Long-Run Consequences of Labor Coercion: Evidence from Russian Serfdom *

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Abstract

This paper examines the long-run consequences of Russian serfdom. We use novel data measuring the intensity of labor coercion at the district level in 1861. Our results show that a greater legacy of serfdom is associated with lower economic well-being today. We apply an IV strategy that exploits the transfer of serfs from monastic lands in 1764 to establish causality. Exploring mechanisms, we find a positive correlation between the earlier experience of serfdom and pre-Soviet urbanization and land inequality, with negative implications for human capital investment and agglomeration over the long-run.

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

JEL Classification: N33, N54, O10, O43

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Introduction

Throughout human history, "coercive" labor relations have been relatively common, from Roman slavery to forced cotton harvests in contemporary Uzbekistan.¹ Economists have long argued that unfree labor generates economic inefficiencies, but whether impediments persist once the institution is abolished has only recently entered the discussion. In this paper, we study whether institutions of unfree labor can have economic consequences long after their demise, using one of the most prominent examples of historical coerced labor: Russian serfdom. The correlation depicted in Figure 1 suggests that Imperial Russia's retention of serfdom until the 1860s is associated with lower income levels in today. Our paper argues that this relationship is indicative of an underlying causal mechanism. Taking advantage of new data just prior to Emancipation in 1861, along with a novel identification strategy, we uncover a robust negative relationship between this institutional heritage and economic development in areas of the former Russian Empire today. We then investigate the mechanisms underlying this persistence and conclude that the evidence points to long-run constraints on labor mobility and structural change in former serf areas. Our results provide important new evidence on the economic importance of institutional legacies and add to the emerging empirical literature documenting adverse long-run consequences of forced labor (e.g. Engerman and Sokoloff (1997), Dell (2010), Nunn (2008b), Acemoglu, García-Jimeno and Robinson (2012), Acharya, Blackwell and Sen (2016)).²

Russian serfdom was a system of labor coercion that existed from the 16th century to 1861, and has been perceived as a crucial institution in the region's economic history (Acemoglu and Robinson, 2012).³ Indeed, at a time when the Industrial Revolution was fundamentally changing the economies of Western Europe, around 50% of peasants in European Russia were obliged to work for the landowning nobility 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 payment obligations to the newly freed peasants. The changes that these formerly *privately* "owned" peasants went through may be contrasted with the experience of the rest of the peasantry, who resided on state or Imperial family-owned lands prior to 1861, and who saw a reform process in the 1860s that changed relatively little of their landholdings or obligations. These peasants possessed more land and faced a more liberal (at least on average) policy and institu-

¹Around 21 million people in the world today are in forced labor, coerced either by private individuals or the state according to the International Labor Organization ILO 2012 Global Estimate of Forced Labour.

²In considering the external validity of our findings, it is worth noting that important differences existed between Russian serfdom and forced labor in other contexts. First of all, serfs tended to enjoy considerable autonomy in how they allocated their time unlike, for example, the majority of American slaves. Second, although there were important exceptions, 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. This means that race or ethnicity as mechanisms of persistence, certainly important in the North and South American cases, can largely be excluded in the Russian one.

³Slavery had a long history in Kievan and Muscovite Russia. The laws and customs regarding debt servitude and other forms of personal obligation helped structure those that later formalized serfdom (Hellie (1982)).





Notes: GDP per capita in 2014 taken from Worldbank; Date of emancipation from various sources, see Appendix.

tional environment prior to the 1860s, and their reform experience solidified these differences in the short and medium term. In this paper, we leverage this heterogeneity within the pre-1861 peasantry to identify longer-run consequences of serfdom.

We rely on newly collected district (*uezd*) level data from a tax census conducted in the late 1850's to map the variation in the share of the population who were serfs across the European part of Imperial Russia. To test for differences in subsequent economic outcomes across districts with high and low levels of historical serfdom, we match our measure of serfdom's intensity with modern outcome data (especially from the Life in Transition Survey (LiTS)) and from data defined for intermediate dates in the Imperial, Soviet, and post-Soviet periods. We document that households in districts where serfdom was widespread before 1861 are poorer today (2006), conditional on a large set of local bio-geographic characteristics, household variables, proxies for early development, and provincial fixed effects. According to our OLS estimates, a standard deviation increase in the share of the population who were serfs is associated with 10 - 14% lower average household consumption today.

These OLS estimates would be biased, however, if unobserved district characteristics influenced where serfdom was more common and, at the same time, affected economic outcomes in the long-run. To address these omitted variable concerns, we make use of plausibly exogenous variation in the extent of serfdom derived from the transfer of church land and serfs to state control by Catherine the Great in the 18th century. Church serfs, who resided on land transferred in parallel to the noble estates and subject to largely the same constraints as privately owned serfs, were, as a result of this reform, fully integrated into the "state peasantry" by the early 19th century. We exploit this historical experiment by using the geographic distribution of monasteries (the most significant holder of populated church property) before the onset of Catherine's reforms in 1764 to instrument for the intensity of serfdom at the district level just prior to emancipation. The instrument is a strong predictor of serfdom's intensity, and the IV results again show that the prevalence of the historical institution is negatively related to current household expenditures.⁴

Critically, we then move on to investigate the robustness of our main results and to explore the potential mechanisms behind this correlation.⁵ We confirm the negative relationship between serfdom's intensity and long-run outcomes by studying modern household asset ownership, by employing night-time luminosity in 2008 at the historical district level as a proxy for the level of development, and by controlling for a host of pre-reform initial conditions. Further, we show that the agricultural suitability of the land only matters for long-run well-being in areas where serfdom was less prevalent, suggesting off-setting constraints on development in areas of greater serf presence. In working to identify the mechanisms underlying these constraints, we focus on a large set of possible channels. Based on a wealth of newly collected data, we argue that the transmission of cultural preferences, inequality and public goods mechanisms, and direct (intergenerational) human capital differences were probably of secondary importance in driving our main results. Rather, we employ data on industrial development and urbanization from the Imperial to post-Soviet periods to establish that areas with relatively more serfs saw little catch-up growth over the entire era. These findings suggest a (dis-)agglomeration mechanism for the link between serfdom and modern outcomes: persistent constraints on labor mobility that began under serfdom and perpetuated themselves over time inhibited local growth spillovers and processes of structural change.

Whether serfdom generated a legacy for subsequent Russian economic development has long been a topic of scholarly interest. Alexander Gerschenkron (1966), among others, attributed the slow pace of development in late-Tsarist Russia to serfdom and particular features of the emancipation process that seemingly perpetuated many institutional restrictions in the countryside (also see Dennison (2011) and Lenin (1911)). However, empirical work on Russian serfdom and emancipation, both in general and in terms of documenting subsequent effects, is relatively limited. One notable exception is Markevich and Zhuravskaya (2016), who estimate that provinces with above average levels of serfdom (as a share of the total population) were growing relatively faster after emancipation. In a related work, Nafziger (2013) shows that the emancipation process largely defined the subsequent structure of factor endowments and land prices in the countryside prior to the Revolution of 1917. However, these studies do not effectively consider the possible omitted variable bias that our IV strategy addresses.

At the same time, whether economic differences between high and low serf regions persisted beyond the Imperial period has not previously been studied. This is not surprising given

⁴Our IV coefficients are larger than the OLS ones – we discuss several possible reasons below.

⁵We provide key results from robustness exercises and explorations of causal mechanisms in the main text, while leaving many supplementary results for the Appendix.

that the Soviet Union stands between then and now, and that regime completely revolutionized Russian economic, political, and social institutions. However, researchers have found long-run effects of institutional variation in other contexts, even in the face of subsequent and dramatic changes (e.g. Nunn (2008a) and Michalopoulos and Papaioannou (2013)). Given the qualitative importance of serfdom for Russia's economic development, both prior to 1861 and before 1917, it is particularly valuable to investigate the extent to which this institutional regime generated long-run effects. If one establishes a correlation between past serfdom and present outcomes, identifying the underlying mechanisms of persistence is obviously imperative, particularly as such an exercise may suggest historical factors underlying the economic difficulties that countries in this region have faced since the end of communist rule. In this way, our study also contributes to the literature on historical development and persistence (Nunn (2013) provides an excellent survey). While we emphasize the agglomeration implications of a local legacy of serfdom, our empirical investigation also provides novel evidence other possible channels of historical persistence, from factor inequality and human capital investment, to cultural preferences (as in Galor, Moav and Vollrath (2009), Galor and Moav (2006), Nunn and Wantchekon (2011), and many others).

Section 1 describes the historical background, including the measurement and determinants of the geographic variation in serfdom. Section 2 estimates the impact of serfdom on long-run development. Section 3 investigates potential channels of persistence. Section 4 concludes.

The History, Measurement, and Determinants of Serfdom

Historical Background⁶

Russian serfdom emerged as a set of formal constraints and informal practices in the 16th and 17th centuries. In return for service to the Tsars during Muscovite and Imperial state expansion, the elite received large 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 laboring 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 control over various aspects of their lives. These attempts came to be supported by the state through various 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 context 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,

⁶This account is drawn from various studies. A good summary is provided in Moon (1999).

and even other peasants, and they faced substantive restrictions on their personal, family, and community autonomy (Wirtschafter (1997)). This had implications for their rights under Russian civil, criminal, and property law, including restrictions on land ownership and on the free contracting of their own labor. 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.⁷ Second, serf-owners demanded seigniorial rents and obligations. Extraction took the form of labor obligations, cash or in-kind payments, or a combination of the two. On many estates, owners actively managed the labor decisions of their serfs on and off the estate, either in person or through managerial staff. Such estates often possessed demesnes, with labor on the owner's land compensated by the granting of use-rights to the rest of the property. On other estates, serfs were granted substantial freedom to allocate their labor as they saw fit, subject usually to owner 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.

Despite substantial, estate by estate, variation, these attributes suggest an institutional regime that was antithetical to economic development. The labor, property, and education decisions of serfs were often circumscribed, resulting in disincentives for investment (of all sorts), the misallocation of labor and other resources, impediments to the adoption of better agricultural techniques, and a host of other constraints. And given the prevalence of serfdom, these microeconomic conditions may have slowed Russian industrial development and kept rural incomes low. Many contemporary observers acknowledged the disincentives for economic growth that the institution generated prior to 1861. Indeed, supporters of the status quo argued for continuing the institution less in economic terms than to maintain the Imperial regime, to defend Slavic traditions, and to support some form of elite tutelage over masses ill-equipped for freedom.⁸

Despite contemporary views and a long subsequent scholarly debate, there is remarkably little causal evidence on the economic impact of serfdom (and 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 Marxist orientation placed the argument before the evidence. Domar and Machina (1984) utilized more comprehensive information on the price of land with and without resident peasants to argue that serfdom was profitable to the nobility and, therefore, worth defending when emancipation was proposed. But profitability is not the same as efficiency, and there is little hard evidence on the corresponding growth implications of serfdom from a neoclassical perspective. An important exception is the recent work of Markevich and Zhuravskaya (2016), who evalu-

⁷From 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.

⁸See the discussions and citations in Emmons (1968), Field (1976), and Khristoforov (2011).

ate the impact of serfdom by looking at differential economic changes between provinces with more or fewer serfs before and after 1861. They argue for strongly negative effects of serfdom, although this conclusion is based on relatively limited provincial data, and they do not explicitly address the possibility of omitted variables.⁹ Thus, despite limited causal evidence, most scholarship on Russian serfdom asserts that it 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. Lit-vak (1972)) argued that emancipation and the accompanying land reforms actually worsened former serf land holdings and imposed considerable new burdens on the rural economy.¹⁰ This literature argued that while former serfs retained land as part of the reforms, they received these property rights collectively through the newly formalized commune, the land they received was often different (worse) in amount and quality from what they had before, and they were held jointly responsible for (possibly higher than before) mortgage-like payments in return. In contrast, more recent studies such as Hoch (2004) and Kashchenko (2002) argue that the majority of former serfs were made better off – at least in terms of factor endowments and obligations – than Soviet studies asserted.¹¹

In his influential interpretation, Gerschenkron (1966) emphasized the negative implications of the peasantry's joint liability and communal property rights 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. Although emancipation and subsequent land measures were perhaps most dramatic for the former serfs, by the 1880s, the different types of peasants were administratively unified and possessed similar institutions of communal self-governance, (generally) collective property rights, and joint liability for taxes and land payments. Of course, such nominal similarities may have hidden many persistent *de facto* differences in the conditions faced by the different peasant groups. Indeed, 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 famous Stolypin land reforms of the early 20th century (named for the Prime Minister Pëtr Stolypin) improved incentives in peasant agriculture by offering mechanisms for consolidating plots and exiting the commune. But these 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, World Wars, collectivization, famine, and the slow collapse of the agricultural sector from the 1970s onward. None of these changes explic-

⁹We examine the argument and findings of Markevich and Zhuravskaya (2016) in more depth below. In general, Markevich and Zhuravskaya (2016), and related works such as Nafziger (2012*b*), face a key difficulty in evaluating the contemporary economic impact of Russian serfdom: the dearth of quality data prior to 1861.

¹⁰None of these Soviet works were based on causal identification.

¹¹All of these studies have relied on empirical evidence that was not necessarily representative, was too aggregate to identify differences, or covered an intermediate stage of a very complicated and drawn-out reform process.

itly or differentially targeted former serfs, but they may have generated or reinforced important and persistent effects that built upon pre-existing geographic, institutional, and economic differences among peasants.

Measuring 19th–Century Serfdom

While serfdom was a defining feature of Russian society by the early 19th century, not all peasants resided on noble–owned land or were subject to quasi-feudal exploitation by the gentry. Indeed, by the 1850s, 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, possessed more land and freedom to engage in contracts, and were generally only liable for direct (and lower) tax-like obligations (Nafziger (2013)). As we noted above, these factor endowment differences persisted in the decades after 1861, and different groups of peasants may have faced persistently different institutional conditions, despite nominal administrative and legal convergence following serf emancipation.

In studying 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 extent of serfdom by relying on data generated by ten tax censuses undertaken between 1719 and 1858.¹² 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.¹³ Relying on the 10th tax census of 1858, as reported in Troinitskii (1982 (1861), we construct our main indicator of serfdom's intensity, *Serfs, perc. of pop*, which divides the total number of serfs by the total district population.¹⁴ Since we do not know the total number of peasants per district, we use the overall population as a denominator.¹⁵ The resulting indicator covers 495 historical districts in 50 provinces of European Russia, without Poland and Finland.

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%.¹⁶ In our study area, serfs averaged

¹²Initiated by Peter the Great, these collected data on the populations that were obligated for taxes of different types.

¹³To do this, we digitized a 19th century district-level map of European Russia. This results in a finer level of aggregation than related scholarship, including Markevich and Zhuravskaya (2016).

¹⁴Unfortunately, district-level population totals from the 10th tax census are unavailable. As a result, we draw on Bushen (1863), which provides the total populations 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 may have largely relied upon the 10th tax census).

¹⁵An ideal intensity measure would use the number of *peasants* as 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.

¹⁶See the distribution function in Figure A1 in the Appendix.

38% of a district's population.¹⁷ Figure 2 shows the underlying variation in serfdom across European Russia just before Emancipation.¹⁸ 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.





Factors Underlying the Variation in Serfdom

As a first step in our analysis, we explore potential explanatory factors underlying the geographic "incidence" of serfdom.¹⁹. This can be considered a prelude to our causal empirical framework outlined below. We begin by noting that the location of a district likely influenced whether serfdom reached it to any significant degree. 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 the direct (log) distance from each district centroid to Moscow (often controlling to province as

¹⁷See Table A1 in the Appendix for all relevant summary statistics.

¹⁸The picture is very similar if the denominator only includes the rural population.

¹⁹All of the variables mentioned in this section are summarized in the Appendix Table A1, where further details can be found.

well). We also take into account a district's geographic 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, and in particular wheat, were dominant in the Empire's agriculturally productive areas, we use modern geo-spatial data to produce a time-invariant measure of the land's suitability for growing wheat (we also consider soil suitability for growing other grains such as oat, barley and rye). Other environmental conditions might have affected local agricultural productivity, the mobility of the population (hence, the incentives for maintaining serfdom), and local incomes. Therefore, we also construct variables that measure the fraction of land covered with forest today, the terrain slope of the terrain, and the presence of a river. ²⁰

A prominent hypothesis regarding the emergence of serfdom states that a high land-labor ratio made feudal labor coercion more likely (Domar (1970)).²¹ Scarcity provided the incentives to tie labor to the land by creating and perpetuating institutional constraints on mobility. Although the employment of serfs on private estates was not necessarily a choice variable (since the laws governing serfdom applied to all estates), and the spread of noble landholding was likely driven by geography and Muscovite expansion, this framework might have some relevance if estate owners were more willing to free their peasants prior to 1861 in areas where labor was relatively more abundant. To account for this possibility, we control for population density in 1600, taken from the History Database of the Global Environment (HYDE), version $3.1.^{22}$

In Table 1, we explore the possible determinants of the distribution of serfdom through OLS regressions that rely on either across-district (Column 1) or within-province variation (Columns 2–4). In the basic cross-sectional specification (Column 1), the coefficients on longitude and distance to Moscow are negative and statistically significant, consistent with the concentric nature of Muscovite expansion mattering for the eventual extent of serfdom (the coefficient on forest cover also likely reflects this, since Moscow is located in such a region). The suitability for growing wheat is a strong and positive predictor of serfdom's intensity, which is consistent with the spread of noble estates to relatively agriculturally productive areas. We also find that a district's province explains a large part of serfdom's intensity. Moving from the cross-district specification in Column 1 to the provincial fixed-effect model of Column 2 increases the R-squared from 0.4 to 0.7 while reducing the explanatory power of longitude, the area covered

²⁰We take these environmental variables from the *FAO-GAEZ* database. Soviet authorities did engage in agricultural and resource practices that may have impacted agricultural conditions over the 20th century. Such changes were relatively small (or unrelated to the FAO measures), likely uncorrelated with incidence of serfdom, and largely occurred outside of European Russia.

²¹More recently, Acemoglu and Wolitzky (2011) studies coercive labor relations in a principal-agent framework, arguing that labor scarcity affects both demand for, and the outside options of, workers and, thus, has an ambiguous effect on coercion.

²²This database provides a raster for estimated population densities for different points in time with a spatial resolution of 5-minutes. It has been utilized in economics by Fenske (2013).

	Depen	dent variab	le: Serfs %	(1858)
	(1)	(2)	(3)	(4)
Longitude	-0.663** (0.287)	-0.327 (0.523)	-0.308 (0.516)	-0.464 (0.526)
Latitude	-1.402 (0.850)	1.158 (1.218)	1.070 (1.216)	0.704 (1.301)
Forest Cover	0.332** (0.132)	0.047 (0.088)	0.042 (0.084)	0.038 (0.083)
Ruggedness	0.403 (0.314)	0.021 (0.159)	0.026 (0.159)	0.035 (0.156)
Wheat Suitability	0.003*** (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)
River (0-1)	2.289 (1.924)	0.588 (1.453)	0.627 (1.464)	0.636 (1.445)
Distance to Moscow	-0.033*** (0.007)	-0.028** (0.012)	-0.028** (0.012)	-0.032*** (0.011)
Oat Suitability			0.003 (0.003)	
Rye Suitability			-0.002 (0.003)	
Barley Suitability			-0.002 (0.004)	
(ln) Population Density 1600				-3.762* (1.992)
Distance Provincial Capital				-0.000 (0.013)
R-squared	0.42	0.72	0.72	0.73
Province FE	No	Yes	Yes	Yes

Table 1: The Determinants of Serfdom

Notes: OLS regressions. The unit of observation is the district. The dependent variable is serfs as a share of population in 1858. Heteroscedastic-robust standard errors in parentheses, clustered at the Province. * p < 0.10, ** p < 0.05, *** p < 0.01.

with forest, and wheat suitability. Thus, it appears that provincial fixed effects control for geographic and Muscovite expansion explanations for the variation in serfdom. Finally, the specifications of columns 3 and 4 explore whether the suitability for growing other types of grain had an influence (it did not), and whether other aspects of local development – especially population density – played a role in explaining the incidence of serfdom. While the location of the provincial capital turns out to be unrelated to the incidence of serfdom, we do find that districts with higher population density in 1600 display smaller population shares of serfs in 1858, suggesting some support for a Domar-like mechanism.²³

²³In specifications not reported here, we also find that districts that were further away from a city in 1750 (from the dataset of Bairoch, Batou and Chèvre (1988)), a proxy for early development and economic activity, show a marginally greater incidence of serfdom. This would suggest that noble estates did not necessarily arise in more economically advantageous areas, at least once our other controls are included, and it is also consistent with a Domar-like explanation.

Serfdom and Long-Run Development

Defining Outcomes

We now turn to our core empirical framework linking modern economic development to the incidence of serfdom prior to Emancipation. Constructing outcomes for our long-run investigation turns out to be quite challenging. Income per capita is not available at a unit of analysis comparable to our historical data on serfdom. Moreover, our historical sample encompasses several current Eastern European countries, in addition to the Russian Federation.

To circumvent these data limitations, we construct our main outcome variables from the 2006 and 2010 waves of the *Life in Transition Survey* (LiTS).²⁴ We use the geo-locations of the Primary Sampling Units (PSU) of the two waves to precisely locate respondents from several modern countries within the historical districts of Imperial Russia.²⁵ Our main indicator for modern economic development is household expenditure per capita, which is only assessed in the 2006 wave. Household heads reported spending over a 30-day recall period for food and consumption goods, such as clothing, transport, and recreation, and over a 12-month recall period for investments and durable goods such as education, healthcare, and furniture. Expenditures are adjusted for the size of the household to create a measure of economic well-being *per capita*.²⁶ As household expenditure is strictly positive and skewed, we use its logarithm. In addition to our main outcome, we draw on LiTS to construct measures of durable asset ownership, access to basic local public goods in the settlement of residence, preferences regarding . We employ these variables in various robustness checks reported below and in the Appendix.²⁷

An advantage of LiTS is the availability of data on other individual and household characteristics that potentially also affect our outcomes of interest. In our main specifications, we control for household composition in terms of household size, the share of household members younger than 18, the share of household members older than 60, and the share of male household members. We also utilize the religion of the respondent, an indicator variable for whether the primary sampling unit is defined as rural or urban, a dummy for the LiTS survey wave, and other respondent characteristics.²⁸

²⁴The LiTS is collected by the European Bank of Reconstruction to assess household and individual well-being in transition countries.

²⁵Figure A3 of the Appendix shows the PSU locations overlaying the variation in historical serfdom. Summary statistics of our outcome variables are displayed in Table A1 of the Appendix. The Appendix also contains additional information on how are we construct them.

²⁶The expenditures are expressed in US Dollars. 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)).

²⁷An alternative measure of local economic well-being is night-time luminosity, as measured by satellite pictures of the earth over a series of nights. Our findings are robust to using night-time luminosity as an outcome – see Table 8.

²⁸In LiTS, the section on the household's economic situation is answered by the household head, while other questions on attitudes, education, religion and labor are answered by a randomly selected household member. Whenever we use individual level responses provided by this randomly selected member, we additionally control for their age, age sq. and gender.

Estimation Strategy

To assess whether the historical incidence of serfdom affected modern socio-economic outcomes, we begin with the following OLS regression:

$$y_{i,d,p} = \alpha + \beta * serfdom_{d,p} + X_{i,d,p} * \omega + \gamma_p + \varepsilon_{i,d,p}$$
(1)

where *i* represents the household or individual, *d* refers to the historical district, and *p* indicates the historical province. *serfdom*_{d,p} denotes our variable of concern, the share of serfs out of the total population in a (historical) district *d*, located in province *p*. The coefficient of interest is β , which gives the reduced form relationship between the incidence of serfdom and modern outcomes.

The matrix $X_{i,d,p}$ includes household-level and survey controls (household size, share aged 0-18, share aged 60+, share male, religion, and indicators for rural/urban and LiTS wave, where relevant), location of the PSU, and variables defined for historical districts that we link to the PSUs (forest cover, terrain slope, presence of a river, distance to Moscow, wheat suitability, population density in 1600, and the distance to the provincial capital.²⁹ We also include fixed effects for administrative units, denoted by γ_p , which can be countries or historically provinces. In our preferred specifications we include historical province fixed effects, which leaves only within-province variation and rules out that the results are driven by provinces without serfdom, 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. When considering micro-data from the LiTS, we cluster standard errors at the level of the PSU. With outcome data defined or aggregated at the district level, we cluster standard errors at the level of the historical province.

Identification

The outcomes that we consider may be influenced by historical or modern factors that we are unable to control for or observe. If such unobservables are associated not only with outcomes today, but also with the extent of serfdom in the past, the coefficients that we estimate through Equation 1 are possibly biased. For example, additional geographic conditions that we cannot observe might have made serfdom more likely in a certain place, but these characteristics might have direct effects on household expenditures today, either positive or negative. We aim to minimize such biases by conditioning on a large number of individual and geographic factors (including provincial fixed effects), and by controlling for historical population density and other proxies for early economic development. Nevertheless, the estimated coefficient could still be biased, and so we turn to a novel instrumental variable strategy based on a historical

²⁹We also consider as controls other indicators of historical urbanization rates defined both before and after emancipation, although such measures were possibly endogenous to the incidence of serfdom. Table A2 of the Appendix reports examples of the robustness of the results to including such variables.

"experiment" from the 18th century.³⁰

Our IV strategy exploits conditionally exogenous variation in serfdom c. 1858 that resulted from the secularization of church property under Catherine the Great. In 1764, Catherine issued an edict transferring church-held estates (including monastic and convent estates and properties held by the Orthodox hierarchy) and the resident peasant population to state control.³¹ Prior to this date, peasants residing on church and monastic land were subject to the same constraints as privately owned serfs. Indeed, one professed reason for the reform was that the state was concerned about the especially exploitative conditions faced by the church peasants (Zakharova (1982)).³² The 1764 decree secularized church and monastic lands in Siberia and the central provinces of Russia, with later measures in the 18th and early 19th centuries doing likewise for Western and Southwestern provinces.³³ Following these reforms, monastic institutions were closed or consolidated. Those that remained lost their landed property, which was replaced by a relatively low level of direct support from the state.³⁴

Catherine's 1764 reform transferred approximately 2 million church peasants (over 10% of the peasant population at that time) to state oversight and eventual membership in the state peasantry.³⁵ These church peasants were spread across the often dispersed properties of approximately 500 monasteries (our data exclusively refer to monasteries). Our empirical approach employs the location of these monasteries as an quasi-exogenous driver of variation in serfdom just prior to emancipation.³⁶ A key assumption underlying our identification strategy is that the geography of church properties paralleled the granting of populated land for state service (or was correlated with the unobservable determinants of the latter), so that the distribution of the *expropriated* monastic estates may be interpreted as an exogenous source of variation in the presence of state peasants by the 1850s. The historical literature on Russian monasticism supports this interpretation: while some pre-1400 monastic settlements were initially established as

 $^{^{30}}$ If we are measuring the "treatment" of serfdom with some random error, the IV approach also helps us address the classical bias that might result.

³¹Technically, former church peasants were referred to as "economic peasants" until reforms of the 1830s integrated them with the rest of the state peasantry. On occasion below, we refer to these varied church properties as monastic estates or monastic land as a shorthand.

³²We know of no direct evidence that monasteries played any special role in promoting local human capital accumulation among church peasants prior to 1764. Following the reforms, monastic institutions possibly did accumulate wealth available to support local economic activity, but it unlikely that this was significantly more than other other large property holders.

³³As noted by Zinchenko (1985), the Western provinces exhibited extensive property holdings among Orthodox and non-Orthodox religious institutions into the 19th century, with secularization occurring only in response to ethnic-religious unrest (particularly the Polish Rebellion of 1830–31) and as part of the broader state peasant reforms in the 1840s (de Madariaga (1981) and Zakharova (1982)). Our results hold if we focus only on the provinces directly affected by the 1764 law.

³⁴Post-1764 monastic institutions also could (and did) receive charitable bequests, including land. However, they were not allowed to control populated estates.

³⁵Kamenskii (1997) writes of the peasants on expropriated church estates peasants that, "*They were relieved of their labor obligations to the religious institutions, saw and increase in the size of their landed allotments and now found it easier to engage in trade and handcraft.*". The subsequent improvement in the lives of the former church peasants is discussed by Zakharova (1982).

³⁶Quasi-exogenous in the sense that the excludability is conditional on controlling for geographic factors and the direction of Muscovite expansion. Our study echoes the recent work of Heldring, Robinson and Vollmer (2015), who consider the long-run effects of the dissolution of English monasteries in the 16th century.

remote hermitages, the greater number of monasteries, convents, and other church estates that emerged from the 15th to 18th centuries largely obtained their property through grants from the Tsar and other large landowners as Muscovy grew into an Empire.³⁷ Although there were likely unobserved and location-specific factors that lay behind the original acquisition of specific properties by church institutions, such concerns about the exclusion restriction should be mitigated in our district-level analysis.

Our measure of this expropriation is the total number of monasteries per district closed by the main 1764 law or by the subsequent decrees that affected western provinces.³⁸ We would prefer to have the amount and location of all variants of expropriated church lands and the corresponding number of transferred church peasants, but such data are unavailable.³⁹ While monastic holdings were often scattered, including across provinces, they tended to concentrate in a particular district around the home institution, suggesting that our measure can proxy for the resulting transfer of serfs to the state peasantry.

For the instrument to be valid, it needs to be strongly correlated with serfdom's intensity. This is clearly the case with our measure of monastic expropriation: the share of serfs was indeed significantly lower in districts where the number of such monasteries was high. In our results tables (e.g. Table 3), we report Kleibergen-Paap Wald F-statistics, which are always above 10 and range from 12 to over $100.^{40}$ Table 2 investigates our first-stage relationship in more detail. Column 1 shows the coefficient of the baseline first stage relationship (-0.53). The next two models re-estimate the first-stage but adjust the instrument by population (Column 2) and area of the district (Column 3). In either regression the instrument is a negative and significant predictor of serfdom – to ease interpretation, we focus on the number of monasteries below (while controlling for population characteristics of the districts). Column 4 excludes provinces that were not subject to the 1764 decree with little change in the coefficient. Columns

³⁷According to Belov (1989), 140 monasteries were established in the 14th, 205 in the 15th, 409 in the 16th, and 657 in the 17th centuries. Over time, these were increasingly located in rural areas, and by 1700 the majority of existing monasteries (619 out of 1153 – although the data are incomplete) owned land with serfs. For more on the intertwined processes of establishing private estates, monasteries, and Muscovite state control, see Kloss (2013), Ostrowski (1986), Romaniello (2000), and Weickhardt (2012). In more settled areas, a significant amount of monastic land was initially collateral posted by gentry borrowers who defaulted on their loans from monasteries.

³⁸The data were compiled by hand from from the volumes of **?**. We experimented with using the number of monasteries in 1727, which were geolocated as part of the *Imperiia: Mapping the Russian Empire* project (http://worldmap.harvard.edu/maps/886). However, those data appear to include only a subset of all monasteries and led to imprecise first-stage results. In their province-level analysis, Markevich and Zhuravskaya (2016) adopt our monastery instrumental variable approach but rely on the total number of monasteries existing in 1764, both those closed (although they are not clear as to whether they treat monasteries affected by subsequent decrees differently) and those allowed to remain open. Unfortunately, we lack *district–level* information on the monasteries who were expropriated but allowed to stay open. However, this likely just inserts some attenuating measurement error into our first stage, since most of the ones closed were consolidated into other nearby ones allowed to stay open (and all of which lost their landed property). See Figure A2 in the Appendix for a spatial representation of our measure of expropriated monasteries.

³⁹Belov (1989) provides aggregate provincial data on monastic land and serf holdings in 1700, drawn from a variety of largely archival sources. The distribution of these holding, while aggregated to the regional, is consistent with our measure of expropriation.

⁴⁰These strong results persist when the religious composition of the population included as a control, whether defined in 1870 or 1897. These findings are available upon request.

				Depender	nt variable: Serfs %	1858		
	(1)	(2)	(3)	(4)	(5)	(9)	(<i>L</i>)	(8)
	Defini	tions of the In	nstrument	Regions affected by Decree	Dist. Moscow< <i>M</i>	Dist. Moscow>M	Wheat Suitability< <i>M</i>	Wheat Suitability>M
Monasteries	-0.530 * * * (0.140)			-0.513*** (0.156)	-0.582*** (0.142)	-0.329 (0.322)	-0.349** (0.136)	-0.840*** (0.193)
Monasteries p.c.		-4.704*** (1.736)						
Monasteries over area			-7259.183*** (1495.782)					
N	494	483	494	410	250	244	246	248
R-squared	0.74	0.72	0.74	0.73	0.47	0.79	0.80	0.73
Total OI S monocorra D motor	ant of channel	tion is the distai	at The demondant.	in a start of the medanine of the industry	hour of a curlation All	actions control for let	itudo ond lonoitudo of the di	se interference of the distance

Compliers
First Stage and
Table 2:

Notex: OLS regressions. The unit of observation is the district. The dependent variable is the number of serfs as a share of population. All regressions control for latitude and longitude of the district, the area of the district covered by forest, the ruggedness of the district, the suitability of the soil for growing wheat, the presence of a river in the district, and (ln) km distance to Moscow, as well as (ln) population density in 1600, distance to the provincial capital, and province fixed effects. Heteroskedasticity-robust standard errors are in parentheses, clustered at the province level. * p < 0.10, *** p < 0.05, **** p < 0.01.

5 and 6 show that districts with below median distance to Moscow displayed a larger reduction in serfdom (-0.58) from one fewer monastery expropriation than districts further away (-0.33). This likely reflected the much greater density of both monasteries and serf estates closer to the capital. Finally, the first-stage coefficient is larger for districts with above-median suitability for growing wheat (-0.84 vs -0.35) – see Columns 7 and 8. This is consistent with the parallel expansion of estates and monasteries to more agriculturally productive areas.

A valid instrument should also affect the outcomes of interest only through its effect on serf intensity, or, more formally, $corr(Monasteriespre1764_{d,p,c}, \varepsilon_{i,d,p,c} = 0)$, conditional on the set of observable controls and province fixed effects. Although this is not strictly testable, we do find that the geographic distribution of these monasteries was unrelated to other characteristics of serfdom, including the share of serfs on quit rent only (specifications not reported here; results available). There is little evidence that the monastic institutions that remained after 1764 were especially wealthy, as state support was kept at a relatively low level.⁴¹ Along with the similarities in the expansion of monastic and private holdings, this gives some assurance that our expropriation variable is not related to other unobservable factors that might impact long-run outcomes.⁴²

Main Results

We present our main results in Table 3. The OLS estimates from equation (1) with the log of household expenditure as the dependent variable are reported in the first five columns under different strategies regarding the use of fixed effects. The two-stage IV estimates without and with population density and distance to the provincial capital are provided in Columns 6 and 7, with the first-stage coefficients shown in the bottom part of the table. As noted earlier, standard errors are clustered at the level of the primary sampling unit, but these results are robust to other strategies (including various methods to address spatial autocorrelation). All regressions include a large set of local, household, and geographic controls.

Overall, we find a large, negative, and statistically significant relationship between serfdom's intensity and our main measure of economic well-being. Compared to the basic crosssectional results (Column 1), the estimated coefficient on the intensity of serfdom becomes larger in absolute value but is equally significant in Columns 2 and 4 (which employ different types of fixed effects. In Columns 3 and 5, we add controls that proxy for early economic development: log population density in 1600 and the distance to the nearest city in 1750. The coefficient decreases only slightly in absolute terms but stays statistical significant. Importantly,

⁴¹However, as we noted above, monastic institutions continued to receive charitable givings after 1764. It is unlikely that such wealth was sufficient to spark long-run differences, particularly after 1917. While the Church did play a role in providing basic schooling over the 19th century, this was overwhelmingly done at the level of the village priest, rather than by monastic bodies.

⁴²Table A4 in the Appendix reports the estimated relationships between geographic controls and our measure of monasteries. Monasteries were more prevalent closer to Moscow, in eastern parts of provinces, and in areas less suitable for wheat. All of these factors likely reflect the timing and motivations of settlement as Muscovite Russia expanded.

Table 3:	Estimating	the Long-Run	Effects o	of Serfdom
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		Dependent	variable: Log	g Equivalent	Expenditur	e Per Capita	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			OLS			I	V
Serfs % (1858)	-0.396*** (0.095)	-0.530*** (0.114)	-0.423*** (0.120)	-0.598*** (0.180)	-0.415** (0.196)	-2.031*** (0.332)	-2.389*** (0.642)
(In) Population Density 1600			0.128*** (0.048)		0.093* (0.052)		-0.080 (0.090)
Distance Provincial Capital			-0.000 (0.000)		-0.000 (0.000)		0.000 (0.001)
Fixed Effects		Country	Country	Province	Province	Province	Province
Number of Clusters	298	298	298	298	298	298	298
Ν	5605	5605	5605	5605	5605	5605	5605
R-squared	0.39	0.42	0.42	0.44	0.44	0.41	0.42
First Stage						Serfs,	% 1858
Monasteries						-0.013***	-0.009*** (0.002)
First Stage F-Stat						55.65	15.67

Notes: The unit of observation is the individual. The dependent variable is (In) Equivalent Expenditures Per Capita, taken from the 2006 LiTS wave. All regressions include local controls (LiTS survey wave and an indicator whether the PSU is rural or urban), household controls (household size, share of household members aged 0-18, share of household members aged 60+, share of male household members, and religious denomination of the household respondent), and geographic controls (latitude and longitude of the PSU, area of the district covered by forest, ruggedness of the district, suitability of the soil for growing wheat, distance to Moscow, and the presence of a river in the district). Heteroskedastic-robust standard errors are in parentheses, clustered at the primary sampling unit. * p < 0.10, ** p < 0.05, *** p < 0.01.

we also see that early population density is positively related to the level of development today. By controlling for pre-Emancipation population density, not only are we taking into account one possible driver of the incidence of serfdom, but we are likely soaking up many other (potentially unobservable) geographic and other channels of long-run persistence.⁴³

As Columns 6 and 7 indicate, we estimate significant, negative coefficients on the incidence of serfdom in our IV specifications. Overall, these estimates are economically meaningful: a one standard deviation increase in serfdom (around 25 percentage points) is associated with a substantially lower level of per capita expenditure, depending on the specification, of between about 10 and 15% in OLS and up to 38 % in the IV specifications.⁴⁴

Although not out of line with results in similar papers on long-run persistence (e.g. Dell (2012)), there are several possible explanations for the different magnitudes of the coefficients in the OLS and IV specifications. First, the larger estimates in the IV regressions may be a sign of omitted variables in the OLS specifications, which are correlated with serfdom and long-run development in opposing directions, thus biasing the OLS coefficient downwards. If this is the case, our IV estimates indicate the "true" causal relationship between serfdom and our long-run outcomes. Second, the smaller OLS coefficients may result from measurement error in the potentially endogenous variable (the population share of serfs) that the IV overcomes. Since we cannot know the precise mechanism of serfdom's long-run impact, and our indicator is an admittedly crude measure of a heterogeneous practice of "labor coercion," this is a distinct

⁴³Unsurprisingly, as we show in Table A2, this does not persist if we also control for the urbanization rate just after Emancipation.

⁴⁴Since the dependent variable is in logs, the estimated coefficients are presented as a percentage change in the dependent variable given a one unit change in the independent variable (semi-elasticities).

possibility. Third, the magnitude of the IV coefficients may indicate that our instrument picks up other determinants of long-run economic development and, therefore, violates the exclusion restriction. This would be true if the areas where the state or private landowners donated land to monasteries were systematically different (i.e. better) than areas where only private estates (and their serfs) existed, or if monasteries themselves influenced the process of long-run development. The evidence we present above and our reading of the historical literature suggests that both scenarios are unlikely.

A final possibility is that the IV estimates reflect a local average treatment effect for a subsample of districts that were affected by Catherine's transfer (as we measure it) and "complied" with it, while the OLS estimates averages over all areas. Rerunning the model of Column 3 for only those provinces that experienced monastic increases the magnitude of the OLS coefficient from -0.42 to -0.64, while considering only districts with below median distance to Moscow similarly increases the OLS coefficient to -1.35. Thus, it is plausible that at least some of the increase in the magnitude of the coefficient comes from the fact that the IV estimates represent a local average treatment effect for a subset of districts in which the monastic reform applied. Unfortunately, the exact explanation for the larger IV coefficients cannot be distinguished empirically.⁴⁵

Robustness of Our Main Results

We report on a series of robustness exercises based on simple extensions to our main OLS model in Table 4. Columns 1 and 2 include the distance between each district's centroid and the nearest city (defined using Bairoch, Batou and Chèvre (1988)) at two points in time prior to 1861. Controlling for a measure of pre-emancipation urban access in this way does little to the estimated coefficient on serfdom. Columns 3, 4, and 5 control for the presence of coal deposits, rye (instead of wheat) suitability, and mean temperature and precipitation (defined today), none of which has much effect on the estimates. To alleviate concerns about other factors possibly driving persistence, in particular religious differences related to the presence of Orthodox monasteries (the primary target of Catherine's measures), we estimate a model that also controls for the district-level share of the population who were mainstream (non–Old Believer) Orthodox in 1897 in Column 6. This has little impact on the estimates. Finally, Column 7 of Table 4 utilizes a different outcome measure: the principal component of a series of questions regarding the ownership of various assets in the household. Our results are weaker but we still find a relationship between the historical incidence of serfdom and this imprecise measure of household wealth today.

Another strategy to estimate the long-run impact of serfdom in a more indirect fashion is to differentiate the effects of observable characteristics on economic success in areas where peasants were more or less exploited under the institutional regime.⁴⁶ We conduct such exercise

⁴⁵For a similar discussion of larger IV estimates compared to OLS ones, see Dell (2012).

⁴⁶We thank Katia Zhuravskaya for this suggestion.

Table 4: Robustness

Dependent variables:		Lo	og Equivalent Expend	diture Per Capita			Household Assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Controls added:	Dist City 1600	Dist City 1750	Coal Depositories	Rye Suitability	Climate	Orthodox 1897	
Serfs % (1858)	-0.508***	-0.463***	-0.594***	-0.592***	-0.515***	-0.520**	-0.342*
	(0.173)	(0.166)	(0.180)	(0.180)	(0.193)	(0.201)	(0.189)
Ν	5605	5605	5605	5605	5605	5605	12836
R-squared	0.44	0.44	0.44	0.44	0.44	0.44	0.40
Number of Clusters	298	298	298	298	298	298	695

Notes: The unit of observation is the individual. All regressions control for base controls (religious denomination of the respondent, LiTS survey wave and an indicator whether the PSU is rural or urban), household controls (household size, share of household members aged 0-18, share of household members aged 60+, share of male household members), geographic controls (latitude and longitude of the PSU, area of the district covered by forest, ruggedness of the district, suitability of the soil for growing wheat, presence of a river in the district, and distance to Moscow), as well as province fixed effects. The outcome variable in Column 7 is defined for multiple LiTS waves. Heteroscedastic-robust standard errors in parentheses, clustered at the primary sampling unit. * p < 0.10, ** p < 0.05, *** p < 0.01.

	Depend	lent variable	: Log Equ	uivalent E	xpenditure Po	er Capita
	(1) Serfde	(2) $com = 0$	(3) Serfdo	(4) om = 1	(5) Intera	(6) action
Wheat Suitability	0.150*** (0.050)		-0.004 (0.037)		0.137*** (0.037)	
Rye Suitability		0.148*** (0.052)		-0.039 (0.039)		0.127*** (0.036)
Serfdom (0/1) \times Wheat Suitability					-0.152*** (0.044)	
Serfdom (0/1) \times Rye Suitability						-0.167*** (0.043)
N R-squared Number of Clusters	1708 0.28 87	1708 0.28 87	4095 0.43 221	4095 0.43 221	5803 0.44 308	5803 0.45 308

Table 5: The Differential Effect of Land Suitability

Notes: The unit of observation is the individual. All regressions include local controls (religious denomination of the respondent, LiTS survey wave and an indicator whether the PSU is rural or urban), household controls (household size, share of household members aged 0-18, share of household members aged 60+, share of male household members), geographic controls (latitude and longitude of the PSU, area of the district covered by forest, terrain slope of the district, presence of a river in the district, and distances to Moscow), and province fixed effects.

Non-serf provinces are Kurliand, Lifland, and Estliand. Heteroskedastic-robust standard errors are in parentheses, clustered at the primary sampling unit. * p < 0.10, ** p < 0.05, *** p < 0.01.

in the case of land suitability for agricultural production. In the absence of labor exploitation one would expect suitable land to be conductive 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 was prevalent prior to 1861, any positive effect of land quality on long-run economic outcomes might be limited by persistent effects of labor coercion.

Indeed, this is what Table 5 shows. In provinces where serfdom either never existed or ended much earlier (in particular the Baltics, where emancipation occurred in 1819 under very different conditions), land suitability for wheat or rye shows the expected positive (and statistically significant) correlation with per capita expenditures in Columns 1 and 2.⁴⁷ If one considers the rest of Imperial Russia where serfdom was present in 1861, the previously positive impact

⁴⁷We 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.

of land turns negative and insignificant, see Columns 3 and 4. Columns 5 and 6 confirm these separate specifications by utilizing all observations and including interactions between province serf status (= 1 if the province had serfs at the time of Emancipation) and grain suitability. The negative and significant coefficients on the interaction terms imply that the impact of serfdom offset the positive impact of underlying land productivity in the formerly serf areas. While the non-serf provinces are admittedly a small group, this evidence is highly suggestive that a legacy of serfdom did give rise to persistent constraints on subsequent Russian economic development.

Mechanisms

This leads us to *the* essential question – what mechanism(s) explain the evident long-run negative relationship between the incidence of serfdom and economic outcomes today? In general, the literature has suggested a number of possibilities for why variation in historical institutions – particularly coercive labor institutions – might generate long-run economic effects, conditional on geography and other fixed characteristics. Proposed mechanisms include cultural and political preference channels (e.g. Nunn (2012); Acharya, Blackwell and Sen (2016)); human capital accumulation, perhaps with an intergenerational transmission mechanism (e.g. Bertocchi and Dimico (2014)); asset and income inequality with possible public goods implications (e.g. Engerman and Sokoloff (1997); Nunn (2008*a*)); and the interaction of institutional and geographic attributes, often within a context of increasing returns and agglomeration economies (e.g. Davis and Weinstein (2002); Acemoglu, Johnson and Robinson (2001)).

Regarding cultural and political preferences, we find limited evidence that serfdom led to differences in cultural or political attitudes today. 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.⁴⁸ Therefore, we turn to other possible channels and explore which of them are relevant in the Russian case. Unfortunately, data constraints are frequently binding in these exercises, particularly given the relative lack of geographically disaggregate data from the Soviet period.⁴⁹ This leads us to investigate the possible mechanisms underlying long-run effects of serfdoms through a series of cross-sectional regressions with a relatively limited set of dependent variables that proxy for hypothetical channels. We conclude that the evidence points to a long-standing set of constraints on the processes of urbanization and structural change in formerly serf areas of Imperial Russia, with implications for public good provision and human capital accumulation.

⁴⁸Regressions that investigate cultural differences are reported in the Appendix Table A6. We do find some evidence that a legacy of serfdom is associated with a greater willingness to demonstrate or strike, but this is likely driven by underlying differences in economic conditions. See our discussion below.

⁴⁹Most of our "channel" variables are measured in the Imperial or post-Soviet periods. Not only is this due to the massive changes of administrative borders in the Soviet Union, but it is also related to the politically motivated unwillingness of Soviet authorities to collect comparable socio-economic data across small geographic units.

Human Capital

Table 6 considers modern educational outcomes taken from the LiTS. We examine whether the respondent completed secondary school and whether they received some sort of post-secondary education (both dummy variables). Our results show that the incidence of historical serfdom is significantly associated with a lower probability of completing secondary education, both in the OLS and IV regressions. Increasing our measure of serfdom by one standard deviation is associated with a reduction in the likelihood that the respondent has completed secondary education by 4.5 % (OLS) to 15 % (IV). Respondents in serf areas are also less likely to have some education above the secondary level (Columns 3-5), although this result is only marginally statistically significant. Finally, as part of exploration of preference differences, we also investigated whether respondents profess a greater demand for education from the government. Columns 7 and 8 provide strong evidence that this is the case.

Dependent variables:	At	least secon	dary	A	bove secon	dary	Education	Gov Priority
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	O	LS	IV	0	DLS	IV	OLS	IV
Serfs % (1858)	-0.155** (0.065)	-0.135** (0.067)	-0.438** (0.217)	-0.138* (0.072)	-0.055 (0.075)	-0.239 (0.217)	-0.113** (0.057)	-0.244** (0.123)
(ln) Population Density 1600		0.013 (0.019)	-0.011 (0.023)		0.068*** (0.020)	0.053** (0.026)	-0.023 (0.016)	-0.033* (0.019)
Distance Provincial Capital		-0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Ν	12841	12831	12831	12830	12830	12830	12829	12829
R-squared	0.05	0.06	0.05	0.17	0.17	0.17	0.04	0.04
Number of Clusters	695	695	695	695	695	695	695	695
First Stage				Serfs	, % 1858			
Monasteries			-0.008***			-0.008***		-0.008***
			(0.001)			(0.001)		(0.001)
First Stage F-Stat			113.80			113.77		113.92

Table 6:	Channels -	Education
Table 6:	Channels -	Education

Notes: The unit of observation is the individual. All regressions include local controls (religious denomination of the respondent, LiTS survey wave and an indicator whether the PSU is rural or urban), household controls (household size, share of household members aged 0-18, share of household members aged 60+, share of male household members), geographic controls (latitude and longitude of the PSU, area of the district covered by forest, ruggedness of the district, presence of a river in the district, and distance to Moscow), as well as province fixed effects. Heteroskedastic-robust standard errors in parentheses, clustered at the primary sampling unit. * p < 0.05, *** p < 0.01.

These findings on modern educational attainment are suggestive of an underlying human capital mechanism behind serfdom's relationship to long-run development outcomes, which is perhaps surprising given the Soviet Union's dramatic reforms to educational institutions and policies (for example, see Kaser (2006)). While the historical literature asserts that serf schooling decisions and the corresponding supply of educational opportunities were both constrained prior to 1861 (e.g. Eklof (1986)), we can ask whether areas where serfdom was more prevalent showed differences in post-1861 human capital outcomes. Although we lack data on human capital attainment from the Soviet period to extend this analysis after 1917, we can rely on newly collected primary schooling data to explore the historical roots of human capital differ-

entials in the Imperial period. Table 7 reports selected results along these lines.⁵⁰

We begin by examining whether serfdom really did entail the suppression of educational attainment. To document this, we examine the number of schools in a district in 1856 (per thousand inhabitants). ⁵¹ As reported in Table 7, serf areas had fewer schools per thousand inhabitants before emancipation (in 1856) under the OLS specification, but the coefficient loses statistical significance and is very small in the IV estimation (Columns 1 and 2). This relatively weak result on schooling outcomes under serfdom (given the historiography regarding impediments to serf schooling) matches the lack of a relationship between the incidence of serfdom and enrollment rates in 1894 (Columns 3 and 4).

Taking the results of Tables 6 and 7 together, we see some evidence of a human capital aspect to persistent development effects of serfdom. However, this does not appear to represent a specific causal channel (one that might be perpetuated by an intergenerational mechanism aas in), which is consistent with Imperial and Soviet efforts to improve the provision of basic schooling and higher education opportunities, especially in underserved rural areas (Holmes (1991), Kaser (2006), and Nafziger (2012*a*)). Rather, we view these human capital results as indicative of two possible underlying and not mutually exclusive mechanisms: inequality-related constraints on the provision of public goods and lower levels of structural change and urban development (and consequently less demand for education) in formerly serf areas. If, as we explore further below, serfdom had lingering implications for inequality, structural change, and urbanization, these channels would certainly have had consequences for the long-run demand for and supply of basic schooling. While it is puzzling that we do not see some clear consequences for human capital accumulation in the Imperial period, this may reflect the underlying heterogeneity in what constituted serfdom (say, agricultural versus non-agricultural forms of serfdom) or simply mis-measurement.

Serfdom, Inequality, and Public Good Provision

A number of scholars have posited a relationship between labor coercion, the level of income or wealth inequality, and the subsequent provision of public goods, including basic schooling (e.g. Engerman and Sokoloff (1997); Nunn (2008*a*)). Such arguments are closely related to the works like Galor, Moav and Vollrath (2009), who posit that elites in highly unequal (usually specified in terms of land) and largely agrarian societies may have little interest in funding public goods that have limited direct payoffs to themselves.⁵² While there are other possible linkages between inequality and development outcomes (e.g. financial; savings and investment), many of these are possibly more transitory or short-run effects. For inequality to be a channel

 $^{^{50}}$ In addition to the results presented in Table 7, we have analyzed rural primary enrollment rates by gender in 1880 and 1911 and literacy rates (for males) in 1897. The results – available upon request – are very mixed and give little historical evidence of a direct human capital legacy of serfdom.

⁵¹See Nafziger (2012*a*) for more detail regarding these and other schooling data mentioned here.

⁵²This might also be due to differences in the demand for formal schooling across areas with different distributions of wealth and, hence, different employment structures. For evidence of both demand and supply-side mechanisms linking land inequality to schooling in the Prussian case, see Cinnirella and Hornung (2016).

	(1)	(2)	(3)	(4)	(5)	(9)	(7)	(8)
Dependent variables:	Schools 1	per capita	Rural E	nrollment 804	Land owne	d by Nobles	Gini Priv	ate Land
	OLS	VI	OLS	N	OLS	VI	OLS	N
Serfs % (1858)	-0.001** (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.001 (0.001)	0.300^{**} (0.049)	0.291^{***} (0.100)	0.004^{***} (0.000)	0.003^{**} (0.001)
Observations	489	489	494	494	494	494	470	470
R-squared	0.53	0.53	0.61	0.59	0.79	0.79	0.70	0.70
Number of Clusters	50	50	50	50	50	50	49	49
First Stage				Serf	s, % 1858			
Monasteries		-0.537***		-0.530***		-0.530***		-0.636***
		(0.136)		(0.140)		(0.140)		(0.115)
First Stage F-Stat		15.48		14.27		14.27		30.57
<i>Notes:</i> The unit of observative district covered by fores of the district centroid to M Heteroskedastic-robust stand	tion is a distriction is a distriction of the distribution of the distributi	ct. All regress of the district, ell as (ln) pop in parentheses	sions control suitability of pulation densi s, clustered at	for geograph the soil for g ity in 1600, d the province.	ic controls,(latit rowing wheat, p istance to the p * p < 0.10, **	ude and longitures aresence of a river river capita p < 0.05, *** p	ade of the district retrievent of the district $al, and provincion of <0.01.$	ict, the area of t, and distance e fixed effects.

Table 7: Channels – Education and Inequality Before and After Emancipation

of long-run persistence, there must be some sort of underlying factor that reinforces the unequal distribution of resources (and its possible public goods or human capital effects) over time, leading to worse development outcomes for a large share of the population. Generally, Engerman and Sokoloff and others have interpreted this to be the political system, whereby inequality in income or wealth gets translated into political inequality, which reinforces the original unequal distribution of economic power and generates and both bad institutions and bad outcomes in the long-run.

Is this mechanism relevant in the Russian case? Unfortunately, we do not have a good measure of local inequality for the modern period.⁵³ And as we have already seen, we find very limited effects of serfdom on modern preferences for redistribution. On the other hand, Table 7 provides two tests of the link between serfdom and subsequent inequality of land in the early 20th century. We find that the incidence of serfdom was strongly and negatively related to these two measures of land concentration, suggesting that the end of serfdom did not fully equalize the distribution of this key asset. However, as we have already seen, there is little evidence that schooling can similarly be linked to serfdom prior to 1917, and the district-level data do not exist to evaluate other types of locally provided public goods in the Imperial or Soviet periods.⁵⁴

We did investigate the connection between the incidence of serfdom and access to a variety of public goods in the modern LiTS data. However, these results (available upon request) find little sign of a causal relationship between serfdom and locally determined public goods such as water and sanitation access.⁵⁵ In contrast, we do find that centrally provided public goods such as road and rail infrastructure are at a lower level in areas with a higher historical incidence of serfdom.⁵⁶ 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. The results for measures of infrastructure provision do suggest, however, that underlying structural factors related to serfdom might have 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.

⁵³Examining within-PSU inequality using LiTS is not appropriate, as the survey data are not necessarily locally representative.

⁵⁴It 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).

⁵⁵We studied the relationship between serfdom and a principal component drawn from a series of LiTS survey questions that asked about access to specific public goods. While some isolated public goods showed a marginally significant relationship (in the IV model), the negative coefficient on serfdom that we find in the principal component analysis is not robust to the inclusion of a full set of geographic and household controls.

⁵⁶See Table 8 below, as well as additional results available upon request.

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

It seems likely that the estimated relationships between the historical incidence of serfdom and modern levels of human capital and infrastructure were related to long-run impediments in the interconnected processes of urbanization and structural change (i.e. the transfer of factors from relatively low productivity agriculture to higher productivity and productive growth industry).⁵⁷ As argued by scholars such as Davis and Weinstein (2002) in other contexts, institutional variation fostered under a regime like serfdom might have generated local path dependencies that worked through the forces of economic diversification and agglomeration economies to impede local urban and industrial development of Russia over the long run. Such a mechanism would result in local and persistent consequences for labor productivity, industrial growth, urbanization, as well as knock-on effects for the demand for human capital, infrastructure provision, and, eventually, incomes and other measures of well-being.

But what were the underlying constraints on local urbanization and structural change fostered by serfdom? Practically by definition, the Russian version of serfdom imposed additional 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 for the former serfs likely made the post-1861 rural institutional regime - centered on the communal ownership of property and collective liabilities for taxes and land payments - more of a constraint on former serfs than other peasants (Nafziger (2013) and Nafziger (2012b)). This occurred within the larger post-1861 context of relatively high transportation costs and an Imperial internal passport system that functioned to impose additional costs on migration out of the countryside and to more distant (greater than 30 km) and longer-term employment opportunities.⁵⁸ Thus, the different initial conditions and experiences of reforms might have imposed an additional set of costs on former serfs relative to other peasants in considering whether to move off of the farm into urban settings and/or industrial employment opportunities. While there was widespread labor mobility in the period, perhaps in violation of many of the formal and informal constraints, and urban growth and industrial development did emerge as important trends by the end of the 19th century, the question remains whether former serf areas saw some additional impediments in these processes.⁵⁹ If industrial (and urban) development were constrained in those areas as a result, this might have reduced the possibilities for local techno-

⁵⁷Collectivization was explicitly a mechanism aimed to accomplish just this, and it at least partially succeeded (Allen (2003)). However, we have found no evidence that various policy components of "collectivization" were differentially targeted at former serf villages. However, if such villages retained relatively more inequality by the 1930s (which was not likely), then dekulakinization campaigns may have harmed former serf areas to a greater degree. We know of no data that could be employed to test for this possibility.

⁵⁸The 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 largely revolved around maintaining absolutist control over the population to head off any signs of social instability or unrest. For discussions of this system, see Burds (1998) (who also discusses transportation costs) and Chernukha (2007). While some aggregate data on passport issuance are available, we have found no district-level sources of this information.

⁵⁹This explanation is consistent with the framework put forth in Gerschenkron (1966). On labor mobility, urban development, and industrialization in the Imperial period, see ibid., Allen (2003), Burds (1998), and Gregory (1994).

logical, human capital, or Marshallian spillovers, with implications for medium and long-run economic outcomes.

This mechanism might explain differential structural changes in former serf areas to 1917, but did Soviet policies work to reinforce such a differential, leading to the long-run effects of serfdom that we find in modern outcomes? At first glance, the massive population movements, institutional reforms, and non-market factor and resource allocations (including the GULAG) fostered in the Soviet system would seem to preclude any sort of persistence. Moreover, the large shocks of the Revolution, Civil War, collectivization, and World War II should have completely undermined any lingering effects of serfdom-related structural constraints (once many other geographic and economic variables are conditioned upon). However, several forms of (dis-)agglomeration may have held, particularly if labor mobility remained constricted in some way. Several factors likely contributed to that being the case. First, the Soviet regime eventually adopted an even more draconian system of internal passports and residency restrictions aimed at controlling the allocation of labor and limiting social unrest in cities (Kessler (2001)). Second, many Soviet labor decisions were explicitly commands, rather than responses to any sort of market signals. And third, the shortfall of urban housing and other disamenities of early Soviet city life impeded the efficient allocation of labor across sectors (Hoffman (1994)). The result of these and other factors was the likely persistence of productivity gaps across space, which would have further constrained urban development and limited agglomeration economies in the negatively affected areas. Given the earlier relative advantages of the districts with lower serf prevalence, Soviet policies would have potentially worked to perpetuate these structural differences, likely into the post-1991 period.⁶⁰

This account of Imperial and Soviet restrictions on labor mobility and other drivers of structural change and urbanization appears plausible, but can we find empirical support for this mechanism of long-run persistence? We begin in the Imperial period. Table 8 reports estimates from models that utilize several dependent variables related to this channel. In Columns 1 and 2, we consider the rate of urbanization (rather than city size) in 1883 and 1913. As the OLS and IV results show, historical serfdom was strongly associated with lower rates of urbanization before the Revolution. The reduction in the urbanization rate in 1913 of between 4.4 to 22 percentage points implied by a standard deviation increase in serfdom is a large effect, given a mean of 10.09 and a standard deviation of 12.15 for the former.

Columns 2 to 4 investigate industrial production using unique district-level data from just after emancipation. In Column 2, we employ the number of factories per capita in 1868 as the dependent variable.⁶¹ In the IV specifications, serfdom is strongly associated with fewer factories. Using the number of factory workers per capita in 1868 in Column (3), our results indicate a significantly lower level of industrial employment in former serf areas in the IV specification.

⁶⁰If the fall of the Soviet Union truly created a market economy in Russia (a big "if"), then we would expect some of these constraints to ease after 1991. However, a number of factors – residency permits, the employment role of the non-market state sector, housing mismatches, etc. – likely have continued to restrain full convergence of these areas.

⁶¹The denominator is the 1863 population. These data are described further in the Appendix.

			Pre-Soviet			Sovie	at	Post-	Soviet
Dependent variables:	(1) Urbanize 1883	(2) ation Rate 1913	(3) Factories (per 100,000) 1868	(4) (1n) Factory per firm	(5) Production per worker	(6) Road Density	(7) Gulag	(8) (In) Pop Density 2000	(9) (In) Light Density 2008
Panel A: OLS Serfs % (1858)	-0.153*** (0.053)	-0.164*** (0.053)	0.039 (0.109)	-0.004 (0.006)	-0.006* (0.003)	-0.012** (0.006)	-0.003** (0.001)	-0.008** (0.003)	-0.006** (0.003)
Panel B: IV									
Serfs % (1858)	-0.847*** (0.319)	-0.977*** (0.347)	-1.083*** (0.394)	-0.063** (0.029)	-0.033** (0.014)	-0.062** (0.028)	0.000 (0.006)	-0.064^{***} (0.015)	-0.051*** (0.017)
Z	493	494	486	438	436	494	494 	494	494
Number of Clusters	50	50	50	50	50	50	50	50	50
First Stage				Serfs,	% 1858				
Monasteries	-0.537*** (0.136)	-0.530^{***} (0.140)	-0.530*** (0.136)	-0.545*** (0.139)	-0.546*** (0.138)	-0.530*** (0.140)	-0.530^{***} (0.140)	-0.530^{***} (0.140)	-0.530*** (0.140)
F-Stat	15.56	14.27	15.09	15.49	15.56	14.27	14.27	14.27	14.27
<i>Notes:</i> The unit of observa suitability of the soil for gr and province fixed effects F	tion is a distric wing wheat, pr leteroskedastic-	t. All regression esence of a river robust standard	is include geographic cont in the district, and distanc errors are in parentheses, c	rols (latitude a e of the district lustered at the	nd longitude of centroid to Mos province. $* p <$	the district, the area scow), as well as (In 0.10, ** p < 0.05,	a of the district) population de *** $p < 0.01$.	covered by forest, ter insity in 1600, distance	rain slope of the district, to the provincial capital,

Table 8: Channels - Structural Change and Urbanization

Finally, we divide factory turnover in a district in rubles by the number of factory workers and consider this metric as a rough indicator for productivity. As both the OLS and IV specifications indicate (Column 4), productivity was significantly lower in areas with higher levels of serfdom. A one standard deviation increase in serfdom corresponded to 16 to 50% lower industrial productivity. These results are suggestive of the presence of some initial impediments in mechanization and structural change during serfdom and shortly after emancipation. Unfortunately, similar district-level indicators of factory production are currently unavailable for later dates in the Imperial period.⁶² Overall, we interpret the Imperial period results in Table 8 as suggestive of a persistent impact of prior serfdom on subsequent structural change and urbanization.⁶³

Did former serf areas continue to remain behind during the Soviet period, or were there processes of urban or structural convergence, possible fostered by specific policy initiatives? Unfortunately, massive changes in administrative geography and a lack of disaggregate Soviet data constrain our empirical investigation of this question to a few indicators that get at this channel of persistence. First, besides constraining labor mobility in ways possibly similar to the Imperial regime, Soviet authorities engaged in other types of policies with signifiant local effects that may have offset or reinforced the effects of serfdom in ways related to this mechanism. While we cannot document all possible policies that might have shifted resources across space or differentially benefited certain areas over others, Table 8 reports the estimated relationship between the incidence of serfdom and road density and the location of GULAG camps. As we noted above, the transportation infrastructure was more limited in former serf areas (Column 6).⁶⁴ This was likely both an effect of, and a contributing factor towards, the slower pace of structural change in such districts. Although some authors have argued for the importance of the GULAG in local and national economic development through employment or productivity effects (e.g. the chapters of Gregory and Lazarev (2003)), we find no differential placement of the camps relative to the historical incidence of serfdom, using a recently geo-referenced map of the system (see the Appendix for more on these data).

One aspect of structural change that we can investigate over the entire Soviet period – and both before 1917 and after 1991 - is urban growth. Our focus here is on a sample of cities for

⁶²We find relatively ambiguous results using the share of district males with a primary occupation in agriculture in the national census of 1897 (results available upon request). According to the OLS specification, the legacy of serfdom reduced male agricultural employment in 1897 (defined as the primary occupation). However, this difference goes away in the IV specification. We argue that this difference likely reflects unobservable determinants of the distribution of serfdom (towards more non-agricultural areas) that are dealt with though the IV specification. This difference in the OLS and IV results may also be due to measurement error in this variable, since it reflects a wide variety of primary occupations. This measure includes males in fishing, hunting, and both modern and traditional forms of agricultural work in the numerator. By focusing on the primary occupation, it excludes various types of industrial or service-sector secondary occupations, which were often seasonally important.

⁶³We also explored data on the height (in mm) of military recruits in the 1870s as an additional proxy for economic development in the post-emancipation period. OLS estimates (not reported here) show that recruits were significantly smaller on average when they were born in areas with high serfdom. While the IV coefficients are much larger, the coefficients are statistically insignificant.

⁶⁴Although not reported here, the train network was also much less dense in such areas by the end of the Soviet regime. The road, train, and GULAG variables are documented in the Appendix.

Table 9: Persistence throughout Soviet Times: Log City Population 1897 - 2002

Panel A: OLS							
Dependent variable: (ln) Population in	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1897	1926	1939	1959	1970	1989	2002
Serfs % (1858)	-0.010***	-0.009***	-0.006	-0.008*	-0.009**	-0.009**	-0.009*
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Distance Provincial Capital	-0.003***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(ln) Population Density 1600	0.177	0.211*	0.370***	0.352***	0.363***	0.386***	0.392***
	(0.116)	(0.119)	(0.130)	(0.132)	(0.132)	(0.134)	(0.136)
Panel B: IV							
Dependent variable: (ln) Population in	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1897	1926	1939	1959	1970	1989	2002
Serfs % (1858)	-0.021	-0.027**	-0.029*	-0.034*	-0.037**	-0.039**	-0.041**
	(0.015)	(0.014)	(0.017)	(0.017)	(0.018)	(0.019)	(0.019)
Distance Provincial Capital	-0.003***	-0.004***	-0.004***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(ln) Population Density 1600	0.140	0.144	0.290**	0.260*	0.261*	0.279*	0.277*
	(0.126)	(0.131)	(0.144)	(0.149)	(0.150)	(0.155)	(0.158)
N	374	374	374	374	374	374	374
R-squared	0.28	0.20	0.16	0.17	0.14	0.14	0.13
Number of Clusters	266	266	266	266	266	266	266
First Stage F-Stat	16.45	16.45	16.45	16.45	16.45	16.45	16.45

Notes: The unit of observation is a city. All regressions control for provincial fixed effects and geographic controls (latitude and longitude of the district, the area of the district covered by forest, ruggedness of the district, suitability of the soil for growing wheat, presence of a river in the district, and the distance of the district centroid to Moscow). Heteroskedastic-robust standard errors are in parentheses, clustered at the district. * p < 0.05, *** p < 0.05.

which we can follow population change over the 20th century.⁶⁵ 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 2002.⁶⁶ After locating these cities in our historical districts, we regress log population in each year on our measure of serfdom and our standard controls. We find a negative association between city population and the incidence of historical serfdom in the surrounding district for every year – see Table 9. Increasing serfdom by one standard deviation reduces city population by between 20% and 50% on average. Intriguingly, when comparing across years in the IV specifications, the magnitude of the effect becomes *larger*. While this could be due to increasingly urban-biased Soviet policies, it is clearly in line with the relative absence of agglomeration and local spillover processes in former serf areas.⁶⁷ Former serf areas were falling further behind over the Soviet period in terms of urban development, and this persisted into the post-Soviet period.⁶⁸ One can also see this long-run absence of catch-up city growth in Figure 3, in which we plot average log city population from 1897 to 2002 for districts with above and below the median level of serfdom.⁶⁹.

⁶⁵City population as a measure for economic development has been used extensively by economic historians in the absence of other reliable economic data.

⁶⁶Mikhailova's data subsumes the sample of Acemoglu, Hassan and Robinson (2011).

⁶⁷The pattern of persistent differences in urbanization levels according to the experience of serfdom is also consistent with the results obtained from models using city growth as the dependent variable, controlling for the initial level of population in each sub-period (see the Appendix). In such specifications, we again find that historical serfdom has a negative, although not always significant, association with population growth.

⁶⁸As noted in Table 8 (Column 8), we also find that the historical incidence of serfdom is negatively associated with (ln) population density in 2000 in the district. Therefore, our results are not likely an artifact of the focus on cities.

⁶⁹This persistent gap between cities in more and less serf areas holds true we project the city populations back

Figure 3: Serfdom and City Population 1897-2002



While data constraints largely limit us to considering urban population change as a metric of structural transformation, we have compiled a single measure of industrial production that we can track over the Soviet period.⁷⁰ We utilize the number of defense factories in a sample of Russian and Ukrainian cities, as compiled by Acemoglu, Hassan and Robinson (2011) from data collected in an earlier version of Dexter and Rodionov (2016). We observe the number of such factories at four points in time: 1939, 1959, 1970, and 1989. While defense factories in a command economy were certainly not allocated across space as a result of free market mechanisms, it is possible that geographic variation in this specific type of establishment was at least partially indicative of the processes of structural transformation that we are considering.⁷¹ Table 10 reports our findings: much as with the urban population, we finds a statistically significant and increasingly negative effect of historical serfdom on the number of defense plants in these cities over the four cross sections (Columns 1-4). The fact that the coefficient is negative prior to World War II suggests that our findings are not indicative of the wartime movement of production eastward. Column 5 reports a secondary test where we include the original (measured) amount of defense production in 1939 when estimating the determinants of the 1989 level. The fact that we find no residual effect of historical serfdom suggests that the structural effect (if we can interpret these regressions in this way) was fully present early in the Soviet period. Overall, our diverse strands of evidence all appear to point to a mechanism of historical persistence closely tied to constraints on urban development and local economic structural

to 1750 using data from Bairoch, Batou and Chèvre (1988)

⁷⁰Column 9 of Table 8 reports results for specifications of our models with a measure of satellite light density from 2008 as the outcome variable (see the Appendix for more detail). This can be seen as both an alternative measure of local economic outcomes and as an indicator of structural change, since industry tends to generate much more night time illumination than agriculture. Regardless of the interpretation, we find that light density was much lower in areas of higher serf incidence.

⁷¹Part of this might be due to downstream linkages related to the defense factories themselves.

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Number of Factories in	1939	1959	1970	1989	1989
Panel A: OLS					
Serfs % (1858)	-0.144*** (0.055)	-0.214** (0.094)	-0.287** (0.124)	-0.309** (0.135)	0.029 (0.040)
Distance Provincial Capital	-0.032 (0.020)	-0.053 (0.033)	-0.076* (0.042)	-0.088* (0.045)	-0.013 (0.014)
(ln) Population Density 1600	-1.300 (1.090)	-3.276* (1.839)	-4.189* (2.333)	-4.137 (2.529)	-1.086 (1.073)
Number of Factories in 1939					2.346*** (0.198)
Panel B: IV					
Serfs % (1858)	-0.137** (0.059)	-0.243*** (0.094)	-0.407*** (0.137)	-0.504*** (0.167)	-0.187 (0.149)
Distance Provincial Capital	-0.032* (0.018)	-0.052* (0.031)	-0.073* (0.039)	-0.083* (0.042)	-0.009 (0.014)
(ln) Population Density 1600	-1.277 (0.976)	-3.382** (1.677)	-4.621** (2.219)	-4.840* (2.494)	-1.888* (1.138)
Number of Factories in 1939					2.311*** (0.174)
Ν	278	278	278	278	278
R-squared	0.16	0.17	0.17	0.17	0.91
Number of Clusters	205	205	205	205	205
1-Stat	24.22	24.22	24.22	24.22	24.30

Table 10: Channels - The Persistence of Industry Location

Notes: The unit of observation is a city. All regressions control for provincial fixed effects and geographic controls (latitude and longitude of the district, the area of the district covered by forest, terrain slope of the district, suitability of the soil for growing wheat, presence of a river in the district, and the distance of the district centroid to Moscow). Heteroskedastic-robust standard errors are in parentheses, clustered at the district. * p < 0.10, ** p < 0.05, *** p < 0.01.

change – particularly the allocation of labor – that emerged under serfdom and were reinforced in various ways over the subsequent century and a half.

Concluding Remarks

In this paper, we have explored whether coercive labor institutions that existed for centuries in the Russian Empire generated persistent effects on economic development that lasted until today. The evidence that we marshall confirms the adverse economic consequences of Russian serfdom that the literature has assumed but never definitively proven. For identification, we apply a novel identification strategy based on the expropriation of monastic serfs and transfer to state control by the Tsarist government in the 18th century. This goes well beyond existing works that seeks to evaluate the consequences of slavery, serfdom, and other forms of labor coercion for subsequent economic development. In this way, our study adds to a recent literature that has found negative long-run effects of forced labor in other contexts, despite the absence of religious or racial markers of past coercion in the Russian context. We provide evidence that the experience of serfdom – the higher inequality and institutional constraints on factory mobility, before and after emancipation – generated constraints on urbanization and structural change, with repercussions for human capital accumulation and public good provision. These effects persisted through the late Imperial and Soviet periods to today, resulting in slower city growth, weaker infrastructure development, and, eventually, lower educational attainment and income levels. Thus, our results imply that early industrial development and subsequent agglomeration effects (possibly reinforced by constraints on human capital accumulation) can be important channels of historical persistence of the effects of labor coercion, even over 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)). This literature has generally focused on the inefficiencies generated by remnants of Soviet-era institutions and the difficulties in developing modern replacements. As we have emphasized, serfdom and the emancipation reforms constituted a set of relatively dysfunctional institution practices among a large portion of the rural population, with implications for the subsequent development of the Soviet Union and successor states. Thus, 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 and modernization, a hypothesis that has been proposed but remains relatively untested.⁷²

Many interesting questions remain open for further research. For example, one might ask how specific Imperial and Soviet policies, institutions, or economic shocks translated different experiences of serfdom into heterogeneity in outcomes in the long run. A related area of further investigation is the role of heterogeneity in the characteristics of serfdom (size and type of obligations, the nature of estate governance, etc.) and in the emancipation reforms when it comes to generating variation in long-run economic outcomes.⁷³ These and other issues constitute a rich set of research questions that we hope to take up in future work.

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⁷²See Dower and Markevich (2014), Lankina (2012), and Roland (2012).

⁷³Markevich and Zhuravskaya (2016), for example, have found differences in how areas developed immediately after 1861, depending on their specific experiences of serfdom.

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Appendix for Long-Run Consequences of Labor Coercion: Evidence from Russian Serfdom

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Data Appendix and Supplementary Tables and Figures

This appendix accompanies the paper "Long-Run Consequences of Labor Coercion: Evidence from Russian Serfdom" by Johannes C. Buggle and Steven Nafziger. Section A.1 describes the data and its sources. Sections A.2 contains additional tables and results mentioned in the paper, and section A.3 contains supplementary figures.

Data Description and Sources

Serfdom Data: The main explanatory variable, *Serfs % (1858)*, is constructed using the sum of total male and female serfs in 1858 per district (taken from Troinitskii (1982 (1861)), divided by district population in 1858 (taken from Bushen (1863)). The latter source also allows us to construct a measure of population density for 1858.

2. Geographic Controls:

- Longitude and latitude information based on own calculations at the district's centroid using ArcGIS.
- Distance to Moscow gives the distance in kilometers from the centroid of each historical district to Moscow.
- Suitability of the soil for low-input rain-fed wheat, oat, rye and barley, as well as terrain slope, forest cover, mean temperature, and mean precipitation are taken from the FAO-GAEZ database. The latter two variables are utilized in robustness checks not reported in the main paper or the Appendix.

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- The presence of a river (0/1) is calculated using a digitized map of rivers produced by the Alterra Centre for Geo-Information (accessed through http://climateadapt.eea.europa.eu/geonetwork/srv/en/main.home).
- Ln Population Density in 1600 is constructed using population density data from the HYDE 3.1 database which provides population density estimates from 10000 BC to AD 2000 for every hundred years, and every ten years from 1700 onsward (Klein Goldewijk et al., 2011) (downloadable from http://themasites.pbl.nl/tridion/en/themasites/hyde/download/index-2.html).
- The distance to the Provincial capital is constructed by the distance in kilometers from the district's centroid to the centroid of the district where the Provincial capital is located
- Ln Population Density in 2000 is based on the Gridded Population of the World (GPW), v3, data.
- 3. **Monasteries:** Total number of orthodox monasteries between 1764 and 1795, obtained from Zverinskii (2005 (1897)).
- 4. Log Equivalent Expenditure Per Capita comes from questions asking "Approximately how much does your household spend on each of these items per month?" a) Food, beverages and tobacco, b) Utilities (electricity, water, gas, heating, fixed line phone.), c) Transportation (public transportation, fuel for car) and "And approximately how much did your household spend on each of these items during the past 12 months?" a) Education (including tuition, books, kindergarten expenses), b) Health (including medicines and health insurance), c) Clothing and footwear, d) Durable goods (e.g. furniture, household appliances. TV, car, etc). Expressed in US Dollars and adjusted by household size. Source is Life in Transition Survey, wave 2006.
- 5. Asset ownership: Question asks "Do you or anyone in your household own any of the following?" We construct a principle component out of ownership of a car, a second residence, a mobile phone, or a computer. Source is Life in Transition Survey, wave 2006 and 2010.
- 6. **Base and household controls:** Household size, share of male, share of persons aged 0-18, share of persons aged 60+, religious denomination of the respondent, rural/urban sampling village, survey round. Source is Life in Transition Survey, wave 2006 and 2010.
- 7. Education: Secondary equals 1 if the educational level of the respondent is either secondary education, professional education, tertiary education or postgraduate education, 0 otherwise. Above secondary education equals 1 if the educational level of the respondent is either professional education, tertiary education or postgraduate education, 0 otherwise. We also use the question "In your opinion, which of these fields should the first

priority for extra (government) investment?" to construct an indicator variable equal 1 if the respondent mentions education.

8. Attitudes:

- *Equal incomes vs inequality:* Question asks "Now I'd like you to tell me your views on various issues. How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between: Incomes should be made more equal (1) vs We need larger income differences as incentives for individual effort (10)".
- *Reduce Inequality:* Question asks "To what extent do you agree with the following statements: The gap between the rich and the poor today in this country should be reduced" and respondents can strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4) or strongly disagree (5).
- *Demonstrated/Striked/Joined Party:* Question asks "How likely are you to... attend a lawful demonstration participate in a strike join a political party" and respondents can answer "have done (3) might do (2) would never do (1)"
- *Pref Market Economy:* Question asks "With which one of the following statements do you agree most? A market economy is preferable to any other form of economic system Under some circumstances, a planned economy may be preferable to a market economy For people like me, it does not matter whether the economic system is organized as a market economy or as a planned economy" The variable takes on the value 1 if the respondent states that "A market economy is preferable to any other form of economic system " and 0 otherwise.
- *Pref Democracy:* Question asks "With which one of the following statements do you agree most? Democracy is preferable to any other form of political system Under some circumstances, an authoritarian government may be preferable to a democratic one For people like me, it does not matter whether a government is democratic or authoritarian" The variable takes on the value 1 if the respondent states that "Democracy is preferable to any other form of political system " and 0 otherwise.
- Trust:
- 9. City Population 1897-2002: The population of Russian cities has been compiled by Mikhailova (2012) and is based on the population census of the Russian Empire (1897), the Soviet Union (1926-1989) and the Russian Federation (2002). We construct a balanced sample of 374 population centers with city status.

- 10. **Military Industry 1939 1989**: Data on the location of defense-related establishments during the Soviet period for a sample of 278 Russian and Ukrainian cities is taken from Acemoglu, Hassan and Robinson (2011), who matched more 17,914 establishments to their current location. The source data is the "Factories, Research and Design establishments of the Soviet Defence Industry" database Version 11 (2010) by Keith Dexter and Ivan Rodionov. We use the total number of establishments per city, as well as the growth rates of establishments during various time periods as outcome variables.
- 11. Road and Railway Density in the Countries of the former Soviet Union: Road and Railway densities in 1996 are constructed using digitized maps provided by the *Coal Quality and Resources of the Former Soviet Union* project of the U.S. Geological Survey (Brownfield et al. 2001), accessed via http://pubs.usgs.gov/of/2001/ofr-01-104/fsucoal/html/data1.htm.
- 12. Other Historical Outcomes: We drew on a variety of sources to construct other historical outcome measures to investigate the mechanisms behind the persistent impact of serfdom. Male literacy in 1897 is defined for rural residents in their 20s from data reported in Troinitskii (1905). That source also provides the share of the adult male population with agriculture as the primary occupation. Rural enrollment rates for 1880 and 1894 are defined with both numerators and denominators taken from Tsentraf'nyi statisticheckikh komitet, Ministerstvo vnutrennykh del (1884) and Fal'bork and Charnoluskii (1900-1905), respectively – see Nafziger (2012) for more information. Fal'bork and Charnoluskii (1900-1905) also provide the number of formally recognized primary schools by district in 1856. The urbanization rate in 1913 is derived from Tsentraf'nyi statisticheckikh komitet, Ministerstvo vnutrennykh del (1914). The land Gini (both types), the percentage of land owned by the nobility or in communal tenure, and the amount of land possessed per peasant household, all defined in 1905, are from Tsentraf'nyi statisticheckikh komitet, Ministerstvo vnutrennykh del (1906), with additional details provided in Nafziger (2013). Finally, information on factory production and employment in 1868 is compiled from Tsentraf'nyi statisticheckikh komitet, Ministerstvo vnutrennykh del (1872).
- 13. Night-Time Luminosity: We use the log of average luminosity at night measured as "Average Visible, Stable Lights, and Cloud Free Coverage" for the year 2008. The data is taken from the National Geophysical Data Center (http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html).
- 14. **Date of Peasant Emancipation across Countries:** The emancipation dates for the 18 countries used in Figure 1 are taken from several sources. Information for Austria, Denmark, France, Switzerland, Estonia, Latvia, Germany (Prussia), Hungary, Russia and Ukraine, Belarus, Romania is taken from Acemoglu et al. (2007). Data for Netherlands

from Jarrett (2013), for Bulgaria from Zagorov (1955), dates for Croatia from Magas (2008), and for Italy (Naples) and Spain from Atkin, Biddiss and Tallett (2011). For Poland we use the average date of the Duchy of Warsaw and the Kingdom of Poland which are taken from Davies (2005).

	Mean	Sd	Obs
Serfdom and Monasteries			
Serfs % (1858)	38.52	25.01	494
Monasteries	3.60	6.12	494
District Level Covariates			
Longitude	37.10	8.58	494
Latitude	54.10	3.84	494
Forest Cover	36.05	23.57	494
Terrain Slope	91.29	4.91	494
Wheat Suitability	6621.15	2184.24	494
River (0-1)	0.55	0.50	494
Distance to Moscow (km)	634.98	321.59	494
Oat Suitability	6070.91	2303.28	494
Rye Suitability	6000.32	2259.95	494
Barley Suitability	6067.84	2335.83	494
(ln) Population Density 1600	1.13	0.95	494
Distance Provincial Capital (km)	126.09	101.83	494
Share of Jews 1897	3.27	5.49	494
Share of Muslims 1897	2.77	9.50	494
Share of Old Believers 1897	1.73	3.26	494
Share of Orthodox 1897	82.98	25.49	494
Share of Catholics 1897	4.02	13.17	494
Average Temperature	5.39	2.18	494
Average Precipitation	589.46	65.27	494
Additional Outcomes at the District Level			
Intermediate Outcomes			
Schools before 1856 (p. thousand inhabitants)	0.05	0.13	489
log(teacher wage 1910)	5.77	0.20	492
Perc. Land owned by Nobles, 1905	20.86	14.04	494
Land Gini 1905	0.49	0.16	470
Urbanization 1833	9.81	11.14	493
Urbanization 1913	10.09	12.15	494
Factories p.tth. 1868	22.09	43.99	486

Table A1: Summary Statistics

	Mean	Sd	Obs
log(factory production per worker)	13.00	0.93	436
log(factory production per firm	15.44	1.82	438
Male agricultural employment 1897	71.58	14.81	494
Road Density Soviet Union	1.67	1.22	494
Gulag	0.20	0.40	494
Contemporary Outcomes			
(ln) Light Density 2008	0.57	1.01	494
(ln) Pop Density 2000	3.42	1.09	494
Contemporaneous Survey Outcomes (LiTS)			
Serfs % (1858)	23.90	24.89	12831
Latitude PSU	53.66	4.28	12831
Longitude PSU	29.27	6.99	12831
Economic Outcomes			
Log Equivalent Expenditure Per Capita	4.96	0.85	5605
Household Durable Assets (Principal Component)	0.01	1.34	12826
Education			
At least secondary education	0.71	0.45	12831
Above secondary education	0.56	0.50	12830
Mentioned education first gov priority	0.23	0.42	12829
Cultural Attitudes			
Economic inequality	4.74	2.97	6558
Demonstrated	1.38	0.59	11834
Striked	1.30	0.51	11834
Joined Party	1.18	0.45	11834
Pref Market Economy	0.38	0.49	11573
Pref Democracy	0.49	0.50	11663
Trust	0.39	0.49	12481

Table A1: Summary Statistics (continued)

See the Data Appendix for variable definitions and sources.

Additional Robustness Check: Controlling for Past Urbanization Table A2 reports a variant of our basic OLS estimations, using per capita expenditure as dependent variable and controlling for urbanization in 1883. While the rate of urbanization has a positive effect on expenditure in Columns 1 and 2, once we include controls for historical development, postemancipation urbanization becomes insignificant (Column 3). However, this disappears in the IV model (Column 4). Regardless, as Columns 1 - 4 show, serfdom is significantly associated with household expenditure conditional on the rate of urbanization.

	Dependent	variable: Lo	g Equivalent I	Expenditure Per Capita
	(1)	(2)	(3)	(4)
		OLS		IV
Serfs % (1858)	-0.455*** (0.155)	-0.503*** (0.173)	-0.435** (0.194)	-2.145*** (0.583)
Urbanization 1883	0.004** (0.001)	0.004** (0.001)	0.003 (0.002)	0.004** (0.002)
(In) Population Density 1600			0.056 (0.062)	-0.107 (0.092)
Distance Provincial Capital			-0.000 (0.000)	0.001 (0.001)
Ν	5585	5585	5585	5585
R-squared	0.44	0.44	0.44	0.41
Number of Clusters	297	297	297	297
First Stage				Serfs, % 1858
Monasteries				-0.009*** (0.002)
First Stage F-Stat				16.13

 Table A2:
 Additional Robustness

Notes: The unit of observation is the individual. The dependent variable is (Ln) Equivalent Expenditure Per Capita, taken from LiTS wave 2006. All regressions include local controls (religious denomination of the respondent, LiTS survey wave and an indicator whether the PSU is rural or urban), household controls (household size, share of household members aged 0-18, share of household members aged 60+, share of male household members), geographic controls (latitude and longitude of the PSU, area of the district covered by forest, ruggedness of the district, presence of a river in the district, and distance to Moscow), and province fixed effects. Heteroskedastic-robust standard errors are in parentheses, clustered at the primary sampling unit. * p < 0.10, ** p < 0.05, *** p < 0.01.

Cultural Attitudes Did economic exploitation over several centuries shape peoples beliefs and attitudes, perhaps fostering a "culture of serfdom," with persistent implications for economic development? Several recent studies have documented that institutions can impact cultural norms in the long-run (for an overview see Nunn (2012)), which can persist over generations. Moreover, it is possible that various institutional restrictions, social and economic inequality, or persistent limitations on urban development under and after serfdom generated longlasting norms and beliefs that undermined income growth in modern post-Soviet economies.

To explore this possibility, we rely on survey responses regarding various beliefs, as elicited in the 2006 and 2010 rounds of LiTS. Our results are presented in Table A3. We consider attitudes about redistribution (Column 1), questions that ask about participation in political action (Column 2-4), preferences for a market economy (Column 5) or democracy (Column 6), and a basic measure of trust (Column 7). The historical incidence of serfdom was marginally associated with *less* interest in having government reduce inequality (Column 1). We find some evidence that individuals living in areas with historically greater intensity of serfdom were more likely to engage in political actions, such as demonstrations (Column 2) and attending a strike (Column 3).¹ Preferences for a market economy (versus a planned economy) or for democracy (versus autocracy) are not statistically different between areas with a greater or lesser history of serfdom. Trust in others showed little relationship to historical serfdom.

While cultural channels have been emphasized in the literature on persistent effects of past labor coercion (i.e. Nunn and Wantchekon (2011)), we find only limited support for this in the Russian and former Soviet case. Unlike societies with legacies of racially delineated slavery, as the US South, the absence of significant racial or religious differences between former serfs and the rest of the population may have limited any such cultural distinctiveness in the subsequent decades.

¹This is consistent with the results in Dower et al. (2015), who find that emancipation generated considerable collective action in the form of peasant unrest in the early 1860s among the newly freed former serfs. However, we view this result as likely driven by underlying economic differences.

Dependent variables:	Equal Incomes	Demonstrated	Striked	Joined Party	Pref Market Economy	Pref Democracy	Trust
Serfs % (1858)	-1.851* (1.014)	0.214^{**} (0.096)	0.210** (0.083)	0.083 (0.064)	-0.031 (0.086)	0.056 (0.100)	0.011 (0.102)
Z	6558	11834	11834	11834	11573	11663	12481
R-squared	0.10	0.07	0.09	0.05	0.08	0.06	0.04
Number of Clusters	396	645	645	645	693	695	695
Notes: The unit of observe indicator whether the PSU i	tion is the individual s rural or urban) and h	All regressions cc nousehold controls (h	ntrol for bas	se controls (religi	ous denomination of the resp hold members aged 0-18, share	ondent, LiTS survey w	/ave and an s aged 60+,

Table A3: Channels - Cultural Attitudes and Preferences

share of male household members), geographic controls (latitude and longitude of the PSU, area of the district covered by forest, ruggedness of the district, presence of a river in the district, and distance to Moscow), as well as Province fixed effects. Heteroskedastic-robust standard errors in parentheses, clustered at the primary sampling unit. * p < 0.10, *** p < 0.05, *** p < 0.01.

Growth in Industry 1939 - 1989 Table

(4)
(4))39-1989
-0.006 (0.008)
-0.007 (0.009)
.005*** (0.002)
-0.822 (0.681)
233
0.30
1/4
(4) 939-1989
(4) 939-1989
(4) 039-1989 0.074* (0.040)
(4) 039-1989 0.074* (0.040) -0.016 (0.010)
(4) 039-1989 0.074* (0.040) -0.016 (0.010)
(4) 039-1989 0.074* (0.040) -0.016 (0.010)
(4) 039-1989 0.074* (0.040) -0.016 (0.010) 0.004* (0.002)
(4) 039-1989 0.074* (0.040) -0.016 (0.010) 0.004* (0.002) 1.106* (0.656)
(4) 039-1989 0.074* (0.040) -0.016 (0.010) 0.004* (0.002) 1.106* (0.656) 233
(4) 039-1989 0.074* (0.040) -0.016 (0.010) 0.004* (0.002) 1.106* (0.656) 233 0.21

Table A4: Channels - Growth in Defense-Related Establishments

Notes: The unit of observation is a city. All regressions control for provincial fixed effects and geographic controls (latitude and longitude of the district, the area of the district covered by forest, terrain slope of the district, suitability of the soil for growing wheat, presence of a river in the district, and the distance of the district centroid to Moscow). Heteroscedastic-robust standard errors in parentheses, clustered at the district. * p < 0.10, ** p < 0.05, *** p < 0.01.

Which observables determine the location of monastic estates? Table A5 tests for factors that correlate with the location of monastic estates using negative binomial regressions.

		Number of 1	Monasteries	
	(1)	(2)	(3)	(4)
Longitude	-0.008	-0.106***	-0.104***	-0.038
	(0.016)	(0.032)	(0.031)	(0.037)
Latitude	0.033	0.088	0.073	0.118
	(0.051)	(0.097)	(0.100)	(0.100)
Forest Cover	0.017***	-0.004	-0.007	-0.001
	(0.006)	(0.006)	(0.006)	(0.005)
Terrain Slope	0.010	0.017	0.016	0.013
	(0.015)	(0.020)	(0.021)	(0.019)
Wheat Suitability	-0.000	-0.000***	0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
River (0-1)	-0.055	-0.004	0.009	-0.027
	(0.135)	(0.114)	(0.109)	(0.108)
Distance to Moscow	-0.001***	-0.001	-0.001	-0.000
	(0.000)	(0.001)	(0.001)	(0.001)
Oat Suitability			0.000 (0.000)	
Rye Suitability			-0.000 (0.000)	
Barley Suitability			-0.000 (0.000)	
(ln) Population Density 1600				0.064 (0.149)
Distance Provincial Capital				-0.003*** (0.001)
Province FE	No	Yes	Yes	Yes
N	494	494	494	494

Table A5: Determinants of Monasteries

Notes: Negative binomial regressions. The unit of observation is the district. Heteroscedastic-robust standard errors in parentheses, clustered at the province. * p < 0.10, ** p < 0.05, *** p < 0.01.



Figure A1: Distribution of Serfs as Share of Population, c. 1858. N = 495.



Figure A2: Spatial Distribution of Monasteries





Figure A4: Serfdom and City Population 1897-2002 (IV coefficients and 90 % confidence intervals)



Figure A5: Serfdom and City Growth 1897-2002 (OLS coefficients and 90 % confidence intervals)



Figure A6: Serfdom and City Growth 1897-2002 (IV coefficients and 90 % confidence intervals)



Figure A7: Serfdom and Number of Factories (OLS coefficients and 90 % confidence intervals)



Figure A8: Serfdom and Number of Factories (IV coefficients and 90 % confidence intervals)



Figure A9: Serfdom and Growth of Factories (OLS coefficients and 90 % confidence intervals)



Figure A10: Serfdom and Growth of Factories (IV coefficients and 90 % confidence intervals)



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