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# The Slow Road from Serfdom: Labor Coercion and Long-Run Development in the Former Russian Empire *

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**Abstract**

This paper examines the long-run economic consequences of Russian serfdom. Employing data on the intensity of labor coercion at the district level in just prior to emancipation in 1861, we document that a greater legacy of serfdom is associated with lower economic well-being today. Our estimates imply that increasing historical serfdom by 25 percentage points reduces household expenditure today by up to 17%. The analysis of different types of labor coercion reveals substantial heterogeneity in the long-run effects of serfdom. Furthermore, we document persistence of economic development measured by city populations over the period 1800 - 2002 in cross-sectional regressions and panel estimations. Exploring mechanisms, our results suggest that the effect of serfdom on urbanization in Imperial Russia was perpetuated in the Soviet period, with negative implications for structural change, the spatial distribution and productivity of firms, and human capital investment.

**Keywords**: Labor Coercion, Serfdom, Development, Russia, Persistence

**JEL Classification:** N33, N54, O10, O43

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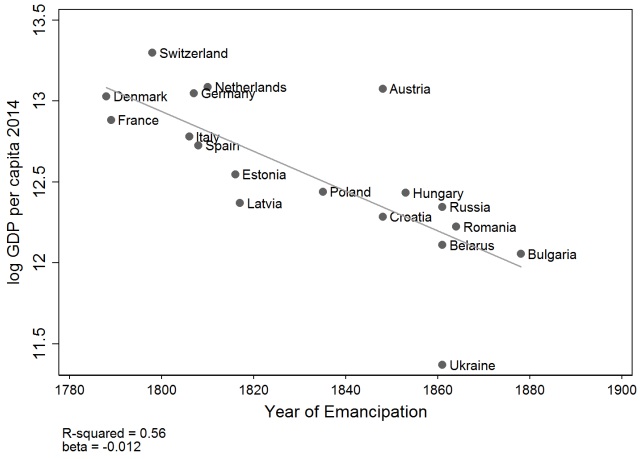
## Introduction

Twenty-five years after the fall of the Soviet Union, the economies of Eastern Europe still lag behind. A large body of research has attributed the slow rate of convergence with advanced economies in the region to the legacy of Soviet-era institutions and the difficulties in transitioning to a market economy. The relatively slow pace of development of the former Soviet member countries may, however, also have deeper historical roots, extending back to the pre-Soviet period. Already at the turn of the 19th century, Imperial Russia was one of the poorest economies in Europe. In 1900, per capita incomes in the countries that would later comprise the USSR were only about a third of those in Western Europe ($1,196 vs. $3,155).[1] While it has been argued that low levels of economic development today could reflect persistent legacies of the Imperial period (e.g. Roland, 2012), this hypothesis remains largely untested, and the possible underlying mechanisms unexplored.

In this paper, we examine whether serfdom, the institution of labor coercion in the Russian Empire, generated long-term economic consequences extending to the present day. Serfdom was not only one of the most prominent institutions of forced labor in history, but it is frequently regarded as a crucial factor behind Imperial Russian (under-) development (Acemoglu and Robinson, 2012; Gerschenkron, 1966; Markevich and Zhuravskaya, 2018). Figure 1 provides suggestive evidence of the legacy of feudal institutions across several European countries. The figure depicts a striking negative correlation between the timing of peasant emancipation and the level of development today, which suggests that Imperial Russia's retention of serfdom until the 1860s may have contributed to lower income levels in the long-run. Clearly, the societies in Figure 1 differ across many historical and contemporary dimensions, making it difficult to isolate the importance of serfdom or to identify the mechanism(s) of historical persistence. Therefore, to test whether and how this correlation may be indicative of an underlying causal relationship, this study investigates the economic effects of serfdom *within* the area of the former Russian Empire, making use of disaggregate data measuring the intensity of labor coercion at the level of the district (*uezd*) just prior to formal emancipation in 1861. Our main estimates document

[1] Estimates from the Maddison project (Bolt and Zanden, 2014).

FIGURE 1: PEASANT EMANCIPATION AND LONG-RUN DEVELOPMENT IN EUROPE




NOTES: This figure plots log GDP per capita in 2014 against the year of peasant emancipation in European countries. See Appendix for data description.

a significant negative relationship between this institutional heritage and measures of economic development today. Critically, we complement this finding with a careful exploration of the possible mechanisms that generated this pattern. Rather than direct institutional, cultural, or human capital channels, the evidence suggests the interaction between initial economic differences, evolving but high restrictions on labor mobility, delays in industrialization, and the reinforcing role of Soviet-era policies on the geography of economic activity, as channel of persistence.

Russian serfdom was a system of labor coercion that existed from the 16th century to 1861.[2] Indeed, at a time when the Industrial Revolution was fundamentally changing the economies of Western Europe, about 45% of peasants (and 39% of the total population) in European Russia were obliged to work for the landowning nobility and/or pay them a portion of their income in the form of quit-rent. Amid broader efforts at modernization following the Crimean War, the Russian state initiated the legal emancipation of serfs in 1861, followed by a drawn out process of land reform that transferred property rights (generally assigned to the communal village) and associated mortgage-like obligations to the newly freed peasants. The experience of the formerly *privately* "owned" serfs may be contrasted with what happened to rest of the peasantry, who either resided on state or Imperial family-owned lands prior to 1861. Serfs possessed less land and faced more

[2]Slavery had a long history in Kievan and Muscovite Russia. The laws and customs regarding debt servitude and other forms of obligation helped structure those that later formalized serfdom (Hellie, 1982).

restrictions on their labor, education, and entrepreneurial decisions prior to the 1860s, and the emancipation reform solidified these differences in the short and medium term.

In this paper, we leverage this heterogeneity within the pre-1861 peasantry to identify the longer-run consequences of serfdom. Our district (*uezd*) level measure of the population who were serfs within the Russian Empire comes from a tax census conducted in the late 1850's. To guide our empirical analysis, we first assess the potential determinants of serfdom's geography. We find that, serfdom was more prominent in districts closer to Moscow, consistent with the spread of the Imperial state, and in districts more suitable for agriculture. Conditioning on fixed effects defined for historical provinces (*guberniia*), we find only weak evidence that our measure of serfdom is correlated with other bio-geographic controls, or with indicators of pre-serfdom economic development. Largely because of the proximity to Moscow and provincial fixed effects, we explain between 37% to 78% of the district-level variation in serfdom on the eve of emancipation. To investigate subsequent economic outcomes across districts with different levels of historical serfdom, we link our measure of labor coercion to rich data on modern outcomes (especially from the Life in Transition Survey (LiTS)) and on outcomes from intermediate dates in the Imperial, Soviet, and post-Soviet periods. Our main results document that households in districts where serfdom was widespread before 1861 are poorer today. For example, a standard deviation increase in the share of the population who were serfs (about 25 percentage points) is associated with 9 - 17% lower average household consumption today.

These findings are robust to controlling for a large set of geographic characteristics, distance to Moscow, household characteristics, proxies for early (pre-1861) development, and several types of fixed effects. Throughout the paper, we assess the importance of unobservable local factors in explaining our results. Applying the method proposed by Oster (2017), we find that selection on unobservables must be at least as large – and often much greater – than on observables to overturn the effect of past serfdom on modern outcomes. This makes us confident that any unobservable correlates of serfdom are not driving our results. Moreover, as an indirect test of the impact of serfdom, we show that the positive effects of agricultural suitability for long-run development are offset in areas where labor

coercion was practiced.

After establishing the long-run negative association between serfdom and modern development outcomes, we document a persistent pattern of differential economic activity between areas of varied exposure to historical serfdom. Estimating city-level cross-sectional and panel regressions for the period 1800–2002, we find that cities were significantly smaller in locations with more historical serfdom prior to emancipation. This gap did not fully close after 1861, and, if anything, widened during the Soviet period.

The persistence of economic development makes our exploration of the underlying mechanisms critical. While researchers have found adverse long-run consequences of forced labor in other contexts (e.g. Engerman and Sokoloff, 1997; Dell, 2010; Nunn, 2008b; Acemoglu et al., 2012; Acharya et al., 2018; Lowes and Montero, 2018), this literature has generally emphasized how persistent cultural, ethnic, racial, or institutional characteristics of the previously coerced population helped generate divergent outcomes. In contrast, our Russian context shuts down these channels, as such differences were largely non-existent between former serfs and the rest of the population, especially after the Bolshevik Revolution that completely revised the broader institutional and administrative structures.[3]

Instead, our proposed channel focuses on evolving constraints on factor mobility that reinforced initial gaps between low and high serf areas to generate path dependencies in the nature of local structural change. Akin to work by Bleakley and Lin (2012), Davis and Weinstein (2002), and others, we hypothesize that structural change and industrial agglomeration were less prominent in former serf areas through out the period, beginning with initial differences prior to 1861, and becoming even more prominent as more modern sectors emerged in the Soviet Union. Labor, migration, investment, and resource allocation policies of the Soviet and post-Soviet regimes worked to reinforce the structural gap between formerly serf and non-serf areas.[4]

[3]While studies such as Michalopoulos and Papaioannou (2013) and Nunn and Wantchekon (2011) find evidence for long-run persistence in the face of dramatic institutional change, their context (primarily Africa) is one where ethnicity, religion, and race play central roles as mechanisms. Russian serfs differed little from their masters with respect to race, ethnicity, or religion. Serfs were a distinct social category that was fundamentally based on ownership and control of labor. Moreover, Russian serfs tended to enjoy considerable autonomy in how they allocated their time unlike, for example, the majority of American slaves. It is worth noting such differences between Russian serfdom and forced labor in other contexts when considering the external validity of our findings.

[4]Delays in structural change can also rationalize the cross-country relationship between incomes and the

To provide empirical support for this framework, we draw on a wealth of novel district-level data on urbanization, infrastructure, industrial development, property holdings, human capital, and policy preferences across our entire period. We establish that the incidence of serfdom was negatively associated with the level of urbanization, industrialization and tertiary sector employment in Imperial Russia, road densities and the presence of firms in the Soviet period, and population density and night-time luminosity after 1990. We also find that the greater prevalence of quit-rent obligations – for which serfs enjoyed greater autonomy to engage non-agricultural activities away from the estate (Dennison, 2011) – was associated with lower employment in agricultural occupations and greater employment in industry in the late Imperial period. These results are another indication that underlying constraints on labor mobility likely impeded convergence, and are consistent with the findings that areas with larger shares of serfs on quit-rent are relatively more developed and less agricultural, even today. Moreover, we document that serfdom is associated with a reduction in the number of industrial establishments over the period 1939-1989, and by the end of Soviet period, firms in former serf areas were smaller, less productive, and more likely to be in agriculture than manufacturing. While we find that schooling outcomes were only slightly different between more and less serf areas during the Imperial period, we estimate substantial gaps in educational attainment in modern data, consistent with the demand-side consequences of a growing complementarity between labor skills and modernizing industry during the Soviet Union. Overall, our results identify a set of theoretically and historically consistent linkages between the incidence of past serfdom and the current spatial distribution of economic activity across the former Russian Empire.

Considering alternative plausible mechanisms, we find little support for a direct channel of persistence working through economic inequality, political structures, and reduced public good provision (e.g. Engerman and Sokoloff (1997), Galor et al. (2009), Galor and Moav (2006)). While there was an association of serfdom with late-Imperial land inequality, there is little effect of serfdom on contemporary measures of inequality, nor

timing of peasant emancipation depicted in Figure 1. Appendix Figure F1 illustrate that a later emancipation of peasants is strongly associated with a larger share of labor in agriculture in 1900, and even in 2000.

on the provision of local public goods today. In addition, our main findings are also unlikely to be driven by a specific culture of serfdom (e.g. Schooler, 1976). We provide extensive evidence that serfdom is not associated with contemporary cultural differences, such as trust, xenophobia, preferences for political and economic institutions, political participation, or communist party membership during the Soviet period. While we find that preferences for redistributive policies are elevated in former areas, we view these differences as reflective of the persistent spatial inequalities driven by differential structural change.

A long literature has attributed the slow pace of development in late-Imperial Russia to serfdom and an emancipation process that seemingly perpetuated many institutional restrictions in the countryside (e.g. Dennison, 2011; Gerschenkron, 1966; Lenin, 1911). However, robust empirical work linking labor coercion in Imperial Russia to subsequent or contemporaneous economic outcomes is limited. An exception is Markevich and Zhuravskaya (2018), who estimate that provinces with above average levels of serfdom (as a share of the total population) grew relatively faster after emancipation, which they argue was largely due to the elimination of disincentives arising from seigniorial obligations. At the same time, Nafziger (2013) shows that the emancipation and land reform processes homogenized institutional structures – particularly the peasant commune – but fixed differences in factor endowments and prices between formerly serf and non-serf areas, a pattern that lasted through the Revolution of 1917. Taken together, this small empirical literature suggest that serfdom imposed meaningful constraints on the rural economy, that some of these were relieved by the reforms of the 1860s, but that former serf areas continued to face persistent differences in land and labor market conditions until the Soviet period. Our study is the first to examine whether economic differences between high and low serf regions persisted beyond the Imperial period.

We also provide new evidence on the economic importance of institutional legacies and contributes to the literature on historical development and persistence (Nunn (2013) provides an excellent survey). Relative to this literature, we document that coercive labor institutions also have economic consequences outside the context of European colonialism, and in the absence of racial or ethnic markers for the affected population. In addition, we

provide new evidence on the long-run economic effects of different forms of labor coercion (corvée vs quit-rent), a distinction that has received little attention in the prior literature.

The paper proceeds as follows. Section 2 describes the historical background. Section 3 examines the effect of serfdom on long-run development. Section 4 documents the nature of persistence in this pattern. Section 5 investigates mechanisms, and Section 6 concludes.

## Historical Background

### Serfdom in the Russian Empire

Russian serfdom emerged as a set of informal practices and increasingly formal constraints in the 16th and 17th centuries. In return for service to the Tsars during Muscovite and Imperial state expansion, the elite received land grants that came with the right to draw upon the labor of the resident population. However, with competition among the servitors and the ease of fleeing to open land, it was difficult for the land-owning class to exploit their peasantry. In this context, the high land-labor ratio motivated the land-owning nobility to act to reduce the mobility of the peasantry and to increase coercive control over various aspects of their lives. These attempts came to be supported by the state through a series of decrees, culminating in the 1649 *Ulozhenie* that sharply constrained peasant mobility and formalized the legal rights of the serf-owning nobility. Over the 18th century, further measures affirmed the control of the nobility over their peasants, with the 1762 "emancipation" of the nobility freeing the serf-owning class from any corresponding obligations for state service. By 1800, the legal and institutional structure of Russian serfdom was firmly in place.

Serfdom varied widely across estates but can be described by certain common characteristics. First of all, serfs constituted a distinct social estate apart from the nobility, the clergy, and even other peasants, and they faced substantive restrictions on their personal, family, and community autonomy (Wirtschafter, 1997). Serf owners held ultimate authority over the daily lives of their peasants, allowing them to intervene in marriage, employment, educational, religious, judicial, and other matters.[5] Many of these constraints were formalized under Russian law, especially with regards to restrictions on land ownership

[5]From the early 19th century, the nobility's autonomy included the possibility of emancipating their serfs on their own terms. This option was exercised relatively infrequently.

and serf rights to freely contract their own labor. Second, serf-owners demanded seigniorial obligations: labor services, cash or in-kind payments, or a combination. On many estates, owners actively managed the labor decisions of their serfs, either in person or through managerial staff. Such estates often possessed demesnes, with serf labor on the owner's land compensated by the granting of use-rights to other property. On other estates, serfs were granted substantial freedom to allocate their labor as they saw fit, subject to the owner's authority over formal contracting. This latter variant was more common in less agriculturally productive regions, where owners tended to transfer the use of all estate land to the serfs in return for cash or in-kind payments (Dennison, 2011; Moon, 1999).

These attributes suggest an institutional regime that was antithetical to economic development. The labor, property, and education decisions of serfs were constrained, which created disincentives for investment (of all sorts), impeded the adoption of better agricultural techniques, and led to the misallocation of labor and other resources in and across sectors. Many contemporary observers acknowledged the negative implications for economic growth that the institution generated prior to 1861. Indeed, supporters of the status quo argued for continuing serfdom less in economic terms than to maintain the Imperial regime or to support elite tutelage over masses ill-equipped for freedom (Emmons, 1968; Field, 1976; Khristoforov, 2011).

However, there remains relatively little causal evidence on the economic impact of Russian serfdom or emancipation. Dennison (2011) argues that serfdom generated adverse distributional and growth effects, although her conclusions are largely based on evidence from a single large estate. Soviet works (e.g. Koval'chenko, 1967) marshaled considerable data to argue that the serf economy was in decline prior to 1861. However, the materials that these scholars employed tended to be rather selective, and their Marxian framework placed the argument before the evidence. Domar and Machina (1984) utilized information on the price of land with and without resident peasants to argue that serfdom was profitable to the nobility up to 1861. But profitability is not the same as efficiency, and there is little hard evidence on the corresponding growth implications of serfdom. An important exception is the recent work of Markevich and Zhuravskaya (2018), who evaluate the impact of serfdom

by looking at differential economic changes between provinces with more or fewer serfs before and after 1861. Results from their difference-in-differences analysis suggest strongly negative effects of serfdom, although they do not explicitly identify a mechanism behind their findings. Overall, most scholarship on Russian serfdom asserts that the institution undermined economic development while it existed.

More empirical attention has been paid to the short and medium-term consequences of emancipation in the half century before the Bolshevik Revolution. Soviet studies (e.g. Litvak, 1972) argued that emancipation and the accompanying land reforms actually worsened former serf land holdings and property rights (by reinforcing communal ownership) and imposed considerable new tax and payment burdens on the rural economy.[6] In contrast, more recent studies such as Hoch (2004) and Kashchenko (2002) assert that the majority of former serfs were made better off – at least in terms of land and obligations.[7] In his influential interpretation, Gerschenkron (1966) emphasized the negative implications of communal property rights (and associated joint liability for land and tax payments) for agricultural productivity and labor mobility after 1861. Gerschenkron and others writing in this vein (i.e. Allen, 2003) have tended to focus on broader institutional impediments that characterized all peasants. Indeed, by the 1880s, the different types of peasants were administratively unified and possessed similar institutions of communal self-governance, (generally) collective property rights, and identical joint liability for taxes and land payments. Such nominal institutional similarities among peasant groups may have hidden persistent *de facto* differences, but as Nafziger (2013) shows using more disaggregate data than previous studies, landholdings were smaller, land inequality was greater, and the associated land and tax obligations were higher in districts with relatively more former serfs, well into the 20th century.

Gerschenkron (1966) argued that the Stolypin land reforms of the early 20th century improved incentives in peasant agriculture by offering mechanisms for consolidating plots and exiting the commune. Although likely important in alleviating some constraints on

[6] None of these Soviet works relied on causal identification.

[7] Such revisionist studies have relied on empirical evidence that is not necessarily representative, is too aggregate to identify differences, or covers an intermediate stage of a complicated and drawn-out reform process.

labor mobility and agricultural productivity (Chernina et al., 2014; Castaneda Dower and Markevich, 2017), these measures were just the first steps in a series of dramatic changes that would deeply impact rural Russian society over the rest of the century: the Bolshevik Revolution, wars, collectivization, famine, industrial policies, and the slow collapse of the agricultural sector from the 1970s onward. None of these changes explicitly or differentially targeted former serfs, but as we develop further below, they may have built upon and reinforced geographic, institutional, and economic differences in ways that perpetuated existing gaps in economic development between former serf and non-serf areas.

**Measuring 19th–Century Serfdom**

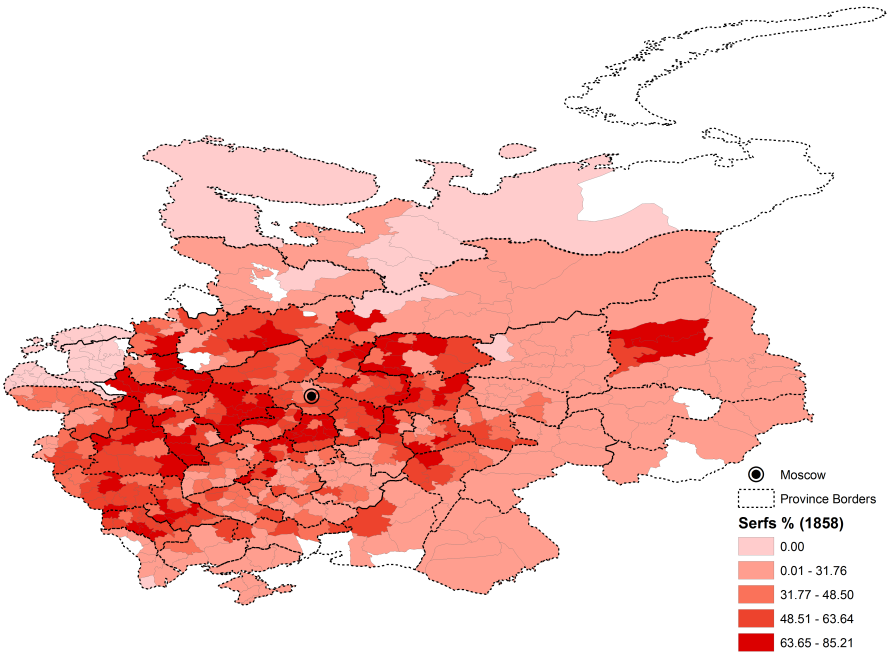
Serfdom was a defining feature of Russian society by the early 19th century, but not all peasants resided on noble–owned land or were subject to quasi-feudal exploitation by the gentry. Indeed, by the 1850s, only a minority of peasants were directly subject to the nobility. Peasants residing on state or Romanov family-owned land (we refer to the latter as "court peasants") were governed by specific administrative bodies, typically possessed more land and greater freedom to engage in contracts, and were generally only liable for direct (and lower) tax-like obligations (Nafziger, 2013). As noted above, factor endowment differences persisted in the decades after 1861, while different groups of peasants experienced at least nominal administrative and legal convergence following serf emancipation.

In analyzing serfdom, scholars have generally focused on specific estates, small geographic areas, or coarse statistics from aggregate data. With regards to the latter, Hoch and Augustine (1979) and Kabuzan (2002) document the changing prevalence of serfdom by relying on data from ten tax censuses undertaken between 1719 and 1858. These two studies report that the share of serfs in the Imperial population crested at just over 50% at the turn of the 18th century, before falling to roughly 35% just before emancipation. We study serfdom at the administrative level of the district (*uezd*), the largest sub-unit of a province, across European Russia.[8] Relying on the 10th tax census of 1858, as reported in Troinitskii (1861), we construct our main indicator of serfdom's intensity, *Serfs % (1858)*, which divides the total number of serfs by the total district population.Since we do not know the total number

[8]To do this, we digitized a late 19th century district-level map of European Russia.

of peasants per district, we use the overall population as a denominator.[9] The resulting measure covers roughly 490 historical districts in 50 provinces of European Russia, without Poland and Finland.

FIGURE 2: SPATIAL DISTRIBUTION OF SERFS AS SHARE OF POPULATION C. 1858.




NOTES: This figure displays serf in 1858 as a share of the population c. 1860.

While over 90% of districts contained some serfs just before emancipation, in only few did the share of serfs in the total population exceed 80%.[10] In our data, serfs averaged 38% of a district's population. Figure 2 shows the underlying variation in serfdom across European Russia just before Emancipation.[11] The map indicates that the institution was largely concentrated in a band from Kiev to the upper Volga. However, even within high-serfdom provinces, there was considerable variation in the share of the population subjugated to the nobility.

[9]Unfortunately, district-level population totals from the 10th tax census are unavailable. As a result, we draw on Bushen (1863), which provides the population totals for 1863. Given the possibility of emancipation-induced migration, this might seem to introduce some measurement error. However, the 1863 population figures were based on administrative records of the tax-paying population, which were unlikely to have been quickly adjusted (and which likely relied upon the 10th tax census). An ideal intensity measure would use the number of *peasants* as the denominator - we control for various urbanization measures in our empirical work below. By necessity, we employ a snapshot of serfdom in 1858, which neglects prior changes in serfdom's intensity. As the level of "labor coercion" is our true variable of interest, this might result in some measurement error.

[10]See the distribution function in Figure A1 in the Appendix.

[11]The picture is very similar if the denominator only includes our best estimate of the rural population.

**Correlates of Serfdom**

As a first step in our analysis, we explore potential factors underlying the geographic incidence of serfdom just prior to Emancipation.[12] This allows us to document the extent to which districts with a greater prevalence of serfdom were systematically different from districts with a lower incidence of coercive labor across a range of geographic and historical co-variates. If the prevalence of serfdom was associated with many district characteristics, we would be concerned about the influence of unobservables that are themselves correlated with our observable co-variates.

TABLE 1: DETERMINANTS OF SERFDOM

| | Serfs % (1858) | | | | | Types of Serfs: Share | | |
|---|---|---|---|---|---|---|---|---|
| | All Districts | | | | LiTS Districts | Quit-Rent | Corvée | Household |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Latitude | -0.100 | -4.063* | -1.422 | -1.333 | 3.526 | 1.084 | -1.798 | -0.783 |
| | (0.648) | (2.063) | (2.008) | (1.967) | (3.448) | (3.627) | (3.057) | (2.978) |
| Longitude | -0.652** | -0.932* | -1.187** | -1.364** | -0.642 | -0.390 | -0.225 | 0.655 |
| | (0.322) | (0.540) | (0.498) | (0.659) | (0.910) | (0.824) | (0.872) | (0.471) |
| Distance to Moscow | -3.724*** | -3.071*** | -2.780** | -2.887** | -2.772 | -1.485 | -0.452 | 1.848 |
| | (0.849) | (0.831) | (1.162) | (1.147) | (2.558) | (2.156) | (2.241) | (1.152) |
| Cereal Suitability | 4.471** | 3.622* | 2.208* | 2.267* | 4.005* | -4.628* | 3.254 | 1.975 |
| | (1.725) | (1.931) | (1.139) | (1.166) | (2.242) | (2.400) | (2.188) | (1.181) |
| Distance to Coast | | 1.765** | 1.563 | 1.735 | 0.749 | 2.595 | -1.880 | -0.816 |
| | | (0.853) | (1.057) | (1.218) | (1.819) | (1.780) | (2.448) | (2.125) |
| Distance City in 1600 | | | | 7.397 | -8.723 | -20.344 | -10.379 | 9.727 |
| | | | | (13.063) | (18.656) | (15.759) | (25.314) | (20.260) |
| Distance Provincial Capital | | | | -0.092 | 0.983 | 0.008 | 0.026 | -1.050 |
| | | | | (1.217) | (1.599) | (1.609) | (1.159) | (0.973) |
| Additional Geography | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | Province | Province | Province | Province | Province | Province |
| R-squared | 0.37 | 0.46 | 0.71 | 0.71 | 0.78 | 0.72 | 0.80 | 0.38 |
| Observations | 490 | 490 | 490 | 490 | 185 | 472 | 472 | 490 |
| Number of Clusters | 50 | 50 | 50 | 50 | 45 | 49 | 49 | 50 |
| F-Stat Joint Signifiance | 21.94 | 14.13 | 2.70 | 2.27 | 2.19 | 1.58 | 2.19 | 1.83 |
| P-Value Joint Signifiance | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.13 | 0.02 | 0.06 |

NOTE: The unit of observation is the district. The dependent variable in Columns 1-5 is the share of serfs in a district population, c. 1858. For Columns 6-8, the dependent variable is the share of such serfs in the total number of serfs. Additional geographic controls are forest cover, ruggedness, river density, mean temperature, mean precipitation, and the share of podzol soils. Heteroscedastic-robust standard errors in parentheses, clustered at the province. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1 provides results from our investigation into possible determinants of the distribution of serfdom across districts in the European part of Imperial Russia. We begin by noting that the location of a district likely had a significant influence over whether and to what extent serfdom was present in 1860. As Muscovy expanded away from Moscow before 1700, state service was often rewarded with the allocation of land in newly incorporated areas, but this practiced eased over the 18th century. Therefore, we consider

[12] All of the variables mentioned are described and summarized in the Appendix Table A1.

the direct distance from each district centroid to Moscow. We also take into account a district's location by controlling for the latitude and longitude of its centroid. Variation in land productivity might have led to differences in the demand for coerced labor or in the desirability of land in return for state service. An important proxy for agricultural productivity is the suitability of the soil for growing crops. As grains were dominant in the Empire's agriculturally productive areas to the south of Moscow, we use modern geo-spatial data to produce a time-invariant measure of the land's suitability for growing cereals (while we also considered soil suitability for growing specific grains, from wheat to oats, barley and rye, these are all highly correlated). Other environmental conditions might have affected local agricultural productivity, the mobility of the population (hence, outside options and the incentives for maintaining serfdom as in Acemoglu and Wolitzky (2011)), and local incomes. Therefore, we also construct and incorporate variables that measure the fraction of land covered with forest today, the share of *podzol* soil (relatively poor for agriculture), the slope of the terrain, distance to the coast, the density of rivers in the district, and the mean growing season temperature and precipitation (averaged over the period 1901-2000).[13] In combination with the spatial location of a district, these variables constitute the base set of geographic controls for the empirical analyses in this paper.

In our initial cross-sectional specification focusing on location and grain suitability (Column 1), the coefficients on longitude and distance to Moscow are negative and statistically significant, consistent with the concentric nature of Muscovite expansion from west to east mattering for the eventual extent of serfdom. A priori, it is not clear how proximity to Moscow of high serf areas would directly relate to long-run economic outcomes. On the one hand, there might be positive development spillovers from the economic center to the areas surrounding it. On the other hand, being close to the political center of an extractive state might generate negative development consequences. As we illustrate empirically below, controlling for the distance to Moscow does not explain away the relationship between historical serfdom and modern outcomes.[14] The suitability for

[13]Many of these environmental variables are measured today. Soviet authorities did engage in agricultural and resource practices that may have impacted agricultural conditions over the 20th century. Such changes were relatively small, likely uncorrelated with incidence of serfdom, and largely occurred outside of European Russia.

[14]Empirically, if anything, places close to Moscow are likely more developed, suggesting that any negative

growing cereals is also a strong and positive predictor of serfdom's intensity in Column 1, which is consistent with the spread of noble estates to relatively agriculturally productive areas.[15] Column 2 adds the rest of the geographic variables (except for the distance to the coast, we do not report the insignificant coefficients for these variables), while Column 3 includes provincial fixed effects (defined for Imperial *guberniia*). While the size of the coefficients on the main variables in Column 1 remain relatively unaffected, we find that a district's province explains a large part of serfdom's intensity. Moving from the cross-district specification in Column 2 to the provincial fixed-effect model of Column 3 increases the $R^2$ from 0.46 to 0.71 (while soaking up some of the impact of several geographic variables).

To take into account "pre-existing" differences in urbanization as measures of past economic development, Column 4 adds the distance of a district to the nearest city as measured in 1600 and reported in the data of Bairoch et al. (1988), and the distance to the district in which the capital of the province is located. Since districts in close proximity to cities and provincial capitals were likely characterized by higher population densities, in the absence of suitable early data, these measures help account for the prominent hypothesis by Domar (1970) regarding the emergence of serfdom in areas with high land-labor ratios. Moreover, the distance to a city is also indicative of the availability of non-coercive outside options for the serf population.[16] As argued by Acemoglu and Wolitzky (2011), the depression of outside options can enable stronger coercion. However, as Column 4 indicates, within provinces, neither variable is a significant predictor of serfdom.

In Columns 5, we estimate the same regression as in Column 4 but only across the districts for which our modern household survey data (see below) are available. We find a similar balancedness in terms of the co-variates considered, with the exception of a positive association between serfdom and cereal suitability. An even larger share of the variation of serfdom in this sub-sample can be explained by our geographic controls and province fixed effects ($R^2$ of 0.78). Columns 6-8 investigate the correlates of the share of different types

impact of serfdom on economic development might be underestimated.

[15] This implies that, if agricultural productivity has a positive impact on development, then models that do not control accurately for suitability would underestimate the effect of serfdom.

[16] Other available indicators of outside options prior to 1861 – such as the presence of factories – are more likely endogenous to the location of serfdom. In particular, we do not have district-level data on industrial activity prior to 1861.

of serfs in the total number. The estimates indicate that the quit-rent form of obligations (*obrok*) was relatively less prominent in areas that were more suitable for cereal agriculture, that corvée (*barshchina*) areas were more riverine, and that non-peasant (household) serfs were located in less fertile regions. Once again, with provincial fixed effects included, the coefficients are at best marginally statistical significant, and as a group they explain relatively little of the overall variation in the type of serfdom.

Overall, we do not find any strong association of these co-variates with serfdom, once we control for province dummies that subsume many relevant geographic and historical characteristics. Appendix Table B1 performs an additional test to examine whether the co-variates of serfdom are associated with long-run development (similar to the omnibus test in Satyanath et al. (2017)). The test indicates that the variation in development outcomes today that is predictable from these co-variates is unrelated to the historical incidence of serfdom. Taken together, these results mitigate concerns that the historical emergence of serfdom is related to unobservable factors that could bias our empirical estimates of the long-run development effects of serfdom away from zero. Rather, we view these results as indicative of balance in observable characteristics between more and less serf areas. All the same, in our empirical work below, we do control for various fixed effects and our baseline set of possible geographic confounders, particularly the distance of a district to Moscow.

## Documenting the Long-Run Impact of Serfdom

### Data

Constructing outcomes for our long-run investigation is challenging, as income per capita is not available at a unit of analysis comparable to our historical data on serfdom, and as our sample spans several current countries. To circumvent these data limitations, we construct our main outcome variables from the three waves of the *Life in Transition Survey* (LiTS).[17] Our main indicator for modern economic development is equivalent household expenditure. It is the sum of spending on food, clothing, education, health, and durables,

[17]The LiTS is collected by the European Bank for Reconstruction and Development to assess household and individual well-being in transition countries. The Appendix contains additional information on the LiTS survey data and the construction of the variables.

expressed in USD and adjusted for the size of the household to create a measure of economic well-being *per capita*.[18] In addition to our main outcome, we draw on the LiTS to measure consumer good ownership (mobile phone, car, computer), the importance of farming and land cultivation.[19] The geo-location of each Primary Sampling Unit allows us to precisely match households to historical districts.[20]

**Baseline Empirical Strategy**

To assess whether the historical incidence of serfdom was associated with modern socio-economic outcomes, we estimate the following model:

$$\log(\text{Expenditure})_{i,d,p,c} = \alpha + \beta \text{Serfdom}_{d,p,c} + H_{i,d,p,c}\lambda + X_{d,p,c}\delta + \Gamma_{p,c} + \epsilon_{i,d,p,c} \quad (1)$$

where $i$ represents the household, $d$ refers to the historical district, $p$ indicates the historical province, and $c$ contemporary country. $\text{Serfdom}_{d,p,c}$ denotes our variable of concern, the share of serfs out of the total population in a (historical) district $d$, located in province $p$, and contemporary country $c$.[21] The coefficient of interest is $\beta$, which gives the effect of serfdom on modern outcomes. $H_{i,d,p,c}$ is a vector of household and survey controls that includes household size, the share of the household aged 0-18, the share aged 60+, the share of males in the household, the household head's religion, and indicators for LiTS waves. $X_{d,p,c}$ is a vector of the district-level controls that we link to the PSUs. Besides the latitude and longitude of the district, we control for the area covered by forest, ruggedness, land suitability for growing cereals, average temperature and precipitation during the growing-season, river density, the share of land with podzol soils, the distance to the coast, and the distance to Moscow. To better account for the influence of local geography on economic activity, we also allow for a non-linear relationship between agricultural suitability and development. Our preferred specification incorporates a subset of these baseline characteristics in a more flexible way by including a set of eight dummies for each class of cereal suitability, quartile dummies for river density, temperature, podzol soil, and

[18] Although, this variable relies on a recall method, the accuracy is remarkably good when compared to directly measured household consumption data (Zaidi et al., 2009).

[19] We also employ the LiTS data to investigate contemporaneous differences in education, public goods provision, cultural attitudes and norms (redistributional preferences, trust, attitudes towards market economies and democratic institutions, xenophobia), and the incidence of protest and collective action.

[20] Appendix Figure A2 shows the PSU locations.

[21] To ease readability, per capita shares of serfdom are divided by factor 100 and vary between 0 and 1.

TABLE 2: ESTIMATING THE LONG-RUN EFFECTS OF SERFDOM

| | (ln) Equivalent Expenditures Per Capita | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Serfs % (1858) | -0.373*** | -0.431*** | -0.379*** | -0.677*** | -0.694*** | -0.644*** |
| | (0.117) | (0.111) | (0.104) | (0.185) | (0.190) | (0.185) |
| Distance City in 1600 | | | 20.544 | | | -54.487 |
| | | | (21.718) | | | (40.700) |
| Distance Provincial Capital | | | -0.062 | | | -0.055 |
| | | | (0.038) | | | (0.045) |
| Household Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Linear Controls | ✓ | | | ✓ | | |
| Flexible Controls | | ✓ | ✓ | | ✓ | ✓ |
| Fixed Effects | Country | Country | Country | Province | Province | Province |
| Observations | 17155 | 17155 | 17155 | 17155 | 17155 | 17155 |
| R-squared | 0.39 | 0.40 | 0.41 | 0.40 | 0.41 | 0.41 |
| Number of Clusters | 45 | 45 | 45 | 45 | 45 | 45 |
| $\delta$ for $\beta = 0$ | 16.126 | 9.856 | 2.486 | 2.772 | 1.518 | 1.166 |
| Lower Bound Estimates | -0.424 | -0.552 | -0.432 | -0.591 | -0.639 | -0.517 |
| *Conley S.E. 250km* | | | | | | |
| Serfs % (1858) | [0.111]*** | [0.104]*** | [0.098]*** | [0.153]*** | [0.131]*** | [0.128]*** |

NOTE: The unit of observation is the household. Household controls include the household size, the share of household members aged 0-18, the share of household members aged 60+, the share of male household members, the religious denomination of the household respondent, LiTS wave fixed effects. Linear controls include latitude and longitude of the district, the area covered by forest, ruggedness, cereal suitability, growing-season temperature and precipitation, river density, share of podzol soil, the distance to the coast, and the distance to Moscow. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as the remaining linear controls. The restricted model used to compute $\delta$ and the lower bound estimates controls for country/province fixed effects. Standard errors clustered at the province are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

precipitation), and linear controls for the remaining variables.

Our measure of serfdom is correlated across space. In most specifications, we include fixed effects for administrative units, denoted by $\Gamma_{p,c}$, which can be modern countries or historically provinces.[22] To account for spatial correlation, we use a conservative approach and cluster either at the level of the province (to account for correlation within a province) or compute Conley (1999) standard errors that allow for correlation of errors within a pre-defined distance.[23]

**Results**

We present our main results in Table 2. The estimates from Equation (1) with the log of household expenditure as the dependent variable are reported under different strategies

[22] In our preferred specifications, and whenever the sample size permits, we utilize historical province fixed effects, which leaves only within-province variation and rules out that the results are driven by provinces without serfdom in 1860, such as the Baltics. This is a demanding specification, since in some provinces the number of households sampled in the LiTS is small and falls in only one district.

[23] To compute spatially-adjusted standard errors we use the routine developed by Colella et al. (2018), that calculates p-values assuming a normal distribution of errors. Results are robust to clustering at the level of the historical district or contemporary primary sampling unit.

regarding the use of fixed effects and controls. Overall, we find a large, negative, and statistically significant relationship between serfdom's intensity and our main measure of economic well-being, conditional on household controls, base geographic controls and fixed effects. The estimated coefficient on the intensity of serfdom is negative and equally significant with either country or provincial fixed effects (albeit larger in magnitude with the latter), with either fully linear or more flexible versions of the geo-climatic controls. In columns 3 and 6, we add controls that proxy for early (pre-1861) economic development: the distance to the nearest city of more than 5,000 inhabitants in 1600, and the distance to the provincial capital. The coefficient decreases slightly in absolute terms but stay significant.

Overall, these estimates are economically meaningful. A one standard deviation increase in the prevalence of serfdom (around 25 percentage points or 0.25 here) is associated with a substantially lower level of per capita expenditure in the modern household data of between 9 and 17%, depending on the specification. This finding is robust to the way we control for geography, administrative unit fixed effects, and to taking into account spatial correlation of errors within a cutoff distance of 250km (standard errors reported at the bottom of the table).[24]

**Assessing Selection on Unobservables**

The negative effects of serfdom on contemporary development presented in Table 2 are robust to an exhaustive set of controls and fixed effects, that together explain about 85% of variation in the main independent variable (see Table 1). Nevertheless, it is possible that unobservables bias our estimates. To assess the scale of any such bias, we employ the methodology of Oster (2017), which tests how strong selection on unobservables has to be to explain away the negative effect of serfdom. It examines coefficient stability by comparing movements of estimated coefficients and the R-squared in models with full controls relative to a model with a restricted set of controls.[25] We present both the $\delta$ estimate of the proportional bias due to unobservables that would have to exist to drive the coefficient of serfdom to zero, along with a lower bound coefficient estimate of the impact

[24] Appendix Table C1 shows that the 250km cutoff produces the largest standard errors.

[25] See Oster (2017) for the formal details of this test. Our restricted model controls for only province or country effects. In an earlier version of the paper, we took the approach of Altonji et al. (2005), which has been adopted in Nunn and Wantchekon (2011) and other studies of historical persistence, which is extended by Oster (2017). Our results with this method also suggest little bias due to unobservables.

of serfdom under equal selection ($\delta = 1$). For both calculations, we assume a maximal R-squared that is 30% larger than the R-squared from the controlled regression, as suggested by Oster (2017). A $\delta$ equal to one means selection on unobservables would be equally impactful on the coefficient estimate as selection on observables, and so values exceeding one imply that selection on unobservables would have to be significantly stronger than selection on observables to explain away our main result. We report these two outcomes of this test in the bottom of Table 2. The $\delta$ values that we compute are consistently larger than one. The implied lower bound estimates are negative, and of large magnitudes that are all economically significant. These findings imply that a bias of our estimates by unobservables is unlikely, and suggest a causal interpretation of the effect of serfdom on contemporary development.[26]

**Further Robustness**

We report additional results from a series of robustness exercises in Table 3. Columns 1 to 3 include additional geographic determinants of agricultural productivity and the choice between agriculture or industrial activity, in particular the within-district variation in land quality (Column 1), differences in the length of the growing period (Column 2), and climatic risk, i.e. the year-to-year variability during the growing-season months (Column 3). Column 4 includes the presence of coal deposits measured during the Soviet period, and Column 5 takes into account the distance from St. Petersburg. The weak relationships of these additional variables with long-run outcomes suggests that the baseline controls, and fixed effects, already absorb the most important geographic factors. Column 6 controls for pre-Emancipation population density, which takes not only into account one possible driver of the incidence of serfdom (as suggested in Domar (1970)), but also soaks up many other (potentially unobservable) geographic and other channels of long-run persistence. To

[26] A previous version of this paper explored an instrumental variables strategy to identify a causal linkage between historical serfdom and economic development today. The instrument – the number of monasteries expropriated (with monastic serfs transferred to the state peasantry) by Catherine the Great in the mid-18th century – was strongly associated with our measure of serfdom c. 1860, and the negative consequences for long-run outcomes remained intact. However, and as noted by referees, there are reasons to question the exclusion restriction for this instrument, as the location of monasteries (and monastic serfs) may be related to unobservable local factors that could plausibly drive longer-run economic outcomes. As such, we have excluded this strategy from the current paper, replacing it with extensive other robustness work (results for IV specifications akin to those of Table 2 are available upon request). It is worth noting that our earlier instrumental variable strategy was recently adopted in Markevich and Zhuravskaya (2018).

TABLE 3: ROBUSTNESS

| | (ln) Equivalent Expenditures Per Capita | | | | | | | Consumer Goods | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Serfs % (1858) | -0.621*** | -0.621*** | -0.635*** | -0.627*** | -0.634*** | -0.666*** | -0.565** | -0.437*** | -0.445*** |
| | (0.197) | (0.187) | (0.185) | (0.189) | (0.185) | (0.191) | (0.219) | (0.149) | (0.144) |
| SD Cereal Suitability | -0.073 | | | | | | | | |
| | (0.095) | | | | | | | | |
| Length Growing Period | | 0.006 | | | | | | | |
| | | (0.004) | | | | | | | |
| Growing Season Variability Precipitation | | | 0.013 | | | | | | |
| | | | (0.018) | | | | | | |
| Growing Season Variability Temperature | | | 19.631*** | | | | | | |
| | | | (6.641) | | | | | | |
| Coal Territory 0/1 | | | | -0.044 | | | | | |
| | | | | (0.080) | | | | | |
| Distance St. Petersburg | | | | | -0.126 | | | | |
| | | | | | (0.142) | | | | |
| (ln) Pop Density 1858 | | | | | | -0.057 | | | |
| | | | | | | (0.100) | | | |
| Religion 1870 | | | | | | | ✓ | | |
| Household Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Linear Controls | | | | | | | | ✓ | |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 17155 | 17155 | 17155 | 17155 | 17155 | 15533 | 17155 | 21734 | 21734 |
| R-squared | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.42 | 0.43 |
| Number of Clusters | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| $\delta$ for $\beta = 0$ | 1.001 | 1.067 | 1.111 | 1.023 | 1.111 | 0.759 | 0.616 | 3.212 | 2.453 |
| Lower Bound Estimates | -0.461 | -0.462 | -0.500 | -0.476 | -0.493 | -0.604 | -0.427 | -0.358 | -0.368 |
| *Conley S.E. 250km* | | | | | | | | | |
| Serfs % (1858) | [0.139]*** | [0.139]*** | [0.139]*** | [0.139]*** | [0.139]*** | [0.139]*** | [0.151]*** | [0.111]*** | [0.100]*** |

NOTE: The unit of observation is the household. Household controls include the household size, share of household members aged 0-18, share of household members aged 60+, share of male household members, religious denomination of the household respondent, Lits Survey Wave fixed effects. Linear controls include latitude and longitude of the district, the area covered by forest, ruggedness, cereal suitability, growing-season temperature and precipitation, river density, share of podzol soil, the distance to the coast, and the distance to Moscow. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as the remaining linear controls. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

alleviate concerns about other factors possibly driving persistence, in particular religious differences, we also control for the district-level share of adherents to the major religions in 1870 - in addition to religious adherents of respondents today. Column 7 shows that religious shares (which are all individually insignificant) slightly reduce the estimated coefficient, albeit in a smaller sample. Finally, Columns 8 and 9 show that our conclusion is unchanged if we employ ownership of various durable consumer goods (mobile phone, car, and computer) in the household as outcome measure from the LiTS. We still find a negative and significant relationship between the historical incidence of serfdom and this measure of household wealth today.[27]

[27] Additional robustness checks of the long-term economic effects of serfdom are reported in the Appendix. Table C3 documents that the main effect of serfdom on household consumption today is not sensitive to the various household controls. Table C4 documents that our findings are robust to controlling for wheat, rye, barley, and oat suitability separately instead of the combined cereal suitability. Table C5 replicates the main results with consumer good ownership as dependent variable. Table C7 reports robustness controlling for (potentially endogenous) rural/urban status of the PSU. Other extensions are discussed in the Appendix.

**The Differential Effect of Geographic Fundamentals**

A more indirect strategy to investigate the long-run impact of serfdom is to differentiate the effects of observable characteristics on economic outcomes in areas where peasants were more or less subjected to the institution.[28] We present such an exercise in Table 4. This depicts the differential long-run effects of geographic determinants of serfdom in provinces where serfdom either never existed or ended much earlier (in particular, the Baltics, where emancipation occurred in 1819 under very different conditions), compared to provinces where it was present. We look at all variables that turn out to be significant predictors of serfdom in Table 1, starting with the case of land suitability for agricultural production. In the absence of labor exploitation one would expect a greater share of suitable land to be conducive to economic development for many reasons, including forward linkages to industrial production, even if the agricultural sector was lagging (as has been the case in the post-Soviet period). However, in areas where Russian serfdom existed prior to 1861, positive effects of land quality on long-run economic outcomes might be limited by persistent effects of labor coercion, since serfdom was more prevalent in more productive lands.

Indeed, this is what Table 4 shows. Looking at only provinces without serfdom in 1861, land suitability for cereals, wheat, rye, barley and oat shows the expected positive (and statistically significant) correlation with per capita expenditures in Column 1.[29] If one considers the rest of Imperial Russia where serfdom was present in 1861, the positive impact of grain suitability turns negative (Column 2). Column 3 and 4 confirm these results conditional on Province instead of Country fixed effects. We still find positive, but insignificant coefficients due to the more limited within-Province variation where serfdom was not prevalent (Column 3), and estimate negative and significant in areas where serfdom existed (Column 4). In the same vein, the share of infertile podzol soils have a differential impact conditional on country fixed effects, but not within-Provinces, where podzol soils cease to be a significant predictor of serfdom.

Besides agricultural suitability, we test for differential effects of proximity to Moscow and to the coast. We find some weak evidence in Columns 3 and 4 suggesting a beneficial

[28] We thank Katia Zhuravskaya for this suggestion.

[29] We define non-serf provinces to be Kurliand, Lifland, and Estliand, which cover much of what are now the modern Baltic countries. This is the reason why these provinces appear oversampled in the LiTS dataset.

TABLE 4: THE DIFFERENTIAL EFFECT OF GEOGRAPHIC FUNDAMENTALS

| | (ln) Equivalent Expenditures Per Capita | | | |
|---|---|---|---|---|
| | Serfdom = 0 | Serfdom = 1 | Serfdom = 0 | Serfdom = 1 |
| | (1) | (2) | (3) | (4) |
| Cereal Suitability | 0.078* | -0.047 | 0.038 | -0.094*** |
| | [0.043] | [0.029] | [0.037] | [0.033] |
| Wheat Suitability | 0.046* | -0.032* | 0.016 | -0.047*** |
| | [0.024] | [0.017] | [0.017] | [0.018] |
| Rye Suitability | 0.048* | -0.052*** | 0.019 | -0.057*** |
| | [0.025] | [0.017] | [0.019] | [0.021] |
| Barley Suitability | 0.044* | -0.047*** | 0.023 | -0.039* |
| | [0.024] | [0.016] | [0.015] | [0.023] |
| Oat Suitability | 0.042* | -0.050*** | 0.021 | -0.053** |
| | [0.023] | [0.015] | [0.019] | [0.021] |
| Podzol Soil | -0.619** | 0.366*** | -0.135 | -0.082 |
| | [0.283] | [0.085] | [0.386] | [0.124] |
| Distance to Moscow | -0.107 | -0.007 | 0.058 | 0.094** |
| | [0.340] | [0.017] | [0.283] | [0.043] |
| Distance to Coast | -0.072 | -0.033* | 0.060 | -0.087*** |
| | [0.044] | [0.018] | [0.064] | [0.031] |
| Household Controls | ✓ | ✓ | ✓ | ✓ |
| Add. Geographic Controls | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Country | Country | Province | Province |
| Observations | 5297 | 11858 | 5297 | 11858 |

NOTE: The unit of observation is the household. The areas without Serfdom include the Baltics. Each cell reports the estimated effect of the geographic variable (cereal/wheat/rye/barley/oat suitability, podzol soils, distance to Moscow, distance to coast) on (log) household expenditure conditional on household controls, additional geographic controls, and fixed effects. Household controls include the household size, share of household members aged 0-18, share of household members aged 60+, share of male household members, religious denomination of the household respondent. Additional controls include latitude and longitude of the district, the area covered by forest, ruggedness, growing-season temperature and precipitation, and river density. Standard errors in brackets are adjusted for spatial dependence, using a cutoff distance of 200km, the largest distance which allows to compute standard errors in both samples. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

effect of spatial distance to Moscow in areas where serfdom existed - which again is consistent with the positive correlation between distance from Moscow and serfdom's intensity. The coefficient for the distance to the coast turns negative in areas where serfdom was widespread, which is what one would expect given that areas with serfdom were located relatively farther away from the coast. Overall, while the non-serf provinces are admittedly a small group, this evidence, and in particular the differential pattern of agricultural suitability, is highly suggestive that a legacy of serfdom gave rise to persistent constraints on subsequent Russian economic development.[30]

**Heterogeneous Effects by Type of Serfdom**

Did local heterogeneity in serfdom matter for long-run outcomes? Employing data from the late 1850s (see the Appendix for details), we can differentiate between the share

[30]The fact that differential effects are particularly strong and consistent for the suitability measures can also be explained by the fact that suitability is the only significant predictor of serfdom in the sample of districts with LiTS data that we consider here (see Table 1).

TABLE 5: HETEROGENEITY IN LONG-RUN OUTCOMES BY TYPE OF SERFDOM

| | (ln) Equivalent Expenditures Per Capita | Consumer Goods | Sale Farm Products | | Land Cultivation | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Serfs % (1858) | | | 0.166*** | | 0.427*** | |
| | | | (0.061) | | (0.152) | |
| Corvée % (1858) | -0.126*** | -0.114*** | | 0.053*** | | 0.097** |
| | (0.037) | (0.032) | | (0.014) | | (0.046) |
| Quit-Rent % (1858) | -0.073** | -0.002 | | 0.018** | | 0.018 |
| | (0.034) | (0.021) | | (0.008) | | (0.011) |
| Household Serfs % (1858) | 0.003 | -0.027 | | -0.001 | | 0.049* |
| | (0.042) | (0.027) | | (0.012) | | (0.025) |
| H0: Corvée = Quit-Rent (*p-value*) | 0.20 | 0.00 | | 0.01 | | 0.09 |
| Household Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province |
| Observations | 14736 | 18609 | 13011 | 11196 | 6171 | 5291 |
| R-squared | 0.38 | 0.43 | 0.08 | 0.09 | 0.18 | 0.19 |
| Number of Clusters | 44 | 44 | 45 | 44 | 38 | 35 |

NOTE: The unit of observation is the household. Corvée, Quit-Rent, and Household Serfs are standardized (mean=0, std=1). Household controls include the household size, share of household members aged 0-18, share of household members aged 60+, share of male household members, religious denomination of the household respondent, LiTS Survey Wave fixed effects. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as the remaining linear controls. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. Sample sizes vary due to the number of LiTS waves reporting the dependent variables. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

of serfs required to pay only quit-rent in cash or kind to their landlords (*obrok*) and the share with at least some labor obligations (corvée or *barshchina*). Consistent with their greater prevalence in less fertile regions (see Table 1), the historical literature emphasizes that serfs on *obrok* generated more of their income from non-agricultural activities that paid a wage, including craft and factory occupations, or from their own enterprises. The resulting relative autonomy of economic decision-making among *obrok* serfs could have led to more favorable long-term economic outcomes compared to the conditions faced by serfs obligated for the more directly coercive *barshchina*.

Table 5 presents results from regressions in which we include the population shares of quit-rent, corvée, and household serfs. The standardized coefficients in Columns 1 and 2 suggests that the negative effects of serfdom on contemporary household expenditure and consumer good ownership are more pronounced in areas with a larger share of corvée serfs and attenuated for districts with a larger share of serfs on quit-rent. In Columns 3 to 6 we document that while areas with greater serfdom are today on average more agricultural, this effect is driven by corvée areas that are significantly more likely to depend on farming and cultivation of land as a source of income today than serfs on quit-rent. This is consistent with the possibility that serfs subject to quit-rent maintained greater autonomy before and after 1861, which translated over time into a greater degree of transition from agriculture

in those areas. Thus, these heterogeneous effects on income and economic activities today shed light on structural change as a mechanism underlying the persistent impact of serfdom, a possibility that we explore further below.

## Tracing the Persistence of Serfdom's Effects

The previous section documented a long-run association between serfdom and economic outcomes today. To understand the mechanisms behind this relationship, it is crucial to identify when formerly serf areas fell behind, and whether there was any process of divergence or convergence over time across historical districts. Unfortunately, generating a consistent indicator of economic development over the entire period is complicated by the changes in regimes and the general lack of dis-aggregate data. We therefore focus on a sample of cities for which we can follow their population during the 19th and 20th century. City population as a measure of economic activity has been used extensively in the development, urban, and history literatures (e.g. Glaeser et al., 1995).[31] In our setting, indicators of urban development allows us to estimate the effect of serfdom before and after emancipation in cross-sectional and panel frameworks. Furthermore, the possible interaction between serfdom and local urban growth over time speaks to our preferred mechanism behind the persistent legacy of coercive labor in the Russian context.

### Cross-Sectional Estimates

We begin with a cross-section of 366 cities for which we can follow population change over the 20th century. We rely on population data collected by Mikhailova (2012), which, in turn, is derived from the Imperial, Soviet, and post-Soviet censuses of 1897, 1926, 1939, 1959, 1970, 1989, and 2002. After locating these cities in our historical districts $d$ and provinces $p$, we regress the log population of city $i$ in each year on the measure of serfdom and our standard controls, including variables that proxy for the pre-1861 level of economic development. We therefore estimate regressions of the form:

$$\log(\text{Population})_{i,d,p} = \alpha + \beta \text{Serfdom}_{d,p} + X_{d,p}\delta + \Gamma_p + \epsilon_{i,d,p} \tag{2}$$

The results from this repeated cross-sectional exercise are reported in Table 6. We find

[31] Especially in agrarian economies, in which urbanization and agricultural productivity are tightly linked, city population are a good measure of economic progress (Bairoch et al., 1988).

TABLE 6: PERSISTENCE THROUGH THE SOVIET PERIOD: CITY POPULATION 1897 - 2002

| Log City Population in | 1897 | 1926 | 1939 | 1959 | 1970 | 1989 | 2002 | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Serfs % (1858) | -1.175*** | -1.113*** | -1.084** | -1.258*** | -1.370*** | -1.428*** | -1.491*** | -0.250 |
| | (0.344) | (0.326) | (0.444) | (0.446) | (0.463) | (0.474) | (0.494) | (0.478) |
| Log City Population 1897 | | | | | | | | 1.056*** |
| | | | | | | | | (0.060) |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 366 | 366 | 366 | 366 | 366 | 366 | 366 | 366 |
| R-squared | 0.34 | 0.32 | 0.30 | 0.32 | 0.31 | 0.30 | 0.31 | 0.67 |
| Number of Clusters | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| $\delta$ for $\beta = 0$ | 6.450 | 95.970 | -14.210 | -16.700 | -27.060 | -35.880 | -82.170 | |
| Lower Bound Estimates | -1.266 | -1.258 | -1.261 | -1.471 | -1.575 | -1.629 | -1.690 | |
| *Conley S.E. 300km* | | | | | | | | |
| Serfs % (1858) | [0.313]*** | [0.325]*** | [0.433]** | [0.433]*** | [0.458]*** | [0.468]*** | [0.474]*** | [0.333] |

NOTE: The unit of observation is a city. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as linear controls of latitude and longitude of the district, the area covered by forest, ruggedness, the distance to the coast, and the distance to Moscow. Distances are the distance to the nearest city in 1600, and the distance to the provincial capital. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

a negative association between city population and the incidence of historical serfdom in the surrounding district for every year. Increasing serfdom by one standard deviation was associated with 25% to 38% lower city population on average.[32] To diagnose the degree to which unobservables might be biasing the estimated effect of serfdom on city population, we present the results from the Oster (2017) test and report them in the bottom of Table 6. The calculated $\delta$'s are large and often negative, suggesting that our estimates are, if anything, possibly biased downwards. When comparing across yearly specifications, the magnitude of the coefficient is slightly smaller in 1939 before becoming larger in the later years. While this pattern could be due to increasingly urban-biased Soviet policies interacting with initial conditions, the consistently negative coefficient is in line with longer run processes originating in the Imperial period. As Column 8 of Table 6 shows, once we control for population in 1897, the coefficient of serfdom becomes insignificant, while the $R^2$ jumps from 0.31 to 0.67. Thus, about 36% of the variation in city population in 2002 is explained by the distribution of population at the end of the Imperial Period. This further suggests that

[32] We get similar results when we control for the geographic environment in a linear fashion, although the effects are slightly smaller and less precisely estimated. See Appendix Table D1. The pattern of persistent differences in urbanization levels according to the experience of serfdom is also consistent with the results obtained using city growth as the dependent variable, controlling for the initial level of population in each sub-period (see Appendix Table D2). In such specifications, we also find persistence, in that historical serfdom has an insignificant association with later population growth but is associated with the initial city population level. See also Figures D1 and D4 in the Appendix for a visual illustration of the estimated coefficients.

serfdom impacted the Imperial spatial economic equilibrium, which then persisted and was even reinforced through the Soviet era, into the post-1991 period.

**Panel Estimates**

Despite the large number of controls and the consistency of the estimates over time, the cross-sectional results may be subject to residual unobserved factors. Therefore, we turn to a panel of cities observed over the entire period 1800 - 2002 (a subset of the cities studied in Table 6) and estimate models of the following form, where $i$ denotes cities, $d$ districts, and $t$ time:

$$\log(\text{Population})_{i,d,t} = \alpha_i + \gamma_t + \beta(\text{Serfdom}_d * \text{Post 1861}) + (X_d * \text{Post 1861})\delta + \epsilon_{i,d,t} \quad (3)$$

If cities in districts with a relatively high incidence of serfdom experienced catch-up growth after emancipation, we would expect the coefficient $\beta$ to be positive and significant. In the case of the persistence of initial conditions under serfdom, $\beta$ should be essentially zero, and if serf areas were falling further behind over time after 1861, $\beta$ would be negative. The advantage of this specification is that it allows us to control for time fixed effects, $\gamma_t$, and for time-invariant fixed but unobservable characteristics of cities, $\alpha_i$ (since each district contains only one city, city fixed effects are equivalent to district fixed effects), that were potentially associated with the strength of historical serfdom and influenced economic development in the long run. In estimating the effect of serfdom, we again allow for a time-variant effects of the fixed observable district characteristics, $X_d * \text{Post 1861}$, and cluster standard errors at the level of the city.

The results in Table 7 are consistent with little catch-up in former serf areas in terms of city growth. Considering the full sample period (1800-2002) in Columns 1 and 2, we estimate a negative coefficient that is, however, not significantly different from zero once we control for the geographic and economic controls interacted with the post emancipation dummy. When we restrict the sample to the years 1800, 1850 and 1897, we find a positive coefficient that is very small and statistically insignificant (Column 3). These results imply that the initial conditions under serfdom were not subsequently overturned. Moreover, the cross-sectional estimates suggested a widening of the economic gap during the Soviet period, and this is confirmed by the negative interaction between serfdom and the Soviet

TABLE 7: PANEL FIXED EFFECTS (1800 - 2002) IN 99 RUSSIAN CITIES

| | Log City Population | | | |
|---|---|---|---|---|
| | Full | | 1800-1897 | Full |
| | (1) | (2) | (3) | (4) |
| Serfs % (1858) × Post Emancipation | -1.588*** | -0.041 | 0.208 | 0.259 |
| | (0.470) | (0.550) | (0.347) | (0.506) |
| Serfs % (1858) × Soviet (1922-1991) | | | | -0.398*** |
| | | | | (0.135) |
| Controls × Post Emancipation | | ✓ | ✓ | ✓ |
| Year FE | ✓ | ✓ | ✓ | ✓ |
| City FE | ✓ | ✓ | ✓ | ✓ |
| Observations | 982 | 982 | 294 | 982 |
| R-squared | 0.75 | 0.79 | 0.75 | 0.79 |
| Number of Clusters | 99 | 99 | 99 | 99 |

NOTE: The unit of observation is a city-year. Controls include latitude and longitude of the district, the area covered by forest, ruggedness, cereal suitability, growing-season temperature and precipitation, river density, share of podzol soil, the distance to the coast, and the distance to Moscow. Standard errors clustered at the city in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

dummy that we obtain in Column 4. If we study a flexible version of Equation (3), we estimate coefficients on the interaction between serfdom and the year dummies that are negative and increase over time, particularly after 1917 (see Appendix Table D3). Figure 3 illustrates the absence of catch-up city growth after emancipation and the associated widening of economic inequality over the Soviet period across areas above and below the median of the distribution of serfdom.[33] This figure and the other evidence presented in this section are inconsistent with a process of convergence in the level of economic development across localities with different exposure to serfdom.[34]

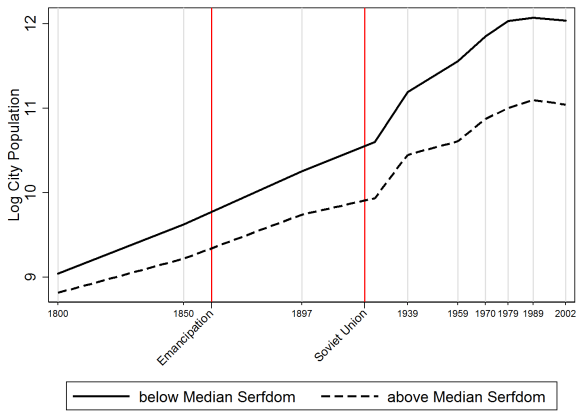
## Mechanisms

This leads us to *the* essential question: how did serfdom generate persistent impediments to economic development? Our findings document a negative association with development, but we have also shown that the strength of this relationship varied over time, with an escalation from the 1930s onward. Any possible mechanisms must take into account these features of the data. We describe and examine the empirical evidence for three different possible mechanisms of persistence: Section 5.1. considers persistent

[33] See the Appendix for i) a visual illustration of the estimated interaction coefficients of serfdom with each time dummy (Figure D5); ii) estimates with standard errors clustered at the level of the province (Table D4); iii) a discussion of possible sample selection bias in the balanced panel (Section D.4); and vi) estimates using data aggregated to the level of the province (Section D.5).

[34] This conclusion is consistent with the results reported in Markevich and Zhuravskaya (2018). Their province-level panel analysis finds large positive economic effects of Emancipation in areas with a greater prevalence of serfs, but this does not imply that full convergence was ever achieved (although this is not directly indicated in their paper).

FIGURE 3: SERFDOM AND CITY POPULATION IN 99 RUSSIAN CITIES (1800-2002)




NOTES: This figure plots average city population for cities whose intensity of serfdom is above the median of the distribution (dashed line), and for cities with below median serfdom intensity (solid line). The sample corresponds to Table 7.

impediments to structural change and local agglomeration, Section 5.2. discusses inequality and public goods provision, while Section 5.3. investigates persistent cultural differences. Overall, the evidence points to a long-standing set of constraints on the processes of urbanization and structural change (with implications for human capital accumulation) in formerly serf areas of Imperial Russia. These impediments were reinforced in various ways through the 20th century, which generated the persistent pattern of spatial inequality in economic outcomes during the Soviet and post-Soviet periods.

**Structural Change, Urban Development, and Local (Dis-)Agglomeration**

**Conceptual Framework.** Serfdom could have negatively impacted modern levels of wellbeing through the generation of persistent constraints on the interconnected processes of urbanization and structural change (i.e. the transfer of factors from relatively low productivity agriculture to higher productivity [growth] industry). As argued by Bleakley and Lin (2012), Davis and Weinstein (2002), Michaels and Rauch (2016), and others, geographic factors and/or historical institutions (such as serfdom) can generate initial spatial patterns in economic activity or urbanization that, through the forces of economic diversification, increasing returns and (dis-)agglomeration, give rise to path dependent variation in local urban and industrial development over the long run. In this sense, the pre-1861 distribution of Russian serfdom may have generated subsequent local and persistent effects on urbanization, industrial growth, infrastructure provision, and labor

productivity, as well as knock-on consequences for inequality and the demand for human capital.

Russian serfdom imposed additional (coercive) constraints on the mobility of labor beyond those experienced by state and court peasants prior to 1861. The relatively more burdensome emancipation settlements and land reforms experienced by the former serfs made the post-1861 rural institutional regime – centered on the communal ownership of property and collective liabilities for taxes and land payments – likely more of a constraint on former serfs than other peasants (Nafziger, 2013, 2012b). Critically, this occurred within the larger post-1861 context of relatively high transportation costs and an Imperial internal passport system that imposed additional costs on migration out of the countryside and to more distant (greater than 30 km) employment opportunities.[35] These frictions in labor mobility likely perpetuated the different initial conditions and consequences of the emancipation reforms among former serfs relative to other peasants when it came to moving off the farm into urban settings and/or industrial employment opportunities.[36] Furthermore, such relative immobility may have constrained local technological, human capital, or Marshallian spillovers, with implications for the path dependency of such early differences. Thus, while there clearly was labor migration in the period, and some growth in urbanization and industry was evident by the end of the 19th century, that former serf areas likely participated to a lesser degree in these processes is our central concern.

This mechanism might explain differential urbanization rates and structural changes in former serf areas to 1917, but how were differential impediments to these processes reinforced or even strengthened by Soviet policies? At first glance, the massive population movements and institutional reforms of the Soviet period would seem to preclude any sort of persistence.[37] However, central features of the Soviet economy and society likely

[35]The administration of the passport system was in the hands of the Ministry of Internal Affairs, with the help of local police officials. The goals of such a system were myriad, but they all revolved around maintaining absolutist control over the population to prevent social instability and ensure tax payments. See Burds (1998) (who also discusses transportation costs) and Chernukha (2007). While limited aggregate statistics on passport issuance are available, to the best of our knowledge, there is no corresponding district-level data.

[36]This explanation is consistent with the framework put forth in Gerschenkron (1966). Collective community tax liabilities (of the peasant communes), inadequate urban housing, and the relatively rigid social estate system also generated frictions in the reallocation of labor. On labor mobility, urban development, and industrialization in the Imperial period, see ibid., Burds (1998), and Gregory (1994).

[37]Collectivization explicitly aimed at breaking up traditional institutions and factor relations in the Soviet countryside, and it at least partially succeeded. However, we have found no evidence that collectivization was

contributed towards persistence of the prior spatial pattern of economic development. First, political goals, planning objectives, and non-market mechanisms for allocating goods, capital, and land inhibited spatial arbitrage and subsequent convergence. Along these lines, the locations and sizes of GULAG camps, "special cities", and many Soviet industrial centers were frequently determined by non-economic concerns. Numerous scholars have argued that the geo-strategic shift of resources eastward (and out of our study region) before, during, and after World War II, along with a continual emphasis on cross-regional "equalization" policies, generated significant spatial distortions in the Soviet economy (e.g. Markevich and Mikhailova, 2013).

Critically for this mechanism, the Soviet regime eventually adopted an even more draconian system of internal passports (*propiski*) and residency restrictions aimed at controlling the allocation of labor and limiting social unrest in cities (Kessler, 2001). While there was some freedom of job choice and location through the Soviet period, these constraints functioned to raise the costs for migration out of the countryside and into cities. As Buckley (1995) and others note, the period of the New Economic Policy in the 1920s saw a general abandonment of Imperial internal passport restrictions before a strengthened system was established in 1932. Over time, further restrictions were imposed on the migration to "secret" or closed cities.[38] Even when and where mobility was possible, the shortfall of urban housing and other disamenities of Soviet city life likely impeded the efficient allocation of labor across sectors through out the period (especially pre-WW II (Hoffman, 1994)). Urban housing inadequacies, internal passports, and various forms of residency restriction continued to generate impediments to labor mobility after 1991 in the Russian Federation, Ukraine, and Belarus.[39]

These impediments to factor mobility from serfdom onwards would have translated into persistent productivity gaps across space, which would have further limited agglomeration

differentially targeted at former serf villages. That being said, if former serf villages retained relatively more inequality by the 1930s (not likely given earlier expropriations), then "dekulakization" campaigns aimed at wealthier peasants may impacted former serf areas to a different degree. We know of no data that could be employed to test for this possibility.

[38] A number of papers have emphasized that closed or secret cities, while initially larger, grew more slowly over the Soviet (and post-Soviet) period. If we control for their presence using data reported in Gang and Stuart (1999), our main findings and extensions are unchanged (not reported here).

[39] See Buckley (1995), Koettl et al. (2014), and Markevich and Mikhailova (2013).

economies and constrained urban development in the negatively affected areas. Given the earlier relative advantages of the districts with lower serf prevalence, post-1861 and Soviet-era policies worked to perpetuate these structural differences, with consequences that appear to have lasted after 1991. While the historical literature suggests this set of mechanisms behind our main findings, we can go further by examining a variety of novel empirical evidence.

**Documenting Structural Change and Urbanization** We begin in the Imperial period. As Table 8 shows, historical serfdom was strongly associated with lower rates of urbanization (as opposed to just city size) before the Revolution (Columns 1 and 2). The reduction in the urbanization rate in 1913 of between about 3.8 percentage points implied by a standard deviation increase in serfdom is a large effect, given a mean of 10.1 and a standard deviation of 12.2 for the former. Columns 3 and 4 investigate industrial production using newly digitized district-level data from just after Emancipation. We find a negative, albeit not statistically significant association between serfdom and the number of firms per capita, but when we divide the ruble value of factory turnover in a district by the number of firms or factory workers, we find that worker productivity was significantly lower in areas with higher levels of serfdom. A one standard deviation increase in serfdom corresponded to about 16% lower industrial productivity.[40] Overall, we interpret the results in Table 8 as consistent with serfdom constraining the mobility of labor and population into more economically dynamic sectors and locations in the post-1861 period.

Although a lack of disaggregate data impedes a detailed documentation of impediments to factor mobility and many spatial policies during the Soviet period, Table 8 also reports the estimated relationship between the historical incidence of serfdom and two related indicators: road density and the location of GULAG camps. We find that transportation infrastructure in the form of road density shortly after 1991 was more limited in former serf areas (Column 5). This was likely both an effect of, and a contributing factor towards, the slower pace of structural change in such districts. Several authors have argued for the

[40] Immediately after 1861, Markevich and Zhuravskaya (2018) find a large and positive industrial productivity increase for provinces with relatively more serfdom before Emancipation, but the mechanisms behind this sudden change are not directly observed. Moreover, such improvements did not fully off-set pre-existing differences between serf and non-serf areas.

TABLE 8: STRUCTURAL CHANGE AND URBANIZATION

| | Pre-Soviet | | | | Soviet | | Post-Soviet | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urbanization Rate | | Factories | Log Production | | | Log Pop. Density | Log Light Density | |
| | 1863 | 1913 | per 1,000 ppl, 1868 | per Worker, 1868 | Road Density | Gulag | 2000 | 1994 | 2008 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Serfs % (1858) | -15.559*** | -15.618*** | -50.056 | -0.651* | -0.009*** | -0.296** | -1.001*** | -0.580** | -0.820*** |
| | (5.051) | (5.524) | (34.049) | (0.338) | (0.003) | (0.124) | (0.339) | (0.247) | (0.295) |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 483 | 490 | 483 | 434 | 490 | 490 | 490 | 490 | 490 |
| R-squared | 0.39 | 0.39 | 0.35 | 0.33 | 0.54 | 0.40 | 0.64 | 0.65 | 0.57 |
| Number of Clusters | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| $\delta$ for $\beta = 0$ | 5.540 | 4.810 | 4.400 | 5.780 | 32.210 | 2.380 | 19.790 | -10.730 | 17.250 |
| Lower Bound Estimates | -14.851 | -14.146 | -49.582 | -0.652 | -0.010 | -0.243 | -1.094 | -0.719 | -0.888 |

NOTE: The unit of observation is a district. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as linear controls of latitude and longitude of the district, the area covered by forest, ruggedness, the distance to the coast, and the distance to Moscow. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

positive local economic impact of the GULAG camps through employment or productivity channels (e.g. Gregory and Lazarev, 2003), both in remote regions and in close proximity to already urbanized localities. Consistent with this and our main results, Column 6 documents a lower incidence of camps relative to the local historical prevalence of serfdom.

Finally, Columns 7-9 of Table 8 employ contemporary measures of urbanization and economic development as outcomes. We consider population density in 2000, and satellite light intensity in 1994 and 2008 as dependent variables. These latter variables can be seen as an indicator of structural change, since industry tends to generate much more nighttime illumination than agriculture. Indeed, we find that modern population density and light density are much lower in areas of higher serf incidence. Finally, the $\delta$ values of the Oster (2017) test, reported at the bottom of Table 8, are either negative, or large and positive, indicating that selection on unobservables is not likely an explanation for these findings.[41]

**Sectoral Employment and Heterogeneity in Structural Change** In Table 9, we examine the occupational structure of the late Imperial period as another way of documenting structural change. We do this by drawing on district-level occupational data from the 1897 national census, using occupational totals across the 65 specified in the original source to define employment shares of different sectors. Relating these to our measure of historical serfdom, we find a positive and significant difference in primary employment (Column 1), and negative, but not significant, differences in secondary or industrial

[41] Appendix Table G4 documents that the negative relationship of serfdom and light density can also be found in other years and when we condition on historical population density in 1858. We also find very similar results when we use linear rather than flexible controls, see Table G1.

TABLE 9: EMPLOYMENT AND HETEROGENEOUS EFFECTS ON STRUCTURAL CHANGE

| | Primary Empl. 1897 | | Secondary Empl. 1897 | | Industry Empl. 1897 | | Factories Per 1,000 ppl, 1868 | | Log Light Density, 2008 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Serfs % (1858) | 0.077* | | -0.008 | | -0.024 | | -50.056 | | -0.820*** | |
| | (0.043) | | (0.023) | | (0.022) | | (34.049) | | (0.295) | |
| Corvée % (1858) | | 0.035** | | -0.016* | | -0.016* | | -10.748 | | -0.240*** |
| | | (0.014) | | (0.009) | | (0.008) | | (6.647) | | (0.081) |
| Quit-Rent % (1858) | | -0.015 | | 0.026*** | | 0.018** | | -6.583 | | -0.020 |
| | | (0.010) | | (0.008) | | (0.008) | | (8.075) | | (0.080) |
| Household Serfs % (1858) | | 0.006 | | -0.008 | | -0.009* | | -7.260 | | -0.102 |
| | | (0.012) | | (0.006) | | (0.005) | | (5.060) | | (0.091) |
| H0: Barschina = Obrok (*p-value*) | | 0.00 | | 0.00 | | 0.01 | | 0.52 | | 0.02 |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 490 | 468 | 490 | 468 | 490 | 468 | 483 | 466 | 490 | 468 |
| R-squared | 0.51 | 0.54 | 0.60 | 0.64 | 0.57 | 0.60 | 0.35 | 0.36 | 0.57 | 0.59 |
| Number of Clusters | 50 | 49 | 50 | 49 | 50 | 49 | 50 | 49 | 50 | 49 |

NOTE: The unit of observation is a district. Corvée, Quit-Rent, and Household Serfs are standardized variables (mean=0, std=1). Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as linear controls of latitude and longitude of the district, the area covered by forest, ruggedness, the distance to the coast, and the distance to Moscow. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

employment (Columns 3 and 5). These average effects mask heterogeneity by different types of serfdom: areas with more serfs on quit-rent, who paid their obligations in cash or kind, had a lower share of the population working in agriculture, and a larger employment in the secondary and industrial sector (Columns 2, 4, and 6).[42] The higher degree of industrialization in districts with larger shares of serfs on quit-rent is also reflected in a larger number of factories in 1868 (Column 8), although this difference is only significant in comparison to the combined share of corvée and household serfs. Finally, constraints on the economic autonomy and transition from agriculture of corvée serfs are reflected in the lower luminosity at night today (Column 10). Overall, we find that districts with relatively more quit-rent serfs saw a greater shift towards higher productivity, non-agricultural activities and locations, with long-run consequences for the level of income today, as suggested in Table 5. Therefore, these results provide additional evidence on the role played by impediments to structural change and urbanization as a key channel underlying serfdom's persistent impact.

**Industrial Production** Did industrial production during the Soviet period reflect the same pattern? We first consider the number of factories of the Soviet defense industry in a sample of Russian and Ukrainian cities, as compiled by Acemoglu et al. (2011) using an early version of the data from Dexter and Rodionov (2016). We observe the number of such factories at six points in time: 1939, 1945, 1959, 1970, 1979, and 1989. While defense

[42] When looking at the share of tertiary sector employment, we find strong negative associations with historical serfdom, as indicated in Appendix Table G3. Districts with higher levels of serfdom display significantly lower employment in service occupations, such as those related to education and commerce.

TABLE 10: SERFDOM AND THE LOCATION OF SOVIET INDUSTRY

| Number of: | Military Firms | | | | | | | Non-Military Firms |
|---|---|---|---|---|---|---|---|---|
| | 1939 | 1945 | 1959 | 1970 | 1979 | 1989 | | 1989 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Serfs % (1858) | -9.538** | -10.919* | -11.966* | -14.351** | -14.942** | -14.957** | 1.014 | -8.380** |
| | (4.511) | (5.438) | (6.010) | (6.801) | (6.903) | (7.127) | (2.330) | (3.939) |
| Number of Factories in 1939 | | | | | | | 1.674*** | |
| | | | | | | | (0.138) | |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 278 | 278 | 278 | 278 | 278 | 278 | 278 | 2656 |
| R-squared | 0.22 | 0.24 | 0.22 | 0.22 | 0.22 | 0.22 | 0.92 | 0.02 |
| Number of Clusters | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 36 |
| $\delta$ for $\beta = 0$ | 1.800 | 1.280 | 1.370 | 1.600 | 1.640 | 1.620 | | 14.940 |
| Lower Bound Estimates | -8.642 | -8.880 | -10.001 | -12.434 | -12.991 | -12.744 | | -8.904 |
| *Conley S.E. 250km* | | | | | | | | |
| Serfs % (1858) | [3.986]** | [5.159]** | [5.838]** | [6.577]** | [6.657]** | [6.915]** | [1.951] | [3.574]** |

NOTE: The unit of observation is a city. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as linear controls of latitude and longitude of the district, the area covered by forest, ruggedness, the distance to the coast, and the distance to Moscow. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

factories in a command economy were certainly not allocated across space as a result of free market mechanisms, the geographic variation in this specific type of establishment could be indicative of the processes of structural transformation if Soviet authorities made location decisions to take advantage of pre-existing industrial activities.[43]

The results in Table 10 document a statistically significant and increasingly negative relationship between historical serfdom and the number of defense plants in observed cities over the six cross sections (Columns 1-6). The negative coefficient prior to World War II suggests that our findings are not indicative of the wartime movement of production eastward. The fact that coefficients increase over time is consistent with localized agglomeration economies that accelerated the allocation of firms away from areas with greater levels of historical serfdom. A one standard deviation increase in historical serfdom results in 3.75 fewer firms in 1989 (or 0.22 of a standard deviation). Column 7 reports that when we include the "initial" (measured) level of defense production in 1939, we find no residual effect of historical serfdom on firms in 1989.[44] Similarly to the results on city

[43] Part of this might be due to localized upstream and downstream linkages related to the defense factories, many of which also produced consumer goods. Other than the eastward shift of industry in World War II and the creation of "closed" cities (see above), we have found little evidence for a particular spatial allocation rule when it came to defense plants, particularly with respect to formerly serf areas. If anything, it seems that its priority status meant that the location of the Soviet defense industry likely built upon and reinforced existing spatial patterns (Markevich, 2008).

[44] For 1959, 1970, and 1989, when we have population data for these cities (to define a per capita measure of defense plants), we find similarly negative effects for 1959 but not for the latter two years. This is consistent with our finding of a much greater urban population growth in less serf areas, leading to some convergence in industrial plants *per capita*. These results are available upon request.

populations, this implies that the structural impact of serfdom's legacy was present early in the Soviet period and then persisted over subsequent decades.[45]

While the defense plant data offer a consistent indicator of industrial activity over the Soviet period, we also employ data on the location and number of non-military firms from the *1989 Soviet Census of Manufacturers*. In Column 8 of Table 10, we establish a similar negative effect of serfdom on the number of such firms in more than 2600 towns in our historical districts. A one standard deviation increase in historical serfdom translates into two fewer firms in 1989 (or 0.11 of a standard deviation). Besides the aggregate number of firms, these data allows us to investigate differences in characteristics across the approximately 14,000 Russian firms observed in this source just before the fall of the Iron Curtain. Table 11 shows these firm-level regressions. Consistent with persistent constraints on structural change (and agglomeration), we find that in 1989 firms in areas where serfdom was historically important were i) more likely to be in the agricultural sector, and less likely to be in manufacturing; ii) employed fewer people; iii) had smaller turnover; iv) and were less productive.

**Human Capital** The implications of coercive labor institutions for long-run human capital accumulation have been cited as another mechanism behind historical persistence. Lower health or education investments under historical institutions can then persist through intergenerational mechanisms, local preferences, and/or supply-side factors (perhaps mediated by an unequal political structure – see below).[46] At the same time, low levels of human capital can cause or reinforce impediments to structural change akin to those documented above (e.g. Rocha et al., 2017).[47] Given this possibility, and to identify whether

[45]The dynamics of this relationship are depicted in Figure E2. We find similar results when we use linear rather than flexible controls (Table E1) or when estimating negative binomial regressions (Table E2). In Table E5, we extend this analysis to investigate whether localities with higher level of historical serfdom grew faster during the Soviet era if they experienced a larger allocation of defense factories early in the period. Interacting the share of serfs with the log number of factories in 1939, we find that the negative effects of serfdom on city population and city growth in the years after is attenuated in cities with a higher number of factories. These results further illustrate the inter-linkages between serfdom, industrial development and urban growth. Finally, if we employ the growth rates of the number of defense plants over different periods as our dependent variables, we find a lack of catch-up growth in industrial production (Table E3 and Figures E3 and E4).

[46]Discussions of long-run persistence through human capital channels in other contexts include Bertocchi and Dimico (2014), Chen et al. (2018), Margo (2016), and Sacerdote (2005). These and other studies tend to emphasize the role of intergenerational transmission via households or local culture.

[47]Ivanov (2016) argues that Soviet areas with greater human capital levels prior to 1991 – for non-market reasons under the planned economy, he asserts – saw greater gains in human-capital intensive activities

TABLE 11: A FIRM-LEVEL ANALYSIS FOR 1989

| | Agriculture | Manufacturing | (log) Employment | (log) Turnover | (log) Turnover per Worker |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Serfs % (1858) | 0.065*** | -0.062*** | -0.290** | -0.381** | -0.096*** |
| | (0.016) | (0.020) | (0.119) | (0.142) | (0.034) |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ |
| SIC Fixed Effects | | | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province |
| Observations | 14154 | 14154 | 14055 | 13933 | 13923 |
| R-squared | 0.03 | 0.02 | 0.57 | 0.63 | 0.77 |
| Number of Clusters | 36 | 36 | 36 | 36 | 36 |
| $\delta$ for $\beta = 0$ | -4.420 | 2.770 | 2.170 | 5.110 | -1.890 |
| Lower Bound Estimates | 0.096 | -0.085 | -0.240 | -0.379 | -0.139 |
| *Conley S.E. 300km* | | | | | |
| Serfs % (1858) | [0.012]*** | [0.018]*** | [0.142]** | [0.165]** | [0.037]** |

NOTE: The unit of observation is a firm. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as linear controls of latitude and longitude of the district, the area covered by forest, ruggedness, the distance to the coast, and the distance to Moscow. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. SIC Fixed Effects are dummies for industrial classifications of firms using the 5-Digit Standard Industrial Classification Codes. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

human capital mechanisms were an independent source of historical persistence, we study schooling and literacy information from before and after the Soviet period (equivalent data at the relevant unit of observation are not available for the Soviet period).

Table 12 presents estimates of the relationship between historical serfdom and human capital outcomes in the late Imperial Period (Columns 1-3) and today (Columns 4-9). While the historical literature asserts that serf schooling decisions and the supply of educational opportunities were both constrained prior to 1861 (e.g. Eklof, 1986), we can also ask whether areas where serfdom was more prevalent showed differences in post-1861 human capital outcomes using novel district-level data. Column 1 finds that district with more serfdom had fewer schools per thousand inhabitants before emancipation. A one standard deviation increase in our measure of serfdom is associated with a lower number of schools by about 0.12 of a standard deviation. However, if we consider educational outcomes about 20 and 50 years after emancipation (Columns 2 and 3), we do not find significant differences in educational attainment, whether measured by enrollment rates or the density of schools.[48] These results suggest a convergence of basic educational attainment shortly

afterwards. This is consistent with our account. Bobonis and Morrow (2014) finds that formerly coerced areas in 19th-century Puerto Rico saw a reduction in literacy in the face of de-industrializing commodity price shocks that reduced the demand for skilled labor. In our Russian context, the dynamic sectors can be interpreted as skilled-labor using.

[48]We have experimented with additional district-level measures of enrollment and schooling from 1894 and 1911 and with literacy rates as documented in the 1897 census. Our finding that human capital "gaps" vanished by the end of the 19th century is supported in these exercises (available upon request).

TABLE 12: HUMAN CAPITAL

| | Historical | | | Modern (2006-2016) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Schools per 1'000 ppl, 1856 | Enrollment 1880 | Schools per 1'000 ppl, 1911 | Highest Education | Post Secondary | Tertiary | Parents Education Years | Parents w/ Tertiary | Education Government Priority? |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Serfs % (1858) | -0.042** | -1.046 | 0.169 | -0.410** | -0.171* | -0.238*** | -2.810*** | -0.264** | -0.121 |
| | (0.016) | (1.441) | (0.218) | (0.193) | (0.091) | (0.071) | (0.814) | (0.118) | (0.085) |
| Household Controls | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Flexible Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distances: City & Prov. Capital | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | Province | Province | Province | Province | Province | Province | Province | Province | Province |
| Observations | 486 | 489 | 486 | 19350 | 19350 | 19350 | 4285 | 13316 | 21400 |
| R-squared | 0.60 | 0.73 | 0.59 | 0.20 | 0.14 | 0.09 | 0.43 | 0.16 | 0.07 |
| Number of Clusters | 50 | 50 | 50 | 45 | 45 | 45 | 40 | 44 | 45 |
| $\delta$ for $\beta = 0$ | 6.094 | 0.198 | -0.660 | 2.255 | 3.135 | 3.135 | 3.696 | 1.892 | -21.252 |
| Lower Bound Estimates | -0.046 | 3.350 | 0.404 | -0.336 | -0.159 | -0.220 | -2.937 | -0.210 | -0.125 |
| *Conley S.E.* | | | | | | | | | |
| Serfs % (1858) | [0.013]*** | [1.422] | [0.185] | [0.159]*** | [0.075]** | [0.073]*** | [0.984]*** | [0.084]*** | [0.081] |

NOTE: The unit of observation is a district in Columns (1) - (3), individual above age 25 in Columns (4) - (6), and an individual of any age in Columns (7) - (9). Household controls include the household size, share of household members aged 0-18, share of household members aged 60+, share of male household members, religious denomination of the household respondent, Lits Survey Wave fixed effects. Flexible controls include eight dummies for cereal suitability, and four dummies for quartiles of growing season temperature, growing-season precipitation, the share of podzol soil, and river density, as well as the remaining linear controls. Distances are the distance to the nearest city in 1600, and the distance to the Provincial capital. The restricted model used to compute $\delta$ and the lower bound estimates controls for province fixed effects. Standard errors clustered at the province in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

after emancipation.

Differences by historical serfdom in educational outcomes do, however, appear in measures of contemporary educational attainment taken from the LiTS (Columns 4-9). Looking across adults above the age of 25, we find that the incidence of historical serfdom is significantly associated with a reduction in the highest education achieved by the respondent (Column 4), which is mostly driven by a reduced completion of post-secondary and tertiary education (Columns 5 and 6). Increasing our measure of serfdom by one standard deviation is associated with a reduction in the likelihood that the respondent has completed tertiary education by 6 percentage points (from a mean of 28%). In addition, we investigate the implications of serfdom for the level of education of respondents' parents to shed more light on the persistence of impediments on human capital accumulation in the Soviet period and beyond (more than 3,000 respondents in the sample are born before 1945). As shown in Columns 7 and 8, the estimated coefficients suggest similarly a reduction in average education of parents.[49] Finally, Column 9 investigates (and rejects) the idea that some of these differences in contemporary human capital stem from lower demand for education by citizens from the government.[50]

Together, the findings in Table 12 provide little support for a direct human capital channel of persistence, given the pattern of convergence after emancipation.[51] Rather,

[49] A one standard deviation increase in past serfdom decreases parents' schooling by 0.6 of a year (or 0.15 of a standard deviation), and the number of parents with tertiary education by 0.11 of a standard deviation.

[50] None of the significant differences in past or contemporary educational outcomes are likely to be driven by unobservables, as documented by the results of the Oster (2017) test at the bottom of Table 12.

[51] This convergence is consistent with late-Imperial efforts to improve the provision of basic schooling, especially in underserved rural areas (Eklof, 1986; Kaser, 2006; Nafziger, 2012a).

these results likely reflect a relatively lower demand and supply for skilled labor in former serf areas during the acceleration of industrial development in the Soviet Union. This is yet another piece of evidence suggesting a mechanism of historical persistence closely connected to constraints on urban development and factor mobility – particularly the allocation of labor out of less productive agriculture – that emerged under serfdom but were reinforced and even strengthened over the subsequent periods.[52]

**Alternative Mechanism I: Inequality, Institutions, and Public Goods Provision**

A large literature posits a relationship between labor coercion, income or wealth inequality, persistent political institutions, and the subsequent provision of public goods, including basic schooling (e.g. Engerman and Sokoloff, 1997; Nunn, 2008a; Dell, 2010).[53] While there are various possible linkages between inequality and development outcomes (e.g. financial access; or through differential incentives to save and invest), many of these are possibly more transitory. For inequality to be a channel of long-run persistence, there must be some sort of underlying structure that perpetuates the unequal distribution of resources (and its possible impact on public goods or human capital) over time, leading to worse development outcomes for a large share of the population. Generally, Engerman and Sokoloff (1997) and others highlighted the role of political institutions, and the reinforcing feedback between the unequal distribution of wealth and political power.[54]

Is this mechanism relevant in the Russian case? The demolition of Imperial institutions, Soviet expropriations and transfers, and the governance structures and reforms of the Soviet and post-Soviet periods would seem to preclude a straight forward inequality / political economy mechanism that differentiated former serf and non-serf areas. Despite this, it might have been the case that some sort of legacy of Imperial inequality did generate longer

[52]Cheremukhin et al. (2017) argue that monopoly power and entry barriers in the industrial sector constrained Soviet growth. While we cannot directly examine their aggregate mechanism in our spatial analyses, we view our emphasis on labor market frictions as complementary with their interpretation.

[53]A similar mechanism is posited in Galor et al. (2009), who asserts that elites in largely agrarian and highly unequal societies (specified in terms of land) may have little interest in funding public goods that have limited direct payoffs to themselves. For evidence of both demand and supply-side mechanisms linking land inequality to schooling in the Prussian case, see Cinnirella and Hornung (2016).

[54] The recent study of Acharya et al. (2018) argues for the long-run political consequences of slavery in the American South, whereby historical coercion was associated with persistent racist beliefs and subsequent institutional capture by whites, both of which shaped black and white political behavior for generations after emancipation. The role played by economic inequality in driving and reflecting these processes is largely implicit in this account.

term outcomes. The evidence presented in Appendix Table C13 shows that the incidence of serfdom was strongly related to measures of land concentration prior to the Soviet period, suggesting that the end of serfdom did not fully equalize the distribution of this key asset.[55] However, as we have already seen, there is little evidence that schooling can similarly be linked to serfdom by the late Imperial period, and we do not have adequate data to evaluate other types of locally provided public goods in the Imperial or Soviet periods at a comparable level of analysis.

Regarding measures of contemporary inequality that we construct from LiTS household data, which are arguably rough, we do not find a significant effect of serfdom, nor do we find that past inequality predicts contemporary inequality (Appendix Table C13). Persistent inequality seems, therefore, to be an unlikely direct mechanism. Furthermore, we also investigated the connection between the historical incidence of serfdom and access to a variety of public goods in the modern LiTS data. However, these results (see Appendix Table C14) find little sign of a relationship between serfdom and locally determined public goods such as water and sanitation access. Given the massive changes imposed by the Bolsheviks on the political and social structures of Russian society, especially at the local level, it would indeed be surprising to see the historical legacy of serfdom continuing to determine the level of locally provided public goods today. That being said, we do find lower levels of more centrally provided (i.e financed) public goods, such as road infrastructure in areas with a higher historical incidence of serfdom (see Table 8). We interpret these results to suggest, however, that underlying structural factors related to serfdom played a key role in determining the long run provision of such public goods. This would also be consistent with the time pattern of the human capital results shown above and with our preferred framework regarding persistent constraints on local structural change in former serf areas.

**Alternative Mechanism II: A Long-Run Culture of Serfdom?**

Did economic exploitation over several centuries shape peoples beliefs and attitudes, perhaps fostering a “culture of serfdom" (e.g. Schooler, 1976), with persistent implications for economic development? Several recent studies have documented that institutions can

[55] It could be the case that land concentration might not quite capture the exact inequality driving potential differences in public good provision. For a longer discussion of public good provision amidst political and economic inequality in late–Imperial Russia, see Nafziger (2011).

impact cultural norms in the long-run, which can persist through transmission within households or local communities (for an overview see Nunn (2012)). When we consider measures of trust, preferences for economic and political institutions, xenophobia, or membership in the Communist Party from LiTS, we find little evidence that serfdom was associated with differences in cultural attitudes today (see Appendix Tables C8, C9, and C10). This is consistent with the absence of racial, ethnic, or class markers for the descendants of serfs, and with the sharp break in political and social life created by the Soviet regime. We similarly do not find a link between historical serfdom and discontent with the government, as manifested in protests or political participation (Appendix Table C12). However, we do find that individuals in areas with a greater prevalence of serfdom are more likely to see luck as the reason for prosperity or poverty, have stronger preferences for redistribution, and prefer to equalize incomes rather than widen income inequality (Appendix Table C13). Rather than a sign of a direct cultural mechanism, we interpret these results as indicative of underlying unequal (spatial) distribution of incomes between formerly high and low serf area today, which derived from the persistent impediments to urban development and structural change.[56]

## Concluding Remarks

In this paper, we explore whether variation in the experience of coercive labor institutions, which existed for centuries in the Russian Empire, generated persistent differences in economic development that lasted until today. The evidence that we marshal confirms the adverse medium and long-run economic consequences of Russian serfdom that has often been assumed but never definitively proven. This is the case across a wide variety of specifications and robustness checks, and we argue that it cannot be driven by unobservable factors associated with both historical serfdom and modern development. We provide evidence that the experience of serfdom and emancipation generated persistent constraints on urbanization and structural change, with repercussions for human capital accumulation. These effects lasted through the late Imperial and Soviet periods to

[56]At the same time, these differences in preferences for redistribution are broadly consistent with the view that the European equilibrium of high redistribution and a notion of social injustice, and the American equilibrium of low redistribution and a belief in effort, may stem from Europe's experience with feudalism (Alesina and Glaeser, 2004).

today, resulting in slower city growth, lower industrial development, weaker infrastructure development, and, eventually, lower educational attainment and income levels. Thus, our results imply that early industrial development and subsequent agglomeration effects can be important channels of historical persistence of the effects of labor coercion, even after periods of dramatic social and economic change.

The failure to develop adequate institutions to support market and political development has been a theme of recent research into Eastern Europe's transition since the fall of the Soviet Union (e.g. Aslund (2013)). Our study points to possible deeper historical roots for the impediments that the Russian Federation and other former members of the Russian Empire currently face in their efforts at economic reform, diversification, and modernization, a hypothesis that has been proposed but remains relatively untested.[57] Along these lines, a number of interesting questions remain open for further research. How did specific Imperial policies, institutions, or economic shocks translate different experiences of serfdom into economic variation across space and over time prior to 1917? In what ways did specific Soviet and post-Soviet policies differ across relatively small areas? Are local policymakers and residents aware of a prior legacy of serfdom? The development of new archival evidence and empirical sources in Russian economic history can hopefully shed light on these and other questions.

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[57] See Castaneda Dower and Markevich (2014), Lankina (2012), and Roland (2012).

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