ESSAYS ON RELIGION AND INSTITUTIONS
IN EUROPEAN ECONOMIC HISTORY

by

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A Dissertation
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Dedication

I dedicate this dissertation to my supportive grandparents Shirley and Bernard Shusta.

Acknowledgments

I would like to thank the following people who made this possible: my parents Tom and Roseanne Finley for being a constant support system through the past five years; my family, friends and classmates for their encouragement and support; and my mentors John V.C. Nye, Noel D. Johnson, Mark Koyama and Raphaël Franck who supported me and challenged me to make this dissertation possible.

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Abstract

ESSAYS ON RELIGION AND INSTITUTIONS IN EUROPEAN ECONOMIC HISTORY

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My dissertation contains three essays on the role of religion and institutions in European economic history.

The first essay investigates the role of transaction costs on effective monitoring within an organization by using a historical case study – the Cistercian Order of Ancien Regime France. The order of Cistercian monks used monitoring to prevent free riding behavior. Through a newly collected dataset on the location and wealth of Cistercian monasteries and transportation networks in 18th century France, I find that monasteries with higher monitoring costs (proxied by transportation costs) engaged in more market-orientated behavior, which constituted free riding according to the membership requirements of the monastic order.

The second essay (co-authored with Mark Koyama) examines the institutional determinants of persecution by studying the intensity of the Black Death pogroms in the Holy Roman Empire. Using a new data set on the intensity of Jewish persecutions during the Black Death, we find that communities governed by Archbishoprics, Bishoprics, and Imperial Free

Cities experienced more intense and violent persecutions than did those governed by the emperor or by secular princes.

The third essay (co-authored with Raphaël Franck and Noel D. Johnson) explores the long-run effects of the widescale land redistribution that occurred during the French Revolution through the confiscation and auctions of Church property on agricultural productivity in the 19th century. We find that French districts with a greater proportion of land redistributed during the French Revolution experienced higher levels of agricultural productivity during the 19th century. We also identify possible channels through which this occurred – drainage and irrigation investment and transportation infrastructure. We argue that this result is consistent with the institutional changes that occurred through redistribution, most notably the improved efficiency of property rights.

Chapter 1: Free Riding in the Monastery: Club goods, the Cistercian Order and Agricultural Investment in Ancien Regime France

1.1 Introduction

The concept of a free rider problem in political economy usually refers to the cost of individuals who benefit from a public good without contributing to its cost. Scholars in management and organizational economics, however, tend to use the alternative use of the phrase free rider according to traditional club theory, as developed predominately by Mancur Olson (1965) and James Buchanan (1965). In club theory literature, a free rider is a member of an organization who gains utility from being in the club (often but not always through consumption of a club good) but does not follow the membership requirements. Buchanan (1965) proposes that free riders occur in a club when it is costly to monitor members' behavior. This paper is an attempt to test Buchanan's hypothesis by examining the effect of the cost of monitoring members on their free riding behavior within an organization.

Specifically in this paper I use a historic case study – the monastic order of Cistercians in 18th century France – to test whether higher costs of enforcing membership rules (and thus less effective monitoring) is associated with a greater propensity to free ride. My main result is that monasteries in the Cistercian Order that faced higher effective monitoring costs were more likely to engage in free riding behavior. This result confirms Buchanan's hypothesis that free riding is a consequence of costly monitoring and has potential applications to present-day organizations.

I chose to study the Cistercian Order of monasteries in 18th century France for three primary

reasons. First, on average, monks have explicit membership requirements. Cistercian monks were required to follow the Benedictine Rule, a detailed handbook that outlined the daily lives of the monks in great detail.[1] Since the membership requirements for a monastic order are well-defined, this makes identifying what constitutes free riding behavior a somewhat easier task.

A second reason for why I chose the Cistercian Order in 18th century France was the existence and nature of two well-documented mechanisms through which Cistercian officials were able to monitor the behavior of monks throughout the Order. The central constitution of the Cistercian Order, known as the *Charter of Charity* outlines two ways in which monitoring could occur: (1) Annual Visitation – a required trip once a year in which an assigned "supervising" proto-abbot would inspect a monastery and its members behavior and (2) General Chapter Attendance – an annual meeting at the "headquarters" of the Order in Citeaux that the abbot of each monastery was required to attend.[2] The advantage that these two monitoring mechanisms generate for a study of the impact of monitoring costs on free riding behavior draws from the main cost associated with each – transportation from one monastery to another. For each mechanism, a physical trip is required by an individual and thus a major driver of the cost of monitoring for these mechanisms is due to transportation costs.

I assert that what constitutes free riding for Cistercian monks, according to the club theory literature, is anything that violates the Benedictine Rule. Detailed accounting of the behavior of Cistercian monks, however, is not easily accessible, but one of the themes in the Benedictine Rule is a deterrence from wealth-generating activities. I propose, therefore, that evidence of wealth-seeking activities by Cistercian monks suggests that members engaged in

[1] The Benedictine Rule includes seventy-three chapters that outline behavioral requirements for monasteries attributed to Benedict of Nursia. More on the specific characteristics of the Rule are provided in Section 1.2.2.

[2] Abbot is the title given to the head of an individual monastery. The term 'proto-abbot' comes from McManners (1999) and Berman (2000a) to designate the abbots of the five supreme monasteries that held supervisory authority over all other monasteries of the Order. These five 'proto-abbots' are associated with the five filiations of the Cistercian Order, which are explained further in Section 2.3. Alternative designations for these five individuals include the 'Fathers Immediate' and the 'Chief Abbots'.

free riding behavior by not following the Benedictine Rule. This brings me to my final reason for studying the Cistercian Order in 18th century France, which relies on a major event at the end of the 18th century that provides one of the first cross-regional surveys of Cistercian wealth – the confiscation of church land during the onset of the French Revolution. While not a perfect measure of free riding behavior, the confiscations and subsequent auctions of Cistercian properties allows me the opportunity to discern the wealth-generating activities of different Cistercian monasteries.

My empirical strategy is to test the effect of different monitoring costs on free riding behavior for Cistercian monasteries in 18th century France. To measure monitoring costs, I use newly digitized maps of transportation networks in late-eighteenth century France and the location of Cistercian monasteries to calculate the least-cost travel path for individuals engaging in the two monitoring trips: (1) annual visitation and (2) general chapter attendance. For each monastery, therefore, I calculate the cost of traveling to Citeaux and their designated proto-abbot's monastery. For a measure of "wealth-generating activities" by Cistercian monasteries, I use a newly collected data set on agricultural investment by calculating ln(Price-per-Acre) for each property and controlling for differences in geographic endowments. I find that properties owned by monasteries with higher costs associated with the two monitoring trips had higher values of agricultural investment.

This paper contributes to a vast literature on the provision of club goods and more broadly that of public goods. Traditionally, club theory has been applied to public transport (i.e. Berglas and Pines (1981); Oakland (1972); Stiglitz (1977)), hospitals (i.e. Pauly and Redisch (1973), international organizations (i.e. Casella and Frey (1992); Fratianni and Pattison (2001)), and wilderness areas (i.e. Cicchetti and Smith (1973); Smith (1975)). More recent contributions to the literature include the application of club theory to topics such as environmental policy (i.e. Nordhaus (2015); Potoski and Prakash (2005)) and sports economics (i.e. Leeds and Von Allmen (2016); Szymanski (2003); Taylor and Gratton (2002)).

This paper relates most closely to the application of club theory to religious organizations.

Major contributions in this literature originate from the work of Iannaccone in identifying the role of strict membership requirements on screening out free riders within religious organizations (Iannaccone (1992, 1994, 1998)). Iannaccone's theory is applied most notably by Berman in understanding terrorist organizations (Berman (2000b, 2011)). Other explorations of club theory literature to the economics of religion include contributions by Carvalho, Koyama and Rubin (Aimone et al. (2013); Carvalho (2013, 2016a,b); Carvalho and Koyama (2016)).

Additionally, this paper contributes to the growing literature on the economics of religion, especially the subset that examines the economic impact of the structure of a religious organization on economic behavior. Most of the research centers around either the entire apparatus of the Catholic Church, as with Ekelund et al. (2006, 1996), or individual congregations and communities as with Davidson (1995). At present, this study is one of the first to apply club theory to explain the economic behavior of a religious order.

A recent contribution to the literature on both the economics of religion and economic growth is that of Andersen, Bentzen, Dalgaard, and Sharp (2016), which examines the external effect of the Cistercian order as a whole on economic growth in Europe. Where the present paper differs from that of Andersen et al. (2016) in studying the Cistercians is the lens of focus; the former is concerned with explaining differences in economic behavior within the Cistercian Order while the latter focuses on the external impact of Cistercian ideology on neighboring towns. Another paper in this literature on religious organizations and economic growth is Heldring, Robinson, and Vollmer (2015) which examines the impact of the dissolution of English monasteries on patterns of economic growth. In this paper, the authors find evidence that farms operated by monasteries of the Cistercian order were more productive compared to other religious orders. The results of the two papers are consistent with the present paper if members of the Cistercian order receive some benefits compared to other orders and laypeople, but those benefits are suppressed when enforcement of Cistercian rules are higher. This trade-off can reconcile the high productivity of Cistercians in more

distant locations with the explicit rules discouraging market-orientated behavior, which I explain further in Sections 2 and 3.

Finally, this paper complements the literature on French economic history and the role of institutions and agriculture on French and European economic growth. The importance of agriculture to the French economy and possible implications for the divergence between France and Britain during the Industrial Revolution is dominated by the work of Allen, Grantham, and McCloskey (Allen (1988, 1999); Allen and Gráda (1988); Grantham (1989, 1980); McCloskey (1972)). Within economic history literature, there is also subsection of work on the role of institutions on French economic growth to include, most notably, the contributions of Hoffman and Rosenthal (Hoffman (1988, 1991, 2000); Rosenthal (1990a,b, 1993)).

The structure of the paper is as follows. In Section 1.2 I provide background on the Cistercian Order's organization and guiding principles. Section 1.3 includes a brief introduction to club theory and the application of club good provision to a religious order. I describe the data and empirical strategy in Section 1.4. In Section 1.5 I report the main empirical results and explore possible threats to causality and alternative specifications. Section 1.6 concludes.

1.2 Religious Orders and the Cistercian Order

The Encyclopedia of Religion and Society (1998) defines a religious order as "A group of either men or women...who voluntarily take vows to live under more stringent religious standards than are required for the modal or average member of their religious tradition." Religious orders vary in their primary goal: contemplative orders focus more on prayer in isolation, semi-contemplative orders combine good deeds with prayer and active orders focus almost entirely on performing good deeds. The majority of religious orders include some aspect of a community, especially those following the Benedictine Rule, which is key for any application of club theory to religious orders. In this paper, I explore the effectiveness

of monitoring devices in preventing free riding within a religious order. As such, before applying club theory to the Cistercian Order, I will begin by providing some background on the foundation of the Cistercian Order, the Benedictine Rule and the Charter of Charity.

1.2.1 The Cistercian Order

The Cistercian Order was founded in 1098 by monks from the Benedictine monastery at Molesme, including the abbot, Robert of Molesme. According to a 12th century Cistercian document titled "Exordium Parvum", which is a compilation of letters and accounts on the foundation of the Cistercian Order, the justification for the split from the Benedictines is attributed to a wish "to adhere more strictly and perfectly" to the Rule of St. Benedict and a desire for "greater quiet". While the Cistercians continued to follow the Benedictine Rule, they are governed by another document as well, known as the Charter of Charity. The Charter of Charity was a constitution that established a system of administrative oversight to maintain uniformity in the Order and the enforcement of the Benedictine Rule.

The rapid expansion of the Cistercian Order is key to understanding the relevance of the Order in European history. A Trappist monk and Cistercian historian, Father Alberic, provides a unique chronicle of the history of the Order from its foundation to its absorption by the Trappists following the French Revolution. Alberic notes that between 1098 and 1153, the number of Cistercian monasteries (or abbeys) was already 343. At the time of the last foundation in 1675, the number had grown to 707 abbeys, not to mention priories and convents. While the Cistercian Order as not as large as other orders, such as the Augustinians or Benedictines, its size combined with its organizational structure makes it unique.

1.2.2 The Benedictine Rule

The Benedictine Rule is a book of precepts believed to be written by Benedict of Nursia in the sixth century. Most of the well-known religious orders of the Church follow a Rule (i.e. Augustinians, Benedictines, Dominicans, Franciscans) or other governing precepts. These Rules often serve as constitutions within monastic communities that govern the behavior of individual monks and establish order within the community. The Benedictine Rule consists of 73 chapters that address topics ranging from more general, such as the appointment of an abbot and admission to the monastery, to more detailed, such as the quantity and quality of food at meals and permitted clothing attire.

One aspect of the Benedictine Rule that is important for the discussion on free riding is the emphasis on asceticism, the practice strict self-denial as a measure of personal and especially spiritual discipline.[3] The Benedictine Rule establishes the guidelines for a community of individuals who seek what historian Lowrie John Daly describes as a life "spent in silence and withdrawl from the world"Daly (1965). From the Benedictine Rule, followers are encouraged to be "free from the vice of proprietary or ownership" and to pledge "not to seek after delights" and "to withdraw ourselves from worldly ways."

A monk following the Benedictine Rule, therefore, can be thought of as an individual who constrains himself from engaging in "worldly ways" by joining a community of like-minded individuals. With membership in the community, the monk accepts constraints on his behavior in exchange for the benefits of membership in a monastic community. Examples of these benefits may be access to resources, tax exemption status or reputational effects.

When the benefits from being in club such as a religious order are sufficiently high, club theory predicts that individuals will have the incentive to join and reap the benefits without adhering to the constraints. Historically, when such a free rider problem occurs, a religious order succumbs to a reform movement. The Cistercian Order was founded as such a reform.

[3]Definition from Merriam-Webster (2004).

1.2.3 The Charter of Charity

In order to achieve what its founders describe as a more strict adherence to the Benedictine Rule, when the founders of the Cistercian Order left the Benedictine monastery, they adopted rules that established binding ties between the monasteries. This was distinctly different from the Benedictine Order, which was comprised of independent, isolated communities with no well-established system of ensuring uniformity in how the Benedictine Rule was to be followed.

Rather than continue with isolated communities, Cistercians established an administrative system through the Charter of Charity that, according to Daly (1965) and other scholars, secured uniformity throughout the order. Both the Benedictine Rule and the Charter of Charity govern the Cistercian Order; the two do not conflict. Whereas the Benedictine Rule concerned practices within a monastery, the Charter of Charity established the guidelines for interactions between monasteries of the Cistercian Order. This was achieved primarily through two mechanisms: annual visitation from supervising proto-abbots and General Chapter attendance.

The first enforcement mechanism, annual visitation, included the yearly visitation of a monastery from the head of its filiation, one of the five proto-abbots. The original mother-house, Citeaux and her four original daughter-houses (Clairvaux, La Ferte, Morimond and Pontigny) comprised the five proto-abbots that served as the heads of their respective filiations. In practice, the filiations mimicked branches of a Cistercian family tree, an example of which is provided in Figure 1.1. The proto-abbots were responsible for the houses founded by its members tracing back to the origins of the Order. As such, all other houses belonged to one of the five filiations and would be visited by their respective proto-abbot. The five main houses were also visited: Citeaux visited the other four and was then visited by one of the four by rotation. All of the Cistercian monasteries in France at the end of the eighteenth century are presented in Figure 1.2. A map of the houses by filiation is included in the Appendix.

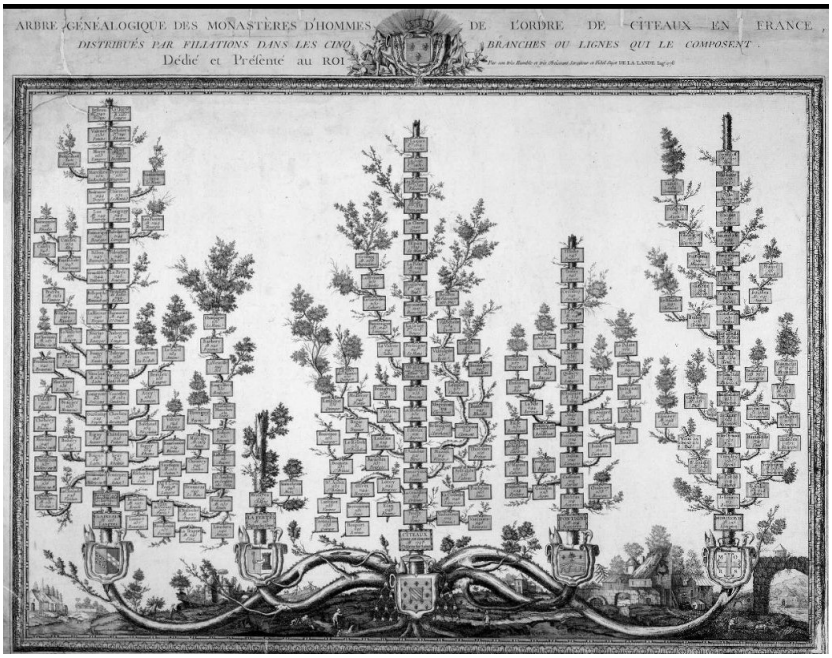


Figure 1.1: Cistercian Family Tree - Le Lande (1776)
Left to Right: Clairvaux, La Ferte, Citeaux, Pontigny, Morimont

As Burton and Kerr (2011) explains, the annual visitation was, in theory, "an effective means of maintaining and implementing uniformity of practice" as well as "a way to provide guidance and support." Burton and Kerr describe the scope of these visitations to include daily habits, prayer, appropriate exercise of charity and the financial state of the house. Alberic (1944) emphasizes the role of the annual visits in maintaining standards of Cistercian ideals in stating, "By the mutual supervision over each monastery, the rendering account of its administration, rigid examination of discipline and the immediate correction of abuses, sure means were offered for maintaining the monastic observance in all its purity."

The second mechanism for enforcing Cistercian rules was required attendance at an annual General Chapter meeting at Citeaux. Abbots from every house were required to attend. According to Alberic (1944), "The General Chapters kept watch with equal severity over the observance of the Rule of St. Benedict, the Charter of Charity, and the definitions and decisions of preceding Chapters." At this meeting, any grievances discovered during

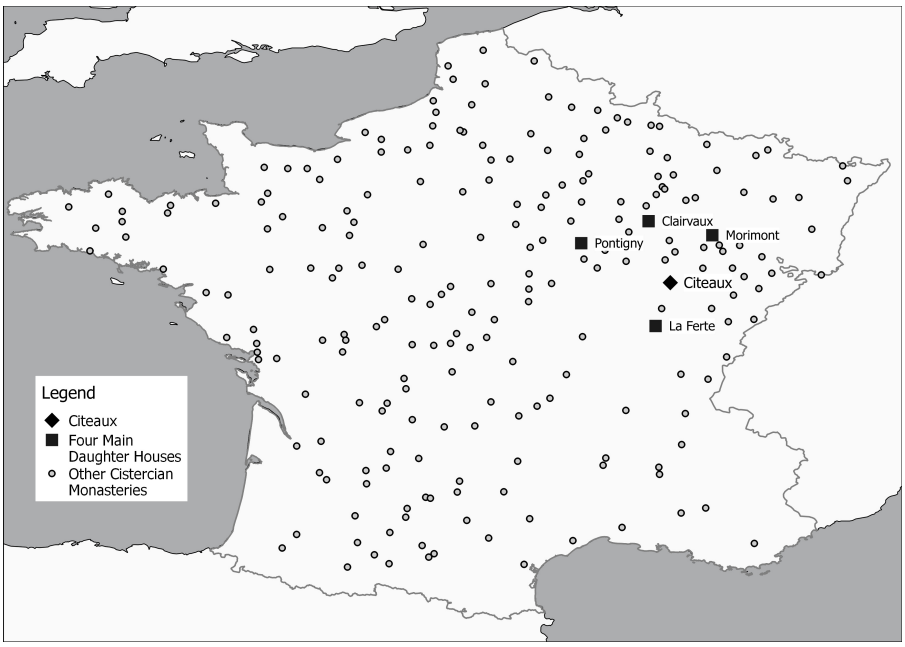


Figure 1.2: Cistercian Houses in the Eighteenth Century

the visitations within each filiation would be addressed. Alberic (1944) asserts that "All affairs of the Order, such as differences between abbots, purchase and sale of properties, incorporations of abbeys, questions relating to laws, feasts, and rites, and, since the middle of the thirteenth century, the erection of colleges – these and many other affairs were submitted to the General Chapter."

These two mechanisms, Annual Visitation and General Chapter Attendance, would, in theory, jointly ensure that members of the Cistercian Order maintain the interpretation of the Benedictine Rule established by Citeaux and the four great daughter-houses. For example, if a monastery engaged in behavior that violated Cistercian rules, an annual visit would allow the proto-abbot to observe the transgression and, if unable to correct directly, report the issue at the General Chapter meeting to the entire Cistercian community for additional means of punishing the transgressing abbots or monks.

It is important to note that the costs of these two enforcement mechanisms were likely not

negligible, especially after the massive expansion of the Cistercian Order. As (Alberic, 1944) describes, in the later centuries, "the large number of monasteries...prevented the [proto-abbots] from making the regular visits to all the houses of their filiations." Additionally, there is no clear evidence that the proto-abbots attempted to internalize the costs of annual visitation by extracting proportionate sums from the monasteries of their filiation. It is likely, therefore, that the proto-abbots were more likely to visit closer monasteries, at least with some consistency, compared to more distant monasteries. This variation could then predict lapses in adherence to the Cistercian rules and subsequently free riding behavior.

In the next section, I will apply club theory to the Cistercian Order and derive a testable prediction for the effect of enforcement on free riding behavior using enforcement costs as a measure of the effectiveness of enforcement for monasteries of the Cistercian Order.

1.3 Club Theory

1.3.1 Club Goods in a Religious Organization

Buchanan (1965) describes club goods as falling between the extreme of pure private and pure public goods. In the literature, club goods are usually described as having some degree of non-rivalry (consumption by one individual does not preclude consumption by another) and/or excludability of benefits.[4] Traditional examples of club goods include hospitals, libraries, universities, movie theaters, and public transportation.

Religious organizations, such as a religious order, differ from traditional applications of club theory due to what Larry Iannaccone calls "participatory crowding"(1992). Traditional applications of club theory, such as public transport, suffer from problems of congestion as group size increases; additional membership lowers utility for existing members. Within a religious organization, however, the opposite effect is observed; additional members

[4]See Buchanan (1965); Sandler and Tschirhart (1997, 1980) for more detailed explanations.

increase utility for existing members. The central problem for these clubs, therefore, is not crowding but rather ensuring group members maintain a sufficiently high level of participation. A key reason for this difference between traditional club theory examples and religious organizations is the nature of the religious organization's club good, group quality. Iannaccone (1992) defines group quality in a religious organization as "a function of the number and average participation of the other club members", where participation refers specifically to participation in religious activities. In other words, group quality creates positive externalities for an individual from being a member of a religious community. These positive externalities are higher with more contributing members in the group and lower with more free riders (non-contributing members).

For members of a religious order, such as the Cistercians, individuals may experience these externalities generated from group quality both inside and outside of the monastery. Within the monastery's walls, Cistercian monks likely gained utility through access to better religious and secular instruction, worship services and social activities. Outside of the monastery, members likely also received benefits from being part of the Cistercian Order through tax-exempt status or reputational effects (i.e. lower negotiation costs from having a reputation as an honest Cistercian monk). Regardless of the way in which these externalities manifest, for the Cistercian Order, the magnitude of their effect grows with more members and higher average participation. In Iannaccone's model, free riding occurs when members of a religious organization engage in less religious participation while still benefiting from the contributions of other members. In a religious order, compared to a religious congregation, more strict requirements for membership will likely lead to more subtle forms of free riding behavior.

1.3.2 Free Riding in a Religious Order

The nature of the free rider problem in a religious order depends upon the constraints adopted by members on what behavior is considered unfavorable. Under the Benedictine Rule, members were discouraged from engaging in market-orientated behavior. I use the term

market-orientated behavior to describe all activities that violate the pledge made by followers of the Benedictine Rule "to withdraw ourselves from worldly ways". Although free riding behavior may take alternative forms for other monastic Rules (i.e. Franciscan or Dominican), for the Cistercian Order under the Benedictine Rule, I define free riding as benefiting from membership in the Cistercian Order while engaging in these market-orientated activities. Examples of market-orientated behavior are consumption of non-essential goods and services and wealth-generating activities such as investment.

Historical accounts suggest that the abbot is the sole decision-maker for all activities within the monastery.[5] An abbot gains utility from three things: (1) his monastery's membership in the Cistercian Order (2) religious ideals (such as asceticism) and (3) market-orientated activities. The abbot faces a trade-off between religious ideals (rejection of wealth) and market-orientated activities (accumulation of wealth). Since individuals that join the Cistercian Order pledge to engage in behavior that supports asceticism, in return for the benefits that membership generates, free riding will occur when the abbot devotes resources to market-orientated activities beyond that which is sufficient for the survival of the members of the monastery (i.e. nutritional needs).

Market-orientated behavior by the abbots is suppressed when the enforcement mechanisms of the Cistercian Order are sufficiently effective. To understand this process, consider an individual whose utility from market-orientated behavior is higher than the average Cistercian and whose utility from religious ideals is lower than the average Cistercian. This individual has an incentive to join the Cistercian Order so long as there are benefits from membership (as explained above). Given that the individual is better off engaging in more market-orientated behavior, a club manager would need to adopt and enforce constraints that encourage the individual to engage in more behavior that is consistent with religious ideals and less market-orientated behavior. So long as the constraints are effective, free

[5]The Benedictine Rule grants abbots "paramount authority" over everything in a monastery, including the allocation of capital and labor (Daly (1965)). Daly explains that "the abbot is the corner stone of the Rule" and although he may seek advice from community members, he is not bound to follow it and his office is for life.

riding individuals in this extreme case will be deterred from joining the Cistercian order.

If, however, there is variation in the effectiveness of enforcement, I can derive the following prediction:

Prediction 1. *Abbots of Cistercian monasteries with less effective enforcement will engage in more market-orientated behavior.*

Historical accounts suggest that proto-abbots were less likely to conduct annual visitation and monasteries were less likely to attend General Chapter meetings when transportation costs were sufficiently high. Let Visitation Cost be defined as the cost of traveling the least-cost path between a monastery and its proto-abbot and let General Chapter Cost be defined as the cost of traveling the least-cost path between a monastery and Citeaux. If the effectiveness of enforcement varies with Visitation Cost and General Chapter Cost, I can change Prediction 1 to the following:

Prediction 2.A. *Abbots of Cistercian monasteries with higher values of Visitation Cost will engage in more market-orientated behavior.*
Prediction 2.B. *Abbots of Cistercian monasteries with higher values of General Chapter Cost will engage in more market-orientated behavior.*

Finally, if I assume agricultural investment (land values after controlling for initial geographic endowments) is a proxy for market-orientated behavior, I arrive at the follow two testable predictions:

Prediction 3.A. *Abbots of Cistercian monasteries with higher values of Visitation Cost will have higher levels of agricultural investment.*
Prediction 3.B. *Abbots of Cistercian monasteries with higher values of General Chapter Cost will have higher levels of agricultural investment.*

1.4 Data and Empirical Strategy

To test the above predictions, I use the following empirical specification:

$$\text{AgriculturalInvestment}_{id} = \alpha + \beta \text{TransportationCosts}_i + \mathbf{X}'\mathbf{\Omega} + \Lambda_d + \epsilon_i \ , \tag{1.1}$$

where $\text{AgriculturalInvestment}_{id}$ is a measure of agricultural investment for a given property i across departments d and $\text{TransportationCosts}_i$ can take values for a given monastery's Visitation Cost or General Chapter Attendance Cost for properties i. Standard errors are clustered at the department level.

1.4.1 Market-Orientated Behavior - Agricultural Investment

As a proxy for market-orientated behavior, I collect a measure of agricultural investment from a newly collected dataset of 322 agricultural properties owned by 73 monasteries of the Cistercian Order at the end of the Ancien Regime in France. The properties are presented in Figure 1.3. The sample is compiled from listings of auctioned properties confiscated by the National Assembly in October 1790 and sold between 1791 and 1793. For some parts of France, these auctions were advertised through the bi-weekly distribution of pamphlets describing the different properties and their characteristics. These listings usually included the property's location, size, type (building, farm, etc.), tenants and lease characteristics (if present), the previous owner and an estimated initial bidding price for the listed auction.

I use the initial bidding price at auction as a measure of the value of the land. As Bodinier and Teyssier (2000) explains, "The properties were estimated by experts or evaluated following the amount of rent."[6] These evaluations were then used to establish the initial bid at auction, giving a measure of the value of the property at the time they were evaluated. Ideally the final selling price of the land, denoted in livres, would be used to reflect the

[6]Translation provided by the author.

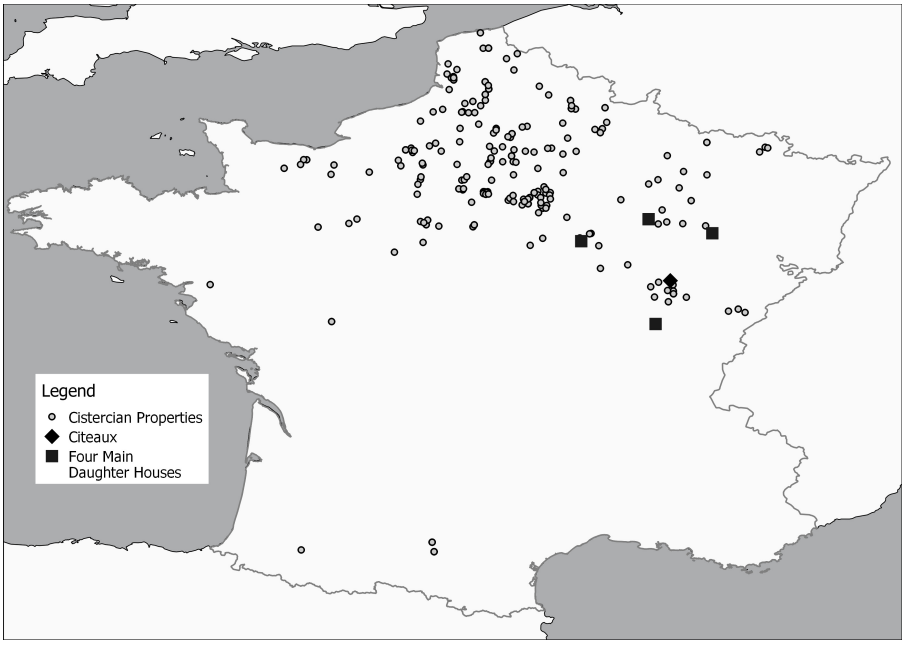


Figure 1.3: Cistercian Properties

property's market value but this information is not readily available on a large scale. In lieu of this, the initial bidding prices are used.

In order to estimate agricultural investment of the Cistercian monasteries, I only examine agricultural plots owned by the Cistercians. I therefore exclude properties owned by the crown, nobles, clergy and other religious orders (placebo tests using properties of the Benedictine Order are presented in Section 5.2.3). I also exclude properties with buildings (monasteries, chapels, etc.) and only use properties for which the actual size of the plot is provided.[7]

While the total price provides the total value of the plot, in order to capture agricultural investment, I use a more comparable measure, price-per-acre. The task of collecting acreage for the different properties is hampered by the lack of uniform measurements in France

[7] Auction listings do not provide enough detail on the building's characteristics to accurately compare buildings owned by different Cistercian monasteries. Agricultural properties, however, are easier to compare by using geographic characteristics of the location.

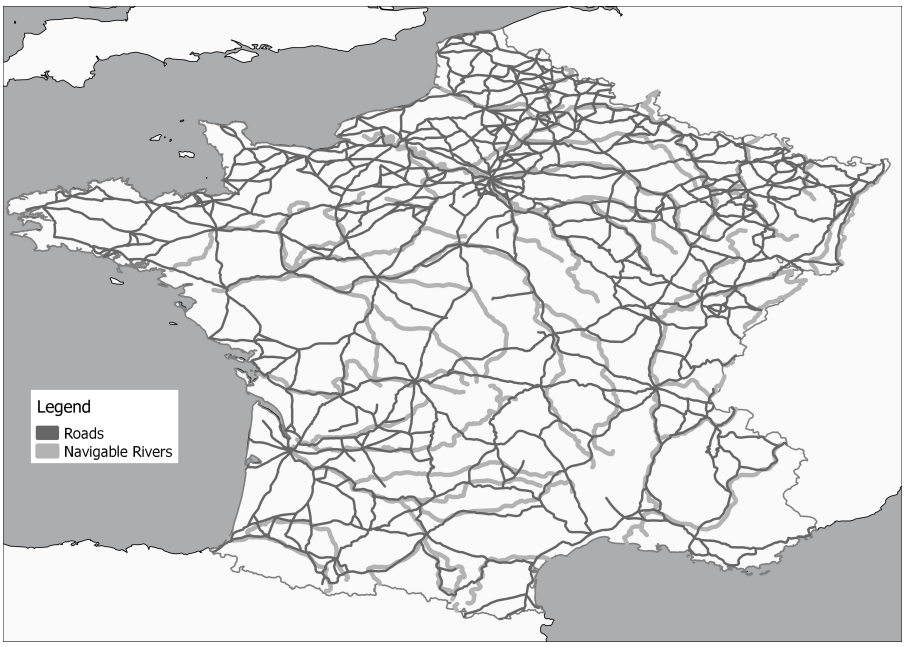


Figure 1.4: Transportation Networks in 1789

before the Revolution. Local regions developed individual measures of land size and the auction listings reflect this disaggregation. I therefore converted non-acre measures provided in the auction listings (i.e. arpens, rasieres, septiers, esseins, etc.) to acres using historic dictionaries of measurement (i.e. Doursther (1840); Gattey (1812)) for reference. Once I am able to calculate total acreage, I derive the price-per-acre for the agricultural property.

After controlling for geographic endowments and characteristics of the labor force, I assert that what is left is a measure of the agricultural investment pursued by the Cistercian house that owned that property.[8]

1.4.2 Enforcement Costs - Transportation Costs

Since the costs associated with annual visitation and general chapter attendance vary with transportation costs, in order to derive enforcement costs of monitoring devices for the owners of the agricultural properties in the sample, I calculate the cost of traveling between (1) the monastery and the proto-abbot and (2) the monastery and Citeaux.

To calculate these travel costs, I manually digitized maps of transportation networks for France at the beginning of the French Revolution. The two main transportation networks within France at this time were navigable rivers and roads.[9] Figure 1.4 presents the transportation networks used for this analysis.

Once I combine transportation networks with the location of Cistercian monasteries in France, depicted in Figure 1.2, and transportation costs, I can calculate the least-cost path of traveling the two trips in question (Annual Visitation and General Chapter Attendance). For transportation costs, I follow Masschaele (1993) costs calculations for transport in medieval England for four transportation nodes: porters (speed normalized to 1), roads (0.81), rivers and canals(0.51) and seas (0.1). In Section 5.2.3 I show that the results are robust to alternative cost specifications.

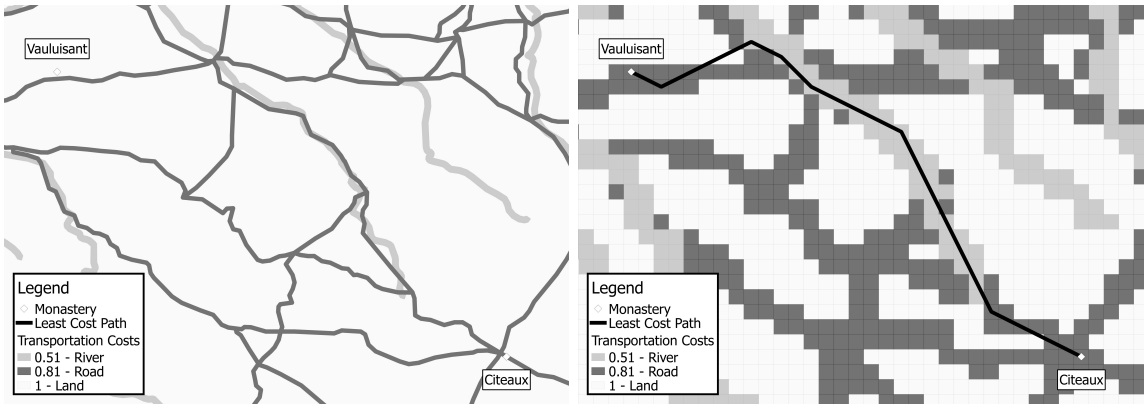
To calculate monitoring costs I use Dijkstra's algorithm to calculate the least cost path across 5x5 km cells for every monastery pair.[10] Each of the 5x5 km cells holds the value of the least-cost transportation option. An example of a monastery pair (Citeaux and Valuisant) is shown in Figure 1.5a. A sample least-cost path for Valuisant and Citeaux using these cost specifications is shown in Figure 1.5b.

I normalize the resulting travel cost to values between 0 and 1 and match each property with its owner's travel cost to derive the variable "Visitation Cost". A value of 1 for Visitation

[8] For a discussion on what constituted agricultural investment in the eighteenth century, see Allen (1999); Allen and Gráda (1988); Jones (1965).

[9] See Rosenthal (1990a) for explanation on the small presence of canals in the Ancien Regime.

[10] Dijkstra (1959)



(a) (b)

Figure 1.5: Least-Cost Path Calculation

Cost, therefore indicates that the property's owner is the further from its proto-abbot while a value of 0 for Visitation Cost indicates that the owner is the proto-abbot. I then repeat the process with Citeaux to create the variable "General Chapter Attendance Cost". Again, I match properties to owners and normalize the resulting travel cost to values between 0 and 1 such that 1 is the most costly travel for a given property's owner to Citeaux and 0 is the value for a property owned by Citeaux itself.

1.4.3 Covariates

I control for potential covariates, including geographic characteristics of the agricultural properties, characteristics of the property owners and market conditions such as the degree of market access and local competition. Sample statistics for the dependent variable, explanatory variables and covariates are presented in Table 1.1.

I include a number of property-specific controls to capture differences in quality that may contribute to the value of the land other than agricultural investment. Following the literature on the relationship between agricultural productivity and plot size in agriculture,

I include a variable titled Total Acreage that measures the size of the property in acres. [11]. I also include indicator variables that capture differences in the descriptions provided of the properties from the auction listings. I create dummy variables Arable Land, Manor, Domaine and Forest that take a value of 1 if the property is described as one of these types (Farmland is the omitted case). It is important to note that Manor and Domaine may capture institutional differences as well as quality. Each property included in the sample falls under one of these categories and alternative property types (i.e. vineyards) are excluded.

I also control for differences in geographic endowments. This is important because most properties were acquired through donations and variation in the quality of land donated in different regions could be a confounding factor in the test of transportation costs. For each property, I collect a measure of soil quality for wheat and potatoes (Potato Soil Suitability and Wheat Soil Suitability) from the FAO following work by Nunn and Qian (2011) and Alesina et al. (2013) among others. I also include a dummy variable called Coast Dummy (¡10km) that takes a value of 1 if the property is located near the French coastline and 0 otherwise.[12]

To capture the effect of different market conditions on agricultural land values, I control for characteristics of the local town. To measure market access, I follow Donaldson and Hornbeck (2016) and Donaldson (2016) to create a measure of market access using the 1793 census for population and transportation networks for the late eighteenth century. In the interest of time, I limit the calculations to the 537 capitals (chef-lieux) of the French districts in 1789 and create a heatmap with weighted decay reflecting the market access value for each capital city. I then assign a value for each property from their location on the generated heatmap. The resulting measure is called Market Access.

As another control for local market conditions, I collect the variable Town Population using

[11] See Binswanger et al. (1995); Olson (1985) for more

[12] A continuous variable of distance from the coast would be strongly correlated with distance from the proto-abbots or Citeaux so a dummy variable is used instead. The results are robust to other specifications for the dummy variable such as properties 5km or 25km from the coast.

Table 1.1: Sample Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
ln(Price-per-Acre)	322	5.906	0.784	3.744	9.285
Visitation Cost	322	0.353	0.203 0	1	
General Chapter Cost	322	0.434	0.187	0	1
Total Acreage	322	116.495	122.746	1.25	739.87
Arable Land	322	0.258	0.438	0	1
Manor	322	0.0776	0.268	0	1
Domaine	322	0.127	0.334	0	1
Forest	322	0.0403	0.1971	0	1
Potato Soil Suitability	322	3.593	1.178	1	8
Wheat Soil Suitability	322	4.817	1.128	3	8
Coast Dummy (¡10km)	322	0.0124	0.111	0	1
Market Access	322	32.480	49.452	2.0699	246.817
Town Population	322	0.848	1.359	0.023	20.135
Literacy	322	2.416	1.330	0.298	6.759
Encyclopedia Subscribers	322	116.667	116.871	1.398	493.876
Travel Cost (Monastery to Prop.)	322	0.452	0.935	0	6.664

the local town's population from the 1793/Year II census. Finally, I use the data collected Mara Squicciarini and Nico Voigtländer on literacy and encylopedia subscriptions to measure local human capital, both average and upper-tail (Squicciarini and Voigtländer (2015)). Since the data on literacy and encyclopedia subscriptions are collected at the city level, I also create heatmaps for these two variables and collect measures for the agricultural properties. These measures are captured in the variables Literacy and Encyclopedia Subscribers.

The owners of these agricultural properties may exert influence upon land values through channels other than effective monitoring. One such channel may be the degree of monitoring between the owner and the property. As Hoffman (2000) explains in examining French feudalism in the Ancien Regime, "If a landlord resided on his property or lived close by, he could monitor tenants and laborers at lower cost." Since Hoffman suggests that the distance between the owner of a property and its tenants could lead to less effective oversight, I

control for the cost of traveling from the monastery itself and the agricultural property through the variable Travel Cost (Monastery to Prop.).

1.5 Results – Monitoring Costs and Free Riding Behavior

1.5.1 Main Results

My theory predicts that Cistercian monasteries that faced higher monitoring costs engaged in more agricultural investment. The empirical tests of Prediction 3.A. and 3.B. are presented in Tables 1.2 and 1.3, respectively. Table 1.2 presents the results for the first explanatory variable, Visitation Cost. Table 1.3 presents the results for the second explanatory variable, General Chapter Cost. In all specifications reported standard errors are clustered at the department level.

In Column (1) of Table 1.2, the positive estimated coefficient on Visitation Cost suggests that the cost of traveling from a proto-abbot to a monastery is positively correlated with the value of the land. This result remains even after introducing controls for geographic endowments, market conditions and owner characteristics. The estimated coefficient of 0.561 in Column 5 suggests that a monastery facing the highest costs for visitation (a value of 1 in this sample) will have properties with price-per-acre 56.1 percent higher compared to properties owned by the proto-abbot (a value of 0).

Table 1.3 presents similar results for the explanatory variable of General Chapter Cost. The positive estimated coefficient for General Chapter Cost presented in Column (1) suggests that as the cost of traveling from the monastery to Citeaux increases for a given property, the value of the land increases. This result holds even after introducing the full set of controls. The estimated coefficient of 0.707 in Column (5) suggests that a monastery facing the highest costs for General Chapter Attendance (a value of 1 in this sample) will have properties with price-per-acre 70.7 percent higher compared to properties owned by Citeaux

Table 1.2: Main Results: Visitation Cost

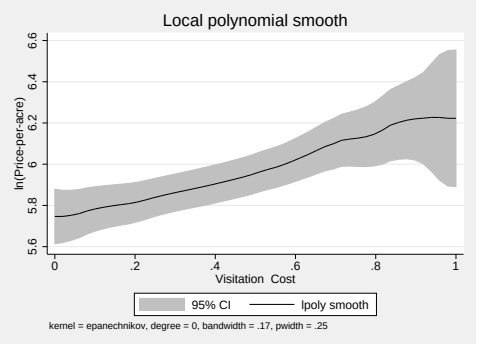
	Dependent Variable: ln(Price-per-Acre)				
	(1)	(2)	(3)	(4)	(5)
Visitation Cost	0.733***	0.533**	0.638**	0.626***	0.561***
	(0.256)	(0.220)	(0.234)	(0.221)	(0.199)
Total Acreage		-0.00254***	-0.00186***	-0.00197***	-0.00175***
		(0.000419)	(0.000581)	(0.000611)	(0.000584)
Arable Land			0.415***	0.357***	0.332***
			(0.117)	(0.120)	(0.119)
Manor			-0.568**	-0.633**	-0.659**
			(0.221)	(0.230)	(0.268)
Domaine			0.497***	0.508***	0.523**
			(0.178)	(0.171)	(0.190)
Forest			0.245	0.275	0.366
			(0.334)	(0.331)	(0.339)
Potato Soil Suitability				0.169*	0.189**
				(0.0834)	(0.0864)
Wheat Soil Suitability				-0.105	-0.162**
				(0.0677)	(0.0608)
Coast Dummy (¡10km)				0.425*	0.541**
				(0.248)	(0.200)
Market Access					0.00344
					(0.00230)
Town Population					0.0271
					(0.0369)
Literacy					-0.0188
					(0.0780)
Encyclopedia Subscribers					0.000486
					(0.000508)
Travel Cost (Monastery to Prop.)					-0.0291
					(0.0378)
Constant	5.647***	6.013***	5.762***	5.358***	5.326***
	(0.192)	(0.160)	(0.185)	(0.369)	(0.413)
Observations	322	322	322	322	322
Adjusted R^2	0.033	0.186	0.233	0.248	0.297

Notes: This table shows the effects of the cost of traveling between a mother-house and daughter-house pair on the natural log of price-per-acre for 322 agricultural properties owned by the male Cistercian houses. The travel cost is the travel time of the least cost path across cells of 5x5 km between daughter-house i and mother-house j using four transportation modes depending on their availability in each cell: porters (speed normalized to 1), roads (0.81), rivers(0.51) and seas (0.1). Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

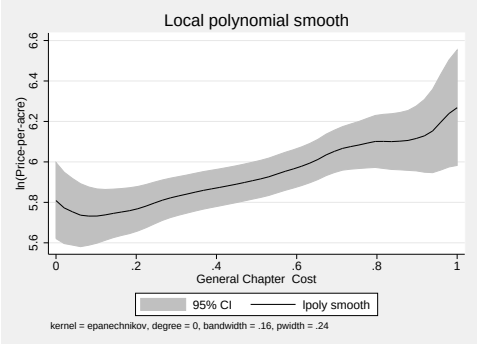
Table 1.3: Main Results: General Chapter Cost

	Dependent Variable: ln(Price-per-Acre)				
	(1)	(2)	(3)	(4)	(5)
General Chapter Cost	0.731**	0.603*	0.741**	0.749**	0.707**
	(0.296)	(0.318)	(0.333)	(0.325)	(0.288)
Total Acreage		-0.00258***	-0.00190***	-0.00201***	-0.00178***
		(0.000429)	(0.000595)	(0.000626)	(0.000592)
Arable Land			0.418***	0.358***	0.332**
			(0.117)	(0.121)	(0.120)
Domaine			0.584***	0.595***	0.576***
			(0.192)	(0.179)	(0.182)
Manor			-0.603**	-0.678***	-0.718**
			(0.228)	(0.240)	(0.277)
Forest			0.283	0.314	0.399
			(0.356)	(0.351)	(0.356)
Potato Soil Suitability				0.177**	0.193**
				(0.0863)	(0.0878)
Wheat Soil Suitability				-0.113	-0.164**
				(0.0699)	(0.0618)
Coast Dummy (¡10km)				0.392	0.514**
				(0.248)	(0.197)
Market Access					0.00312
					(0.00227)
Town Population					0.0231
					(0.0360)
Literacy					-0.0260
					(0.0789)
Encyclopedia Subscribers					0.000712
					(0.000532)
Travel Cost (Monastery to Prop.)					-0.0237
					(0.0380)
Constant	5.589***	5.945***	5.659***	5.235***	5.213***
	(0.215)	(0.208)	(0.247)	(0.418)	(0.431)
Observations	322	322	322	322	322
Adjusted R^2	0.027	0.188	0.238	0.255	0.305

Notes: This table shows the effects of the cost of traveling between a mother-house and daughter-house pair on the natural log of price-per-acre for 322 agricultural properties owned by the male Cistercian houses. The travel cost is the travel time of the least cost path across cells of 5x5 km between daughter-house i and mother-house j using four transportation modes depending on their availability in each cell: porters (speed normalized to 1), roads (0.81), rivers(0.51) and seas (0.1). Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



(a) Visitation Cost



(b) General Chapter Cost

Figure 1.6: Kernel-weighted local polynomial regressions

(a value of 0).

The values from a kernel-weighted local polynomial regression of ln(Price-per-Acre) on Visitation Cost and General Chapter Cost are presented in Figures 1.6a and 1.6b. Both figures show the positive relationship between monitoring costs and agricultural investment. One noticeable feature of Figure 1.6b is the apparent downward-sloping portion at low values of General Chapter Cost. This reflects the high agricultural investment from Citeaux that may result its position as the supreme monastery of the order, which works as a bias against the result for General Chapter Cost.

1.5.2 Robustness Checks

The causal relationship between the location of a monastery and agricultural land values is threatened by potential of endogeneity from characteristics of the owners or the enforcement mechanisms that are correlated with both agricultural investment and monitoring costs. In this section I conduct robustness checks on the sensitivity of the results to the inclusion of additional characteristics on the monasteries themselves. I also check the sensitivity of the results to omitting filiations since distance from the proto-abbot may be correlated with the number of monasteries within a given filiation.

Table 1.4: Internal Characteristics of the Monasteries

	Dependent Variable: ln(Price-per-Acre)					
	(1)	(2)	(3)	(4)	(5)	(6)
Visitation Cost	0.565***		0.781***		0.497*	
	(0.202)		(0.220)		(0.253)	
General Chapter Cost		0.685**		0.989***		0.665*
		(0.283)		(0.299)		(0.351)
Revenue-per-Member	0.110*	0.0967				
	(.0642)	(0.0612)				
Number of Monks			0.00539	0.00661*		
			(0.00365)	(0.00330)		
Monastery Age					-0.000635	-0.000476
					(0.00156)	(0.00166)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	322	322	322	322	322	322
Adjusted R^2	0.302	0.308	0.301	0.312	0.295	0.303

Notes: This table duplicates the results of Tables 1.2 and 1.3 with the full spread of controls and the added variables: Revenue-per-member, which is the Revenue (in 1000s) divided by the number of members, Age of the Monastery (years from foundation to 1790) and number of monks in the monastery. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Internal Characteristics of the Monasteries

To test whether characteristics of a Cistercian monastery other than the probability of free riding are correlated with both monitoring costs and agricultural investment, I collected additional variables to control for specific characteristics of each Cistercian monastery. In 1768, all French monasteries were subject to a survey by special commission, the results of which were reprinted later by Lecestre (1902) and report the monastery, its revenue and the number of members. From this survey, I created the variables Revenue per Member and Number of Monks. I also created a variable Monastery Age that captures the age of the monastery, calculated as (1790 - foundation), collected from various historical accounts.

It is possible that Revenue-per-member and travel costs from the proto-abbot and Citeaux are

correlated if the free riding activity occurs through increased productivity by the monastery. I replicate the main empirical results in Table 1.4 and Columns (1) and (2) report the estimated coefficients for the two explanatory variables after controlling for revenue-per-member in the owner monastery. Including the variable Revenue-per-Member does not significantly change the coefficients for Visitation Cost (from 0.561 to 0.565) and General Chapter Cost (from 0.707 to 0.685). This result by itself, however, does not preclude the possibility that increased productivity is the channel through which free riding occurs if the revenue reported to Citeaux was not accurate. Historical accounts support the inaccuracy of reported income, either through negligence or deception. [13]

In theory, the membership size of a given Cistercian monastery could be correlated with distance from Citeaux and the proto-abbots if monasteries closer to the great houses of the Cistercian Order experience higher recruitment rates. This may occur if the major houses serve as generators of demand for Cistercian ideals or lifestyles. In this case, houses located farther from Citeaux and the four proto-abbots would have fewer members and could possibly be more productive (fewer members lowers negotiation costs between the abbot and member monks). If this were the case, Visitation Cost and General Chapter Cost would be capturing both monitoring and this recruitment effect.

Controlling for the Number of Monks within a monastery, however, does not discount the effect of Visitation Cost and General Chapter Cost on agricultural investment but, in fact, strengthens its. These results, presented in Columns (3) and (4) of Table 1.4 show that

[13]For example, the Cistercian monastery at Acey was "almost last among abbeys for wealth" in the late seventeenth century while the Abbot at the time, Francois de Croy, lavishly decorated a guesthouse in the monastery, the contents of which were not documented until well after his death (Blanchot (1898)). The full description is: "The house is richly furnished. There is everywhere Caen blue serge curtains on the beds, Caen gray serge on the windows, wool, white and daffodil in the interior entrance doors, tapestries, carved wood chairs, garnished with [silk] fabric of lemon and purple; here a large mirror three feet wide by five feet tall with a gold frame and table; a four-post bed with four slopes of wool and thread curtains, white and green; there, two cane armchairs decorated with pillows and feather cushions, covered with fine Indian; further, a small walnut table with crowbars used as a bar on which there are thirteen coffee cups and saucers and sugar, all of Japan porcelain; a backgammon accompanied by her ladies and cones; a game of checkers on Russia leather. The library contains fourteen folio volumes, twenty-eight in-quarto, two hundred in-douze, seventy-eight brochures, plus a telescope, prints, and a chess game. In the bedrooms, which are carpeted with fabrics, we see repetition clocks with gilded copper consoles, gaming tables topped with green cloth, portraits to paintings, mirrors in gilt framework, in-laid secretary writing desks.'" Translation provided by author.

the estimated coefficients on Visitation Cost and General Chapter Cost actually increase in magnitude after controlling for the membership size of the monasteries.

Finally, the estimated relationship between travel costs and agricultural investment could be driven by an endowment effect in which older monasteries were more likely to be given better quality land in donations. Laws prohibiting the redistribution of church lands in France would then guarantee that older monasteries would have better initial land quality.

Including a variable that measures the age of the monastery, the results of which are reported in Table 1.4 Columns (5) and (6), does appear to slightly weaken the estimated effects of Visitation Cost and General Chapter Cost. This result, however, is not surprising given that the Cistercian Order grew through a ripple-effect; oldest monasteries of the Cistercian Order are necessarily closer because the Cistercian Order branched out incrementally. There is necessarily, therefore, a correlation between distance from Citeaux and the age of the monastery. The magnitudes of the estimated coefficients on Visitation Cost and General Chapter Cost do not greatly change, however, and the estimated coefficients on Age of the Monastery are not statistically significant. I take this as evidence that the age of the monastery is not driving all of the variation captured in travel costs from Citeaux and the proto-abbots.

Differences between Filiations

Another threat to the causal relationships between these travel cost measures and agricultural investment may originate from a correlation between distance from the filiation and number of houses under the direct supervision of a single abbot. Compared to independently formed communities, the Cistercian Order could only spread through the direct involvement of members from an established house. Individuals from a "mother-house" would be responsible for the foundation of their "daughter-house". This process, then, required individuals from a Cistercian house to physically travel to the location of the new Cistercian house. It follows that filiations with more houses (and thus more members) were more likely to travel greater

Table 1.5: Robustness Test: Omitting Filiations and Visitation Cost

	Dependent Variable: ln(Price-per-Acre)				
	(1)	(2)	(3)	(4)	(5)
Visitation Cost	0.728**	0.516**	0.724***	0.454**	0.568**
	(0.307)	(0.182)	(0.224)	(0.194)	(0.206)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes
Omitted Filiation	Citeaux	Clairvaux	Morimont	Pontigny	La Ferte
Observations	227	166	297	274	320
Adjusted R^2	0.308	0.421	0.289	0.296	0.295

Notes: This table duplicates the results of Table 1.2 with the full spread of controls with each of the five filiations omitted. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

distances compared to filiations with fewer houses.

The spread of the Cistercian Order could therefore have created a correlation between the distance from the proto-abbot and monastery for a given filiation and number of houses in the filiation. For example, of the 226 Cistercian monasteries in 1770, Clairvaux's filiation contained 92 houses compared to La Ferte's 3 monasteries. It is plausible that the abbot of Clairvaux would be less effective at monitoring compared to La Ferte. I should note, however, that the Cistercians attempted to address this problem by allowing abbots to appoint proxies for visitation. The usage of these proxies and their relative effectiveness compared to the abbot is not well-established.

To test whether within-filiation effects, such as the monitoring capabilities of a single proto-abbot, are driving the results, I replicate the main empirical results while omitting each of the five filiations. The resulting estimated coefficients for Visitation Cost and General Chapter Cost are presented in Tables 1.5 and 1.6. Compared to the baseline coefficient estimates of 0.561 for Visitation Cost and 0.707 for General Chapter Cost, the coefficient estimates appear to change somewhat when certain filiations are omitted and yet the positive relationship between travel costs and agricultural investment persists.

Table 1.6: Robustness Test: Omitting Filiations – General Chapter Cost

	Dependent Variable: ln(Price-per-Acre)				
	(1)	(2)	(3)	(4)	(5)
General Chapter Cost	0.678**	0.702**	0.902***	0.621**	0.721**
	(0.323)	(0.291)	(0.316)	(0.279)	(0.295)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes
Omitted Filiation	Citeaux	Clairvaux	Morimont	Pontigny	La Ferte
Observations	227	166	297	274	320
Adjusted R^2	0.305	0.433	0.298	0.305	0.303

Notes: This table duplicates the results of Table 1.3 with the full spread of controls with each of the five filiations omitted. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

One set of coefficient estimates that are worth noting are those of Column (3) in each table, in which properties owned by the Morimont filiation are omitted. Figure A.3 in the Appendix shows that all of the properties in the sample from southern France belong to the Morimont filiation. If all of Morimont's properties had high levels of agricultural investment, dropping the Morimont filiation would weaken the result. The opposite appears to be true, however, since the estimated coefficient on Visitation Cost increases fro 0.561 to 0.724 and the estimated coefficient on General Chapter Cost increases from 0.707 to 0.902. This suggests that it is not internal characteristics of the Morimont filiation driving the main empirical results.

Another set of coefficient estimates I will highlight are those of Clairvaux, reported in Columns (2) for both tables. If the Clairvaux filiation were driving the result, dropping the properties of that filiation would cause the effect of the travel costs on agricultural investment to disappear. Instead, the results from Tables 1.5 and 1.6 suggest that no single filiation is driving the result.

Additional Robustness Checks

In addition to testing for the above threats to causality, I test for the robustness of the result in a variety of ways. I will briefly discuss the tests here while the results are included in the attached Appendix.

Placebo Test with Benedictine Order I duplicate the results from Table 1.3 using properties owned by monasteries of the Benedictine Order of the Ancient Observance. The results from these tests are presented in Table A.1. The Benedictine monasteries of the Ancient Observance are the unreformed followers of the Benedictine Rule and thus they most closely represent the Benedictine Order from which the Cistercian Order broke away. Using a sample of properties owned by the Benedictine Order, I find that the coefficient on distance from Citeaux is not statistically significant. This is expected if Benedictine monasteries do not face constraints from Citeaux.

Omitting Particular Regions To ensure that particular regions are not driving the result, I omit each of the three regions most distant from Citeaux for which I have properties in my sample (Occitanie, Nouvelle-Aquitaine and Pays de la Loire). A map identifying those regions is included in the Appendix in Figure A.1 and the empirical results are presented in Table A.3. The results are robust when omitting each of the three regions.

Omitting Most Represented Houses For reasoning similar to that of regional bias, to ensure that any particular house is not driving the sample, I omit three of the most over-represented houses in the sample: Citeaux, Le Gard and Jouy. Results are robust to the exclusion of these three houses.

Alternative Cost Specifications I test for different cost specifications than that of Masschaele (1993). Specifically, I use cost measures from Bairoch and Braider (1991), Boerner and Severgnini (2011) and Campbell, Galloway, Keene, and Murphy (1993). The results are reported in Table A.4 in the Appendix. Using difference cost specifications in the calculation of Visitation Cost and General Chapter Cost does not overturn the relationship between

travel costs and agricultural investment.

Checks for Sample Selection Bias The auction pamphlets from which I collected the data set on agricultural properties may be subject to sample selection bias. First, the listings in the sample range from March 1791 to January 1793. It is likely that following early auctions, publishers may have adjusted prices, especially if the initial valuation was too low. If this is the case, later auctioned properties would have higher values. If the composition of locations for properties also changed over time, this could bias the main results. To control for potential bias in estimated values that are correlated with time, I include a continuous variable, Pamphlet ID, that takes a value of 1 for the first auction in my sample and 50 for the last. The results in Table A.5 suggest that there may have been adjustments in prices over time but the results for Visitation Cost and General Chapter Cost do not greatly change.

Additionally, when the auction listings were created, the pamphlet was distributed in Paris and the commission overseeing its publication stated a focus on properties within 100 lieues of Paris, or approximately 400 kilometers. There are, however, properties included from outside of this radius. If the publishers agreed to include distant properties only if the value was sufficient to attract buyers from Paris, this could result in an under-representation of low-value properties in locations distant from Paris and an over-representation of high value properties.

To test for potential sample selection bias, I use two variables, Distance from Paris and Dummy for 100 Lieux. The variable Distance from Paris is measured in 1000 kilometers and inclusion of the variable in empirical specifications does not retract from the main result. The variable Dummy for 100 Lieux takes a value of 1 if the property is located farther than 400 km (100 lieux) and 0 otherwise. The estimated coefficient for Dummy for 100 Lieux in both regressions is negative, indicating that distant properties actually had lower levels of agricultural investment. The explanation for this may be the result of selection by the publishers on other criteria. Regardless, the estimated coefficients for the main explanatory

variables remain mostly the same.

Propensity Score Matching Given that the location of the monasteries may not be random, I use Propensity Score Matching to determine the average treatment effect (ATE) and the average treatment effect on the treated (ATET) for two new variables: High Visitation Cost and High General Chapter Cost. These variables are binary such that High Visitation Cost takes a value of 1 if Visitation Cost is above the mean and 0 otherwise. The same specification applies for High General Chapter Cost. The estimated ATE and ATET for the two explanatory variables when matching on only geographic controls are reported in Table A.6 and reported for matching on all main controls in Table A.7.

Selection on Observed and Unobserved Variables I test for the potential of selection on land values from unobserved variables following Altonji et al. (2005) and Oster (2013). In Table A.8, I report the results of always controlling for Total Acreage (given the apparently strong effect of the variable on ln(Price-per-Acre) from Tables 1.2 and 1.3).The evidence suggests that the main results for Visitation Cost and General Chapter Cost survive this procedure. Oster (2013) suggests that the null hypothesis cannot be rejected so long as $\delta \in [0, 1]$. Using this benchmark, the results of Panel A show that with all of the assumed values of R_{max}, I can reject the null hypothesis. This suggests that there is insufficient evidence to warrant rejecting the main results due to potential bias from unobserved variables. In Panel B, I show that even when I assume that unobserved variables have the same explanatory power as my observed variables (controls from Tables 1.2 and 1.3 except for Total Acreage), the magnitude the change in the resulting coefficient estimate is not large. In Table A.9, I repeat the process without controlling for Total Acreage and the results are consistent that the bias from unobserved variables does not appear to warrant rejection of the main results.

1.6 Concluding Remarks

This paper addresses the relationship between monitoring costs and free riding behavior within an organization using the historic case study of the Cistercian Order in Ancien Regime France. Using the application of standard club theory to a religious order that discouraged wealth-generating activities, I derive a prediction for the relationship between monitoring costs and market-orientated behavior. I test this prediction using the variation in monitoring costs inherent to the Cistercian Order's two main enforcement mechanisms, annual visitation and General Chapter attendance and a proxy for market-orientated behavior – agricultural investment.

Using a newly collected data set of agricultural properties owned by the Cistercian Order at the onset of the French Revolution, I find that properties owned by monasteries with higher monitoring costs engaged in more agricultural investment, which I assert constitutes free riding behavior according to the Benedictine Rule. This result holds after controlling geographic characteristics and local market conditions. Additionally, the results are robust to the inclusion of additional covariates, different specifications and tests for sample selection.

The evidence presented in this paper supports the role of effective monitoring within a religious organization as a means to deter free riding behavior of its members. These results are applicable even in the twenty-first century for multinational religious organizations plagued by stories of corruption and embezzlement. As technology advances to decrease the relative cost of monitoring, these religious organizations could, in theory, establish more effective enforcement mechanisms than that of the twelfth century Cistercians.

This paper also illuminates the importance of understanding the internal structure of a religious order on the economic behavior of its members. Evidence for a relationship between monitoring and free riding behavior in the Cistercian Order suggests the importance of understanding the differences between constraints faced by a monastery that is part of a larger network and a monastery that functions as an independent entity.

Chapter 2: Plague, Politics, and Pogroms: The Black Death, Rule of Law, and the persecution of Jews in the Holy Roman Empire (with Mark Koyama)

2.1 Introduction

The rule of law entails equality before the law for all and the protection of minority rights (see Bingham, 2010). This paper sheds new light on the factors that make minority groups more or less vulnerable to persecution. It does so by studying the persecution of Jews in the Holy Roman Empire during the Black Death (1348-1350). The pogroms that accompanied the Black Death were the most severe of the middle ages and numerous scholars have seen these as marking a decisive point in Judeo-Christian relations (Cohn, 2007; Voigtländer and Voth, 2012). Large-scale massacres occurred across the Holy Roman Empire. In the some cities such as Mainz, Strasbourg, and Erfurt chroniclers report thousands of Jews being burnt alive (Jacobs (1912, 234), (Nohl, 1924, 181-192), Baron (1965a), and Breuer (1988, 145–150)). But in other parts of the Holy Roman Empire violence against Jews was insignificant.

This paper provides evidence that pogroms were most intense in communities where the political authority of the emperor was contested, specifically in communities under the immediate local authority of Imperial Free Cities, Archbishops or Bishops. Jews received more protection when they resided in lands directly governed by the Holy Roman Emperor or under the authority of one of major secular rulers. Drawing on a model of the fiscal anti-commons, these results are consistent with the argument that during periods of crisis strong centralized rulers have a greater incentive to protect minority groups like the Jews

than do rulers of contested polities. Our findings suggest that fragmented legal authority was a major impediment to the protection of minority rights during the Middle Ages.

We are not the first authors to study the Black Death pogroms. Voigtländer and Voth (2012) analyze the persecutions that took place during these years in order to examine the persistence of antisemitic beliefs from the medieval period through to the twentieth century. As we discuss below, our paper is different to Voigtländer and Voth (2012) because our interest is in the institutional determinants of antisemitic violence during the period 1347-1350.

Our historical setting is well suited to explore how institutional variation at a local level can affect the rights of minorities. In contrast to the rule of law in modern states that promise equal legal protection to all citizens, the Holy Roman Empire, like other premodern polities, governed by laws based on differential rather than equal treatment. It relied on personal and identity rules rather than general rules or laws.[1] Identity rules are rules where either the form of the rule or the enforcement of the rule depends on the social identity of the parties involved. In contrast, impersonal or general rules are rules where both the form of the rule and the enforcement of the rule are independent of the identity or status of individuals subject to the rule.

A classic example of identity rules that were used to generate rents for the political elite is provided by the condition of Jews in medieval Europe: their legal status differed from that of their Christian neighbors and they were subject to a series of discriminatory rules restricting their economic and social freedom. Their different legal status, however, made Jewish moneylending an important source of revenue as Jews were allowed to lend openly at interest whereas Christian usury was prohibited. Because Jewish moneylending provided an important source of rents to the both the emperor and to other elites, the position of Jews

[1] It is precisely the existence of general rules that legal scholars claim is a crucial feature of rule of law as it is understood in modern liberal societies—rules that are stable, consistent and applicable to all (Dicey (1908, 198–199), Hayek (1960), Fuller (1969), and Hadfield and Weingast (2012)). General rules help protect the rights of minority groups. See Acemoglu and Robinson (2012); North et al. (2009).

was conditional on their ability to generate tax revenues for the rulers. Viewed as chattel of the emperor, they relied on his authority for protection against violence. But as the *de jure* and *de facto* authority of the emperor varied greatly across the Holy Roman Empire, so did the degree of legal protection experienced by Jewish communities.

We provide evidence that variation in the institutional strength of the Holy Roman Emperor can explain variation in the severity of the persecutions that Jewish communities across the Holy Roman Empire faced during the pogroms that accompanied the Black Death in 1348-1350. Our analysis draws on a simple but robust theoretical prediction that rent contestation will undermine the incentives of rulers to protect unpopular minority communities from violence. Where the emperor had sole control over Jewish communities and uncontested right to tax them, he had an incentive to protect the Jews as indeed he did in his capital of Prague. Elsewhere in the empire, however, the authority of the Emperor to tax the Jews was challenged by the Imperial Free Cities, Archbishops, Bishops and by the secular electors. Simple theoretical reasoning therefore suggests that we should expect the Jews to be most vulnerable where the authority to tax them was most contested.

To substantiate this hypothesis we employ evidence from the *Germania Judaica* (1968) and a range of other historical sources. We use these sources to create a novel dataset of Jewish communities in the Holy Roman Empire. To measure antisemitic violence, we first code the intensity of a persecution or pogrom along a 1–5 scale by reading every entry of the *Germania Judaica*. Second we construct a binary measure that distinguishes between persecutions that are described as involving fatalities from those that did not.

Our empirical approach exploits the fact that political power within the Holy Roman Empire was highly fractured as the Emperor did not possess a territorial monopoly on violence and his ability to enforce his authority varied greatly across space (Volckart, 2002; Wilson, 2016). We find that Jewish communities where the authority of the emperor was challenged by an Archbishop, Bishop or an Imperial Free City are associated with an increase in the intensity of a pogrom by approximately 1/4th to 1/6th our measure of pogrom intensity. In contrast

Jewish communities were less vulnerable if they resided in land directly controlled by the emperor.

To overcome the lack of experimental variation, we utilize a host of historical and geographic control variables using GIS software. The results are robust to the inclusion of measures of the underlying wealth of a Jewish community, their experience of past pogroms and the spread of the plague. Furthermore our findings are unchanged when we use alternative empirical specifications, regional fixed effects, alternative indexes of pogrom intensity, and a propensity score matching approach. Finally, we use the approach developed by Altonji et al. (2005) and Oster (2013) to show that potential bias from unobservables cannot explain our results. Taken together, this analysis provides quantitative evidence that is highly supportive of our theoretical and historical analysis. This evidence is highly consistent with the claim that contested political authority made Jewish communities more vulnerable in the medieval Holy Roman Empire.

Studying the persecution of Jews in the Holy Roman Empire sheds light on several open questions in institutional economics and law and economics. First, late medieval Europe provides a laboratory for us to study what institutions were conducive to the emergence of institutions capable of protecting minority rights. The Holy Roman Empire was a polycentric legal order. Numerous scholars make the case for the importance of decentralized and polycentric legal and political institutions in promoting markets, rule of law, and constraints on government.[2]

A range of different forms of political organizations including independent city states flourished within the Holy Roman Empire each with their own courts and jurisdiction.[3]

[2]Berman (1983); De Long and Shleifer (1993) and Jones (2003), apply this argument in a medieval context. More generally this argument draws on the work of Vincent and Elinor Ostrom (see Ostrom et al., 1961).

[3]This relates to a literature going back to Weber (1958) and Pirenne (1925) arguing that independent city states played a crucial role in spurring economic growth in preindustrial Europe. Stasavage (2014) provides evidence that suggests that while the rise of urban autonomy was associated with an initial increase in economic development in the long-run the institutions of the independent city states of medieval Europe became captured by oligarchic elites and adopted institutions that proved inhospitable to growth.

In this paper we show that within the Holy Roman Empire, independent city states were engaged in more intense and violent antisemitic pogroms than did territories ruled directly by the either or other feudal lords.

Our findings are more consistent with a different literature that emphasizes the importance of establishing a minimally effective central state in order to enforce rules, solve the problem of violence, and provide some measure of the rule of law. This view is expressed in Douglass North's writings (North, 1981) and the work of Mancur Olson (Olson, 2000). Recent historical work has shown that most European polities lacked 'minimally effective states' until the early modern period (Dincecco, 2009, 2010; Epstein, 2000; Grafe, 2012; Hough and Grier, 2015; Johnson and Koyama, 2014a; North et al., 2009).[4] Building on these insights, Johnson and Koyama (2014b) provide evidence that legal fragmentation in seventeenth century France was associated with more intense witch-trials and that a process of legal centralization was required to control the use of torture and curtain the panic over witchcraft. In contrast to the arguments in favor of a polycentric political order, these arguments suggest that political centralization may be crucial to the emergence of the rule of law. In a similar vein, Leeson and Russ (2015) argue that contested religious markets help to explain the intensity of witch-hunts in the early modern period. These debates have contemporary relevance as many of the poorest parts of the world lie in those area of sub-Saharan Africa with little history of statehood (Borcan et al., 2014; Chanda and Putterman, 2007; Gennaioli and Rainer, 2007; Michalopoulos and Papaioannou, 2013) where the reach of the government does not extend far beyond the capital city (Michalopoulos and Papaioannou, 2014).

Looking are more recent periods of history, Jha (2013) finds that a history of trade mitigated anti-Muslim persecutions in coastal India cities. He argues that this was because in these cities the economic role played by Muslim minorities was both highly complementary (and difficult to find substitutes for) to that of the Hindu majority. Miguel (2005) provides

[4]Most research in this area has focused on England, France and Spain. To the best of our knowledge the Holy Roman Empire has not been intensively studied from an institutional perspective with the partial exception of Volckart (2000, 2002, 2004).

evidence that high levels of precipitation are associated with a higher number of witchcraft deaths in modern-day Tanzania. Shocks of this kind can interact with economic conditions in different ways. Jha (2014) studies the political and historical determinants of ethnic riots and violence in Gurajat in 2012. He finds that political incentive to incite violence interact with the history of a particular town but are dampened by the presence of inter-ethnic complementarities.

it is clear that ethnic violence in recent decades has been most intense in weak and failed states (e.g. Yanagizawa-Drott, 2014). But while a considerable body of research have studied the determinants of historical and contemporary persecutions, there has been less attention in the economics literature on the role played by political institutions as either facilitators of persecution or barriers to persecution.[5] One contribution of our paper is a focus on how fragmented political and legal institutions acted as a transmission mechanism for the shock of the Black Death leading to more intense persecutions in some parts of the Holy Roman Empire than in others.

In focusing on the institutional determinants of pogrom intensity, our research question differs from that of previous studies of antisemitic violence.[6] The principle interest of Voigtländer and Voth (2012) is in using medieval antisemitism as a measure of deep cultural beliefs which they argue persisted through to the twentieth century and helped to explain local variation in support for the Nazi party and Jewish persecution in the 1920s and 1930s.[7] Grosfeld et al. (2013) examine the persistence of anti-market sentiments in the Pale of Settlement in eastern Europe where Jews were confined from the early nineteenth to the early twentieth century.

[5]Political scientists do focus on the role that politics and, in particular, elections play in stimulating ethnic violence. The literature on ethnic violence in developing counties in political science is extensive. We do not attempt to survey it comprehensively here. Classic references in the literature on ethnic violence include Wilkinson (2004).

[6]Our main data source, the *Germania Judacia*, was first employed by Voigtländer and Voth (2012) who have made their data publicly available. We returned to the original *Germania Judaica* to collect additional data on both Jewish communities that were wiped out during the Black Death period and on Jewish communities outside modern Germany but within the borders of the Holy Roman Empire. Furthermore, Voigtländer and Voth (2012) use data on the number of persecutions during the Black Death era while we collect data on the intensity of Black Death pogroms.

[7]Voigtländer and Voth (2013) provide evidence that these beliefs also continue to shape attitudes towards intermarriage with Jews in Germany today.

Using a regression discontinuity design, they provide evidence that the anti-market values that developed in this region in the past have persisted this day. Durante et al. (2015) finds evidence for both the role of economic supply shocks and for the role of economic segregation in explaining the pattern of pogroms in late nineteenth century Russia.[8] Ongoing work by Sascha Becker and Luigi Pascali studies how the pattern of antisemitic violence in Germany differed in Catholic and Protestant areas after the Reformation due to different patterns of economic specialization. Anderson, Johnson, and Koyama (2016) explore the economic and climatic factors behind Jewish persecutions throughout medieval and early modern Europe. They find that periods of cold temperature lowered agricultural productivity and made persecutions more likely and that this effect is largest in areas with weaker states. In contrast to these papers our primary interest is in studying the institutional determinants of persecutions.[9]

The structure of the paper is as follows. In Section 2.2 we provide necessarily details for our historical setting and outline our hypothesis that fragmented legal and political institutions made Jewish communities vulnerable to persecution. Section 2.3 describes our data and empirical strategy. We present our main empirical result that pogroms were more intense in political contested communities in Section 2.4. As our hypothesis is not the only possible explanation for why variation in the intensity of Jewish persecutions during the Black Death, in Section 2.5 we examine several other alternative hypotheses. Finally, Section 2.6 concludes by discussing the implications of our analysis.

[8] D'Acunto et al. (2014) study how medieval Jewish persecutions affect attitudes towards finance in Germany today. Pascali (2016) studies the role played by Jewish moneylenders in medieval and renaissance Italy. Other research has explored the long-run consequences of the Spanish inquisition (Vidal-Robert, 2014) and the persecution of individuals for speech crimes in Qing dynasty China (Koyama and Xue, 2015).

[9] Other related research focus on the economic attributes of Jewish communities in the medieval period (Botticini and Eckstein, 2012; Johnson and Koyama, 2016; Pascali, 2016).

2.2 The Rule of Law, the Protection of Minorities, and Legal Fragmentation in the Holy Roman Empire

The Holy Roman Empire offers a historical laboratory to study the conditions of minorities in a legally fragmented polity. In this section we describe how the prohibition of lending money at interest led to the emergence of politically regulated Jewish moneylending in the medieval Europe and this generated economic rents for rulers. We argue that rulers who had consolidated control over these rents had an incentive to protect Jewish communities. This can be called the *rent consolidation* motive. In contrast, where control for these economic rents was contested or dissipated, the incentive for rulers to invest in protecting minority groups was much weaker.

Medieval polities like the Holy Roman Empire had no monopoly on legitimate force; they subcontracted many governmental functions to local lords and to the church; and they did not collect permanent taxation.[10] In this sense they were not states (Hoffman, 2015). They are better understood as corresponding to coalitions of elites that could prove stable for a period of time. North, Wallis, and Weingast (2009) use the terminology natural states to characterize the coalitions that constituted such premodern polities.

Political authority in the Holy Roman Empire was both fragmented and contested. The emperor was at the apex of the system. The emperor was elected from among the most important secular princes of the empire. From the thirteenth century onwards, the most important rulers below the emperor were the seven Electors—four of whom were secular princes: the King of Bohemia, the Count Palatine of the Rhine, the Duke of Saxony, and the Margrave of Brandenburg; and three of whom were Archbishops (those of Mainz, Trier, and Cologne). The other territorial princes ranked below the Electors but were sovereigns in their own territories and included the various dukes, counts, margraves, and landgraves of the empire.[11].

[10] See, for an analysis, Bonney (1999); Finer (1999a).

[11] Figure B.1 presents a stylized depiction of the political structure of the Holy Roman Empire in the late

In addition to the secular princes, Archbishops and Bishops wielded independent political authority in the empire.[12] The Bishop of Constance owned two forests, eighteen manors, eight abbeys, as well as various mines, mints, and rights to tax various markets and to collect tolls (Arnold, 1991b, 220). Bishops across the Holy Roman Empire had similar lands, rights and powers: for example '[a]part from the cathedral town, the Bishop of Liège owned three counties, thirty castles, twenty monasteries, three dozen principal manors, and all the effects dependent upon these places, extending the bishops' judicial authority over the whole region of the middle Meuse' (Arnold, 1991b, 220).[13] The bishops of this period can be viewed as secular rulers. Wilson (2016) describes as instance in 1316 during an invasion of Rome by the German king and claimant to the title of Holy Roman Emperor, Henry VII when 'Archbishop Baldwin of Trier, the only senior German lord accompanying Henry, split the skull of a defender with his own sword' (Wilson, 2016, 68).

The Imperial Free Cities were also politically independent.[14] They were self-governing, maintaining their own armies and forming alliances and leagues with and against one another. As autonomous powers in their own right, they could contest the authority of the emperor over local matters such as the right to collect taxes from Jewish moneylending. Finally, there were numerous free lordships ruled by lords who owed fealty to the emperor directly. However, these lordships were small and did not possess important Jewish populations in this period so we ignore them in our analysis. Next we will establish why the fragmented

middle ages

[12]The independence of the Bishoprics and Archbishoprics was the result of the Investiture Controversy. It was confirmed by the Concordat of Worms in 1122 (Whaley, 2012, 26).

[13]The Archbishops of Trier and Mainz in the Rhineland were particularly powerful. But the Bishops of Saxony and Bavaria were also effectively independent rulers in their own lands while the Archbishops of Salzburg were particularly successful in extending their authority and independence (Arnold, 1991b, 27). For instance 'Archbishop Eberhard II (1200–46) was responsible for reinvigorating Salzburg as a notable power in the Empire. Although he aspired to no *ducatus*, he founded three propriety sees, at Chiemsee in 1215, Seckau in 1218 and Lavant in 1225, in order to extend his authority into Bavaria, Styria and Carinthia respectively ... The Archbishop also inherited countries from the Bavarian aristocracy, rebuilt castles and monasteries, and, above all, made good use of his forest rights to open up the Alpine valleys through colonization into a substantial principality in Salzburg's immediate hinterland' (Arnold, 1991b, 224).

[14]This designation refers to both the Imperial Cities that were nominally subject to the authority of the emperor and the Free Cities that had originally been subject to the authority of the Bishops. and Archbishops (Whaley, 2012, 26). By the late middle ages this distinction was obscure and both types of cities were referred to as Imperial Free Cities.

character of political authority and rent-seeking in a fragile natural state made minorities especially vulnerable during periods of crisis.

2.2.1 The Restriction on Moneylending

The roots of antisemitic violence in medieval Europe were complex and we do not purport to offer a complete explanation of them here.[15] Following Langmuir (1963), we label the sentiments that animated this violence antisemitic rather than stemming from purely religious antagonism as they drew upon a standard set of tropes and images that continue to inspire anti-Jewish hatred into modern times. Elements of medieval antisemitism can be traced back to classical antiquity (see Nirenberg, 2013, 13–182). But the heightened religiosity of western Europe after the Crusades sharpened the extent to which Jews came to be viewed as alien 'others'.

There was also an important political-economy element to antisemitic agitation in the medieval period. These political economy considerations hinged on the fiscal value of a Jewish community to rulers—a value that was itself largely determined by the demand for Jewish economic services, the most important of which was moneylending. Lending at interest was condemned as usury by the Church throughout medieval Europe and heavily restricted by secular governments (Koyama, 2010b; Rubin, 2010).[16]

The commercial revolution of the twelfth and thirteenth centuries increased the demand for credit in the economy (Spufford, 2002). As a consequence, the prohibition on moneylending generated considerable economic rents, which secular rulers tried to capture. From the twelfth century onward, the role of moneylender devolved increasingly onto Europe's Jewish community: 'moneylending was the mainstay of Jewish economic activity, the means by which the Jewish community as a whole maintained its economic viability and won the political support requisite to its survival' (Chazan, 1997, 26).[17] Lacking permanent sources

[15] For detailed historical examinations of this topic see Cohen (1982); Poliakov (1965); Trachtenberg (1943).
[16] For further historical details see de Roover (1967); Langholm (1992); Nelson (1949).
[17] Also see Noonan (1957, 35). In the early middle ages, Jewish had flourished as merchants and doctors

of taxation, these monopoly rents constituted a non-negligible part of royal revenue.[18] Consequently, as residual claimants on Jewish incomes, rulers had a financial incentive to protect Jews from either elite or popular hostility (see Barzel, 1992; Chazan, 2010; Koyama, 2010b). As Nirenburg writes: 'This special relationship between Jews and rulers proved tremendously useful to European monarchs and magnates trying to establish and expand their power in the eleventh, twelfth, and thirteenth centuries' (Nirenberg, 2013, 194).

2.2.2 The Black Death Pogroms

The Black Death pogroms were not the first to befall the Jewish communities of Europe. During the medieval period, Jewish communities spread across western and central Europe. The largest Jewish community was in Spain, but the communities in Germany—particularly along the Rhineland were prosperous and well established (Chazan, 2006, 2010). Following the First Crusade, massacres and pogroms took place across all of Europe, and in the late thirteenth and early part of the fourteenth century Jewish communities were expelled from England and France, and the Rintfleisch and Armleder pogroms afflicted Jewish communities in Germany.[19]

But the Black pogroms were the largest of the entire medieval period. The Black Death was perhaps the largest demographic shock in European history (Jedwab et al., 2016; Voigtländer and Voth, 2013).[20] It gave rise to a new round of antisemitic violence across Europe.

as well as moneylenders but from the late twelfth century onwards they increasingly specialized in the latter occupation (Botticini and Eckstein, 2012, 153–247). Lombard moneylenders did continue to play a role in some parts of Europe—particularly after 1300. Clerical attitudes towards Jewish moneylending tended towards rhetorical denunciation but tacit collusion and approval (see Stow, 1981, 161). Of course, restrictions on usury were frequently evaded in practice. However, evading these laws required considerable financial sophistication. Therefore the bulk of the everyday credit for consumption smoothing purposes was providing by Jews or other licensed lenders (see Koyama, 2010b).

[18] Data does not enable us to measure the size of the rents generated by the usury prohibition accurately, but the data that we do have suggests that it was sizable (see Koyama, 2010a; Mundill, 2010). For example, in 1211 King John levied a tillage of £44,000 on the Jewish community of England at a time when the total annual revenue collected by the king during his revenue varied between £22,183 and £98,791 (Koyama (2010a, 384)). Even if this entire sum was not collected, the fact that the king could demand so much would only have been possible if the Jewish community was earning very considerable returns from moneylending.

[19] For details on the crusader massacres see Golb (1998) and Stow (1992, 102–120).

[20] Relatedly, Richardson and McBride (2009) show how the Black Death sparked both religious and

Beginning in Switzerland in 1348, as rumors of the plague spread from Italy and France, Jews were accused of poisoning wells. Confessions were extracted through torture and the libel that the Jews were the perpetrators of the plague spread across Europe, particularly in the Holy Roman Empire.

The Papacy opposed antisemitic violence. Pope Clement VI issued two Papal Bulls condemning the attacks against Jews and denouncing the well-poisoning libel (Chazan, 2010, 153-154). Nevertheless, despite this condemnation, the majority of Jewish communities in the Empire suffered some level of violence during the period 1348-1350. These pogroms pose a puzzle for scholars. Traditional historians were perplexed by 'the complete helplessness of the authorities against these outbursts of popular fury' given that the 'loss to imperial and princely treasures was immense'. In particular, they struggled to understand why 'far from taking any steps to prevent outbreaks, the emperor in several instances gave beforehand practical immunity to the perpetrators of the crime, by making arrangements as to what should be done with the houses and goods of the Jews in the event of a riot' (Jacobs, 1912, 278).[21]

Subsequent historians have sought to understand this puzzle. While traditional accounts of the plague pogroms emphasized mob violence and popular anger against Jews as the prime mover in the Black Death pogroms, Cohn (2007) forcefully argues, on the basis of chroniclers' records, that mobs of peasants or artisans did not drive these pogroms. Rather, in some cases, as in Strasbourg, the Jewish community was formally sentenced to death by the city elite 'before any peasant might have stabbed or drowned any escaping Jew' (Cohn, 2007, 18). Cohn argues that 'patrician-dominated city councils' made the conscious decision to expropriate, expel or massacre Jewish communities.[22] In many cases

economic change in England.

[21]For example, Nohl comments: '[t]he massacres of the Jews in the fourteenth century are so deeply revolting, because the ruling classes, as well as the clergy and the educated classes of that time, were perfectly conscious of the lack of foundation in the accusations brought by the people against the Jews' (Nohl, 1924, 181).

[22]He notes that 'city councils, majors and noble castellans from Basel, Bern, Breisach am Rhein, Chillion, Colmar, Freiburg, Bresigau, Kenzingen, Lausanne, Mainz, Münsingen, Oberneheneim, Offenburg, Schlettstadt, Villeneuve, Waldkirch and Zofingen—supplied 'proof' that Jews had been found guilty in these cities' tribunals

the persecutions of the Jews was legally sanctioned. But because the Jews had previously been promised protection by both imperial and local authorities these persecutions represent legally sanctioned breaches in the rule of law. In many cases, Jewish victims were accused and then tortured in order to obtain confessions of guilt that could be used against their fellows. Cohn notes that

> 'city councils, mayors and noble castellans from Basel, Bern, Breisach am Rhein, Chillon, Colmar, Freiburg im Breisgau, Kenzingen, Lausanne, Mainz, Münsingen, Obernehenheim, Offenburg, Schlettstadt, Villeneuve, Waldkirch and Zofingen—supplied 'proof' that Jews had been found guilty in these cities' tribunals of causing the plague through poisoning. Notaries registered the accusations, and their courts duly examined the evidence and delivered their verdicts' (Cohn, 2007, 19).

Nevertheless, the existing historical literature has not systematically established when and where persecutions were more intense nor what factors were associated with pogrom intensity. Instead, the current state of the historical literature highlights the need for an institutional and political economy approach to understanding why so many Jewish communities in Germany were wiped out during the Black Death period.

Notwithstanding the example Cohn offers of Strasbourg, in most cases throughout the Holy Roman Empire, local authorities did not in general instigate or support the pogroms. But they were often lackluster in their attempts to protect the Jewish communities from violence. The two exceptions to this were King Casimir in Poland who was able to protect Jews and the Holy Roman Emperor Charles IV in Bohemia. However, in the rest of the Empire, Charles either failed to prevent pogroms from occurring or he explicitly handed over his rights to the Jews to cities like Frankfurt, Nuremberg, and Worms where they were massacred (Breuer, 1988).

There are many possible explanations for the variation of the response of political rulers to

of causing the plague through poisoning' (Cohn, 2007, 19).

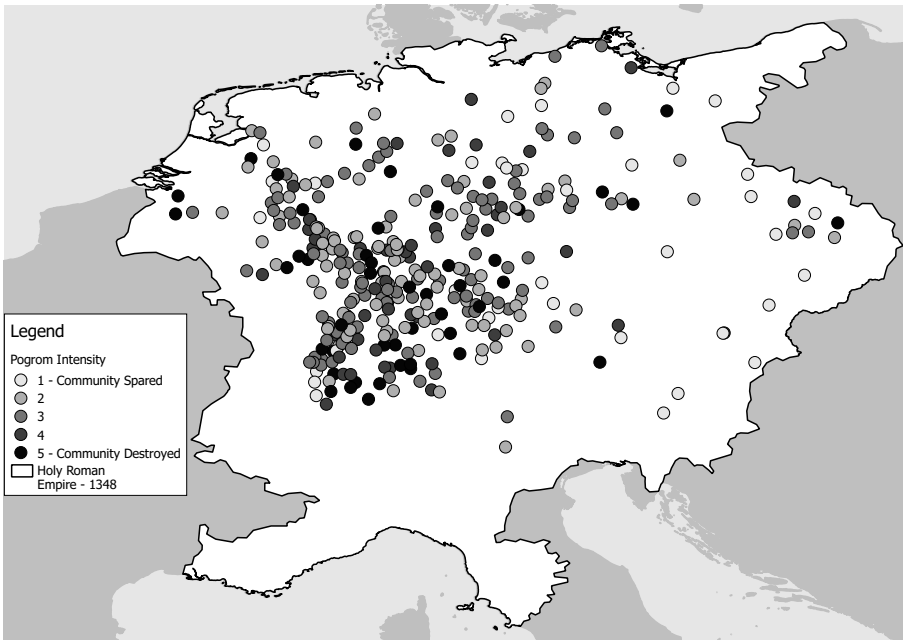


Figure 2.1: The intensity of pogroms in the Holy Roman Empire 1348–1350.

antisemitic violence. Of these the one that fits the evidence best is based on the incentives of local rulers to protect Jewish communities from violence. We suggest that where the rights to tax Jewish communities were securely possessed by the emperor, he had strong incentive to invest in protection. However, where the rents from Jewish moneylenders were contested by local rulers and no individual ruler had secure access to the future stream of revenue associated with Jewish lending, Jewish communities were much more vulnerable both to mob violence and to predation from local rulers themselves as was the case in Strasbourg.

Our dependent variable is pogrom intensity. We focus on pogrom intensity rather than the mere existence of a pogrom for several reasons. First, very few Jewish communities were entirely spared during the Black Death period (Toch, 1997, 70). Figure 2.1 depicts the Black Death pogroms in the Holy Roman Empire. Of the 340 Jewish communities in our dataset, all but 37 suffered some level of antisemitic violence during the Black Death period. Consequently in our analysis we distinguish between Jewish communities that were spared,

expelled, suffered some violence, saw killings or massacres or were exterminated entirely.[23]

Second, among those communities that suffered some form of persecution there was tremendous variance. In Strasbourg thousands of Jews were burnt alive by the population. Elsewhere, violence against Jews was ad hoc and sporadic, and did not result in the elimination of the community, whereas in other parts of Germany orderly expulsions were carried out. The richness of the *Germania Judaica* and the other sources allow us to exploit this variation in persecution intensity.

2.2.3 The Rent Contestation Hypothesis

To establish the economic logic underlying our argument we develop a simple model. Based on the above analysis, we study how the incentive of a ruler to protect a Jewish community depends on his ability to extract fiscal resources from them. This is greater when a single political authority has uncontested authority over the Jewish community than when multiple political authorities claim authority over them.

Rulers benefited from the presence of Jews in their territories in several ways. By the fourteenth century, the most important of these was their ability to directly or indirectly tax the profits of Jewish moneylending (Botticini and Eckstein, 2012). Consequently, in our model we focus on the revenue generated by Jewish moneylending. These rights were traditionally held by the emperor. However, as imperial authority waned in the fourteenth century these rights were increasingly contested by local authorities.

Let us first consider the profitability of taxing Jewish moneylending. The per period profits associated with a volume of moneylending x are valued at $V(x)$ where $V(x)$ is continuous and twice differentiable and $V'(x) > 0$, and $V''(x) < 0$. For illustrative purposes, we will consider a linear demand function $V(x) = \alpha x$ and quadratic costs $c = \frac{1}{2}x^2$.[24] We abstract from the

[23] While we use a map of the entire Holy Roman empire in 1348, the authority of the emperor no longer held sway in northern Italy, where in any case there were no pogroms recorded in the *Germania Judaica*.

[24] A general version is available upon request.

market structure of Jewish moneylending and for simplicity assume that moneylending is competitive.[25]

We first consider the case where there is a single tax authority. The profit function of moneylenders is:

$$\max_x \pi = \alpha x(1-\tau_C) - \left(\frac{x^2}{2}\right) . \tag{2.1}$$

The first order conditions to this maximization problem yield the optimal amount of moneylending: $x_C^* = \alpha(1-\tau_c)$. As the revenue of the centralized ruler is $R_C = \tau_C x^*$, substituting in for x_C^*, we can determine the ruler's optimal tax rate as follows:

$$\max_{\tau_C} R_C = \max_{\tau_C} \tau_C(\alpha - \alpha\tau_c) . \tag{2.2}$$

The first order conditions can be rearranged to show that the revenue maximizing tax is $\tau_C^* = \alpha/2$. The corresponding equilibrium volume of moneylending activity is $x_C^* = \alpha/2$. Total revenue R_C is $\alpha^2/4$.

Now we can consider the taxes that accrue if the rights to tax Jewish moneylending are claimed by more than one ruler. This corresponds to the case where a local ruler such as a bishop or Imperial Free City's town council tries to tax the Jewish community as well as the emperor. The objective function of a representative moneylender is now:

$$\max_x \pi\alpha(1-\tau_i-\tau_j) - \left(\frac{x^2}{2}\right) , \tag{2.3}$$

where i and j represent two rulers with the authority to tax in a given locality. The optimal amount of lending is $x_F^* = \alpha(1-\tau_i-\tau_j)$. From the symmetric solution we obtain the equilibrium tax imposed by each ruler: $\tau_i = \tau_j = \frac{\alpha}{3}$. Consequently, the volume of

[25]This is purely to simplify notation and ensure our model is tractable. In reality moneylending was often monopolistic. But adding this more realistic feature into our model does not change our results.

moneylending when there are two tax authorities is $\frac{\alpha}{3}$ while revenue for each ruler is $R_i = R_j = \frac{\alpha^2}{9}$. Clearly $R_i + R_j < R_c$. Furthermore, it is straightforward to show that this result generalizes and that if there are n tax-collecting authorities, tax revenue for each individual authority will be equal to $\frac{\alpha^2}{(n+1)^2}$, which is clearly declining in n.

Now let us consider what determines the number of tax authorities n. The decision whether or not to contest the authority of the emperor to tax Jewish moneylending was a costly one. It depended on the power and capacity of the local ruler vis-à-vis the emperor in that particular region. Now suppose that there are $m > n$ local authorities in a region. We can consider their decision to challenge the emperor's rights to tax Jewish moneylending as a binary decision represented by the indicator variable ϕ_i. Specifically let us denote the cost of contesting the emperor by κ_i where κ reflects the reflect the strength and capacity of ruler i in comparison to the emperor. The decision to contest the imperial right to tax the Jews is therefore given by:

$$\phi_i = \begin{cases} 1 & \text{if } R_i(n) - \kappa_i \geq 0 \ , \\ 0 & \text{if } R_i(n) - \kappa_i < 0 \ , \end{cases} \tag{2.4}$$

where $n = m\phi_i$. In equilibrium, therefore, the number of rulers who actively contest the emperor n will adjust until

$$\kappa^* = R_i(n) = \frac{\alpha^2}{(n+1)^2} \ , \tag{2.5}$$

where κ^* is equal to the cost of the marginal ruler. This model generates a simple testable hypothesis: where κ^* is high, the number of authorities who tax the Jews will be low: Jewish moneylending will remain a lucrative source of taxation. But where κ^* is low, more that one authority may seek to tax the Jewish community and, as a consequence of too many fiscal authorities, the rents associated with Jewish moneylending will be dissipated.

This simple framework predicts that where Jewish moneylending could be securely taxed by a single ruler, that ruler had a stronger incentive to retain their services and hence to protect them from violence. Of course, many factors could make Jewish communities vulnerable to persecution. As we have noted the libel of well-poisoning that accompanied the Black Death can be viewed as an exogenous source of greater antisemitic sentiment (and this is how it is interpreted by Voigtländer and Voth (2012)). Economic shocks in general made Jewish communities more vulnerable to violence as shown by Anderson et al. (2016). Patterns of economic complementarity and substitutability may also have shaped the vulnerability of Jewish communities as Jha's hypothesis suggests (Jha (2013, 2014)). What our model highlights is an additional institutional channel that can account for local variation in antisemitic violence in response to a common shock like the Black Death. In the next section we take this hypothesis to the data.

2.3 Data and Empirical Identification Strategy

We now discuss how we test our hypothesis that political fragmentation made Jewish communities more vulnerable during the Black Death period.

Data Our data set is a combination of city-level data from the *Germania Judaica* (Avneri, 1968) and newly collected GIS data. We follow the example of Voigtländer and Voth (2012) in collecting data from settlements with a Jewish community that specifically mention the fate of the community during the Black Death period. Our data set includes a larger sample than Voigtländer and Voth (2012) since we are not concerned with matching our settlements to towns or cities in modern Germany. Unlike Voigtländer and Voth (2012), we include settlements that were part of the Holy Roman Empire but are now part of modern Austria, France or Switzerland. For each settlement that mentions the Black Death in Avneri (1968), we collect the description of the community's experience to code the intensity of the pogrom.

Our main measure of pogrom intensity varies from 1 to 5 and is taken from reading every entry of the *Germania Judaica*. A value of 1 means that the community was spared from the persecutions during this time. A value of 5 means that the entire community was eliminated through massacres and large-scale violence. Between these thresholds, we use the description of the persecutions from the text of *Germania Judaica* to code varying levels of the intensity of the persecutions. Communities for which records indicate that Jews were killed in large numbers (include several martyred or burnt), but not eliminated, received a value of 4. A community that had a few deaths (but no indication of widespread deaths) received a value of 3. Communities that were expelled received a value of 2. Further detail on the scale of pogrom intensity is included in Table B.3. This coding is ordinal and not cardinal. A level 4 persecution was more intense than a level 2 persecution but it was not necessarily twice as intense. As an alternative to our main specification, we also code persecutions as either not involving fatalities (1-2) or involving fatal violence (3-5). We also vary the specification of the index. Our results are not sensitive to different ways of coding the data.[26]

In order to measure political fragmentation in the Holy Roman Empire, we examine the towns in Avneri (1968) to determine the local ruler overseeing the Jewish community, including Imperial Free City town councils, Bishops, Archbishops as well as the secular princes, lords, landgraves, margraves, etc.[27] As we have argued, the Bishops and Archbishops of the Holy Roman Empire in this period were by and large secular rulers. Nevertheless, we are aware that in studies of the Protestant Reformation (e.g. Rubin, 2014), Bishoprics are also used as a proxy for prior levels of Christianity. To assuage concerns that Bishoprics and Archbishoprics are proxies for Christianization, we conduct a range of robustness checks in Section 2.5.

In addition, we collect GIS data on the Holy Roman Empire during this time to account for the territorial boundaries of the secular princes. We are able to include whether a town was

[26] We discuss these alternative specifications in section 5.1 and report the results in Tables B.8 to B.10.

[27] We follow Voigtländer and Voth (2012) by using data from Jacobs (1912), which we augment with information from Avneri (1968).

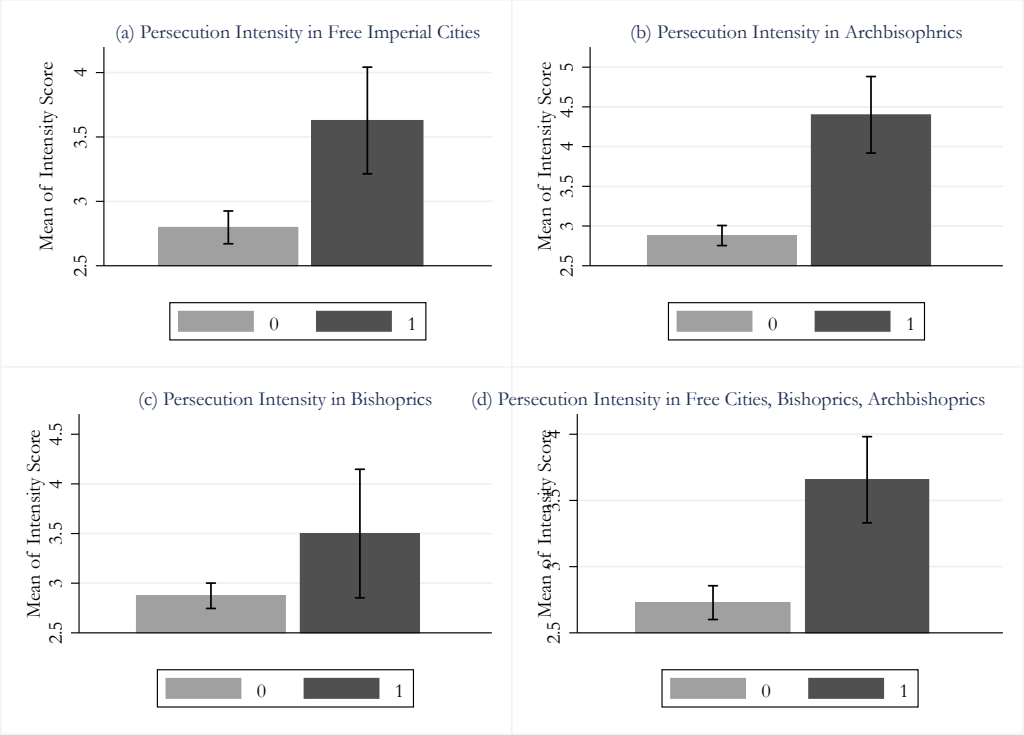
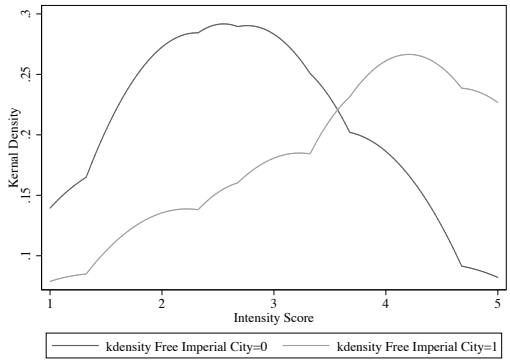


Figure 2.2: Persecution Intensity Comparisons
Panel (a) depicts persecution intensity in Imperial Free Cities verses other communities. Panel (b) compares persecution intensity in Archbishoprics compared to other communities. Panel (c) compares persecution intensity in bishoprics compared to other communities. Panel (d) compares communities located in Imperial Free Cities, Bishoprics and Archbishoprics in comparison with all other communities. 95% confidence internal.

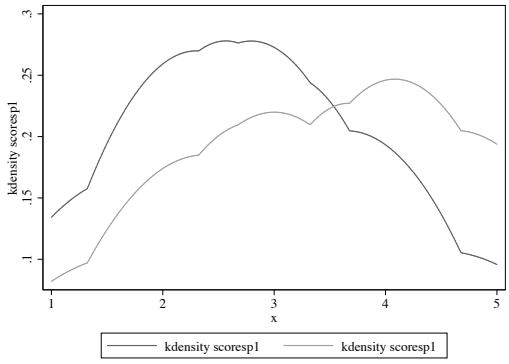
under the jurisdiction of five of the main political houses (Hapsburg, Luxembourg, Wettin, Wittelsbach, Wurtemberg). The location of these measures of political fragmentation for the settlements in our data set are depicted in Figures 2.4a to 2.4c.[28] The figures make it clear that Imperial Free Cities, Bishoprics, and Archbishoprics were fairly even distributed across the Empire.

Our hypothesis is that political fragmentation meant that the rents associated with taxing Jewish moneylending became contested between the emperor and local rulers. This dissipated

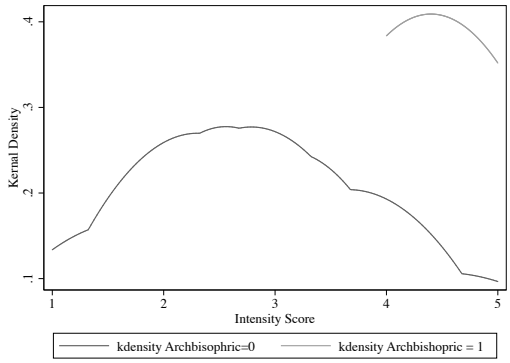
[28]The data on these territories comes from Shepherd (1911), which contains a map of Europe in 1378.



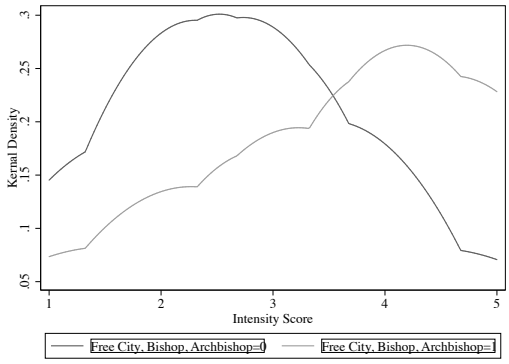
(a) Kernel density plot (bandwidth=0.75) comparing communities in Imperial Free Cities with other communities.



(b) Kernel density plot (bandwidth=0.75) comparing communities in Bishoprics with other communities.



(c) Kernel density plot (bandwidth=0.75) comparing communities in Archbishoprics with other communities.



(d) Kernel density plot (bandwidth=0.75) comparing communities in either Imperial Free Cities, Bishoprics, or Archbishoprics with all other communities.

Figure 2.3: Kernel density plots

the value of these rents and made Jewish communities less valuable both to the emperor and to local rulers and hence more vulnerable to violence during the wave of antisemitism that accompanied the Black Death.

In testing this hypothesis we estimate a reduced form relationship between political fragmentation and pogrom intensity as we not have data on the profitable of Jewish moneylending or the specific contributions made by Jewish communities to the coffers of the either the Emperor or local authorities.

Figures 2.2 and 2.3 depict our main results non-parametrically. Figure 2.2(a) compares the mean intensity score of communities that are located in Imperial Free Cities with those that are not. Figure 2.2(b) compares the mean intensity score of communities that are located in Archbishoprics with those that are not. Figure 2.2(c) compares the mean intensity score of communities that are located in Bishoprics with all other communities. Figure 2.2(d) compares all communities combined in Imperial Free Cities, Bishoprics and Archbishoprics with other communities. In all cases there is a visible difference in persecution intensity in those communities where the emperor faced a challenge to his direct authority.

Figure 2.3 performs a similar exercise showing the kernel density of the persecution intensity score. The kernel density score of communities located in Imperial Free Cities, Bishoprics, and Archbishoprics is shifted to the left of the kernel density score of all other communities implying that these 'treated' communities experienced more severe persecutions. We now conduct a more formal analysis to show that these relationships in the data are borne out in a regression framework.

Our theory predicts that in areas where there were multiple political authorities vying for fiscal authority over the Jews, Jewish communities are more likely to face intense persecutions. To test this we estimate:

$$\text{Pogrom Intensity}_l = \alpha + \beta \text{Politically Contested}_l + \mathbf{X}'\mathbf{\Omega} + \Lambda_i + \epsilon_l \ , \tag{2.6}$$

where our dependent variable is *Pogrom Intensity* varies from 1 to 5 and our variable of interest Politically Contested$_l$ takes a value of one if a community is located at the seat of a bishopric, seat of an Archbishopric or an Imperial Free City and zero if it was ruled directly by a secular prince or the emperor. We estimate this model as both an ordered Probit and as a linear probability model.

As, our setting is non-experimental, we are cautious about interpreting our results as reflecting the causal impact of political contestation on pogrom intensity. Identification

relies on our ability to control for differences between communities ruled by ecclesiastical authorities or free cities, that is, on the extent to which our vector of controls $\mathbf{\Omega}$ picks up the relevant geographic, political and economic city-level characteristics that might affect persecution intensity, our estimate of β will reflect the effect of contested political authority on persecution intensity. Considering the challenges associated with obtaining data for the medieval period, we believe that we are able to control for as many of the most important economic and political differences between different communities as is feasible. But, by definition, we are unable to directly control for unobservable differences between to different communities. To limit the possibility of bias from such unobservables, we employ fixed effects for higher level political units Λ_i in most specifications. These political units correspond to aggregate regions within the Holy Roman Empire such as Bavaria, Franconia, and Saxony.[29] Finally, we will carry out several exercises to quantify the magnitude of potential bias from unobservables and conduct a range of placebo tests.

Baseline Controls To control for underlying geographic and economic characteristics that might make some communities more likely to engage in persecutions we use a range of controls. We employ data on wheat suitability from the FAO.[30] We include two additional geographic controls *Ruggedness* and *NavRiver*. On the one hand, geographic isolation may make communities more hostile to outsiders. On the other hand, Nunn and Puga (2012) shows that rugged areas in sub-Saharan African were better able to escape from the slave trade; similarly, Jews in more rugged areas may have been less vulnerable to antisemitic violence. *NavRiver* is a dummy variable that takes a value of 1 if a settlement is located on a navigable river. Access to navigable rivers might make Jewish communities more accessible and more hence more vulnerable. For similar reasons, we employ a measure of urban density

[29] We also cluster our standard errors at the political unit level.

[30] This data is based on information on crop characteristics and climatic and geographic data including measures of precipitation, frequency of wet days, mean temperature, daily temperature range, vapor pressure, cloud cover, sunshine, ground-frost frequency, and wind speed. The geographic data include information on soil types and slope characteristics. We assume a 'moderate' level of inputs to wheat cultivation. This is consistent with farmers who produce primarily for home consumption, but sell some of their produce to the market.

consistent with other work on early modern Europe.[31] Our urban density variable is called *PopDensity* and we construct it with the Bosker et al. (2013) dataset of cities. To construct measures for each of our settlements, not all of which are included in the Bosker et al. (2013) dataset, we use geospatial data to create a population heatmap. We are then able to extract a value for each settlement that represents how close a settlement was to a major urban center.

Another potential source of bias comes from the openness of a settlement to trade and migration. Commerce might make communities more tolerant towards outsiders such as Jews—as predicted by the *doux commerce* hypothesis (Hirschman, 1977; Jha, 2013). Alternatively, the existence of a trade route might make a Jewish community especially valuable from a fiscal point of view. If the location of trade networks are correlated with the extent of political centralization in the Holy Roman Empire, this may bias our results in favor of our hypothesis. Proximity to a navigable river already helps to control for access to trade. Using historical maps, we are also able to extract the location of major trade routes during the time of the Black Death (Figure B.2a). We construct a variable called *TradeRoutes* for each settlement that indicates if they are within five kilometers of a major trade route.[32] We also control for the presence of major economic centers known for either grain production, wine cultivation, or the textile industry. We create three variables, called *Grain*, *Linen* and *Wine* that take a value of 1 if the settlement is located in the area and 0 otherwise. As indicated by Figure B.2b the center for the exporting of grain was concentrated in the Baltic region whereas wine and textile production were more prevalent in western Germany. Textile production was mostly concentrated in the Flanders region while wine production was based in Burgundy, the Rhineland and central Germany.

Past Pogroms Voigtländer and Voth (2012) establish that the extent of antisemitism varied considerably at a local level within Germany and that latent antisemitism persists for

[31] See De Long and Shleifer (1993) and Acemoglu et al. (2005).

[32] Other specifications which control for the accessibility of trade routes and distance to industry centers do not affect our results and are available upon request.

long periods of time. Our best proxy for antisemitism is to include a binary variable that takes a value of 1 if the community experienced a previous pogrom and a 0 otherwise based on data contained in Voigtländer and Voth (2012) and Avneri (1968). [33]

Spread of the Black Death Christakos et al. (2005) provides data on on the incidence and intensity of the Black Death in Europe. Following Jedwab, Johnson, and Koyama (2016) we code this data for the Holy Roman Empire. In our baseline regressions we control for whether or not a community was said to be affected by the Black Death.[34]

2.4 Main Results

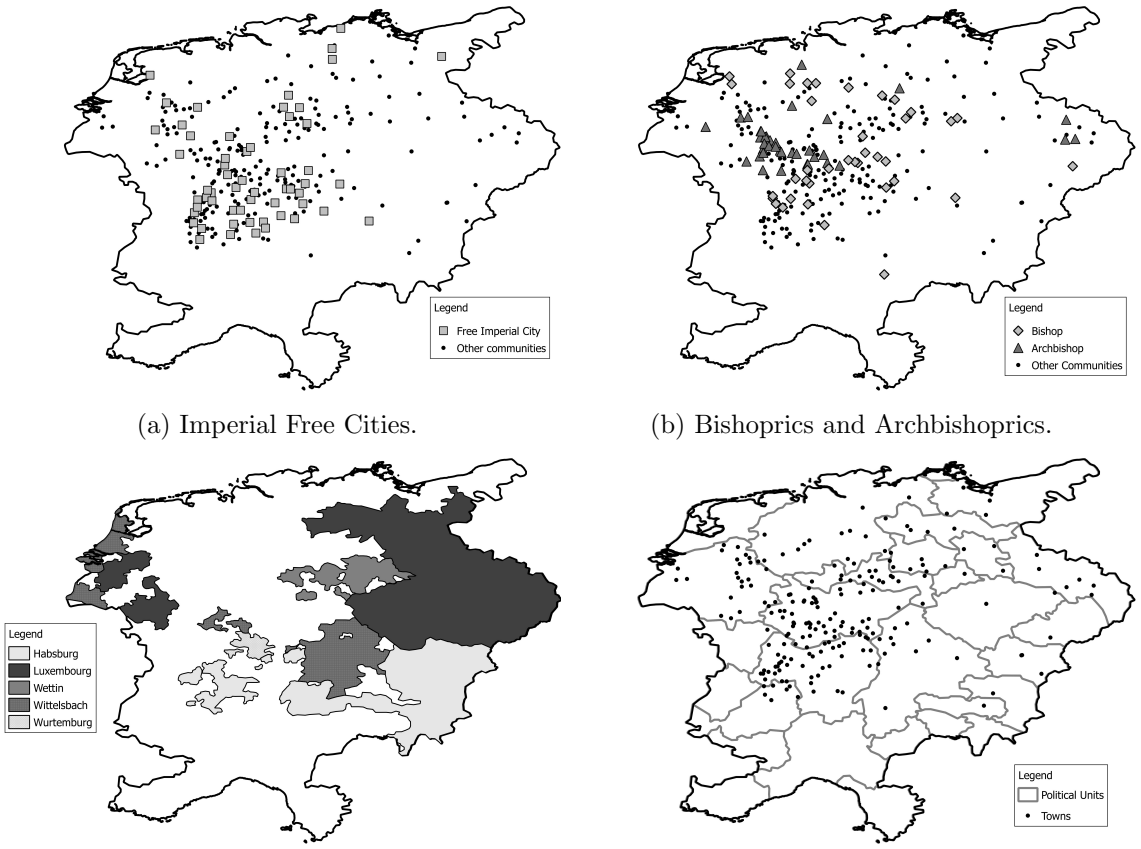
Our theory predicts that the degree to which political authority was contested was an important determinant of pogrom intensity. We report our baseline results in Table 2.1. Our three explanatory variables are whether or not a community was located in an Imperial Free City, the seat of an Archbishopric or the seat of Bishopric. Columns (1)-(4) present our results using OLS. In Columns (5)-(8) we report our results using an ordered probit. In all specification we report robust standard errors clustered at the level of the political unit.[35]

Column 1 present our baseline result without controls. The coefficient we report suggests that the presence of an Imperial Free City is associated with a greater pogrom intensity of 0.841 or just less than 1/5th of the range of our intensity measure. The subsequent columns (2-4) show that this estimate remains comparable in magnitude when we introduce our baseline controls, include information about past pogroms, and explicitly control for spread of the Black Death. In Columns (5)-(8) we conduct the same analysis using an ordered Probit specification. The coefficient we obtain in Column (5) implies an odds ratio

[33] Specifically, we include pogroms from 1096, 1146, 1287, 1298, 1336 and 1337.

[34] See Figure B.3.

[35] There are 22 clusters in all. See Colin Cameron and Miller (2015) for a discussion of the appropriate number of clusters. A map of the clusters is provided in Figure 2.4d.



(a) Imperial Free Cities.

(b) Bishoprics and Archbishoprics.

(c) Political Houses.

(d) Regions

Figure 2.4: Explanatory Variables and Selected Controls
Sources: GIS data compiled from Avneri (1968), Jacobs (1912) and Shepherd (1911).

of 4.249.[36] This implies that a community governed by a Imperial Free City had a 4 to 1 greater chance of having a higher intensity score.

During this period, archbishops and bishops represented particular obstacles to the authority of the emperor: they had religious authority and they were territorial rulers in their own right. We therefore expect to see an especially large coefficient for our variables Archbishoprics and Bishops. Indeed, in Table 2.1 we show that the effect of a Bishopric on pogrom intensity is comparable in size to the effect we obtain for an Imperial Free City while Archbishoprics are still more strongly associated with more intense pogroms. Even after controlling for a range

[36] We replicate Table 2.1 reporting odds ratio in the Web Appendix (Tables B.17.)

of controls, the results in Column (4) suggest that the existence of the seat of a bishopric increases intensity by 1.055 while the existence of the seat of an Archbishopric increases the pogrom intensity by 1.156.

This is highly consistent with our model and with recent studies of the dilemma facing bishops in the Holy Roman Empire. In the words of one historian: 'the bishops, in their twofold role as prelates of the Church and territorial rulers, felt the tension between the demands of Canon Law, on the one side, and the exigencies of their political interests, on the other' (Cluse, 2013, 1). These findings are consistent with our argument, but on their own they do not rule out alternative hypotheses. A possible alternative hypothesis is simply that the bishops were unable to tax Jewish moneylending due to concerns about usury. If this was the case then they would clearly have less of an incentive to offer protection to Jewish communities. However, evidence from Berenbaum and Skolnik (2007), Cluse (2013), and Haverkamp (2015) provides plenty of evidence of bishops taxing Jewish moneylenders. In their capacity as secular as well as religious authorities, the bishops enforced repayment of debts to Jews. In 1344, the bishop of Augsburg went so far as to excommunicate the city of Augsburg for the non-repayment of Jewish debts (Berenbaum and Skolnik, 2007). The Archbishop of Trier is described as having 'built the financial foundation of his policies ... with the help of "his Jews"' (Haverkamp, 2015, 39-40).

However, it was indeed the case that ability of bishops to tax Jewish were often less securely grounded than those of the Emperor. When bishops tried to assert their authority to tax Jewish communities these were often contested by local cathedral chapters.[37] This conflict within the ecclesiastical hierarchy further weakened the position of Jews in territories ruled by bishops. This is not an alternative to our argument but in fact complements it.

Pogroms were less severe where imperial authority was strong and unchallenged. As we

[37] In some cities like Osnabruck, the bishop specific issued maximum interest rates (in this case a rate of $36\frac{1}{9}\%$) that could be charged by Jewish lenders and they fined Jewish lenders who charged higher rates (Berenbaum and Skolnik, 2007). In contrast to the position of the higher churchmen, the lower clergy tended to hold that 'the traditional demands for tolerating the Jews could apply only as long as those Jews were not active, as "public usurers"' (2 Cluse, 2013).

have noted, the Emperor Charles IV protected Jews where his authority was strong as it was in Prague. And all the evidence suggests that he viewed the Jews as an important fiscal resource.[38] Outright massacres were most common where imperial authority was weaker. In these territories the Emperor in some cases anticipated violence against the Jewish community and 'sold or transferred the holdings of the Jews, if and when they should be killed, to the cities and nobles who saw fit to support him (Breuer, 1988, 146–147). Perhaps the most striking example of this is provided by Archbishop Baldwin of Trier to whom Charles IV granted the rights to collect the property and debts of Jews in event of them being massacred; in the wake of this 'sale' the Jews of Trier were indeed killed.

The Imperial Free Cities also witnessed tension and conflict over the right to tax Jewish moneylending. In Frankfurt in the period prior to the Black Death the taxes collected from Jewish lending were claimed by both the city and the Emperor. Haverkamp observes that in many towns 'the municipal leadership's interest in protecting the Jews was reduced by the fact that they had little or no share in the fiscal rights over the Jews, who were subjects of the town lord or other authorities (Haverkamp, 2015, 48).

In these cities, the Emperor recognized that he did not have the power to protect the Jews so he 'sold them' thereby condoning whatever antisemitic violence he could not prevent. In Nuremberg, the Emperor 'presented the city council with a letter exonerating it in advance from any responsibility for whatever harm might befall the "servants" of the imperial treasury'. In this case, 'Charles's foresight was justified; for when the plague at length appeared, late in 1349, the Jews were driven to a square, therefore known as the Judenbühl, and burned or slaughtered to a man'

[38] Soon after he ascended the throne, he renewed a Bohemian privilege of 1254, which established principles of incorporating Jews into Bohemian society. Additionally, he subscribed to the traditional relationship of granted protection of the Jews in exchange for higher taxes, as seen in September 1347 when he recommended that the Jews of Breslau be given protection of the city council. He also founded a new Jewish settlement, Neustadt, on the outskirts of Prague that was organized as a municipality apart and granted its residents special privileges. One of these privileges is that Jews were promised tax exemption if they settled permanently and built brick houses (see Agnew, 2004; Baron, 1965b).

Table 2.1: Baseline Results

	Dependent Variable: Pogrom Intensity (1-5)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS				Ordered Probit			
Imperial Free City	0.841***	0.746***	0.746***	0.791***	0.827***	0.806***	0.806***	0.829***
	(0.208)	(0.265)	(0.254)	(0.277)	(0.247)	(0.255)	(0.242)	(0.264)
Archbishopric Seat	1.563***	1.275***	1.276***	1.156***	1.661***	1.296***	1.295***	1.153***
	(0.288)	(0.413)	(0.358)	(0.383)	(0.139)	(0.324)	(0.246)	(0.282)
Bishopric Seat	0.735***	0.915***	0.916***	1.055***	1.018***	0.893***	0.893***	0.958***
	(0.211)	(0.241)	(0.234)	(0.278)	(0.232)	(0.209)	(0.202)	(0.223)
Baseline Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes	No	No	Yes	Yes
Plague Spread	No	No	No	Yes	No	No	No	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	340	340	340	340	340
Adj. / Pseudo R^2	0.121	0.131	0.129	0.151	0.033	0.046	0.047	0.071

Notes: This table reports the effect of a community being located near an Imperial Free City, or the seat of a Bishopric or Archbishopric on the intensity of Black Death pogroms between 1348-50. Columns (1)-(4) report our OLS estimates. In Columns (5)-(8) we report our ordered Probit results. Baseline controls include whether a community was close to navigable rivers or land routes, measures of textile, wine, and grain production, urbanization, wheat suitability, and ruggedness. Fixed Effects refer to larger political unit fixed effects. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

(Lowenthal, 1964, 129).[39] The results we present in Table 2.1 suggest that experience of Trier and Nuremberg were indeed generalizable. In Table 2.2 we show that our results are robust when we control for the identity of the secular princes of the empire. By the mid-fourteenth century, the major secular princes of the Holy Roman Empire were independent rulers in their own right. And, though the emperor was nominally the lord of all Jews in the empire, the right to tax Jews in their territories had been claimed by the more powerful secular princes. As in Table 2.1, in Table 2.2 we include both our OLS and Ordered Probit specifications. The coefficients we obtain on Archbishoprics, Bishoprics and Imperial Free Cities remain unaffected. The coefficients we obtain on the identity of the houses are largely insignificant when we employ our full suite of controls.

The two exceptions are the land under control of the Luxembourg family, which produces a negative and weakly significant coefficient while lands controlled by the Habsburgs were more likely to experience a higher intensity pogrom. The political environment of the time of the Black Death can partly account for this finding. Emperor Charles IV was from the House of Luxembourg and he laid claim to the crown in 1346 in opposition to the then emperor, Louis IV of Wittelsbach. Lands under control of the Luxembourg family were therefore under the direct control of the Emperor or his relatives. A negative coefficient on our dummy variable for communities in Luxembourg lands, therefore, is consistent with the having more consolidated authority in these lands.

The positive coefficient associated with lands control by the Habsburg family is more surprising as Albert II, the Habsburg Duke of Austria, Styria, and Carinthia was known as 'the supporter of Jews' from his enemies and he was known for his attempts to protect Jewish communities during the Black Death (Haverkamp, 2015, 47). One possible explanation for this coefficient is conflict between the Emperor and the Habsburgs. The Habsburg family were a major competitor to the Luxembourg family. A positive coefficient, therefore, on our

[39]Lowenthal summarizes this as follows: 'Charles IV who began by forbidding the people to touch as much as a hair of his Jews ended by contracting with the city councils to share in the spoils' (Lowenthal, 1964, 127).

Table 2.2: Major Political Houses:

	Dependent Variable: Pogrom Intensity (1-5)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS				Ordered Probit			
Imperial Free City	1.034***	0.958***	0.954***	1.031***	0.945***	0.888***	0.886***	1.016***
	(0.200)	(0.187)	(0.185)	(0.261)	(0.218)	(0.206)	(0.207)	(0.290)
Archbishopric Seat	1.877***	1.463***	1.428***	1.321***	1.741***	1.368***	1.337***	1.378***
	(0.184)	(0.278)	(0.226)	(0.277)	(0.290)	(0.362)	(0.318)	(0.380)
Bishopric Seat	0.906***	0.803***	0.797***	1.145***	0.836***	0.774***	0.767***	1.269***
	(0.252)	(0.211)	(0.214)	(0.191)	(0.248)	(0.215)	(0.218)	(0.257)
Habsburg	0.728*	0.672*	0.673*	0.891***	0.656*	0.620**	0.620**	0.939***
	(0.352)	(0.325)	(0.323)	(0.223)	(0.337)	(0.311)	(0.309)	(0.207)
Luxembourg	-0.357	-0.436*	-0.446*	-0.255	-0.395	-0.473*	-0.485*	-0.331
	(0.272)	(0.216)	(0.217)	(0.168)	(0.305)	(0.262)	(0.267)	(0.204)
Wettin	0.406	0.491	0.488	0.597	0.417*	0.541**	0.538**	0.702
	(0.265)	(0.302)	(0.302)	(0.486)	(0.231)	(0.264)	(0.264)	(0.472)
Wittelsbach	-0.0313	-0.0750	-0.0675	0.171	-0.0268	-0.0688	-0.0604	0.186
	(0.221)	(0.205)	(0.223)	(0.186)	(0.219)	(0.197)	(0.215)	(0.200)
Wurtemberg	0.00616	-0.0595	-0.0383	0.0409	0.0372	-0.0388	-0.0167	0.0464
	(0.191)	(0.208)	(0.161)	(0.141)	(0.178)	(0.191)	(0.148)	(0.130)
Baseline Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes	No	No	Yes	Yes
Plague Spread	No	No	No	Yes	No	No	No	Yes
Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	340	340	340	340	340	340	340	340
Adjusted R^2 / Pseudo R^2	0.142	0.175	0.176	0.246	0.047	0.061	0.061	0.094

Notes: This table reports the effect of a community being located near an Imperial Free City, or the seat of a Bishopric or Archbishopric on the intensity of Black Death pogroms between 1348-50 controlling for the identity of the major secular rulers. Columns (1)-(4) report our OLS estimates. In Columns (5)-(8) we report our ordered Probit results. Baseline controls are the same as in Table 2.1. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

indicator for Habsburg lands could be consistent with the Emperor's authority being more contested in communities under the domain of the Habsburg family

2.5 Alternative Explanations and Robustness Checks

We have provided robust evidence of a correlation between political contestation as measured by the presence of an Imperial Free City or a Bishopric of some kind and pogrom intensity. In this Section we consider a range of other potential explanations for the variation in the level of Black Death persecutions. We show that these hypotheses either fail to find empirical support or do not affect the coefficients we obtain for our explanatory variables.

2.5.1 Alternative Explanations

Spread of the Black Death A natural explanation of the intensity of the pogroms faced by Jewish communities in this period would be the intensity of the Black Death itself as the antisemitic violence was sparked by the libel that the Jews caused the plague by poisoning wells (see Nohl, 1924). Among modern historians Aberth (2000), for instance, makes the case for the pogroms as a seemingly rationale response to the plague.[40]

Despite being a plausible hypothesis, it does not accord with the evidence. Our main specifications in Table 2.1 control for the spread of the Black Death and demonstrate that this is not driving our results. In fact, we find no meaningful relationship between plague incidence and pogrom intensity. Our findings are therefore inconsistent with a simple scapegoating story whereby Jews were killed simply in response to a natural disaster. Instead it is consistent with the comments of contemporary chroniclers who observed that "The ready cash of the Jews was also the poison which killed them. Had the Jews been poor, they would not have been burned"' (quoted in Breuer, 1988, 150).

[40]He writes: 'what lay behind the pogroms was a quite rational attempt to avert or end the plague, an unprecedented and unexpected catastrophe the fear of which trumped all other considerations' (Aberth, 2000, 163).

The Wealth of Jewish Communities The above quote lends credence to an alternative hypothesis: that rioting mobs specifically targeted wealthier or more prominent Jewish communities. This goes directly against our hypothesis, as our model suggests that communities would have been wealthier where they were more secure and where they were protected by a single ruler such as the Emperor or another powerful secular ruler. It is hard to test this perfectly as information on the incomes and wealth of Jewish communities in the Holy Roman Empire has not survived. *Germania Judaica* and Haverkamp and Bardelle (2002) provide documentation of Jewish properties seized following the various forms of persecution. These properties are proxy for the wealth of Jewish community. Perhaps communities were persecuted for their properties and wealth and not necessarily as a result of fragmented authority?

Table B.4 presents our analysis controlling for a variety of measures of the wealth of a Jewish community. In Column (1) and (4) we show that our baseline coefficients remain qualitatively the same once we control for whether or not a community had a synagogue. Another measure of the wealth of a community is its age. Haverkamp (2015) speculates that areas with older settlements tended to experience more intense persecutions and this might be one reason why. If the presence of an older community was correlated with the existence of a bishopric or an Imperial Free City this could bias our coefficients upwards. Therefore we collect data on settlement age from the entries in *Germania Judaica* to test this possibility. Columns (2) and (5) indicates our results are unchanged when we control for the age of a Jewish community. Finally, historians observe that the most prosperous Jewish communities were located along the river Rhine (Chazan, 2010). To ensure that this is not a source of bias, we control for distance to the river Rhine in Columns (3) and (6). The coefficient estimates we report are largely unchanged by the inclusion of these controls. Thus while we cannot rule out the possibility that wealth played a role in the pogroms; the best evidence we have suggests that this effect was less important than the incentive that rulers had to permit or prevent antisemitic violence.[41]

[41] For a theoretical perspective, it is not clear that greater wealth, all else equal would increase the incentive

Other Differences in Political Institutions We have focused on the differences between Jewish communities governed by Imperial Free Cities or ruled directly by Archbishops or Bishops. Thus one source of potential bias could arise due to the different legacies of different political arrangements in various parts of the Holy Empire. This would be the case if these factors also affected the location of Bishoprics and Imperial Free Cities. For example, Stasavage (2011) argues that the pattern of state formation in medieval Europe was decisively shaped by the partition of the Carolingian empire at the Treaty of Verdun in 843. In particular, he argues that collapse of the Kingdom of Lothariginia, which lay between Western and Eastern Francia bisecting the Low Countries, the Rhineland, Switzerland, and Northern Italy, can help explain why political authority remained weak and fragmented in that part of western Europe through the medieval and early modern period.[42] He provides evidence that the borders of the Middle Kingdom cut across linguistic and ethnic lines and did not correspond to prior political divisions. Figure B.2c in the Appendix shows the borders of Lothariginia. In Table B.5, Columns (1) and (4) we control for the whether or not a Jewish community was located in a part of the Empire that had previously belonged to Lotharingia. The estimates we obtain on our variables of interest remain unaffected. Columns (2) and (5) include a measure whether or not a community was in the territory of one of the Electors of the Empire. In Columns (3) and (6), we include another proxy for the authority of the Emperor, measured as the natural log of the distance from Prague, the capital of Emperor Charles IV, and the communities in our sample. The coefficients for our variables of interest remain largely unchanged, but this alternative measure of the authority of the emperor similarly predicts less intense persecutions as predicted by our framework.

to destroy the community because a wealthier community could be expected to generate larger tax revenues in the future.

[42]He observes that '[t]he divisions laid out at Verdun in 843 would have lasting implications not only because Lothariginia collapsed but also because stronger kingdoms emerged elsewhere in the other parts of the former Carolingian Empire ... Lotharingia, in strong contrast, remained a border zone of fragmented and shifting political control, flanked by larger powers on either side' (Stasavage, 2011, 99).

Different Patterns of Economic Specialization Among Jews Research by Jha (2013, 2014) argues that patterns of economic complementarities and substitutability affect the ability of a minority community to survive. This line of reasoning is consistent with older work which argued that the Jews suffered expulsions and persecutions in England and France following the emergence of Italian merchants who could substitute for the role they played in the medieval economy (Veitch, 1986).

While we cannot test this alternative hypothesis directly, we are able to control for many of the factors that historians have identified as playing a crucial role in shaping the economic role played by Jews within the medieval economy. Haverkamp (2015), for example, writes that Jews played an important commercial role 'in the regions characterized by viticulture' (p 15). For this reason we control for areas where wine production was important (notably in the Rhine valley, Alsace, Franconia and Swabia). We also control for economic variables such as distance to trade routes and urbanization that should control for differences in levels of economic development that might give rise to Jews playing a different role in different parts of the Empire. We do not find evidence that any of these controls affect the coefficients we obtain for our variables of interest.

Prior Levels of Christianization Another possible explanation for pogrom intensity could be that prior levels of Christianization or the influence of the Catholic Church led to worse antisemitic violence. Many historians argue that the Catholic Church played a key role in generating antisemitic stereotypes: associating Jews with both heretics and the antichrist (see, for example, Cohen, 1982; Lehmann, 1995; Nicholls, 1963). St. Augustine, however, taught that the Jews were to be protected because they were meant to serve as 'witnesses' to the errors of their ancestors who had turned away the Savior Jesus Christ. And, as we have seen, during the antisemitic violence of 1348-1350, the Pope condemned the violence and sought to protect Europe's Jewish communities. Haverkamp, for instance, observes that '[i]n the German Kingdom as elsewhere, many churchmen shared the view

that Jews were useful, even indispensable, for key concerns of Christian traditions and belief' (Haverkamp, 2015, 30).

For this reason we do not expect a direct relationship between Christianization *per se* and antisemitism. Nevertheless, traditional historians like Nohl (1924) indicted the lower clergy and the monks as guilty of fermenting hatred against the Jews. Nohl wrote that 'The clergy were opposed to the Jews because they were increasing in the towns and reducing the incomes of the parishes. Besides, by letters of privilege granted by the princes, they were exempt from the far-reaching ecclesiastical jurisdictions' (Nohl, 1924, 192).

To test whether the lower clergy and monks were indeed associated with the intensity of violence directed against Jewish communities, we control for the presence of a monastery before the onset of the Black Death. Following Pfaff and Corcoran (2012), we use Jürgensmeier and Schwerdtfeger (2006) to collect information on whether or not the town had a monastery established before the Black Death. The results of these robustness checks are given in Table B.6, Columns (1) and (4).[43] The results remain largely unchanged.

Flagellants The flagellants were bands of religious zealots who roamed much of western Europe in the wake of the plagues. They sought to atone for the sins that they supposed responsible for the plague by flagellating their own bodies. Traditional historians saw their progress as closely associated with antisemitic violence. Ziegler (1969), for instance, notes that 'In July, 1349 when the Flagellants arrived in procession at Frankfurt, they rushed directly to the Jewish quarter and led the local population in wholescale slaughter. At Brussels the mere news that the Flagellants were approaching was enough to set off a massacre, which in spite of the effort of the Duke of Brabant, some six hundred Jews were killed' (Ziegler, 1969, 106). Flagellants were associated with antisemitic violence in Freiburg, Augsburg, Nüirnberg, Munich, Königsberg, and Regensburg (Nicholls, 1963, 246). More recent accounts downplay the idea that the flagellants were antisemitic mobs. Aberth writes:

[43] We also conducted tests with the number of monasteries. The results were unchanged.

'The simple fact is that the timing is not quite right in many places for the Flagellants to have instigated Jewish pogroms' as in many cases Jews were killed prior to the arrival of the flagellants (Aberth, 2000, 155). To test this alternative hypothesis we collect data on the known path of flagellant movements. The results of these robustness checks are given in Table B.6, Columns (2) and (5). We find that the path of the flagellants does not explain antisemitic violence.

In summary, our analysis allows us to rule out some of the explanations for pogrom intensity suggested by historians. In contrast, our hypothesis that it was political fragmentation that made Jewish communities vulnerable to persecution appears to be a relatively robust one.

2.5.2 Robustness Analysis

We perform a number of robustness checks in our Web Appendix where we provide additional tables and results. Here we summarize the main robustness results.

Propensity Score Matching As an alternative to regression analysis and to allow our covariates to vary in a non-linear way, we construct a propensity score based on our main geographic and economic covariates (previous pogroms, navigable rivers, trade routes, urbanization, wheat suitability, textile production, ruggedness, wine production, distance to the Rhine and whether or not a community was in Lotharingia). We then estimate the average treatment effect on the treated (ATET) for the effects of an Archbishopric, Bishopric, and Imperial Free City on the intensity of persecution in Table B.7. The ATET coefficients are comparable in magnitude to our OLS results.

A Binary Measure of Persecution Intensity To ensure that our results are robust to specification bias, we employ three binary measures from our intensity scale. Table B.10 includes our three binary measures using varying specifications. The results confirm that the presence of an Imperial Free City or a bishopric was associated with worse persecutions

regardless of the specification. The results from Column (1) of Table B.10 indicate that communities located in an Imperial Free City were 25% more likely to experience a violent pogrom (a value greater than or equal to a 3 on our scale indicating some fatalities). Communities located in a bishopric were 20% more likely to experience a violent pogrom. Communities in an Archbishopric were 37% more likely to experience a violent pogrom. These results complement our baseline findings shown in Table 2.1.

Sample Selection Bias Another possible source of bias comes from our data source. The length of each entry in the *Germania Judaica* varies according to the importance of the settlement (how large it was, how long it lasted, and how much information we have about it). It is possible that our measure of intensity is partially picking up better known communities which therefore received lengthier treatment in the *Germania Judaica*. Voigtländer and Voth (2012, 1374) note that Imperial Free cities and Bishoprics possessed 'older Jewish communities, which suggests that they were the most attractive to Jews'. If more established or better known communities were disproportionately located in areas ruled by Bishops or in Free Cities this could be a source of upwards bias in our estimates. This suggests that we should directly control for the length of each entry in the *Germania Judaica*.

Table B.12 reports the results controlling for both entry length and the number of citations. The coefficients we obtain for Imperial Free Cities, Archbishoprics and Bishoprics shrink somewhat but remained precisely estimated with the inclusion of the natural log of the entry length and the number of citations. Some caution is required in interpreting these estimates as more extreme violence in a community could itself have led to a longer entry in the *Germania Judaica* by making a town notorious especially amongst Jewish chroniclers. Therefore, there is a danger that by directly controlling for entry length we may mechanically reduce some of the legitimate variation in pogrom intensity. It is nonetheless reassuring that our results remain robust.

Randomized Treatment As a further robustness check we use a pseudo-random number generator to assign the status of Imperial Free City, Bishopric, or Archbishopric to each community. To ensure that our analysis is comparable we randomly assign a community to a 'Randomized Imperial Free City' using a uniform distribution where the proportion of randomly treated communities is restricted to be equal to the proportion of Imperial Free Cities in our dataset. We perform the same exercise for Bishoprics and Archbishoprics. Finally, we also generate a random intensity score measure assuming that communities are allocated to an intensity score based on a uniform distribution. Table B.14 presents the results of these placebo tests. It is evident that when we randomized either treatment (Col. 1-4) or outcome (Col. 5-8) we find no relationship between political institutions and persecutions. This strengthens our confidence that the effects we obtain reflect the impact of fragmented institutions on pogrom intensity.

2.5.3 Potential bias from unobservables

As a final check we perform a series of tests to show that results are not contaminated by bias from unobservable variables. We follow procedure suggested by Altonji et al. (2005) and Oster (2013) to place bounds on how large any bias from unobservables would have to be to undermine our results.

One concern in all non-experimental settings is the possibility of selection on unobservables. Table 2.3 shows the amount of selection on unobservables relative to selection on observables in order to produce a coefficient equal to our baseline estimates. In Panel A we show the magnitude of selection on unobservables relative to selection on observables needed to produce a treatment effect of zero for a given R^2. The R^2 in our baseline specification is 0.19; we label this $\tilde{R}$. Oster (2013) suggests setting R_{max}=1.3$\tilde{R}$. Under this assumption the ratio of selection on unobservables relative to observables (δ) would have to equal 21 in order to generate a treatment effect of zero. Oster (2013) suggests a benchmark value for $\delta \geq 1$ for us to reject the hypothesis that the treatment effect we estimate is the product of

Table 2.3: Selection on Observed and Unobserved Variables

	Panel A: Varying R_{max}					
	Baseline Effect [R^2]		Controlled Effect [R^2]		Null Reject	δ
			Imperial Free City			
1. R_{max}=1.3$\tilde{R}$	0.82993	[0.055]	0.81983	[0.193]	Yes	21.76690
2. $R_{max} = 0.6$	0.82993	[0.055]	0.81983	[0.193]	Yes	13.18521
3. $R_{max} = 1$	0.82993	[0.055]	0.81983	[0.193]	Yes	9.08963
			Bishopric			
4. R_{max}=1.3$\tilde{R}$	0.62654	[0.013]	0.75678	[0.193]	Yes	-1.50453
5. $R_{max} = 0.6$	0.62654	[0.013]	0.75678	[0.193]	Yes	-0.83884
6. $R_{max} = 1$	0.62654	[0.055]	0.75678	[0.193]	Yes	-0.55712
			Archbishopric			
7. R_{max}=1.3$\tilde{R}$	1.51940	[0.024]	1.24582	[0.193]	Yes	1.79084
8. $R_{max} = 0.6$	1.51940	[0.024]	1.24582	[0.193]	Yes	1.28951
9. $R_{max} = 1$	1.51940	[0.024]	1.24582	[0.193]	No	0.97695
	Panel B: Assume $\delta = 1$					
			Imperial Free City			
	$R_{max} = 0.6$	R_{max}=1.3$\tilde{R}$	Controlled Effect		[R^2]	
10. Estimated β	0.79009	0.81566	0.81983		[0.193]	
			Bishopric			
	$R_{max} = 0.6$	R_{max}=1.3$\tilde{R}$	Controlled Effect		[R^2]	
11. Estimated β	1.05090	0.79804	0.75678		[0.193]	
			Archbishopric			
	$R_{max} = 0.6$	R_{max}=1.3$\tilde{R}$	Controlled Effect		[R^2]	
12. Estimated β	0.58635	1.15331	1.24582		[0.193]	

Notes: The table shows the amount of selection on unobservables relative to selection on observables in order to produce a coefficient equal to our baseline estimates, and shows estimated treatment effects under the assumption of equal selection on observables and unobservables. Panel A shows the magnitude of selection on unobservables relative to selection on observables needed to produce a treatment effect of zero under different R_{max}. Rows 2, 5, and 7 use an R_{max} equal to 0.6. Rows 1, 4, and 7 use the cutoff suggested by Oster (2013), R_{max}=1.3$\tilde{R}$. Rows 3, 6, and 9 use the largest possible R-squared, which is 1. Panel B assumes the effect of unobservables is equal to the effect of observable ($\delta = 1$). It then reports the corresponding estimate of β. In both panels,'the column of 'controlled effect' refers to the case where all controls in Table 2.1 are included. We exclude fixed effects from these regressions. Results including fixed effects are available upon request.

selection on unobservable characteristics. It is evident from Table 2.3 that all of our results survive this procedure with the narrow exception of Row 9 which reports the effect of an Archbishopric on pogrom intensity under the demanding assumption that $R_{max} = 1$.

Panel B of Table 2.3 assumes that the amount of selection on unobservables is equal to that on observables ($\delta = 1$). We then reports the corresponding estimate of β under different hypothesized values of R_{max}. It is evident that for R_{max}=$1.3\tilde{R}$, our estimated values of β are very close in magnitude to the coefficients we obtain under our benchmark analysis. This provides reassurance that our results are not driven by unobserved differences in the treated and untreated Jewish communities.

2.6 Implications and Conclusion

This paper asks what institutions make minority groups vulnerable to persecution? To address this question we study the Holy Roman Empire in the fourteenth century, a fragmented and weak state, troubled by perennial warfare between different claimants to the throne and power struggles between religious and secular authorities.

We study the persecution of Jews during the Black Death. We show that legal and political fragmentation within the Holy Roman Empire was associated with more intense persecutions. Despite Pope Clement VI calling for Jews to be protected during the Black Death, pogroms convulsed all of the Holy Roman Empire in the Black Death period. But persecutions in communities controlled by Archbishoprics, Bishoprics and Imperial Free Cities were significantly more intense than in areas controlled by the emperor or the major houses. This finding is robust to controlling for previous pogroms, the geographical and economic characteristics of each community and a range of other economic, political and institutional variables. We conduct a propensity score analysis based on observables and an Altonji et al. (2005); Oster (2013) style analysis to quantify potential bias from unobservables. This analysis provides confidence that the effect of political fragmentation on pogrom intensity is

a genuine one.

These findings are significant for several reasons. First, the events we study were of decisive importance for the history of Jewish communities in Europe—large numbers of Jews left Germany for Poland and Eastern Europe in the wake of these massacres. They only returned during the seventeenth century. This had important economic consequences as recent research has provide empirical evidence that Jews had higher levels of human capital than their Christian neighbors (Botticini and Eckstein, 2012), that Jewish communities provided financial services in this period (D'Acunto et al., 2014; Pascali, 2016), and that cities with Jewish communities grew faster than other cities in the early modern period (Johnson and Koyama, 2016).

Voigtländer and Voth (2012) demonstrate that the pogroms in the Black Death period left a lingering and persistent legacy of antisemitism that can be detected in the 20th century. They treat the Black Death as an event that lowered the countywide threshold for antisemitic violence. Importantly, as they make clear, the correlates of medieval pogroms do not explain twentieth-century antisemitism (Voigtländer and Voth, 2012, p. 1344). This conclusion is consistent with our analysis. Their empirical strategy identifies the importance of antisemitic culture and beliefs, while we identify the separate role played by political institutions. While cultural values have been shown to be remarkably persistent since the political institutions of the medieval Holy Roman empire have long since been dismantled there is little reason to support that medieval political institutions would continue to influence modern antisemitism.[44]

Second, our account helps shed light on the political development of central Europe. In western Europe, the medieval period saw the establishment of comparatively powerful monarchies in England, France and later in the unified kingdoms of Castile and Aragon

[44]This is not to say the culture factors did not interact with institutional ones. In regressions that include an interaction between past pogroms and our explanatory variables we find that Black Death pogroms were more severe in communities that had suffered from previous outbreaks of antisemitism and were located in Imperial Free Cities (see Table B.16) in the Web Appendix.

(Bisson, 2009; Given, 1989; Strayer, 1971). This process of medieval state building set the foundation for the rise of powerful polities in the early modern period (Ertman, 1997; Finer, 1999b; Gennaioli and Voth, 2015; Tilly, 1990). Legal centralization played an important role in this process—a process that led eventually to the rise of states governed by the rule of law. In the Holy Roman Empire, however, this process stalled and went into reverse and as a result central Europe remained politically fragmented until the nineteenth century (Scales, 2005; Wilson, 2016). The fragmentation of the Holy Roman Empire had important consequences for the success of the Reformation, an event that greatly shaped subsequent European history (see Becker et al., 2016). Our analysis sheds lights on the causes of this political weakness at a crucial point in the institutional history of the Holy Roman Empire.

Finally, our results have implications for understanding what institutions make minority groups vulnerable to violence and persecutions (Horowitz, 2001; Jha, 2013, 2014; Wilkinson, 2004). While ethnic and religious minorities receive the protection of strong states and the rule of law in modern developed economies, in other parts of the world such as the Middle East, they remain vulnerable to the threat of violence. Alawites, Druze, Christian Copts, Yazidis, Samaritans, Zoroastrians have all faced intensified religious persecution in recent years as the authority of centralized states has collapsed in the region (Russell, 2014). There are many notable examples of powerful and centralized states persecuting and exterminating minority groups particularly in the twentieth century.[45] But the number of persecutions associated with the absence of political direction is often not well appreciated (see Chua, 2004). Our analysis suggests that Mancur Olson's reasoning about the incentives of a stationary bandit is highly relevant for understanding what conditions make ethnic or religious minorities vulnerable. That is, in the absence of the rule of law, minorities groups may be better protected under the authority of a single autocrat and that they become particularly exposed to the threat of violence in periods when power is contested.

[45]The most infamous are the Armenian genocide and the Holocaust. Even in these cases historians have argued that the worst massacres occurred after the destruction of state authority in a particular area (see Synder, 2015).

Future research should explore further how political institutions interact with economic or epidemiological shocks in order to make minority groups become vulnerable.

Chapter 3: The Long-Run Effects of the Redistribution of Church Land in France (with Raphaël Franck and Noel D. Johnson)

3.1 Introduction

The twentieth century is marked with legislative attempts to implement wide-scale land redistribution schemes, including but not limited to Mexico (1934), Guatemala (1952), Philippines (1963) and countries belonging to the former Soviet Union in the early 1990's. Such land reforms, however, are not a recent phenomenon. In this paper, we explore the effects of the extensive land redistribution that occurred during and after the French Revolution as a result of the confiscation of Church property by the French Assembly in 1789. Using highly disaggregated data on French districts, we find that regions with a greater proportion of land redistributed during the French Revolution experienced higher agricultural productivity in the 19th century.[1] We also identify two possible mechanisms through which this channel worked—irrigation and drainage investments and changes in transportation infrastructure.

Our approach is different from previous studies in both the land redistribution and French economic history literature. First, by using the historic case of the redistribution during the French Revolution, we have the advantage over recent work in development economics of documenting long-run changes in the economy, such as investments in irrigation, drainage and infrastructure. In contrast, more recent episodes of land redistribution may be restricted

[1]The term "district" in this paper refers the first level of subdivision of French departments that were established in 1790 and replaced by arrondissements in 1800. We consistently use the 1790 districts for this project and match to arrondissements when appropriate. There were 534 if these districts in 1790, of which 194 are in our sample.

to shorter time horizons. Additionally, this study is (to the authors knowledge) the first to quantify the long-run effects across regions of France that resulted from the revolutionary confiscations and, more generally, the end of feudalism. France formally abolished feudalism at the end of the 18th century, signifying an end to centuries under a system of overlapping property rights.[2] Any effect on the French economy from the unwinding of old property rights arrangements, however, may be difficult to notice in an otherwise sedentary land market. In France, however, this dismantling of old property rights may have occurred more quickly through the confiscation and auctioning off of church land. This method of redistribution (through auctions) lowered the transaction costs faced by farmers who wished "to enlarge their ownership, to buy the plot or plots that made it possible to build a whole (farm) in one piece"(Bodinier and Teyssier, 2000, 443). We can exploit, therefore, the highly disaggregated spatial variation in church property across France to test whether places with more land redistribution actually did outperform those places where the transaction costs of reallocating land were potentially higher.

Our empirical results suggest that land redistribution in France led to better economic outcomes. First, we find that French districts with a higher proportion of land redistributed had higher wheat yields in the 19th century, which we interpret to mean that land redistribution had a positive effect on agricultural productivity. The second part of our empirical result includes an exploration of potential mechanisms to explain this correlation between agricultural productivity and land redistribution. In looking at the number of pipe manufacturers in a district in 1856, we find that a greater proportion of land redistributed in a district is associated with a higher number of pipe manufacturers. Historical accounts suggest that pipe manufacturers chose to locate close to the sites of drainage projects. This result, therefore, supports the potential role of drainage investment as a mechanism through which land redistribution led to better agricultural productivity. We also explore the potential mechanism of transportation infrastructure by using the change in road networks between 1789 and 1841 and calculating market access measures, holding population constant. We find

[2]See Bloch (1964) and Markoff (2010) for more on the abolition of feudalism.

that districts with a higher fraction of land redistributed experienced an increase in market access due to improvements in transportation networks and not by changes in population. This result suggests that investments in transportation infrastructure may serve as another channel through which Revolutionary confiscations led to higher agricultural productivity.

We control for various sources of potential endogeneity in the allocation of Church land prior to the French Revolution. To capture changes in the quality of agricultural land, we control for wheat and potato soil suitability from the FAO, which is time invariant and thus exogenous to changes in property rights arrangements. We also include fixed effects for twelve regions in France to address potential bias from cross-regional trends in the allocation of Church land. Our most relevant results, therefore, focus on within-region variation in the allocation of Church land. Additionally, we control for movements in population through the use of a general market access measure (different from the decomposed measure that focuses on changes in transportation networks) that captures changes in the population of the capital of each district from 1789 to 1841. Finally, we conduct placebo regressions using potato yields rather than wheat yields during the 1840s. As we explain in Section 4.2, differences in the cultivation of potatoes and wheat leads us to hypothesize that potatoes would not have benefited from land redistribution to the same extent as wheat. We therefore use potato yields as a placebo test and find no effect from the revolutionary confiscations on potato productivity after controlling for differences in geographic characteristics (such as cross-regional differences).

This paper addresses questions particularly relevant to both development economics and economic history. First, this paper contributes to the question in development economics of whether or not land redistribution schemes lead to greater investment and agricultural productivity. Additionally, this paper complements the work on the economic consequences of the French Revolution by looking specifically at the effect of the confiscation, and subsequent auctioning off, of church land during the Revolution on 19th century economic outcomes. More generally, this paper speaks to the broader literature dealing with the abandonment

of feudalism and the transition to modern economic growth associated with the Great Divergence.

Numerous scholars in development economics promote the potential benefits of these land reform schemes for agricultural productivity (Binswanger and Deininger, 1993; Binswanger et al., 1995; Deininger et al., 2003) and investment (Fenske, 2011; Goldstein and Udry, 2008). At the heart of most of these projects is the Coase Theorem that, in essence, proposes that a more efficient allocation of resources can be achieved with more clearly defined property rights and lower transaction costs. Land reform schemes, therefore, often center around clarifying property rights arrangements and lowering transaction costs faced in traditionally inefficient land markets.

One of the most relevant papers to this project is that of Besley and Burgess (2000), in which the authors explore the effect of land reforms in India from 1958 to 1992. Besley and Burgess (2000) find that Indian states with a greater volume of land redistributed experienced a decline in poverty and a rise in agricultural wages. This result is consistent with our result if the increase in agricultural yields that we find coincide with increases in the marginal productivity of labor and subsequently a rise in agricultural wages.

Another relevant work is that of Vollrath (2007), in which the author finds that greater inequality in operational farm size is associated with lower productivity. This result supports the idea that land redistribution schemes leading to more equitable distributions of land would be associated with an increase in agricultural productivity. While we are not able to discern the changes in farm size resulting from the land redistribution of the French Revolution, there is evidence to suggest that some division of large properties occured (see Bodinier and Teyssier (2000)), which supports our results of an increase in agricultural productivity as a result of the redistribution of land.

This paper is also in line with the theoretical studies of Galor and Zeira (1993) and Galor and Moav (2004) that argue that land inequality is conducive to economic development

under specific conditions. Galor and Moav propose that when economic growth depends on physical capital accumulation, inequality enhances development by moving resources towards the owners of capital whose marginal propensity to save is higher. Historical accounts of the land redistribution of the French Revolution suggest that inequality rose as a few individuals acquired large quantities of land.[3] The theoretical proposition of Galor and Moav suggests that this would not hinder but in fact enhance economic development.

Scholars in economic history have also explored the economic impacts of historic land reforms.[4] Perhaps the most closely related study to ours is that of Heldring, Robinson, and Vollmer (2015). They explore the long-run effects of the dissolution of monasteries in 1535 on English industrialization and find a robust relationship between monastic income in 1535 and their measures of industrialization in England during the 1830s. Heldring et al. propose that the dissolution of monasteries created a major shock to English society that led to the creation of a commercially orientated class of farmers who were believed to be key to British industrialization. Our paper is distinct, however, both in the difference in geographic focus as well as our measure of the shock: we measure the quantity of land confiscated rather than the incomes of the displaced owners. The results of the British Dissolution, however, are consistent with our results for the confiscations during the French Revolution.

Another relevant paper is that of Bleakley and Ferrie (2014) who test whether land redistribution could lower transaction costs and, as a consequence, whether the Coase Theorem's predictions on land redistribution hold. They use data on random land allocations on the Georgia Frontier in the early 19th century and find support for the Coase Theorem in the long run although some initial stickiness in plot size appear for some time after the initial allocations. This test of the Coase Theorem complements the present study as it suggests that lower transaction costs as a result of land redistribution can lead to more efficient

[3]Bodinier and Teyssier (2000) provide a detailed analysis on the quantity of land accumulated by major buyers during the auctions. As an example, in a study on the sale of property in Tours, the authors state "25% of acquirers acquired 75% of the total amount".

[4]See Banerjee and Iyer (2005) and Carlson and Roberts (2006) for more literature on historic land reforms.

outcomes, consistent with historical accounts on the impact of the revolutionary confiscations on land markets in France.

Additionally, our paper complements literature on the economic history of France. Numerous scholars have explored the economic, social and political state of France after the Revolution (Chevet and Saint-Amour, 1991; Grantham, 1980; Rosenthal, 1992; Squicciarini and Voigtländer, 2015), as well as the state of the French economy prior to the Revolution (Appleby, 1979; Hoffman, 1982, 2000; Rosenthal, 1993).[5]

One of the most relevant works for this project in French economic history is Jean-Laurent Rosenthal's *The Fruits of Revolution: Property Rights, Litigation, and French Agriculture, 1700–1860*. In this pivotal work on French economic history, Rosenthal explores the effect of changes in property rights during the French Revolution on investment in drainage and irrigation that led to increased agricultural productivity. Rosenthal proposes that inefficient property right institutions of Old Regime France led to an under-investment in agricultural improvements that was eventually remedied by the French Revolution. The narrative proposed by Rosenthal is consistent with our study so long as the marginal improvements that resulted from better property rights were higher in magnitude when more land was redistributed across various regions of France.

The structure of the paper is as follows. Section 3.2 provides some historical background. We describe our data sets and outline our empirical strategy in Section 3.3. We present our main empirical result that districts with a greater fraction of land redistributed experienced better economic outcomes after the Revolution in Section 3.4 and in Section 3.5 we show the results are robust to various controls and specifications. Finally, Section 3.6 concludes by discussing the implications of our analysis.

[5]For a comprehensive account of work on the economic history of France, see Grantham (1997) and Hoffman and Rosenthal (2000).

3.2 Historical Background

Deserving of the name, the French Revolution served as a turning point for many political, economic, and social systems. In this section, we provide some background on the state of property rights and Church wealth before the Revolution as well as a discussion of land redistribution during the Revolution itself. We also detail property rights after the Revolution and changes in agriculture and investment markets.

Property Rights Before and After the Revolution

A well-known explanation for the economic development that France experienced during the nineteenth century pertains to the legal reforms undertaken during the Revolution and the First Empire. Recent proponents of this view include Crouzet (2003), Acemoglu et al. (2011) and in particular, Rosenthal (1992). The latter argues that pre-revolutionary France was characterized by a complicated and overlapping system of feudal property rights. The slow and complex judicial process further complicated the definition and enforcement of property rights. Ultimately, this set of feudal institutions resulted in substantial under-investment in agriculture—and it was only the Revolution's abolition of the Old Regime's institutions and Napoleon's establishment in 1804 of the *Code Civil* that improved the conditions for economic growth.

Nonetheless, even if there were conflicts over property rights in pre-revolutionary France which were slow to be adjudicated, French agriculture experienced some changes during the 18th century.[6] In particular, there was an enclosure movement supported by the Monarchy, and progressively implemented by the local Parliaments, which seems to have triggered some gains in productivity (Vivier, 1998).[7]

Moreover, the implementation of the laws from the *Code Civil* after 1804 was not immediate

[6]It is beyond the scope of this study to analyze the evolution of French agriculture during the 18th century and the Revolution. Seminal studies on this issue include Ado (2012); Jones (1988); Labrousse (1933); Lefebvre (1924)

[7]The first enclosure law was adopted in the *Trois-Evéchés* province on 12 June 1769 while the last one was passed on 30 March 1781 in the *Cambrésis* province.

and created its own set of problems.[8] There is, indeed, substantial evidence that in nineteenth century France, the laws from the *Code Civil* were not always applied in many regions and that pre-revolutionary legal traditions often prevailed (e.g., Soboul (1968)). It was only in the second half of the nineteenth century that property rights became easier to enforce more clearly defined around 1850 with the completion of the cadastre which delineated plots of land in each department (Bloch, 1929). The adjudication of property rights also remained a complicated process, whether it involved the lease of commons held by French municipalities (Vivier, 1998) or water management and land irrigation (Ingold, 2011). The sale of land was still complex and this led to the creation of a large market of land rents that enabled the continued existence of open-field farming in nineteenth-century France (Grantham, 1980). In line with the well-known analysis of Tocqueville (1856) regarding the process of state centralization in France which had begun in the 17th century under King Louis XIII and King Louis XIV, these inefficiencies can partly be explained by the existence of an overarching, and often inefficient, state bureaucracy.[9]

Because of the factors delineated above, which may be seen as holdovers from the feudal regime, the 1789 Revolution brought about an undeniable simplification of the legal system in France at the national level but the change in legal institutions should not be seen as a confounding factor in our analysis of land redistribution. This is because we analyze the local variations in the share of Church land that was redistributed at a lower level of aggregation than the potential improvement in the quality of institutions. In addition, our empirical analysis will include many control variables (which we discuss below in Section 3.3) and regional fixed effects to account for variations in property rights in France prior to the Revolution.

[8]The issues surrounding the implementation of the *Code Civil* in 19th century France are independent of the well-known argument that the French *Code Civil* is less flexible and therefore less conducive to economic growth than common law (see, e.g., La Porta et al. (1998), for a survey). If anything, Le Bris (2017) finds that during the 1801-1821 period, the adoption of the *Code Civil* had little economic impact in the French regions where common law was used before the Revolution.

[9]Thinkers of persuasion other than Tocqueville noted the existence of an inefficient bureaucracy in mid-nineteenth century France. For instance, Marx (2008) wrote that the administration in France was a "parasitic body which enmeshes the body of French society and chokes all its pores".

Ecclesiastic Wealth in the Ancien Regime

Edmond Jean François Barbier (1857), a lawyer in 18th century France, asserted in his journal that a third of all territory in France was in the possession of the Church. Later calculations place the number between 6 percent (Sée (1968)) and 10 percent (Lefebvre (1947)).

Historian John McManners, in a comprehensive exploration of the Church in eighteenth century France (2000), argues that while these estimates held for all of France, the proportion of Church lands within smaller geographic units was more varied. McManners provides evidence that within towns, the fraction of land held by the Church could vary from as large as one third in Toulouse to 3 percent in Limoges.

According to McManners, agricultural property served as a major income stream for ecclesiastical institutions. It was not uncommon for sizable plots of Church land to be leased out to rural laity and in some cases entrepreneurs who would then sublet the land themselves. Not all property was consolidated into major plots—McManners cites a local priest (curé) who owned over fifty separate plots.

While historical accounts and estimates suggest an efficiently functioning labor market that benefited the Church, the Church was undoubtedly involved in the complicated web of property rights described in the previous section. One of the major hindrances for the Church was a policy known as *"mortmain"*, under which Church property was considered inalienable. As McManners explains, "ecclesiastical property could not be alienated without the king's agreement. There had to be an enquiry *de commodo et incommodo*, and if sale was recommended, the decision had to be authorized by the local judges of the Crown or, for great benefices, by letters patent registered in the relevant parlement." (1999, 114-115) The transfer of property was therefore possible, but at a sizable cost. The justification for these regulations, according to McManners, stemmed from fears "that an enduring corporation which already had vast possessions, would expand continually unless limitations

were maintained" (1999, 85).

Regardless of the cause, these regulations on the sale and purchase of land by Church officials likely hindered entrepreneurs wishing to partake in investment projects. As McManners explains, "anyone with an improving scheme for a road, a canal, or a public building, or wanting to round off his heritage or expand his business, would be likely to run athwart some ecclesiastical property owner" (1999, 116). It follows from these accounts that where a greater share of land was held by the Church, investment projects would face greater obstacles.[10]

Revolutionary Confiscations

In November 1789, the National Assembly passed legislation that declared all ecclesiastical property to be at the disposal of the Nation and, beginning in December 1790, local governments began to auction off these properties. Auctions were largely conducted by local governments (districts, cantons, municipalities, etc.) but were regulated by guidelines established by the National Assembly. In addition to outlining procedures for the actual auction itself, the guidelines called for a survey of the property that was to be sold in order to establish an initial bidding price at auction. We exploit these surveys in some of our robustness regressions in Section 3.6.

In an extensive accounting of the characteristics of the sale of these properties during the Revolution, Bodinier and Teyssier (2000) divide the properties into two groups, which the authors refer to as "origins". These categories are defined according to the owners of the properties; the first origin includes all properties (primarily ecclesiastical) except for those of the *emigrés*, which are accounted for in the second origin.

Bodinier and Teyssier (2000, p. 153) estimates that more than 1.1 million properties were sold during the Revolution with 700,000 from the first origin (which began in 1790) and 400,000 from the second origin (which began in 1793). According to Bodinier and Teyssier

[10]These observations are also highly consistent with the argument in Rosenthal (1992).

(2000), for both origins, the "most important lots" were sold early. For the first origin, 40% of all properties were sold by the end of 1791 and for the second origin, 53.9% were sold by the end of 1794.

3.3 Data and Empirical Strategy

For our empirical tests, we combine district-level data on confiscations from Bodinier and Teyssier (2000) with newly collected data on agricultural productivity and investment in 19th century France.

3.3.1 Data

Revolutionary Confiscations

Our primary data on land confiscations was collected by Bodinier and Teyssier (2000) at the district level for Revolutionary France. Of the 534 districts created in 1789, the Bodinier and Teyssier (2000) data cover 194. However, since many districts contained a disproportionate amount of church land, Bodinier and Teyssier (2000) estimate that these 194 districts contain about two-thirds of church land. Figure 3.1 shows the spatial distribution of the confiscations. These data constitute our primary independent variable and measure of the percent of land redistributed through the French Revolution in each district.

We focus exclusively on the first origin confiscations collected by Bodinier and Teyssier (2000) for two main reasons. First, as Bodinier and Teyssier (2000) explain, the timing and execution of the second origin confiscations were different from the first origin confiscations (Bodinier and Teyssier, 2000, 140). Bodinier and Teyssier (2000) assert that second origin confiscations occurred later and were subject to more interruptions, such as the decision on November 21, 1795 (30 brumaire an IV) to suspend the sales of properties for approximately six months (until May 20th or 1 prairial of the following year). Bodinier and Teyssier (2000)

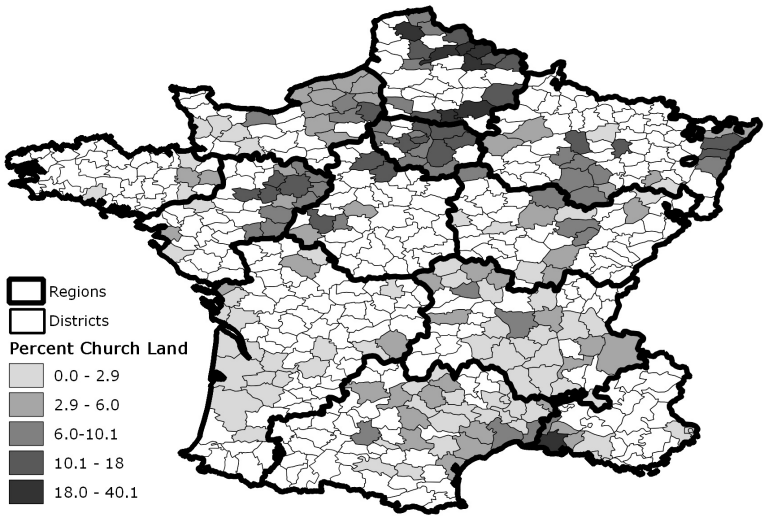


Figure 3.1: Land Confiscations

provide evidence to suggest that this interruption would have affected second origin sales more than first origin sales given that most first origin properties were sold off by this point.[11]

Our second reason for focusing on the first origin confiscations draws from the assertions by Bodinier and Teyssier (2000) that the second origin sales included more complicated procedures and the families of the *emigrés* were allowed options to avoid foreclosure. In turn, this prevented some confiscated *emigré* property from going to auction (Bodinier and Teyssier, 2000, 111,140). The fraction of land confiscated during the second origin as collected by Bodinier and Teyssier (2000) may not be reflective of the fraction of land redistributed. Bodinier and Teyssier (2000) nonethelesss show that the majority of Church land was sold, supporting our focus on first origin confiscations (Bodinier and Teyssier, 2000, p. 111).

In our robustness regressions, however, we will show that our main results are robust to

[11]Bodinier and Teyssier (2000) provide numerous anecdotal evidence to support this timing as well as quantifiable evidence in the tables on pages 151-152.

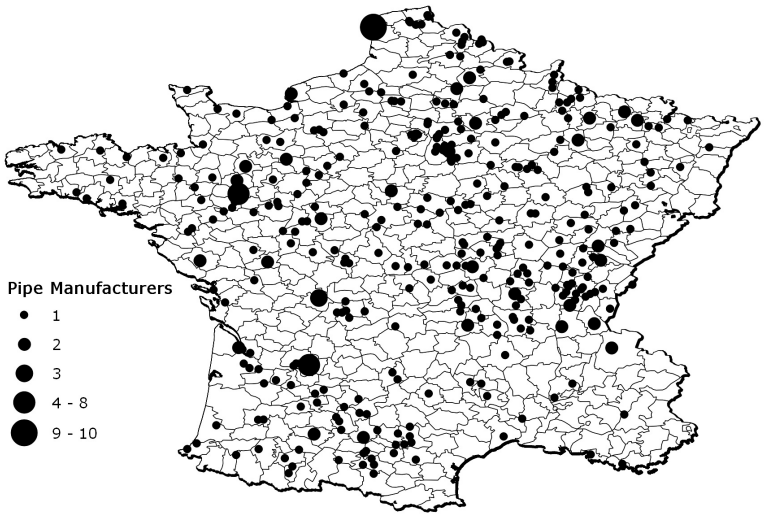


Figure 3.2: Drainage Pipe Manufacturers

including a variable measuring the percent of land confiscated in a district from the *emigrés*.

19th century Agricultural Productivity – Wheat Yields

Our first measure of the impact of revolutionary confiscations on economic activity in France is wheat yields in 1841. We collect the yields from the *Statistique Agricole* that was published in 1842 and contains wheat yields at the arrondissement level that we then match with the geographic location of the Revolutionary districts. Figure C.1 in the Appendix shows the hectoliters per hectare of Wheat produced for all of France in 1841.

19th century Investment – Pipe Manufacturers

Our second measure of the impact of revolutionary confiscations on economic activity in France comes from the location of drainage pipe manufacturers in France in 1862. These observations were collected by Barral (1862) and geo-coded for this project. Figure 3.2 shows the location and number of pipe manufacturers from this data set.

Other Covariates

We will include a host of controls in our main empirical results. For example, to capture differences in geographic suitability, we control for wheat and potato soil suitability from the FAO. Additionally, we include fixed effects for twelve regions within France.[12]

We also control for changes in market access at the district level using newly digitized maps of transportation networks from 1789 and 1841 and the location and population of the capital of each district for each time period. Transportation networks are presented in Figures C.2 and C.3. Data on population for the capital of each district comes from the 1793 (Year 2) census.

3.3.2 Empirical Strategy

We adopt several strategies to identify the effect of Revolutionary land confiscations on agricultural productivity at the district level. A fundamental empirical obstacle we face is that our data on district level agricultural productivity are time-invariant. Another empirical challenge we face is that our data on land confiscations cover only about half of the districts in France. As such, the first thing we do is compare that balance of observables between districts included in our confiscations data and those not included. We do this in Table 3.1. In column (1) of the table we investigate the bivariate correlation between each variable and a dummy variable equal to one if the district is in our sample (each row in columns (1) and (2) represents a separate regression). Column (2) includes twelve district fixed effects (see Figure 3.1). Column (3) reports coefficients from a multivariate regression in which all variables are included and Column (4) includes region dummy variables in the multivariate regression. We first show that there is no correlation between a district's suitability for wheat cultivation and whether it's in our sample (Fischer et al., 2002).

The second regression shows there is also no statistical difference in the amount of land

[12]We do not set fixed effects for the department level because there is not enough variation within the departments due to the dis-aggregation of Bodinier's survey of French districts.

Table 3.1: Balance of Samples With vs. Without Data on Confiscations

	Dependent Variable: In Sample =1, Out Sample = 0			
	(1)	(2)	(3)	(4)
	Bivariate	*Bivariate, FE's*	*Multivariate*	*Multivariate, FE's*
Wheat Suitability	0.0206	0.00796	0.0177	-0.00703
	(0.0184)	(0.0205)	(0.0447)	(0.0473)
Hectares Wheat	-0.001	0.0292	-0.0272	-0.0312
	(0.0209)	(0.0219)	(0.0223)	(0.0240)
Potato Suitability	0.0266	0.0228	0.0173	0.0329
	(0.0222)	(0.0252)	(0.0510)	(0.0541)
Hectares Potatoes	0.0829	0.161	0.122	0.172*
	(0.100)	(0.108)	(0.0985)	(0.105)
Elevation Range	-0.0190	-0.0843*	-0.303	-0.755
	(0.0348)	(0.0441)	(0.415)	(0.491)
Market Access 1789	0.118***	0.108***	0.116***	0.101***
	(0.0185)	(0.0196)	(0.0200)	(0.0213)
Change in MA 1789-1841	-0.121**	-0.0973*	-0.0515	-0.0340
	(0.0541)	(0.0499)	(0.0561)	(0.0504)
Region FE's	No	Yes	No	Yes
Include All Covariates	No	No	Yes	Yes
N	534	534	534	534

under wheat cultivation for the different samples. Rows (3) and (4) show the equivalent regressions for potato suitability and cultivation. We also examine whether the difference between the maximum and minimum elevation in a district differs across samples, using the data from the NASA 90 meter SRTM data (Jarvis et al., 2008). This variable is a potentially important predictor of likelihood to invest in drainage since regions with a high elevation gradient would be naturally drained. Under the bivariate regression, elevation range is not a significant predictor of sample, however it is correlated with sample once the twelve region fixed effects are included. In the multivariate regressions in columns (3) and (4), however, the coefficient on the elevation variable becomes statistically indistinguishable from zero.

In column (1) of the table we investigate the bivariate correlation between each variable and a dummy variable equal to one if the district is in our sample (each row in columns (1) and (2) represents a separate regression). Column (2) includes twelve district fixed effects (see Figure 3.1). Column (3) reports coefficients from a multivariate regression in which all variables are included and Column (4) includes region dummy variables in the multivariate regression. We first show that there is no correlation between a district's suitability for wheat cultivation and whether it's in our sample (Fischer et al., 2002). The second regression shows there is also no statistical difference in the amount of land under wheat cultivation for the different samples. Rows (3) and (4) show the equivalent regressions for potato suitability and cultivation. We also examine whether the difference between the maximum and minimum elevation in a district differs across samples, using the data from the NASA 90 meter SRTM data (Jarvis et al., 2008). This variable is a potentially important predictor of likelihood to invest in drainage since regions with a high elevation gradient would be naturally drained. Under the bivariate regression, elevation range is not a significant predictor of sample, however it is correlated with sample once the twelve region fixed effects are included. In the multivariate regressions in columns (3) and (4), however, the coefficient on the elevation variable becomes statistically indistinguishable from zero.

We are particularly concerned that locations which are more economically viable may either be more likely to be in our sample, or that within our sample, the church may have owned more land in these places. This could potentially generate endogeneity through multiple channels (e.g. if capital is cheaper in these locations, then investment in agricultural improvements might also be more likely). To control for this potential source of bias, we construct measures of market access for each district in 1789 and 1841 (see, for example, Donaldson (2016) and Donaldson and Hornbeck (2016)). Market access captures the "embededness" of a region within the urban network while controlling for transportation costs. A higher score for market access suggests that businesses in a region have both more potential customers and suppliers. Market access measures combine two types of data, urban populations and the

travel cost between these populations. Our urban population data in 1789 and 1841 come from the Year II census (1793) from the *Dictionnaire universel* (1804) and the censuses of 1836 and 1841 from Motte et al. (2003). To construct our measure of transport costs we geocode maps of the road and canal network in France in both 1789 and 1841 from Bonin and Langlois (1989) and Grangez (1845), which are then combined with time invariant maps of the rivers and seas.[13] We then split France into 5x5 kilometer grids and construct a map of the least cost travel technology for each grid.[14] We then apply Djikstra's algorithm to the grid map to calculate the least cost travel path and total cost of travel between each district centroid (van Etten, 2012). Our measure of market is then calculated as,

$$MA_i = \sum_{j \neq i}^{d} N_j \tau_{ij}^{-\sigma} \tag{3.1}$$

Where, MA_i is market access for district i, the total number of districts is d, N_j is the population of district j, and τ_{ij} is the lowest cost for traveling between districts i and j. The term σ in equation 3.1 is a trade cost elasticity which measures the responsiveness of the traders to transport costs between locations. We takes the value of σ as one, but experiment with other values to show our results are robust. In our regressions, we follow the current literature and use the natural log of the expression in equation 3.1.

In Table 3.1 our measure of market access in 1789 is strongly correlated with being in sample. This makes sense given that our confiscations data were compiled, in part, from separate regional studies and that the Authors of these studies almost certainly would be biased to focus on more well known or economically central locations (Bodinier and Teyssier, 2000). As such, we will be careful to condition on market access in our main regressions below. When we investigate the percentage change in market access between 1789 and 1841 in the last row of the Table, there is no correlation. Also, it is important to keep in

[13] See appendix Figures C.2 and C.3 for the road networks.

[14] The costs of traveling by river, sea, road, or no technology (portage) are taken from Bairoch and Braider (1991).

mind that all of our regressions will use only the sample for which we have information on Revolutionary confiscations (sample=1). Our identifying assumption is, therefore, that there is no systematic relationship between selection into our sample and both Revolutionary confiscations and the various outcomes we investigate. Conditional on our controls and region dummies, we feel that the possibility of such selection is minimized.

In what follows we will show a robust relationship between Revolutionary land confiscations in a district and both the productivity of wheat production and the acreage of wheat grown in 1841. Given that we condition these regressions on market access in 1789, potential wheat suitability, and our 12 region fixed effects, we are confident that this is a causal relationship. This causal interpretation is bolstered by another set of regressions we will present which shows there is no relationship between potato productivity or acreage in 1841 and land confiscations. As we will discuss, this is consistent with there being less of an incentive to drain land or invest in irrigation for potato cultivation given the contemporary reputation (and reality) of the potato as an extremely high yield and robust crop. Furthermore, potato cultivation was about a tenth of wheat cultivation in 1841. As such, we would not expect any relationship between agricultural investment and confiscations for this crop. We will then bolster our empirical case by showing a robust relationship between Revolutionary land confiscations and the presence of producers of the main technology for drainage and irrigation—pipes. Then, we present evidence that market access increased more in places with greater confiscations—consistent with land reallocation lowering the transaction costs of making public goods investments more generally. Furthermore, we will show that the increases in market access stemmed, primarily from extensions of the transport network (roads and canals) and not from increases in population. Lastly, we will present a large number of robustness tests of our main results.

3.4 Main Results

We begin by running a series of regressions of the form:

$$\begin{aligned}\text{Outcome } 1841_i = \alpha + \beta \text{Percent Confiscated}_i + \gamma \text{Soil Suitability}_i \\ + \delta \text{Market Access } 1789_i + \theta_j + \varepsilon_i\end{aligned} \tag{3.2}$$

where Outcome 1841_i is one of our agricultural outcome for district i in 1841. The main outcomes we will investigate are wheat yields, acreage of wheat production, potato yields, and acreage of potato production. Percent Confiscated$_i$ is the percent of church land confiscated in district i during the Revolution, Soil Suitability$_i$ is the measure of either wheat or potato production potential from the FAO, and Market Access 1789_i is our measure of market access in 1789. In the regressions we also include twelve region dummy variables (θ_j).

Our main coefficient of interest, which we report in the tables, is β. We express Percent Confiscated as a number between 0 and 100 and the dependent variables are always logged. As such, a value of β of 0.08, for example, can be interpreted as a ten percentage point increase in land confiscated leads to an eight percent increase in the dependent variable. We report robust standard errors for regression coefficients.

3.4.1 Wheat Production

In Table 3.2 we report the results of running regression 3.2 using the outcomes of wheat yields in Panel A and wheat acreage in Panel B. Regressions (1)-(3) in both panels do not include region dummies but gradually add our main control variables for potential crop suitability and market access in 1789. Regressions (4)-(6) add the same control variables but, as they include the region dummies, the coefficient on Percent Confiscated identifies on

Table 3.2: Percent Land Confiscated in District and Wheat Production

	Panel A: Dependent Variable: Log Wheat Yield in 1841					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.0276***	0.0245***	0.0246***	0.00983***	0.00945***	0.00882**
	(0.00376)	(0.00387)	(0.00400)	(0.00345)	(0.00339)	(0.00352)
Wheat Suitability	No	Yes	Yes	No	Yes	Yes
Market Access 1789	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.298	0.344	0.344	0.614	0.617	0.618
	Panel B: Dependent Variable: Log Wheat Hectares in 1841					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.0386***	0.0215**	0.0138*	0.0311**	0.0246**	0.00857
	(0.00937)	(0.00884)	(0.00820)	(0.0120)	(0.0105)	(0.0101)
Wheat Suitability	No	Yes	Yes	No	Yes	Yes
Market Access 1789	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.0589	0.200	0.252	0.228	0.326	0.386

only within region variation.

In Panel A, regressions (1)-(3) there is a robust relationship between Percent Confiscated and Log Wheat Yields in 1841. The coefficient in column (3) of 0.0246 suggests an increase in district level confiscations by ten percent is associated with an increase in wheat yields of close to twenty-five percent. When district fixed effects are included, this estimate shrinks to about 0.009, suggesting a ten percent increase in confiscations led to about the same percentage increase in yields. One interpretation of these estimates is that they are consistent with confiscations lowering the transaction costs of making investments in irrigation or of draining more fertile land and, thus, increasing the productivity of wheat production.

In Panel B, we show that there is also a robust, though statistically less precise, relationship between acreage of land in a district dedicated to wheat cultivation and Revolutionary confiscations. The point estimates in column (3) suggests a ten percent increase in confiscations is associated with fourteen percent more land being dedicated to wheat production. Under the full specification with all controls and region dummies in column (6) this estimate becomes statistically insignificant but retains its economic significance, suggesting that a ten percent increase in confiscations leads to about a nine percent increase in acreage dedicated to wheat cultivation. Taken together, these results are consistent with an increase in what cultivation due to improved drainage and reclaimed land.

3.4.2 Potato Production

In this subsection we run our baseline regressions using potato yields and acreage as our outcomes. We do this because there are several historical reasons for us to believe that potatoes were less likely to be affected by investments in irrigation and drainage than wheat. As such, we consider the regressions in this section to be placebo regressions.

The potato is a promising candidate as a placebo crop for us for several reasons. First, the potential yields, as defined by the FAO, of both the potato and wheat in France are very

spatially correlated. The correlation between the yields of the two crops across districts is 0.92 and statistically significant at the 1% level. Figure C.5 in the Appendix shows the scatter plot of the two yields. If all we're picking up in our baseline regressions on wheat yields is initial suitability of land for wheat production (perhaps because the Church was more likely to acquire suitable land and, therefore, more Revolutionary confiscations occur in these districts), then we should get similar regression coefficients on percent land confiscated when using potato yields or acreage.

Second, there is ample historical and scientific evidence that potatoes were extremely robust and could be grown virtually anywhere, regardless of irrigation or drainage. Indeed, the potato first found its footholds in France during the eighteenth century in the most rugged and difficult locations to grow food, including the Pyrénées and Dauphiné (Zuckerman, 1999, 78). This trend was reinforced by the eighteenth century reputation of the potato of causing disease and depleting fertility of the soil. By the end of the eighteenth century, however, the potato's reputation was changing to that of an extremely robust and nutritious complement to more traditional fare. This change was encouraged by the government. For example, Antoine-Augustin Parmentier was associated with Louis XIV's court and a dedicated advocate for the adoption of the potato. In order to counter claims that the potato ruined the soil, in 1786 he ran a public experiment outside just outside of Paris in which planted potatoes on 50 acres of sandy soil. He did not post a guard at field at night and, as he expected, peasants stole potatoes from his successful crop, a fact which Parmentier then used this often in his writings defending the potato (Zuckerman, 1999, 83). Parmentier's claims are backed up by in district wheat and potato yields in 1841 as illustrated in Appendix Figure C.6. Furthermore, recent research by Nunn and Qian (2011) has established that regions in the world that were more likely to adopt the potato also experienced faster population growth during the eighteenth and nineteenth centuries. All of this evidence is consistent with the belief of many that potatoes could be grown successfully virtually anywhere and that, therefore, investment and scale were less necessary with the

potato.

The third point is that potatoes were typically not grown on as a large a scale as wheat and, as such, large scale investments in irrigation or drainage would have been less likely to be undertaken by potato producers. While we do not have data on individual farm sizes, we do know that in 1840, potato only occupied 3.6% of French arable (Zuckerman, 1999, 185). Furthermore, at the district level, potato acreage was much smaller than wheat, as illustrated by Appendix Figure C.7. According to these data, the average district in out sample had about 2,440 hectares of land under potato cultivation. This was about ten times less than the average of 22,000 hectares of wheat under cultivation. The relatively small scale of potato cultivation is also consistent with the perception by end of the French Revolution that the potato, while not necessarily suitable for respectable tables, was a perfect crop to plant as a hedge against famine—something for farmers of other crops to plant on the margins of their land as a sort of insurance policy.

In Table 3.3 we run the same regressions as in Table 3.2, but using the potato as the outcome. Also, instead of controlling for potential wheat suitability from the FAO, we now control for potential potato suitability. In Panel A columns (1)-(3) there is a positive relationship between potato yields in 1841 and percent land confiscated, however, when we add our twelve region fixed effects in columns (4)-(6) this relationship completely disappears. We find this pattern in the coefficients reassuring since it suggests that there was, indeed, a systematic spatial relationship between crop suitability and church landholdings in France. However, given the insignificance of our placebo regressions, our identification strategy of focusing on the variation within each of our twelve regions, seems to be effective. In Panel B we look at whether there is any systematic relationship between overall potato cultivation in a district and percent church land confiscated. None of these regressions are economically or statistically significant. This is consistent with potato cultivation being on a relatively small scale and unaffected by potential investments in reclaiming drained or newly irrigated land.

Table 3.3: Percent Land Confiscated in District and Potato Production

	Panel A: Dependent Variable: Log Potato Yield in 1841					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.0267***	0.0232***	0.0249***	0.00388	0.00370	0.00563
	(0.00652)	(0.00675)	(0.00675)	(0.00579)	(0.00586)	(0.00614)
Potato Suitability	No	Yes	Yes	No	Yes	Yes
Market Access 1789	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.0996	0.130	0.139	0.499	0.499	0.503
	Panel B: Dependent Variable: Log Potato Hectares in 1841					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	-0.00484	-0.00538	-0.00405	0.00739	0.00633	0.00322
	(0.00904)	(0.00931)	(0.00975)	(0.0110)	(0.0108)	(0.0110)
Potato Suitability	No	Yes	Yes	No	Yes	Yes
Market Access 1789	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.00117	0.00142	0.00339	0.282	0.287	0.290

3.4.3 Pipe Manufacturers

In this section we investigate a direct channel between revolutionary confiscations and agricultural productivity—investments in irrigation and drainage. While we do not observe these investments directly, we do observe the primary input into them, pipe manufacturers. Much like concrete today, because of low economies of scale and high transport costs, pipes were usually produced close to their point of consumption in the nineteenth century (Barral, 1862). As such, we can exploit the very disaggregated data on the locations of pipe manufacturers to proxy for local investments in irrigation and drainage (see Figure 3.2).

One issue we must deal with is determining the correct way to assign a pipe plant to a district. Using just the manufacturers inside the district would be sub-optimal given there is no reason a farmer on the border of a district would not purchase pipe from a nearby plant just over the border. As such, we draw a buffer of twenty-five kilometers around each district and assign the manufacturer to the district if it falls within either the district itself or the buffer (see Figure C.4 in the Appendix). Given the average size of districts, this solution tends to assign plants from all neighboring districts to the central one, more or less assuming farmers did not go more than fifty kilometers to buy pipe.[15]

In Table 3.4 we report our regressions of percent of Revolutionary confiscations on the number of pipe plants near the district. The bivariate regression in column (1) suggests a 10% increase in confiscations is associated with 2.4 more pipe plants near the district. Relative to the mean number of pipe plants of 5.4 and the standard deviation of 4.4, this is an economically large effect. In column (2) we control for the elevation range in the district, under the assumption that regions with more geographic relief will tend to naturally drain and will, potentially, benefit more natural, gravity assisted, irrigation.

[15] We experiment with buffers of 0km, 15km, 50km, and 100km as well. Statistical and economic significance increases with buffer size up to 50km and then declines.

Table 3.4: Percent Land Confiscated in District and Number of Pipe Manufacturers

	Dependent Variable: Number of Pipe Manufacturers in 1856					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.242***	0.202***	0.198***	0.189***	0.167**	0.144**
	(0.0633)	(0.0634)	(0.0649)	(0.0656)	(0.0669)	(0.0671)
Elevation Range	No	Yes	Yes	No	Yes	Yes
Market Access 1789	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.105	0.133	0.134	0.387	0.420	0.427

When we do this, the coefficient on percent confiscated remains stable at about 0.2. The coefficient on elevation range (not reported) is, as expected, negative and suggests a one standard deviation increase in elevation ranges is associated with about 0.75 fewer pipe manufacturers. In column (3) we add a control for initial market access in 1789. The estimate on percent confiscated is unaffected and the coefficient on market access in 1789 (not reported) is statistically indistinguishable from zero.

In columns (4)-(6) we run the same regressions as (1)-(3) but include our twelve region fixed effects. The full regression in column (6) suggests a ten percent increase in confiscations leads to an increase of about 1.4 pipe manufacturers near the district. We take these results, as a whole, as strong evidence that one of the mechanisms through which agricultural productivity is correlated with Revolutionary confiscations is through investments in drainage and irrigation.

3.4.4 Market Access

In this section we investigate whether Revolutionary confiscations were associated with an increase in investment in transportation infrastructure. Research on England around the time of the Glorious Revolution suggests that lowering the transaction costs of reallocating property

rights may increase investment in road projects (Bogart, 2005; Bogart and Richardson, 2009). While we do not have direct evidence on investment in roads by individuals or organizations in France during the first half of the eighteenth century, we do know what the network of roads and canals looked like in both 1789 and 1841. These networks are illustrated in Appendix Figures C.2 and C.3. We construct measures of market access for both 1789 and 1841 and then calculate the district-level change in market access over these periods. We then investigate whether there is a correlation between Revolutionary land confiscations in a district and the change in market access.

In Panel A of Table 3.5 we investigate the overall percentage change in market access of a district and land confiscations. We control for initial market access, elevation range (as a proxy for ruggedness) and, in columns (4)-(6) our twelve region fixed effects. While all the coefficients are positive in these regressions, the only statistically significant coefficients are when we condition on elevation range or the district fixed effects. In column (6), for example, we include all controls and dummy variables and the coefficient on confiscations suggests a ten percentage point increase in confiscations is associated with a fourteen percentage point increase in market access.[16] The results in Panel A are not particularly robust but this is because market access combines two types of information: the size of surrounding markets, as proxied by urban populations, and the cost of getting to these markets, as proxied by the least cost travel cost through the transport network to the cities. If Revolutionary confiscations lowered the transaction costs of building roads or canals, at least initially, we would expect market access to increase because the transport network improves near a district, not because cities become more populous.[17] To test this proposition, we construct two additional measures of change in market access. First, we construct the percentage change holding constant urban populations at their 1789 levels while allowing the transport network to change between 1789 and 1841. Second, we construct a measure which holds the

[16] We calculate the percentage difference in market access as the log difference between 1789 and 1841.

[17] In the general equilibrium, of course city populations are endogenous to the transport network (and vice versa). However, in the relatively short run, we would expect confiscations to lower the costs of making investments in transport which, over time, would translate into greater urban populations.

Table 3.5: Percent Land Confiscated in District and Market Access

	Panel A: Dep. Variable: Change in Market Access 1789-1841					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.00344	0.00634	0.0112***	0.00768	0.0128*	0.0141**
	(0.00394)	(0.00404)	(0.00390)	(0.00672)	(0.00697)	(0.00673)
Market Access 1789	No	Yes	Yes	No	Yes	Yes
Elevation Range	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.00260	0.0504	0.103	0.0928	0.128	0.146
	Panel B: Dep. Variable: Change in Market Access with 1789 Population					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.00322*	0.00403**	0.00497***	0.00412**	0.00490**	0.00524***
	(0.00184)	(0.00186)	(0.00189)	(0.00199)	(0.00201)	(0.00193)
Market Access 1789	No	Yes	Yes	No	Yes	Yes
Elevation Range	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.0148	0.0398	0.0525	0.385	0.390	0.398
	Panel C: Dep. Variable: Change in Market Access with 1789 Transport Network					
	(1)	(2)	(3)	(4)	(5)	(6)
Percent Confiscated	0.00233	0.00435	0.00748**	0.00538	0.00959	0.0104*
	(0.00327)	(0.00334)	(0.00301)	(0.00586)	(0.00615)	(0.00600)
Market Access 1789	No	Yes	Yes	No	Yes	Yes
Elevation Range	No	No	Yes	No	No	Yes
Region FE's	No	No	No	Yes	Yes	Yes
N	194	194	194	194	194	194
R-sq	0.00141	0.0291	0.0552	0.0547	0.0832	0.0912

transportation network constant at 1789 levels and allows urban populations to change.

We report the results of using change in market access holding constant population in Panel B. Across all the regressions, the coefficients on confiscations are positive and statistically significant. Furthermore, the coefficients are also relatively large, suggesting a ten percent

increase in confiscations is associated with between a 3.2% and 5.2% increase in transportation infrastructure between 1789 and 1841. These estimates may be compared to the mean change in transport infrastructure or 16%.

In Panel C we investigate the impact of confiscations on the change in market access, holding constant the transportation infrastructure at its 1789 value. Here the results are less robust than in Panel B. There is no statistically significant relationship in columns (1), (2), (4), or (5). It is only when we condition on elevation range (ruggedness) in column (3) or elevation range the region dummies in column (6) that the coefficients become significant. When the relationship is precisely estimated, the effects are fairly large. The coefficient in column (6) suggests a ten percent increase in confiscations leads to a ten percent increase in surrounding urban populations (relative to the mean increase of 16%).

Overall, we interpret the results of decomposing market access in Panels B and C as suggesting a robust and empirically large effect of Revolutionary confiscations on improvements in the transportation network. The results in Panel C are more difficult to interpret. They suggest a large, but statistically non-robust, relationship between confiscations and urban development. One possible interpretation of the results in Panels B and C is that the coefficients in Panel B reflect broader increases in the transport network associate with confiscations across all cities, whereas the results in Panel C are driven by a few outlier districts. Indeed, when we implement a robust regression procedure to re-estimate Panels B and C, the results in Panel B (holding population constant) hold up, while those in Panel C are completely wiped out.[18]

3.5 Robustness

In this section we perform various robustness tests on our main results regarding confiscations and wheat yields and pipe manufacturing. Each column in Table 3.6 represents a different

[18]Robust regression results available upon request.

test. For each test we report the coefficient on confiscations using four different specifications. The first row reports specifications based on column (3) of Table 3.2. The second row adds region fixed effects and, as such, is based on column (6) of Table 3.2. The third row is based on the controls and specification used in column (3) of Table 3.4 and the fourth row adds region fixed effects in a similar fashion to column (6) of Table 3.4.

In column (1) we add a control for potato suitability from the FAO to the specifications and find the coefficients are robust to this. In column (2) we control for potential spatial correlation across districts by clustering standard errors on the department. There are, on average seven districts in each department. When we do this, the coefficients retain their statistical significance.

During the Revolution it was not only church land that was confiscated. There was also a significant amount of land redistributed from *emigrés*, or nobles who fled their estates to escape potential persecution at the hands of the revolutionaries (Franck and Michalopoulos, 2017). In column (3) we control for these additional confiscations by including a variable equal to the amount of *emigré* confiscations in each district. Our coefficient estimates are unaffected.

While we believe our market access in 1789 variable should control for geographic advantages of different districts, it is possible that being close to the sea, by itself, is the best predictor of these differences (see, e.g. Acemoglu et al. (2005) on access to the Atlantic or Braudel (1949) on access to the Mediterranean). As such, in columns (4), (5), (6), and (7) we control for a district's distance to the North Sea, the Atlantic, the Mediterranean, and any sea. In all cases our main results are robust.

In columns (8) and (9) we trim the top and bottom 1% and 5% of confiscation observations respectively from the sample. We do this in order to investigate whether our results are being driven by extreme observations. For the top and bottom 1% the results are robust. When we trim the top and bottom 5% the fixed effects estimate using pipe manufacturers

Table 3.6: Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Potato	*Cluster Dept*	*Emigré Confiscations*	*Distance North Sea*	*Distance Atlantic*	*Distance Mediterraean*	*Distance Any Sea*
$OLS_{WheatYield}$	0.0247***	0.0246***	0.0245***	0.0126***	0.0242***	0.0169***	0.0254***
	(0.00409)	(0.00462)	(0.00393)	(0.00303)	(0.00388)	(0.00311)	(0.00419)
$FE_{WheatYield}$	0.00882**	0.00882*	0.00795**	0.00885**	0.00855**	0.00881**	0.00914**
	(0.00353)	(0.00499)	(0.00352)	(0.00360)	(0.00349)	(0.00353)	(0.00366)
$OLS_{PipeMnfg}$	0.205***	0.198**	0.196***	0.154**	0.198***	0.179**	0.171***
	(0.0686)	(0.0824)	(0.0645)	(0.0726)	(0.0647)	(0.0698)	(0.0641)
$FE_{PipeMnfg}$	0.131**	0.144**	0.124*	0.142**	0.146**	0.144**	0.104
	(0.0661)	(0.0718)	(0.0651)	(0.0678)	(0.0674)	(0.0669)	(0.0636)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	194	194	194	194	194	194	194

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Trim Top and Bottom 1%	*Trim Top and Bottom 5%*	*Market Access Alt BO*	*Market Access Alt CA*	*Market Access Alt MA*	*Average Auction Price*	*Average Auction Size*
$OLS_{WheatYield}$	0.0307***	0.0373***	0.0248***	0.0246***	0.0247***	0.00496**	0.00614**
	(0.00420)	(0.00533)	(0.00403)	(0.00399)	(0.00402)	(0.00246)	(0.00255)
$FE_{WheatYield}$	0.0126***	0.0169***	0.00896**	0.00895**	0.00894**	0.00519	---
	(0.00408)	(0.00623)	(0.00353)	(0.00350)	(0.00352)	(0.00412)	
$OLS_{PipeMnfg}$	0.236***	0.197*	0.201***	0.205***	0.203***	0.260**	0.219**
	(0.0855)	(0.101)	(0.0655)	(0.0647)	(0.0653)	(0.0985)	(0.0967)
$FE_{PipeMnfg}$	0.198**	0.149	0.148**	0.152**	0.149**	0.278**	---
	(0.0908)	(0.0962)	(0.0676)	(0.0675)	(0.0676)	(0.109)	
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	186	176	194	194	194	40	40

as the outcome becomes statistically insignificant (p-value = 0.123), though it retains its economic significance.

In columns (10), (11), and (12) we use different parameterizations drawn from the literature for the cost of travel over roads, canals, rivers, and seas when we construct our market access measures. In column (10) we include the cost specifications from Boerner and Severgnini (2011), while in column (11) we use Campbell et al. (1993). Finally in column (12) we use the cost specifications from Masschaele (1993). These specifications differ from those of Bairoch and Braider (1991), which we use otherwise, in the relative weights placed on sea, river and road travel cost compared to portage (no technology).

In additional to the aggregate district data on confiscations, there are incomplete data at the auction plot level on characteristics of the church properties. These data were compiled by the Revolutionaries themselves in order to make public the information concerning the plots before the auctions took place. We compile the information on the estimated value and plot size for over 4000 entries in these auction books. Unfortunately, there is only coverage for a subset of auction plots within the Paris Basin. This still constitutes about 2,000 plots, however. Figure C.8 in the Appendix shows the spatial distribution of these auction plots as well as the subset from which we draw our sample. From these data we create district level measures of the estimated value of the church properties (from revolutionary assessors) as well as the surveyed size of the properties. In columns (13) and (14) we report the coefficients on confiscations while including these two additional variables as controls. While the coefficient on wheat yields does shrink by about a third in the regressions, it retains its statistical significance. The pipe manufacturers regressions are relatively unaffected.[19]

[19]We do not run these auction plot level regressions using the region fixed effects due to the severe reduction in variation across regions.

3.6 Conclusion

During the 1789 Revolution, the land owned by the Church was confiscated and auctioned. This study analyzes the impact of this redistribution on agricultural investments and yields until the middle of the 19th century. The results suggest that wheat yields were higher in districts where more Church land was sold and two potential mechanisms to explain this relationship are drainage investment and transportation infrastructure.

We include a host of controls and conduct various robustness checks to support a causal relationship between confiscations and agricultural outcomes. Our results hold after controlling for sources of potential endogeneity, such as differences in geographic land quality. We also include regional fixed effects to capture differences across regions on church land accumulation and changes in market access to control for market integration and movements in population. To test for the robustness of our results, we first conduct a placebo test with potato cultivation, which historical accounts suggest would not benefit as greatly from new property rights arrangements. We also include a host of other controls and different market access specifications, all of which we believe strengthen our interpretation of the main results in the paper.

Our interpretation of the results, supported by evidence from historians, is that the sale of Church land gave some areas a temporary head start, not by making land distribution more equal, but by reallocating property to rich individuals who were more likely to make investments. In other words, by getting past the Old Regime's legal institutions which were not conducive to growth in the 18th century, the Revolution lowered transaction costs and enabled the consolidation of landholdings, thereby making agricultural investments profitable. As such, these results are in line with the theoretical studies of Galor and Zeira (1993) and Galor and Moav (2004) that argue that land inequality is conducive to economic development when economic growth depends on physical capital accumulation. The results are also in line with the results of Rosenthal (1992) that the dismantling of old property

rights arrangements led to more investment .

One important question we do not resolve, is whether the redistribution of Church lands only granted a "one-off" increase in productivity to a region or whether productivity permanently increased relative to non-treated regions. Assuming our interpretation that the confiscations merely lowered the transaction costs of exiting feudal land arrangements, then we would expect that, over time, that comparable regions where there was no redistribution should have caught up with those where there was more. Further research could investigate this question by looking at whether such convergence did occur later in the 19th century or even after WWI.

Appendix A: Free-Riding in the Monastery: Club Goods, the Cistercian Order and Agricultural Investment in Ancien Regime France

A.1 Robustness Tests

Table A.1: Placebo Test: Benedictine Monasteries

	Dependent Variable: ln(Price-per-Acre)		
	(1)	(2)	(3)
Distance from Citeaux	0.00188	0.00279	-0.0000550
	(0.00165)	(0.00146)	(0.00111)
Property-Specific Controls	Yes	Yes	Yes
Geographic Controls	No	No	Yes
Market Characteristics	No	No	Yes
Observations	163	163	163
Adjusted R^2	0.233	0.246	0.472

Notes: Columns 1 and 2 duplicate the results ofTables 1.2 and 1.3 with properties owned by monasteries of the Benedictine Order. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.2: Omitting Most Represented Houses

	Dependent Variable: ln(Price-per-Acre)					
	(1)	(2)	(3)	(4)	(5)	(6)
Visitation Cost	0.632**		0.524**		0.571**	
	(0.264)		(0.194)		(0.217)	
General Chapter Cost		0.852***		0.676**		0.711**
		(0.289)		(0.305)		(0.304)
Omitted House	Citeaux		Le Gard		Jouy	
Observations	306	306	305	305	307	307
Adjusted R^2	0.313	0.321	0.311	0.319	0.291	0.299

Notes: This table duplicates the results of Tables 1.2 and 1.3 with the full spread of controls with the three most represented houses omitted. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

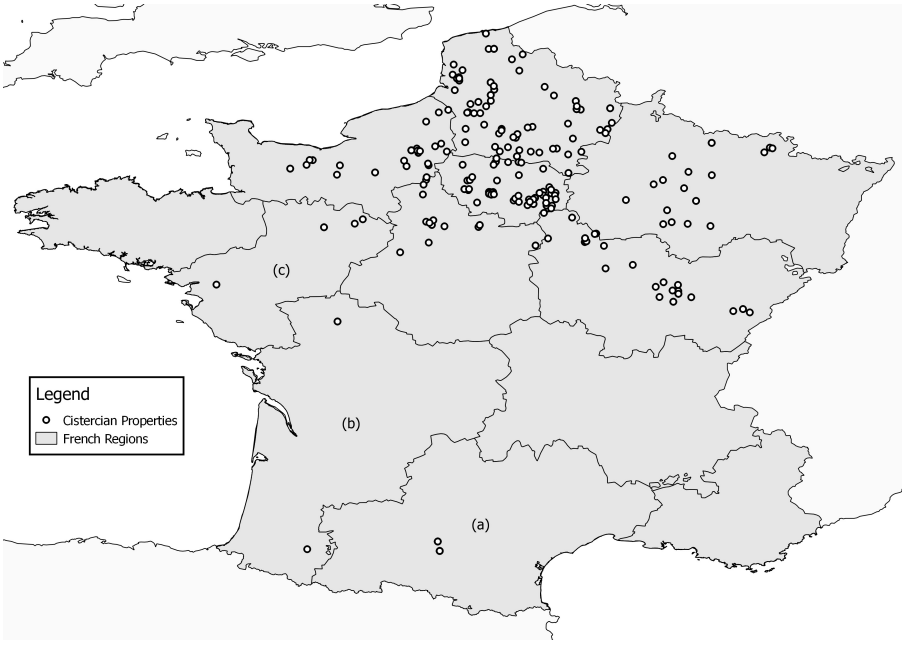


Figure A.1: Regions

Table A.3: Omitting Particular Regions

	Dependent Variable: ln(Price-per-Acre)					
	(1)	(2)	(3)	(4)	(5)	(6)
Visitation Cost	0.673***		0.594***		0.550**	
	(0.205)		(0.213)		(0.199)	
General Chapter Cost		0.826***		0.759**		0.691**
		(0.283)		(0.321)		(0.288)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Omitted Region	Occitanie (a)		Nouvelle-Aquitaine (b)		Pays de la Loire (c)	
Observations	311	311	319	319	317	317
Adjusted R^2	0.294	0.302	0.297	0.306	0.288	0.295

Notes: This table duplicates the results of Tables 1.2 and 1.3 with the full spread of controls with particular regions omitted. Letters (a)-(c) correspond with the regions in figure A.1. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Alternate Cost Specifications

	Dependent Variable: ln(Price-per-Acre)					
	(1)	(2)	(3)	(4)	(5)	(6)
Visitation Cost (Bairoch and Braider)	0.484**					
	(0.188)					
General Chapter Cost (Bairoch and Braider)		0.689**				
		(0.309)				
Visitation Cost (Boerner and Severgnini)			0.616***			
			(0.216)			
General Chapter Cost (Boerner and Severgnini)				0.710**		
				(0.287)		
Visitation Cost (Campbell et al.)					0.471***	
					(0.166)	
General Chapter Cost (Campbell et al.)						0.631**
						(0.261)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	322	322	322	322	322	322
Adjusted R^2	0.292	0.304	0.297	0.305	0.296	0.306

Notes: This table duplicates the results of Tables 1.2 and 1.3 with the full spread of controls using different transportation cost specifications from Bairoch and Braider (1991), Boerner and Severgnini (2011) and Campbell et al. (1993). Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Tests for Sample Selection Bias

	Dependent Variable: ln(Price-per-Acre)					
	(1)	(2)	(3)	(4)	(5)	(6)
Visitation Cost	0.594***		0.560***		0.751***	
	(0.166)		(0.196)		(0.208)	
General Chapter Cost		0.734***		0.707**		0.890***
		(0.240)		(0.280)		(0.287)
Pamphlet ID	4.813**	4.794**				
	(1.879)	(1.759)				
Distance from Paris (in 1000 km)			0.682	0.692		
			(0.787)	(0.771)		
Dummy if Distance from Paris¿100 lieux					-0.577**	-0.589**
					(0.243)	(0.261)
Property-Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Market Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	322	322	322	322	322	322
Adjusted R^2	0.311	0.318	0.298	0.306	0.303	0.312

Notes: This table duplicates the results of Tables 1.2 and 1.3 with the full spread of controls and controls for sample selection bias. The variable Pamplet ID is a time trend for the date of publication for the estimated land values that takes a value of 1 for the first pamplet in the sample and 50 for the last. Distance from Paris (in 1000 km) measures the distance from the property to Paris. Dummy if Distance from Paris¿100 lieux is an indicator variable that takes a value of 1 if the property meets the explicit geographic focus of the auction listings on properties within 100 lieux (400 km) of Paris. Standard Errors are clustered at the departmental level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Propensity Score Matching: Only Geographic Controls

	Dependent Variable: ln(Price-per-Acre)			
	ATE	ATET	ATE	ATET
	(1)	(2)	(3)	(4)
High Visitation Cost	0.288***	0.300***		
	(0.0822)	(0.103)		
High General Chapter Cost			0.289***	0.296**
			(0.0868)	(0.133)
Observations	322	322	322	322

Notes: This table reports the propensity score matching average treatment effects and average treatment effects for the treated for the explanatory variables of interest. Columns (1) and (2) present the results for High Visitation Cost and Columns (3) and (4) present the results for High General Chapter Cost. All variables were matched on the following controls: Total Acreage, Arable Land, Domaine, Manor, Forest, Wheat Soil Suitability and Potato Soil Suitability. Standard Errors are robust: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.7: Propensity Score Matching: All Main Controls

	Dependent Variable: ln(Price-per-Acre)			
	ATE	ATET	ATE	ATET
	(1)	(2)	(3)	(4)
High Visitation Cost	0.266***	0.300***		
	(0.0766)	(0.103)		
High General Chapter Cost			0.293***	0.296**
			(0.0988)	(0.133)
Observations	322	322	322	322

Notes: This table reports the propensity score matching average treatment effects and average treatment effects for the treated for the explanatory variables of interest. Columns (1) and (2) present the results for High Visitation Cost and Columns (3) and (4) present the results for High General Chapter Cost. All variables were matched on the following controls: Total Acreage, Arable Land, Domaine, Manor, Forest, Wheat Soil Suitability, Potato Soil Suitability, Market Access, Literacy, Encyclopedia Subscribers and Travel Cost(Monastery to Prop.). Standard Errors are robust: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.8: Selection on Observed and Unobserved Variables – All Controls Except Total Acreage

Panel A: Varying R_{max}						
	Baseline Effect $[R^2]$		Controlled Effect $[R^2]$		Null Reject	δ
Visitation Cost						
1. R_{max}=1.3$\tilde{R}$	0.53284	[0.191]	0.56088	[0.328]	Yes	-3.35127
2. $R_{max} = 0.5$	0.53284	[0.191]	0.56088	[0.328]	Yes	-3.01027
3. $R_{max} = 0.75$	0.53284	[0.191]	0.56088	[0.328]	Yes	-2.23706
4. $R_{max} = 1$	0.53284	[0.191]	0.56088	[0.328]	Yes	-1.77989
General Chapter Cost						
5. R_{max}=1.3$\tilde{R}$	0.60313	[0.193]	0.70659	[0.335]	Yes	-0.21805
6. $R_{max} = 0.5$	0.60313	[0.193]	0.70659	[0.335]	Yes	-0.20106
7. $R_{max} = 0.75$	0.60313	[0.193]	0.70659	[0.335]	Yes	-0.15897
8. $R_{max} = 1$	0.60313	[0.193]	0.70659	[0.335]	Yes	-0.13145
Panel B: Assume $\delta = 1$						
Visitation Cost						
	$R_{max} = 0.5$	R_{max}=1.3$\tilde{R}$	Controlled Effect		$[R^2]$	
9. Estimated β	0.59633	0.58307	0.56088		[0.328]	
General Chapter Cost						
	$R_{max} = 0.5$	R_{max}=1.3$\tilde{R}$	Controlled Effect		$[R^2]$	
10. Estimated β	0.82698	0.77995	0.70659		[0.335]	

Table Notes: The table shows the amount of selection on unobserved variables relative to selection on observed variables in order to produce a coefficient equal to our baseline estimates, and shows estimated treatment effects under the assumption of equal selection on observed variables and unobserved variables. For all regressions, total acreage is included due to the strong effect on ln(price-per-acre) as observed in Column (2) of Tables 1.2 and 1.3. Therefore the selection based on total acreage is not included for comparison with unobserved variables. Panel A shows the magnitude of selection on unobserved variables relative to selection on observed variables needed to produce a treatment effect of zero under different R_{max}. Rows 2 and 5 use an R_{max} equal to 0.75. Rows 1 and 4 use the cutoff suggested by Oster (2013), R_{max}=1.3$\tilde{R}$. Rows 3 and 6 use the largest possible R-squared, which is 1. Panel B assumes the effect of unobserved variables is equal to the effect of observed variables ($\delta = 1$). It then reports the corresponding estimate of β. In both panels, all of the controls (except for total acreage) from Tables 1.2 and 1.3 are included as observed variables.

Table A.9: Selection on Observed and Unobserved Variables– All Controls

Panel A: Varying R_{max}						
	Baseline Effect [R^2]		Controlled Effect [R^2]		Null Reject	δ
Visitation Cost						
1. R_{max}=1.3$\tilde{R}$	0.73286	[0.036]	0.56088	[0.328]	Yes	2.49253
2. $R_{max} = 0.5$	0.73286	[0.036]	0.56088	[0.328]	Yes	2.20778
3. $R_{max} = 0.75$	0.73286	[0.036]	0.56088	[0.328]	Yes	1.59055
4. $R_{max} = 1$	0.73286	[0.036]	0.56088	[0.328]	Yes	1.24304
General Chapter Cost						
5. R_{max}=1.3$\tilde{R}$	0.73125	[0.030]	0.70659	[0.335]	Yes	9.88241
6. $R_{max} = 0.5$	0.73125	[0.030]	0.70659	[0.335]	Yes	9.18650
7. $R_{max} = 0.75$	0.73125	[0.030]	0.70659	[0.335]	Yes	7.41327
8. $R_{max} = 1$	0.73125	[0.030]	0.70659	[0.335]	Yes	6.21385
Panel B: Assume $\delta = 1$						
Visitation Cost						
	$R_{max} = 0.5$	R_{max}=1.3$\tilde{R}$	Controlled Effect		[R^2]	
9. Estimated β	0.45912	0.49718	0.56088		[0.328]	
General Chapter Cost						
	$R_{max} = 0.5$	R_{max}=1.3$\tilde{R}$	Controlled Effect		[R^2]	
10. Estimated β	0.69321	0.69843	0.70659		[0.335]	

Table Notes: The table shows the amount of selection on unobserved variables relative to selection on observed variables in order to produce a coefficient equal to our baseline estimates, and shows estimated treatment effects under the assumption of equal selection on observed variables and unobserved variables. Panel A shows the magnitude of selection on unobserved variables relative to selection on observed variables needed to produce a treatment effect of zero under different R_{max}. Rows 2 and 5 use an R_{max} equal to 0.75. Rows 1 and 4 use the cutoff suggested by Oster (2013), R_{max}=1.3$\tilde{R}$. Rows 3 and 6 use the largest possible R-squared, which is 1. Panel B assumes the effect of unobserved variables is equal to the effect of observed variables ($\delta = 1$). It then reports the corresponding estimate of β. In both panels, all of the controls from Tables 1.2 and 1.3 are included as observed variables.

A.2 Additional Figures

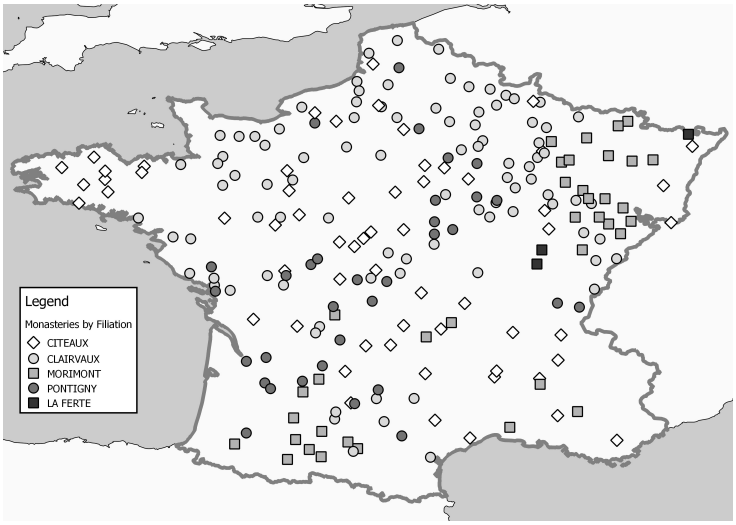


Figure A.2: Monasteries by Filiation

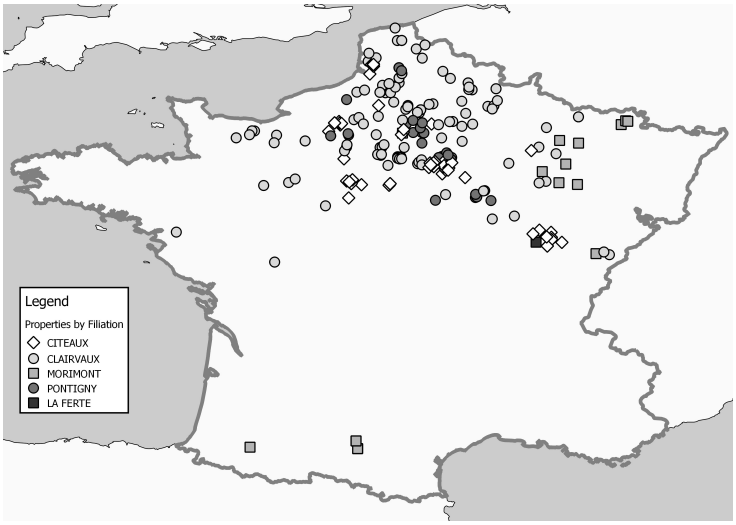


Figure A.3: Properties by Filiation

Appendix B: Plague, Politics, and Pogroms: The Black Death, Rule of Law, and the persecution of Jews in the Holy Roman Empire

In this appendix we provide further details concerning (1) data collection; (2) the administrative and political structure of the Holy Roman Empire (3) additional maps of some of our control variables; and (4) the results of various robustness exercises that we have described in the main text.

B.1 Data Collection

The main source for our persecution intensity score is the *Germania Judaica* (Avneri, 1968). This is a on-going multivolume project that aims to document all aspects of Jewish life in German speaking central Europe from the middle ages to the modern period. We focus on volume I which covers the medieval period. The *Germania Judaica* is the basis for most historical studies of the Jews in the Holy Roman Empire and it also provides the main source for recent work in economics on antisemitic violence such as Voigtländer and Voth (2012).

To collect our dependent variable we personally went through every entry for the volume covering the time of the Black Death reading the description of each communities experience during the Black Death. The vast majority of entries include detailed descriptions of the persecutions suffered during these years.

We collect the description for every town with a specific mention of the fate of the Jewish community during the persecutions of the Black Death. We were concerned that towns that were spared may not be mentioned so we collected information on towns or communities that mention a community within twenty years or so of the Black Death but without any specific mention of a persecution.

While many of the towns have descriptions that match directly with our persecution intensity score categories, some descriptions were vague or nonexistent. To address these, we checked with two additional sources, *Encyclopedia Judaica* (2007) and the *Encyclopedia of Jewish Life Before and During the Holocaust* (2001). After dropping towns without any distinct description in any of our sources, we are left with 340 towns with a Jewish community.

For these 340 towns, we also collected from *Germania Judaica* our main explanatory variables: whether the town was an Imperial Free City, the seat of the Bishop or Archbishop and under the rule of a member of one of the major political houses.

B.2 The Political and Administrative Structure of the Holy Roman Empire

In Section 2.2 we provide as brief an overview of the history and administrative structure of the Holy Roman Empire as is necessary to understand our analysis. Here we provide more details concerning the state of the Empire during the mid-fourteenth century.

The Holy Roman Empire was established by Charlemagne in 800. Following the decline of the Carolingian empire, the title was revived by Otto I in the mid-tenth century. A series of strong emperors in the twelfth and thirteenth century partially succeeded in building a powerful feudal monarchy along the lines that the kings of England and France were able to do in their respective realms.

But their attempts to build such a centralized monarchy were repeatedly thwarted by conflicts between the Church and Emperor. Emperors were repeatedly excommunicated throughout the late eleventh century and twelfth centuries. And in the thirteenth century, this conflict between the papacy and the emperor intensified. Frederick (r. 1212–1250) challenged papal power in Italy; but from a German perspective he was an absentee ruler for most of his reign and conceded power and authority to the electors and princes in return for

their support for him in Germany while he focused on maintaining imperial authority in Italy (Abulafia, 1988; Arnold, 2000). The resulting political fragmentation and 'the jurisdictional autarky of the princes' that characterized the Holy Roman empire was thus a response to the needs of a weakened emperor to maintain some semblance of peace and order, but it had 'the inevitable result' of the 'territorial particularism of churchmen, lay princes, and interstitial cities which persisted until modern times' (Arnold, 2000, 244).[1] The legacy of these developments was such that by the fourteenth century 'the nadir of the medieval *Reich*, viewed as a system of power' occurred. (Scales, 2005, 177). This provides the setting for our study.

In particular, the years prior to 1348 were years of civil war. Louis IV of Bavaria (r. 1328–1347) was first elected in 1314, but it took years of civil wars and conflicts against rival claimants backed by the papacy before he was actually crowned. Upon his coronation Louis deposed Pope John XXII on the grounds of heresy, setting up a rival in his stead. His policies, however, brought him into conflict with many of the German princes who together with the Pope backed a rival claimant, Charles of the House of Luxembourg, as emperor.

Thus for the period with which we are concerned the Holy Roman Emperor was both an imperial overlord and a great territorial prince in his own right, but he was not did have the power to subdue his nobility or to make laws for the entire empire (Arnold, 1991a,b, 2000; Scales, 2005; Stubbs, 1908).[2]

The weakness of the Holy Roman Emperor saw the emergence of Imperial Free Cities, Bishoprics, and Archbishoprics and the lands of the major Dukes and Electors as *de facto* independent territories. Figure B.1 provides a stylized depiction of the political structure

[1] Frederick established a centralized state administration in Sicily but in Germany he left a legacy of decentralized and contested authority. Arnold discounts the possibility of Frederick reversing this situation and imposing centralized control in Germany because '[t]he German magnates were so well equipped with economic, jurisdictional, and military resources and opportunities, all of which were phenomenally expanded during the twelfth and thirteenth centuries' (Arnold, 2000, 243).

[2] 'Although the western Roman emperor was respected as overlord and sovereign from 962 until 1806, his powers were not of a kind to convert the inherited drives of the princes and the Church away from regional and territorial autarky, let alone to subvert the resulting structure of independent principalities, bishoprics, and evacuees, with the urban states as an interstitial element.' (Arnold, 1991b, 280).

of the Holy Roman Empire. It is a simplification: the number of independent sovereign entities within the Holy Roman Empire is unknown, but is estimated to have exceed one thousand, but it captures the most important distinctions between the secular princes such as the Count Palatine of the Rhine or the Duke of Saxony, the Archbishops, the Bishops, and the Imperial Free Cities. The Holy Roman Emperor's claim of ownership over all Jews within the empire was central to the overall assertion of imperial authority.[3] The fate of the Jews during the Black Death pogroms therefore encapsulates the failure of the emperor to assert his claims to sovereignty over the religious and secular princes of the empire.

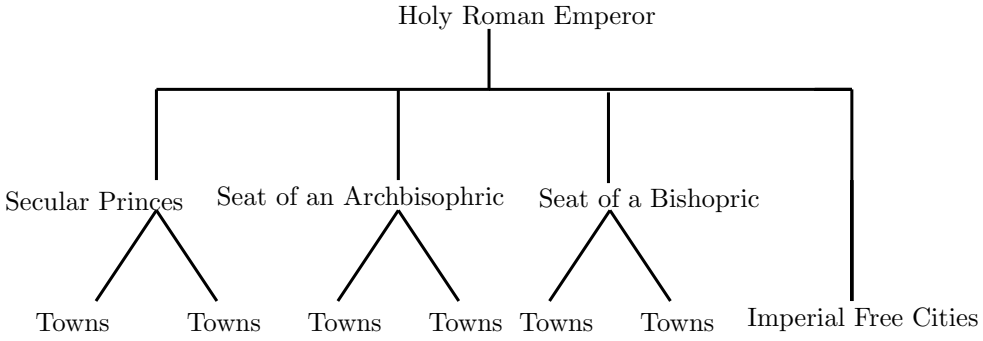


Figure B.1: A stylized depiction of the political structure of the Holy Roman Empire. The Imperial Free Cities includes both Free Cities and Imperial Cities.

[3] Jordan (1998) discusses how asserting rights to tax all Jews in the realm was one of the ways that Philip Augustus asserted royal authority in France during the previous century.

B.3 Select Summary Statistics

Table B.1: Summary Statistics

	All Towns	Imperial Free City	Archbishopric Seat	Bishopric Seat
Urbanization	0.3053	0.2798	0.3583	0.2269
Wheat Suitability	0.5402	0.611	0.5612	0.3658
Ruggedness	16.7698	11.3604	14.2352	17.6522
Trade Routes	0.1147	0.2093	0.4	0.25
Navigable Rivers	0.1441	0.093	0.8	0.3125
Previous Pogroms	0.2058	0.2326	0.6	0.1875
Textile Production	0.1265	0.093	0.2	0
Grain Production	0.0559	0	0.2	0
Wine Production	0.2794	0.279	0.4	0

Table B.2: Balance Table

Variable	Untreated	Mean	Treated	Mean	Mean Difference
Previous Pogroms	276	0.196	64	0.250	-0.054
Ruggedness	276	17.607	64	13.158	4.449*
Wheat Suitability	276	0.539	64	0.546	-0.007
Navigable Rivers	276	0.130	64	0.203	-0.073
Trade Routes	276	0.087	64	0.234	-0.147***
Textile Production	276	0.138	64	0.078	0.060
Wine Production	276	0.293	64	0.219	0.075
Grain Production	276	0.065	64	0.016	0.050
Urbanization	276	0.313	64	0.273	0.040*

Notes:Treated communities include communities located in either Imperial Free Cities, seats of Bishoprics or seats of Archbishoprics. Untreated communities refer to all other communities. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.3: Pogrom Intensity

Pogrom Intensity	Description	Frequency
1	Spared	37
2	Expelled	98
3	Few deaths	112
4	Many deaths	47
5	Destroyed	46
Total		340

B.4 Additional Tables

Table B.4: Jewish Wealth

	Dependent Variable: Pogrom Intensity (1-5)					
	(1)	(2)	(3)	(4)	(5)	(6)
		OLS			Ordered Probit	
Imperial Free City	0.831***	0.834***	0.808***	0.795***	0.797***	0.770***
	(0.269)	(0.258)	(0.236)	(0.282)	(0.270)	(0.252)
Archbishopric Seat	1.150***	1.153***	1.152***	1.153***	1.152***	1.150***
	(0.274)	(0.285)	(0.241)	(0.374)	(0.389)	(0.343)
0.5em] Bishopric Seat	0.953***	0.981***	0.933***	1.046***	1.081***	1.047***
	(0.233)	(0.220)	(0.222)	(0.286)	(0.273)	(0.282)
0.5em] Synagogue	0.0286			0.0542		
	(0.124)			(0.120)		
0.5em] Settlement Age		-0.0271			-0.0285	
		(0.0485)			(0.0494)	
0.5em] Proximity to the Rhine			0.328			0.361
			(0.331)			(0.346)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	340	340	340
Adj. / Pseudo R^2	0.281	0.282	0.285 8	0.116	0.116	0.118

Notes: Columns 1 and 4 control for the presence of a synagogue. Columns 2 and 5 include a variable of 100 times the age of the settlement. Columns 3 and 6 include a dummy that takes a value of 1 if the community is within 5 kilometers of the Rhine and 0 otherwise. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.5: Alternative Institutions

	Dependent Variable: Pogrom Intensity (1-5)					
	(1)	(2)	(3)	(4)	(5)	(6)
		OLS			Ordered Probit	
Imperial Free City	0.854***	0.815***	0.828***	0.817***	0.776***	0.796***
	(0.267)	(0.266)	(0.264)	(0.285)	(0.278)	(0.272)
Archbishopric Seat	1.192***	1.234***	1.145***	1.195***	1.244***	1.143***
	(0.298)	(0.250)	(0.289)	(0.404)	(0.352)	(0.390)
Bishopric Seat	0.953***	0.946***	0.961***	1.058***	1.043***	1.068***
	(0.222)	(0.230)	(0.227)	(0.277)	(0.282)	(0.296)
Lothringia	-0.398			-0.372		
	(0.237)			(0.263)		
Prince-Elector		-0.184			-0.219	
		(0.242)			(0.257)	
ln(*DistancetoPrague*)			0.0781			0.297
			(0.143)			(0.446)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	340	340	340
Adj. / Pseudo R^2	0.185	0.181	0.180	0.118	0.117	0.117

Notes: Results in Columns 1 and 4 include a dummy that takes a value of 1 if the community was in the Lothringian border. In Columns 2 and 5, we control for whether the owner was a prince-elector. In Columns 3 and 6 we include a variable for the natural log of the distance from the settlement to Prague. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.6: Religious Institutions

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
	OLS		Ordered Probit	
Imperial Free City	0.827***	0.822***	0.781***	0.773***
	(0.227)	(0.223)	(0.241)	(0.234)
Archbishopric Seat	1.255***	1.231***	1.170***	1.142***
	(0.231)	(0.224)	(0.335)	(0.312)
Bishopric Seat	0.761***	0.761***	0.804***	0.801***
	(0.185)	(0.189)	(0.223)	(0.223)
Monestaries_dummy	0.118		0.110	
	(0.123)		(0.129)	
Flagellants (10km)		0.0531		0.0317
		(0.235)		(0.223)
Baseline Controls	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	340	340	340	340
Adj. / Pseudo R^2	0.134	0.132	0.071	0.071

Notes: Results in Columns 1 and 4 include a dummy that takes a value of 1 if the community was located near a monastery and 0 otherwise. In Columns 2 and 5 we control for the path of the flagellants with a dummy variable that takes a value of 1 if the community was within 10km of the flagellant path and 0 otherwise. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.7: Propensity Score Matching

			Intensity Score			
	ATE	ATET	ATE	ATET	ATE	ATET
	(1)	(2)	(3)	(4)	(5)	(6)
Imperial Free City	0.359	0.791***				
	(0.395)	(0.178)				
Bishopric Seat			0.482	1.500***		
			(0.777)	(0.407)		
Archbishopric Seat					1.176*	2***
					(0.658)	(0.239)
Observations	340	340	340	340	340	340

Notes: This table reports the propensity score matching average treatment effects and average treatment effects for the treated for the explanatory variables of interest. Columns (1) and (2) present the results for Imperial Free Cities, Columns (3) and (4) present the results for Bishopric Seats and Columns (5) and (6) present the results for Archbishopric Seats. All variables were matched on the following controls: Previous Pogroms, Navigable Rivers, Trade Routes, Urbanization, Wheat Suitability, Ruggedness, Lothringian and Proximity to the Rhine. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.8: Alternative Index Specifications

	Dependent Variable: Pogrom Intensity (1-5)					
	(1)	(2)	(3)	(4)	(5)	(6)
		OLS			Ordered Probit	
Imperial Free City	0.547**	0.694**	0.413	0.739**	0.610**	0.541
	(0.216)	(0.300)	(0.250)	(0.329)	(0.300)	(0.348)
Archbishopric Seat	0.998***	1.088***	0.933***	5.513***	1.086**	5.366***
	(0.132)	(0.362)	(0.225)	(0.275)	(0.469)	(0.462)
Bishopric Seat	0.746***	0.879***	0.668***	1.083***	0.938***	0.943***
	(0.191)	(0.206)	(0.123)	(0.292)	(0.243)	(0.202)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	340	340	340
Adj. / Pseudo R^2	0.169	0.191	0.172	0.080	0.069	0.079

Notes: This table presents the results of the baseline regression using different index specifications. These alternative specifications are outlined in Table B.9. Columns (1) and (4) use Alternative Index 1. Columns (2) and (5) use Alternative Index 2. Columns (3) and (6) use Alternative Index 3. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.9: Alternative Index Specifications

Community's Experience	Index Value: Main Specification	Alternative Specification (1)	(2)	(3)
Spared	1	1	1	1
Expelled	2	2	3	3
Few killed	3	3	2	2
Many killed	4	4	4	4
Massacred	5	4	5	4

Table B.10: Binary Intensity Scores

	OLS (1)	(2)	(3)	Logit (4)	(5)	(6)
Imperial Free City	0.251***	0.395***	0.305***	1.295***	2.196***	2.627***
	(0.0612)	(0.121)	(0.0607)	(0.386)	(0.651)	(0.359)
Archbishopric Seat	0.392***	0.616***	0.192	0	0	0.884
	(0.0800)	(0.0659)	(0.221)	(.)	(.)	(1.553)
Bishopric Seat	0.281**	0.362***	0.217*	1.623**	2.269***	1.794**
	(0.110)	(0.0920)	(0.110)	(0.739)	(0.436)	(0.822)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	321	313	314
Adjusted R^2	0.065	0.202	0.185	0.097	0.245	0.340

Notes: This table presents OLS results and logit for binary coding of the pogrom persecution values. The dependent variable for Columns 1 and 4 is a dummy variable that takes a value of 1 if the community experienced a fatal pogrom and 0 otherwise. Columns 2 and 5 presents the results with a dependent variable that takes a value of 1 if many (or all) Jews died and 0 otherwise. In Columns 3 and 6 the dependent variable is a dummy variable that takes a value of 1 if the community was massacred and 0 otherwise. Robust standard errors clustered on the political unit level in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.11: Varying the Sample

	Dependent Variable: Pogrom Intensity (1-5)					
	OLS					
	(1)	(2)	(3)	(4)	(5)	(6)
Imperial Free City	0.640***	0.882*	0.884***	0.907***	0.808***	0.833***
	(0.166)	(0.499)	(0.214)	(0.232)	(0.232)	(0.244)
Archbishopric Seat	1.075***	1.373***	1.155**	1.266***	1.194***	1.199***
	(0.243)	(0.282)	(0.434)	(0.263)	(0.248)	(0.242)
Bishopric Seat	0.675***	0.709***	0.861***	0.632	0.797***	0.697***
	(0.200)	(0.197)	(0.190)	(0.431)	(0.181)	(0.207)
Dropped Region	Franconia	Lorraine	Swabia	Saxony	Thuringia	Bavaria
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
	Ordered Probit					
	(7)	(8)	(9)	(10)	(11)	(12)
Imperial Free City	0.578***	0.809	0.858***	0.864***	0.753***	0.790***
	(0.152)	(0.516)	(0.229)	(0.243)	(0.241)	(0.254)
Archbishopric Seat	0.870***	1.293***	1.042*	1.166***	1.089***	1.153***
	(0.282)	(0.366)	(0.556)	(0.363)	(0.348)	(0.342)
Bishopric Seat	0.691***	0.765***	0.895***	0.745	0.856***	0.690***
	(0.199)	(0.237)	(0.218)	(0.457)	(0.215)	(0.227)
Dropped Region	Franconia	Lorraine	Swabia	Saxony	Thuringia	Bavaria
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes
Observations	250	267	294	310	319	320
Adjusted R^2	0.107	0.127	0.161	0.142	0.147	0.131

Notes: In this Table we systematically exclude the most populous political units from our analysis. Columns 1 and 7 excludes Franconia (where 90 Jewish communities were located. Columns 2 and 8 exclude the Dutch of Lorraine. Columns 3 and 9 exclude the Duchy of Swabia. Columns 4 and 10 drop the Duchy of Saxony. Columns 5 and 11 exclude the Langrave of Thuringia. Finally Columns 6 and 12 exclude the Duchy of Bavaria. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.12: Sample Selection Issues

	Dependent Variable: Pogrom Intensity (1-5)							
	OLS				Ordered Probit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Imperial Free City	0.695***	0.551***	0.455*	0.409**	0.647***	0.483***	0.416*	0.342*
	(0.184)	(0.151)	(0.217)	(0.183)	(0.175)	(0.145)	(0.213)	(0.179)
Archbishopric Seat	1.358***	0.998***	1.151***	0.874***	1.290***	0.931***	1.190***	0.871***
	(0.219)	(0.250)	(0.153)	(0.226)	(0.243)	(0.321)	(0.208)	(0.329)
Bishopric Seat	0.688***	0.624***	0.863***	0.802***	0.640***	0.599***	0.882***	0.853***
	(0.166)	(0.169)	(0.174)	(0.191)	(0.163)	(0.177)	(0.211)	(0.228)
Ln(EntryLength)	0.202*		0.283**		0.170		0.266**	
	(0.110)		(0.109)		(0.110)		(0.115)	
Citations		0.0110**		0.0136***		0.0118**		0.0154***
		(0.00409)		(0.00296)		(0.00528)		(0.00465)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	340	340	340	340	340	340	340	340
Adjusted R^2 /Pseudo R^2	0.100	0.120	0.162	0.181	0.036	0.054	0.090	0.107

Notes: In this table we present the OLS and Ordered probit results for our baseline regression after controlling for two measures of possible sample selection: the length of the entry and number of citations in *Germania Judaica*. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.13: Sample Selection Issues

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
	OLS		Ordered Probit	
Imperial Free City	0.695***	0.551***	0.647***	0.483***
	(0.184)	(0.151)	(0.175)	(0.145)
Archbishopric Seat	1.358***	0.998***	1.290***	0.931***
	(0.219)	(0.250)	(0.243)	(0.321)
Bishopric Seat	0.688***	0.624***	0.640***	0.599***
	(0.166)	(0.169)	(0.163)	(0.177)
Ln(EntryLength)	0.202*		0.170	
	(0.110)		(0.110)	
Citations		0.0110**		0.0118**
		(0.00409)		(0.00528)
Baseline Controls	Yes	Yes	Yes	Yes
Previous Pogroms	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes
Fixed Effects	No	No	No	No
Observations	340	340	340	340
Adj. / Pseudo R^2	0.100	0.120	0.036	0.054

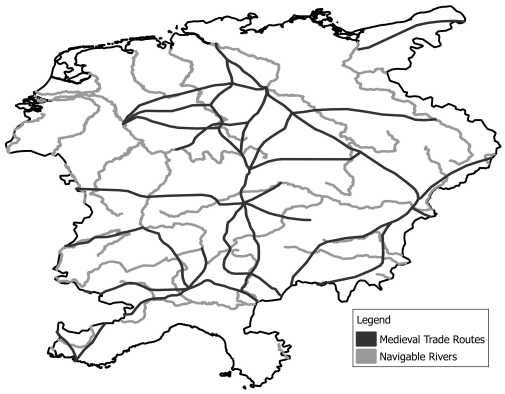
Notes: In this table we present the OLS and Ordered probit results for our baseline regression after controlling for two measures of possible sample selection: the length of the entry and number of citations in *Germania Judaica*.Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.14: Placebo Tests

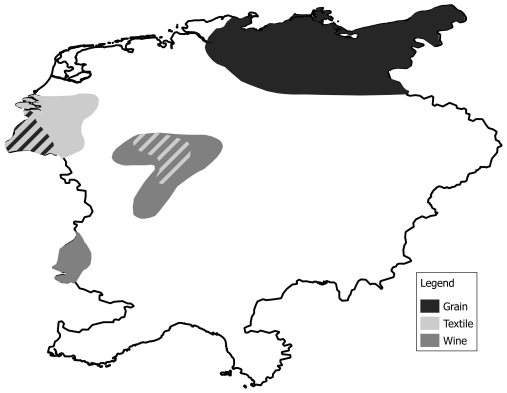
	Dependent Variable: Pogrom Intensity (1-5)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Intensity Scores (OLS)				Randomized Intensity Scores (OLS)			
Randomized Imperial Free City	0.0355	0.0427	0.0437	0.0412				
	(0.183)	(0.183)	(0.179)	(0.202)				
Randomized Bishropic	-0.310	-0.322	-0.331	-0.250				
	(0.320)	(0.336)	(0.355)	(0.406)				
Randomized Archbisophric	-0.137***	0.0475	0.0742	0.0776				
	(0.0371)	(0.0546)	(0.0636)	(0.0874)				
Imperial Free City					0.227	0.189	0.211	0.181
					(0.333)	(0.377)	(0.377)	(0.376)
Archbishopric Seat					-0.230	0.0545	0.182	0.397
					(0.304)	(0.475)	(0.497)	(0.578)
Bishopric Seat					-0.483	-0.551	-0.512	-0.389
					(0.399)	(0.376)	(0.351)	(0.312)
Baseline Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes	No	No	Yes	Yes
Plague Spread	No	No	No	Yes	No	No	No	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	340	340	340	340	340	340	340	340
Adjusted R^2	0.050	0.083	0.082	0.108	-0.009	-0.004	-0.002	0.012

Notes: This table replicates our baseline OLS analysis for randomly assigned Imperial Free Cities, Bishoprics and Archbishoprics and a randomly generated intensity score measure. Columns (1)-(4) report our OLS estimates using randomized treatments. In Columns (5)-(8) we report our results using a randomized intensity score. Baseline controls include whether a community was close to navigable rivers or land routes, measures of textile, wine, and grain production, urbanization, wheat suitability, and ruggedness. Fixed Effects refer to larger political unit fixed effects. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

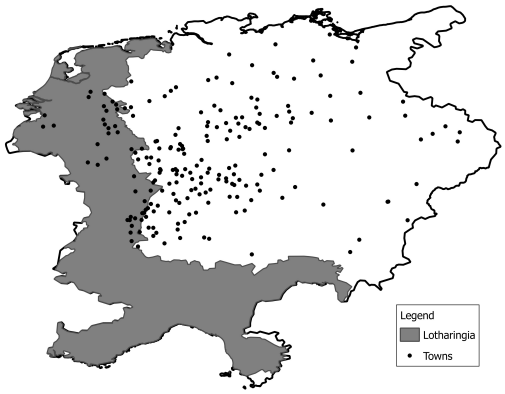
Figure B.2: Additional Maps



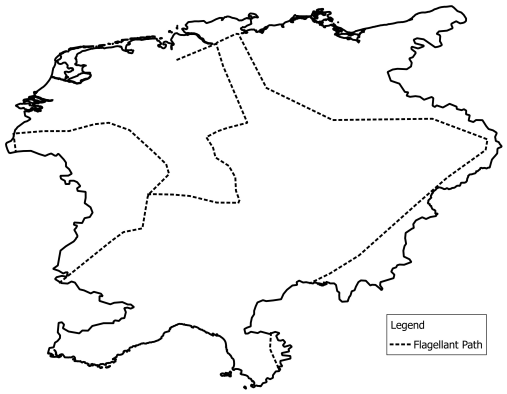
(a) Navigable Rivers and Trade Routes.



(b) Industrial Centers.



(c) The borders of Lotharingia.



(d) Path of the Flagellants.

Figure B.3: Spread of the Black Plague between 1348 and 1350

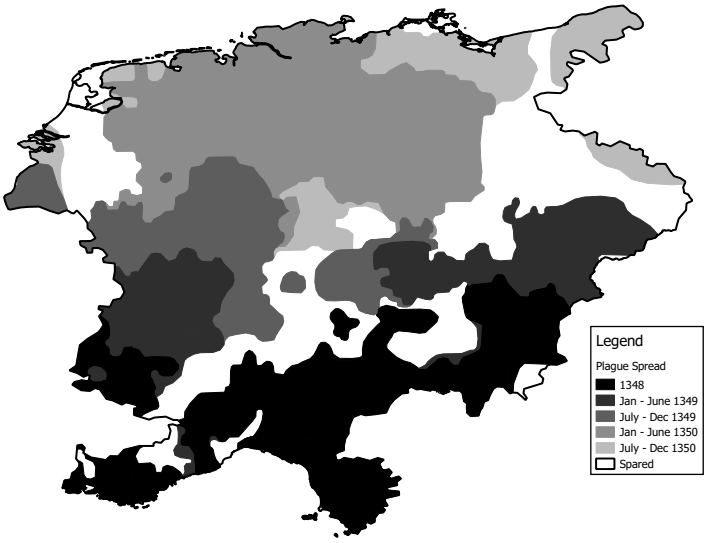


Table B.15: Distribution of the spread of the Black Plague

Year	Plague Spread Month	Frequency
	Pre-1349	4
1349	Jan-Mar	4
	Apr-June	54
	July-Sept	148
	Oct-Dec	29
1350	Jan-Mar	56
	Apr-June	85
	July-Sept	30
	Oct-Dec	5
Spared from plague or later		34

Table notes: "Spared or later" category includes communities that experienced the plague after 1350.

Table B.16: Interactions with Previous Pogroms

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
Free Imperial City	0.749***	0.718**	0.689***	0.661**
	(0.204)	(0.252)	(0.210)	(0.261)
Archbishopric Seat	0.699*	0.280	0.582*	0.241
	(0.359)	(0.469)	(0.339)	(0.474)
Bishopric Seat	0.701***	0.876***	0.730***	0.958***
	(0.152)	(0.171)	(0.171)	(0.212)
Previous Pogrom	-0.00703	-0.0836	-0.0228	-0.111
	(0.236)	(0.224)	(0.210)	(0.198)
Past Pogrom*Free Imperial City	0.328*	0.496**	0.405**	0.612***
	(0.158)	(0.191)	(0.179)	(0.231)
Previous Pogroms	Yes	Yes	Yes	Yes
Plague Spread	Yes	Yes	Yes	Yes
Fixed Effects	No	Yes	No	Yes
Observations	340	340	340	340
Adj. / Pseudo R^2	0.103	0.188	0.0	0.1

Notes: In this table we present the OLS and Ordered probit results for our baseline regression including an interaction term for previous pogroms in communities ruled by Free Imperial Cities. The interaction term of archbishoprics and bishoprics is dropped due to collinearity. The interact term is significant but it does not detracted from the coefficient we obtain for our main explanatory variables in our baseline specification. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B.5 Tables with Odds Ratios

Table B.17: Baseline Results: Odds Ratios

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
	Ordered Probit: Odds Ratios			
Imperial Free City	4.249***	4.225***	4.239***	4.750***
	(2.88)	(2.86)	(3.01)	(2.82)
Archbishopric Seat	15.17***	8.780***	8.932***	7.499***
	(6.05)	(3.07)	(3.67)	(3.03)
Bishopric Seat	6.050***	5.134***	5.167***	6.351***
	(3.70)	(3.63)	(3.77)	(3.64)
Baseline Controls	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes
Plague Spread	No	No	No	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	340	340	340	340
Adj. / Pseudo R^2	0.100	0.120	0.036	0.054

Notes: In this table we present the Odds Ratios for the Baseline Regression presented in Table 2.1. Robust standard errors clustered on the political unit level in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.18: Major Political Houses: Odds Ratios

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
	Ordered Probit: Odds Ratios			
Imperial Free City	6.665***	6.616***	6.654***	7.404***
	(4.05)	(3.89)	(4.08)	(3.53)
Archbishopric Seat	23.43***	14.44***	14.97***	13.02***
	(6.45)	(3.92)	(4.74)	(4.06)
Bishopric Seat	8.725***	7.211***	7.303***	9.342***
	(4.29)	(4.28)	(4.46)	(4.53)
Habsburg	4.924***	4.597***	4.631***	5.710***
	(4.38)	(4.26)	(4.26)	(4.69)
Luxembourg	0.663	0.429*	0.433*	0.478
	(-0.90)	(-2.28)	(-2.19)	(-1.83)
Wettin	2.888	2.647	2.665	2.860
	(1.42)	(1.31)	(1.35)	(1.27)
Wittelsbach	1.363	1.390	1.368	1.356
	(1.04)	(0.87)	(0.74)	(0.78)
Wurtemberg	1.054	1.026	1.006	1.083
	(0.15)	(0.07)	(0.02)	(0.32)
Baseline Controls	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes
Plague Spread	No	No	No	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	340	340	340	340
Adj. / Pseudo R^2	0.100	0.120	0.036	0.054

Table Notes: In this table we present the Odds Ratios for the Major Houses Regression presented in Table 2.2. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.19: Alternative Institutions: Odds Ratios

	Dependent Variable: Pogrom Intensity (1-5)			
	(1)	(2)	(3)	(4)
	Ordered Probit: Odds Ratios			
Imperial Free City	5.152**	4.580**	5.053**	4.730**
	(2.89)	(2.75)	(2.73)	(2.83)
Archbishopric Seat	8.382**	9.272***	7.577**	7.223**
	(3.00)	(4.03)	(3.24)	(2.84)
Bishopric Seat	6.391***	6.244***	6.438***	6.536***
	(3.70)	(3.55)	(3.59)	(3.47)
Lothringia	0.459			
	(-1.70)			
Prince-Electors		0.639		
		(-0.83)		
Monasteries			1.451	
			(1.32)	
ln(*Distance to Prague*)				1.679
				(0.57)
Baseline Controls	No	Yes	Yes	Yes
Previous Pogroms	No	No	Yes	Yes
Plague Spread	No	No	No	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Observations	340	340	340	340
Adj. / Pseudo R^2	0.100	0.120	0.036	0.054

Notes: In this table we present the Odds Ratios for the Baseline Regression presented in Table B.5. Robust standard errors clustered on the political unit level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix C: The Long-Run Effects of the Redistribution of Church Land in France

C.0.1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Percent Confiscated	194	5.901546	5.866913	0	40.1
Log Wheat Yield	194	2.542434	0.2965593	1.894766	3.240641
Log Potato Yield	194	4.567149	.4968883	3.328712	6.007618
Pipe Manufacturers	194	5.396907	4.382276	0	24
Elevation Range	194	473.9433	503.8787	54	3536
Wheat Suitability	194	3.782438	1.213183	1.333333	8
Potato Suitability	194	4.928633	1.04627	2.75	8
Log Market Access 1789	194	12.51086	1.052389	10.27445	15.75631
Change in MA 1789-1841	194	0.3311653	0.396266	-1.472215	1.539228

Table C.1: Descriptive Statistics

C.0.2 Additional Maps

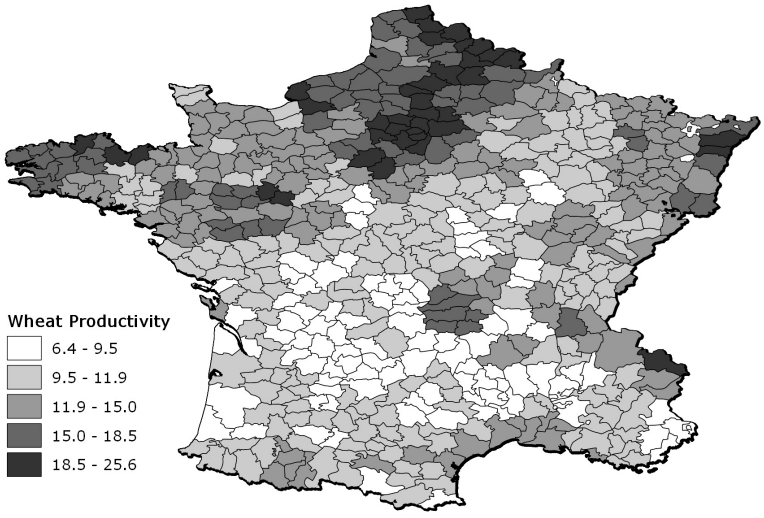


Figure C.1: Wheat Productivity

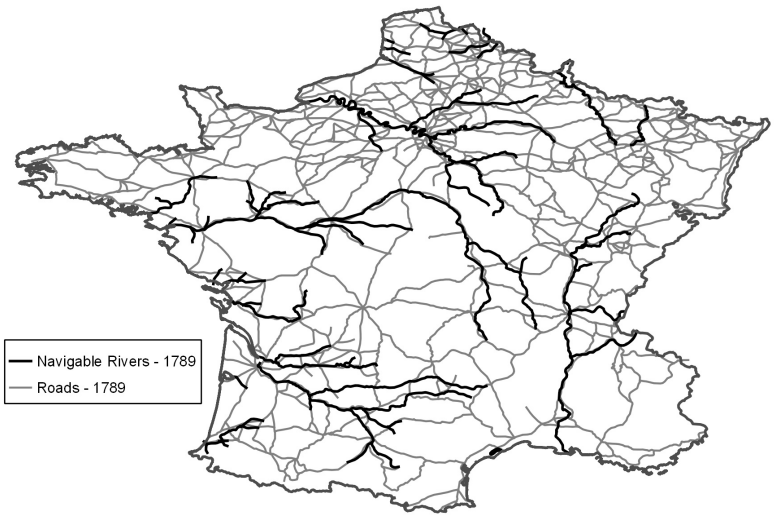


Figure C.2: Transportation Networks in 1789

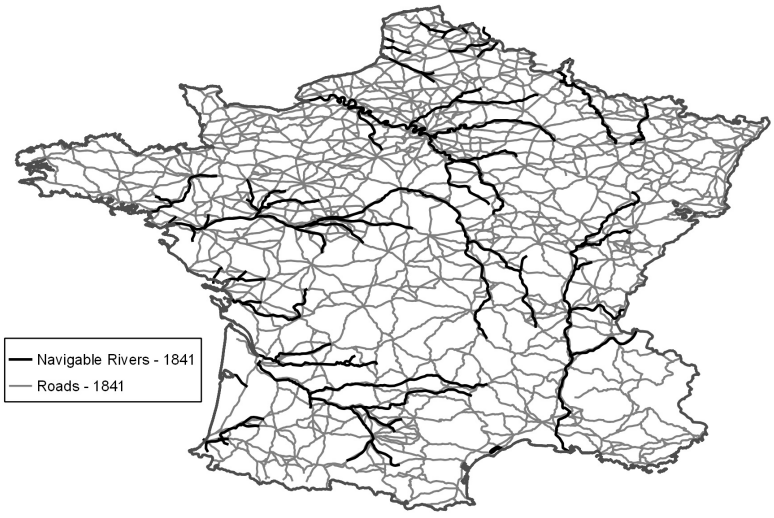


Figure C.3: Transportation Networks in 1841

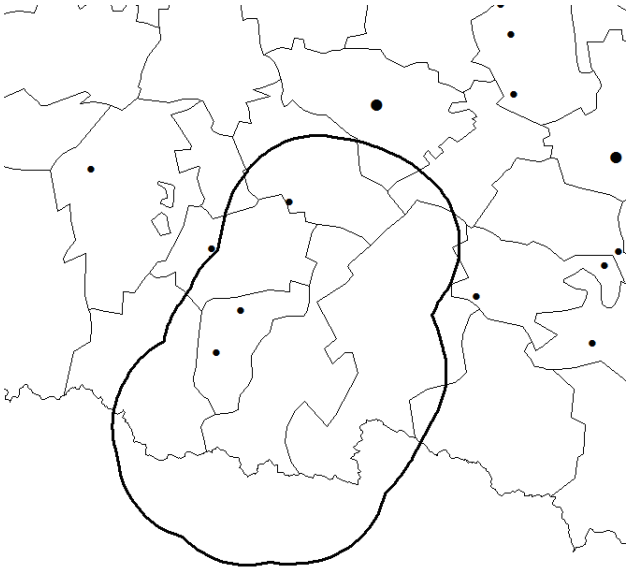


Figure C.4: Construction of 25km buffer around the districts. Circles represent pipe manufacturers.

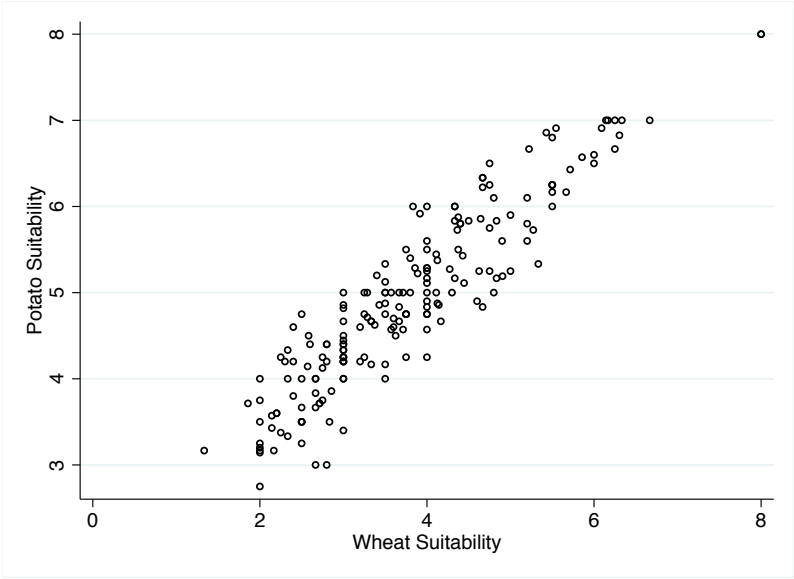


Figure C.5: Wheat versus Potato Potential Suitability (Source: FAO)

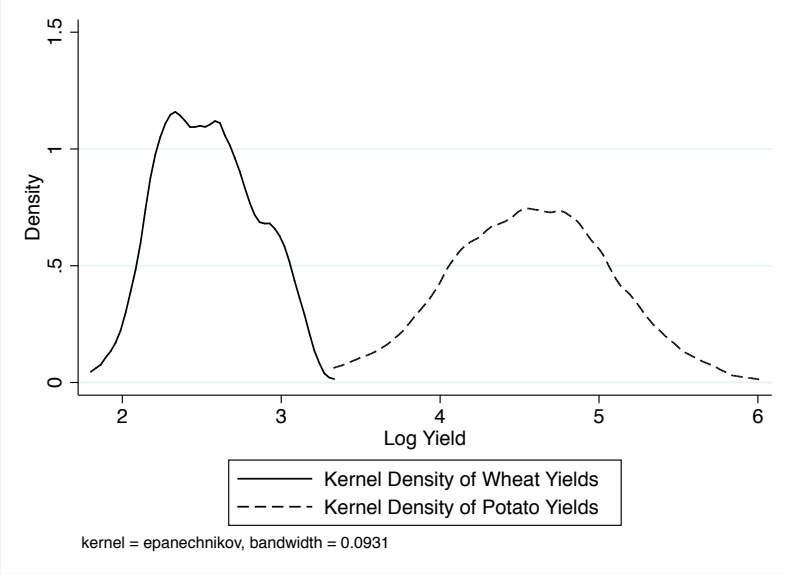


Figure C.6: Distribution of Wheat and Potato Yields, 1841

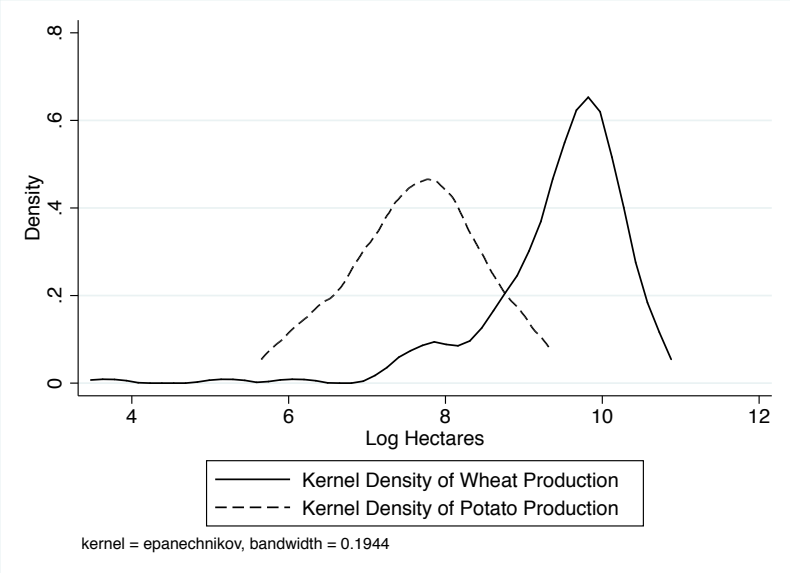


Figure C.7: Distribution of Wheat and Potato Acreage

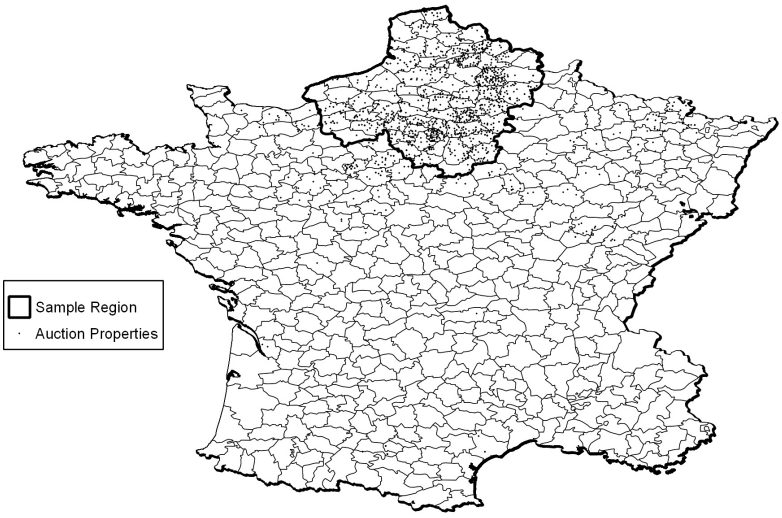


Figure C.8: Auction Plot Locations. Sample used in regressions includes districts with bold border.

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Biography

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