in development economics (with the exception of Comola and Prina, 2014) take the network structure as given. Our study suggests that the speed and magnitude of change of such institutions can be quite high, which clearly calls for more in-depth studies of such institutional change in other contexts.

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Table 1: Production system at the extended family level, by distance to the province capital

Decile of distance to province capital	% of extended families cultivating	Average # years since started cultivating (if cultivate=1)	% of extended families making hay
1	85%	18	98%
2	76%	17	100%
3	70%	15	100%
4	60%	13	99%
5	63%	11	99%
6	59%	15	99%
7	56%	11	96%
8	55%	11	96%
9	47%	11	81%
10	45%	11	80%
Total	62%	14	95%

Note: The variable *# years since started cultivating* is only available for two provinces.

Table 2: Descriptive statistics for the sample of extended families

Variable	Definition	Mean	Std. Dev.	Min	Max	N
cultivate	1 if extended family cultivate crops	0.61	0.49	0	1	11217
# years cultivating	number of years since the extended family started cultivating	6.61	13.13	0	300	6015
hay	1 if extended family make hay	0.94	0.24	0	1	11337
distance	distance to province capital in versta (1.5 km)	177.55	154.03	0	900	11097
ln(distance)	Log of distance	4.72	1.40	-2.30	6.80	11097
# units	number of nuclear units in extended family	5.94	1.47	0	22.5	10168
household size	average size of households composing the extended family	5.94	1.47	0	22.5	10168
individual hay	1 if at least some households of extended family own individual hay plots – defined when hay=1	0.53	0.50	0	1	8565
collective hay	1 if (some) households of same extended family have impartible ownership over hay plots – defined when hay=1	0.47	0.50	0	1	8722
joint cultivation	1 if at least some households jointly cultivate crops – defined when cultivate=1	0.71	0.45	0	1	6315
hired crop	1 if labor hired for crop cultivation by at least one household in extended family – defined when cultivate=1	0.38	0.49	0	1	5534
hired hay	1 if labor hired for hay making by at least one household in extended family – defined when hay=1	0.49	0.50	0	1	10621
yearly contract husbandry	1 if labor hired on yearly basis for husbandry by at least one household in extended family	0.37	0.48	0	1	9696
working out or business	1 if at least one member of extended family working out for wage or has a business	0.66	0.47	0	1	11270

Note: The variable *# years since started cultivating* is only available for two provinces. The difference in the number of observations across variables is due to the fact that some pages or portion of pages in the archives were not readable.

Table 3: Distance to province capital and adoption of more land-intensive techniques (at extended-family level, with province fixed effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	**OLS**	**Tobit**	**Tobit**	**OLS**	**OLS**
	cultivate	**cultivate**	**# years cultivating**	**# years cultivating**	**hay**	**hay**
distance	-0.001***		-0.045***		-0.001***	
	(-33.77)		(-29.47)		(-63.93)	
Ln(distance)		-0.058***		-1.367***		-0.016***
		(-18.64)		(-14.55)		(-10.38)
# units	0.012***	0.015***	0.238***	0.412***	0.000	0.003***
	(17.27)	(20.52)	(11.10)	(18.31)	(0.91)	(8.23)
N^	9861	9861	5747	5747	9978	9978

Notes: t-statistics in parentheses, * p<0.10 ** p<0.05 *** p<0.01. For tobit, reported coefficients correspond to marginal effects at mean. The variable *# years since started cultivating* is only available for two provinces. The difference in the number of observations for the number of extended families plowing and making hay is due to the fact that some pages in the archives were not readable.

Table 4: Changes in production systems (5 provinces of Akmolinsk region, 1896-1909)

Province	**Year**	**Haystacks produced, mln**	**Number of HHs that cultivate**	**Share of all HHs that cultivate**	**Total area cultivated for crops, thousand desyatinas**
Akmolinsk	1896-1900	2.56	7192	0.53	19.55
	1909	2.65	8821	0.54	22.55
Atbasar	1897	1.20	3492	0.67	5.79
	1909	1.70	3785	0.55	7.07
Kokchetav	1896	1.46	2782	0.22	5.59
	1907	1.87	3027	0.19	4.69
Omsk	1901	0.98	206	0.03	0.53
	1908	2.14	2338	0.27	5.43
Petropavl	1901	0.93	2688	0.24	5.91
	1908	3.26	5812	0.44	15.42

Table 5: Extended family size, by distance to the province capital

	# households in extended family			# members per household		
Decile of distance	**mean**	**standard deviation**	**median**	**mean**	**standard deviation**	**median**
1	8.7	6.9	7	5.9	1.4	5.8
2	8.7	6.5	7	6.1	1.5	5.9
3	8.0	6.1	6	6.0	1.4	5.9
4	7.0	5.2	6	6.0	1.4	5.8
5	7.5	5.8	6	5.8	1.6	5.7
6	7.6	5.9	6	5.9	1.6	5.7
7	7.3	6.7	6	5.9	1.4	5.8
8	6.7	5.2	5	6.0	1.5	5.8
9	6.8	5.5	5	5.9	1.4	5.8
10	6.3	5.0	5	5.9	1.6	5.7
Total	7.5	6.0	6	6.0	1.5	5.8

Table 6: Extended family size and distance to the province capital

	(1) **# units**	(2) **# units**	(3) **unit size**	(4) **unit size**
distance	-0.0066***		-0.0003**	
	(-14.94)		(-2.27)	
Ln(distance)		-0.2538***		-0.0222*
		(-5.82)		(-1.95)
N	9990	9990	9925	9925

Note: t-statistics in parentheses, * p<0.10 ** p<0.05 *** p<0.01.

Table 7: Changes in size distribution of extended families (5 provinces of Akmolinsk region, 1896-1909)

Province	Year	Extended families with __ household units								Total
		1-5	6-10	11-15	16-20	21-30	31-40	41-50	>50	
Akmolinsk	1896-1900	421	675	277	87	52	11	2	0	1525
	1909	419	645	336	124	69	18	2	4	1617
Atbasar	1897	208	231	114	34	17	3	1	1	609
	1909	178	280	142	61	38	1	2	1	703
Kokchetav	1896	694	617	214	64	43	9	4	1	1646
	1907	607	637	307	121	55	19	5	5	1756
Omsk	1901	274	224	108	69	20	5	1	0	701
	1908	218	262	156	78	52	16	3	0	785
Petropavl	1901	457	495	219	64	48	18	0	3	1304
	1908	343	512	285	112	78	15	8	4	1357

Table 8: Matching of extended family in Petropavl province over the two waves of the panel

	1901			1908		
	(1)	(2)	(3)	(4)	(5)	(6)
Extended families that:	Freq.	Percent	Average units	Freq.	Percent	Average units
Did not split nor merged	907	67.94	8.5	907	65.58	9.9
Split between 1901 and 1908	188	14.08	10.7	396	28.63	8.6
Merged between 1901 and 1908	89	6.67	6.3	43	3.11	14.9
Existed only in 1901 data	151	11.31	7.7			
Appeared in 1908 data				24	1.74	7.7
Unable to match				13	0.94	10.8
Total	1335	100	8.6	1383	100	9.7

Table 9: Change in the size of communes (in provinces of Akmolinsk region)

Province	**Year**	**Number of communes**	**Extended families per commune**
Akmolinsk	1896-1900	308	5.0
	1909	443	3.7
Atbasar	1897	122	5.0
	1909	162	4.3
Kokchetav	1896	336	4.9
	1907	679	2.6
Omsk	1901	151	5.4
	1908	228	3.6
Petropavl	1901	270	4.9
	1908	397	3.4

Table 10: Changes in clan identification (5 provinces of Akmolinsk region, 1896-1909)

Uezd			**Clans in wave 1**				**Clans in wave 2**		
		Total	With 1 extended family	Federating from 2 to 5 extended families	Federating more than 5 extended families	Total	With 1 extended family	Federating from 2 to 5 extended families	Federating more than 5 extended families
Akmolinsk	Freq.	417	127	212	78	589	300	233	56
	Share		*0.30*	*0.51*	*0.19*		*0.51*	*0.40*	*0.10*
Atbasar	Freq.	122	32	45	45	169	70	65	34
	Share		*0.26*	*0.37*	*0.37*		*0.41*	*0.38*	*0.20*
Kokchetav	Freq.	354	90	163	101	558	261	204	93
	Share		*0.25*	*0.46*	*0.29*		*0.47*	*0.37*	*0.17*
Omsk	Freq.	108	22	46	40	198	75	83	40
	Share		*0.20*	*0.43*	*0.37*		*0.38*	*0.42*	*0.20*
Petropavl	Freq.	201	37	82	82	386	151	174	61
	Share		*0.18*	*0.41*	*0.41*		*0.39*	*0.45*	*0.16*

Table 11: Property rights over hay plots within extended families, by distance to the provincial capital

decile of distance	Individual hay	At least some collective rights (including yearly reallocation)
1	65%	35%
2	66%	36%
3	54%	50%
4	53%	50%
5	52%	41%
6	43%	56%
7	46%	53%
8	52%	48%
9	46%	50%
10	48%	51%
Total	53%	47%

Table 12: Correlation between land and labor allocation and distance to province capital (at extended-family level, with province fixed effects)

	(1)	(2)	(3)	(4)
	individual hay	**individual hay**	**collective hay + yearly divide**	**collective hay + yearly divide**
distance	-0.0008***		0.0005***	
	(-13.72)		(9.32)	
Ln(distance)		-0.0355***		0.0300***
		(-6.98)		(5.91)
# units	0.0012	0.0028***	-0.0002	-0.0011
	(1.24)	(2.86)	(-0.24)	(-1.18)
N	7404	7404	7558	7558

t-statistics in parentheses * p<0.10 ** p<0.05 *** p<0.01

Table 13: Changes in property rights over hay plots in extended families (6 provinces, 1896-1909)

Province	Year	Individual hay	Yearly reallocation	Collective hay	Mixed (at least two forms coexist in same extended family
Akmolinsk	1896-1900	0.49	0.04	0.30	0.07
	1909	0.55	0.11	0.23	0.11
Atbasar	1897	0.34	0.06	0.55	0.01
	1909	0.45	0.14	0.28	0.13
Kokchetav	1907	0.53	0.29		0.18
Petropavl	1901	0.37	0.43	0.14	0.02
	1908	0.40		0.60	
Aktuybinsk	1898-1899	0.74	0.06	0.12	0.07
Kustanay	1898	0.51	0.15	0.16	0.17

Notes: The categories are defined only for families making hay. The shares do not sum up to one in the first year as for some families making hay the variables are not defined (3% of the cases). In most of these cases (82%) it is the first year that hay is prepared so that the institutional arrangement governing hay plot allocation may not be defined yet.

Table 14: Collective plowing and participation to the labor market, by distance to the provincial capital

	(1)	(2)	(3)	(4)	(5)
	joint cultivation (among families that cultivate)	**hired labor for crop (among families that cultivate)**	**hired labor for hay (among families that make hay)**	**hired labor for husbandry (yearly contract)**	**working out for wage or business**
1	54%	59%	58%	50%	70%
2	71%	41%	54%	43%	74%
3	79%	31%	50%	42%	76%
4	73%	31%	43%	33%	68%
5	66%	32%	47%	36%	67%
6	81%	37%	45%	37%	65%
7	71%	44%	47%	35%	60%
8	72%	29%	45%	30%	63%
9	74%	36%	48%	32%	62%
10	86%	36%	51%	38%	58%
Total	71%	39%	49%	38%	67%

Table 15: Correlation between labor allocation and distance to province capital (at extended-family level, with province fixed effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Joint cultivation	Joint cultivation	hired labor crop	hired labor crop	hired labor hay	hired labor hay	yearly contract husbandry	yearly contract husbandry	working out wage or business	working out wage or business
distance	0.0003***		-0.0011***		-0.0004***		-0.0002***		-0.0003***	
	(4.35)		(-16.84)		(-7.47)		(-4.64)		(-10.16)	
Ln(distance)		0.0308***		-0.0688***		-0.0088**		-0.0185***		-0.0088***
		(5.86)		(-12.88)		(-2.30)		(-4.67)		(-2.79)
# units	0.0125***	0.0123***	0.0117***	0.0129***	0.0195***	0.0203***	0.0153***	0.0155***	0.0230***	0.0239***
	(13.26)	(13.17)	(12.10)	(13.28)	(22.87)	(23.95)	(18.73)	(19.29)	(31.69)	(33.18)
N	0.0003***		-0.0011***		-0.0004***		-0.0002***		-0.0003***	

t-statistics in parentheses

* p<0.10 ** p<0.05 *** p<0.01"

Table 16: Change in joint cultivation and labor market for Kustanay and Aktyubinsk provinces

		among HH cultivating:		among HH making hay:	share of household:	among HH hiring for husbandry :		share of household:
province	wave	Joint cultivation	hiring crop	hiring hay	hiring husbandry	yearly contract husbandry	# workers on yearly contract	working for wage or w/ business
Kustanay	1	61%	16%	13%	29%	48%	1.004	31%
	2	42%	26%	26%	24%	84%	1.805	47%
Aktyubinsk	1	57%		27%	42%	40%	1.396	32%
	2	50%	23%	26%	36%	73%	1.627	37%

Table 17:Examples of labor contracts and self-employment (Petropavl province, 1901)

Labor contracts				
Type of contract	*Occupation*	*Total salary*	*Part in cash*	*Part in kind*
Annual	Agricultural worker (batrak)		60 rubles	1 shirt, 1 pair of trousers, 1 pair of boots
Annual	Agricultural worker (batrak)	49 rubles	19 rubles	Clothes worth 30 rubles
Annual	Agricultural worker (batrak)		30 rubles	Clothes
Seasonal (6 months)	Haymaking and livestock breeding	56 rubles	50 rubles	Clothes worth 6 rubles
Seasonal (30-40 days)	Mower	19 rubles (on average)	15-20 rubles	Clothes, depending on in cash part; plus some livestock or food products
Annual or seasonal (winter)	Shepherd	66 rubles (on average, annual)	36 rubles	Clothes worth 30 rubles; plus abundant food products
Seasonal	Woodcutter	20 rubles (on average)	20 rubles	None
Self-employed				
Shuttle trader		33 rubles (on average, per season)		
Wholesale trader		200 rubles		

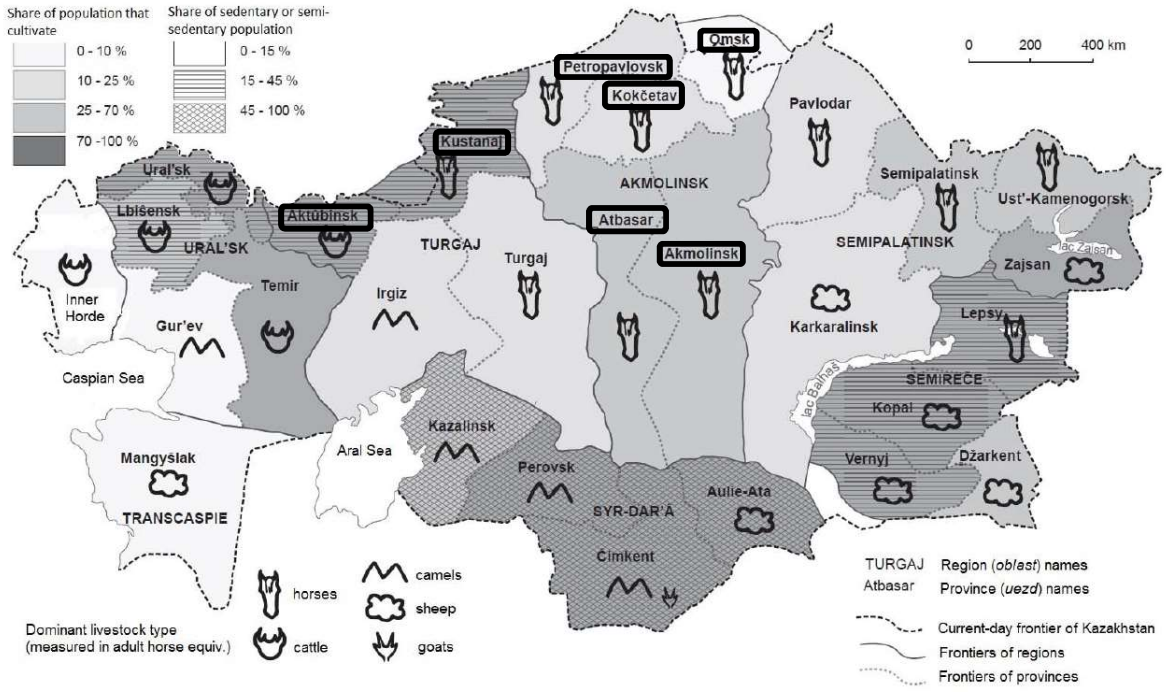


Figure 1. Administrative structure of Kazakhstan at the end of the 19th century

Source: Ferret (2014), Map 2.

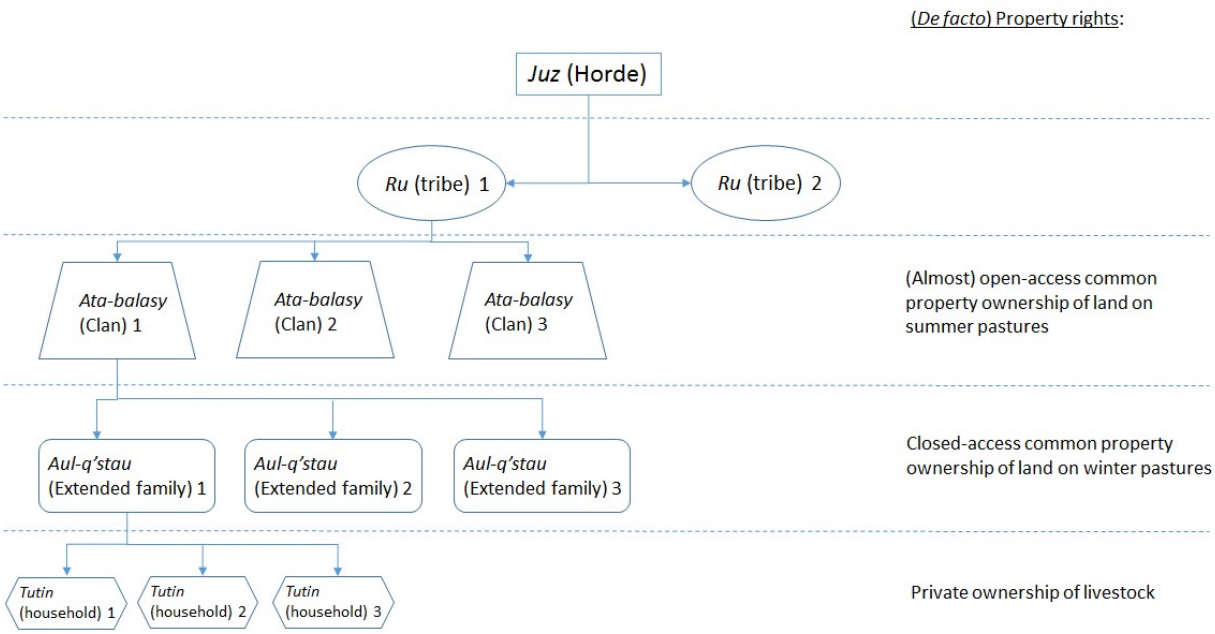
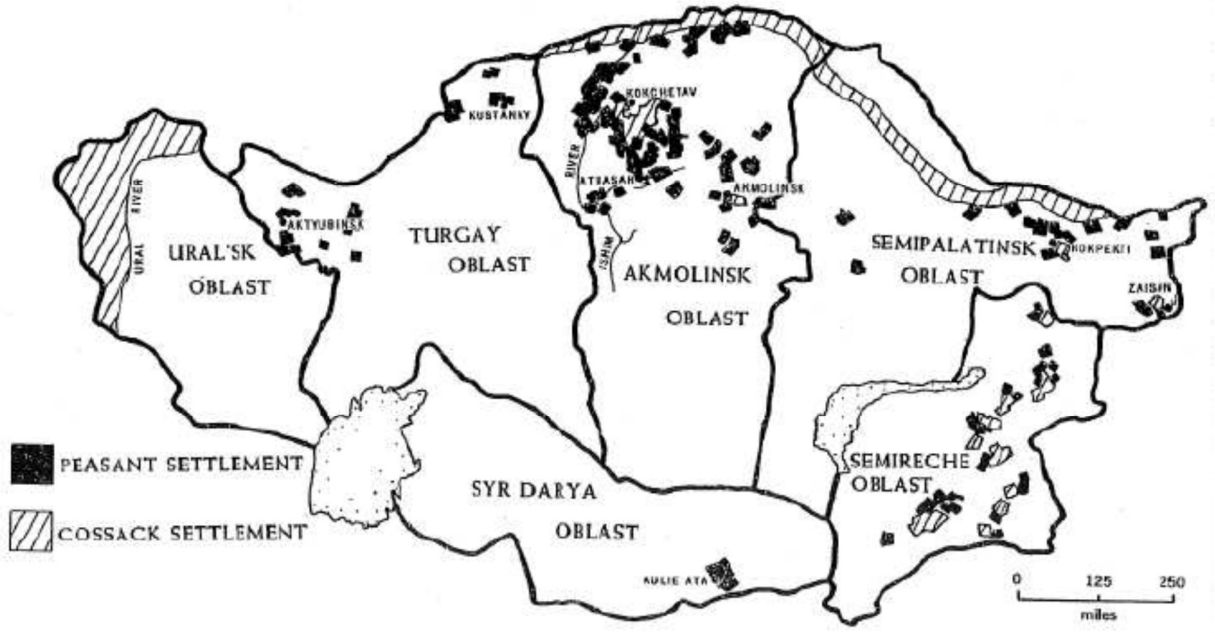
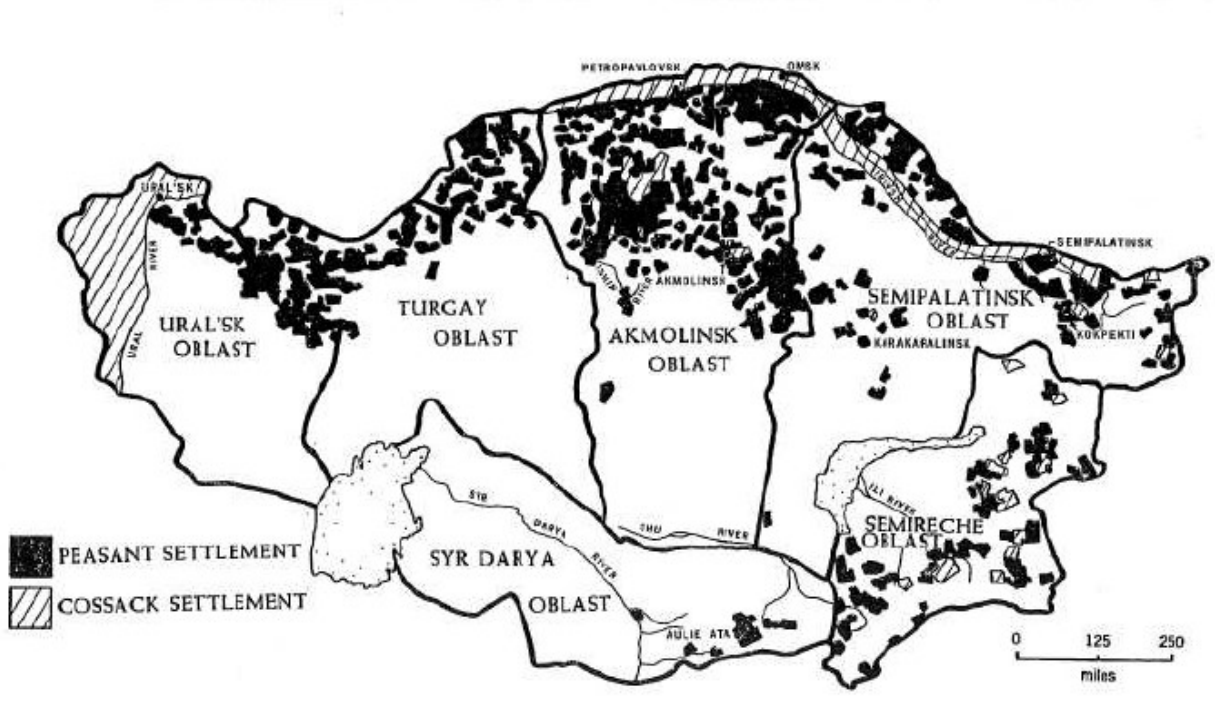


Figure 2. Social structure and pre-colonial property rights in the Kazakh society in the 19th century

Source: Guirkinger and Aldashev (2016), on the basis of Chapter 7 of Tolybekov (1971).



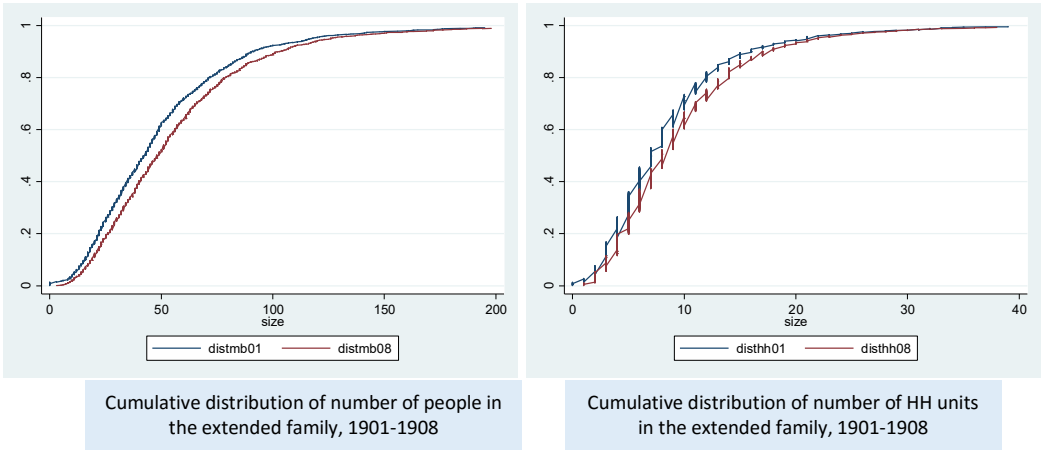
Panel A. Pattern of Russian settlements in Kazakhstan around 1900



Panel B. Pattern of Russian settlements in Kazakhstan around 1915

Figure 3. Evolution of Russian settlements in Kazakhstan in the early 20th century

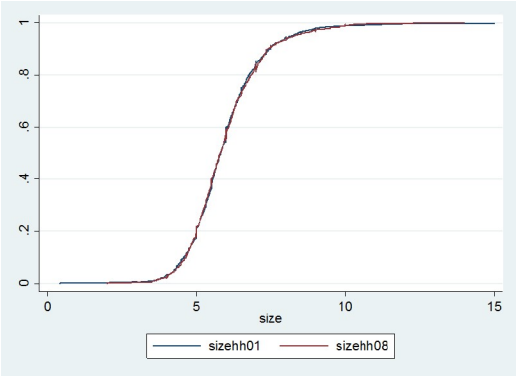
Source: Demko (1969).



Cumulative distribution of number of people in the extended family, 1901-1908

Cumulative distribution of number of HH units in the extended family, 1901-1908

Figure 4. Cumulative distributions of the size of extended families, Petropavl province, 1901-1908



Cumulative distribution of number of people in the household unit, 1901-1908

Figure 5. Stability in the size distribution of household units, Petropavl province, 1901-1908

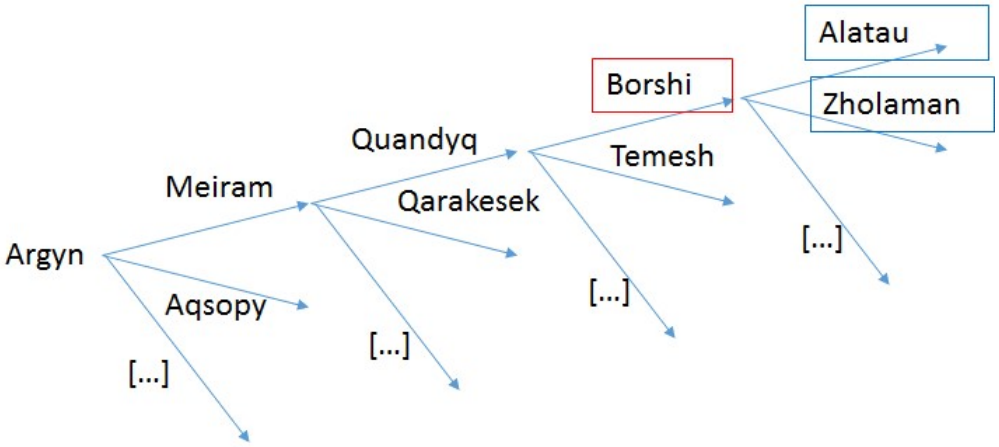


Figure 6. An example of a clan genealogical tree

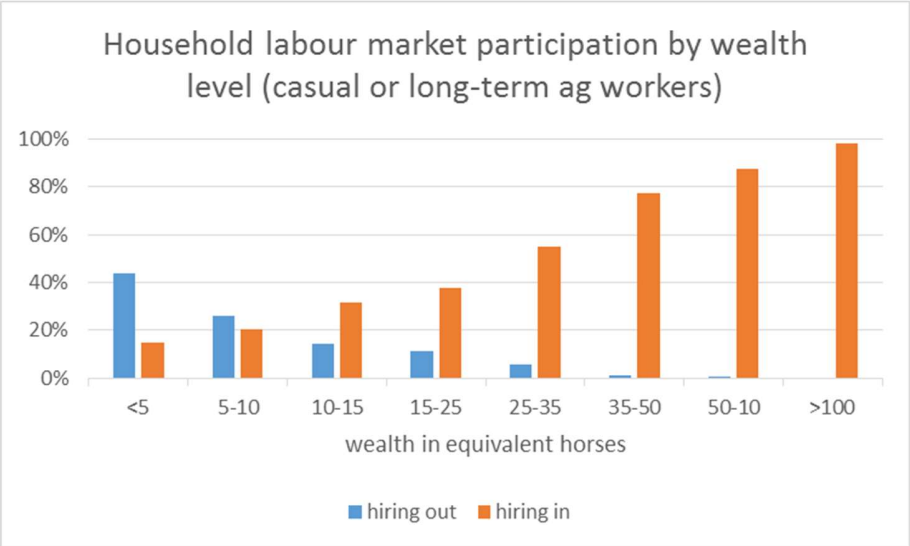


Figure 7. Household labor market participation, Aktyubinsk and Kustanay provinces, 1908

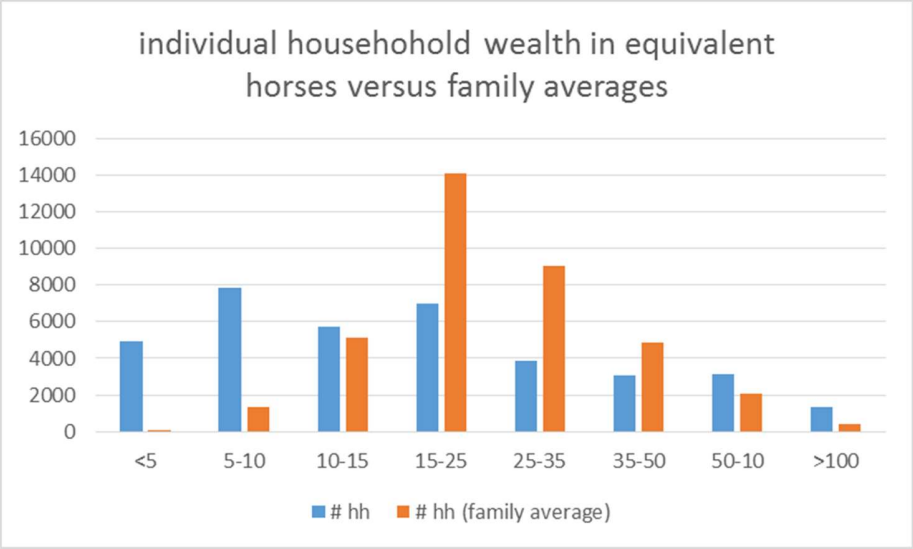


Figure 8. Household wealth distribution, Aktyubinsk and Kustanay provinces, 1908