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Essays in Political Economy

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ABSTRACT OF THE DISSERTATION

Essays in Political Economy

by

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This dissertation studies the determinants of political institutions and their impact on economic development in various historical contexts. The first chapter focuses on the Catholic Church, which for centuries determined the political, economic, and cultural development of Europe and was the greatest and most enduring rival to the nation-state. Why did the Church's power decline earlier in Northwestern Europe than in the East and South? I argue that to a large extent the differential political influence of the Church can be explained by differential demand for collective security in the face of the possible invasion by the militarily superior "infidels." Catholic states had to cooperate to achieve military success. To mitigate the interstate collective action problem, Catholic states voluntarily delegated legal and fiscal authorities to a common non-territorial jurisdiction, which was the Church. States in Northwestern Europe had lower demand for protection against the "infidels," therefore, commitment to the Church was weaker. To measure the Church's political power across time and space at the subnational (diocesan) level, I have assembled a novel dataset on appointments of bishops between 1198 and 1517, the beginning of the Protestant Reformation. Using historical GIS data, I find that in the dioceses located closer to the territory of the "infidels," bishops were differentially more likely to be selected by the pope or cathedral chapters than by secular rulers, compared to the dioceses that were secure from external military threats. This finding is inconsistent with Charles Tilly's thesis that "war made states." It also emphasizes that the Reformation was not a watershed in the state-Church relations but was rather an organic development.

The second chapter examines the economic origins of discrimination against Jewish entrepreneurs in the Russian Empire. Prior to 1889, a large share of Russian private capital was invested in state and state-subsidized assets that yielded a fixed return and were deemed safe. After the government received access to new external sovereign debt markets with lower interest rates, it forcefully converted bonds on the domestic market. Combined with other policy changes between 1889 and 1894, this shock freed large amounts of domestic private capital that now had to be reinvested in the equity market. I explore the relationship between anti-Jewish restrictions in the equity market that began around the same time, in 1890, and capital intensity of 3-digit manufacturing industries (SIC). Russian law required all corporate charters to be approved by the central government, which was also used as an opportunity to target specific corporations and to preclude Jews from creating and/or investing in them. Using the RUSCORP database of all manufacturing corporations created in 1891–1902 (Owen, 1992) and novel data on all Russian factories in 1890, I find a positive association between capital intensity and the probability of restrictions. I address some of the possible alternative explanations for the observed pattern using the St. Petersburg Stock Exchange data and the data on major merchant guilds.

In the third and final chapter, I study the role of labor mobility restrictions, that existed under serfdom, in shaping economic development. In the Russian Empire, twenty-three million people, who were serfs in 1858 and were not allowed to move to cities, were freed in the following twelve years. Was removal of the mobility restrictions a major factor in the subsequent urban growth? I develop a structural model of rural-urban migration incorporating restrictions on mobility for different types of peasants, features of the countryside and hypothetical urban destinations, and the travel costs for different modes of transportation. I estimate this model using novel detailed data on peasants, cities, and railroads in the Russian Empire, covering the period from 1811 to 1910. The estimated parameters suggest that moving to cities was not advantageous to peasants in and of itself. Instead, construction of railroads was the single most important factor explaining rural-urban migration. This is likely because allocation of rural labor was not efficient historically, independently from the impact of serfdom. My within-model calculations suggest that by 1910, the total urban population enabled by the railroad network was comparable to that in a counterfactual scenario in which serfdom never existed.

The dissertation of Imil Nurutdinov is approved.

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Минем бабама

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CHAPTER 1

From Christendom to Nation-State: How the Decline of External Military Threats Led to Secularization in Europe, 1198–1517

1.1 Introduction

The Catholic Church was a pivotal actor in the political and economic development of pre-modern Europe. It was the largest landowner in a still overwhelmingly agrarian society. The Church's doctrine regulated public morality by claiming monopoly of knowledge and banning usury. Popes crowned Holy Roman Emperors and imposed trade embargoes on entire regions. What explains the rise and fall of the Catholic Church as a political actor? Why did the Church's power decline more quickly in some regions than others? Was the Protestant Reformation (1517) a turning point in the state-Church relations or continuation of the previous trend?

I argue that the influence of the Church lasted to a large extent because of demand for collective security against external military threats. For a long time after the fall of the Roman Empire, European polities were fragmented. At different points in time, the military capacity of the Lithuanians, Moors, Turks, and other non-Christians exceeded that of any one Catholic state, hence cooperation was required to achieve military success. As a public good, collective security tends to be underprovided, because states have incentives to free ride (Olson and Zeckhauser, 1966). I argue that an effective and enduring alliance of Catholic states required partial delegation of legal and fiscal authorities to a common non-territorial jurisdiction, which was the Church. These authorities were locally exercised by bishops, who limited rulers' discretionary power over domestic and international affairs, and papal collectors, who transferred clerical taxes from dioceses to the Curia starting with the pontificate of Pope Innocent III (1198–1216). Unlike individual Catholic rulers, the Church *internalized* the potential loss of followers to the "infidels" in *other* states and had incentives to take preemptive military action to defend its

position in the "religious market." In addition, warfare led by the Church was funded from the proceeds of taxes on the clergy, which was less politically problematic than lay taxation by secular rulers. The latter was coercive in nature and required sensitive political concessions on the part of rulers, whereas the Church effectively acted as a corporation that distributed the rents among its "shareholders."

To test my argument empirically, I leverage the geographic and temporal variation in the identity and location of the "infidels." To construct a measure of external military threats, I have created GIS maps of all the "infidel" states in Europe and the adjacent regions in the Middle East and North Africa using the *Centennia Historical Atlas* (Clockwork Mapping, 2018). Based on these GIS maps, I define vulnerability of a given diocese in a given period as the shortest distance from the "infidels" in the previous period. To measure the political power of the Church across time and space, I examine whether a bishop in a given diocese-year was appointed by the sovereign, rather than being chosen by the cathedral chapter or the pope. Bishoprics were endowed with land and movable wealth. Additionally, bishops played a major role in the feudal hierarchy and state and religious administration. Therefore, other things equal, both the Church and sovereigns sought to influence appointments of bishops. I interpret observed non-interference in the appointment process by sovereigns as a sign of a quid pro quo and investigate whether protection from external military threats by the Church can serve as a plausible mechanism. Using dozens of diocese-specific sources, I have assembled a novel dataset on appointments of bishops of 63 dioceses in fifteen present-day European states. Combined with the GIS maps, for most dioceses the resulting annual panel covers the period between 1198 and 1517.

The data granularity allows me to study the impact of external military threats on the Church's political power not only cross-nationally but also subnationally (at the diocesan level). This is particularly important in the context of medieval Europe, in which states such as France and the Holy Roman Empire were only nominally ruled by a single sovereign. Using a panel regression with diocese and time fixed effects and diocese-specific trends, I have shown that bishops were more likely to be appointed independently from the sovereign in more vulnerable dioceses. By contrast, in less vulnerable dioceses, bishops were more likely to be appointed by secular rulers, which likely indicates lower demand for military cooperation. In that sense, the Reformation was not a watershed in the Church-state relations but was rather an organic development. The association between external military threats and the Church's political power is present in the short and medium term but gradually decreases with time

and generally vanishes at panel intervals longer than twenty-five years.

To further illuminate the mechanism, I conduct a case study using the *actual* conflict data as an "independent variable" instead of military threats. Analyzing episcopal appointments in Poland between 1198 and 1517, I find that the political power of the Church did not change monotonically over time but instead closely followed the dynamics of Lithuanian raids prior to the Christianization of Lithuania (1387), with a higher frequency of the past raids associated with a larger percentage of bishops appointed without interference by Polish rulers. Once the Lithuanian threat to Poland disappeared, Polish rulers increasingly appointed bishops themselves. I complement this case study with historical evidence on interactions between the Church and rulers in a neighboring state, Pomerania, that was relatively secure from Lithuanian attacks.

The paper proceeds as follows. In the next section, I review the related literature. In Sections 1.4 and 3.2, I discuss the historical context and propose a theoretical framework that helps explain the role of the Church in medieval military alliances. In Section 1.5, I present the data. Section 1.6 describes the empirical strategy and results. I conduct a historical case study to provide additional support for the relationship between the Church's power and collective warfare in Section 1.7. In Section 1.8, I link my main empirical findings to the debate on the origins of the Protestant Reformation and its role in European development. The final section concludes.

1.2 Related Literature

This paper is closely linked to the literature on state formation (Besley and Persson, 2009; Gennaioli and Voth, 2015). Tilly (1992) has famously argued that "states made war, and war made states." The later literature has made this argument more nuanced and context-specific in an attempt to explain why certain European states failed to centralize, despite the war pressure, or even disappeared altogether. Gennaioli and Voth (2015) have suggested that the costs of state centralization were differential across states, depending on the initial level of fractionalization (e.g., linguistic or ethnic). What remains unclear is why at different points in history non-territorial governance structures, such as the Catholic Church, dominated European politics. In a seminal work, Spruyt (1996) alludes to this puzzle but does not provide an explanation. Crucially, the state formation debate originated by Tilly (1992) has

exclusively focused on how military *conflict* affects domestic institutions, omitting the possibility—and challenge—of interstate cooperation. By studying governmental structures beyond the nation-state, such as the Church, and by focusing on military alliances, my analysis offers a more realistic model of state formation. My main finding that the Church was *stronger* when the danger of foreign invasion was imminent goes against the prediction of Tilly's (1992) model of state formation: if one considers investment in state capacity as the *only* possible response to addressing external military threats, making the Church subordinate to the sovereign by appointing loyal bishops would be a natural step in the process of strengthening the state.

Because warfare was the single most important type of expenditure in the pre-modern period, disagreements over war financing constituted major distributional conflict in every state. It has been argued that specific institutional designs, whereby the military was recruited and maintained, could be linked to regime stability (Blaydes and Chaney, 2013) and political representation (Karaman and Pamuk, 2013) in pre-modern states. In turn, as Acemoglu et al. (2005) pointed out, institutions that were created before 1500 tended to persist in the subsequent period, which resulted in a significant divergence of per capita income before the Industrial Revolution.[1] In this literature, the set of relevant political actors tends to be *domestic*—it typically includes kings (the landed elite) and merchants (the commercial class).[2] My study is the first to emphasize the role of a large foreign interest group, the clergy, in making prolonged, large-scale warfare possible. Governed by canon law, at least nominally, the pre-Reformation clergy was not subject to "domestic" (royal) laws. Therefore, the degree to which rulers exercised control over the Church could shape domestic institutions via the *fiscal-military channel*, although the net effect is theoretically ambiguous. On the one hand, if protection from external military threats could be provided externally to some extent, conflict over taxation with domestic subjects would become less acute. On the other hand, given the sheer size of the Church's wealth, the clergy had great bargaining power of their own. In the very first provision of Magna Carta (1215), King John declared that "the English Church shall be free, and shall have its rights undiminished, and

[1] A recent paper by Angelucci et al. (2018) also stresses the persistent nature of medieval institutions studying the case of England.

[2] One—indirect—way whereby "interactions" with foreign states could be incorporated in the political calculus of rulers is to allow for the possibility of exit by those who otherwise would be taxed (see Dincecco and Wang, 2018, for a version of this argument with applications to various historical contexts). By contrast, I study the involvement of foreign actors in domestic politics more directly.

its liberties unimpaired."[3] Therefore, the net effect of the Church's power on domestic institutions is theoretically ambiguous: it could have strengthened sovereigns in some cases and constrained them in others, depending on whether the Church's interests aligned with those of domestic actors.

The Church could also shape domestic institutions through its primary activity, i.e., the *religious channel*. Historically, religion seems to have played an important role in failed political transitions, and hence it contributed to the persistence of bad institutions (Belloc et al., 2016; Chaney, 2013; Rubin, 2017). The specific mechanisms and scope conditions are not clear, however. The main assertion in this literature is that in the absence of ideological competition, religious authorities enjoy a unique type of political power—spiritual, or "legitimizing." As I have shown, the relative power of the Church varied greatly during the Middle Ages, even though its doctrine remained (mostly) unchallenged. Therefore, selection and control of religious leaders ought to be investigated further to improve the understanding of the link between religion and political institutions.

Because the late medieval Church made claims that extended far beyond the Papal States in Italy, this study also illuminates the debate on the origins of modern international relations. Krasner (1993) wrote that while "all European thinkers accepted the concept of Christendom, a unified society that was governed by divine law," the exact content of divine law and who was the supreme leader "were matters of continuous dispute" (p. 255). Philpott (2000) places the Church-state relations at the center of the international order prior to the Protestant Reformation (1517). He goes so far as to argue that, "had the Reformation not occurred, a system of sovereign states would not have arrived, at least not in the same form or in the same era" (p. 206).[4] I focus on a major claim that the Church insisted upon—the right to appoint bishops independently—and offer one of the first, to my knowledge, thorough empirical investigations of conflicts between the Church and secular rulers prior to the Reformation.[5] Echoing Krasner (1993) to some extent, it could be concluded that there was no single point of transition from

[3] https://www.bl.uk/magna-carta/articles/magna-carta-english-translation. Accessed on December 3, 2018.

[4] Philpott's (2000) argument is based on the *idea* of sovereignty. Nexon (2009) offers a different explanation for the role that the Reformation played in the rise of the nation-state—the resulting religious differentiation made it even harder for rulers to claim power, given that their legitimacy depended on complex dynastic relationships.

[5] A recent paper by Bueno de Mesquita and Bueno de Mesquita (2018) also aims at this, by comparing the background ("alignment") of appointed bishops before and after the Concordat of Worms (1122), leveraging the divergent implications of the Concordat for wealthy and poor dioceses. By contrast, I focus on a later period and a different set of dioceses, study the selection *procedure* rather than the *identity* of bishops, and do not investigate the role of the wealth per se.

medieval fragmentation to the modern system of sovereign states. Rather, European rulers conceded sovereignty to the Church and claimed it back when it was politically and economically beneficial to them.

1.3 Historical Background

1.3.1 Late Medieval Warfare: The Unsustainable Costs and Necessity of Cooperation

The costs of recruitment of troops, transportation, and food supply in late medieval Europe were high compared to revenues that sovereigns had at their disposal. Prolonged, large-scale warfare was too expensive for any individual European state. It is estimated that in 1187–1190, the annual revenue of the king of England was between £22,000 and £28,000, which included extraordinary taxation intended for the Third Crusade (Tyerman, 1988, p. 79). For the crusade itself, an annual pay of just 790 soldiers on thirty-three ships came to £2,400 in 1190 (ibid., p. 80).[6] The ever increasing military spending of the thirteenth- and fourteenth-century English monarchs required sensitive political concessions to towns and the Parliament (Angelucci et al., 2018) and borrowing from external agents, namely Italian bankers (Ormrod, 1999).[7]

To give another example, consider Hungary, one of the largest and most militant medieval states. It is estimated that in 1454, the "traditional" sources of King Ladislaus V yielded around 250,000 florins annually, whereas the maintenance of 10,000 soldiers was worth between 200,000–300,000 florins per year, which does not include the maintenance of fortifications (Engel, 2001, p. 310).[8] Through extraordinary taxation of the peasantry, the total annual revenue of the king rose to 650,000 florins a year by 1476. By comparison, the annual revenue of the Ottoman Empire, the most serious threat to

[6]This figure does not include the cost of buying and maintaining ships, paying the wages of crew, and the costs of any later repairs, equipment, and food. Importantly, the high cost of the maintenance of a medieval army, expressed in annual terms, is not peculiar to the crusades *per se*; due to their prominence, however, crusading expenditures happen to be better and more consistently documented.

[7]Even so, "the scale of royal borrowing was often out of all proportion to the real value of the taxes, and the crown's refusal to keep faith with its foreign creditors contributed to the collapse of several of the Italian firms" (Ormrod, 1999, p. 36).

[8]As for the latter, 150,000–200,000 florins "constituted the minimal amount required annually for the upkeep of the southern defence perimeter" (Bak, 2004, p. 126).

Hungary, during the same period was almost three times as large (ibid., p. 311).

Naval warfare was particularly expensive. Unlike land warfare, which was often fought by mercenaries, who could resort to looting if the sovereign defaulted on his obligations, naval operations required upfront payments. Maintaining ten war galleys in the first half of the fourteenth century would cost one approximately 100,000 florins annually (Housley, 2003, pp. 47–48). A combination of naval and land operations, planned for a crusade to Egypt in the 1320s, with 15,000 infantry and 900 cavalry that would land in the Nile delta, was supposed to exceed 2,100,000 florins (ibid.). It is useful to mention in this context that the annual revenue of Holy Roman Emperor Charles IV (1346–1378) is estimated at 164,000 florins (Isenmann, 1999, p. 260). The revenue of Venice, the wealthiest state, by the end of the century was significantly larger than that of the emperor—over 1,000,000 florins (Isenmann, 1999, p. 261)—yet still less than necessary for the defense of her commercial interests in the Eastern Mediterranean.

1.3.2 Catholic Alliances: From the Reconquest of Jerusalem to Warfare at Home

In 1095, Pope Urban II called Western Christians to assist the Byzantine emperor in his struggle against the Seljuq Turks and to recapture Jerusalem. The crusades that followed "were, perhaps, the largest-scale military mobilizations of the medieval period" (Blaydes and Paik, 2016, pp. 551). The first two crusades, while not lacking structure, did not have a single leader and were mostly based on religious enthusiasm (Housley, 2010, pp. 291–292). After the achievements of the First Crusade were reversed by Saladin's capture of Jerusalem in 1187, it became clear that a stronger financial and political commitment to the protection of the Holy Land was necessary for enduring success. The Third Crusade involved careful planning with an important administrative innovation: the Saladin tithe, levied in 1188 by King Henry II in England and by King Philip II in France. In England, this tax was collected from the laity and religious orders by royal officials with much scrutiny and resulted in a significant sum. By contrast, the French king "almost had to apologise [to his magnates] for having proposed the levy in the first place" (Tyerman, 1988, p. 77). In Germany, collection was not even attempted (Housley, 2010, p. 295). Despite serving as a major precedent of direct income taxation in England and the religious importance of the proposed cause, the Saladin tithe was not consequential for the crusading movement

from a military perspective.[9]

Yet the crusades continued. The pontificate of Pope Innocent III (1198–1216) marked two significant changes in the nature of the crusades and their organization. First, the crusades were increasingly framed as warfare at the "domestic" front—against the Moors in Iberia, the Tatars and Lithuanians in Eastern Europe, the Turks in the Mediterranean. In the fourteenth century, all the crusades that materialized were focused on one of these fronts, while the *passagium generale*—the reconquest of the Holy Land—became impractical (Housley, 1986). Second, the burden of financing shifted from the laity to the clergy, with the first crusade tax of Pope Innocent III in 1199. During the pontificate of Pope Honorius III (1216–1227), the financial office of the papacy, the Apostolic Chamber (*Camera Apostolica*), started systematic collection of taxes employing papal agents and Italian bankers throughout Europe. In the late thirteenth and early fourteenth century, papal assessors created valuations of all benefices (districts) of the Church, known as *taxatio*. With some revisions, these valuations remained in place for the rest of the Middle Ages, being the basis for future taxes (Lunt, 1934).[10] In the fourteenth century, the system of papal taxation became even more centralized and sophisticated.[11] The major sources of clerical income at the local level were tithes (the payment of which had to be made before any other form of tax), fees for church services, and generous lay donations (Resl, 2007). Additionally, religious houses accumulated vast amounts of land through bequests (Burton, 2007). As a result, the economic base of the Church, which was already substantial by the pontificate of Pope Innocent III, grew even stronger in the period preceding the Reformation. For example, at the beginning of the fourteenth century, the Church owned 53.4% of landed incomes in England (Campbell, 2005, p. 12). In Norway, by the middle of the same century, "the Church controlled more than 40% of the total value of land" (Emanuelsson, 2005, p. 260).[12]

[9] This is not to say that the crusading efforts of European monarchs had no impact at all. Blaydes and Paik (2016) discuss some of the long-term effects of the crusades as a secular enterprise.

[10] Not all taxes on clergy were levied with the *explicit* purpose of crusade financing, yet there are no reasons to think that popes did not combine revenues from different sources.

[11] Simultaneously, the fourteenth-century popes elaborated theological arguments whereby they claimed the right of appointment to the ever increasing number of dioceses and smaller benefices, known as the right of provision (Weakland, 1968).

[12] Though reduced during the Reformation, the value of the Church's assets remained significant until the Napoleonic Wars, when remnants thereof were transferred to secular rulers. In the Holy Roman Empire alone, between 1803 and 1806 the Church lost territory inhabited by 3.2 million persons, or one-seventh of the Empire's population (Brady, 2009, p. 410).

Papal taxation of the clergy proved much more successful than the Saladin tithe that was imposed on the laity. For example, approximately two-thirds—950,000 livres—of the costs of the Seventh Crusade (1248–1254), led by King Louis IX of France against Egypt, were funded from the proceeds of Church taxation (Housley, 2010, p. 296). The Avignonese popes maintained a separate war chest: "[T]he sum of over a million florins in gold was handed on from John XXII to Benedict XII, and from Benedict XII to his successor, with the intention that this treasure should be preserved in order to finance a future crusade in the Levant" (Partner, 1980, p. 31). Besides this sum, Pope Clement VI contributed between 112,000 and 145,000 florins to the Smyrna Crusade (1343–1349), which resulted in the emergence of the only Christian outpost in Western Anatolia (Housley, 1986).

After the prolonged Great Western Schism (1378–1418), the Council of Constance (1414–1418) eliminated some of the papal taxes and altered collection of others (Stump, 1989). As a frontier Catholic state, Hungary enjoyed special treatment in the fifteenth century. According to one source, between August 1464 and the spring of 1466, King Matthias Corvinus received more than 100,000 ducats directly from the papacy.[13] "There were further payments in 1467–9, directly to the king or indirectly to his captains" (Housley, 2010, p. 304). To fund anti-Turkish warfare, in 1462 the pope imposed a tenth on the archdiocese of Santiago de Compostella in Galicia (Spain). We do not know the exact value of the total income of Santiago de Compostella at the time, but it is known that the crusade tax negotiated by the papal legate was 100,000 florins. Due to further resistance of the clergy of the archdiocese, this sum was reduced to 35,000 florins, which was to be paid in two installments between 1474 and 1475 (Vázquez Bertomeu, 2002, p. 66). Even this reduced sum is striking in proportion to the aforementioned budget of the King of Hungary during the same period, considering that Galicia was relatively remote from the Ottoman Empire (though close to the other "infidels" in Granada and North Africa) and that it was just one of the many church provinces in which the tenth was levied.

Collection of revenues from the clergy continued after the beginning of the Reformation (1517), even showing the signs of a "resurgence" by the end of the century.[14] Likewise, the papacy continued

[13] The content of gold in ducats and florins was similar.

[14] "[I]n the second half of the sixteenth century there was a certain resurgence of the collectories in Spain, Portugal, the Kingdom of Naples and (modestly) in the rest of Italy. By 1592 these sources were reckoned to be counted on for something approaching 100,000 silver scudi annually, and similarly in 1619–23" (Partner, 1980, p. 48).

subsidizing Catholic warfare. Pope Sixtus V (1585–1590) accumulated large sums that were supposed to be used for a "future crusade against the Turks, or in case of […] the imminent occupation by heretics or infidels of a Catholic country" (Partner, 1980, p. 30). During the Great Turkish War, Pope Innocent XI (1676–1689) donated a total of 1,562,500 gold ducats to Holy Roman Emperor Leopold I. This amount is roughly equivalent to 470 mln Ottoman akçes. By comparison, in 1660 the total salary payments of the Ottoman army amounted to 286 mln akçes (Murphey, 2001, p. 17).

1.4 Theoretical Framework

1.4.1 Towards a Theory of Interstate Cooperation

In this section, I propose a theoretical framework that helps explain why the Church was better positioned to facilitate collective warfare against the "infidels" than individual Catholic rulers. Addressing major security challenges, and providing global public goods more generally, requires cooperation among many states. In the absence of international enforcement, a participating state has an incentive to renege on its promises and free ride. Indeed, it was the commitment problem that undermined medieval alliances, e.g., the Hanseatic League of northern German cities (Spruyt, 1996, pp. 163–164). Alliances such as the NATO can be sustained in the long run if a hegemon, such as the US, bears a disproportionate share of the burden. However, no state could play such a role in late medieval Europe.[15]

As discussed in the previous section, Catholic states, especially those located in the periphery, had to cooperate to achieve military success. Why did not Catholic alliances break down, unlike the Hanseatic League?[16] I argue that alliances against the "infidels" proved enduring because rulers of the member states voluntarily constrained discretionary power over domestic and international affairs.[17]

[15]Building on historical and climatic evidence, Stasavage (2016) attributes the small size of medieval European states to the "accidental" nature of the barbaric invasions that destroyed the Roman Empire. The Carolingian Empire was an exception, although it was short-lived.

[16]In a *strict* sense, they did break down, of course, as evident from numerous conflicts between England and France, or Poland and the Teutonic Order. However, in a broader sense, Catholic military alliances existed from the time of the First Crusade (1095) until the anti-Ottoman Holy League of 1717.

[17]Interestingly, conversion of pagans to Catholicism could also be motivated by security concerns. "[T]he possibility cannot be excluded that the conversion [of Cumans] had been requested in the aftermath of the crushing defeat that the Mongols had inflicted upon Cumans and Rus' at Kalka, in the summer of 1223. The campaign led by Jebe and Sübedei north of the Caucasus Mountains and deep into the steppe lands north of the Black Sea provoked much turmoil among the

Honoring Church liberties in the form of exemption from royal taxation and non-interference in appointments of bishops served as a commitment device.

Two related aspects of the functioning of Catholic alliances need to be explained further: Why did it have to be the Church and not some other organization? If the papacy were to lead alliances on behalf of Christendom, why was its legal and fiscal power, however substantial it may have been, confined to the clergy?[18] The key to the answer lies in the interaction between the religious, political, and economic roles of the Church. Unlike individual rulers, the Church also operated in the market for religious services, or salvation (Ekelund et al., 2006). Therefore, the Church had a *private* incentive to lead collective warfare: it internalized the potential loss of followers to the "infidels" and therefore had incentives to act preemptively.[19] So long as war was fought against the "infidels," the cause that was deemed as pious as rational, it was possible to induce positive selective incentives of the laity, in the form of donating to the Church or not expropriating its possessions.[20] Relatedly, if funds for crusading were to be raised by secular rulers instead of the Church, they would not be able to credibly commit not to use the tax proceeds against their Catholic neighbors, giving rise to the "security dilemma" and undermining the very purpose of collective warfare. The case of the aforementioned Saladin tithe (1187) is illustrative in this regard. It is hard to tell what share of the collected tithe King Richard I of England actually spent on the Third Crusade, but he did take his time to conquer the Christian kingdom of Sicily en route to the Holy Land in 1190 (Runciman, 1954).

The failure of the Saladin tithe, as an unpopular tax on the laity, also highlights the domestic political economy conflict. While coercive, the Saladin tithe was practically hard to justify in the sense that

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local nomads. […] That bleak perspective may have led some Cuman groups to seek protection from neighboring powers" (Spinei, 2008, pp. 418–419).

[18] As far as litigation of a civil nature was concerned (e.g., property), canon law only applied to disputes among clerics and to disputes between clerics and laymen. As for taxation of the laity, in 1274, at the Second Council of Lyons, Pope Gregory X made the first and last attempt to impose a mandatory tax on all Christians to support crusading. There is no evidence that it was collected anywhere (Housley, 2010, p. 295). While secular rulers, in turn, did tax the clergy, until the Reformation this could not have happened without a formal authorization of a bishop or the pope.

[19] Along these lines, Ekelund et al. (2006) view the crusades as a form of "entry control."

[20] The necessity of private rewards in large voluntary organizations was perhaps first emphasized by Olson (1965): "An organization that did nothing except lobby to obtain a collective good for some large group would not have a source of rewards or positive selective incentives it could offer potential members. Only an organization that also sold private or noncollective products, or provided social or recreational benefits to individual members, would have a source of these positive inducements" (p. 133).

once the royal bureaucracy developed capacity to extract taxes, it would likely do so for non-crusading activities as well.[21] Scholars of state formation have modeled warfare as an example of a good that the public might have incentives to fund under the "right" (i.e., democratic) type of political institutions (Besley and Persson, 2009). At the same time, precisely because political representation took a long time to develop (Angelucci et al., 2018), increasing state capacity, necessary to collect the Saladin tithe and its would-be analogs, was met with suspicion and resistance of the laity. By contrast, papal taxation of the clergy did not have this flaw, because joining the Church was a voluntary decision and therefore must have been incentive-compatible.[22]

Besides the fiscal dimension, popes performed important functions in the sphere of diplomacy and international law, which were also instrumental to the success of Catholic military alliances. To protect the property of crusading monarchs and their claims to the throne, popes developed a legal framework whereby compromising property rights of crusaders was punishable by excommunication; royal regents, typically the spouses of kings, became a protected category under canon law (Park, 2018).[23] Importantly, the degree to which such protections were enforced depended on the strength, i.e., independence from the sovereign, of local ecclesiastical authorities.

To an extent, a durable alliance can be viewed as a substitute for the fiscal-military state, or even a fiscal-military state operating on a different level. I argue that there are two major differences between a nation-state and a supranational organization, such as the Church. First, relations between popes and sovereigns were transactional rather than coercive. The availability of the "exit" option for the member states means that the alliance is more credible the higher the perceived net benefits of participation; depending on the present geopolitical circumstances and beliefs about the future states of the world, the net benefits could be negative. By contrast, returns to investment in state capacity are typically *non-decreasing*.[24]

Second, delegation of authority to a supranational organization coordinating the alliance (such as the Church) and investment in fiscal capacity have different spillover effects, especially in the long

[21] Acemoglu et al. (2016) offer a theoretical model along these lines.

[22] Many clerical offices could be purchased against a fixed upfront payment or a stream of "dividends."

[23] Similar legal protections existed for crusaders of lower rank and those who facilitated the crusades.

[24] Or at least they are conceptualized as such in the current literature (Besley and Persson, 2009).

run. Supranational organizations are plagued by agency problems, and the Catholic Church was no exception. Corruption of the popes, which among other things diverted resources from warfare, was notorious. Also, the role of state capacity greatly increased with the development of military technology (Gennaioli and Voth, 2015). It seems that monetary transfers from one Catholic state to another, mediated by the papacy, were more effective in the era of mercenaries and less effective in the era of standing armies, which required stable streams of revenue. Therefore, the states that chose to delegate authority to the Church prior to the "Military Revolution," could be locked in an inefficient equilibrium ex post, even if they had acted rationally. Finally, strong state capacity proved essential to the growth in the non-military sector, via better enforcement of contracts and property rights and better provision of public goods.

Hypotheses To summarize, I expect that the Church enjoyed greater power in more vulnerable dioceses. Additionally, I expect that demand for Church-provided collective security (monotonically) decreased as non-Catholic military threats became distant not only spatially but also *temporally*. That is, I expect that the impact of the proximity to the "infidels" was more pronounced over a five-year period relative to a ten-year period, over ten years relative to twenty-five, and so on.

1.4.2 Appointments of Bishops as an Indicator of the Church's Power

To test the empirical implications of my argument, a metric of the Church's power in the late Middle Ages is required. Such a metric should satisfy three conditions. First, it needs to be related to the "primary" functions performed by the Church, namely, provision of religious services. Second, it needs to be an *outcome of bargaining* between the sovereign and clergy, therefore, it should capture an asset that is inherently valuable to both. Three, it needs to be defined, and measured, at the subnational level, to account for the fact that medieval states were fragmented and sovereigns were constrained in their ability to broadcast power.

I argue that the process whereby bishops were selected is a good candidate for such a metric. Bishops were religious, political, and economic actors. In the first capacity, bishops had considerable discretion in such matters as enforcing papal bulls, imposing interdicts, holding diocesan synods, improving discipline of clergy. A bishop dedicated to clerical reform and pastoral work stayed in his

diocese frequently, while a bishop serving the monarch was likely busy with diplomatic and other missions at the royal court.[25] Additionally, archbishops had authority to investigate and confirm episcopal elections in other dioceses, unless they were immediately subject to the Holy See.

As political actors, bishops were highly influential in state administration. Indeed, the choice of a particular bishop could be consequential for internal political stability. Many bishops came from a noble (and sometimes royal) background, therefore, they were well-positioned to organize a conspiracy or uprising against the sovereign.[26] The choice of archbishops was a particularly sensitive issue for sovereigns, because archbishops had the exclusive right, granted by the pope, of crowning future kings. In an electoral monarchy such as Poland, kings feared that the throne could be contested in the future, so appointing a loyal person to the archdiocese of Gniezno could improve the odds of favorable succession. A related concern for those involved in politics of the Holy Roman Empire was that the archbishops of Cologne, Mainz, and Trier were among the seven imperial electors, and their vote could be decisive in determining the succession of the imperial throne.

Finally, in their capacity as feudal lords, bishops ran large and wealthy estates, purchased cities,[27] made investment in various business ventures, such as salt mines, issued their own currency,[28] and maintained their own armies.[29] As economic agents of the Church, their responsibility was to preserve the Church's wealth and protect it against encroachments of other lords. Additionally, bishops could impose and collect new local taxes on consumption goods, such as wine and beer, which often provoked

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[25] Absenteeism of bishops was one of chief Martin Luther's criticisms, which was addressed during the Council of Trent (1545–1563).

[26] The origin of bishops seemed to matter. If a chapter was allowed to freely elect bishop, the pool of potential candidates was not limited to that diocese or even that state. In such a case, the elected bishop could act in the interests of the pope or another state. For example, in 1438 the chapter of Uppsala, which was antagonistic towards King Eric of Pomerania, elected Nils Ragvaldsson as archbishop, who supported the plan of the Danish elite to replace Eric with Christopher of Bavaria. The plan was successful (SRA, SBL26). On the other hand, papal appointments were made strategically as well. In 1301, Boniface VIII translated Hugues de Chalon from Liège to Besançon to protect Burgundy against the pretensions of the French king Philip the Fair (BHRR1, FEG4). Note: I use abbreviations to refer to primary sources. See the full list in Appendix.

[27] In 1350, archbishop of Milan, Giovanni III Visconti, purchased the city of Bologna for 180,000 florins, which the pope later punished by excommunication (VAB).

[28] For instance, archbishops of Reims had their own currency as late as the 1350s (FEG3).

[29] For example, in 1373, the private troops of Albert von Sternberg, the bishop of Litomysl, joined the army of the Bohemian king during the invasion of Brandenburg (BHRR1).

popular uprisings.[30] From the perspective of sovereigns, dioceses, in addition to their tax value, were viewed as an important patronage good that could be used to reward loyalists.[31]

1.5 Data

1.5.1 Dependent Variable: Appointments of Bishops

I use the beginning of the pontificate of Pope Innocent III (1198) as the starting point in my analysis for two reasons. Many dioceses in Northern, Central, and Eastern Europe were created during the eleventh and twelfth centuries, and organization of the cathedral chapter and demarcation of the diocesan boundaries took several decades. Also, the sources on France and the Holy Roman Empire I use begin with the pontificate of Pope Innocent III. For consistency of analysis, and because the creation of new dioceses could have been endogenous to the phenomena I study, I only include the dioceses that existed by 1198. The beginning of the Protestant Reformation (1517) marks the end of my analysis because many dioceses left the jurisdiction of the pope or were secularized.

I have created an original dataset on appointments of bishops using the most up-to-date, to my knowledge, and authoritative printed sources available. For a bishop's biography to be as complete as possible, the researcher has to draw from accounts of contemporaries or chroniclers (if they exist), the local (diocesan) archives, and the archives in the Vatican. The Archivio Segreto Vaticano became open to the general public in 1881, and it has taken scholars decades of research to extract relevant information (Boyle, 2001), a mission that is far from being complete. Therefore, with some exceptions, I have discarded the sources published prior to the twentieth century, such as the *Gallia Christiana* and the first edition of the *Fasti Ecclesiae Anglicanae*. On the other hand, relying on the "official" papal registers alone can lead to false conclusions. For instance, starting from the late thirteenth century, what was *de jure* regarded as a papal appointment (provision) was, in a number of cases, confirmation of a previously held capitular election or approval of a princely request. I provide the complete list of

[30] To give one example, Burchard von Schraplau, who was appointed by the pope to the archdiocese of Magdeburg in 1308, was not popular in the local community due to the new taxes on beer and salt. In 1328, he was arrested by citizens and later murdered (BHRR1).

[31] Needless to say that clergy, and popes in particular, used wealthy bishoprics for patronage purposes as well.

sources in Appendix.

For a bishop to be included in my dataset, the following pieces of information were required:

- the dates of the appointment, confirmation, and termination;
- the circumstances of the appointment and whether the diocese was contested;
- whether the bishop was actually able to take possession of the diocese;
- whether there were interruptions of the episcopate due to secular or papal interference.

In the dataset, I distinguish between bishops chosen by the cathedral chapter, pope, and what I refer to as the "prince." Those bishops whose appointment is only described in generic terms, without a reference to a specific authority or legal procedure (e.g., election, nomination, papal provision), are coded as missing values. The prince is a heterogeneous category, meaning a secular sovereign who had de facto political power in the diocese. Depending on the local context, it could be the king, duke, or city council. For a given diocese, the identity of the prince could change over time. For instance, at various points appointments of bishops of Poitiers were influenced by dukes of Berry and later by French kings. To give another example, dukes of Austria and Bavaria, as well as Holy Roman Emperors, clashed over appointments of bishops of Passau during almost the entire period of study. Because I am primarily interested in the political conflict between the Church and secular rulers *as a whole*, I do not distinguish between the identities of the latter in my analysis. By default, vacancies are coded as princely appointments,[32] unless the identity of the temporary administrator is known (who is then coded as a bishop). Historically, many administrators during *sede vacante* were appointed by secular authorities. Sometimes bishops from the nearby jurisdictions acted as administrators, but they were rarely, if at all, present in vacant dioceses. Also, such bishops could in turn be appointees of princes.[33]

[32]The results in the empirical section are robust to this assumption.

[33]For instance, the archdiocese of Bremen was vacant from 1463–1496, with Heinrich von Schwarzburg serving as an administrator. After he was installed the bishop of Münster by the duke of Cleves in 1466, he constantly resided in his main see. I conduct a robustness check by dropping vacant years below. The notable exception is the Bohemian archdiocese of Prague, the Catholic administration in which was disrupted in 1421 over the course of the Hussite Wars. After the end of the rebellion, the archdiocese was governed by administrators chosen by the chapters, some of which were confirmed by the pope. Because Prague did not have an archbishop until 1561, it is dropped from the sample after 1421.

I describe the construction of the dataset in detail in Appendix. To illustrate how bishops were coded, consider the career of Marquard von Randeck (Randegg), who was born around 1300.[34] Before becoming a bishop, Marquard served at the court of Emperor Louis IV of Bavaria. On June 27, 1343, he was elected bishop of Bamberg by part of the chapter against an unknown opponent. The pope did not want to grant the bishopric to a partisan of the emperor, quashed the election, and appointed Friedrich von Hohenlohe instead. Five years later, on May 5, 1348, the pope awarded Marquard the diocese of Augsburg at the request of the new emperor, Charles IV of Luxembourg. While a bishop, Marquard served at Charles IV's court. On August 23, 1365, the pope translated (transferred) Marquard from Augsburg to the Patriarchate of Aquileia. Although Marquard remained loyal to Charles IV, there is no indication in the sources that this translation was requested by the emperor. Marquard effectively took possession of Aquileia in December 1365. Therefore, I code Marquard as a princely appointee during his Augsburg episcopate (from 6/27/1343–8/23/1365) and as a papal appointee during the patriarchate, interrupted by his death (1365/8/23–1381/1/3).[35] Because he did not exercise control over the diocese of Bamberg, Marquard is omitted from the list of its bishops.

The resulting dataset includes 63 dioceses, covering the present-day Austria, Belgium, Cyprus, Czech Republic, France, Germany, Hungary, Italy, Latvia, Netherlands, Poland, Spain, Sweden, Switzerland, UK. While the sample is not representative of Latin Christendom, my goal was 1) to ensure that the most important dioceses (archdioceses) from each state are included (e.g., Reims in France, Cologne in Germany, Gniezno in Poland), and 2) to have sufficient geographic variation in a cross section, subject to the data availability. The panel is unbalanced due to the data availability or ambiguity in the sources. Certain already coded dioceses were excluded from the sample because the total length of unambiguous appointments of bishops, including confirmed vacancies, was less than half of the panel length (320 years). For most dioceses that are included in the sample, I have uninterrupted observations between 1198–1517 (see Appendix). Figure 1.1 shows the sample dioceses at four different points in time.

[34] Source: BHRR1.

[35] Aquileia itself is not in the sample because of the lack of information on other patriarchs.

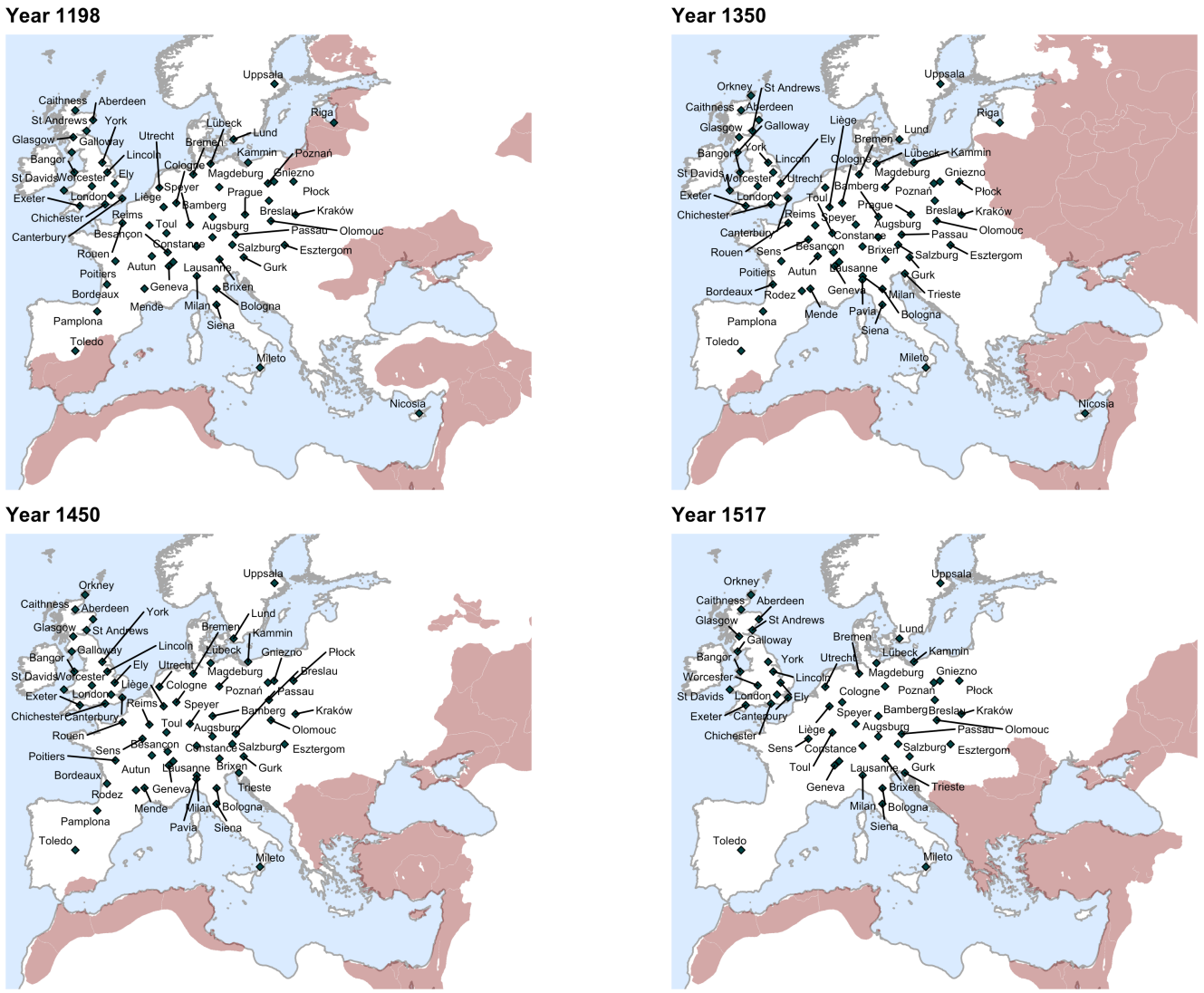

Figure 1.1: Four snapshots of the sample dioceses and "infidels" (shaded). Missing dioceses indicate that the information on them is not available or ambiguous in certain years. Source of the physical layer: ESRI.com shapefile. Source of the historical boundaries: computed by the author using the *Centennia Historical Atlas* (Clockwork Mapping, 2018). See Appendix for the data description.

There are a total of 1,370 unique bishops in the dataset, who held 1,483 terms. Some bishops occupied several dioceses; others left their first diocese and eventually returned. If secular administration of a given diocese ("temporalities") was taken over by the prince, or if the bishop was excommunicated/suspended by the pope and could no longer effectively exercise his rights, the appointment is considered terminated. If the temporalities were restored, or if the bishop was absolved, I code continuation as a new term. The time interval between the suspension and restoration is coded as vacancy. Tables 1.2 and 1.3 show the distribution of bishops by the initiation and termination event, respectively. The average term length is roughly between 10 and 12.5 years, with moderate variation by the appointing authority and time period (Table 1.4).

Table 1.1: Bishops data coverage by the modern state (1198–1517)

Modern state	N, unique bishops	N, dioceses	Total length, years
Austria	48	2	588
Belgium	21	1	316
Cyprus	14	1	161
Czech Republic	39	2	496
France	223	10	2,758
Germany	205	9	2,704
Hungary	29	1	281
Italy	149	7	1,768
Latvia	15	1	246
Netherlands	20	1	297
Poland	134	6	1,831
Spain	51	2	585
Sweden	49	2	592
Switzerland	54	2	557
UK	341	16	4,774
All	1,370	63	17,954

Note:
Periods of vacancy are not included in the total length.

1.5.2 Independent Variable: External Military Threats

To measure the degree of external military threats faced by medieval Catholic states, I utilize raster maps from the *Centennia Historical Atlas* (Clockwork Mapping, 2018). These maps have been re-

Table 1.2: Bishops' terms by the initiation event and century (1198–1517)

Initiation event / Century	13th	14th	15th	16th	N, total
Elected	333	176	145	20	674
Appointed by pope	66	186	137	22	411
Translated	35	121	113	16	285
Appointed by prince	16	8	22	2	48
Postulated	6	4	6	1	17
Appointed by (arch-)bishop	10	3	2	–	15
Succeeded	–	1	5	6	12
Custody granted by prince	–	1	9	1	11
Changed allegiance	3	3	–	–	6
Absolved by pope	2	1	1	–	4
All	471	504	440	68	1,483

Note:
Prince refers to the secular sovereign, the identity of which is context-specific (the king, duke, city council, etc.). "Appointed" is not equivalent to "nominated." For more detail, see Appendix. Century refers to the century of the initiation event. The years 1198 and 1199 are included in the thirteenth century.

cently used by Abramson and Carter (2016) and Abramson (2017).[36] They indicate yearly territorial changes and cover the entire period of 1198–1517. Conveniently, the *Centennia Historical Atlas* depicts actual territorial possessions and not territories claimed. I use the boundaries as of the beginning of each year.

To identify the relevant population of the "infidels" in a given year, I record all non-Christian states that were partly or fully located in Europe or in the regions adjacent to Europe at any point. If in some year such a state was conquered or converted to Christianity (e.g., the Cumans from 1227 or Lithuania from 1387), it is no longer considered an external threat for my purposes. Certain states, such as the Timurid Empire, did not have recorded military encounters with Catholic states, but I still include them in the sample for consistency, because other states that historically occupied Asia Minor *did* have conflicts with the Catholics and were the target of the crusades. See Appendix for the full list of the "infidels" used in the analysis.

I adopt a similar vectorization procedure to the one used in Abramson and Carter (2016) and Abram-

[36] I am grateful to Scott F. Abramson for sharing his GIS version of these maps.

Table 1.3: Bishops' terms by the termination event and century (1198–1517)

Termination event / Century	13th	14th	15th	16th	N, total
Died	337	357	306	93	1,093
Translated	13	78	64	14	169
Resigned	26	25	35	12	98
Removed by pope	13	6	10	1	30
Elevated to cardinal	4	16	3	–	23
Suspended by prince	7	6	8	2	23
Removed by prince	4	3	4	–	11
Administration expired	4	4	1	–	9
Suspended by pope	5	3	1	–	9
Changed allegiance	3	3	–	–	6
Excommunicated	3	2	–	1	6
Elevated to pope	–	1	2	1	4
Diocese lost	–	–	1	1	2
All	419	504	435	125	1,483

Note:
Prince refers to the secular sovereign, the identity of which is context-specific (the king, duke, city council, etc.). Century refers to the century of the termination event. The years 1198 and 1199 are included in the thirteenth century.

Table 1.4: Bishops' term length by the appointing authority and century (1198–1517)

Bishop chosen by / Century	13th	14th	15th	16th	Total average, years
Chapter	12.5	12.8	14.7	17.6	13.3
Pope	11.2	9.3	12.1	13.0	10.9
Prince	12.4	12.8	11.5	16.6	12.7

Note:
Prince refers to the secular sovereign, the identity of which is context-specific (the king, duke, city council, estates, etc.). Century refers to the century of appointment. The years 1198 and 1199 are included in the thirteenth century.

son (2017), except I also include the states in the Middle East and North Africa and use annual, instead of five-year, intervals. I use 141 cities in Europe and beyond for georeferencing, meaning that the coordinates of those cities on the resulting vector maps and in the real world exactly coincide, and the areas around them are interpolated using a cubic spline method. The list of the cities used for georeferencing is provided in Appendix.

1.6 Empirical Strategy and Results

To analyze the effect of external military threats on the probability of a diocese being governed by a papal appointee, I consider the following regression model:

$$PrincelyAppointee_{it} = \sum_{k=1}^{5} \beta_k Infidels_{i,t-1}^{k} + \delta_i + \lambda_t + \psi_i t + \epsilon_{it}, \tag{1.1}$$

where i denotes the diocese and t denotes the year. The dependent variable, $PrincelyAppointee_{ij}$, captures the institutional state: it is equal to 1 if diocese i in year t was governed by a bishop or archbishop chosen by the sovereign and 0 otherwise (i.e., if the prelate was chosen by the pope or chapter). $Infidels_{i,t-1}^{k}, k = 1, \ldots, 5$ is a set of indicator variables defined as:

$$Infidels_{t-1}^{k} = I\{l^{k-1} \leq DistancetoInfidels_{i,t-1} < l^{k}\}, k = 2, \ldots, 5, \tag{1.2}$$

with $l^1 = 0, l^2 = 200, \ldots, l^5 = 1000$ km.

$DistancetoInfidels_{i,t-1}$ is the shortest distance from diocese i to the closest non-Christian state ("infidel") at time $t-1$. More precisely, it is the great-circle distance between the episcopal see (location of the cathedral) of diocese i and the polygons representing potential threats. Note that by construction, the events defined by the indicator variables (1.2) are mutually exclusive. Therefore, the distance of more than 1000 km between diocese i and the closest "infidel" serves as the reference group in my analysis.[37] The specification (1.2) is flexible in that it allows for a possibly heterogeneous impact of external threats at different cutoff points. In other words, the "treatment" intensity could be different when moving from 0 to 201 km and from 800 to 1001 km. The width of the intervals (200 km) was chosen so as to have a sufficient number of dioceses between the cutoff points (see Table 1.5).

The coefficients β_k capture the effect of the proximity (remoteness) of non-Christian security threats on the likelihood of the (arch-)bishop being chosen by the secular sovereign. The diocese fixed effect, δ_i, captures unobservable time-invariant characteristics of a particular region, such as the

[37] By construction, England and Scotland are included in the reference group during the entire period of study. My calculations suggest that the shortest distance between London and the "infidels" in 1198, at the beginning of the panel, is approximately 1,158 km.

Table 1.5: Distribution of the sample dioceses by the distance to the "infidels" (1198–1517)

Distance, km	Unique dioceses
0–200	7
200–400	15
400–600	26
600–800	32
800–1000	36
1000+	37

Note:
For every diocese, distance is defined as the great-circle distance between the episcopal see (location of the cathedral) and the nearest "infidel."
The number of dioceses in the second column does not sum to the total number of dioceses in the sample (63), because the distance to the "infidels" from any given diocese could change over time.

pre-existing economic and political institutions and previous (pre-1198) religious and cultural trends, which are likely correlated with appointments of bishops and the distance from the European periphery. The term λ_t is the year fixed effect, which absorbs the events common to all dioceses in year t, including the identity of the pope, whether the Curia was located at Rome or Avignon, and various conflicts and reformist tendencies within the Church (e.g., the Conciliar movement in the fifteenth century). The terms $\psi_i t$ are diocese-specific trends. These trends account for possible slow-moving social and cultural variables that are heterogeneous across dioceses and correlate both with appointments of bishops and the proximity to non-Catholic military threats. For instance, in the fifteenth century, the ideas of Gallicanism spread over most of France, which resulted in the increased independence of the French clergy from the pope and the reduction in the taxes paid to the Curia (Thomson, 1980). It is likely that this shock to the self-perceived national identity of French bishops also improved the bargaining position of the king. By its nature, however, the shock and the renegotiated tax levels were confined to the territory of France (its northern and central part in particular). Therefore, the omission of the diocese-specific trends would likely lead to a bias in the coefficients of interest. Finally, ϵ_{it} is the error

term.

It is important to note that, implicitly, the variable on the left-hand side of Equation (1.1) is viewed as an outcome of bargaining between the secular ruler and the Church, represented by the cathedral chapter or Curia, at any given point in time. The fact that in a relatively large number of cases—26% (see Table 1.3)—bishops' term did not end due to a natural cause supports this assumption. Likewise, I assume that the length of the interval between the appointment and confirmation of a new bishop, which is regarded as vacancy, is also an equilibrium outcome.[38] By design, Equation (1.1) does not distinguish between papal appointments and elections by cathedral chapters, so long as those occurred independently from the will of the sovereign. I do not assert that the interests of the pope and the local clergy were perfectly aligned.[39] Rather, I assume that they were "aligned enough" in the face of a possible conflict with sovereigns.

At the core of my identification strategy is the parallel trends assumption, that is, I expect the changes in the selection of bishops in different dioceses to be attributable to the changes in the degree of external threat and not to other events associated with the proximity to the "infidels." The inclusion of the diocese-specific trends makes this approach more flexible. While the coefficients yielded by estimation of Equation (1.1) should be regarded as suggestive rather than causal due to the non-experimental nature of the data, I believe that my empirical strategy can highlight novel patterns about the relationship between the Church's power and non-Catholic military threats.

Considering the large number of fixed effects included, I estimate Equation (1.1) and its modifications using a linear probability model (LPM).[40] Because episcopal sees are not distributed independently across space, the inclusion of the distance variables on the right-hand side of the equation can potentially induce spatial correlation in a cross section. I account for spatial correlation by adopting Conley's (1999) method to compute the standard errors. This method models error spatial dependence

[38] For instance, the pope could investigate a given election or appointment with scrutiny or confirm it quickly instead. In turn, chapters, princes, and elected bishops themselves could request the pope to speed up the confirmation process.

[39] There were genuine, prolonged conflicts within the Church. The most serious crises, the Great Western Schism (1378–1417) and the Conciliar movement following the Council of Constance (1414–1418), gave rise to several anti-popes, who were viewed as legitimate by part of the clergy.

[40] Limited dependent variable models, such as logit and probit, suffer from the incidental parameter problem in the panel data context (Wooldridge, 2010, p. 611). In addition, using a logit or probit model would lead to the loss of information on dioceses that never had princely appointed bishops during the period of interest, such as Aberdeen and Cologne.

assuming that it linearly decreases with distance from every given diocese and disappears completely at a certain threshold. I choose 200 km as the threshold.[41]

In the main part of my analysis, I exclude the period of the Great Western Schism (1378–1417), because at the time, there were two—and after the Council of Pisa (1409) three—rival popes. It is likely that the bargaining process between princes and popes during this period was different. A second rationale for excluding this period from the sample is that certain dioceses, such as Constance, were simultaneously claimed (and effectively governed) by two rival bishops, appointed by the Avignonese and Roman popes, with or without support of secular powers. Excluding such cases decreases the likelihood of a measurement error.[42]

Due to the persistent nature of the state boundaries and institutions, and the "inertia" in the turnover of bishops (as many of them remained in office until they passed away), I estimate Equation (1.1) using data at different intervals: five, ten, twenty-five, and 50 years.[43] With the panel length close to or greater than the average length of episcopal appointments, within-bishop correlation in the error terms in Equation (1.1) becomes less of a concern. Additionally, this strategy allows me to distinguish between the short-, medium-, and long-term impact of external military threats on appointments of bishops.

The results of estimation of Equation (1.1) are presented in Table 1.6. Columns (1)–(4) and (5)–(8) provide the results without and with the diocese-specific trends, respectively. Note that given the slow-moving nature of political institutions, and the fact that in certain periods the state borders were essentially constant, the inclusion of the trends in the regression could be demanding.

The estimate in *"Infidels," 0—200 km* in column (1) indicates that the effect of being located within 200 km from the nearest "infidel" is -34.6 p.p., relative to the baseline. In other words, having a common border with the "infidels," or being almost adjacent, is associated with a differential 34.6 p.p. *increase* in the likelihood of the bishop being selected independently from the sovereign (by the pope

[41] The results below are robust to the choice of alternative threshold values.

[42] I still include the period of 1378–1417 as a robustness check below.

[43] As in other studies that use a similar empirical strategy (e.g., Acemoglu et al., 2008), I do not average over these intervals and use actual observations instead.

or chapter).[44] Given that the baseline probability is 31.1 percent, this is a substantively large effect. Note that, because Table 1.6 includes the diocese fixed effects, and because I only analyze the dioceses created before 1198, this effect cannot be explained by the location of certain dioceses in the European periphery *per se*.

Consistently with the hypotheses above, as external military threats become more distant geographically, the Church's political power decreases, almost monotonically. This is reflected in the magnitude of the respective coefficients in *"Infidels"*, 200 to 1000 km. For example, the differential impact of being located between 800 and 1000 km away from the closest "infidel"—compared to the dioceses located more than 1000 km away—is only -10.4 p.p., approximately a third of the baseline.

In columns (2)–(4), I estimate the same equation using data at larger intervals. With the exception of the coefficients in *"Infidels," 0—200 km*, the magnitude of the effect gradually diminishes as external military threats are measured at a more distant point in time, and vanishes almost completely at the interval of 50 years. It should be emphasized, however, that the statistical power also decreases as the sample size shrinks, especially considering the number of the fixed effects included. Therefore, the available data might not be adequate for detecting the impact of the presence of external military threats on the Church-state relations at very large intervals.

The inclusion of the diocese-specific trends does not affect the results qualitatively for the 5-year panel and distance up to 600 km, as indicated in column (5). Accounting for the unobserved slow-moving changes in dioceses, the estimated impact of the distance from the "infidels" on the likelihood of bishops being chosen independently from the sovereign varies between -18.4 and -15.1 p.p. As columns (6)–(8) show, the estimates render imprecise and become statistically indistinguishable from zero at larger intervals.[45]

I conduct two sets of robustness checks. First, in Table 1.7 I show that the results of the baseline specification are not sensitive to the assumption of vacancies being treated as princely appointments. Excluding all periods of episcopal vacancy (unless the identity of the temporary administrator and how he was chosen is known), I find that, if anything, the effect of the distance from the "infidels" on

[44] Recall that the reference group is the dioceses located more than 1000 km away from the closest "infidel."

[45] Column (8) is included for consistency. Given the number of the fixed effects and diocese-specific trends in the model, the number of observations in the 50-year panel is not adequate for identification of the main variables of interest.

appointments of bishops is even stronger at all intervals and distances (between -35.6 and -12.5 p.p. in the five-year panel). At the same time, the baseline probability drops to 26.9 percent. Finally, I re-estimate Equation (1.1) by including the period of the Great Western Schism (1378–1418) in the sample (see Table 1.8). Reassuringly, the results are qualitatively similar to the main specification.

Table 1.6: Main results

	Dependent variable: Pr(Princely appointee=1)							
	5-year	10-year	25-year	50-year	5-year	10-year	25-year	50-year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
"Infidels," 0–200 km	−0.346***	−0.372***	−0.406***	−0.341*	−0.184*	−0.229*	−0.200	−0.128
	(0.074)	(0.102)	(0.149)	(0.189)	(0.101)	(0.135)	(0.216)	(0.292)
"Infidels," 200–400 km	−0.202***	−0.195***	−0.176	−0.206	−0.180**	−0.161	0.023	−0.003
	(0.053)	(0.073)	(0.120)	(0.149)	(0.080)	(0.109)	(0.169)	(0.210)
"Infidels," 400–600 km	−0.176***	−0.206***	−0.142	−0.016	−0.151**	−0.162*	0.003	0.064
	(0.044)	(0.062)	(0.104)	(0.149)	(0.064)	(0.083)	(0.135)	(0.186)
"Infidels," 600–800 km	−0.161***	−0.145***	−0.113	−0.093	−0.064	−0.036	0.057	0.099
	(0.039)	(0.055)	(0.083)	(0.124)	(0.047)	(0.063)	(0.101)	(0.153)
"Infidels," 800–1000 km	−0.104***	−0.115**	−0.157**	−0.051	−0.039	−0.026	−0.040	0.088
	(0.034)	(0.049)	(0.074)	(0.103)	(0.039)	(0.055)	(0.088)	(0.110)
Diocese FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Diocese-specific trends					✓	✓	✓	✓
Mean Dep. Var.	0.311	0.306	0.309	0.3	0.311	0.306	0.309	0.3
Number of dioceses	63	63	63	63	63	63	63	63
N	3,328	1,668	658	300	3,328	1,668	658	300
Adjusted R^2	0.131	0.118	0.103	0.135	0.233	0.225	0.175	0.209

Notes:

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Columns (1)–(8) display the results of estimation of Equation (1.1) using data at different intervals.

The sample is an unbalanced panel for 1198–1517.

The period of the Great Western Schism (1378–1417) is excluded from the sample.

Conley (1999) standard errors are in parentheses. The cutoff is 200 km.

Table 1.7: Main results: Robustness to the exclusion of vacant dioceses

	Dependent variable: Pr(Princely appointee=1)							
	5-year	10-year	25-year	50-year	5-year	10-year	25-year	50-year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
"Infidels," 0–200 km	−0.356***	−0.362***	−0.377**	−0.352*	−0.194*	−0.203	−0.035	−0.092
	(0.074)	(0.103)	(0.146)	(0.189)	(0.101)	(0.136)	(0.210)	(0.290)
"Infidels," 200–400 km	−0.227***	−0.204***	−0.140	−0.215	−0.179**	−0.134	0.190	0.035
	(0.050)	(0.070)	(0.114)	(0.146)	(0.077)	(0.107)	(0.160)	(0.198)
"Infidels," 400–600 km	−0.187***	−0.216***	−0.153	−0.088	−0.127**	−0.137*	0.119	0.008
	(0.042)	(0.059)	(0.097)	(0.135)	(0.060)	(0.079)	(0.122)	(0.166)
"Infidels," 600–800 km	−0.190***	−0.177***	−0.066	−0.103	−0.075*	−0.048	0.195**	0.083
	(0.036)	(0.050)	(0.077)	(0.114)	(0.043)	(0.059)	(0.091)	(0.135)
"Infidels," 800–1000 km	−0.125***	−0.132***	−0.097	−0.058	−0.060*	−0.044	0.066	0.034
	(0.032)	(0.047)	(0.072)	(0.099)	(0.036)	(0.052)	(0.082)	(0.101)
Diocese FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Diocese-specific trends					✓	✓	✓	✓
Mean Dep. Var.	0.269	0.269	0.267	0.273	0.269	0.269	0.267	0.273
Number of dioceses	63	63	63	63	63	63	63	63
N	3,137	1,582	621	289	3,137	1,582	621	289
Adjusted R^2	0.169	0.151	0.129	0.162	0.279	0.261	0.208	0.246

Notes:

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Columns (1)–(8) display the results of estimation of Equation (1.1) using data at different intervals.

The sample is an unbalanced panel for 1198–1517.

The period of the Great Western Schism (1378–1417) is excluded from the sample.

Conley (1999) standard errors are in parentheses. The cutoff is 200 km.

Table 1.8: Main results: Robustness to the inclusion of the Great Western Schism (1378–1417)

	Dependent variable: Pr(Princely appointee=1)							
	5-year	10-year	25-year	50-year	5-year	10-year	25-year	50-year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
"Infidels," 0–200 km	−0.300***	−0.343***	−0.408***	−0.321*	−0.168*	−0.217*	−0.193	−0.030
	(0.069)	(0.097)	(0.149)	(0.193)	(0.094)	(0.128)	(0.205)	(0.292)
"Infidels," 200–400 km	−0.188***	−0.175**	−0.176	−0.187	−0.150*	−0.123	0.025	0.074
	(0.051)	(0.071)	(0.118)	(0.149)	(0.077)	(0.106)	(0.153)	(0.201)
"Infidels," 400–600 km	−0.160***	−0.187***	−0.127	0.019	−0.124**	−0.128	0.017	0.140
	(0.041)	(0.059)	(0.099)	(0.145)	(0.059)	(0.078)	(0.120)	(0.173)
"Infidels," 600–800 km	−0.131***	−0.112**	−0.102	−0.074	−0.042	−0.009	0.037	0.053
	(0.036)	(0.051)	(0.079)	(0.119)	(0.043)	(0.059)	(0.093)	(0.140)
"Infidels," 800–1000 km	−0.104***	−0.117**	−0.158**	−0.046	−0.040	−0.033	−0.057	0.054
	(0.032)	(0.046)	(0.071)	(0.095)	(0.036)	(0.052)	(0.084)	(0.102)
Diocese FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Diocese-specific trends					✓	✓	✓	✓
Mean Dep. Var.	0.31	0.304	0.305	0.294	0.31	0.304	0.305	0.294
Number of dioceses	63	63	63	63	63	63	63	63
N	3,752	1,850	718	360	3,752	1,850	718	360
Adjusted R^2	0.128	0.118	0.103	0.096	0.222	0.218	0.170	0.144

Notes:

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Columns (1)–(8) display the results of estimation of Equation (1.1) using data at different intervals.

The sample is an unbalanced panel for 1198–1517.

Conley (1999) standard errors are in parentheses. The cutoff is 200 km.

1.7 Case Study: Episcopal Appointments in Poland Before and After the Christianization of Lithuania (1387)

In this section, I conduct a case study to further illuminate the mechanism relating appointments of bishops to protection from external military threats. In large swaths of Central and Eastern Europe, which were Christianized by 1000, monarchs enjoyed the exclusive right of nomination of bishops until the thirteenth century and bargained with the pope to regain this right in the fifteenth century.[46] Here I focus on the case of Poland, for which I have nearly complete data coverage. According to my data, the first bishops that were appointed independently from Polish monarchs governed from 1212 in Poznań, from 1220 in Gniezno, from 1225 in Płock, and only from 1267 in Kraków,[47] the capital of the senior member of the ruling Piast dynasty.

I link the rise of the political power of the Church in thirteenth-century Poland to the rise of external military threats at its eastern border. In 1241, Poland suffered from a major Tatar invasion in 1241; subsequent Tatar invasions occurred in 1259, 1332, 1338, 1341.[48] In addition, between 1248 and 1342 the Grand Duchy of Lithuania grew from a union of Baltic pagans to a powerful state, absorbing large territories of the former Kievan Rus' (see Figure 1.2). Błaszczyk (1998) records a total of 52 Lithuanian raids against Poland between 1220 and 1376 (Figure 1.3). Internal political instability in Poland made the matters even worse. Following the death of King Bolesław III Wrymouth (1138), Poland was divided into five principalities. Dynastic rivalries among the members of the Piast dynasty led to the decrease of the historical territory and to the weakness of the kingdom, making it vulnerable against external threats (Frost, 2015).[49]

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[46] To give an example from Bohemia, King Ottokar I agreed to recognize future elections of bishops of Olomouc in 1207. The first independent appointment was made in 1241 (BHRR1).

[47] I do not have information on one remaining Polish diocese, Włocławek (Kujawy). The dioceses of Breslau (Wrocław) and Kammin (Kamień Pomorski), for which I do have data, were under the jurisdiction of the Holy Roman Empire during the period of study.

[48] Sources: PBK for 1241 and 1259, Knoll (1974) for 1332–1341.

[49] Note that political fragmentation was typical of other contemporary European states, such as the Holy Roman Empire and France.

Figure 1.2: Expansion of the Grand Duchy of Lithuania in the thirteenth and fourteenth centuries. Source of the image: adapted from Rowell (1995, p. XXV). The solid black line depicts the border of the Duchy by the end of Gediminas' reign (1315/1316–1341/1342). The shaded areas outside this line represent Lithuania's allies and dependent territories.

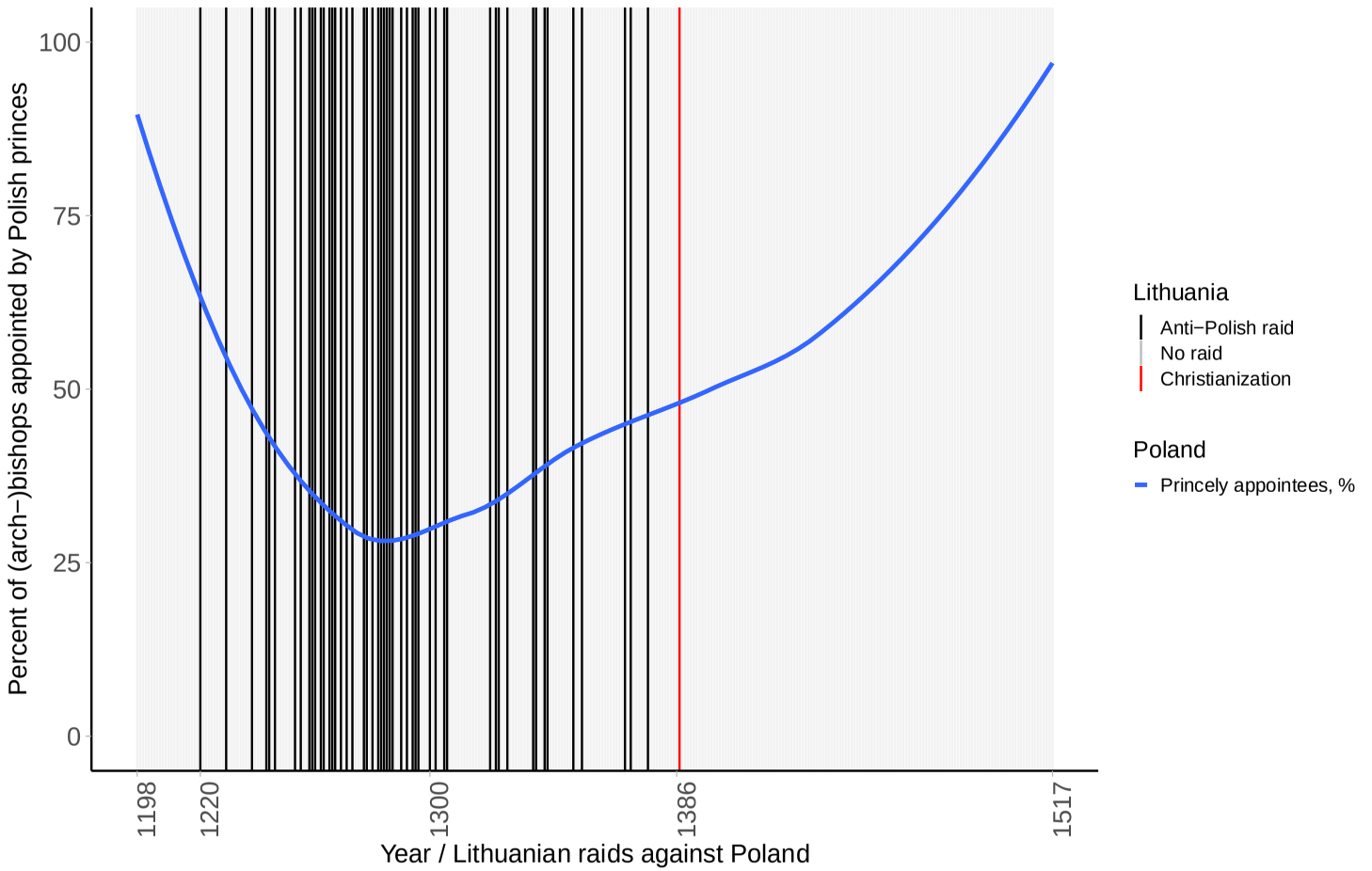

Figure 1.3: Frequency of Lithuanian raids against Poland and appointments of Polish (arch-)bishops, 1198–1517. The blue line represents the (smoothed) percentage of archbishops of Gniezno and bishops of Poznań, Płock, and Kraków, whose appointment was influenced by the King of Poland, Duke of Greater Poland, Prince of Masovia, and/or other Polish rulers. The missing values (nineteen diocese-years) are ignored. Two "historical" dioceses of the Kingdom of Poland, Breslau (Wrocław) and Kammin (Kamień Pomorski), are not included because they were under the jurisdiction of the Holy Roman Empire during this period. The information on bishops of Włocławek (Kujawy), the remaining diocese, is not available. The black vertical lines represent all recorded Lithuanian raids against Poland proper (i.e., excluding attacks against the Teutonic Order) between 1220 and 1376; one raid that took place before 1210, for which the exact location and date are unknown, is not shown. The red vertical line indicates the year of the Christianization of Lithuania (1387), after which the two kingdoms entered a personal union. Source of the bishops data: author's dataset (see Section 1.5). Source of the Lithuanian raids data: Błaszczyk (1998, p. 77).

Under such circumstances, Polish rulers had to seek help externally. Because the Tatars and Lithuanians were not Christians, warfare against them could be presented as a pious cause. For example, in 1363 King Casimir III wrote to the pope, re-iterating the previous requests and saying that the battle "for the Kingdom of Poland, which is located near the perverse nations of unbelievers, is a defense of the faith which ought to be supported by subsidies" (Knoll, 1974, p. 393).

The Church was responsive to these requests. On May 14, 1253, Pope Innocent IV proclaimed a crusade "against the Tatars and their pagan allies" (Knoll, 1974, p. 386). In October 1343, Pope Clement VI demanded the bishop of Kammin (in Pomerania), Johann von Sachsen-Lauenburg, to collect the so-called Peter's Pence and transfer it to the archbishop of Gniezno.[50] It is important to mention in this context that Pomerania did not have a common border with Lithuania, and therefore supporting Poland in its struggle against the Lithuanians could be viewed as a waste of resources by Pomeranian rulers. It is also worth emphasizing that Johann von Sachsen-Lauenburg had been appointed to the diocese of Kammin by the pope, and not by the duke of Pomerania, in September 1343. In December of the same year, the pope also ordered a levy of a two-year tithe from the diocese of Kammin in favor of Casimir III to fight against the Tatars and Lithuanians.

The tensions between the secular and ecclesiastical authorities in Pomerania grew. In 1356, Duke Bogislaw V of Pomerania-Wolgast forced the clergy of Kammin to sign a treaty requiring that elections of future bishops would only occur with consent of the duke. Simultaneously, the diocesan possessions were put under ducal protection. The first bishop of Kammin who was elected in accordance with the treaty of 1356, Philipp von Rehberg, governed from 1371.[51] Strikingly, in Poland itself, the overall pattern of appointments of bishops closely followed the frequency of Lithuanian raids against Poland before Lithuania's Christianization in 1387, which marked the end of the crusades in Eastern Europe (Figure 1.3). As Frost (2015) argues, nor the conversion of Lithuania to Catholicism, nor its eventual union with Poland were inevitable from the perspective of contemporaries. The fact that the Church simultaneously enjoyed political power in the two neighboring states, which faced the threat of invasion by the common enemy to a varying degree, is indicative of the fact that the Church facilitated military cooperation between them.

[50] Source: BHRR1.

[51] Source: BHRR1.

1.8 Implications: The Protestant Reformation (1517) and European Development

The ubiquity of the Church in all aspects of life in the late Middle Ages is manifested in the fact that social scientists have studied its influence through what it was *not*, i.e., by focusing on the crises that diminished the Church's bargaining power vis-à-vis secular rulers. The Protestant Reformation (1517) was the most serious crisis experienced by the Church, and its political and economic ramifications are hard to overstate.[52] Increased religious competition in the aftermath of the Reformation diminished the "legitimizing" authority of the Church, and the papacy in particular, which incentivized rulers to turn to other sources of legitimacy, such as assemblies and parliaments (Rubin, 2017).[53] In the socioeconomic sphere, the decline of the authority of the Roman Church not only led to higher religious competition but also to *secularization*, in the form of the decreased attractiveness of religious education and more resources allocated towards civil purposes (Cantoni et al., 2018). While the direct relationship between the Reformation and economic prosperity is hard to establish due to the lack of contemporaneous data, it seems that in the long run, at least, the Reformation indeed contributed to higher prosperity via the spread of literacy (Becker and Woessmann, 2009).[54] Scholars have also pointed out the negative outcomes associated with the Reformation, such as the spread of anti-Semitism (Becker and Pascali, 2018).

Why did the Reformation begin when *and* where it did? The existing quantitative studies on the origins of the Reformation tend to conceptualize it as a purely religious movement and focus on either

[52] It has been argued that the earlier crisis of the Church, the Great Western Schism (1378–1417), also had a lasting impact on European development via the human capital channel (Cantoni and Yuchtman, 2014).

[53] "The decline of religious legitimacy following the Reformation paved the way for different propagating agents to increase their say in governance. The agents in the best position to replace the Church were …merchants, urban commercial interests, and the landed elite" (Rubin, 2017, p. 137).

[54] To the extent that reliable, if highly aggregated, economic indicators do exist for the pre-Reformation period (Fouquet and Broadberry, 2015), there is at least suggestive evidence of England's and Holland's economies accelerating after 1500, while Italy's being stagnant. Using urbanization rates as an outcome, Acemoglu et al. (2005) reach the same conclusion, although they emphasize a different mechanism in explaining post-1500 prosperity. The political impact of the Reformation is similarly had to put in quantitative terms. Using the frequency of parliamentary meetings as one such metric, van Zanden et al. (2012) document the rise of parliaments in most, though not all, Protestant lands after 1500, with some reversal in the seventeenth century.

the timing *or* the geography of the Reformation but not both.[55] Iyigun (2008) investigates the temporal margin and argues that the advance of the Turks in the sixteenth century "enabled" the Reformation by diverting the resources of Catholic states and the Holy Roman Emperor in particular. Rubin (2014) investigates the geographic margin and argues that the diffusion of the Reformation was associated with the spread of the printing press. I do not argue that ideology was not an important factor in the success of the Reformation; combined with favorable external conditions (such as the advancement of the Turks or the availability of the printing press in a particular location), Martin Luther's 95 Theses indeed could have sparked a much stronger reaction than Bohemian Hussitism a century earlier, for example. However, the ideological appeal of Protestantism seemed to matter more in the Holy Roman Empire than elsewhere.[56] At the beginning of the Reformation in other Northern European states, particularly in Sweden, conversion to Protestantism was not part of a popular movement but was rather a well-calculated political decision.[57] It is also unclear why Catholicism could not benefit from the spread of the printing press to the same extent as Protestantism did. In fact, it was often the Catholic Church that promoted the printing press. Saxony, the birthplace of the Reformation, was coincidentally one of the major centers of Catholic printing, which only intensified after 1517 as Duke George of Saxony fought a polemical battle against Luther using pamphlets (Volkmar, 2017).

To explain both the timing and the geography of the Reformation, one should focus on the political context of converting to Protestantism. What did Northern European rulers find appealing about the Reformation? I argue that the decision of the political elites in Northern European states to break ties with the papacy was influenced by their relative security from external military threats in the sixteenth century. As Luther wrote in his "Address to the Christian Nobility of the German Nation" (1520):[58]

> Long ago the emperors and princes of Germany allowed the Pope to claim the annates from

[55] See Becker et al. (2016) for a recent review of the literature.

[56] Cantoni (2012) suggests that the adoption of Protestantism by princes in the Holy Roman Empire was influenced by the behavior of their neighbors, which might or might not have been ideologically motivated.

[57] "[T]he period of transition lasted for a greater number of years, approximating to an organic development rather than a sudden break. Outside Stockholm the Reformation depended little on a popular awakening. The attitude of the king was of first importance." (Andersen, 1990, p. 156).

[58] Adapted from https://sourcebooks.fordham.edu/mod/luther-nobility.asp. Accessed on November 30, 2018. Emphasis is mine. Annate is a tax that bishops, confirmed by the pope, were obliged to pay to the Curia. It was proportional to the annual income of a diocese (roughly between one-third and one-half).

> all German benefices. The object of this concession was that the Pope should collect a fund with all this money to **fight against the Turks and infidels, and to protect Christendom.** […] Even if it were proposed to collect any such treasure for use against the Turks, we should be wise in future, and remember that **the German nation is more fitted to take charge of it than the Pope.**

Somewhat ironically, according to historical accounts, the fiscal authority of the papacy in Northern Europe had declined well before rulers converted to Protestantism: "In the financial field the Protestant revolution […] terminated and legalized a process which was near its end when the revolution broke out" (Partner, 1980, p. 49). In Denmark, kings increasingly shirked participation in the crusades in Southern Europe by somewhat exaggerating the threat they faced in their lands: "The idea that the heathens also attacked Christendom in the North and Danish kings had a crusade frontier of their own—often preventing them from participating in the crusade against the Turk—was to be a standard argument during the [fifteenth] century" (Jensen, 2007, p. 51). Since by that time the supposed pagan "threat" in Northern Europe was virtually non-existent, the unwillingness of Danish kings to participate in the crusades reflects the fact that Denmark would have been a net "donor" in the Catholic collective security system.

The example of the relations between French kings and the papacy is also instructive. While French kings did not convert to Protestantism, the political power of the Church in France was weak. In the aftermath of the Pragmatic Sanction of Bourges (1438), most bishops in central and northern France were nominated to chapters by the king, after which they were always "elected." During the sixteenth century, not only did France not participate in Catholic alliances against the Ottomans but King Francis I even established his own alliance with Sultan Suleiman I in 1536. As Vaughan (1954) wrote, "the geographical position of France sheltered her. […] Thus it was France who… grasped at the Turkish sword to throw it into the scales of the European balance" (p. 104). In 1551, the royal council even discussed establishment of a French patriarchate, with Cardinal Charles de Bourbon as the patriarch, which terrified the pope. The cardinal, however, "curbed his ambition for the sake of Catholic unity against the Protestants and the Turks" (Baumgartner, 1986, p. 17).

The examples of Denmark and France, along with the case study of Poland in the previous section,

signify the importance of external security threats, or the lack thereof, in the state-Church relations prior to the Reformation.

1.9 Conclusion

For centuries, the Catholic Church determined the political, economic, and cultural development of medieval Europe. I argue that to a large extent, the differential decline in the influence of the Church was because of differential demand for collective security. Popes coordinated military alliances against the non-Catholic "infidels," such as the Lithuanians, Moors, and Turks, which posed significant threat to the states in Southern and Northeastern Europe but not in Northwestern Europe. I measure the influence of the Church in a given diocese and period by asking whether the bishop was appointed independently from the sovereign in that region. Using originally collected data, I provide evidence for the inverse relationship between external military threats—and hence potential demand for interstate cooperation—and the likelihood of the bishop being an appointee of the sovereign.

The main implication of the present study for the debates on the rise of centralized states and the origins of the Reformation is that, unless one defines the decline of the Church in strictly theological terms, it was not a "one-off" event: bishops that were subordinate to secular rulers emerged before the Reformation. For instance, in the sixteenth century, France was on the verge of establishing its own patriarchate, which could have been akin to the Church of England under King Henry VIII. Therefore, arguments linking the Reformation to European political and economic development should either consider an extended sample of states or rather focus on the more "immediate" theological and cultural aspects of Protestantism. Somewhat speculatively, the Church-state equilibrium, resulting from the asymmetry of external military threats, could partly explain why by 1500 England and the Netherlands became more prosperous than Italy and why they remained so before the onset of the Industrial Revolution.

To conclude, it should be noted that as an international organization, the medieval Church was plagued by agency problems. Corruption, nepotism, and luxurious lifestyle of popes, which among other things diverted resources from warfare, were notorious. Therefore, it is better to think of delegation of authority to the Church as a "second-best" solution to the collective security problem in the

world in which interstate contractual obligations are otherwise hard to enforce. Overall, though, the Church as a supranational institution was replaced with a system of sovereign states not long after it became obsolete, and even burdensome, from a military perspective.

1.10 Appendix: Data Sources and Description

1.10.1 Appointments of Bishops: Sources

Because over the course of their career many bishops moved from one diocese to another, the details on their biography are often scattered across multiple sources. Below is the complete set of sources I used, although some of the dioceses they are dedicated to are not included in the database.

For the sake of brevity, I cite entire volumes and not individual chapters. It should be noted, however, that in many cases articles on particular bishops, included in the same volume, are written by different authors.

1.10.1.1 Castile and Navarre

AT Los arzobispos de Toledo en la Baja Edad Media (s. XII–XV)

HOP1 Historia de los obispos de Pamplona. Vol. I

HOP2 Historia de los obispos de Pamplona. Vol. II

1.10.1.2 Cyprus

Coureas1997 The Latin Church in Cyprus, 1195–1312

Coureas2010 The Latin Church in Cyprus, 1313–1378

EOHCC État et origine du haut clergé de Chypre avant le Grand Schisme d'après les Registres des Papes du XIIIe et du XIVe siècle

HALIC Histoire des archevêques latins de l'île de Chypre

1.10.1.3 Denmark and Sweden

BLS Biskopar i Lunds stift 1060–1637

DBL4 Dansk biografisk Lexikon. Vol. 4

DBL6 Dansk biografisk Lexikon. Vol. 6

DBL8 Dansk biografisk Lexikon. Vol. 8

DBL14 Dansk biografisk Lexikon. Vol. 14

DBL17 Dansk biografisk Lexikon. Vol. 17

NFB18 Nordisk familjebok. Vol. 18

SBL4 Svenskt biografiskt lexikon. Vol. 4

SBL16 Svenskt biografiskt lexikon. Vol. 16

SBL18 Svenskt biografiskt lexikon. Vol. 18

SBL20 Svenskt biografiskt lexikon. Vol. 20

SBL22 Svenskt biografiskt lexikon. Vol. 22

SBL26 Svenskt biografiskt lexikon. Vol. 26

SBL28 Svenskt biografiskt lexikon. Vol. 28

SBL29 Svenskt biografiskt lexikon. Vol. 29

SRA Svea rikes ärkebiskopar från 1164 till nuvarande tid

1.10.1.4 England (with Wales)

All *Fasti* volumes refer to the second edition.

FEA1bath Fasti Ecclesiae Anglicanae 1066–1300: Volume 7, Bath and Wells

FEA2bath Fasti Ecclesiae Anglicanae 1300–1541: Volume 8, Bath and Wells Diocese

FEA1chichester Fasti Ecclesiae Anglicanae 1066–1300: Volume 5, Chichester

FEA2chichester Fasti Ecclesiae Anglicanae 1300–1541: Volume 7, Chichester Diocese

FEA1coventry Fasti Ecclesiae Anglicanae 1066–1300: Volume 11, Coventry and Lichfield

FEA2coventry Fasti Ecclesiae Anglicanae 1300–1541: Volume 10, Coventry and Lichfield Diocese

FEA1exeter Fasti Ecclesiae Anglicanae 1066–1300: Volume 10, Exeter

FEA2exeter Fasti Ecclesiae Anglicanae 1300–1541: Volume 9, Exeter Diocese

FEA1hereford Fasti Ecclesiae Anglicanae 1066–1300: Volume 8, Hereford

FEA2hereford Fasti Ecclesiae Anglicanae 1300–1541: Volume 2, Hereford Diocese

FEA1lincoln Fasti Ecclesiae Anglicanae 1066–1300: Volume 3, Lincoln

FEA2lincoln Fasti Ecclesiae Anglicanae 1300–1541: Volume 1, Lincoln Diocese

FEA1london Fasti Ecclesiae Anglicanae 1066–1300: Volume 1, St. Paul's, London

FEA2london Fasti Ecclesiae Anglicanae 1300–1541: Volume 5, St Paul's, London

FEA1monastic Fasti Ecclesiae Anglicanae 1066–1300: Volume 2, Monastic Cathedrals (Northern and Southern Provinces)

FEA2monastic Fasti Ecclesiae Anglicanae 1300–1541: Volume 4, Monastic Cathedrals (Southern Province)

FEA1salisbury Fasti Ecclesiae Anglicanae 1066–1300: Volume 4, Salisbury

FEA2salisbury Fasti Ecclesiae Anglicanae 1300–1541: Volume 3, Salisbury Diocese

FEA1welsh Fasti Ecclesiae Anglicanae 1066–1300: Volume 9, the Welsh Cathedrals (Bangor, Llandaff, St Asaph, St Davids)

FEA2welsh Fasti Ecclesiae Anglicanae 1300–1541: Volume 11, the Welsh Dioceses (Bangor, Llandaff, St Asaph, St Davids)

FEA1york Fasti Ecclesiae Anglicanae 1066–1300: Volume 6, York

FEA2york Fasti Ecclesiae Anglicanae 1300–1541: Volume 6, Northern Province (York, Carlisle and Durham)

1.10.1.5 France

FEG1 Fasti Ecclesiae Gallicanae. Vol. 1, Diocèse d'Amiens

FEG2 Fasti Ecclesiae Gallicanae. Vol. 2, Diocèse de Rouen

FEG4 Fasti Ecclesiae Gallicanae. Vol. 4, Diocèse de Besançon

FEG5 Fasti Ecclesiae Gallicanae. Vol. 5, Diocèse d'Agen

FEG6 Fasti Ecclesiae Gallicanae. Vol. 6, Diocèse de Rodez

FEG7 Fasti Ecclesiae Gallicanae. Vol. 7, Diocèse d'Angers

FEG8 Fasti Ecclesiae Gallicanae. Vol. 8, Diocèse de Mende

FEG10 Fasti Ecclesiae Gallicanae. Vol. 10, Diocèse de Poitiers

FEG11 Fasti Ecclesiae Gallicanae. Vol. 11, Diocèse de Sens

FEG12 Fasti Ecclesiae Gallicanae. Vol. 12, Diocèse d'Autun

FEG13 Fasti Ecclesiae Gallicanae. Vol. 13, Diocèse de Bordeaux

FEG14 Fasti Ecclesiae Gallicanae. Vol. 14, Châlons-en-Champagne

FEG15 Fasti Ecclesiae Gallicanae. Vol. 15, Diocèse de Chalon-sur-Saône

FEG16 Fasti Ecclesiae Gallicanae. Vol. 16, Diocèse d'Auxerre

FEG17 Fasti Ecclesiae Gallicanae. Vol. 17, Diocèse de Toul

1.10.1.6 The Holy Roman Empire, Baltic, and Switzerland

BHRR1 Die Bischöfe des Heiligen Römischen Reiches: 1198 bis 1448

BHRR2 Die Bischöfe des Heiligen Römischen Reiches: 1448 bis 1648

HS13 Helvetia sacra. Vol. 1.3, Archidiocèses et diocèses. Le diocèse de Genève. L'archidiocèse de Vienne en Dauphiné

HS15 Helvetia sacra. Vol. 1.5, Erzbistümer und bistümer/Archidiocèses et diocèses. Das bistum Sitten/Le diocèse de Sion. L'archidiocèse de Tarentaise

1.10.1.7 Hungary

EE Esztergomi érsekek 1001–2003

KEE A kalocsai érsekek életrajza (1000–1526)

MES4 Monumenta Ecclesiae Strigoniensis. Volume 4

MVA1 Magyarország világi archontológiája 1000–1301

MVA2 Magyarország világi archontológiája 1301–1457

MVA3 Magyarország világi archontológiája 1458–1526

1.10.1.8 Italy

CCS Il cammino della Chiesa salernitana - nell'opera dei suoi vescovi (sec. V–XX). Vol. 1

CDCPT Cronotassi per le diocesi di Cremona, Pavia e Tortona nei secoli XIV e XV

CSSV La Chiesa di Siena e i suoi Vescovi

CVAP Cronotassi dei vescovi e arcivescovi di Pisa

CVDB Cronotassi dei vescovi della Diocesi di Bisignano (A.D. 744–1990)

VAB I Vescovi e gli Arcivescovi di Bologna, 2nd ed.

VAM Vescovi e arcevescovi di Milano, 2nd ed.

VM I Vescovi di Mileto

VV I Vescovi di Verona

1.10.1.9 Poland

AGT Arcybiskupi gnieźnieńscy w tysiącleciu

DAP2 Dzieje Archidiecezji Poznańskiej. Vol. 2

EP Episkopat Płocki w latach 1075–2015

PBK Poczet biskupów krakowskich

1.10.1.10 Scotland

FES Fasti Ecclesiae Scoticanae Medii Aevi Ad Annum 1638

1.10.2 Appointments of Bishops: Construction of the Dataset

Due to significant contextual variation, the differential availability of primary sources, and differential timing of publication, there is considerable heterogeneity in how episcopal appointments are described across sources. Importantly, these accounts also vary by the period of study, which could reflect legal and theological innovations of the Church, or changes in the Church-state relations, or both. For instance, before 1300 most papal appointments are described in sources as "appointments" (proper), whereas after 1300 many papal appointments are referred to as "provisions." I have developed a consistent and flexible coding protocol that homogenizes the cross-country and cross-period contextual differences identified in the sources.

For every diocese, I classify all bishops as appointees of the pope, appointees of sovereigns, or as being independently chosen by the chapter. The following cases are coded as **papal appointees**:

- The bishop was appointed (provided) by the pope, and there is no evidence that this appointment was influenced by any secular authority. This category also includes the cases of indecisive capitular elections, in which two or more candidates contested the diocese and the outcome of which was decided by the pope.
- The bishop had previously served as bishop of a different see, and the pope translated (trans-

ferred) him to the current diocese, provided that there is no indication of the translation being a fulfillment of the prior request of the sovereign or the chapter.

- The bishop was elected by the chapter at the recommendation of the pope.
- The pope appointed the bishop as a coadjutor to his predecessor, whom he succeeded upon his death or resignation.[59]

The category of bishops **chosen by the chapter** includes the following cases:

- The bishop was elected by the majority of the chapter without papal recommendation or request of the sovereign. Royal assent was not sought *or* was not given.[60] If the bishop was elected by the minority of the chapter, it is assumed that he would not have been able to prevail without external interference.[61]
- The bishop was postulated by the chapter without request of the sovereign.[62] Royal assent was not sought or was not given.
- The bishop was chosen as a coadjutor to his predecessor by the chapter, or by the predecessor himself, whom he succeeded upon his death or resignation.[63]
- The bishop was translated from a different see at the request of the chapter, which was preceded either by a free election or by postulation without interference of the sovereign.
- The bishop was appointed by the pope at the request of the chapter.
- The bishop was appointed by another bishop or archbishop, who had the right of nomination, without request of the sovereign.[64]

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[59] Assuming that appointment as a coadjutor was not influenced by the sovereign, as above.

[60] The latter case is interpreted as *formal* acknowledgment of the sovereign's supremacy, though his assent seemingly was not binding for the cathedral's decision.

[61] Almost all cases of election by the minority indicate such interference, as well as the identity of the interfering secular power or the pope.

[62] Postulation refers to the chapter's request to appoint someone who otherwise could not be elected due to canon law restrictions or other barriers. Examples of such cases include candidates that did not hold necessary dignities, lacked education, were below the canonical age, were bishops elsewhere, etc.

[63] Again, assuming that this appointment was not influenced by the pope or by the sovereign.

[64] Historically, this type of appointments mostly concerned dioceses that had been created recently and did not yet have a chapter (e.g., those in the Baltic) or that were under a direct jurisdiction of the archbishop (such as Seckau and Lavant in Austria, which were under the jurisdiction of Archbishop of Salzburg). Although the right of nomination was given by the pope, I place such appointments in this category because nor the pope nor the sovereign were directly involved.

Finally, the following cases fall into the category of **princely appointees**:

- The bishop was directly appointed by the sovereign, avoiding a canonical procedure. This category also includes bishops that were granted custody of the diocese by the sovereign *before* a formal appointment by the chapter or by the pope took place.
- The bishop was elected or postulated by the chapter at the request of the sovereign or was elected by the chapter's minority that was aligned with the sovereign. This category also includes contested elections in which the successful candidate would not have been able to prevail without support of the sovereign. In addition, if the chapter sought royal assent after the election, and this assent was given, the elected bishop is also coded as a princely appointee.
- The bishop was appointed or translated by the pope at the request of the sovereign. This category also includes translations that required assent of the sovereign.
- The sovereign appointed the bishop as coadjutor to his predecessor, whom he succeeded upon his death or resignation.

Unless the bishop was directly appointed by the pope, appointment of any new bishop required confirmation. I use one of the following events as evidence of confirmation (whatever occurred earlier or was appropriate for the corresponding appointment type):

- Appointment confirmed
- Consecrated
- Election confirmed
- Enthroned
- Oath received
- Postulation confirmed
- Provision bull issued
- Succession confirmed
- Temporalities restored

In most cases, the month, if not the exact day, of confirmation is available, and I trace bishops' careers starting from that date to their death or other termination event (translation, suspension, removal,

etc.). If the confirmation information is not available, I use the appointment date as the confirmation date, given that there is no evidence that the appointed bishop could not exercise his authority. If historians provide two or more alternative dates of the same event, I use the earliest, given that there is no particular reason to prefer one over the other(s).

I exclude bishops that were appointed but were barred from entering the diocese or otherwise experienced difficulty in taking possession. At the same time, I do include bishops that were confirmed but did not manage to reach their see before death (e.g., if they died at the Curia). In certain cases, bishops who were not able to exercise their authority due to resistance of the sovereign or disapproval by the pope after the initial appointment were able to take possession of the diocese after they swore allegiance to the pope or sovereign. I code such events as "changed allegiance."[65]

[65]For example, in 1242, Heinrich von Bilversheim was imposed on the chapter of Bamberg by Emperor Frederick II, despite the bishopric was reserved by the pope. Lacking papal confirmation, the bishop-elect could not take possession. In the meantime, Pope Innocent IV ordered investigation of Heinrich's election. Persuaded by the Duke of Bavaria, Heinrich swore allegiance to the pope in August or September of 1245, after which he received episcopal consecration on October 1, 1245 (BHRR1).

Table 1.9: The sample dioceses

No.	Diocese	Modern state	Historical state	Archdiocese	First year	Last year	Vacant years	Missing years	Note
1	Aberdeen	UK	Scotland	No	1198	1517	4	–	
2	Augsburg	Germany	HRE	No	1198	1517	3	–	
3	Autun	France	France	No	1198	1501	22	–	
4	Bamberg	Germany	HRE	No	1198	1517	43	–	
5	Bangor	UK	England	No	1198	1517	5	2	
6	Besançon	France	Burgundy	Yes	1198	1502	10	–	
7	Bologna	Italy	Bologna, Milan	No	1198	1517	51	–	
8	Bordeaux	France	England, France	Yes	1198	1500	29	10	
9	Bremen	Germany	HRE	Yes	1198	1517	12	–	
10	Breslau (Wrocław)	Poland	HRE	No	1198	1517	1	6	
11	Brixen (Bres-sanone)	Italy	HRE, Tyrole, Austria	No	1198	1517	19	–	
12	Caithness	UK	Scotland	No	1198	1517	51	15	
13	Canterbury	UK	England	Yes	1198	1517	13	–	
14	Chichester	UK	England	No	1198	1517	33	7	
15	Cologne	Germany	HRE	Yes	1198	1517	1	–	
16	Constance	Germany	HRE	No	1198	1517	20	15	
17	Ely	UK	England	No	1198	1517	3	–	
18	Esztergom	Hungary	Hungary	Yes	1198	1517	39	–	
19	Exeter	UK	England	No	1198	1517	7	–	
20	Galloway	UK	Scotland	No	1198	1517	4	26	The see was located at Whithorn

Table 1.9: The sample dioceses *(continued)*

No.	Diocese	Modern state	Historical state	Archdiocese	First year	Last year	Vacant years	Missing years	Note
21	Geneva	Switzerland	Savoy, Geneva	No	1198	1517	26	55	
22	Glasgow	UK	Scotland	Yes	1198	1517	13	–	Became an archdiocese in 1472
23	Gniezno	Poland	Poland	Yes	1198	1517	7	–	
24	Gurk	Austria	HRE, Austria	No	1198	1517	8	29	
25	Kammin	Poland	HRE	No	1198	1517	25	–	
26	Kraków	Poland	Poland	No	1198	1517	11	17	
27	Lausanne	Switzerland	HRE, Savoy	No	1198	1517	2	–	
28	Liège (Lüttich)	Belgium	HRE, Brabant, Holland	No	1198	1517	4	–	
29	Lincoln	UK	England	No	1198	1517	7	–	
30	London	UK	England	No	1198	1517	14	–	
31	Lübeck	Germany	HRE	No	1198	1517	10	–	
32	Lund	Sweden	Denmak, Sweden	Yes	1198	1517	24	–	
33	Magdeburg	Germany	HRE	Yes	1198	1517	24	–	
34	Mende	France	France	No	1198	1504	10	49	
35	Milan	Italy	Milan	Yes	1198	1517	53	–	
36	Mileto	Italy	Sicily, Naples, Aragon	No	1198	1517	21	48	
37	Nicosia	Cyprus	Cyprus	Yes	1198	1382	24	–	
38	Olomouc (Olmütz)	Czech Republic	Bohemia	No	1198	1517	14	4	

Table 1.9: The sample dioceses *(continued)*

No.	Diocese	Modern state	Historical state	Archdiocese	First year	Last year	Vacant years	Missing years	Note
39	Orkney	UK	Norway, Scotland	No	1247	1517	3	58	The see was located at Kirkwall. Information prior to 1247 is ambiguous
40	Pamplona	Spain	Navarre, France	No	1198	1507	32	4	
41	Passau	Germany	Bavaria	No	1198	1517	7	–	
42	Pavia	Italy	Milan, Pavia	No	1311	1511	24	–	Information prior to 1311 is not available
43	Płock	Poland	Poland, Masovia	No	1198	1517	19	2	
44	Poitiers	France	England, France	No	1198	1505	12	–	
45	Poznań	Poland	Poland	No	1198	1517	1	–	
46	Prague	Czech Republic	Bohemia	Yes	1198	1421	30	–	Became an archdiocese in 1344
47	Reims	France	France	Yes	1198	1507	36	24	
48	Riga	Latvia	Livonia, Teutonic Order	Yes	1198	1448	5	–	Became an archdiocese in 1253

Table 1.9: The sample dioceses *(continued)*

No.	Diocese	Modern state	Historical state	Archdiocese	First year	Last year	Vacant years	Missing years	Note
49	Rodez	France	France	No	1211	1501	5	1	Information prior to 1211 is ambiguous
50	Rouen	France	England, France	Yes	1198	1510	13	12	
51	Salzburg	Austria	Austria	Yes	1198	1517	15	–	
52	Sens	France	France	Yes	1200	1517	5	46	
53	Siena	Italy	Siena	Yes	1198	1517	–	100	Became an archdiocese in 1459
54	Speyer	Germany	HRE	No	1198	1517	38	3	
55	St Andrews	UK	Scotland	Yes	1198	1517	11	–	Became an archdiocese in 1472
56	St Davids	UK	England	No	1198	1517	4	–	
57	Toledo	Spain	Castile	Yes	1198	1517	9	–	
58	Toul	France	Lorraine, France	No	1198	1517	37	–	
59	Trieste	Italy	HRE, Venice, Austria	No	1199	1517	15	21	
60	Uppsala	Sweden	Sweden	Yes	1198	1517	24	–	
61	Utrecht	Netherlands	HRE, Holland, Burgundy	No	1198	1517	23	–	
62	Worcester	UK	England	No	1198	1517	4	–	
63	York	UK	England	Yes	1198	1517	13	–	

Note: Missing years refer to the years for which the appointment information is ambiguous. HRE stands for the Holy Roman Empire.
Source: author's dataset.

Table 1.10: The sample non-Christian states

No.	State	Pagan	Muslim	First year	Last year	Note
1	Almohads		Yes	1198	1269	
2	Almoravids		Yes	1198	1205	
3	Astrakhan Khanate		Yes	1467	1517	
4	Aydin		Yes	1315	1411	
5	Ayyubids		Yes	1198	1250	
6	Barbarossa Brothers		Yes	1517	1517	
7	Candar		Yes	1320	1461	
8	Crimean Khanate		Yes	1430	1475	
9	Cumans	Yes		1198	1226	Christianized in 1227. Conquered by the Mongols in 1242
10	Dulgadir		Yes	1468	1471	
11	Eretnids		Yes	1337	1398	
12	Finns	Yes		1198	1297	Conquered by Sweden
13	Germiyan		Yes	1315	1429	
14	Golden Horde		Yes	1297	1504	Converted to Islam in 1315
15	Hafsids		Yes	1237	1517	
16	Hamit		Yes	1315	1435	

Table 1.10: The sample non-Christian states *(continued)*

No.	State	Pagan	Muslim	First year	Last year	Note
17	Ilkhanate		Yes	1297	1340	In Centennia Historical Atlas, the Golden Horde and the Ilkhanate are labeled as the Mongols until 1297. The Ilkhanate converted to Islam in 1295
18	Karaman		Yes	1336	1468	
19	Karasi		Yes	1315	1362	
20	Kazan Khanate		Yes	1446	1517	
21	Lithuanians	Yes		1198	1386	Christianized in 1387
22	Mamluks		Yes	1251	1517	
23	Marinids		Yes	1270	1459	
24	Menteshe		Yes	1315	1413	
25	Mongols	Yes		1222	1296	Succeeded by the Golden Horde and the Ilkhanate
26	Nasrids		Yes	1270	1492	
27	Ottoman Empire		Yes	1315	1517	
28	Prussians	Yes		1198	1272	Conquered by the Teutonic Order
29	Saruhan		Yes	1318	1410	
30	Seljuqs of Rum		Yes	1198	1243	
31	Seljuqs		Yes	1198	1239	
32	Tekke		Yes	1315	1429	

Table 1.10: The sample non-Christian states *(continued)*

No.	State	Pagan	Muslim	First year	Last year	Note
33	Timurid Empire		Yes	1385	1405	Successor states existed until 1507 but were remote from Europe
34	Volga Bulgaria		Yes	1198	1235	Conquered by the Mongols in 1236
35	Wattasids		Yes	1460	1517	
36	Zayanids		Yes	1241	1383	

Source: calculated by author using the *Centennia Historical Atlas* (Clockwork Mapping, 2018)

1.10.3 Creation of GIS Maps

To create vector maps based on raster images from the *Centennia Historical Atlas* (Clockwork Mapping, 2018), I first used 141 city for georeferencing:

Aberdeen, Aleppo, Alexandria, Algiers, Amsterdam, Ankara, Annaba, Antalya, Arkhangel'sk, Athens, Badajoz, Baghdad, Barcelona, Bari, Bejaia, Belgrade, Benghazi, Bergen, Berlin, Bilbao, Bolzano, Bordeaux, Brussels, Bucharest, Budapest, Caen, Cairo, Cartagena, Casablanca, Cologne, Copenhagen, Cádiz, Damascus, Derbent, Dijon, Dublin, Durres, Edirne, Erfurt, Fes, Galway, Gdańsk, Geneva, Genoa, Glasgow, Goteborg, Granada, Groningen, Ha'il, Hanover, Helsinki, Istanbul, Izmir, Jerusalem, Kaliningrad, Karaman, Kazan, Kharkiv, Kiev, Klaipėda, Kosice, Krasnodar, La Rochelle, Linz, Lisbon, London, Londonderry, Lubeck, Luxembourg, Lviv, Madrid, Malatya, Marrakesh, Marseille, Melilla, Milan, Minsk, Moscow, Mosul, Munich, Naples, Nicosia, Nis, Nuremberg, Odessa, Oporto, Oran, Oslo, Palermo, Paris, Perugia, Pisa, Plymouth, Poitiers, Posnan, Prague, Pskov, Qazvin, Riga, Rostov-on-Don, Sarajevo, Saratov, Sevastopol, Sinop, Sivas, Smolensk, Sofia, Split, St. Petersburg, Stavropol, Stockholm, Strasbourg, Swansea, Syracuse, Tallinn, Tangier, Thessaloniki, Timisoara, Tlemsen, Tolouse, Trabzon, Trieste, Tripoli (Lebanon), Tripoli (Lybia), Trondheim, Tunis, Tyre, Valencia, Valladolid, Veliky Novgorod, Vichy, Vienna, Vilnius, Vologda, Voronezh, Warsaw, Wrocław, Yerevan, York, Zagreb, Zaragoza.

After georeferencing, I applied a cubic spline method to generate the vector polygons representing the "infidels."

CHAPTER 2

Discrimination, Market Entry Barriers, and Corporations in Imperial Russia

2.1 Introduction

In his seminal study, Gerschenkron (1962) argued that the lack of large-scale private capital was one of the main causes of Russia's underdevelopment before World War I. Recent scholarship has suggested that to the extent that such capital was available, it was under-utilized, because firms failed to adopt a corporate form of organization (Gregg, 2018). In this paper, we examine the political factors that likely contributed to this failure by focusing on how a specific group of economic agents, Jewish entrepreneurs, were restricted in their ability to create and invest in corporations due to discrimination.

In the Russian Empire, general incorporation law did not exist. Instead, every single corporate charter had to be reviewed and approved by local authorities and the central government on the case-by-case basis. At the end of this process, the charter was signed by the tsar. Further changes to charters also required the government's approval. If incorporation was so time-consuming and difficult, why did firms incorporate at all? Gregg (2018) emphasizes the following benefits as the primary motives of incorporation. First, owners of corporations, unlike other enterprise forms, enjoyed full limited liability. Second, the corporate form made it easier to raise long-term capital, provided access to foreign and domestic stock and bond markets, and allowed to lock in capital to make capital investments.

Starting from 1890, some newly issued and updated charters contained discriminatory clauses that banned Jewish entrepreneurs from buying shares of such corporations and/or purchasing property (see Figure 2.1 for an example). What explains the timing of discriminatory restrictions against Jewish entrepreneurs? The rise in anti-Semitism alone fails to explain the variation in the number of discrimi-

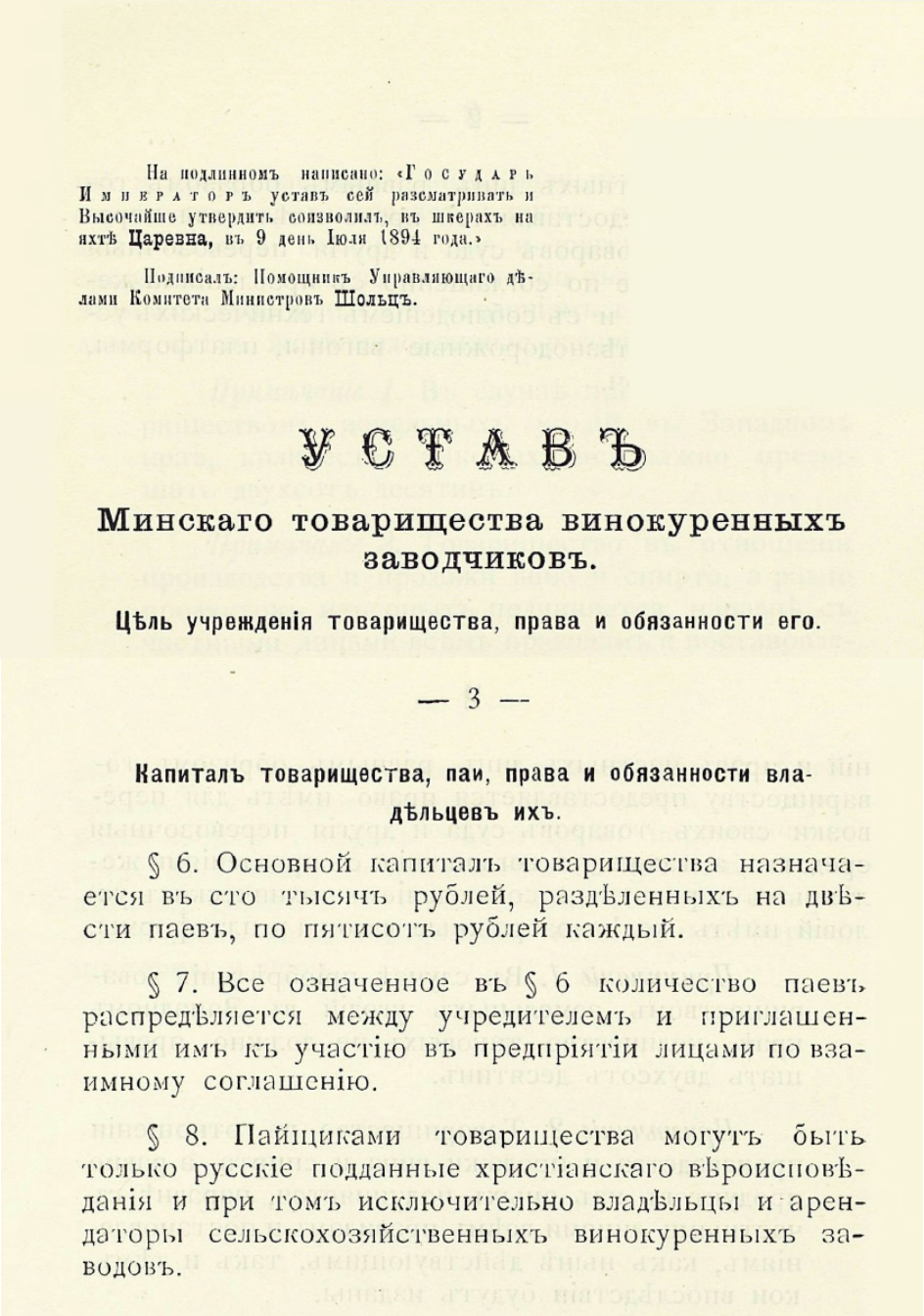
natory restrictions across different industries. Also, the government's decision to restrict incorporation for any particular group of agents is not theoretically obvious, assuming that it seeks to maximize tax revenue and capital invested in strategic sectors.[1] We argue that some producers sought to limit entry of new firms on the market by limiting the potential entrants' access to equity capital. To that end, they appealed to nationalist rhetoric and lobbied the government to impose restrictions on creation and investment in corporations by Jews.

What determined which industries were affected by anti-Jewish discrimination? Prior to 1889, a large share of Russian private capital was invested in state and state-subsidized assets that yielded a fixed return and were deemed safe. In the 1880s, the government received access to new external sovereign debt markets with more favorable interest rates than on the domestic market. To decrease its obligations, the government forcefully converted bonds on the domestic market between 1889 and 1894, offering lower interest rates to investors in government securities than before. During the same period, the government forcefully repurchased shares of railroad companies, the rate of return on which was guaranteed and was comparable to government securities. These two policy changes freed large amounts of domestic private capital that now had to be reinvested in the private sector (the equity market in particular). We argue that this inflow of capital unintentionally created competitive pressure among firms, especially in the industries with relatively high entry costs before the shock, i.e., the capital-intensive industries (see Figure 2.2).

We use the RUSCORP database of all corporations whose charters were approved (Owen, 1992) and focus on the period between 1891–1902,[2] for which we have information on anti-Jewish restrictions at the corporation level (from Levin, 1902). To construct a measure of capital intensity, we assemble a novel dataset on all factories in the Russian Empire in 1890. We manually classify every factory by 3-digit SIC (Standard Industrial Classification) industries. After that, we define an industry's capital intensity as the total machine power, the closest proxy for capital we can obtain, divided by the total

[1] Such as production of steel and heavy machinery, which are important for military purposes. This logic would work under the assumption that elites do not fear replacement, or if there are significant external threats (Acemoglu and Robinson, 2006).

[2] The first three corporate charters with anti-Jewish clauses were issued in 1890. We drop the 1890 cross section from analysis because of the lack of variation in the dependent variable, and also because our main explanatory variables are measured in 1890.



На подлинномъ написано: «Государь Императоръ уставъ сей разсматривать и Высочайше утвердить соизволилъ, въ шкерахъ на яхтѣ **Царевна,** въ 9 день Іюля 1894 года.»

Подписалъ: Помощникъ Управляющаго дѣлами Комитета Министровъ **Шольцъ.**

УСТАВЪ

Минскаго товарищества винокуренныхъ заводчиковъ.

Цѣль учрежденія товарищества, права и обязанности его.

— 3 —

Капиталъ товарищества, паи, права и обязанности владѣльцевъ ихъ.

§ 6. Основной капиталъ товарищества назначается въ сто тысячъ рублей, раздѣленныхъ на двѣсти паевъ, по пятисотъ рублей каждый.

§ 7. Все означенное въ § 6 количество паевъ распредѣляется между учредителемъ и приглашенными имъ къ участію въ предпріятіи лицами по взаимному соглашенію.

§ 8. Пайщиками товарищества могутъ быть только русскіе подданные христіанскаго вѣроисповѣданія и при томъ исключительно владѣльцы и арендаторы сельскохозяйственныхъ винокуренныхъ заводовъ.

Figure 2.1: Example of a charter: Minsk Distilling Co. (1894). Source of the image: the Russian State Library website (http://www.rsl.ru). The preamble on the top image says, “Emperor reviewed and approved this charter on the *Tsarevna* yacht on July 9th, 1894.” According to Section 8 of the charter (bottom image), “Only Russian subjects of the Christian faith who are the owners and leasers of the distilling factories can be shareholders of this corporation.”

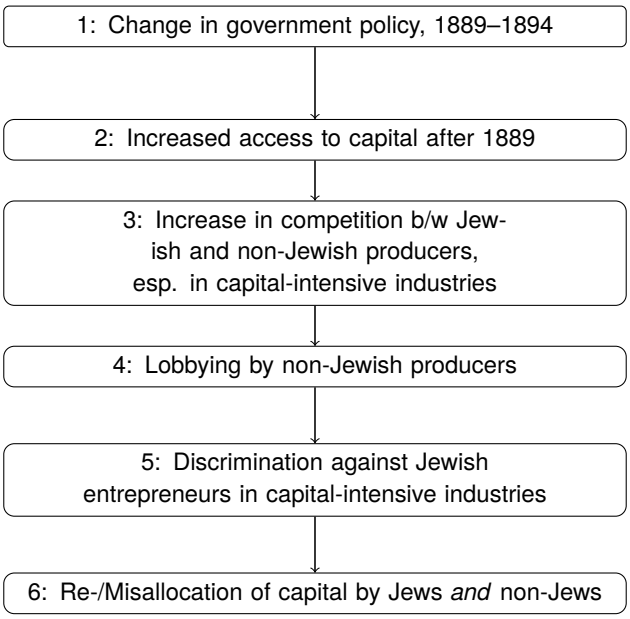


Figure 2.2: Steps of the theoretical argument

number of workers. To cross-validate this measure, we construct an analogous measure of capital intensity for the U.S. using the 1890 Census of Manufacturers (although not all industries can be matched across the two datasets). Using a probit model with year fixed effects, we show that restrictions against Jewish entrepreneurs were more likely to be imposed in more capital-intensive industries.

We address two potential concerns related to our research design. A first is that the RUSCORP database does not include charters of would-be corporations that were not approved, which can lead to selection bias. Also, entrepreneurs might have been disincentivized from investing effort in creating a corporation due to the risk of rejection or red tape. To create a pool of counterfactual entrepreneurs, we utilize the fact that anyone seeking to establish a firm of a certain size, be it in a corporate or other legal form, had to first register with a merchant guild by purchasing a certificate in every city where it would have business activity. We collect information on all guild members registered in St. Petersburg, Moscow, and Odessa, the three major cities of industry and commerce, as of 1890. This dataset includes more than 11,000 individuals who had the legal right to establish a corporation in the respective city (although they did not necessarily use this right). Then, we match this sample with the data on those who actually established corporations between 1853 and 1913 (from the RUSCORP). Using the information on ethnicity and national origin of guild members and founders of corporations, we ask whether guild

members from Jewish background were differentially less likely to create a corporation in any industry after 1890 in a differences-in-differences setting. If that were the case, our results from the pooled regression would rather be indicative of a more general discrimination trend than discrimination in a particular set of industries. However, we do not find evidence of Jewish guild members being overall less likely to incorporate after 1890. Instead, anti-Jewish restrictions seem to have been targeted against corporations in capital-intensive industries.

A second, related, concern is that we lack a counterfactual for would-be *targeted* corporations before the beginning of the capital shock in 1889. Because the first charter with anti-Jewish clauses was issued in 1890, we cannot directly estimate the "treatment effect" of the change in government policy at the industry level, holding unobserved time-invariant characteristics of industries fixed. Theoretically, discrimination could have been caused by some other process, correlated with capital intensity and other observable variables. The central question is whether the lack of discriminatory "pre-trend" before 1890 is evidence of Jewish entrepreneurs selecting into a different set of industries—compared to the post-1890 period—or the conditions that caused discrimination had not yet been in place before 1890, as we argue. We cannot answer this question directly given the available data, but to the extent that other market participants observed a differential treatment of Jewish entrepreneurs after 1890, that should have been reflected in market valuation of corporations in which Jews served as founders. Using the data on 155 corporations whose shares were traded at the St. Petersburg Stock Exchange between 1865 and 1913, we show that stock returns of corporations founded by Jews outperformed stock returns of other corporations before 1890 but underperformed after. This finding suggests that discrimination against Jewish entrepreneurs was likely not anticipated by the equity capital market.

To further explore the nature of competition between Jewish and non-Jewish entrepreneurs, we test whether the former had a competitive advantage in technology and skills. Historians have argued that minority businessmen—Germans, Jews, and Poles—had higher levels of human and social capital because a disproportionately large share of these minority groups lived in cities, and also because they maintained tight-knit networks (e.g., Rieber, 1982). With such a competitive advantage, Jewish entrepreneurs would have disproportionately clustered in high capital-intensive industries before 1890. Therefore, they could have become targets of discriminatory policy for the reasons unrelated to the capital shock per se. We explore this possibility using a subsample of incorporated factories in 1890,

for which we have information on ethnicity of their owners. Specifically, we test whether various measures of factory productivity—revenue per worker, total factor productivity of revenue (TFPR), and horsepower per worker—were systematically related to ethnicity of factory owners. We find that there were no statistically significant differences in productivity between factories owned by Jews and non-Jews in terms of revenue per worker and horsepower per worker; in terms of TFPR, factories owned by Jews were somewhat less productive. This result provides additional support for the hypothesis that discrimination against Jewish entrepreneurs originated in the capital shock rather than the technological "catch-up" of their non-Jewish competitors.

While being focused on Imperial Russia, this paper contributes to the broader political economy of development literature by documenting how certain firms and groups of agents can be selectively excluded from participating in capital markets. At the country-industry level, at least, there seems to be a positive association between how easy it is for firms to attract financial capital and the rate of industrial growth (Rajan and Zingales, 1998).[3] The "traditional" channel whereby legal systems influence the size of capital markets is investor protections (La Porta et al., 1997). In our context, the issue of protection of investors per se was less relevant considering that some investors—Jewish entrepreneurs and their partners—were legally restricted from entering capital markets in the first place. Therefore, our study further illuminates the potential mechanisms whereby political institutions and legal systems can shape capital markets and, therefore, economic development.

More generally, we are not aware of any other empirical research that explicitly examines political barriers to entry at the firm level.[4] The lack of empirical evidence in the modern context is not least because such barriers are not legal in most countries. Therefore, researchers have to rely on such indicators of the regulation of entry as the number of procedures, official time, and official cost as proxies for political barriers (Djankov et al., 2002); the main disadvantage of these measures is that they are typically the same for the entire industry or country. The absence of general incorporation law—and democratic norms—in the Russian Empire provides us with a unique research setting. Our

[3] It should be noted that the existing firm-level evidence on the *independent* contribution of the corporate form to growth and productivity is limited (Gregg, 2018).

[4] Gregg and Nafziger (2017) and Gregg (2018) also study the process of incorporation in the Russian Empire, but they do not investigate anti-Jewish restrictions nor political barriers more generally.

main insight is the seemingly higher degree of short-sightedness of authoritarian rulers—the Russian tsars—compared to the "stationary-bandit" view of dictatorships (Olson, 1993; Acemoglu and Robinson, 2006). Acemoglu and Robinson (2006) argue that "external threats often make incumbents more pro-innovation" (p. 117); in this light, Russia's defeat in the Crimean War (1853–1856) was "the turning point in the attitudes of the Russian state to economic development" (p. 128). We disagree with this notion. Considering that anti-Jewish restrictions were more likely in more capital-intensive industries, we reach a paradoxical conclusion: capitalists were blocked from entering the industries where capital was most needed.[5] Rather, the fact that the government seemingly weighed the interests of certain producers against achieving the long-run developmental objectives is consistent with the "oligarchic" model (Acemoglu, 2008; Cheremukhin et al., 2017). In this model, the ruling elite deliberately creates entry barriers, impeding future innovation and growth, to secure current rents.

This paper also speaks to the growing number of studies on ethnic conflict and persecution of minority groups in various historical contexts. It has been argued that inter-ethnic relations are shaped by the long-run division of labor between groups (Jha, 2013). The established norms of co-existence can be adversely affected by external shocks that increase inter-ethnic competition (Becker and Pascali, 2019) or political uncertainty about the future (Grosfeld et al., 2018). The main difference between these papers and ours is that discrimination against the minority (the Jews) in our setting did not occur "spontaneously," at the grassroots level, but with direct involvement of the state. Although competition between Jewish and non-Jewish entrepreneurs does play a role in our explanation of anti-Jewish restrictions, it was ultimately the central government who decided the fate of each corporation. Curiously, tsarist policy towards Jews was more "rational" in that it seemed to ration the degree of discrimination from year to year and from industry to industry, in contrast to anti-Jewish pogroms in Germany and Russia, which once began, were uncontrolled (Becker and Pascali, 2019; Grosfeld et al., 2018).

The paper proceeds as follows. In Section 3.2, we provide a brief overview of the state of markets, social relations, and politics in late nineteenth-century Russia. In Section 2.3, we describe construction of the dataset. In Section 2.4, we present our main empirical findings and address some of the alternative mechanisms. The final section concludes.

[5] Russia's largely unsuccessful participation in World War I also demonstrated its technological inferiority.

2.2 Historical Background

2.2.1 Capital and Capitalists in Late Nineteenth-Century Russia

The defeat in the Crimean War (1856) demonstrated the technological inferiority of Russia's then-feudal economy. The reforms initiated during the reign of Tsar Alexander II (1855–1881), including the emancipation of serfs (1861), were meant to accelerate industrialization. However, the Russian Empire remained a largely agricultural ("backward") economy by the turn of the century, with large-scale private capital being scarce (Gerschenkron, 1962). Cheremukhin et al. (2017) have put forward a different explanation for Russia's underdevelopment: high market entry barriers and monopoly power. This could explain why capital *appeared* more limited than it might actually have been—if it was under-utilized. The recent literature on the Russian economic history has explored specific frictions that impeded firms' ability to borrow and expand, in particular, the highly politicized process of incorporation (Gregg and Nafziger, 2017; Gregg, 2018).

On the other hand, a number of historical and sociological accounts of late Imperial Russia have stressed the importance of anti-capitalist sentiments in Russian society, not least among the entrenched merchant class (Rieber, 1982; Rogger, 1986; Löwe, 1993). From this perspective, ethnic and religious minorities—Germans, Jews, Poles, and others—were viewed as unwelcome agents of change, whose "cosmopolitan" values, incompatible with paternalism, undermined the moral fabric of the Russian majority.

Before the late 1880s and early 1890s, the merchant class and nobility, the main owners of capital, did not find it in their best interest to invest in the private sector because of the hypertrophied state sector. The state diverted private investment by heavily subsidizing the construction of railroads, perceived as a strategic necessity, and by issuing bonds on the domestic market with a relatively high interest (up to 5%). While not being a direct owner nor manager of railroad corporations, the government guaranteed dividends payable to their stockholders, with the rate of return comparable to that of government bonds (5%). The following quote of a contemporary, who lived in the second half of the nineteenth century, reflects the prevailing business attitude of that age:

> A medium-size [sugar] factory requires up to 2 million rubles of basic capital, and almost

> as much is needed for operations. […] However, this capital can be easily transformed into government bonds yielding a guaranteed return of 200 thousand rubles, allowing a fortunate owner of such capital to philosophically reflect on worldly matters under the sun of Biarritz […] whereas investment in the sugar industry means randomness and insecurity. (Moshenskii, 2014, p. 216)

There were two major stock market booms (*azhiotazh*) in Russia during the nineteenth century. One occurred in 1857, when the government decreased the interest paid on deposits in state-controlled banks from 5% to 4%. After the devastating Crimean War, the government sought to decrease its obligations. At the same time, facilitating investment in non-state assets was perceived as a benevolent goal by Tsar Alexander II and the finance minister (Shepelev, 1973, pp. 70–71). Unsurprisingly, these were the newly created railroad corporations that benefited from the market boom most. In 1857–1858, state banks lost 159 million rubles of private savings, while the government-guaranteed shares of the Russian Railroad Co. (1857) attracted 75 million rubles, which was an enormous emission at the time (Shepelev, 1973, pp. 74–75).

The second boom, which is the subject of this study, occurred in the 1890s. Like the previous one, it was caused by a change in government policy. By the 1880s, state-subsidized railroad corporations had proved to be corrupt and ineffective; the lack of uniform transportation standards increased the cost of operation, while the low density of the railroads network did not allow corporations to benefit from economies of scale. Instead of continuing to guarantee the 5% return on shares of these corporations, the government forcefully purchased them or exchanged for 4% government bonds. Most railroad corporations were repurchased between 1889 and 1894 (see Table 2.1 and Figure 2.3). Around the same time, in 1889–1894, the government forcefully converted 5% bonds to 4% bonds, which happened shortly after the French sovereign debt market became the main creditor of the tsarist government. This took holders of Russian government debt by surprise, who, "having lost one-fifth of their revenue, had to [find a way to] increase it" (Moshenskii, 2014, pp. 117–118). To signify the scale of the policy change, of the 2,628 million rubles of new sovereign debt added during the tenure of Finance Minister Ivan Vyshnegradskii (1887–1892), only 899 million were financed domestically.

The net effect of government interventions in 1889–1894 was that former shareholders had incen-

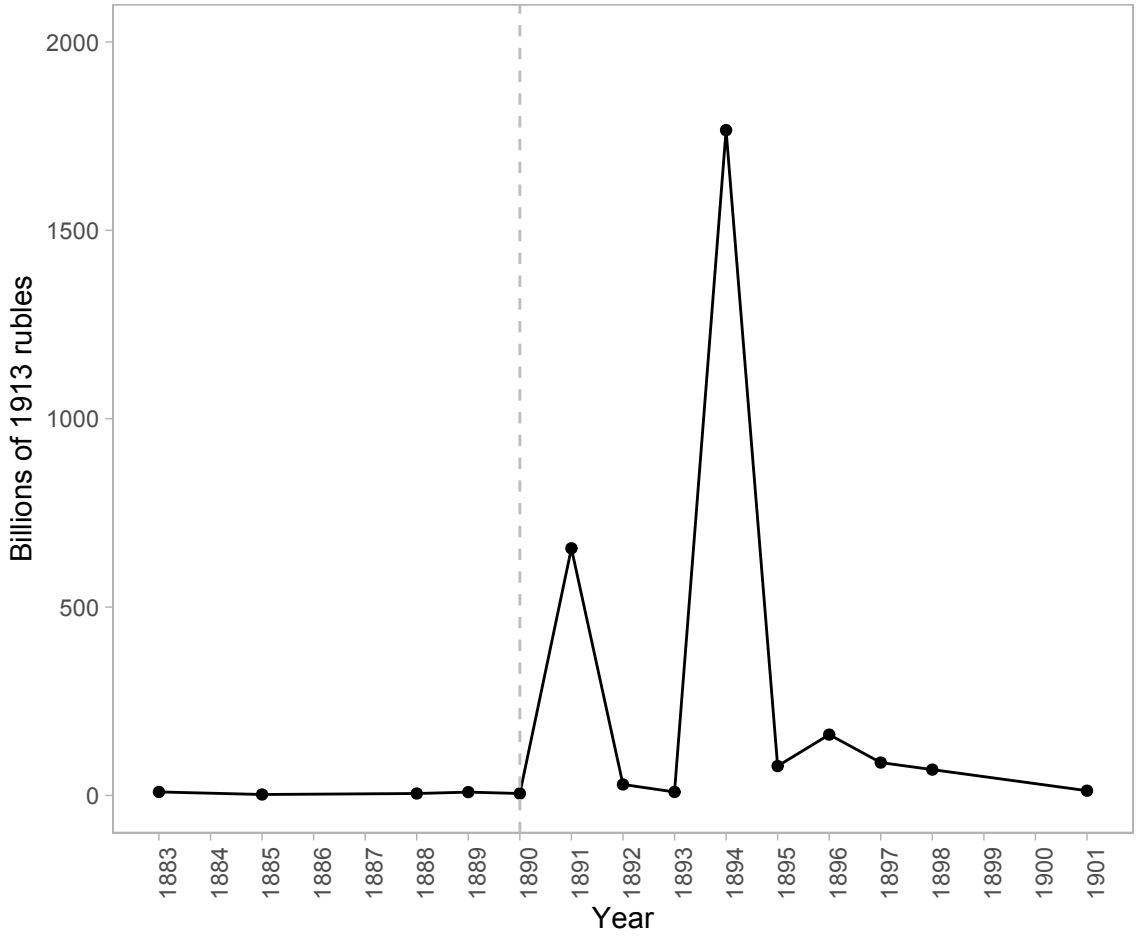


Figure 2.3: The dynamics of the government-initiated capital shock, 1883–1901. The dashed vertical line indicates the year when the first corporate charter with anti-Jewish restrictions was issued (1890). The ruble values are deflated to the 1913 level using the price index in Strumilin (1954). See text and Table 2.1 for additional information on how each observation is constructed.

Table 2.1: Main government's interventions on the domestic capital market, 1883–1901

Year	Operation	Value, millions of rubles	Interest decreased?
1883	Purchase of Tambov-Saratov Railway	7.5	Yes
1885	Purchase of Putilov Railway	1.0	Yes
1885	Purchase of Murom Railway	0.9	Yes
1887	Purchase of Ural Railway	14.5	No
1888	Purchase of Riazhsk-Morshansk Railway	3.5	Yes
1889	Purchase of Transcaucasia Railway	8.5	No
1889	Purchase of Riazhsk-Viazemsk and Morshansk-Syzran Railways	6.2	Yes
1890	Purchase of Tambov-Kozlov Railway	3.5	Yes
1891	Conversion of domestic sovereign debt	70.0	Yes
1891	Conversion of domestic sovereign debt	194.0	Yes
1891	Conversion of domestic sovereign debt	190.0	Yes
1891	Purchase of Kursk-Kharkov-Azov Railway	7.8	Yes
1891	Purchase of Libava-Romny Railway	4.6	Yes
1892	Purchase of Oryol-Griazi Railway	11.6	Yes
1892	Purchase of Orenburg Railway	10.1	Yes
1893	Purchase of Donetsk Railway	6.9	Yes
1894	Conversion of domestic sovereign debt	1120.0	Yes
1894	Purchase of Riga-Dvinsk Railway	9.5	Yes
1894	Purchase of Oryol-Vitebsk Railway	11.4	Yes
1894	Purchase of Russian Railroad Co. (RRC)	113.6	Yes
1894	Purchase of Riga-Mitava Railway	1.4	Yes
1894	Purchase of Dvinsk-Vitebsk Railway	19.1	Yes
1895	Purchase of Moscow-Kursk Railway	54.8	Yes
1895	Purchase of Lozovo-Sevastopol Railway	1.7	Yes
1896	Purchase of Warsaw-Terespol Railway	8.4	Yes
1896	Purchase of Moscow-Brest Railway	11.7	Yes
1896	Conversion of domestic sovereign debt	97.3	Yes
1897	Purchase of Baltiiskaia Railway	24.3	Yes
1897	Purchase of Privislinskaia Railway	7.6	Yes
1897	Purchase of RRC bonds	31.1	Yes
1898	Purchase of Iugo-Zapadnye Railway	50.8	Yes
1898	Conversion of domestic sovereign debt	2.7	Yes
1901	Purchase of Ivangorod-Dombrova Railway	10.0	Yes

Notes:
This table displays the major activities of the Ministry of Finance and the Committee of Ministers on the domestic securities market between 1883 and 1902. Purchases of railway lines and bonds of railroad companies refer to forceful purchases of these lines and bonds using cash or government-issued bonds. The ruble values in column (3) are expressed in nominal terms for the indicated date. Column (4) indicates whether government-issued bonds used in the respective operation offered a lower rate of return to the holders of the assets being replaced. Payments in cash are coded as lower-interest bonds. Source: compiled by authors based on Ministerstvo Finansov (1902), Kislinskii (1902), and Migulin (1903). See Appendix for the full references.

tives to seek for higher rates of return elsewhere, in particular, in the private equity market. As we argue, this inflow of capital likely created a political economy conflict between market incumbents and entrants, those who were more politically connected and those who were not. We expect that this conflict was particularly acute in relatively capital-intensive industries.

2.2.2 Russian Corporate Law

Incorporation is an important way for firms to attract external capital. Besides issuing equity, the legal entity status, separate from any of its participants, allows corporations to lock in the assets, which in turn provides them with the advantage of being able to invest in long-term, highly specific projects (Blair, 2003). Limited liability of equity investors, a third distinguishing feature of corporations as compared to other enterprise forms, further facilitates inflow of capital, in particular from small investors who do not play an active role in governance (Easterbrook and Fischel, 1985).

The Russian Corporate code, which was enacted in 1836, remained in place, with certain revisions, until the end of the monarchy in 1917 (Owen, 1991). Despite the numerous attempts to reform the Code by the finance ministers from Reutern to Witte to Kokovtsov, its main provision was left intact: prospective entrepreneurs were required to seek permission of the central and local government to establish a new corporation; the tsar himself approved incorporation by signing the corporate charter.[6] It is no surprise that the concession system of incorporation gave rise to bureaucratic arbitrariness (*proizvol*) (Owen, 1991). The processing time could vary from six months, as in the case of the Ramiba Bentwood Furniture Company of Penza (Gregg, 2018, p. 10), to the sixteen years that it took the Poznanski Cotton Company of Lodz to receive a new charter (see Figure 2.4). In 1900, Minister of Finance Sergei Witte wrote to Tsar Nicholas II:

> Even if corporations receive charters …these charters often restrict participation by foreigners and Jews …which makes it impossible for these corporations to have enough starting capital. Many manufacturing industries are overseen by other Ministries, [such as] the Ministry of Defense. […] Regardless of general regulation of enterprises, their fate is at the mercy of numerous local officials, from lower-ranked police officers to general-governors. (Quoted in Shepelev, ed, 1999, p. 357)

Not only draft charters went through the bureaucratic maze—so did initiatives to reform the system. In 1892, the Department of Trade and Manufacture of the Ministry of Finance created a committee

[6] The system of incorporation by registration (*iavochnaia sistema*) was only introduced on April 1, 1917 by the new Provisional Government (Owen, 1991, p. 190).

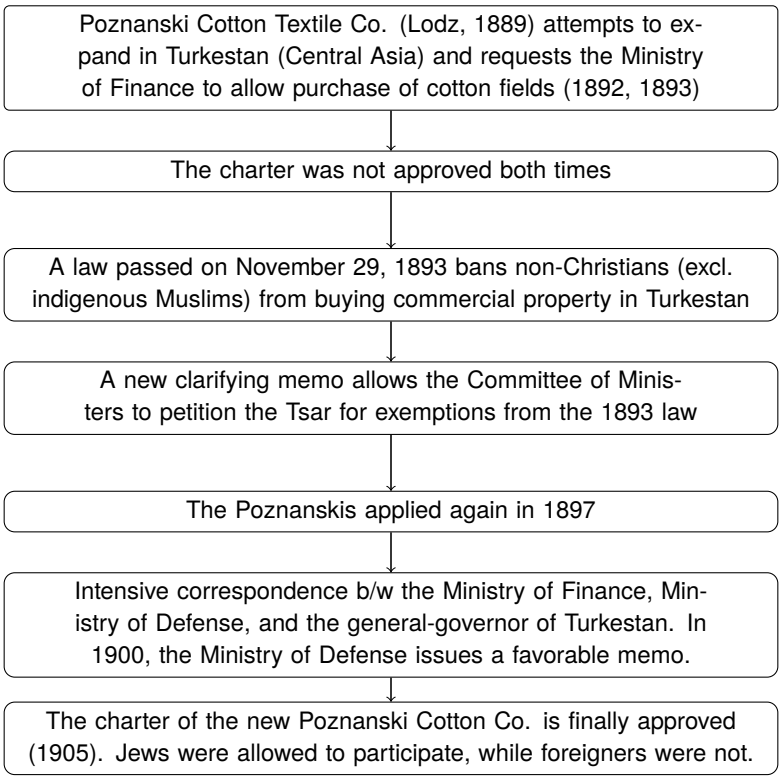


Figure 2.4: Example of the incorporation process: Poznanski Cotton Co. (1905). The Poznanski brothers had Jewish background. The information is from Laverychev (1974, pp. 59–60).

to "explore the possibility of removing barriers to incorporation" (Shepelev, 1981, p. 231). In 1894, the committee's proposal was sent to governors, municipal and rural (*zemskiie*) governments, and advisory councils on trade and manufacturing. The further development of the proposal stalled; in 1899, the Ministry explained the delay by the "diverse interests that would be affected by this legislation" (Shepelev, 1981, p. 232).

The subsequent proposals in the early twentieth century failed as well. The negative impact of the concession system on the industrial growth was well understood by all ministers—the disagreement was primarily due to the fact that incorporation by registration would make it harder to impose ad-hoc restrictions (Shepelev, 1981, p. 234). Under the concession system, every charter was legislation in its own right, and as such it could override the existing regulations and decrees pertaining to a given industry. Therefore, by blocking the initiatives of the Ministry of Finance certain ministers and interest groups sought to reserve the right to decline a charter or to include arbitrary provisions in it.[7]

2.2.3 Jews in the Russian Empire

2.2.3.1 Imperial Policy

After annexing large portions of Poland in the late 18th century, Russia became home to the largest Jewish diaspora in the world. By the decrees of 1791, 1804, and 1835, the government restricted their legal residence to the Pale of Settlement. As Gessen (1911) wrote, "the Pale of Settlement was the result of the lobbying efforts of Moscow and Smolensk merchants who feared competition with Jews" (p. 91).

Imperial policy towards Jews was not coherent nor consistent, while its enforcement was not thorough and instead was arbitrary. On multiple occasions, certain tsarist ministers attempted to improve the status of Jews, or weaken the enforcement of the previously passed discriminatory laws. The most important for the subject of this paper is the decree of 1859 that allowed Jewish entrepreneurs—merchants of the first guild—to permanently reside in any imperial city outside the Pale.[8] As a result,

[7] Owen (1991) seems to disagree with our assessment of the role played by the finance ministers: "The most enlightened ministers, including Reutern, Bunge, and Witte, all preferred the old way: rigid laws tempered by arbitrary exceptions for favored petitioners" (p. 210).

[8] Jewish merchants of the second guild were allowed to reside in the "inner" provinces temporarily. In addition, first-

the two centers of Russian commerce, Moscow and St. Petersburg, experienced a dramatic increase in the Jewish population (Nathans, 2002).

In 1862, Minister of Finance Michael Reutern introduced a new legislation advocating for an even more comprehensive equalization of rights of Jews and non-Jews. In particular, he questioned that Jews were driving the Russians out of commerce. Instead, "society would be better off under the improved allocation of human capital, decreased smuggling, with simultaneous growth in the manufacturing sector."[9] Such initiatives, though often futile, were not uncommon among high-level officials even at the height of the "official" anti-Semitism in the 1880s (during the reign of Alexander III). In other cases, legislation that sought to soften discrimination was lobbied by local administration due to the negative economic consequences of anti-Jewish restrictions (Raskin, 1993, p. 70). Figure 2.5 depicts the overall dynamics of imperial legislation pertaining to Jews from 1810–1917.

2.2.3.2 Jewish Entrepreneurship

Who were Jewish entrepreneurs and how did they differ from the average inhabitant of the Pale of Settlement? Rubinow (1975) points out that "notwithstanding a few individual cases, the number of great Jewish capitalists [in the Pale of Settlement] is small, and that the majority of the Jewish manufacturers are people of moderate means" (p. 541). Since only relatively wealthy individuals, regardless of their background, could become members of the first guild and establish corporations, these are the "individual cases" that we focus on in this paper.

Despite the unfavorable legal status of the Pale of Settlement, where Jewish entrepreneurs accumulated capital initially, its geographic proximity to Western Europe was advantageous: "Non-Russian merchants not only reaped commercial and investment advantages from their close and constant contact with foreigners in the ports and frontier towns but also benefited from easy access to Western technology and know-how" (Rieber, 1982, p. 75).[10] Kahan (1983) argues that foreign trade was one of the major sources of Jewish capital, at least in the first half of the nineteenth century (p. 108). External

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and second-guild members were able to obtain an honorable citizen (*pochetnyi grazhdanin*) status, which also gave the path to legal residence outside the Pale.

[9] As quoted in Ulianova (2010, pp. 324–325).

[10] We explore whether Jewish-owned factories were indeed more productive below.

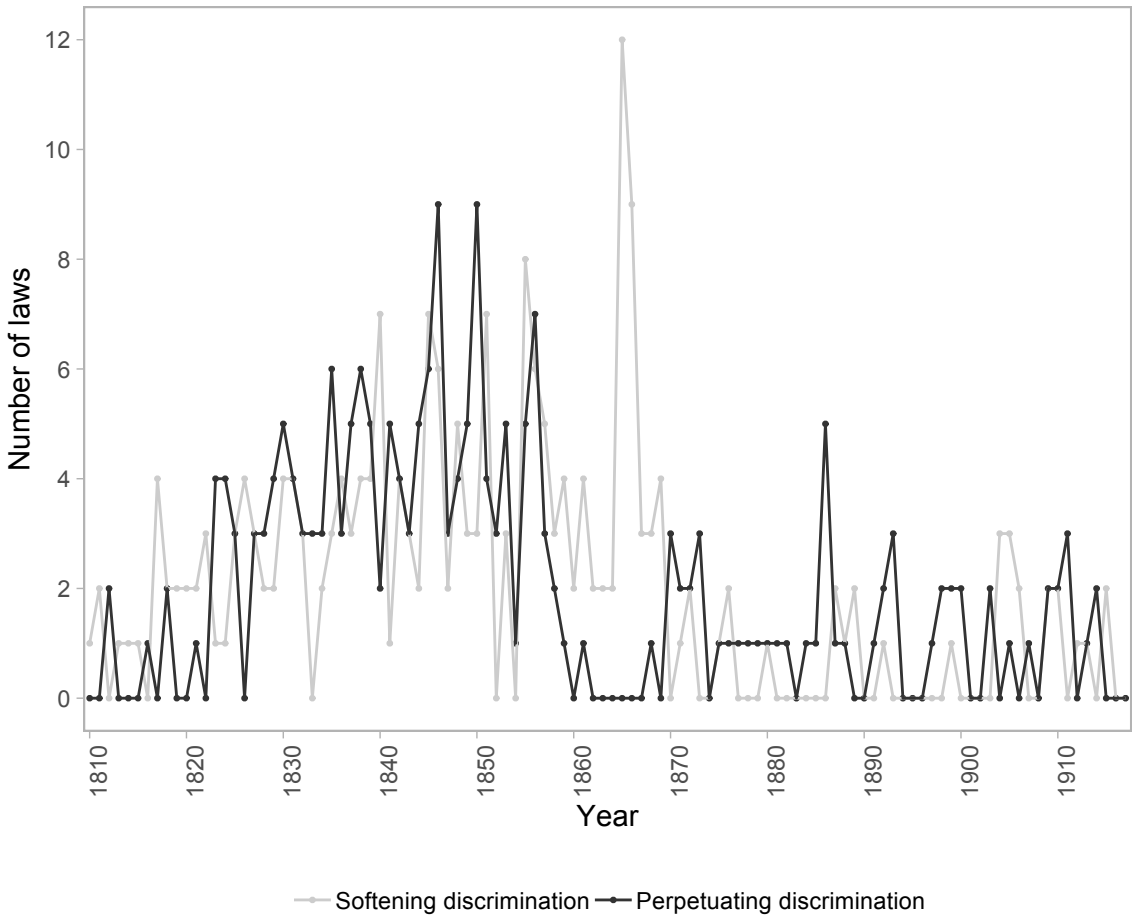

Figure 2.5: Laws concerning the status of Jews, passed by different branches of the central government between 1810 and 1917. The plot is constructed based on the information in Table 1 in Raskin (1993).

financing was also crucial:

> [T]he Jewish banks made a special effort to attract savings from non-Jews and to borrow from Jewish banks abroad […] the banks were capable of paying high interest and dividends and their connections with the Jewish banks in Germany and later in France, resulted in capital imports and transfers to Russia. (Kahan, 1983, p. 110)

Over time, Jewish banking grew so important for attracting foreign capital that in 1913 Trade and Manufacture Minister Sergei Timashev warned of the possible harmful impact of anti-Jewish discrimination:

> [B]anning Jews from boards of directors would be quite harmful as corporations not only would be able to attract less Jewish capital […] but less foreign capital as well. The latter is invested in our manufacturing sector not directly but via private banks, whose directors, in many cases, are Jews. Therefore, prohibiting Jews to oversee individual corporations [in the capacity of members of boards of directors] would decrease foreign capital attracted by the affected corporations. (Quoted in Shepelev, 1987, p. 206)

Historians have pointed out that entrepreneurial activity of Jewish capitalists was not confined to few industries, both in the Pale and beyond (Rubinow, 1975; Kahan, 1983).[11]

2.2.3.3 Jewish Entrepreneurs in Moscow

To illustrate the complex relations between the central government, local authorities, and Jewish entrepreneurs, we consider the case of Moscow in the 1890s.

In 1891–1905, the governor general of the Moscow region was Grand Duke Sergei Alexandrovich, who was the brother of Tsar Alexander III and uncle of his successor, Nicholas II. Historians have argued that, unlike his predecessor, Sergei Aleksandrovich had strong prejudice against Jews (Aizenberg, 2003, p. 337). Shortly after taking office, in 1891–1892, the general governor issued a decree

[11] "One could have encountered them at the oil wells of Baku, in the gold mines of Siberia, on the fisheries of the Volga or Amur, in the shipping lines on the Dnepr, in the forests of Briansk, on railroad construction sites anywhere in European or Asiatic Russia, on cotton plantations in Central Asia, and so forth" (Kahan, 1983, p. 111).

that prohibited Jewish artisans from residing in the Moscow region. By some estimates, 86% of Jews were expelled from Moscow over the course of few months (Aizenberg, 2003, p. 338). Jewish guild merchants, including owners of factories and corporations, were allowed to stay. Moreover, during the 1890s the number of Jewish merchants in Moscow's first guild increased steadily, reaching 267 (30%) in 1898. Supported by Russian guild members who feared the growing (albeit exaggerated) influence of Jews, in 1899 the Moscow general governor lobbied the tsarist government to impose a 33% cap on Jewish membership in the first guild (Aizenberg, 2003, p. 354). This restriction remained in place until the 1917 Revolution.

2.2.3.4 Anti-Jewish Clauses in Corporate Charters

Jews that moved from the Pale to the "interior" provinces of Russia following the liberalization in 1859 "met with the resistance of entrenched economic interests. […] There were indeed complaints about the new ways of doing business introduced by the Jews, which did not sit well with old regulated forms of trade stemming from a corporate organization and many local regulations against the Jews applied" (Löwe, 1993, p. 58).

Starting from 1890, upon approval by the government, certain corporate charters received additional clauses that restricted management and ownership of the respective companies and their property by Jews. Even if such clauses did not ban Jews altogether, they often made their participation economically meaningless. For example, e.g., if a textile company owned by Jews was not allowed to purchase or lease property in rural and/or cotton-growing areas, it could not successfully compete against corporations that did not face such restrictions. The first charter issued with such discriminatory clauses was that of the Zarozhan Mfg. Co. (1890), headquartered in Odessa. It said, "Jews can be neither shareholders, nor members of the Board of Directors, nor real estate managers. This condition must be indicated on the shares" (as quoted in Levin, 1902, p. 223).

Not all Jewish entrepreneurs faced discrimination. Wealthiest entrepreneurs, such as Goratsii Günzburg, were creditors to the Tsar and were granted a nobility status.

2.3 Construction of the Dataset[12]

2.3.1 Incorporations and Restrictions

Our main data source on corporations is the RUSCORP database (Owen, 1992), which contains information on firms whose charters were accepted by the Ministry of Finance. The "legislative" nature of each corporate charter is reflected in the fact that it was eventually published in the Complete Collection of Laws (*Polnoe sobranie zakonov Rossiiskoi Imperii*). These charters record characteristics of corporations at inception, such as the amount of basic capital; their functions; restrictions, if any, on their operations; basic information on their founders. While the compiler of the RUSCORP himself acknowledges that distinguishing new corporations from re-chartered ones may be challenging (and in our experience we have identified corporations that received charters but are not included in the RUSCORP),[13] this database has been used as the main reference in the literature (Hillmann and Aven, 2011; Gregg and Nafziger, 2017; Gregg, 2018).

The RUSCORP also codes anti-Jewish restrictions contained in corporate charters (the variables PROP, OWN, and MAN), albeit using this information poses certain challenges. The first is that restrictions against Jews and foreigners, though possibly different in nature, were not clearly separated when assigning the codes.[14] Second, Owen (1992) notes that PROP and OWN "often appear in charters in an inverse relationship to one another" (Codebook, p. 5). In the database itself, they *always* do, which we believe is an artifact of compilation and does not necessarily reflect the nature of the historical administrative process. Third, with the exception of Turkestan, the RUSCORP fails to specify whether restrictions in a certain area or industry were idiosyncratic (i.e., Jews had full legal rights otherwise) or whether a given corporation was discriminated according to general legislation. Fourth, by comparing records in the RUSCORP and actual charters we have detected coding errors.[15]

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[12] See Appendix for the full list of data sources.

[13] Some of these corporations are listed in Levin (1902).

[14] Additionally, the OWN variable in the database contains restrictions with code 7, which is not mentioned in the Codebook.

[15] For instance, the Kerting Bros. Machinery Co. (1904) would have been coded as having no anti-Jewish capital restrictions according to the RUSCORP. However, the note to paragraph 3 of the charter says that Jews and foreigners cannot own or lease property in certain areas. The charter can be accessed at https://dlib.rsl.ru/viewer/01004732097.

Given these challenges, our preferred source on anti-Jewish restrictions is Levin (1902), who lists all corporations that were created by July 1902 and whose charters contained discriminatory clauses. Despite the shorter time span (the RUSCORP extends to 1913), the information provided in Levin (1902) is more complete and less ambiguous for our purposes. Levin (1902) classifies all charters by three groups. The first one includes corporations whose charters had unconditional restrictions against Jews regardless of where a given corporation operated. Those were restrictions that did not allow Jews to be managing directors, and, in most cases, shareholders as well. The second category includes certain corporations in the Pale of Settlement, in which Jews could not be shareholders and managing directors. The last category includes those corporations that allowed Jewish ownership but could not purchase property in the Pale of Settlement.

For the sake of comparison, we collapse all three types of restrictions from Levin (1902)[16] and the variables PROP, OWN, and MAN from the RUSCORP with at least some reference to Jews (see Figure 2.6). In what follows, we use what Levin codes as restrictions of the "first type" as our outcome variable. Figure 2.7 shows the intensity of these restrictions by province. As one can see, in some provinces more than half of all new corporate charters contained anti-Jewish clauses, while in others discrimination was absent.[17]

[16]Excluding the ones applied retrospectively, which are missing in the RUSCORP.

[17]It should be noted that Figure 2.7 does not reflect the significant variation in the total number of all incorporations across provinces.

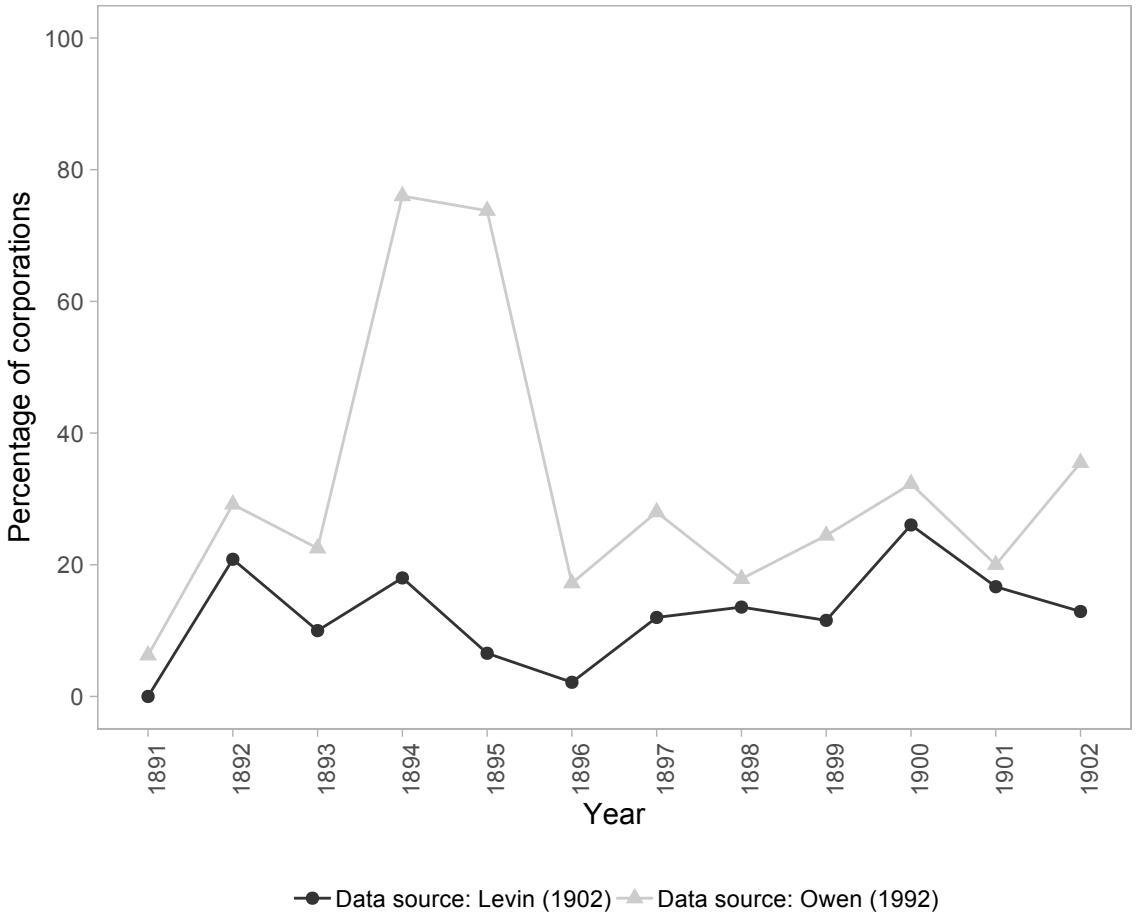

Figure 2.6: Capital restrictions against Jews (all incorporations)

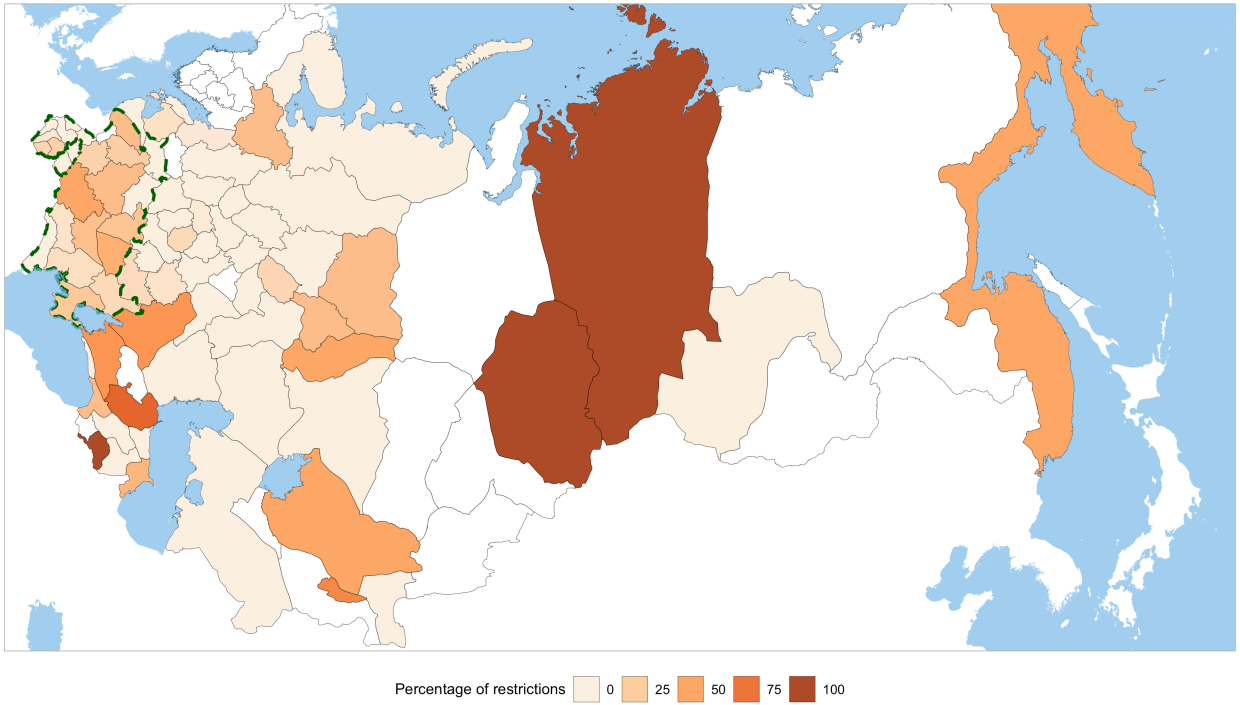

Figure 2.7: Capital restrictions against Jews by province in 1891–1902. Source of the incorporations data: Owen (1992). Source of the restrictions data: Levin (1902). The white color indicates zero incorporations during 1891–1902. The dashed green line displays the border of the Pale of Jewish Settlement.

2.3.2 Stock Returns

To test whether the change in government policy was expected by the market, we use the database on the prices of stocks traded at the St. Petersburg Stock Exchange in 1865–1913 assembled by Goetzmann and Huang (2018). We have calculated monthly returns (for two consecutive months), as well as annual returns (the average of monthly returns in a given year). We have merged the stock returns data with the RUSCORP using corporations' names. The resulting number of the matched corporations is 155. We use this data to test whether the stocks of corporations owned by Jews differentially underperformed after 1890, which would imply that the stock market did not expect the change in government policy (otherwise, the stock prices would have adjusted prior to the shock, and we would see no differential performance after 1890).

2.3.3 Factories and Industries

Our main source on industry-level variables is Orlov (1894), who compiled official data from the Department of Trade and Manufacture (Ministry of Finance) for the year 1890. Using Orlov (1894), we have collected information on all factories in European Russia and manually classified them by 3-digit SIC (Standard Industrial Classification) industries.[18] Exclusion of the so-called miscellaneous industries,[19] which are too broad to be meaningful, restricts our sample to 85 and 19313 factories. Of these, we further exclude the industries where there were no incorporations between 1891 and 1902 (according to the RUSCORP), as well as the factories lacking the information on machine power and/or the number of workers. The resulting sample that we use in the main part of our analysis includes 73.

For each industry, we measure capital intensity as the ratio of total horsepower (almost exclusively, steam engine power) and the total number of workers. Ideally, to measure capital intensity, we would prefer to use the ratio of aggregate capital and aggregate wages. To the best of our knowledge, there is no reliable data that goes back to the nineteenth century that would allow us to calculate such measures—not only for the Russian manufacturing sector, but also for industries in Western Europe and North America. Great Britain, for example, conducted its first Census of Production in 1907. The

[18] Use of 3-digit SIC codes is common in the literature (e.g., Atack et al., 2008).

[19] They have the SIC codes of the form "XX99."

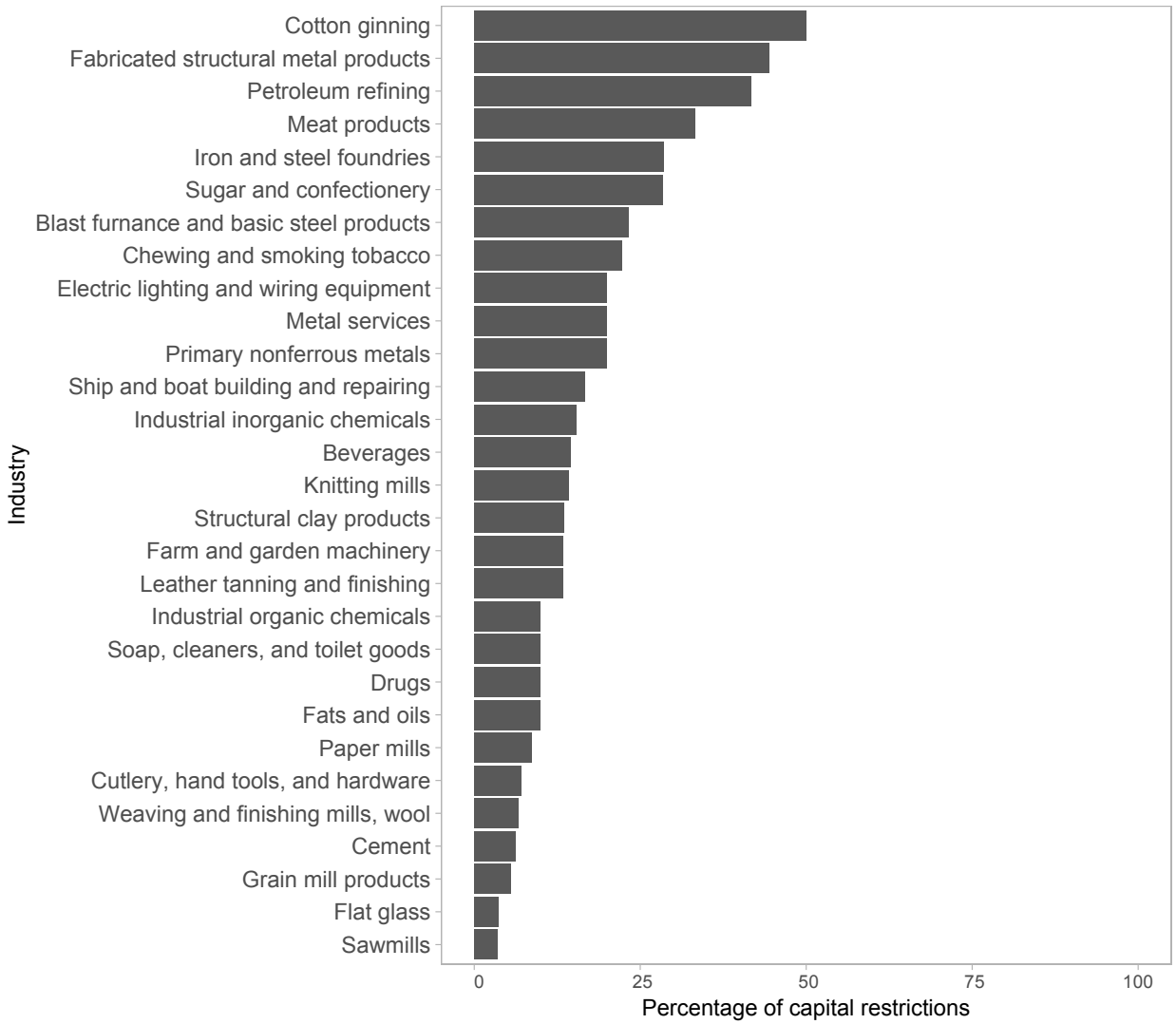

Figure 2.8: Capital restrictions against Jews by industry (percentage of corporations with discriminatory clauses in charters)

U.S. Census of Manufacturers was first carried out in 1850, and it reported the aggregate capital used until 1919. In the subsequent years this information was not provided because that it was "so defective as to be of little value except as indicating very general conditions. […] While there are some establishments whose accounting systems are such that an accurate return for capital could be made, this is not true of the great majority, and the figures, therefore, do not show the actual amount of capital invested" (Flux, 1924, p. 356).

We acknowledge the possible weakness of our measure of capital intensity, namely that the differential adoption of steam engines across industries can reflect the differences in the production process (technological level) rather than capital intensity per se.[20] Somewhat reassuringly, using the 1850–1880 U.S. Census of Manufacturers data, Atack et al. (2008) find a strong correlation between capital intensity and the percent of factories using steam or water power.

We deflate all the money variables (output in rubles, the amount of basic capital) to the 1913 level using the price index in Strumilin (1954).

Table 2.2: Summary statistics: Incorporated factories

Statistic	N	Mean	Median	St. Dev.	Min	Max
Revenue, ths of 1913 rub	457	1,646.93	740.74	2,564.41	2.68	20,148.15
Number of workers	457	661.63	342	1,265.64	2	17,252
Presence of a steam engine	457	0.89	1	0.31	0	1
Horsepower	457	255.26	91	673.26	0	6,952
Revenue per worker	457	4.29	1.94	16.28	0.09	325.93
Horsepower per worker	457	0.40	0.26	0.49	0.00	3.40
Jewish founder	410	1.14	1.00	0.35	1.00	2.00
Foreign founder	410	1.39	1.00	0.49	1.00	2.00
Joint-stock company	410	1.20	1.00	0.40	1.00	2.00
High-status founder	410	1.26	1.00	0.44	1.00	2.00

2.3.3.1 Comparison with the U.S. Census of Manufacturers

To cross-validate our measure of capital intensity, we use the information on fixed assets, wages paid, and the number of workers in each industry from the 1890 U.S. Census of Manufacturers. We code

[20] E.g., Franck and Galor (2017) use the adoption of steam engines in France in the late nineteenth century as a measure of technological progress.

Table 2.3: Summary statistics: Industries

Statistic	N	Mean	Median	St. Dev.	Min	Max
Number of factories	73	235.67	46	588.16	1	3,799
Total output, ths of 1913 rub	73	22,525.47	4,122.11	52,903.56	48.89	285,243.60
Number of workers, total	73	11,562.84	2,585	25,465.17	32	157,433
Horsepower, total	73	3,386.14	382	9,020.76	0	57,335
Capital intensity (horsepower per worker)	73	0.28	0.15	0.37	0.00	2.06

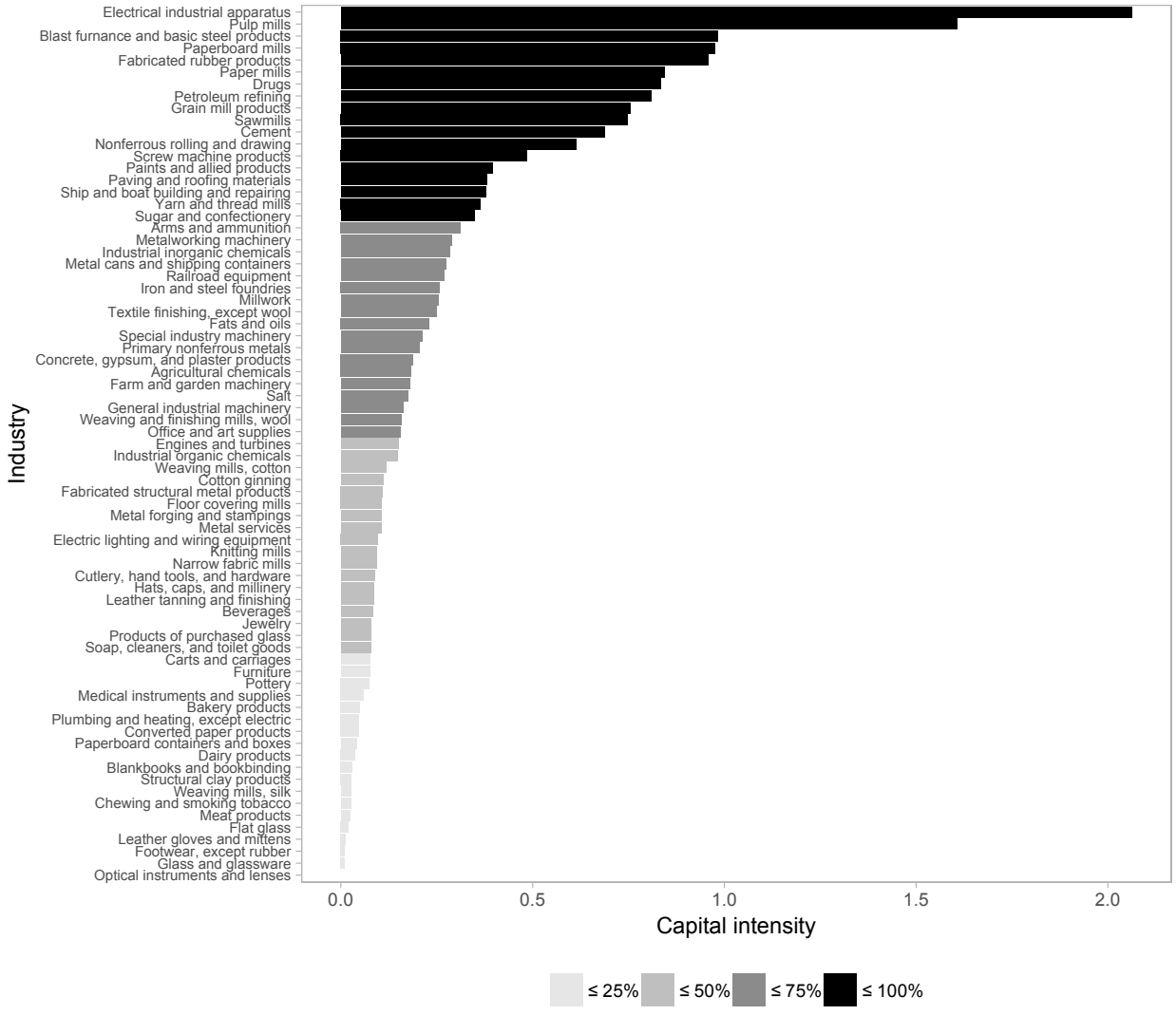

Figure 2.9: Capital intensity by industry (horsepower per worker, grouped by quartiles)

Table 2.4: Cross-validation of the capital intensity measure

	Horsepower per worker	Fixed assets per $1 of wages	Fixed assets per worker
Capital Intensity, Russia	0.54	0.33	0.33

Notes:
This table displays correlations between the capital intensity measure we calculate for Russian industries using Orlov (1894), and analogous measures for U.S. industries, calculated using the data from the 1890 Census of Manufacturers.

the U.S. industries using the same industrial classification as in Russia's case. Because of the way the data was aggregated and reported in the Census, we are not able to match a number of industries.[21]

We expect the measures of capital intensity for the U.S. and Russian industries to be positively correlated. Table 2.4 suggests that there is indeed a positive, if modest, correlation. Unsurprisingly, the capital intensity index for the U.S. industries measured the same way—total horsepower per worker—has the highest correlation (0.54). The correlation of our index for Russian industries with the ratio of fixed assets and total wages is 0.33 (in the U.S. data, this correlation equals 0.49).

2.3.4 Founders

We match founders from the RUSCORP database by their first, last, and middle names and dates of incorporation (i.e., we ensure that the time span between the creation of a pair of corporations by the same individual is not too large). For the manufacturing and banking sectors, we have identified 7,052 unique founders (out of 8,639). Overall, 66 percent of corporations had more than one founder. There is one instance when a corporation had 77 shareholders, but on average there were roughly 3 founders per corporation. This pattern is not surprising, since only 155 corporations had their shares publicly traded at the St. Petersburg stock exchange. According to the RUSCORP data on corporations founded between 1835 and 1913, the proportion of female founders was 6 percent. 11 percent of founders were Jewish.

[21] Unfortunately, disaggregated data from the 1890 Census no longer exists because it was destroyed by a fire in 1921.

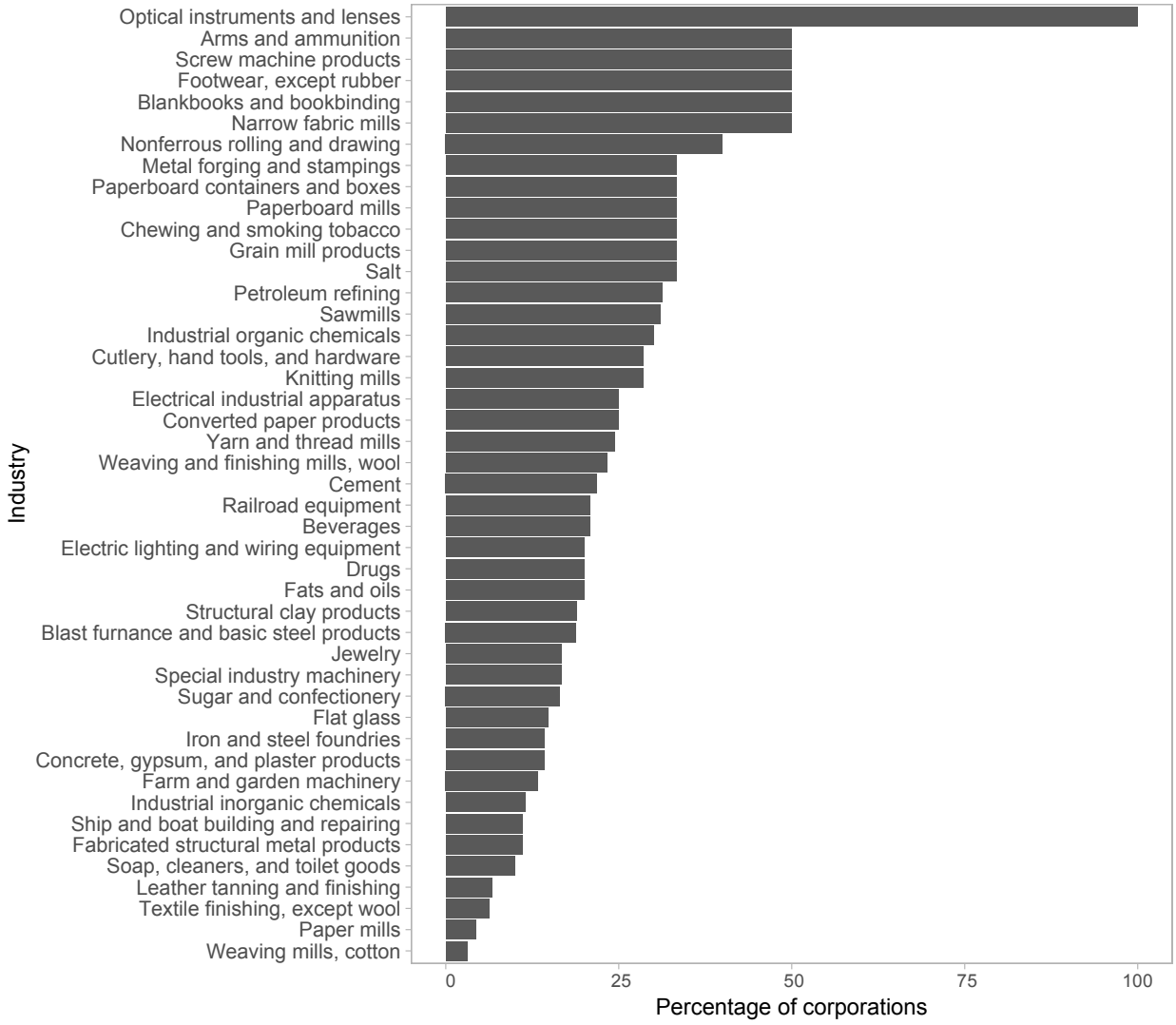

Figure 2.10: Jewish founders by industry (percentage of corporations with at least one Jewish founder)

Table 2.5: Summary statistics: Manufacturing corporations (new charters), 1891–1902

Statistic	N	Mean	St. Dev.	Min	Max
Capital restrictions against Jews (Owen)	936	0.30	0.46	0	1
Capital restrictions against Jews (Levin)	936	0.13	0.33	0	1
Industry with an excise tax	936	0.23	0.42	0	1
Inside the Pale	936	0.43	0.50	0	1
Joint-stock company	936	0.68	0.47	0	1
New enterprise	936	0.29	0.45	0	1
Basic capital, ths of 1913 rubles	936	1,464.59	2,333.10	124.53	27,742.75
Foreign founder	936	0.18	0.38	0	1
High-status founder	936	0.23	0.42	0	1
Jewish founder	936	0.18	0.39	0	1
Founder banker (matched founders only)	910	0.04	0.18	0.00	1.00

2.3.5 Guild Members

Traditionally, members of merchant guilds constituted a separate privileged estate. However, by the 1890s, the status of a guild member ceased to be hereditary and was instead an instrument of fiscal and administrative control. All owners of factories, that had steam-powered machinery or employed more than sixteen workers, had to obtain a first- or second-guild certificate (Owen, 1991, p. 61). To become a member of either guild, one was not required to obtain permission of other guild members—only to purchase a certificate (i.e., pay an annual membership fee), the cost of which varied by location. Such location was defined as the place the corresponding business activity took place. First-guild certificates were more expensive but they also allowed their holders to run larger businesses. If one's total annual production exceeded 15,000 rubles, or if he or she engaged in wholesale trade, purchase of a first-guild certificate was required.

We have collected data on all members of the first and second merchant guilds (as of 1890) in three major commercial and industrial centers of the Empire—St. Petersburg, Moscow, and Odessa—11,172 in total. We are not aware of similar data sources for other cities around 1890. While by necessity we omit other important centers, such as Kiev, Riga, and Warsaw, we believe that this only affects the interpretation (external validity) of our analysis and not internal validity.[22] Also, due to the capitals'

[22] With more than one million inhabitants according to the 1897 Imperial Census, St. Petersburg and Moscow were the two largest cities. Warsaw was the third-largest city (684,000), Odessa fourth (404,000), Riga sixth (282,000), Kiev seventh (248,000).

disproportionately large economic and political role, many merchants residing elsewhere sought to join the first and second merchant guilds of St. Petersburg and Moscow. 6 percent of all merchants were Jewish.

2.4 Empirical Analysis and Discussion

2.4.1 Hypotheses and Empirical Strategy

We expect a positive relationship between an industry's capital intensity and the probability of anti-Jewish capital restrictions in that industry in the aftermath of the change in government policy, which we define as the period from 1891 onward. While the government began repurchasing shares in railroad corporations and converting government bonds earlier, we do not expect these measure to have taken full effect until later in the 1890s, not least because the incorporation process was time-consuming. The first recorded charters with anti-Jewish clauses—three in total—are dated 1890, and we drop them from analysis. Additionally, we are only able to measure capital intensity as of 1890.

Because the timing of our "treatment"—increased investment activity in response to the abrupt change in government policy—coincides with the beginning of anti-Jewish restrictions, we are not able to use a differences-in-differences framework and to control for the unobserved time-invariant characteristics of industries.[23] Instead, we rely on identifying variation at the *firm* level.

In each cross-section, all incorporations were either existing establishments (factories) or new enterprises. The former could rely on cash flow from operations and were less dependent on external finance than new enterprises. Conditional on that they *already* operated in the market, they were a lesser threat to their competitors than entrants. Additionally, all else equal, owners of existing factories likely had greater political weight. Therefore, we expect that discrimination against corporations that were new enterprises was more frequent. We test this proposition using a pooled probit model with year fixed effects.

[23] In other words, the left-hand side part would be zero for all industries before 1890.

2.4.2 Stock Returns

Using the St. Petersburg Stock Exchange data, we estimate the following process for stock returns:

$$\begin{aligned} R_{ijmrt} = \beta_1 JewishFounder_{ijrt} + \beta_2 JewishFounder_{ijrt} \times PostShock_{mt} \\ + \gamma' x_{ijrt} + \delta_j + \psi_m + \xi_t + \nu_r + \epsilon_{ijmrt}, \end{aligned} \tag{2.1}$$

where m is month, t year, j industry, i corporation, r region. R_{ijmrt} are stock returns. $JewishFounder_{ijrt}$ is the indicator variable equal to one if one of the i-th corporation founders was Jewish (based on the RUSCORP data). $PostShock_{mt}$ is the indicator variable equal to one after January 1890, when we observe the first anti-Jewish restriction in the charters data. The corporation-level characteristics we control for, x, are whether the corporation i has a high-status founder (a nobleman or senior official), a Jewish founder, or a foreign founder. δ_j, ψ_m, ξ_t, and ν_r are the full sets of fixed effects: industry, month, year, and region. Region fixed effects roughly control for market access, based on the geographic location of a corporation's operations (from the RUSCORP).[24] We cluster the standard errors at the corporation level.

We test whether stock returns of corporations owned by Jews outperformed stock returns of other corporations before 1890 but underperformed after. The estimation results are presented in Table 2.6. The empirical pattern we observe is consistent with the explanation that the market did not expect discrimination against Jewish entrepreneurs prior to the change in government policy. Corporations with Jewish founders had higher stock returns before 1890 and lower returns after 1890, and the pattern holds both for the monthly and annual data.[25]

We cannot estimate a more sophisticated model—with a separate process for volatility of stock returns—because of the highly unbalanced nature of the panel. Another caveat is that we can only calculate returns for the stocks traded at the St. Petersburg Stock Exchange due to the data availability. Therefore, the results in Table 2.6 should be viewed as suggestive.

[24] The region is an aggregate variable equal to one of the following categories: the Central region, West, North, South, Baltic, Volga-Ural, Poland, Finland, Siberia, and Caucasus. An additional category, defined in the RUSCORP as the "entire Empire," is for corporations that operated in all regions.

[25] We use annualized returns to address the high volatility of monthly returns.

Table 2.6: Stock returns at the St. Petersburg Stock Exchange do not predict capital restrictions against Jews pre-1890

	Dependent variable: Stock return			
	Monthly		Annual	
	(1)	(2)	(3)	(4)
Jewish founder	0.279*	1.220***	0.186	1.096***
	(0.148)	(0.207)	(0.210)	(0.287)
Jewish founder × Post-1890		−1.070***		−1.153***
		(0.255)		(0.363)
Foreign founder	0.287**	0.308**	0.308	0.340*
	(0.135)	(0.129)	(0.197)	(0.194)
High-status founder	−0.151	−0.173	0.033	0.001
	(0.114)	(0.113)	(0.172)	(0.168)
Industry FE	✓	✓	✓	✓
Month FE	✓	✓		
Year FE	✓	✓	✓	✓
Region FE	✓	✓	✓	✓
Corporations	155	155	155	155
N	3,547	3,547	851	851
R^2	0.138	0.142	0.270	0.279

Notes:

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
Standard errors, clustered by corporation, in parentheses.
Monthly returns are based on two consecutive months.
Annual returns are averages across monthly returns.

2.4.3 Capital Intensity: Validity Check

As a next step, we investigate how accurately our measure of capital intensity reflects the underlying differences across industries. We use the following intuitive benchmark. We test whether a corporation's basic capital is correlated with capital intensity of its industry:

$$log(Basic\ capital)_{ijrt} = \beta CI_{jr,1890} + \gamma' x_{ijrt} + \lambda_t + \delta_r + \gamma_j + \epsilon_{ijrt}, \tag{2.2}$$

where $log(Basic\ capital)_{ijrt}$ is the basic capital of the corporation i (in 1913 rubles); $CI_{jr,1890}$ is capital intensity of the industry j in the region j in 1890; λ_t, δ_r, and γ_j are the full sets of year, region, and industry fixed effects; ϵ_{ijrt} is an unobserved error. Year fixed effects absorb common shocks, such as recessions. Similar to Equation (2.1), we control for corporation-level characteristics x_{ijrt}: whether the corporation i has a high-status founder (a nobleman or senior official), a Jewish founder, or a foreign founder. Controlling for social status is important because lobbying for restrictions could be more successful when the founder of the new firm had connections in the government. We cluster standard errors at the industry level.

Reassuringly, the results in Table 2.7 seem to be consistent with the notion that corporations in relatively high capital-intensive industries tend to have larger basic capital. Also, this relationship appears to be monotonic. In other words, our measure of physical capital—total horsepower per worker—predicts the amount of financial capital reasonably well. We estimate Equation (2.2) separately for all incorporations (models (1)–(2), Table 2.7) and for new corporations only (models (3)–(4), Table 2.7). In baseline models (1) and (3) we do not include region and industry fixed effects, since a corporation's location, as well as its choice of industry, may be endogenous. Including both region and industry fixed effects does not change our main result: capital intensity at the industry/region level remains positively correlated with basic capital.

Table 2.7: Measured capital intensity is correlated with financial capital

	Dependent variable: log(Basic capital)			
	All incorporations		New enterprises	
	(1)	(2)	(3)	(4)
Capital intensity	0.474***	0.362***	0.742**	0.643**
	(0.172)	(0.118)	(0.299)	(0.281)
Joint-stock company	0.375***	0.355***	0.534***	0.518***
	(0.066)	(0.087)	(0.166)	(0.186)
High-status founder	−0.133**	−0.051	0.039	0.153
	(0.055)	(0.061)	(0.141)	(0.153)
Jewish founder	0.309***	0.312***	0.517***	0.569***
	(0.107)	(0.099)	(0.190)	(0.173)
Foreign founder	0.052	0.034	−0.001	0.001
	(0.058)	(0.054)	(0.108)	(0.087)
Year FE	✓	✓	✓	✓
Region FE		✓		✓
Industries	73	73	73	73
Regions	11	11	11	11
N	936	936	269	269
R^2	0.154	0.239	0.264	0.362

Notes:

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
Standard errors, clustered by industries, in parentheses.
Basic capital is measured in thousands of 1913 rubles.

2.4.4 Capital Intensity: Probability of Restrictions

For corporation i formed in industry j, and year t, we estimate the following regression:

$$Pr(y_{ijt} = 1) = \Phi(\beta CI_{j,1890} + \gamma' x_{ijt} + \lambda_t). \tag{2.3}$$

Here, y_{ijrt} is a dummy that equals 1 if a capital restriction is imposed (the first category as classified in Levin, 1902, i.e., unconditional restrictions against Jews, regardless of where a corporation operated). $CI_{j,1890}$ is capital intensity of the industry j in the region j in 1890. We include a set of control variables at the industry j level, such as the size of the industry and whether this industry had an excise tax. For each corporation, we control for whether its headquarters were located in the Pale of Jewish Settlement, whether at least one of the founders had a noble status, and whether it was a joint-stock company. In addition, we include a dummy for whether at least one of the founders was also a founder of a bank,[26] which we use as a proxy for capital.

Table 2.8 displays the results of estimating Equation (2.3) using a probit model with year fixed effects. The standard errors are clustered at the industry level. The first panel (models (1) and (2)) in Table 2.8 shows the results for all incorporations. In the second panel (models (3) and (4)), we estimate Equation (2.3) using the subsample of new enterprises. In Figure 2.11, we plot predicted probabilities and conditional marginal effects of capital intensity for all incorporations (model (2)) and separately for new enterprises (model (4)), along with their 95% confidence intervals.

It is easy to see that Equation (2.3) is plagued by a selection problem: given the high procedural costs of incorporation, Jewish entrepreneurs could have rationally chosen not to incorporate if they anticipated being discriminated against. Also, discrimination may have had an *indirect* effect on Jews by deterring non-Jews from collaborating with them and thus decreasing the odds of successful incorporation.[27] In either case, selection would bias our estimates downwards; therefore, the findings we report here are conservative.

If a corporation increases its capital intensity from 0.08 (the lower 25th percentile of the capital

[26] Such overlap is possible because our main sample only includes manufacturing corporations.

[27] See Hillmann and Aven (2011) for suggestive evidence along these lines.

Table 2.8: Capital restrictions are relatively more common in more capital-intensive industries (manufacturing, 1891–1902)

	Dependent variable: Pr(Restriction against Jews=1)			
	All incorporations		New enterprises	
	(1)	(2)	(3)	(4)
Capital intensity	0.547**	0.569**	0.982**	0.979**
	(0.249)	(0.264)	(0.483)	(0.487)
Log(Industry size)	−0.037	−0.033	0.019	0.034
	(0.047)	(0.046)	(0.084)	(0.084)
Industry with an excise tax	0.904***	0.873***	0.699	0.562
	(0.205)	(0.208)	(0.458)	(0.474)
Inside the Pale	0.329***	0.324***	0.412	0.437
	(0.122)	(0.120)	(0.267)	(0.267)
Joint-stock company	−0.140	−0.169	−0.539*	−0.579
	(0.169)	(0.185)	(0.308)	(0.398)
High-status founder	0.169	0.189	0.176	0.294
	(0.156)	(0.160)	(0.272)	(0.298)
Founder banker		0.597**		0.654
		(0.292)		(0.574)
Pr(Y=1)	0.128	0.128	0.123	0.171
Year FE	✓	✓	✓	✓
Industries	73	73	47	47
N	936	910	269	263
Log Likelihood	−304.074	−286.081	−93.701	−87.761

Notes:

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
This table displays the maximum likelihood estimates for Equation (2.3).
Standard errors, clustered by industries, in parentheses.
For each industry, capital intensity is defined as horsepower per worker.

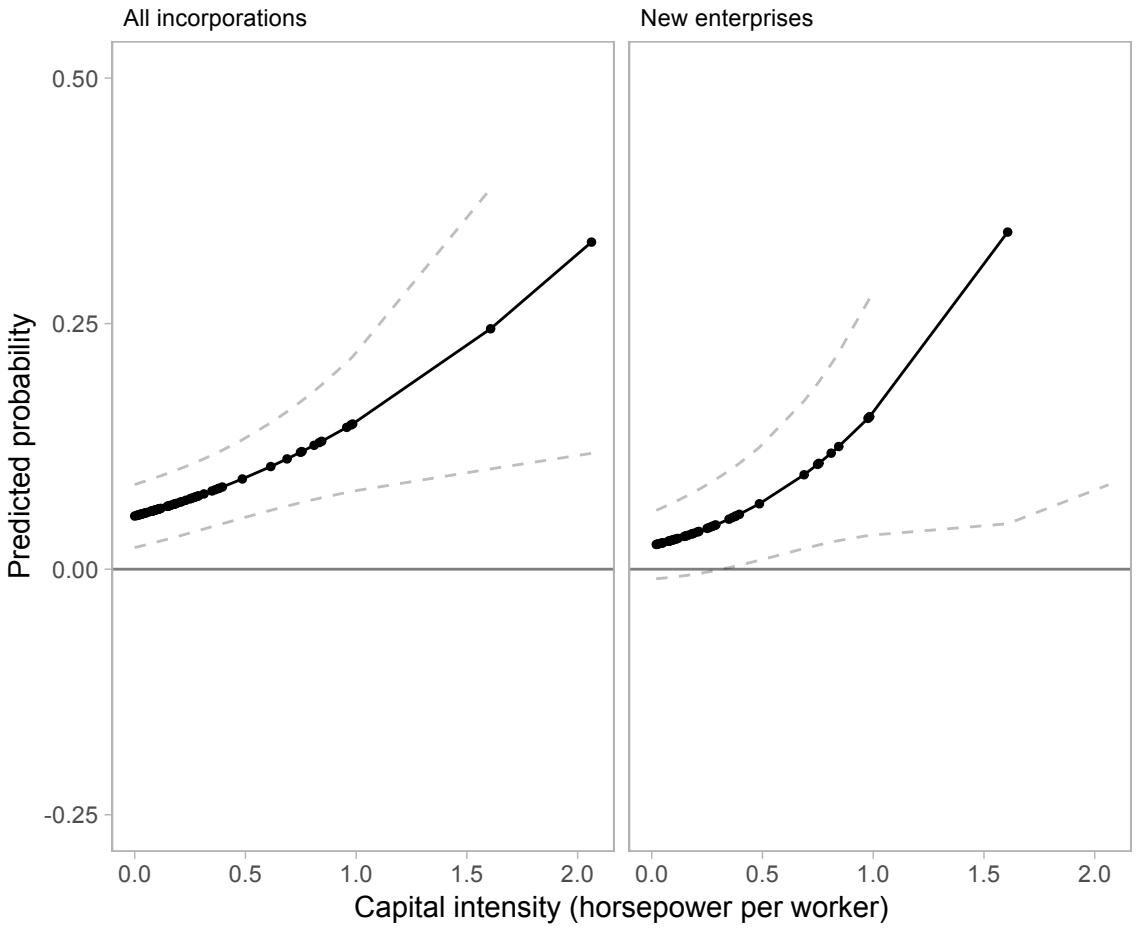

Figure 2.11: Predicted probabilities for capital intensity (models (2) and (4) in Table 2.8)

intensity distribution, i.e., low capital intensity) to 0.28 steam horsepower per capita (the upper 25th percentile of the distribution, i.e., high capital intensity), the predicted probability of a capital restriction increases roughly from 5.9 to 7.4 percent. The baseline probability of facing a capital restriction is 12.8 percent (model (2) in Table 2.8), therefore, the 1.5 p.p. increase is a substantively large effect. The risk of anti-Jewish restrictions in a high capital-intensive industry was almost 11.7 percent higher than in a low capital-intensive industry.

Whether a given industry had an excise tax could be an important confounding factor, at least as far as the government's interests are concerned. There are three such industries: production of wine, tobacco, and sugar. On the one hand, the government may have favored the creation of monopolies and therefore sought to limit competition. In the wine industry, the government introduced its own monopoly in 1894. In the sugar industry, producers formed a formal government-approved syndicate

in 1895. The tobacco industry was highly concentrated in the late 1890s, although the formal syndicate was only formed in 1914. On the other hand, the stream of excise tax revenues should have remained high enough, therefore, it was in the government's industry to facilitate industrial growth by allowing Jews to invest and create corporations. Which consideration prevailed is ultimately an empirical question. For model (2) in Table 2.8, the average marginal effect of moving from an industry without an excise tax to an industry with an excise tax is 15 p.p. (10 p.p. for model (4)). The average marginal effect of having a founder who was also a founder of a bank is 10 p.p. in model (2) and 12 p.p. in model (4). Combined, these patterns are consistent with the notion that non-Jewish entrepreneurs sought to limit inflow of capital into their industries.

2.4.5 Factory Productivity

An alternative explanation for the mechanism of discrimination we suggest could be that factories owned by Jews were more productive, and therefore Jewish entrepreneurs threatened their competitors on the market. Higher productivity could stem from superior technology or better management practices, which would be consistent with certain historical accounts of Jewish entrepreneurs and entrepreneurs from other minority backgrounds, such as Germans and Poles (Rieber, 1982; Owen, 1991). We believe that was not the case. If anti-Jewish capital restrictions had been due to the differences in productivity alone, they would have been in place before 1890, unless non-Jewish entrepreneurs experienced a "catch-up" around 1890.

For a subsample of incorporated factories, i.e., those that were property of corporations, we can test this proposition explicitly thanks to the information on founders' ethnicity in the RUSCORP. By merging our main factory dataset with the RUSCORP, we identify 457 factories that belonged to 321 unique corporations (some corporations owned multiple factories). Although incorporated factories were not representative—they were, on average, larger and more productive (Gregg, 2018)—the richer information on such factories allows us to test hypotheses that would be difficult to test otherwise. Additionally, this bias would strengthen our previous results if we were to find that incorporated factories owned by Jews were no more productive than those owned by non-Jews.

We estimate the following equation:

$$log(Productivity_{pij}) = \alpha + \beta JewishFounder_{ij} + x'_{ij}\delta + \epsilon_{ij}, \tag{2.4}$$

where factory p is owned by corporation i in industry j; x_{ij} is the vector of control variables. We cluster standard errors by corporations, since one corporation could own several factories in the same industry.

First, following Gregg (2018), we use revenue per unit of labor as a proxy for a factory's productivity. We also calculate firm-level productivity as total factor productivity of revenue (TFPR), based on the approach in Hsieh and Klenow (2009). Under the assumption of the Cobb-Douglas production technology in each industry, TFPR can be calculated as follows:

$$TFPR_{pij} \approx (MRPK_{pij})^{\alpha_j} (MRPL_{pij})^{1-\alpha_j}, \tag{2.5}$$

where $MRPK$ is a marginal product of capital, $MRPL$ is a marginal product of labor.

Finally, following Franck and Galor (2017), we use horsepower per worker as another proxy for advanced technology (48 factories out of 457 did not have a steam engine).

If the alternative explanation about the superior business practices and higher productivity of Jewish entrepreneurs holds, we should observe a positive effect of having at least one Jewish founder on the factory's productivity. The results in Table 2.9 suggest that factories owned by Jews had similar productivity in 1890 compared to the productivity of the factories owned by non-Jews (in terms of revenuer per worker and horsepower per worker). The only statistically significant difference in productivity that we find is for the TFPR measure. We can see in Table 2.9 that for TFPR the effect goes in the opposite direction: productivity in 1890 was lower for factories owned by Jews compared to factories owned by non-Jews.

Table 2.9: Differential factory productivity by owners' ethnicity (incorporated factories sample, 1890)

	TFPR	Revenue per worker	Horsepower per worker
	(1)	(2)	(3)
Jewish founder	−0.255**	−0.178	−0.056
	(0.117)	(0.124)	(0.050)
Foreign founder	−0.188**	0.056	0.127***
	(0.091)	(0.086)	(0.035)
Joint-stock company	0.185*	0.220**	0.185***
	(0.106)	(0.105)	(0.042)
High-status founder	0.032	0.058	0.085**
	(0.102)	(0.099)	(0.040)
Constant	1.474***	1.558***	0.255***
	(0.063)	(0.060)	(0.024)
N	297	410	410
Adjusted R^2	0.029	0.007	0.084

Notes:

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
Standard errors, clustered by corporations, in parentheses.
Revenue per worker is the total annual output (in 1913 rubles) per worker.
We use the inverse hyperbolic sine transformation of the dependent variable.

2.4.6 Guild Members: Decision to Incorporate

We examine the decision to create a corporation at the individual level estimating the following equation:

$$Pr(y_{ijt} = 1) = \sum_{T=-6}^{4} \beta_T Jewish_{ij} \times \mathrm{I}\{t = T\} + \delta_i + \lambda_t + \psi_j t + \epsilon_{ijt}, \tag{2.6}$$

where δ_i and λ_t are the sets of individual (merchant-specific) and time fixed effects. $Jewish_{ij}$ is the dummy variable whether the *i*th merchant in the *j*th city is Jewish. $\mathrm{I}\{t = T\}$ is the dummy variable for a 5-year interval in the period 1860–1913 (1885–1890 is a baseline 5-year period). We also add city-specific time trends, $\delta_i t$. If the discriminatory policies introduced by the tsarist government after 1890s had a deterrence effect on Jewish merchants, we expect to see negative coefficients β_T after 1890.

The results in Table 2.10 suggest that there is no evidence in favor of the deterrence effect: Jewish merchants were not less likely to incorporate compared to their non-Jewish competitors after the first anti-Jewish restriction was introduced in 1890. In fact, we observe the opposite effect: Jews were more likely to incorporate than non-Jews in 1860–1885, and even right after the restrictions were introduced, in 1895–1900. These results should be viewed as suggestive. The overall percentage of the merchants who incorporated during the period 1860–1913 is only 4.1 percent, therefore, if we look at the probability of incorporation for a given merchant over time it becomes an extremely rare event.

2.5 Conclusion

In the Russian Empire, the incorporation process was highly politicized. Starting from 1890, the Russian government selectively restricted investment and ownership of corporations by Jews. This paper explores the determinants of this discriminatory policy. We argue that the cross-industry variation in anti-Jewish restrictions can be explained by increased competition between Jewish and non-Jewish entrepreneurs in the capital market. Between 1889 and 1894, the government forcefully converted bonds and repurchased shares of railroad companies, decreasing the rate of return on the assets that were previously deemed as safe and attractive investments. As a result of this intervention, large amounts of private capital were freed and had to be reinvested elsewhere.

Table 2.10: Incorporation by merchants of the first and second guild

	Dependent variable: Pr(Incorporation=1)			
	All		First guild	Second guild
	(1)	(2)	(3)	(4)
Jewish × 1860–5	0.001*	0.001*	0.002*	0.0001***
	(0.0004)	(0.0004)	(0.001)	(0.00005)
Jewish × 1865–70	0.001*	0.001*	0.002**	−0.00003
	(0.0004)	(0.0004)	(0.001)	(0.0001)
Jewish × 1870–5	0.001	0.001	0.0002	0.002
	(0.001)	(0.001)	(0.002)	(0.002)
Jewish × 1875–80	0.002**	0.002**	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Jewish × 1880–5	0.002*	0.002*	0.005*	0.0004
	(0.001)	(0.001)	(0.003)	(0.001)
Jewish × 1890–5	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.001)
Jewish × 1895–1900	0.003**	0.003**	0.006*	0.003*
	(0.002)	(0.002)	(0.004)	(0.001)
Jewish × 1900–5	0.0001	0.0001	0.00003	0.0003
	(0.001)	(0.001)	(0.002)	(0.0005)
Jewish × 1905–10	0.001	0.001	0.002	0.0001
	(0.001)	(0.001)	(0.002)	(0.001)
Jewish × 1910–13	0.001	0.001	0.004	−0.00002
	(0.001)	(0.001)	(0.002)	(0.001)
Pr(Y=1)	0.000842	0.000842	0.00288	0.000585
Year, merchant FE	✓	✓	✓	✓
City-specific trends		✓		
Merchants	11,172	11,172	1,256	9,916
Merchants incorporated	415	415	139	276
N	603,288	603,288	67,824	535,464
Adjusted R^2	0.012	0.012	0.022	0.006

Notes:

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.
Standard errors, clustered by merchant, in parentheses.
The reference period is 1885–1890.

Using the St. Petersburg Stock Exchange data, we find that the capital market did not anticipate anti-Jewish discrimination that followed the shock. In particular, stocks of corporations founded by Jewish entrepreneurs outperformed the market before 1890 and underperformed after. Consistently with the argument that the tsarist government sought to limit influx of capital into certain industries, we find that anti-Jewish restrictions were more likely in more capital-intensive industries, as well as the industries with a special fiscal regime (production of wine, tobacco, and sugar). In addition, to define the pool of potential market entrants, we assemble novel datasets on members of major merchant guilds in 1890. We do not find evidence that Jewish entrepreneurs were overall less likely to incorporate after 1890. Finally, we do not find support for the hypothesis that anti-Jewish discrimination was driven by the differences in factory productivity between Jewish and non-Jewish entrepreneurs.

2.6 Appendix: Data Sources

2.6.1 Government Policy (Official and Unofficial Historiography)

Ministerstvo Finansov. 1802–1902. Chast' vtoraia [Ministry of Finance. 1802–1902. Part 2]. St. Petersburg: Ekspeditsiia zagotovleniia gosudarstvennykh bumag, 1902. Official publication of the Ministry of Finance of the Russian Empire.

Kislinskii, N. A. (1902). *Nasha noveishaia zheleznodorozhnaia politika po dokumentam arkhiva Komiteta Ministrov. Tom 3 [Our railroad policy, based on the archives of the Committee of Ministers. Vol. 3]*. St. Petersburg: Gosudarstvennaia tipografiia. Official publication of the Committee of Ministers of the Russian Empire.

Migulin, P. P. (1903). *Nasha noveishaia zheleznodorozhnaia politika i zheleznodorozhnye zaimy (1893–1902) [Our recent railroad policy and railroad bonds]*. Kharkov: Tipo-litografiia "Pechatnoe Delo."

2.6.2 Corporations

Owen, Thomas C. (1992). *RUSCORP: A Database of Corporations in the Russian Empire, 1700–1914. 3d release*. Ann Arbor, MI: Inter-University Consortium for Political and Social Research.

2.6.3 Anti-Jewish Restrictions, 1891–1902

Levin, E. B. (1902). *Sbornik ogranichitel'nykh zakonov i postanovlenii o evreiakh po 1-e iiulia 1902 goda [A Collection of Restrictive Laws and Decrees on the Jews as of July 1, 1902]*. St. Petersburg: Tipografiia M. M. Stasiulevicha.

2.6.4 Factories in 1890 (Russia)

Orlov, Petr Aleksandrovich (1894). *Ukazatel' fabrik i zavodov Evropeiiskoi Rossii [A Directory of Factories in European Russia]*. St. Petersburg: Tipografiia V. Kirshbauma.

2.6.5 Industries in 1890 (United States)

Department on the Interior, Census Office (1895). *Report on Manufacturing Industries in the United States at the Eleventh Census: 1890. Part I. Totals for States and Industries.* Washington, D.C.: Government Printing Office. Official publication.

2.6.6 Merchant Guilds in 1890

Adresnaia kniga odesskikh 1 i 2 gil'dii kuptsov. 1890–1891 [A Directory of Merchants of the First and Second Guild in Odessa. 1890–1891]. Odessa, 1890.

Spravochnaia kniga o litsakh, poluchivshikh na 1890 g. kupecheskie svidetel'stva po 1 i 2 gil'diiam v Moskve [A Directory of Individuals Who Obtained a Merchant Certificate of the First and Second Guild in Moscow as of 1890]. Moscow: Tipografiia A. G. Kol'chugina, 1890.

Spravochnaia kniga o litsakh sankt-peterburgskogo kupechestva i drugikh zvanii, poluchivshikh v techenie vremeni s 1 noiiabria 1889 po 1 fevralia 1890 g. svidetel'stva i bilety po 1 i 2 gil'diiam na pravo torgovli i promyslov [A Directory of St. Petersburg Merchants and Other Individuals Who Obtained a Merchant Certificate of the First and Second Guild Between November 1, 1889 and February 1, 1890]. St. Petersburg: Gosudarstvennaia tipografiia, 1890.

CHAPTER 3

Labor Mobility Restrictions and Urban Growth: Evidence from the Russian Empire

3.1 Introduction

"Understanding serfdom is …necessary if one wishes to understand divergence or convergence in the long-term growth performance of European societies" (Ogilvie and Carus, 2014, p. 483). In this paper, we focus on the direct, yet understudied, mechanism whereby serfdom may have affected economic development: restrictions on mobility of labor. In the Russian Empire, twenty-three million people, who were serfs in 1858 and were not allowed to move to cities, were freed in the following twelve years. Was removal of the mobility restrictions a major factor in the subsequent urban growth?

The answer to this question is theoretically ambiguous. Migration to a city is preferred to staying in the countryside if: 1) the wages in the urban sector are higher than in the agricultural sector; 2) the city is a generally more attractive place to live (e.g., due to access to higher-quality public goods); and 3) the transportation costs of moving are not too high. By imposing constraints on spatial allocation of labor over an extended period of time, serfdom may have affected all three factors. As a first step in our investigation, we develop a structural model of rural-urban migration, in which peasants face the following decision-making problem. They can stay in the countryside or move to one of the existing cities; serfs are only able to move after becoming free. In the model, moving to a particular city can be a preferable option because of the specific features of that city or because cities in general are more attractive to live in. Further, the cost of moving depends on the available modes of transportation. For every period, the model predicts the share of peasants leaving each location in the countryside and the total flow of migrants to each city. Out-migration from the countryside is (partly) compensated by the natural population growth.

We estimate this model using novel detailed data on peasants, cities, and railroads in the Russian Empire, covering the period from 1811 to 1910. Besides Russia proper, this data also includes the Kingdom of Poland and the Grand Duchy of Finland, autonomous regions within the Empire that had distinct historical institutions. The central part of out dataset is a balanced panel of 569 cities with fourteen cross-sections. Identification of the model's parameters hinges upon the observed changes in each city's population between consecutive time periods. The estimated parameters suggest that moving to cities was not advantageous to peasants in and of itself. Instead, the single most important factor explaining rural-urban migration was construction of railroads. This is likely because allocation of rural labor was not efficient historically, independently from the detrimental, yet relatively smaller, impact of serfdom. Our within-model calculations suggest that by 1910, the total urban population enabled by the railroad network was comparable to that in a counterfactual scenario in which serfdom never existed. By and large, our findings are consistent with Alexander Gerschenkron's seminal research on the economic development of the Russian Empire prior to World War I. He argued that, while abolition of serfdom was "an absolute prerequisite for industrialization," it did not begin until "the railroad building of the state assumed unprecedented proportions and became the main lever of a rapid industrialization policy" (1962, p. 19).[1]

Our results complement the existing empirical studies of coercive institutions in various historical contexts, from Latin America (Dell, 2010) to Europe (Acemoglu et al., 2011; Buggle and Nafziger, 2018; Markevich and Zhuravskaya, 2018) to Southeast Asia (Dell and Olken, 2018). Markevich and Zhuravskaya (2018) have argued that abolition of serfdom in the Russian Empire led to increased productivity of the agricultural sector due to improved incentives of peasants. Industrial output, measured at the aggregate level, has also increased. Another set of papers has documented persistence of the negative effects of coercive institutions long after they were abolished (Buggle and Nafziger, 2018; Dell, 2010). Among the channels of persistence, three have been highlighted: inferior provision of public goods (especially, transport infrastructure), low human capital accumulation, and path dependence due to agglomeration effects.[2]

[1] By 1913, Russia's railroad network became the second-largest in the world in terms of the total track length (The World Almanac and Encyclopedia, 1914, p. 213).

[2] Dell and Olken (2018) signify the importance of these channels for long-run development providing detailed micro-level evidence in the context of the Dutch colony in Java.

While these and other studies have investigated the effect of coercive institutions on urbanization, or outcomes that are typically associated with it (industrial output), to the best of our knowledge, constraints on labor mobility *as such* have not yet been examined. This is understandable given the analytical challenge faced by the researcher: how to define a relevant unit of measurement for individuals who, theoretically, could move anywhere? From a technical viewpoint, measuring coercive institutions at some pre-defined administrative (provincial, district) level or the level created by the researcher (e.g., cell grid) limits potential mobility of rural labor to the areas bounded by the borders of respective units. We believe that in this particular context, any choice of the level of measurement would be ad hoc and cannot be supported by theory. To illustrate the scope of this measurement problem, in the Russian Empire, according to the 1897 Imperial Census, just over half (53.3%) of all urban dwellers were born in the same district, with substantial geographic variation in the percentage of non-locally born (Rashin, 1956, pp. 131–132). This, in turn, could explain some of the ambiguous or null findings regarding the impact of abolition of serfdom (Buggle and Nafziger, 2018) and the seemingly unimportant role of mobility constraints for industrialization in Russia (Cheremukhin et al., 2017). In our empirical design, "effective" mobility restrictions are not defined by the chosen level of measurement but rather by the institutional features (serfdom) and transportation costs, i.e., the historical context itself.

The rest of the paper is organized as follows. In Section 3.2, we provide a brief historical background and discuss mobility restrictions that existed for various types of rural dwellers in the Russian Empire. In Section 3.3, we describe the data. In Section 3.4, we discuss a structural model of rural-urban migration, its estimation, and the main results, including counterfactual analysis. The final section concludes.

Geographic coverage Due to computational complexity of our model, which increases exponentially with geographic coverage, and limited data availability in some cases, we confine our analysis to the territory of European Russia, including the steppe part of the North Caucasus, Western Siberia (Tobolsk Province), Finland, and Poland. The remaining part of Western Siberia and entire Eastern Siberia, the mountainous part of the North Caucasus, Transcaucasia, and Central Asia are beyond the scope of the sections that follow.

3.2 Historical Background

3.2.1 Legal Restrictions on Rural-Urban Mobility

We study how serfdom affected rural-urban mobility. In doing so, we focus on the *legal* restrictions that differentially affected a particular social group, serfs, compared to other categories of rural dwellers. Straightforward as it may sound, empirical analysis of these restrictions poses certain conceptual and practical challenges. First, to a certain extent, almost all social groups in Russia faced movement restrictions. Therefore, we need to "scale" their severity according to a common benchmark. Second, serfdom was not brought about by a single decree or even a series of laws. As the Russian Empire gradually acquired new lands, it also absorbed local legal traditions and customs, including those governing coercive labor relations. The pre-existing laws in the new territories were not replaced but were rather "amended" by Russian law. In Russia itself, all existing laws were only systematized and organized by codes in 1832, when the first edition of the *Digest of Laws of the Russian Empire* (*Svod zakonov Rossiiskoi Imperii*) was issued. Some of the local variations of serfdom were not labeled as such by contemporaries, although we do include individuals governed by such institutions in our definition of serfs below.

To better understand how serfdom affected rural-urban mobility, it is worth discussing what it meant to be a "rural" and "urban" subject in the Russian Empire—from the perspective of subjects themselves, local authorities, and the central government. In the next two sections, we discuss the social relations in the Empire overall and in European Russia and Siberia in particular. After that, we turn to the periphery—Bessarabia, Finland, and Poland—and focus on the main differences in the treatment of rural dwellers in each region.

3.2.1.1 On the Social Structure in the Russian Empire

In general, the legal status of a Russian subject at any point in time depended on the estate (*soslovie*) they belonged to, as well as their *sostoianie*.[3] The estates in the Russian Empire roughly corresponded

[3] *Sostoianie* (plural: *sostoianiia*) literally means "state" in Russian, however, we do not translate it here to avoid collision with other meanings of the term. It should be noted that the discussion in this section is based on authors' reading of the *Digest of Laws of the Russian Empire*, in particular, the sections pertaining to the rights to movement. The compilers of

to the estates of the realm in Western Europe, with each having a "natural" set of privileges and obligations (nobles, merchants, peasants, etc.). Having a certain economic meaning at its inception, by the nineteenth century the system of estates evolved to a legal, or political, reality (Mironov, 2000). An individual's estate was generally transmitted by inheritance, but it could also be acquired through marriage or purchase of a certificate (for the urban estates).

On the other hand, the system of *sostoianiia* was peculiar to Russia. One's religious affiliation, the precedent of being included in a tax census in a certain location (or owning property there), and the type of land they lived in (state- or privately owned) were legally consequential for the individual's *sostoianie*. For instance, a Jewish urban dweller had a different *sostoianie* compared to his Christian counterpart residing in the same city, but their *sostoianie* would become the same if the former baptized. To provide another example, from a perspective of a state peasant, moving from a privately to state-owned land also meant a change in their *sostoianie*, even though the individual remained a member of the same estate (state peasantry).[4]

Rural dwellers (*sel'skie obyvateli*) were represented by two major groups, state peasants and serfs. Belonging to either estate did not necessarily imply an agricultural occupation: many state peasants engaged in commercial activities and services, while many serfs were domestic servants. With some qualifications, numerous other groups of rural dwellers, e.g., the cossacks in Little Russia, could be equated to one of those two in terms of their rights to movement. Because the data sources we use do not always explicitly categorize such groups, the distinction between estates and *sostoianiia*, sometimes subtle, turns out to be important for how variables are coded in practice (we discuss the data itself in Section 3.3).

State peasants were under the jurisdiction of the Ministry of State Property, which delegated the administrative functions, including taxation, provision of justice and local public goods, and conscription, to rural communes (*obschina*). Oversight and enforcement of these functions was left to local

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the Digest and contemporary jurists did not necessarily distinguish between the estates and *sostoianiia* the same way. That said, we believe that our interpretation is useful for comparing mobility restrictions.

[4]Loosely speaking, if one's estate determined their corporate social identity, the *sostoianie* was rather idiosyncratic and, from the perspective of the Russian legal code, subject to fewer rigid constraints (such as those determined at birth). Whether specific constraints associated with one's estate or *sostoianie* were actually fixed or changed over a lifetime varied from one individual to another.

authorities and police, which only took an active role in administration if there were significant arrears and abuses of law (Mironov, 2000, pp. 448). While not being a privileged social group, state peasants enjoyed such individual rights as the right to purchase movable and immovable property in their name and participate in commerce on their behalf (Mironov, 2000, pp. 391).

In contrast to state peasants, serfs were under double fiscal pressure: they owed duties both to the state and their lords. These duties were either paid in kind, by performing labor service known as the corvée system (*barschina*), or in a monetary form (quit rent, *obrok*). Each particular manorial estate adopted one of the two forms of collection of duties, which in turn determined how serfs were administered. By the mid-nineteenth century, around 56 percent of serfs, living under the corvée system, were governed directly by their lords or designated estate managers. The remaining 44 percent, living under the quit-rent system, were organized into rural communes (Mironov, 2000, pp. 451).[5] Within communes, governance was based on customs and tradition, which were comparable to those existing in communes of state peasants. Such similarity was confined to peasants' internal affairs, however. From the state's perspective, all serfs were considered private property of their lords. As such, serfs' individual rights were limited, and they could only participate in economic transactions (including purchasing property) and civil disputes as agents of their lords. In turn, lords were *legally* responsible for paying duties to the state on behalf of their serfs. Lords were also held liable if serfs failed to do military service. It is perhaps this responsibility of lords that essentially left serfs' right to movement at the discretion of their lords, as we point out below.

An account of serfdom in pre-1861 Russia would be incomplete without addressing coercive labor relations that existed at factories.[6] As Tugan-Baranovskii (1970) wrote, "[i]n 1804, 45,625 out of 95,202 factory workers …were hired wage laborers" (p. 82). Forced factory workers included gentry-owned serfs,[7] possessional (*posessionnye*) peasants, and so-called ascribed (*pripisnye*) peasants.[8] Dif-

[5]It has long been noted that the corvée system was more prevalent in the South, Ukraine, and Belarus, i.e., the regions with more favorable agricultural conditions (Ignatovich, 1910, pp. 52–53).

[6]The recent empirical scholarship on Russian serfdom seemingly overlooks this category of forced laborers.

[7]Gentry-owned serfs might or might not be included in the aforementioned total number of factory workers, because sometimes they were simply listed as "serf peasants" in official statistical publications.

[8]The specific titles of forced factory workers varied from one official publication to another. We use the homogenized titles of such workers as they appear in the Tenth Revision.

ferentiation between serfs and possessional peasants existed because, according to law, hereditary nobles had the exclusive right of owning serfs as private property. Possessional peasants were property of the factory that employed them, hence such peasants were owned by merchants, non-hereditary nobles, and other privileged groups indirectly, through ownership of the factory in question. Ascribed peasants were state peasants employed at factories of strategic importance, such as mining and metals, in Northern Russia, the Ural region, and Siberia, which sometimes was emphasized in their title (*gornozavodskie*). Administratively, ascribed peasants were under the jurisdiction of the Mining Department of the Ministry of Finance, although in practice factories employing them were controlled by private managers and, therefore, their status was almost the same as that of possessional peasants *de jure* and *de facto*. The rights to movement of these different groups of forced factory workers were essentially the same before 1861, and as we will see, the Emancipation Manifesto did not distinguish between them by the type of formal ownership. Almost all the mass of forced factory labor resided in the countryside, even if agriculture was not their primary occupation. In what follows, we use the term "serfs" with respect to forced factory workers as a shortcut, regardless of whether they were owned by hereditary nobles or not.

3.2.1.2 Regulation of Movement of State Peasants and Serfs before 1861

Now we turn to comparison of specific laws governing movement of state peasants and serfs. After serfdom was abolished, regulation became unified, therefore, we focus on the differences that existed before 1861. Rural-urban mobility implies moving from the countryside to an urban settlement, either for temporary or permanent residence. In the context of the Russian Empire, movement could be understood: 1) as a physical activity (relocation), and 2) as acquisition of a legal status, associated with a certain estate and *sostoianie*, that allowed one to reside in a city for an extended period. Both types of movement were heavily regulated, and to a certain degree the possibility of one implied the possibility of the other. For specific definitions and provisions, we rely on the last pre-reform edition of the *Digest of Laws* (1857), in particular, the volume 9, *Laws on the Sostoianiia* (*Zakony o sostoianiiakh*), and the volume 14, *Digest of Regulations concerning Passports and Fugitives* (*Svod ustavov o pasportakh i ssylnykh*).

The very first article of the *Digest of Regulations* stated that nobody could leave their place of permanent residence without a legal sanction or documentation appropriate to their status. In particular, Article 111 required all traveling peasants to obtain a document of one of the three types, depending on the distance between the final destination and their place of permanent residence, as well as the expected travel duration. The three types were:

1. **Permission written on regular paper** was required if peasants aimed to travel for work no farther than thirty versts (Article 112).[9]

2. **Permission written on stamped paper** was required if peasants aimed to travel for work farther than thirty versts, for a period of up to six months (Article 118).

3. **A passport** was required if peasants aimed to travel for work farther than thirty versts and for a period of more than six months (Article 141).

State peasants had to obtain an applicable document from local authorities, while serfs had to obtain it from their lords (Articles 114, 119, 145, and 146). In the case of serfs, certain exemptions applied if they sought permission to travel not for their own benefit but on behalf of their lords. Additional minor exemptions applied to peasants who aimed to travel to sell their products at farm markets, as well as to those living in the peripheral regions (in the North and Caucasus). Regulation of travel was not simply formal but was actively enforced. For instance, "in 1847, as many as 10,000 seigniorial peasants [serfs] left their homes in famine-struck Belorussia without permission to work on the construction of the St. Petersburg-Moscow railroad. They were rounded up and returned" (Moon, 2002, p. 340).

Because the travel restrictions were defined in terms of peasants' initial location, i.e., the place of permanent residence, the severity of those restrictions in practice depended on: 1) how such a location was defined according to law and 2) how hard it was for a peasant to change it. Article 10 defined the place of permanent residence of state peasants and serfs as those settlements or manors in which they were registered during the most recent revision (*reviziia*), or tax census. For forced factory workers, their "place" of permanent residence was defined as the factory employing them. For household serfs whose owners resided in a city, the place of permanent residence was the respective city. An important

[9]One verst is equal to 1.0668 km.

addition to Article 10 allowed state peasants to have permanent residence in a city if they owned real estate there (Article 11). Therefore, the respective law, enacted in 1827,[10] made state peasants much more mobile than serfs. According to Article 1138 of the *Laws on the Sostoianiia*, serfs were also allowed to purchase real estate in cities. However, all transactions, including selling the existing property, had to be first approved by their lords, and owning property in a city did not grant serfs the right of permanent residence there.

Another way for rural dwellers to overcome the travel restrictions was to join the *sostoianie* of urban dwellers (*gorodskie obyvateli*) in their desired destination, a socially heterogeneous group of merchants, honorary citizens, artisans, and burghers (*meschane*). For urban dwellers, a city was the place of permanent residence by definition.[11] According to Articles 439–444, state peasants willing to become urban dwellers had to first quit their rural commune. As a general rule, the commune could not reject peasants' request to quit unless they owed taxes, were subject to military service, or were under criminal investigation (Article 444).[12] Additionally, peasants seeking to become urban dwellers had to receive approval from the municipal authorities in a desired destination. The central government, which sought to make cities more viable economically, made the latter requirement a mere formality by issuing a special decree in 1832 and thereby facilitated migration of state peasants to cities (Rydziunskii, 1958, pp. 176–177).

In contrast, it was practically impossible for serfs to become urban dwellers; the central government only liberalized the process of transition for freed serfs (by the aforementioned decree of 1832). Article 1147 stated that serfs could only quit serfdom if they were freed by their lords or "by law." The latter could only happen in one of the following circumstances, listed in Article 1185:

1. A court trial established a non-serf origin of the individual.
2. The serf converted to Christianity, but their lord was non-Christian.

[10]The 1827 version of the law applied to all cities, except Moscow and St. Petersburg. In 1848, the law was extended to the capitals (Rydziunskii, 1958, p. 185).

[11]All the estates comprising urban dwellers are listed under Article 424 of the *Laws on the Sostoianiia*. After 1870, the differences between them essentially disappeared (Mironov, 2000).

[12]The rules were stricter for women and non-Orthodox Christians.

3. The serf informed authorities of the lord's treason or conspiracy against the tsar, and this information was proved correct [reference to Article 1197].
4. The serf was captured by a foreign state outside Russia.
5. The serf was acquired by the state.

Serfs could not gain freedom otherwise. Leaving the lord temporarily was subject to the aforementioned restrictions and contingent on his or her consent. Violating these laws was a criminal offense. If serfs did receive freedom, the process of acquiring a status of an urban dweller was essentially the same as for state peasants.

Table 3.1 re-iterates the key differences in the rights to movement of state peasants and serfs.

Table 3.1: Classification of rural-urban mobility restrictions by peasants type before 1861

Type of peasants	Travel/temporary residence in a city (0–12 months)	Permanent residence in a city	Transition to urban dwellers
State peasants	Yes, with permission from local authorities	Yes, if they owned property	Possible
Serfs	Yes, with permission from their lord	Only as domestic servants to their lords	Practically impossible

Notes:
This comparison is based on regulation of movement in European Russia and Siberia. See text for details on mobility restrictions in the Kingdom of Poland.

3.2.1.3 Rural Population and Labor Relations on the Empire's Periphery

In the previous sections, we have provided a brief account of the pre-1861 legal conditions of rural dwellers in European Russia and Siberia. The same regulation also applied to Russian subjects, originally from European Russia and Siberia, residing in Bessarabia, the Grand Duchy of Finland, and the Kingdom of Poland. The native population of these regions continued to live under the local legal codes after their annexation by Russia in the nineteenth century. The central government did exert effort to unify the legal system across the Empire, especially starting from the 1860s, but this process was not complete by the 1917 Revolution. In the pre-1861 period, the differences in laws between Russia proper and the periphery were particularly prominent, and they deserve an independent discussion.

In Bessarabia,[13] there were two groups of rural dwellers whose pre-1861 legal status was equivalent to that of serfs in European Russia: household serfs of Russian origin and the Roma (*krepostnye tsygane*). Together, they constituted less than two percent of Bessarabia's total rural population. The rest was mostly comprised of so-called tsarans, free but landless peasants who were obliged to pay a quit rent or in kind for using land owned by nobles. Unlike Russian serfs, tsarans were allowed to move from one landlord to another if they did not accumulate arrears. This right could be exercised between October 1 and April 1 every year. Tsarans were also allowed to retain their movable property when leaving their landlord. Most importantly for our purposes, as specified in Articles 898–901 of the *Laws on the Sostoianiia*, tsarans were allowed to permanently move to cities on the terms similar to those that existed for state peasants in European Russia. Therefore, we treat tsarans as state peasants rather than serfs in our analysis, although some of the historical literature concerning the liberalization of regulation of tsarans in the 1860s views it in the more general context of emancipation of serfs in Russia (e.g., Zaionchkovskii, 1968).

The Grand Duchy of Finland became part of Russia in 1809, and it was soon granted an autonomy by the tsarist government. Finnish rural population continued to live under the same regulations as during Swedish rule. The most recent decree governing social relations was that of 1789, which confirmed the equal status of all Finnish subjects in general and with respect to land ownership in particular. By 1864, peasantry owned more than half of all land in Finland. The remaining land was mostly state-owned (35 percent). Peasants living on state-owned lands paid rent and could privatize them in return for payment of a perpetual land tax (Obruchev, ed, 1871, pp. 226–227). Labor coercion did not exist in Finland.

Before being annexed by Russia in 1815, the territory of the future Kingdom of Poland was part of the Duchy of Warsaw, a buffer state created by French Emperor Napoleon I in 1807. The new state received a Constitution (1807) and the Napoleonic Code (1808), which abolished serfdom (*poddaństwo*) and declared equality of all subjects before the law. As a result, at least nominally, serfs received personal freedom and civil rights (Bardach et al., 2009, p. 380). Since the status of land according to the Constitution remained ambiguous, a separate royal decree of 1807 clarified that peasants only had lim-

[13] Bessarabia is a historical region covering parts of present-day Moldova and southwestern Ukraine. It was under Ottoman rule until 1812.

ited rights to the land they cultivated, in the form of temporary or permanent (hereditary) lease in return for payment of a quit rent (*czynsz*). Peasants' obligations to landlords were to be specified in contracts, which in turn were to be registered by notaries who ensured that contracts were not imposed forcefully (Bardach et al., 2009, p. 380). However, both the practice of the labor relations and subsequent legislation, favoring the interests of the landed nobility (*szlachta*), demonstrated abuses of the civil code enacted in 1808 and eventually led to reimposition of serfdom in all but name. Many peasants were forcefully evicted from land without contracts being signed. If a peasant received financial assistance from the landlord, he could not leave the land until after the loan was repaid. Further, peasants were allowed to leave their village only with permission of the vogt (*wójt*), a village mayor, typically appointed by the landlord himself (Bardach et al., 2009, p. 381). Overall, besides the emergence of a large class of landless peasants, the reforms in the Duchy of Warsaw led to partial return of peasants to the feudal land tenure system (corvée, *pańszczyzna*), whereby peasants performed labor services in kind, without contracts (Koryś, 2018, p. 95). Therefore, the economic rights of such peasants (*pańszczyznianay*), and the rights to property in particular, did not fall under the Napoleonic Code, even though their personal rights were protected, if undermined. Only peasants who signed contracts and paid a quit rent (*czynszowy*) were recognized by the Code as leasers of land, with the respective legal protections (Kostiushko, 1962, p. 29).

After the Duchy of Warsaw was annexed by Russia and became known as the Kingdom of Poland, the tsarist administration adopted a new constitution (1815), which confirmed the previously granted liberties. The Napoleonic Code remained in force, and so did the corvée system. Administrative control over peasants was left at the hands of vogts, who continued to limit peasants' mobility by denying passports at their discretion (Bardach et al., 2009, p. 393). Enforcement of payments of peasants' obligations was done by the military when necessary (Bardach et al., 2009, p. 423).

Before the reform of 1864, all landed peasants in Poland could be broadly classified by:

1. Whether they lived on private land or land owned by the state and local officials.
2. Whether they were in a corvée or quit-rent relationship with their landlord.[14]

[14]Note that the distinction between the two systems in the context of our discussion of the labor relations in European Russia and Siberia only applied to serfs. Here, this distinction applies to all types of peasants who used land (except those who were landowners themselves).

There was also a significant number of peasants who lived under the mixed system (*czynszowo-pańszczyzniany*). Such peasants paid a quit rent in return for tenancy. In addition, they were obliged to perform labor services in kind for a certain number of days. In contrast to peasants under the "full" corvée system, peasants under the mixed system did not perform such services regularly, on a weekly basis (Grabski, 1904, p. 374).[15] From the central government's perspective, emancipation of peasants, all of whom already had the personal rights enshrined in the Napoleonic Code, was understood as transition from the corvée system to one based on a quit rent (Chistiakov, ed, 1989, p. 401). This process, known as *oczynszowanie*,[16] was actively facilitated by the government: half of all peasants on state-controlled lands paid a quit rent by 1830 (Kostiushko, 1962, p. 27), and by 1859 the transition was complete. In private lands, *oczynszowanie* was much slower due to resistance of the nobility. By 1859, almost 748,000 peasants—of the total rural population of approximately 3.6 million, excluding nobles—still lived under the corvée system.[17] In 1861, Minister Aleksander Wielopolski initiated mandatory *oczynszowanie* for all peasants living on private lands, but by that time such measure was deemed too coservative and was not implemented to due the outbreak of the so-called January Uprising in 1863 (Bardach et al., 2009, p. 425).

To summarize, although from a legal viewpoint the system of *pańszczyzna* that existed in Poland until 1864 was different from "classical" serfdom (*poddaństwo*), abolished in 1807, in practice the conditions of peasants living on private lands under the corvée system were similar, or even more severe, to the conditions of serfs in European Russia and Siberia. *Pańszczyzniany* peasants were not owners of the land they were obliged to cultivate; obligations themselves were not regulated by the civil code; peasants could not leave their landlord without permission; they could be evicted at any point. For the purposes of our analysis, we treat all other types of Polish peasants, including those who paid a quit rent and lived on private land, analogously to state peasants in European Russia and Siberia.

[15] Grabski (1904) groups peasants under the quit-rent and mixed systems together, and so do we.

[16] *Oczynszowanie* [of peasants] literally means "making [peasants] *czynszowy*" in Polish.

[17] Calculated based on the data presented in Section 3.3.

3.2.2 The Legal Implications of the 1861 Manifesto for Rural-Urban Mobility

On March 3 (O.S. February 19), 1861, Tsar Alexander II signed the Emancipation Manifesto, nominally abolishing serfdom in all of European Russia (except Poland) and Siberia. The Manifesto consisted of two parts. The first was the *General Law on Freed Peasants*, which granted serfs the *sostoianie* of free rural dwellers and the right to purchase land owned by their former lords. The second part included the *Provision on Household Serfs* and the eight *Local Regulations*, which specified the conditions of emancipation in certain provinces and for certain subgroups of serfs. The key changes pertaining to serfs' rights to movement, brought about by the Manifesto, are contained in the laws No. 36657, 36658, 36667–36669, and 36673 of the *Complete Collection of Laws of the Russian Empire* (*Polnoe sobranie zakonov Rossiiskoi Imperii, Collection Two, Volume XXXVI*, 1863).[18]

The Manifesto's provisions applied to household serfs and peasants according to how they were registered by the Tenth Revision of 1858/1859. If a peasant became a household serf between the time of the Tenth Revision and 1861, he or she was still subject to the respective provisions for peasants, and vice versa. Household serfs, who were not tied to land, were required to continue serving their lords until February 1863. Upon the end of this two-year transitory period (or earlier, if they were freed by their lords), former household serfs were endowed with the full set of rights associated with the *sostoianie* of free rural dwellers, with an additional option of immediately becoming urban citizens and even being exempt from paying duties to the state for the first few years. The *Local Regulations* for Bessarabia stated that all serfs would automatically acquire the status of tsarans (free peasants) after a two-year period. For serfs employed at private factories, except those in Perm province, the transitory period was also defined as two years. For ascribed and possessional peasants, and factory peasants in Perm province, the transitory period was three years.

For all other categories of serfs, both the *General Law* and the *Local Regulations* set the transitory period at nine years, starting from 1861. As a result of the reform, peasants became the owners of land they previously cultivated.[19] They were not allowed to sell this land and to move to cities until

[18] Chistiakov, ed (1989) provides useful clarification of some of the provisions of the Manifesto.

[19] With the exception of Bessarabia. We do not focus on the land aspect of the reform as such in this paper. See Markevich and Zhuravskaya (2018) for a recent account of how the reform affected peasants' incentives in agriculture.

after the end of the transitory period. In all but three provinces, this condition could not be changed even if lords desired to shorten the transitory period for their former serfs. The *Local Regulations* for Volhynian, Kiev, and Podolian provinces contained clauses according to which peasants could sell their land allotments and quit the rural commune before the end of the transitory period. In particular, they would have to have enough capital to register as merchants or to purchase real estate of a certain size.[20]

3.2.3 Post-1861 Legislation Concerning Serfs

The *General Law* and *Local Regulations* described how the process of emancipation was supposed to unfold in most of the Empire, when the Manifesto was published in 1861. In 1863, a major rebellion, known as the January Uprising, broke out in the Kingdom of Poland and soon spread to the former territories of the Polish-Lithuanian Commonwealth in Western Russia.[21] Considering that in Western Russia the rebellion was primarily led by the Polish nobility, the central government sought to increase its base of support among peasants in the affected regions by lifting the financial burden off former serfs (Zaionchkovskii, 1968, p. 214). This is how the laws No. 39337, 39928, and 40172, all passed in 1863, came into being.[22] These laws amended the 1861 legislation by abruptly ending the transitory period in the following provinces: 1) Kovno, Vilna, Grodno, Minsk, Volhynian, Kiev, Podolian, and part of Vitebsk, where the transitory period ended in 1863; 2) Mogilev and the remaining part of Vitebsk, where the transitory period ended in 1864. Simultaneously, the price at which former serfs were supposed to buy out their land allotments according to the 1861 *Local Regulations* was decreased. Thus, the January Uprising introduced a discontinuity in the duration of the transitory period for former landed serfs: it was effectively two or three years in most of modern-day Belarus and Western Ukraine,[23] as opposed to nine years in the rest of European Russia and Siberia.

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[20] Due to the events that followed, these clauses were not consequential.

[21] Along with Prussia and Austria, Russia participated in the Partitions of Poland in 1772, 1793, and 1795. As a result, Russia acquired the territories of modern-day Lithuania, Western Belarus, and Western Ukraine, which had a sizable Polish minority.

[22] *Complete Collection of Laws of the Russian Empire. Collection Two. Volume XXXVIII*, 1866.

[23] This change in regulation occurred independently of the legislation on former serfs in Bessarabia, as well as household serfs and forced factory workers elsewhere, for whom the transitory period was also between two and three years.

In Poland itself, the rebellion received a wider popular support, having united pro-independence activists and radical democrats (Kostiushko, 1962, pp. 54–55). The agrarian reform was one of the main policies that the Central National Committee (*Centralny Komitet Narodowy*), the main organization of the rebellion, promised to pursue in the event that the rebellion succeeded. The decree of January 22, 1863 promised redistribution, with compensation, of land from landlords to peasants, who were then under the corvée or quit-rent system; the remaining feudal obligations would be canceled (Kostiushko, 1962, pp. 56–57). These provisions applied to both private and state-owned estates. Another decree, released on the same date, sought to attract support of landless rural dwellers by promising to provide them with a land allotment, at the expense of state-owned estates, upon completion of military service (Kostiushko, 1962, p. 57). Although most peasants did not play an active role in the rebellion itself, they sympathized with it, and stopped fulfilling their obligations to landlords (Kostiushko, 1962, pp. 62–63). Therefore, the central government was forced to make even more generous concessions than in Western Russia. The law no. 40609,[24] published in 1864 exactly three years after the publication of the 1861 Emancipation Manifesto, completely and immediately abolished the corvée system. It also equalized all landed peasants in rights by replacing the existing payments in kind or a monetary form with a universal land tax. The value of the latter was lower than the monetary equivalent of both obligatory labor services and quit rent prior to 1864. Peasants became full owners of the land they cultivated, regardless of whether it belonged to the state or private individuals. All existing arrears were canceled. Although both peasants under the corvée and quit-rent system benefited from the reform, it most significantly affected the conditions of the former. With newly acquired property rights, including the right to sell their allotments, *pańszczyzniany* peasants no longer had to perform obligatory labor services in return for tenancy, which had previously kept them tied to land.

[24] *Complete Collection of Laws of the Russian Empire. Collection Two. Volume XXXIX*, 1867.

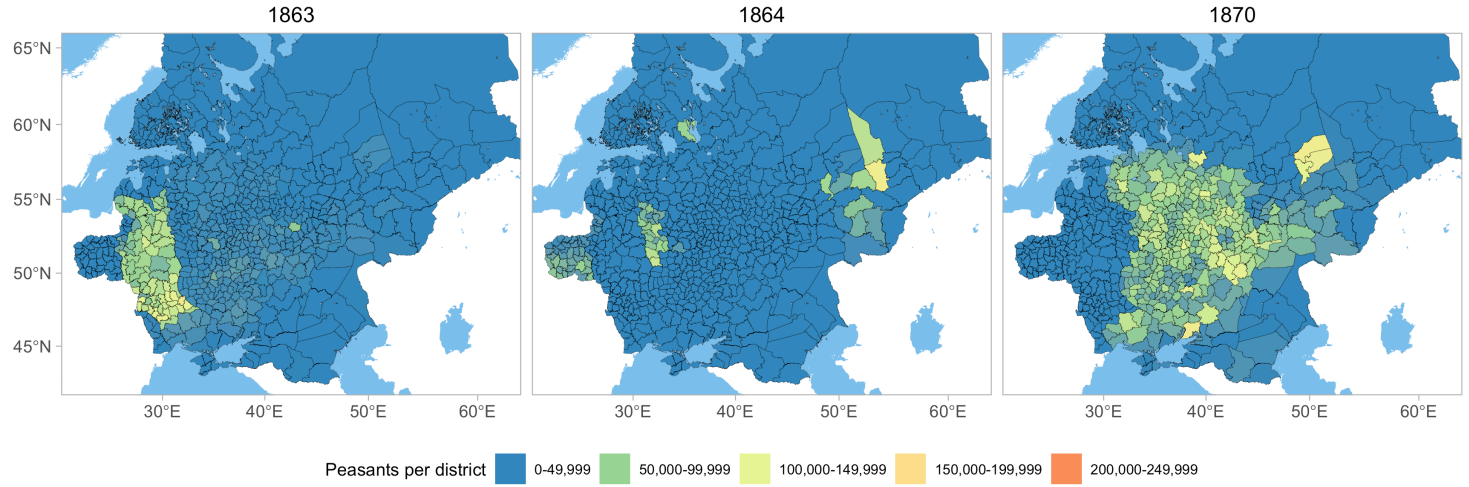

Figure 3.1: Spatial distribution of serfs in 1858/1859 by the year of emancipation. Source of the GIS map: constructed by authors. Source of the serfs data: see text. The year of emancipation refers to the end of the transitory period following the official publication of the law abolishing serfdom. See Table 3.2 for the total number of serfs freed each year. The provinces that are on the map but not in the sample: Sukhum District, the mountainous part of the North Caucasus, Derbent, the Land of the Orenburg Kirghiz, the Land of the Siberian Kirghiz, Tomsk. The equidistant conic projection is used.

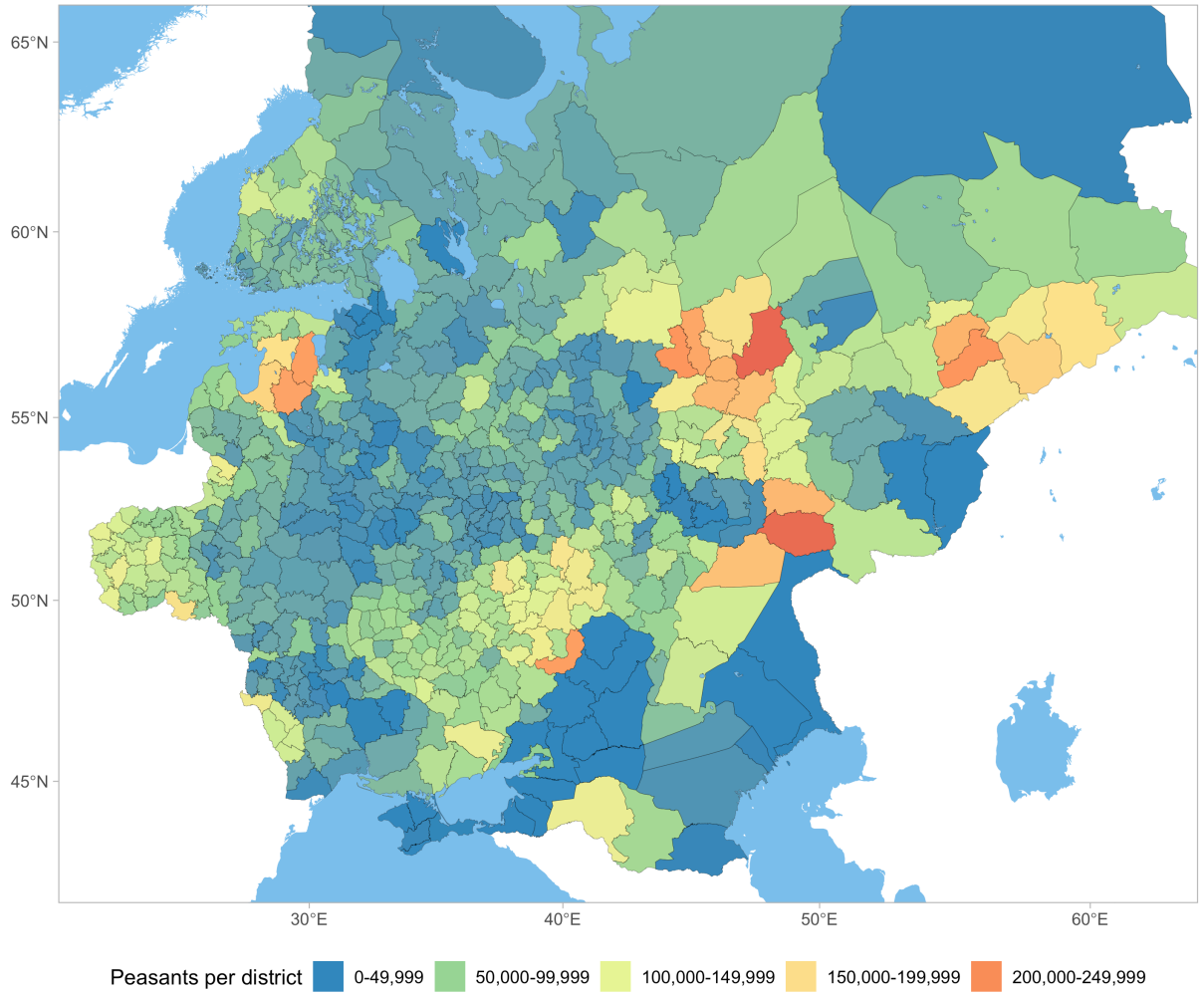

Figure 3.2: Spatial distribution of state peasants and related groups of rural dwellers in 1858/1859. Source of the GIS map: constructed by authors. Source of the serfs data: see text. The provinces that are on the map but not in the sample: Sukhum District, the mountainous part of the North Caucasus, Derbent, the Land of the Orenburg Kirghiz, the Land of the Siberian Kirghiz, Tomsk. The equidistant conic projection is used.

Table 3.2: The dynamics of emancipation after the 1861 Manifesto

Year	Serfs freed, total
1863	6,136,887
1864	2,045,497
1870	14,848,187
Total	**23,030,571**

Notes:
This table displays the total number of serfs who resided in the sample districts in 1858/1859 and who were emancipated in the indicated year. The year of emancipation refers to the end of the transitory period following the official publication of the law abolishing serfdom. At the estimation stage, these figures are multiplied by the respective increase in the total population between 1858 and the year when migration flows are estimated (see Section 3.4).

3.3 Data Construction

In this section, we describe construction of the database and discuss the issues pertaining to measurement. The complete list of the data sources we use is provided in Appendix. As a first step, we describe the creation of the GIS map that "nests" our main variables and that is used for some calculations.

3.3.1 GIS Map of the Russian Empire in 1858

We have created an original GIS map of the Russian Empire with the province and district borders corresponding to 1858, one of the two years covered by the Tenth Revision (tax census).[25] To the best of our knowledge, this is the first GIS map of Russia whose administrative units are consistent with the years of the Tenth Revision. Additionally, the map covers the regions in which the Tenth Revision was not conducted, namely the Kingdom of Poland and the Grand Duchy of Finland. Correctly defining the administrative borders is particularly important because the phenomenon we study—urbanization—is

[25] Most of the primary information for the revision was collected by the end of 1859, except for the Far East, where the revision ended in 1860.

an outcome of a spatial optimization problem, and most of the data on rural population we use is from the Tenth Revision.

The first-level administrative unit in the Empire, comparable to a U.S. state, was a province (*guberniia*, *oblast'*). Provinces tended to be too large and heterogeneous to be used as primary "building blocks" in construction of the database. Instead, we measure our non-city-level variables at a lower level of aggregation, which we refer to as a district (roughly equivalent to a U.S. county).[26] *Uyezd* served as such a unit in most of Russia proper, except the South, Caucasus, and Siberia, where some provinces were divided into several *okrug*s. In the Baltic, *uyezd* (*kreis* in German) was a third-level unit, while in most cases statistical information was reported at the *okrug* level, which we define as a district for our purposes. The term *powiat*, used for describing second-level subdivisions within the Kingdom of Poland, was typically translated as "*uyezd*" in official publications in Russian. Although historically *powiat*s and *uyezd*s were not equivalent, we use *powiat*s as districts because their degree of granularity was comparable. In the Grand Duchy of Finland, the system of *uyezd*s was rarely used by the local administration, despite being adopted by the central government in St. Petersburg. Instead, Finnish officials and statistical agencies reported information separately for cities and rural communes, as during Swedish rule. Rural communes were represented by parishes (*församling*), which sometimes were further divided into chapels (*kapell*).[27] Parishes and chapels were relatively small and numerous (almost 470 in total in 1860). We aggregate them at the district, i.e., *uyezd*, level, as defined by the central government, by matching the boundaries as depicted on the base map. We also use several statistical publications in Russian that provide (incomplete) correspondence between parishes, chapels, and *uyezd*s.[28] In almost all cases, we are able to perfectly match these different subdivisions, except for several parishes.[29] The resulting number of districts in the territory of the Empire we study is 589.

The main base map we use is *Karta Evropeiskoi Rossii i Kavkazskogo kraia [A map of European*

[26]To be more precise, we measure those variable at districts' centroids.

[27]We use the terms in Swedish because it was the only official language of the Duchy until 1863. In some Russian sources, the German term *kirchspiel* is also used when referring to parishes.

[28]Those are the same publications that we use as the population data sources. See the complete list in Appendix.

[29]Given that the remaining ambiguities only concern parishes and chapels that share a common border, and that their combined population is relatively small, the resulting measurement error is unlikely to have a significant impact on our analysis.

Russia and the Caucasus], created by the Imperial Russian Geographic Society between 1857 and 1860 and published in 1862.[30] The district borders on this map mostly correspond to the 1858 borders, except for the mountainous part of the North Caucasus (not in the sample) and several other districts. For Western Siberia, we use *General'naia karta Zapadnoi Sibiri s Kirgizskoi Step'iu [A general map of Western Siberia with the Kirghiz Steppe]*, with the border corrections as of 1855. Due to the vast territory of the Empire, both base maps were printed on separate pages, which we stack together after georeferencing. Though we believe that the overall quality of georeferencing is high, the resulting vector images of certain provinces are distorted because pieces of their raster counterparts are scattered across several images. To correct for these distortions, and, where necessary, to make the district borders consistent with those existing in 1858, we additionally use raster maps of individual provinces created by the Ministry of the Interior, military agencies, and third parties.

Because the reliability of our empirical results to a large extent depends on how accurately the GIS map reflects the proportions of the historical districts,[31] we perform the following quality check. We compare the areas (in square kilometers) of the 1858 districts, as calculated by contemporary statisticians, and the areas of the same districts calculated using the GIS software. We are able to do such comparison for 540 out of 590 districts; for the remaining districts, we lack the historical data. Figure 3.3 plots the areas of the districts from our GIS map against the areas measured by contemporaries (in log terms). Reassuringly, the deviations from the 45-degree line do not seem systematic in either direction across the spectrum. Also, the deviations are small in magnitude.[32]

3.3.2 Urban Population in 1811–1910

3.3.2.1 Defining a City in Imperial Russia

Unlike their counterparts in Western European states, cities in the Russian Empire often did not develop organically from rural settlements but instead acquired their status via governmental legislation. For

[30] For more detail, see the accompanying *Obiasnitel'naia zapiska [An explanatory note]*, published along with the map.

[31] Preserving the relative proportions is important because all our district-level variables, including rural population, are defined, and measured, at the centroid of each district.

[32] It should also be noted that contemporary measurement is not inherently preferable, because the level of technology in the 1860s, when the area calculations were made, was not very high.

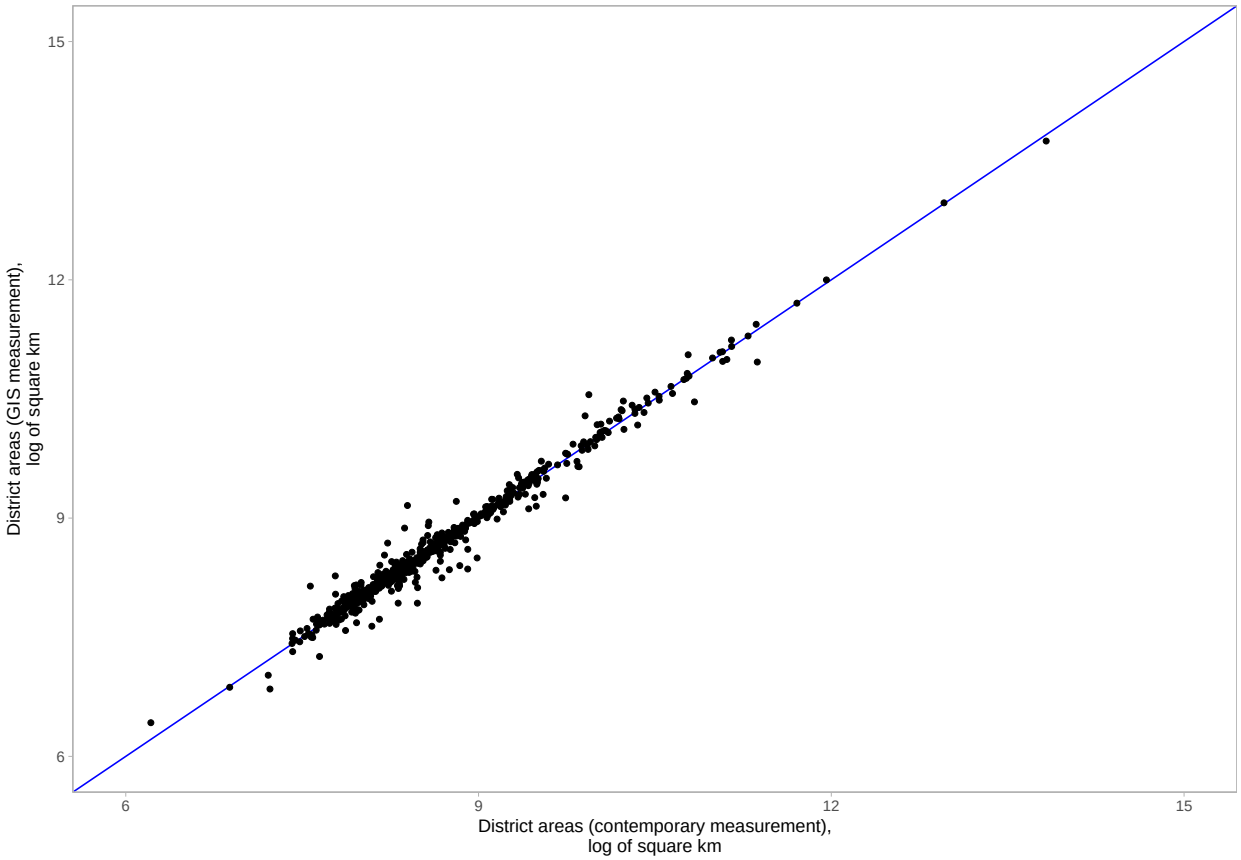

Figure 3.3: Comparison of the district areas calculated by contemporaries (the x-axis) and by GIS software (the y-axis). In the latter case, the *st_geod_area* function from the *sf* package for R is used, so that area calculation is not projection-specific. The blue line represents the 45-degree line. The log scale is used because several districts were disproportionately large. Source of the GIS map: constructed by authors. Source of contemporary area measurement: *Materialy po delam Tsarstva Pol'skogo...* (1864) for the Kingdom of Poland, *Bidrag til Finlands officiella statistik* (1870) for the Grand Duchy of Finland, and Bushen (1863) for the rest of the Empire (see the references in Appendix).

instance, during the reign of Empress Catherine the Great (1762–1796), 216 new "cities" replaced former villages, many of which failed to live up to their new status (Rydziunskii, 1958, p. 7). Social historians have pointed out the difficulty that the definition of a "typical" city poses for comparison of urbanization in Russia and elsewhere (Mironov, 1990). This ambiguity is confined to Russia proper, which is most of our sample. In Poland and Finland, cities were explicitly defined as such because all of them had a charter.

There was only one census in the Russian Empire in the modern sense of the word—that of 1897. It was meant to capture the entire urban and rural population on the same date (O.S. January 28). In all other years before the 1917 Revolution, official statistical publications did not account for at least some segment of the population. To define the universe of cities, we took a union of all settlements listed as cities in the Sixth Revision (1811), and all settlements mentioned in official statistical publications, dedicated to cities, published by the Central Statistical Committee of the Ministry of the Interior.[33] These publications appeared under different titles and nominally contained snapshots of urban population for the following years: 1825, 1833, 1840, 1847, 1856, 1858, 1863, 1867, 1870, 1885, 1897, 1904, 1910. In other words, for a given year, our definition of a city includes any settlement that was deemed important enough to be included in the official statistical publication for that year among cities "proper."[34] Some cities lost their legal status between 1811 and 1910, while some former villages were granted this status; yet other groups of settlements, such as posads and mestechkos (shtetlekh), were never deemed "proper" cities, however, they were historically important as centers of trade and manufacturing.[35]

As a next step, we geocode all cities using the coordinates from Google Maps, Yandex Maps, and Wikipedia.[36] To verify these coordinates, we plot all the cities on our GIS map. For cities present on the base maps, we manually check if their (georeferenced) location is consistent with the actual location. We also check if cities map onto the 1858 districts as expected, using the information on the

[33] See the complete list of these publications in Appendix.

[34] Mironov (1990, 2000) follows the same approach for defining a city.

[35] Henceforth we will refer to all settlements in the resulting database as "cities" as a shortcut, which may or may not reflect their actual legal status in a given year.

[36] The latter also contains the coordinates of settlements that no longer exist.

city-district correspondence from a 1858 publication. For cities that are missing in that publication, we use the information from Wikipedia and the National Library of Russia website[37] to make sure that all the cities and 1858 districts are matched correctly.

Due to the evolution of the legal status of settlements and the lack of contemporaneous information possessed by the Ministry of Interior, the panel that we constructed initially contained many missing observations. We appended this panel by the information from other sources (see below). The resulting balanced panel consists of 569 cities.[38] Concentration of cities, in terms of their number per area, was highly unequal historically. The Kingdom of Poland had the highest concentration, followed by Central Russia, Ukraine, and Western Belarus; in the North, South, and East, the concentration was the smallest. With the exception of the Kingdom of Poland, our panel largely reflects these regional differences (Figure 3.4).

3.3.2.2 On the Data Sources

The sources we use include printed publications and archival material, prepared by the central government and local civil and religious authorities. We also use publications by contemporary academic societies, such as the Imperial Russian Geographic Society, that either explicitly cited official sources[39] or plausibly had access to them. We never use "guesstimates" of population from travelers' memoirs and similar unofficial and non-academic sources.

Unfortunately, all official statistical publications suffer from imperfect measurement. Another issue is the lack of consistency in reporting from year to year and from city to city. Prior to the 1860s, the main variation in reporting is due to the purpose of the collected information (fiscal, administrative). Starting from the 1860s, publications primarily differ in methodology of reporting, by including or not including suburbs and temporary dwellers.[40] Table 3.3 groups the sources we use by the origin of data.

Revisions, the predecessor of modern censuses, were conducted in European Russia and Siberia,

[37] http://nlr.ru/res/refer/r_imp/bd/town_list.php. Accessed on March 24, 2019.

[38] As the reader will see at the estimation stage in Section 3.4, having a balanced panel is crucial for our purposes.

[39] In a small number of cases, we also rely on the secondary literature satisfying this criterion.

[40] See the discussion in Mironov (2000, p. 313–314).

Table 3.3: Primary sources on the population of cities and their coverage, 1811–1910

Origin of data	Years covered	Type of population recorded
Revisions	1811, 1833, 1858	Registered
Church data (European Russia, Siberia)	1811	Present
Church data (Finland)	1811–1910	Present
Police data (Ministry of the Interior, Central Statistical Committee)	1825–1910	Registered/Present
Reports of governors and other local authorities	1825–1910	Present
Reports of local statistical committees	1840–1910	Present
City/provincial censuses	1867–1910	Present
Imperial Census	1897	Present

primarily for tax purposes, until 1858. Importantly, all the revisions in the nineteenth century also included the population that were exempt from taxation (*nepodatnye sosloviia*), such as nobility and clergy. For a number of cities, the Sixth (1811) and Eighth (1833) Revisions only indicated the number of males, which we multiplied by 2 to get an estimate of the total population. To a varying degree, most pre-1840 estimates of urban population in Russia proper, including reports by local governors and police, were initially based on the updated figures from the most recent revision (Kabuzan, 1963; Mironov, 1990).

Table 3.4: The total number of freed and fugitive serfs arriving in cities before the 1861 Manifesto

Period	Freed serfs	Fugitive serfs
1816–1819	5,198	1,672
1820–1824	9,486	749
1825–1829	8,176	964
1830–1834	16,108	194
1835–1839	11,272	2,773
1840–1844	6,053	1,738
1845–1849	5,660	523
1850–1854	27,860	1,470
Total	**89,813**	**10,083**

Notes:
Source: Rydziunskii (1958, p. 376).
This table displays the number of serfs who acquired the *sostoianie* of urban dwellers in European Russia and Siberia.

For several settlements in Russia that did not yet have a city status in 1811, we used the information collected by the Orthodox Church. The Orthodox Church was required to keep registers that recorded

births, deaths, marriages, baptisms, and confessions at the parish level starting from 1722. This information was then aggregated at the national level by the Most Holy Synod, a separate branch of the central government. Comparison of estimates of population made by the Church with the revisions and police data suggests that the former were of high quality, at least as far as the Orthodox population was concerned (Mironov, 1990).[41] We rely on the Church's data more extensively in the cases of Finland and Poland, where religious authorities served as the primary providers of the information on population both before and after each region was annexed by the Russian Empire (Kabuzan, 1992). In Poland, civil authorities replaced the Church in that capacity in the 1850s. In Finland, in addition to clerical registers that continued to be regularly updated, there were one-day censuses in the largest cities every five years starting from 1870. Overall, the population data in Finland was deemed of such high quality that the tsarist government decided not to conduct the 1897 Imperial Census there (Kabuzan, 1992).

If multiple population estimates exist for a given city and year, we prioritize: 1) one-day censuses over other forms of measurement; 2) provincial and local sources over reports by the central government; and 3) the information on the present, rather than registered, population. Wherever applicable and possible, we subtract the population of military garrisons and sailors, and use consistent administrative units. In particular, we either collapse the population of two settlements in the entire panel, if they merged at some point between 1811 and 1910, or we disaggregate the combined population, provided that the separate estimates for each city are available. Unfortunately, such consistency comes at the expense of the loss of certain observations.[42] For many post-1897 publications (i.e., corresponding to the years 1904 and 1910), one recurring issue is that local statistical committees in certain provinces stopped accounting for in- and out-migration, and instead they reported the 1897 figures plus the net natural increase (the number of births minus the number of deaths in the period following 1897). This issue was well understood by contemporary and Soviet historians (Kabuzan, 1982, p. 101). In some cases, we were able to find alternative official sources that did not suffer from the problem of ignoring the net migration flows.

[41] All the settlements in question were located in religiously homogeneous areas, which minimizes the possible bias.

[42] For example, Gomel (Belarus) became the new center of former Belitsa district in 1854, while Belitsa itself became a suburb of Gomel. From 1856 on, Gomel-Belitsa are reported jointly in all official publications, while prior to 1856, only Belitsa is reported. We were able to find a separate estimate for Gomel in 1847, but not for the earlier years, which is why *both* Belitsa and Gomel are not included in the balanced panel.

It should be noted that not only most sources failed to reflect the population of cities on the same date, but sometimes the difference in the moment of measurement could be as large as one year within the same cross section, or even more.[43] If the information on a certain city was missing in the primary statistical publication for a given year (e.g., 1840), we tried to find another estimate of population from an official source, dated within two years before and after that year (1838–1839 and 1841–1842). The concern of the date mismatch is partly mitigated by the fact that our cross sections are at least three years apart from each other, with the exception of 1856 and 1858.[44] The total number of mismatched city-year observations in the balanced panel is 120, which is negligibly small compared to the total number of observations (7,966).

[43]If population is reported as of January 1 of a given year, we consider it as population in the previous year for our purposes.

[44]In the latter case, we counted all observations from 1857 as those from 1858, preventing the possibility of overlap.

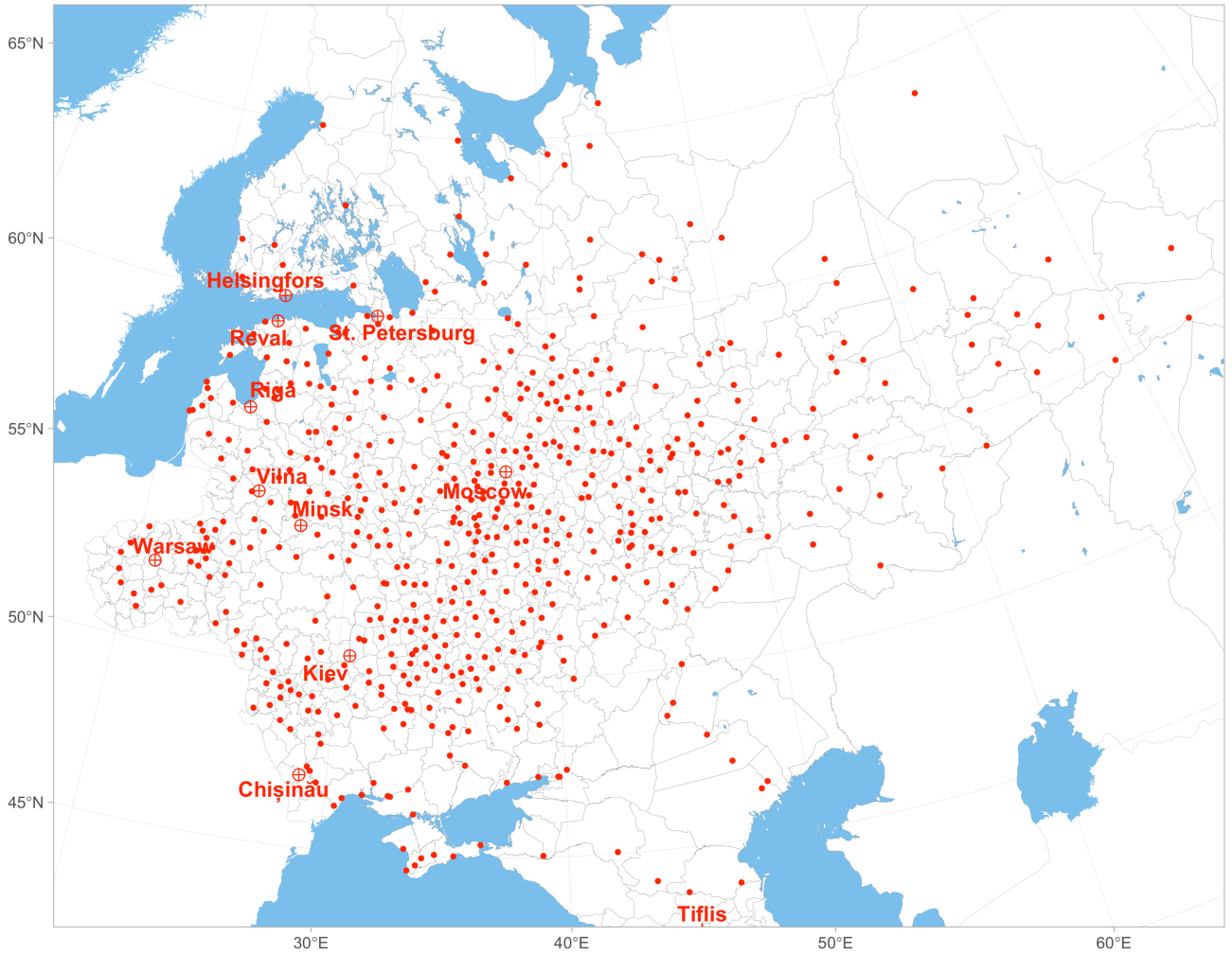

Figure 3.4: The cities in the balanced panel (in red) and district boundaries (light gray). Source of the GIS map: constructed by authors. Labeled are the imperial capital, St. Petersburg, and the capitals of the modern states. The city names and district boundaries are as of 1858/1859. The equidistant conic projection is used.

3.3.3 Rural Population in 1858/1859

Due to frequent boundary changes, it is not possible to construct a consistent panel of rural population for the period we study, neither at the province nor district level. Instead, we create one snapshot using the observed rural population data. For the other years, we calculate the *hypothetical* population based on our assumptions about the rate of natural population growth and the model of rural-urban migration (see below), holding the district boundaries fixed.

We choose 1858/1859 as the "baseline" year for two reasons. First, this is when the last comprehensive census of serfs was conducted before their emancipation in European Russia, Siberia, and the Kingdom of Poland. Second, there were no significant changes in the external boundaries of the Empire after 1858 (within the limits we study). Our main data source is the Tenth Revision, conducted in 1858 and 1859.[45] Among the reported groups of rural dwellers, we exclude the following: foreign colonists (such as German settlers), nomadic tribes (e.g., the Kalmyks), the Jews, peasants exempt from taxation (*na l'gote*). Together, they constituted a relatively small fraction of the total rural population. We also exclude the nobility, military, and clergy. Due to certain ambiguity in the titles of peasants, we cross-check the information in the Tenth Revision with that in *Statisticheskii obzor*... (1861). We classify as state peasants those who were under the jurisdiction of the Ministry of State Property, other ministries and their departments, as well as former serfs (and their descendants) in the Baltic provinces, where serfdom was abolished in the 1810s. We classify as serfs the following groups: land-cultivating serfs, domestic servants, serfs at gentry-owned factories, possessional peasants, and ascribed peasants.

For Poland, where the Tenth Revision was not conducted, we use alternative sources. For *pańszczyzniany* and *czynszowy* peasants living on private lands, we use the information from *Kalendarz Wydawany*... (1860). For all other Polish peasants, including those who were landless, we use the information from *Materialy po delam Tsarstva Pol'skogo*... (1864). In both cases, the data is given for 1859. We exclude the nobility and Jews from the number of state peasants, which otherwise includes all rural dwellers except *pańszczyzniany* peasants living on private lands. Finally, for Finland, where serfdom did not exist, and where the Tenth Revision was not conducted either,

[45] This data is available in *Perepisi naseleniia Rossii*... (1972). For this and other sources, see the full references in Appendix.

we define as "state" peasants all rural dwellers reported in *Bidrag til Finlands officiella statistik*... (1870). This information is given for 1860.

We define the moment of emancipation of serfs as the end of the transitory period following the official publication date of the respective law abolishing serfdom. Note that the aforementioned sources report the information on population at the district level. For the purposes of our analysis, we assume that within each district, the full mass peasants was concentrated at the district's centroid. One implication of this assumption, which we discuss below, is that some peasants, who may have resided in cities, are counted as though they resided in the countryside.[46]

3.3.4 Population Growth

Because we only observe the rural population in 1858/1859, it is important to account for population change over time to approximate the true size—actual or counterfactual—of migration flows in the periods before and after 1858/1859. Assuming that the rate of natural population growth—net increase in a given year over the total population in the previous year—was uniform across all districts, one can measure it using the empire-wide increase in the total population. We use the data from *Statisticheskii ezhegodnik Rossii. 1913 g. [A statistical yearbook of Russia. 1913]* (1914), which reports the total population of the Empire, including Poland and Finland, at annual intervals between 1800 and 1913. Column (2) in Table 3.5 displays the total population in the relevant years. Column (3) displays the ratio of the total population in a given year over the total population in 1858 (the base year). These ratios serve as factors by which the remaining rural population, i.e., net of out-migration, is multiplied at the estimation stage.

3.3.5 Transportation and Least-Cost Distance

The cost of transportation is one of the most important factors in the decision to migrate. By the beginning of 1911, the three most important types of transportation, in terms of the total network length, were dirt (unpaved) roads, waterways (rivers, canals, lakes, seas), and railroads. In European

[46] This issue is mostly a concern for the Tenth Revision data. The Polish and Finnish sources separated urban and rural population more explicitly.

Table 3.5: Change in the total population of the Russian Empire (relative to 1858)

Year	Total population, millions	Total population/Total population in 1858
1825	53.5	0.72
1833	59.9	0.80
1840	63.9	0.86
1847	68.1	0.91
1856	73.3	0.98
1858	74.5	1.00
1863	76.1	1.02
1867	81.8	1.10
1870	86.3	1.16
1885	111.0	1.49
1897	128.9	1.73
1904	144.2	1.94
1910	163.8	2.20

Notes:
The total population includes parts of the Caucasus and Siberia, as well as Central Asia, that are not in the sample.
Source: calculated by authors using the information from *Statisticheskii ezhegodnik Rossii. 1913 g.* (1914) (see the reference in Appendix).

Russia, including the Caucasus and Poland, the total length of each network was 526, 188, and 61 thousand versts, respectively.[47] We assume that dirt roads only enabled traveling afoot. Travel through waterways was typically provided by steamship services. Use of the latter "declined substantially toward the end of the [nineteenth] century, and retained a significant share of passenger transportation only in Siberia" (Metzer, 1976, p. 97). Paved roads constituted the fourth largest network, with the total length of 33.5 thousand versts by 1911.[48] These roads were used by stagecoach services (diligences), which "had been reduced to an insignificant level as early as the 1860's" (Metzer, 1976, p. 96). Due to their relative insignificance, we do not include diligences in our model.

For land surface, rivers, lakes, and seas, we use the readily available shapefiles from the Natural

[47]The figures are from the table on p. 5 in *Statisticheskii sbornik Ministerstva putei soobschenia. Vypusk 124 [A statistical digest of the Ministry of Transportation. Volume 124].* St. Petersburg, 1914. Here, the length of the waterways network only includes rivers and canals.

[48]The figure is for European Russia, as above.

Earth website.[49] Because these shapefiles only contain major rivers and lakes, from which we exclude the reservoirs created in the twentieth century, we assume that all of them were navigable between 1811 and 1910. As for the railroad network, we have created a new GIS map of all railway lines built in the Russian Empire between 1838, when the first public line[50] was opened, and 1910. This GIS map is based on shapefiles corresponding to the modern railroad network of the now-independent states that used to be part of the Russian Empire. These shapefiles are part of the *Digital Chart of the World* (DCW), a project of the Environmental Systems Research Institute (ESRI) developed on commission for the U.S. Defense Mapping Agency.[51] After merging the individual shapefiles, we assign the opening year to each railway line, if the line was opened by 1911. The rest of the railroad network, that exists today but did not exist until after 1911, is removed. We use Afonina (1995) as the main reference on construction of railroads starting from 1838. We verify the information in Afonina (1995) by comparing it to historical maps of railway lines released in 1862, 1893, and 1913.[52] After georeferencing these maps, we append the railway lines that existed historically but do not exist today (and hence are missing in the DCW shapefiles). Figure 3.5 displays the expansion of the railroad network using the resulting GIS map, overlayed with the waterways network.

[49] http://www.naturalearthdata.com. Accessed on May 19, 2019.

[50] Tsarskoye Selo Railway.

[51] The data was first released to the public in 1992. The project specification is available on the website of the National Geo-Spatial Intelligence Agency (http://earth-info.nga.mil/publications/specs/printed/89009/89009_DCW.pdf). Currently the shapefiles can be downloaded at http://www.diva-gis.org (accessed on May 19, 2019). The scale of the database is 1:1,000,000.

[52] See the list of these maps in Appendix.

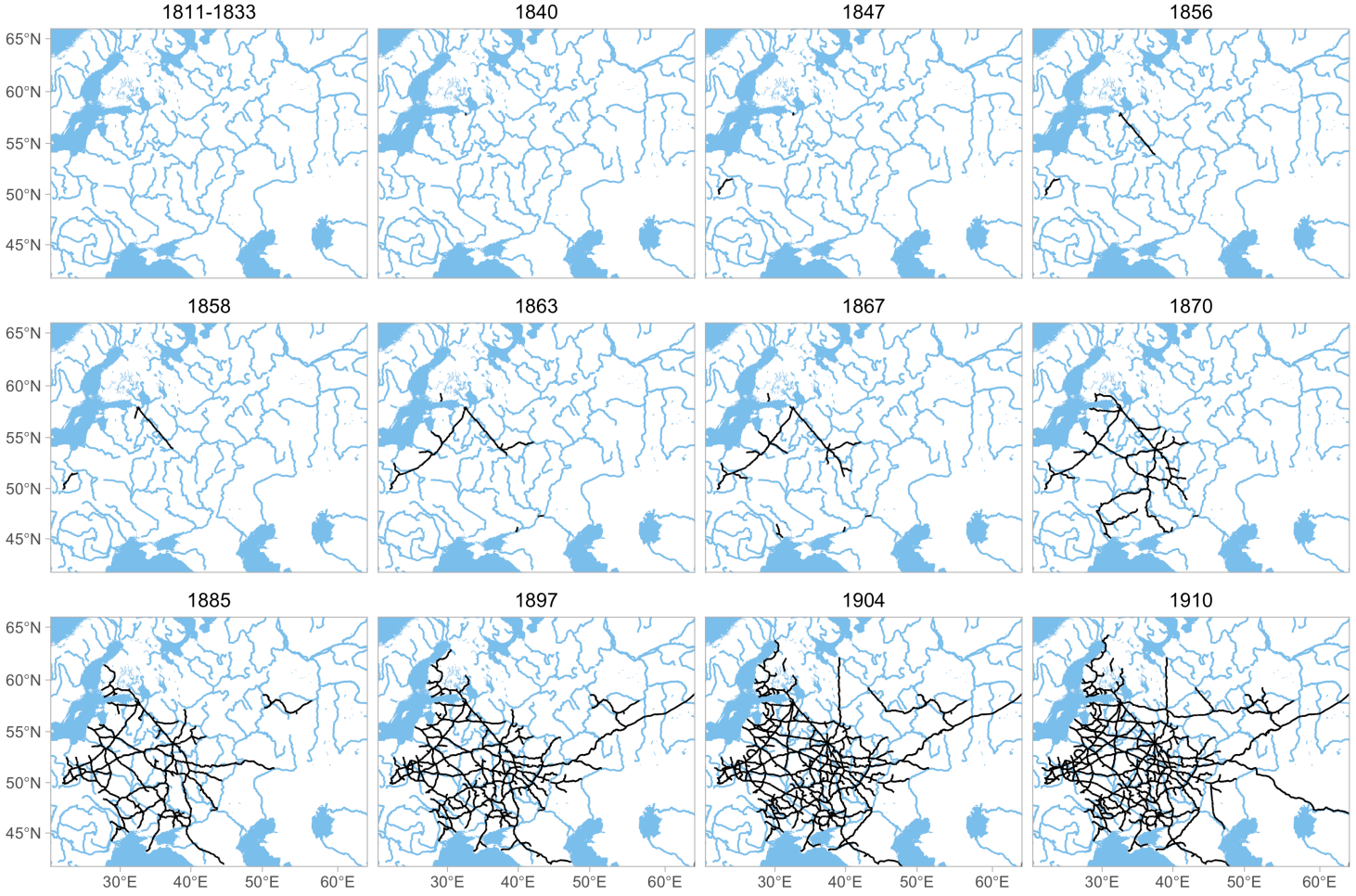

Figure 3.5: The waterways (in blue) and railroad (in black) network in the Russian Empire. Source of the waterways network: Natural Earth. Source of the data on the railroad network: constructed by authors. The waterways network includes seas and major lakes and rivers, considered navigable over the entire period of 1811–1910. The first public railway line, Tsarskoye Selo Railway, began operation in 1838. The equidistant conic projection is used.

For any given route between two points, the total transportation cost includes the fare cost and the opportunity cost. Both components are functions of time spent (i.e., speed) en route; the fare could also depend on the travel class. For consistency, we define the opportunity cost for the same income level across all modes of travel. Following Metzer (1976), we set this level at 12 kopecks per hour, which is equivalent to the estimated average wage of all railroad passengers in 1907 (p. 103). Further, we assume that passengers in our model pay third-class fares, which means a lower quality of accommodation than the first and second class but higher than the special fares that existed for migrants and prisoners. According to Metzer (1976), a typical third-class fare for railroads was 1.44 (1.35) kopecks per verst (km) in 1906. The estimate for a third-class steamship fare in 1900, obtained by Metzer (1976), is 0.62 (0.58) kopecks per verst (km). Naturally, the "fare" for traveling afoot is zero.[53] We list other fare estimates for the sake of comparison in column (1) in Table 3.6. One important difference between traveling afoot and other modes of travel is a daily limit to one's physical ability to walk. We assume that a typical peasant could travel no more than seven hours a day at a speed of 5 versts (5.334 km) per hour.[54] Because the capacity of railroads and steamship services is twenty-four hours a day,[55] the "effective" speed of traveling afoot is $7 * 5.334/24 = 1.556$ km per hour. The speed estimates for railroads and steamships are provided by Metzer (1976) (see column (2) in Table 3.6). To calculate the opportunity cost for each transportation type, expressed in kopecks per km, we divide the aforementioned hourly wage, 12 kopecks, by the effective hourly speed (column (3)). Finally, the corresponding total cost is a sum of column (2) and column (3).

To calculate the least-cost distance between the sample cities and district centroids, we first rasterize the GIS map by creating a 1000 by 1000 grid of cells. We overlay this grid with three shapefiles—one corresponding to land surface, the waterways network, and the railroad network—and assign a dummy to each cell indicating whether the cell enables transition through it using a given transportation type. After that, we define the cost of transition through each cell as the minimum of the inverse of the total

[53] We do not account for the cost of food and lodging during the travel.

[54] This number of hours per day is likely to be too high, considering that many peasants traveled with their families.

[55] Strictly speaking, this is not correct. Steamship services only operated during the navigation period between May and October every year. To calculate the actual capacity of steamship services, as expressed in hours per year, one has to make assumptions about the degree of substitution between railroads and the waterways network, and how this substitution would be reflected in the observed fares for both modes of travel.

Table 3.6: Comparison of the travel costs for different modes of transportation in the early twentieth century

Mode	Fare, kopecks per passenger-km	Effective speed, km per hour	Opportunity cost, kopecks per km	Total cost, kopecks per km
Afoot (no transportation)	0.00	1.56	7.71	7.71
Railroad, first class	3.21	35.20	0.34	3.55
Water, first	1.27	7.47	1.61	2.87
Water, second	0.86	7.47	1.61	2.47
Railroad, second class	2.03	35.20	0.34	2.37
Water, third, fourth, and migrant	0.58	7.47	1.61	2.19
Railroad, third class	1.35	35.20	0.34	1.69
Railroad, migrant class	0.91	35.20	0.34	1.25
Railroad, fourth class	0.67	35.20	0.34	1.02

Notes:
Source: authors' calculations based on Metzer (1976).
Metzer (1976) expressed all the variables in versts, which we convert to kilometers. The steamship fares are given for 1900. The railroad fares are given for 1906. In the model, we use the third-class fares both for railroads and steamship services. See text for more detail.

cost from Table 3.6 over the set of applicable transportation types. Essentially, this procedure assigns a negative weight to every grid cell. To calculate the least-cost distance between a pair of points on the grid, we apply the *costDistance* function from the *gdistance* package for R.[56] Finally, to improve performance of numerical optimization, we scale the least-cost distance, dividing it by the maximum.

For the sake of illustration, in Figure 3.6 we show the least-cost path between the centroid of Kholm district (Pskov province) and the city of Pskov given the available modes of transportation in each period between 1811 and 1910 and the aforementioned assumptions about the travel costs. Note that until St. Petersburg–Warsaw Railway went through Pskov province in 1859, all travel had to be done afoot or using the relatively costly waterways network. The increasing access of railroads reshaped the optimal route between the two points (effective starting from 1863). Given that among the three modes of transportation we consider, only the railroad network evolved over time. Because its expansion greatly reduced the cost of travel, albeit heterogeneously across time and space, we view availability of railroads as a useful "policy parameter" that will be manipulated in counterfactual analysis (see Section 3.4).

[56]This function uses Dijkstra's algorithm, representing the grid as a graph.

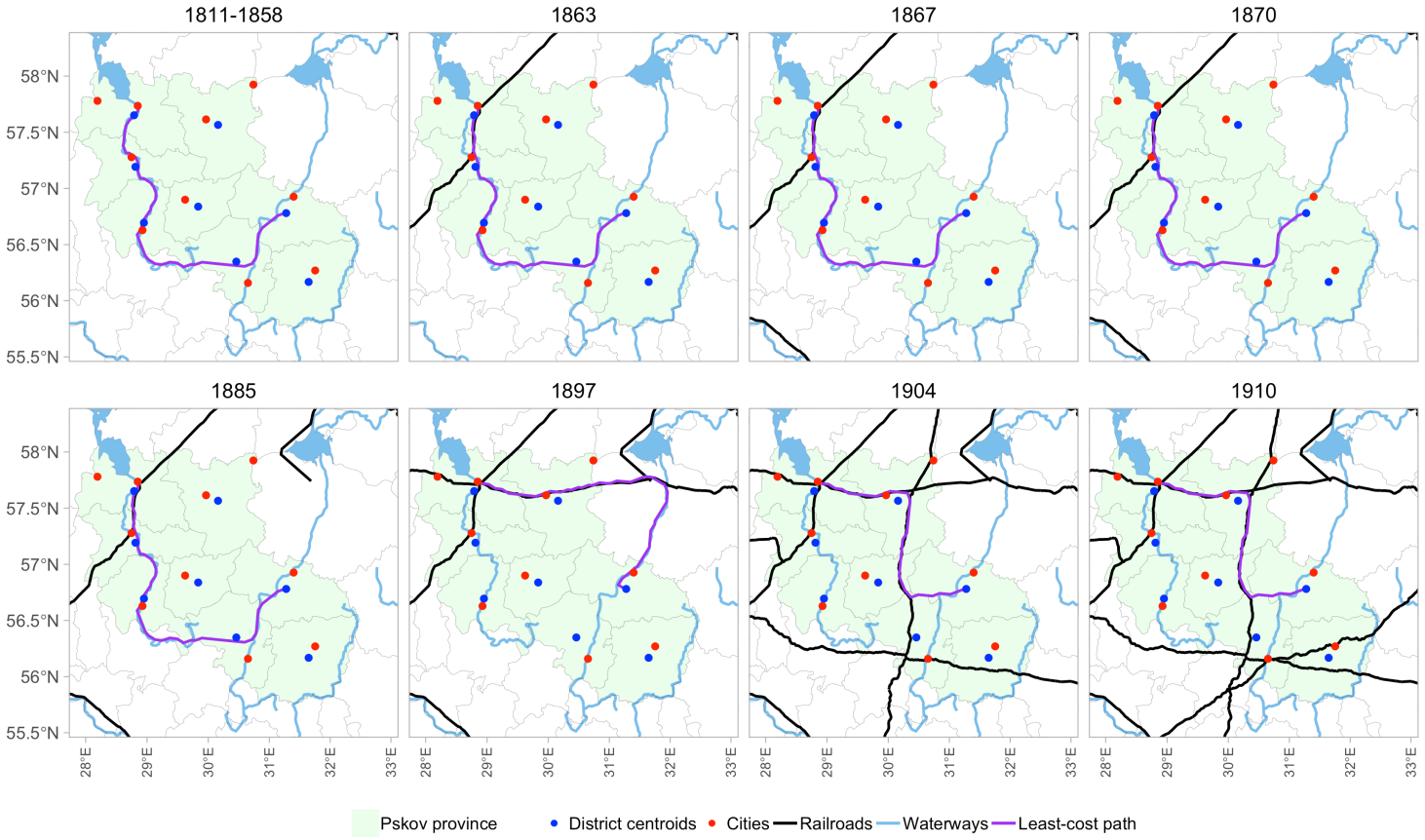

Figure 3.6: The least-cost path between the centroid of Kholm district (Pskov province) and the city of Pskov (purple line), 1811–1910. Source of the GIS map: constructed by authors. The blue dots represent the district centroids ("origins"). The red dots are cities in the balanced panel. See text for more detail on how the travel costs are calculated.

3.3.6 Other Variables

Here we describe additional variables that we use as proxies for "pull" and "push" factors in rural-urban migration.

City status in 1858 We control for the administrative status of cities as a proxy for the level of provision of local public goods. The central government distinguished among four types of cities: 1) the capitals (St. Petersburg and Moscow); 2) province centers; 3) district centers; 4) others.[57] We use the information on each city's administrative status as of 1858, the last pre-1861 period, using the same sources as for urban population in 1858. In addition, we cross-check this information with the 1855–1860 raster maps.

Seaport in 1904/1910 We also create a dummy for whether a given city was a seaport, which could be an important determinant of growth due to trade and access to foreign markets. For European Russia and Siberia, we use the information from the two main statistical publications for 1904 and 1910.[58] For Finland, we treat all cities located within 10 km from the coastline as seaports.

Land suitability We use land suitability as a proxy for income in the agricultural sector. Other things equal, more favorable agricultural conditions lead to higher productivity and, therefore, higher income (in the absence of serfdom). In turn, higher income in the agricultural sector decreases peasants' willingness to move to a city. Following other literature, e.g., Nunn and Qian (2011), we construct an index of land suitability using the current (2012) version of the FAO GAEZ database.[59] This database provides information on the potential yield for each crop at a given input level and water supply. Rye was the single most important crop in the Russian Empire, because it could grow well in low-fertility soils; it was (and still is) often planted in the fall. Oat, the second most popular crop, was cultivated under

[57] Because the primary second-level administrative unit in Finland was a parish, there were no district centers.

[58] 1904: Ministry of the Interior, Central Statistical Committee, *Goroda Rossii v 1904 godu [Russian cities in 1904]*, St. Petersburg: Tipografiia N. L. Nyrkina, 1906. 1910: Ministry of the Interior, Central Statistical Committee, *Goroda Rossii v 1910 godu [Russian cities in 1910]*, St. Petersburg: Tipografiia N. L. Nyrkina, 1914. We use both sources because each of them contains errors and omissions.

[59] http://gaez.fao.org. Accessed on May 19, 2019.

comparable climatic and soil conditions. The third most popular crop, wheat, was primarily grown in the South. Combined, these three crops accounted for around eighty percent of the total agricultural output between 1801 and 1914 (Mironov, 1985, p. 44).[60] The level of granularity in the FAO GAEZ database is 5 arc minutes by 5 arc minutes. For our purposes, we calculate the rye, oat, and wheat suitability indexes, divided by their respective maxima, at the centroid of each district (analogously to how we calculate the rural population mass above). To approximate the historical conditions as much as possible, we use the versions of the indexes corresponding to the 1961–1990 period, low input level, and rain-fed water supply.

Table 3.7 reports descriptive statistics for all the variables used in analysis.

Table 3.7: Summary statistics

	Obs.	Mean	SD	Min	Max
Panel A. Rural population in 1858/1859					
Number of serfs (by district)	589	39,102	30,721	0	130,517
Number of state peasants (by district)	589	43,784	39,429	0	223,162
Panel B. District characteristics					
Land suitability, rye (by district)	589	0.35	0.35	-1	0.82
Land suitability, oat (by district)	589	0.34	0.38	-1	0.76
Land suitability, wheat (by district)	589	0.51	0.3	-1	0.8
Panel C. Urban population in 1811–1910					
Total population (by city and year)	7,966	13,065	51,508	100	1,637,100
Panel D. City characteristics					
Capital (by city)	569	0	0.06	0	1
Province center in 1858 (by city)	569	0.1	0.31	0	1
District center in 1858 (by city)	569	0.73	0.45	0	1
Seaport in 1904/1910 (by city)	569	0.05	0.22	0	1
Panel E. Origin-city characteristics					
Travel cost (by origin, city, and year)	4,356,833	0.25	0.14	0.003	1

Notes:
Historically, the capitals were also province centers and province centers were also district centers. To study the differential impact, we define these categories as mutually exclusive in the data.

[60] Excluding Poland and Finland.

3.4 Model and Estimation

3.4.1 Formal Setup

For the sake of brevity, we refer to all rural dwellers, including domestic servants and factory workers, as peasants (male). We index locations in the countryside with o (for "origin") and cities with d (for "destination"). We parametrize the mobility status of all peasants at origin o and time t using a dummy variable, x_{ot}, which takes the value of 0 if their movement is restricted and the value of 1 otherwise. By assumption, if mobility is unrestricted in a given period, it remains so in all future periods. Further, we denote with c_{iot} the movement choice of peasant i at origin o and time t. It is equal to the index of the desired city, d, if the peasant decides to leave the countryside and 0 otherwise.

If $c_{iot} = 0$, peasant i attains the utility equal to $v_{iot} = \delta_{ot} + \mu_{iot}$. Here, δ_{ot} is the average utility of all peasants at origin o and time t. It can account for the local labor market conditions. The term μ_{iot} is the idiosyncratic component of utility. We assume that μ_{iot} are i.i.d. Extreme Value Type I random variables. If $c_{iot} = d$, peasant i attains the utility equal to $v_{iodt} = \delta_{odt} + \mu_{iodt}$. The term δ_{odt} is the average component of utility of all peasants from origin o arriving in city d. It can account for such factors as the cost of moving from origin o to city d, the differential labor market conditions in city d as compared to some other city $\widetilde{d}, \widetilde{d} \neq d$, and the overall advantage of living in a city as compared to the countryside, which we refer to as the *urban premium.* Analogously, the term μ_{iodt} captures the idiosyncratic component and is distributed as i.i.d. Extreme Value Type I. Moving from origin o to city d is only rational if $v_{iodt} > v_{iot}$. Given our assumptions about the distribution of the idiosyncratic terms, μ_{iot} and μ_{iodt}, the probability of moving can be defined for every city d as:

$$\Pr(c_{iot} = d) = \frac{e^{\delta_{odt} - \delta_{ot}}}{1 + \sum_d e^{\delta_{odt} - \delta_{ot}}}, \tag{3.1}$$

which is a choice probability of the multinomial logit model.

Note that the probability in Equation (3.1) is only defined with respect to origin o and city d, whereas the difference between the probability of moving from o to d and from o to $\widetilde{d}, \widetilde{d} \neq d$, is implicitly reflected in the term δ_{odt}.[61] We use this probability to match the observed outcomes with the

[61] Still, the presence of the term δ_{odt} by itself does not address the peculiar substitution pattern, known as the property

structural parameters of interest, δ_{ot} and δ_{odt}. To that end, we first define the origin-level counterpart of Equation (3.1):

$$s_{odt} = \frac{e^{\delta_{odt}-\delta_{ot}} \times x_{ot}}{1 + \sum_d e^{\delta_{odt}-\delta_{ot}} \times x_{ot}} \text{ for every } o, d, \text{ and } t, \tag{3.2}$$

where s_{odt} is the *share* of peasants at time t who prefer to move to city d over staying at origin o given $x_{ot} = 1$.

Let n_{ot} be the number of peasants at origin o and time t. Then, the number of peasants arriving to city d from origin o between periods $t-1$ and t is equal to

$$flow_{dt} = \sum_o (n_{ot} \times s_{odt}) \text{ for every } d \text{ and } t. \tag{3.3}$$

To account for the natural population change in the countryside, net of out-migration, we assume that the number of peasants at origin o changes over time according to the following law of motion:

$$n_{ot} = n_{o,t-1} \times (1 - \sum_d s_{od,t-1}) \times g_t \text{ for every } o \text{ and } t, \tag{3.4}$$

where the term $\sum_d s_{od,t-1}$ captures the total migration to cities from origin o and g_t is the rate of population growth.

In turn, the population growth of cities is given by

$$pop_{dt} = pop_{d,t-1} + flow_{dt} + \varepsilon_{dt} \text{ for every } d \text{ and } t, \tag{3.5}$$

where ε_{dt} is the idiosyncratic error term.

Note that in Equations (3.3) to (3.5) the observed quantities are $n_{o,1858}$, $pop_{d,t-1}$, and pop_{dt}. All other terms need to be assumed or estimated from the data.

---

of independence from irrelevant alternatives (IIA), induced by the choice probabilities in Equation (3.1). See Train (2009) for a textbook treatment.

3.4.2 Assessing the Modeling Assumptions

Before we proceed to estimation, we deem it important to assess the modeling assumptions in light of our previous discussions of the historical context and data.

3.4.2.1 Issues Pertaining to Measurement of State Peasants and Serfs

In the model, state peasants and serfs are "switched" at different times, which is captured by term x_{ot} in Equation (3.2). State peasants optimize their location, subject to parameters δ_{ot} and δ_{odt}, in each period starting from 1811. In contrast, serfs' choice set is defined as empty before emancipation. Because our "treatment" is a dichotomous variable—whether a particular group of rural dwellers was at all allowed to move to cities or not—measurement error could lead to a significant bias in the estimated counterfactuals. On one hand, this bias could be due to imperfect measurement of serfs residing in cities. On the other hand, the bias could be caused by the error in the assumed choice set available to serfs in each time period. Even if serfs decided not to move to a city when they had a choice, the incorrectly defined choice set would distort the structural parameters capturing serfs' opportunity cost of moving. Because both types of error, if present, would likely co-vary with the spatial distribution of serfs,[62] here we provide additional evidence that, as we believe, mitigates these concerns.

Additional barriers to migration of state peasants Taking the transportation costs as given, how safe is the assumption of state peasants being able to move to cities as they wished? One barrier that could prevent them from leaving the countryside was the cost of obtaining a passport, which had to be renewed from time to time.[63] In addition, before moving to a city, state peasants were obliged to make an advance payment of their annual taxes in one installment.[64] A combination of the passport cost and liquidity constraints, effectively increasing the total cost of moving for state peasants, could have led to smaller rural-urban migration flows than our model allows for. In practice, those additional costs incurred by state peasants were usually covered by their employers in cities (Crisp, 1976, p. 233).

[62] In other words, these measurement errors would likely be location-specific and would not be absorbed by the common observable variables.

[63] Passports were valid for a period up to three years (*Digest of Regulations*, Article 142).

[64] If they stayed in the countryside, the taxes could be paid in smaller portions.

Therefore, we believe that the transportation costs, the wage differential between a city and the countryside, and the urban premium—all absorbed by terms δ_{ot} and δ_{odt}—were of the first order compared to other factors explaining state peasants' decision to migrate.

"Missing" serfs in cities Next, as mentioned in Section 3.3, a significant number of our sources on urban population in the pre-1861 period explicitly or implicitly draw from the results of the Sixth (1811), Eighth (1833), and, to a lesser extent, Tenth (1858) Revisions. Because revisions primarily served as tax censuses, they only counted the registered (*pripisnoe*), or permanent, population of cities. A general issue of using the revisions data is that those dwellers who were required to pay their duties to an authority in a certain location did not necessarily *reside* in the same jurisdiction. Also, recall that for European Russia and Siberia we assume that *all* state peasants and serfs, measured in 1858/1859, resided in the rural part of their respective districts. The inconsistency in how the registered and present population was counted is perhaps more problematic for studying rural-urban migration of serfs than state peasants. As discussed in Section 3.2, the only category of serfs who were allowed to legally reside in cities on a permanent basis were domestic servants, and they were counted as urban dwellers in revisions. In contrast, the present population, reported by police and local statistical authorities, also included: 1) those serfs who arrived in cities for short-term service jobs (*otkhodniki*) or to sell their products in markets (with permission from their lords but were counted as urban dwellers by accident); 2) those who were freed by their lords between revisions (*vol'nootpuschennye*); 3) fugitives, i.e., those who escaped from their lords (*beglye*). As for the last two categories of serfs, their total number in all cities in European Russia and Siberia was estimated at just below 100,000 during the period between 1816 and 1854 (see Table 3.4). As for household serfs, included both in the registered and present population of cities, their share in the total urban population continuously decreased: they comprised 8 percent in 1802 and 4 percent in 1857, on the eve of emancipation (Mironov, 2000, p. 325). Therefore, measurement error due to miscounting serfs residing in cities before emancipation is likely to be small compared to the total population of cities. However (in)significant the number of serfs living in cities before 1861 may have been, the inflow of state peasants during the same period was greater by an order of magnitude. According to one account, a total of around 726,000 state peasants became urban dwellers between 1826 and 1851 (Crisp, 1976, p. 234).

3.4.2.2 Zero Natural Population Growth of Cities

Equation (3.5) posits that the natural growth rate of urban population is zero, and all observed changes in population are due to inflow of rural dwellers and random shocks. While this is a convenient technical assumption, we also believe that it reflects the the fact that rural-urban migration was the single most important source of the growth of cities during the nineteenth and early twentieth centuries. Unfortunately, we lack the data on births and deaths at the city level to support this thesis in a systematic fashion. For the sake of illustration, in Table 3.8 we display the population growth of Moscow in 1867–1912, which was the second-largest city in the Empire (after St. Petersburg) and for which we have data at relatively frequent intervals. As one can infer from the changes in the total population between consecutive observations, the net natural growth must have been by an order of magnitude smaller than the growth rate due to migration.

Table 3.8: The total population and net natural increase in Moscow, 1867–1912

Year	Total population, thousands	Net natural increase, thousands	Net natural increase, % of total
1867	399.30	11.4	2.85
1878	696.10	2.2	0.32
1880	–	2.7	–
1882	759.30	-1.7	-0.22
1885	753.50	4.4	0.58
1890	879.00	3.4	0.39
1892	–	0.0	–
1895	–	3.5	–
1897	999.70	4.6	0.46
1900	–	4.4	–
1902	1,174.70	7.8	0.66
1907	1,359.09	8.3	0.61
1912	1,617.20	9.1	0.56

Notes:
Source: compiled by authors based on Gavrilova (2001, pp. 415–417). The net natural increase is the difference between all births and deaths in a given year. The total population in 1885 is from authors' database. The total population in 1882 and 1897 is given for the end of each year.

3.4.3 Estimation and Counterfactuals

3.4.3.1 Parametric Specification

We specify our structural parameters entering Equation (3.2) as follows. Let

$$\delta_{ot} = suitability_o^{rye} + \beta^{oat} \times suitability_o^{oat} + \beta^{wheat} \times suitability_o^{wheat} \text{ for every } o \text{ and } t, \tag{3.6}$$

where each $suitability_o^j$ term is the corresponding land suitability index as defined in Section 3.3.

Next, for every o, d, and t we assume that

$$\begin{aligned} \delta_{odt} = {} & \beta^{cost} \times cost_{odt} + \beta^{seaport} \times seaport_d \\ & + \beta_t^{capital} \times capital_d + \beta_t^{province} \times province_d + \beta_t^{district} \times district_d + \varphi_t, \end{aligned} \tag{3.7}$$

where $cost_{odt}$ is the cost of travel from origin o to city d at time t, $seaport_d$ is a dummy for whether city d is a seaport in 1904/1910, $capital_d$, $province_d$, and $district_d$ are dummies for city d's administrative status in 1858 (capital, provincial center, or district center, respectively), φ_t is the urban premium.

We allow the coefficients in $capital_d$, $province_d$, and $district_d$ to vary over time to capture the potentially differential return to migration to cities of different types at different points in time. Note that, like in other discrete choice models, the absolute levels of utility are irrelevant. The choice probabilities defined by Equation (3.1) only depend on the difference between peasant i's utility from staying at origin o, v_{iot}, and his utility from moving to city d, v_{iodt}. One of the parameters has to be normalized to zero to set the *level* of utility with respect to which other alternatives are evaluated. (This is why there is no constant term in Equation (3.6).) Then, the urban premium, φ_t, captures the average effect of unincluded factors on the utility of moving to city d relative to staying at origin o. Identification of the model is further restricted because we infer the "choice" of staying at origin o indirectly, via the changes in the observed population of cities. As a consequence, one of the coefficients in Equation (3.6) has to be normalized to one to set the *scale* of utility.[65] We normalize the coefficient in

[65] Without such normalization, multiplying all parameters entering δ_{ot} by the same factor would not affect the ratio of the probability of moving to city d relative to the probability of moving to city $\widetilde{d}, \widetilde{d} \neq d$. However, that *would* affect the probability of staying at origin o, which we would not be able to detect.

$suitability_o^{rye}$.[66]

3.4.3.2 Iterative Optimization Procedure

Recall that Equation (3.3) describes migration flows as predicted by the model. To obtain an "empirical" counterpart of the left-hand side of this equation, we rearrange the terms in Equation (3.5):

$$\widehat{flow}_{dt} = pop_{dt} - pop_{d,t-1} \text{ for every } d \text{ and } t. \tag{3.8}$$

Here, the term $\widehat{flow}_{dt}$ differs from the term $flow_{dt}$ in Equation (3.5) in that the unobserved shocks, ε_{dt}, do not enter Equation (3.8). Assuming that the model of migration (given by Equation (3.3)), the models of rural and urban population growth (Equations (3.4) and (3.5)), and the structural parameters (Equations (3.6) and (3.7)) are specified correctly, the theoretical and observed quantities are related via the true, unobserved parameters, (β, φ), as follows:

$$\widehat{flow}_{dt} = flow_{dt}(\beta, \varphi) + \epsilon_{dt} \text{ for every } d \text{ and } t, \tag{3.9}$$

where ϵ_{dt} are i.i.d. shocks.

Finally, to obtain estimates for (β, φ), we solve the following optimization problem:

$$\min_{\beta,\varphi} \sum_d \sum_t \left(\widehat{flow}_{dt} - flow_{dt}(\beta, \varphi)\right)^2. \tag{3.10}$$

Because at every time t the remaining population at origin o, defined by Equation (3.4), and $flow_{dt}$ are co-determined, we use the following iterative procedure to make this optimization problem tractable.

1. We start with some initial values of the parameters, (β_0, φ_0).
2. For each origin o, we calculate the share of peasants that left o between 1856 and 1858, $s_{od,1856}$. To that end, we plug in (β_0, φ_0) into Equation (3.2).

[66] Implicitly, all coefficients in Equation (3.6) are divided by β^{rye}.

3. We calculate the total number of peasants at origin o in 1856, $n_{o,1856}$, according to Equation (3.4). We use the observed population in 1858, $n_{o,1858}$, the population growth between 1856 and 1858, g_{1858} (the third column in Table 3.5), and the share of peasants who left, $s_{od,1856}$, from the previous step.
4. We proceed to calculating (s_{odt}, n_{ot}) for each origin o and the years 1847, 1840, 1833, and 1825. For the period 1858–1910, the procedure is analogous.
5. Once we have a complete "panel" of population at each origin o, $\{n_{ot}\}_{t=1825}^{t=1910}$, we calculate $flow_{dt}$ by replacing the unobserved parameters in Equation (3.3) with (β_0, φ_0) for each d and t. (Its empirical counterpart, $\widehat{flow}_{dt}$, is calculated according to Equation (3.8) once for all iterations.)
6. Solving the optimization problem (3.10) yields the new values of the parameters, (β_1, φ_1).
7. Return to step 2.

We repeat this procedure until convergence in the value of the minimand (3.10).

3.4.3.3 Results

The upper panel in Table 3.9 and Figure 3.7 display the estimates of the "pull" (city-specific) factors.[67] Expectedly, the coefficient in $cost_{odt}$ is negative: other things equal, the more expensive it is for peasants to reach a certain city the less likely they are to migrate there. Further, seaports seem to be more attractive destinations, controlling for other factors. As for the time-varying coefficients, we do not see any particular trend in the value of the urban premium, φ_t. This means that cities by themselves did not become more or less attractive to live in compared to the countryside (at least according to our model and data). As the coefficients in $capital_d$, $province_d$, and $district_d$ show, this observation applies to cities regardless of their administrative status. The observed "anomaly" around the year 1858 is likely due to the short length of the interval between 1856 and 1858. Together, the estimated coefficients in the city status dummies and φ_{1858} seem to "even out" the spike in that year.

The bottom panel in Table 3.9 displays the estimates of the "push" (origin-specific) factors. As one can see, the signs of the coefficients in $suitability_o^{oat}$ and $suitability_o^{wheat}$ are inversely related. This

[67] Note that our solution to the optimization problem (3.10) does not allow for inference. Because the main goal of this study is to conduct counterfactual analysis, point estimates are sufficient for our purposes.

likely reflects the fact that oat, like rye, was primarily grown in the North and wheat was primarily grown in the South. Therefore, the residual North-South variation, not captured by other variables, is absorbed by the land suitability indexes.

Table 3.9: Estimated parameters (time-invariant)

Parameter	Estimate
City-specific	
Travel cost	-124.41
Seaport	2.80
Origin-specific	
Land suitability, oat	7.96
Land suitability, wheat	-6.87

Notes:
All coefficients are estimated relative to the land suitability index for rye. For the estimates of the time-varying parameters, see Figure 3.7.

3.4.3.4 Counterfactual Analysis and Fit

Because we fully specify the processes of migration and population growth in the model, we are able to make counterfactual predictions about rural-urban migration in different years by altering the values of certain parameters of interest. We define the "baseline" scenario as the one that actually happened, with the end of the transitory period in 1863, 1864, and 1870, and the gradual expansion of the railroad network in 1838–1910. The alternative scenarios that we consider include: completely removing the railroad network in all periods, abolishing serfdom in 1811, and combination of the two. To construct the counterfactual population of city d at time t under different scenarios, we sum its estimated population at time $t-1$ and the estimated inflow of migrants at time t:

$$\widehat{pop}_{dt} = \widehat{pop}_{d,t-1} + flow_{dt}(\widehat{\beta}, \widehat{\varphi}), \tag{3.11}$$

where $\widehat{pop}_{d,1811} = pop_{d,1811}$, the observed population in 1811.

Figure 3.8 displays the result of applying this procedure to all 569 cities in the balanced sample.

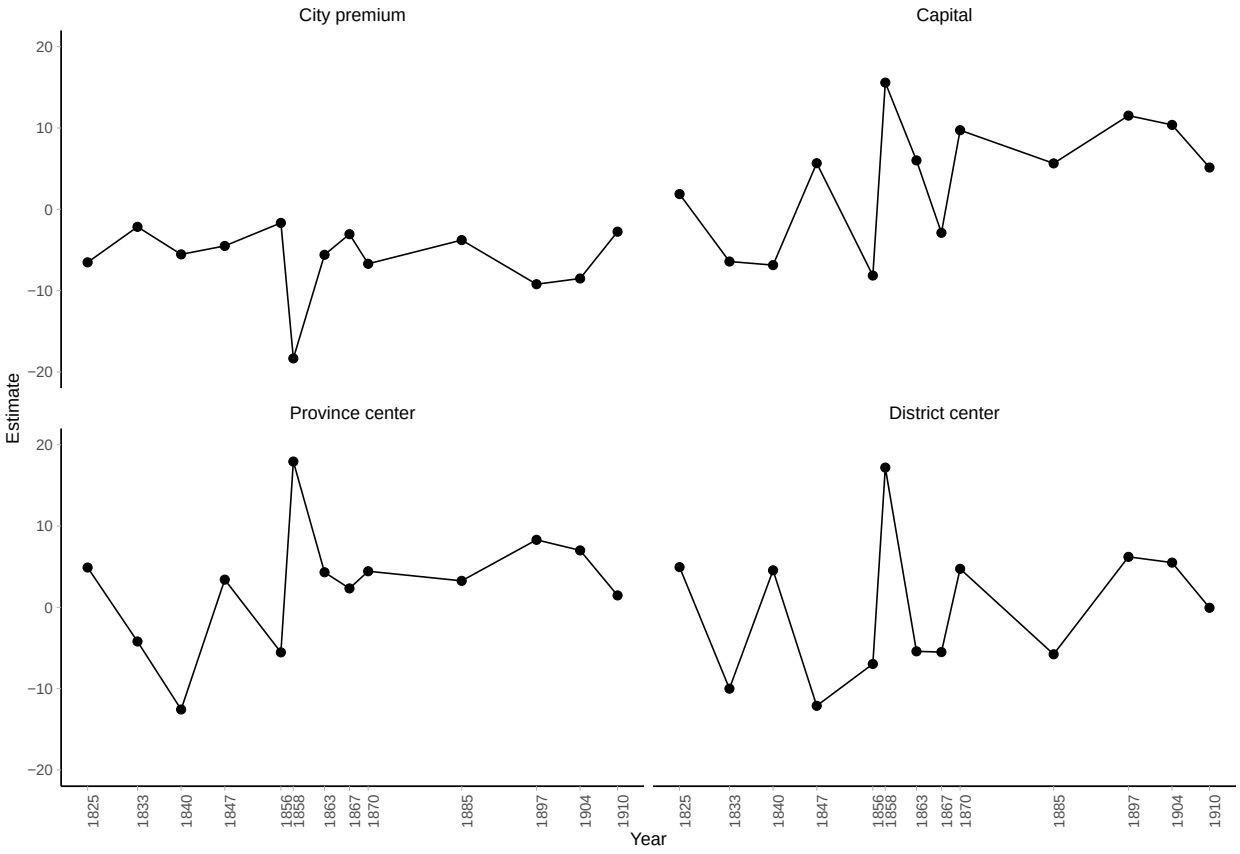

Figure 3.7: Estimated parameters (time-varying). All coefficients are estimated relative to the land suitability index for rye. See Table 3.9 for the estimates of the time-invariant parameters.

Scenario (2) represents the baseline case.[68] Comparison between scenarios (1) and (2) suggests that the negative consequences of serfdom were mitigated to a large extent due to construction of railroads. The considerable divergence between the two scenarios begins as early as in 1870, and by 1910 the gap constitutes several million people added to the total urban population. Importantly, the estimated impact of railroads does not seem to be an artifact of some unobserved interaction between railroad construction and serfdom.[69] As one can see, the gap in the total urban population in 1910 between scenarios (3) and (4), neither of which implies the existence of serfdom historically, is roughly proportional to the gap between scenarios (1) and (2). Also, because we do not find a significant increase in the attractiveness of cities themselves, the apparent mechanism that explains an almost twofold increase in the total urban population between 1870 and 1910 (under scenario (2)) is that the transportation constraints had indeed been binding to peasants before the expansion of the railroad network. This is *not* to say that serfdom did not matter—the absolute level of population in 1910 under scenario (4) is higher than the baseline prediction. However, so long as the transportation costs were not too high, freed peasants moved to cities at an accelerating rate, and eventual convergence of the lines representing scenarios (2) and (4) seems plausible.

In addition, Figure 3.8 provides comparison of the counterfactual scenarios with the observed data. If our model and the chosen parameters described the data perfectly, the observed urban population (black line) and the population predicted by scenario (2) (solid red line) would have coincided. Overall, we underestimate rural-urban migration throughout the period 1825–1910. This could occur for several reasons. First, our geographic coverage is confined to European Russia and Western Siberia, therefore, we do not account for out-migration of rural population to Transcaucasia, Eastern Siberia, and Central Asia. Second, our balanced panel does not include a large number of cities due to missing observations, especially in Poland and Finland. Because by necessity we restrict the choice set available to peasants, the parameters predicting migration to the sample cities are distorted. Third, the specification of the structural parameters (Equations (3.6) and (3.7)) is likely subject to omitted variable bias. In particular, it lacks the covariates capturing agglomeration effects and cross-city spillovers (urban potential).

[68] The difference between what we refer to as the baseline scenario and observed data is that the former relies on the estimated structural parameters, while the latter is generated by a process that we do not observe.

[69] One example of such interaction could be that the central government intentionally constructed railroads in the areas with high historical prevalence of serfdom.

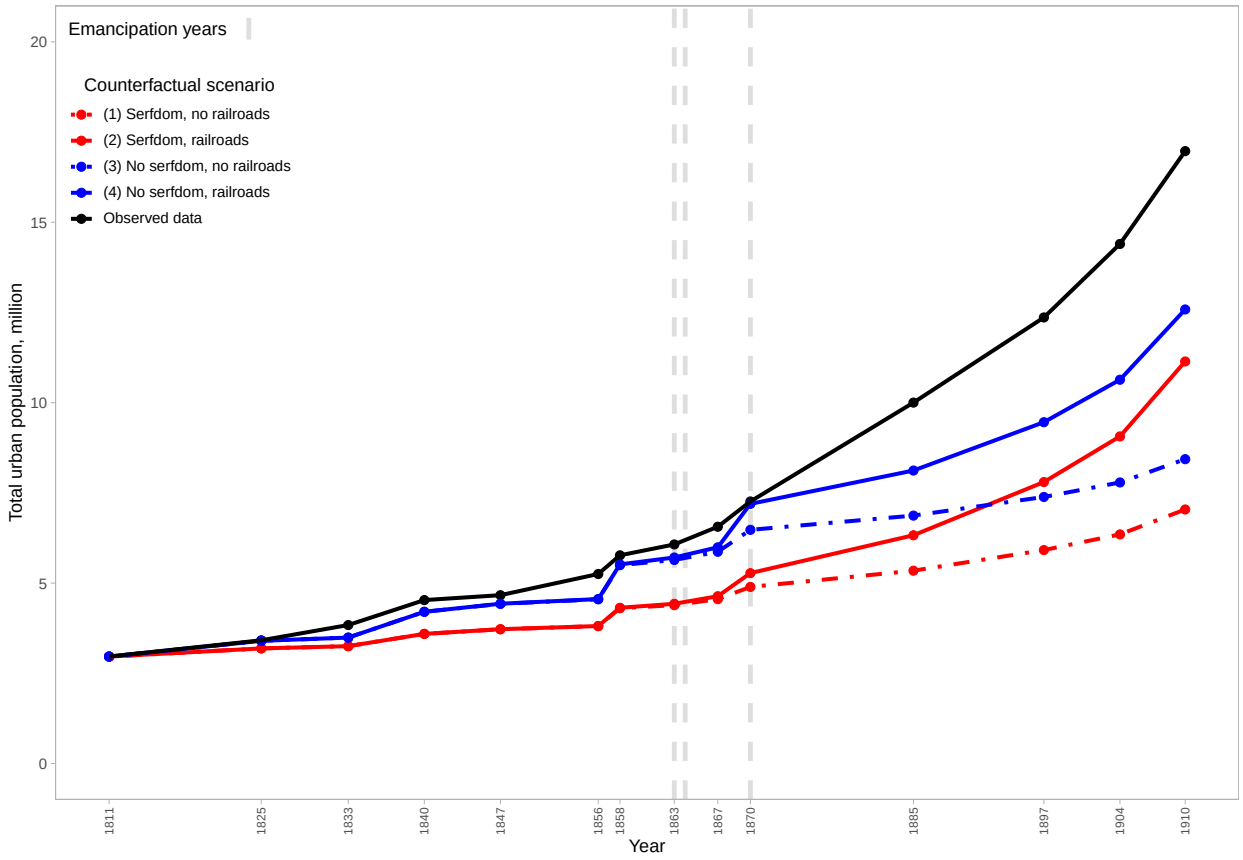

Figure 3.8: Observed urban growth and four counterfactual scenarios. Each line displays the total population of cities in the balanced sample in a given year. In each counterfactual scenario, the predicted population is constructed by plugging in the estimated parameters, displayed in Table 3.9 and Figure 3.7, into Equation (3.11). Scenarios (1) and (3) imply removing the entire railroad network during the period of study. Under scenarios (1) and (2), serfdom is abolished in the same years as in the observed data. Scenarios (3) and (4) imply removing mobility restrictions for all peasants starting from 1811.

That being said, we believe that within-model comparisons are still instructive for evaluating the degree to which removing railroads or abolishing serfdom earlier could have affected rural-urban migration, had the model predicted the data more accurately.

3.5 Conclusion

Historically, serfdom was an institution that tied affected agents to a certain location, such as a manor, mine, or master's house. While constraining mobility provided owners of serfs with sizable economic rents, it also likely distorted the spatial allocation of labor away from its most productive use. Can the market alone restore efficient allocation of labor once serfdom is abolished?

To the best of our knowledge, this is the first empirical study approaching this question via explicit examination of mobility restrictions. We propose a structural model linking restrictions on mobility of rural laborers, serfs, to an important dimension of economic development: urbanization. We estimate this model using novel detailed data covering one century of Russia's history. The estimated levels of the total urban population under different counterfactual scenarios suggest that railroads had a first-order positive impact on urbanization. This effect was seemingly independent from abolition of serfdom (or, rather, complementary to it). In that sense, and in line with Gerschenkron's (1962) account of Russia's economic development, the central government's investment in construction of railroads proved effective at mitigating the negative consequences of serfdom, if not completely eliminating them by 1910.

3.6 Appendix: Data Sources

All the sources below are listed in the chronological order of their publication.

3.6.1 Laws (Official Publications)

Svod zakonov Rossiiskoi Imperii, izdaniia 1857 goda. Tom 9. Zakony o sostoianiiakh [In Russian: Digest of Laws of the Russian Empire, 1857 Ed. Volume 9. Laws on the Sostoianiia], St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1857.

Svod zakonov Rossiiskoi Imperii, izdaniia 1857 goda. Tom 14. Svod ustavov o pasportakh i ssylnykh [In Russian: Digest of Laws of the Russian Empire, 1857 Ed. Volume 14. Digest of Regulations Concerning Passports and Fugitives], St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1857.

Polnoe sobranie zakonov Rossiiskoi Imperii. Sobranie vtoroe. Tom XXXVI. Otdelenie pervoe [In Russian: Complete Collection of Laws of the Russian Empire. Collection Two. Volume XXXVI. Part One], St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1863.

Polnoe sobranie zakonov Rossiiskoi Imperii. Sobranie vtoroe. Tom XXXVIII. Otdelenie vtoroe [In Russian: Complete Collection of Laws of the Russian Empire. Collection Two. Volume XXXVIII. Part Two], St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1866.

Polnoe sobranie zakonov Rossiiskoi Imperii. Sobranie vtoroe. Tom XXXIX. Otdelenie pervoe [In Russian: Complete Collection of Laws of the Russian Empire. Collection Two. Volume XXXIX. Part One], St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1867.

3.6.2 Laws (Secondary Sources and Commentary)

Chistiakov, O. R., ed., *Rossiiskoe zakonodatel'stvo X–XX vv. Dokumenty krestianskoi reformy. Tom 7 [Russian laws in the 10th to 20th centuries. Documents on the Peasant Reform. Volume 7]*, Moscow: Iuridicheskaia literatura, 1989.

Bardach, Juliusz, Bogusław Leśnodorski, and Michał Pietrzak, *Historia ustroju i prawa polskiego*, 6 ed., Warsaw: LexisNexis, 2009.

3.6.3 Raster Maps of the Russian Empire

3.6.3.1 Main Maps (Administrative)

Shtab Otdel'nogo Sibirskogo korpusa (1855). *General'naia karta Zapadnoi Sibiri s Kirgizskoi Step'iu [A general map of Western Siberia with the Kirghiz Steppe]*, [St. Petersburg:] Voenno-topograficheskoe depo.[70]

Imperatorskoe Russkoe geograficheskoe obschestvo (1862). *Karta Evropeiskoi Rossii i Kavkazskogo kraia [A map of European Russia and the Caucasus]*, [St. Petersburg:] Voenno-topograficheskoe depo.[71]

3.6.3.2 Supplementary Maps (Administrative)

Spetsial'naia karta Kievskoi gubernii [A special map of Kiev Province], 1852.

Zuev, N., *Podrobnyi atlas Rossiiskoi Imperii [A detailed atlas of the Russian Empire]*, 1860.

Karta Kazanskoi gubernii [A map of Kazan Province], 1860.

Karta Tavricheskoi gubernii izdaniia Il'ina 1860 goda [A map of Taurida Province, published by Il'in in 1860], 1860.

Ministry of the Interior, Central Statistical Committee, *Spisok naselennykh mest Simbirskoi gubernii [A list of settlements in Simbirsk Province]*, St. Petersburg: Tipografiia K. Vul'fa, 1863.

Il'in, A. A., *Podrobnyi atlas Rossiiskoi Imperii s planami glavnykh gorodov [A detailed atlas of the Russian Empire with maps of the major cities]*, 1876.

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[70] The place of publication is missing.

[71] The place of publication is missing.

3.6.4 Urban Population in 1811–1910

3.6.4.1 Official Publications Used to Define the Universe of Cities

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Shter, M., *Statisticheskoe izobrazhenie gorodov i posadov Rossiiskoi Imperii po 1825 god [A statistical description of towns and posads in the Russian Empire through 1825]*, St. Petersburg: Tipografiia Ivana Glazunova, 1829.

Ministry of the Interior, *Obozrenie sostoianiia gorodov Rossiiskoi Imperii v 1833 godu [A review of the state of towns in the Russian Empire in 1833]*, St. Petersburg: Tipografiia Karla Kraiia, 1834.

Ministry of the Interior, Statistics Department, *Statisticheskie tablitsy o sostoianii gorodov Rossiiskoi Imperii, Velikogo Kniazhestva Finliandskogo i Tsarstva Pol'skogo [Statistical tables on the state of towns in the Russian Empire, the Grand Duchy of Finland, and Kingdom of Poland]*, St. Petersburg: Tipografiia Karla Kraiia, 1842.

Ministry of the Interior, Statistics Department, *Statisticheskie tablitsy o sostoianii gorodov Rossiiskoi Imperii [Statistical tables on the state of towns in the Russian Empire]*, St. Petersburg: Tipografiia Ministerstva vnutrennikh del, 1852.

Ministry of the Interior, Statistics Department, *Statisticheskie tablitsy Rossiiskoi Imperii. Vypusk 1 za 1856 god [Statistical tables of the Russian Empire. Vol. 1, for 1856]*, St. Petersburg: Tipografiia Vtorogo Otdeleniia Sobstvennoi E. I. V. Kantseliarii, 1858.

Ministry of the Interior, *Gorodskie poseleniia v Rossiiskoi Imperii. T. 1–7 [Urban settlements in the Russian Empire. Vols. 1–7]*, St. Petersburg: Tipografiia tovarischestva "Obschestvennaia pol'za," 1860–1864.

Ministry of the Interior, Statistics Department, *Statisticheskii vremennik. Seriia I [Statistical yearbook. Series I]*, St. Petersburg: Tipografiia K. Vul'fa, 1866.

Ministry of the Interior, Statistics Department, *Statisticheskii vremennik. Seriia II, vypusk 1 [Statstical yearbook. Series II. Vol. 1]*, St. Petersburg: Tipografiia V. Bezobrasova i Ko, 1871.

Ministry of the Interior, Statistics Department (1875). *Statisticheskii vremennik. Seriia II, vypusk 10 [Statstical yearbook. Series II. Vol. 10]*, St. Petersburg: Tipografiia V. Bezobrasova i Ko.

Ministry of the Interior, Central Statistical Committee, *Statistika Rossiiskoi Imperii. Sbornik svedenii po Rossii za 1884–1885 gg. [Russian Empire Statistics. A digest of information on Russia in 1884–1885]*, St. Petersburg, 1887.

Ministry of the Interior, Central Statistical Committee, *Statistika Rossiiskoi Imperii. XXV. Sbornik svedenii po finliandskim guberniiam [Russian Empire Statistics. XXV. A digest of information on Finnish provinces]*, St. Petersburg: Tipografiia Bezobrazova i Ko., 1892.

Ministry of the Interior, Central Statistical Committee, *Okonchatel'no ustanovlennoe pri razrabotke perepisi nalichnoe naselenie gorodov [The finally determined present population of towns according to the Census.]*, St. Petersburg: Tipografiia "Obschestvennaia pol'za," 1905.

Ministry of the Interior, Central Statistical Committee, *Goroda Rossii v 1904 godu [Russian cities in 1904]*, St. Petersburg: Tipografiia N. L. Nyrkina, 1906.

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The list below only includes the sources not already mentioned above.

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Królestwo Polskie, Komisja Rządowa Spraw Wewnętrznych i Policji, *Tabella miast, wsi, osad, Królestwa Polskiego : z wyrażeniem ich położenia i ludności alfabetycznie ułożona. Tom 2*, Warsaw: W drukarni Łątkiewicza przy ulicy Senatorskiéy Nro 467, 1827.

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Ministry of the Interior, *Zhurnal Ministerstva vnutrennikh del. Period I. Chast' 15 [The digest of the Ministry of the Interior. Period I. Part 15]*, St. Petersburg: Tipografiia Karla Kraiia, 1835.

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Ministry of the Interior, *Zhurnal Ministerstva vnutrennikh del. Period I. Chast' 18 [The digest of the Ministry of the Interior. Period I. Part 18]*, St. Petersburg: Tipografiia Karla Kraiia, [1835].

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Sobieszczański, Franciszek Maksymilian, *Rys historyczno-statystyczny wzrostu i stanu miasta Warszawy od najdawniejszych czasów aż do 1847 roku*, Warsaw: S. Strąbski, 1848.

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Voenno-statisticheskoe obozrenie Rossiiskoi Imperii. Tom XI. Chast' 1. Khersonskaia guberniia [A military and statistical review of the Russian Empire. Vol. XI. Part 1. Kherson province], St. Petersburg: Tipografiia Departamenta general'nogo shtaba, 1849.

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