Author Manuscript

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/ecoj.12331

This article is protected by copyright. All rights reserved

Jewish Persecutions and Weather Shocks: 1100-1800*

Robert Warren Anderson
University of Michigan, Dearborn

Noel D. Johnson
George Mason University

Mark Koyama
George Mason University

Author Manuscript

Abstract

What factors caused the persecution of minorities in premodern Europe? Using panel data consisting of 1,366 persecutions of Jews from 936 European cities between 1100 and 1800, we test whether persecutions were more likely following colder growing seasons. A one standard deviation decrease in growing season temperature in the previous five-year period increased the probability of a persecution by between 1 and 1.5 percentage points (relative to a baseline of 2 %). This effect was strongest in weak states and with poor quality soil. The long-run decline in persecutions was partly attributable to greater market integration and state capacity.

Throughout most of history, religious minorities were the victims of persecution. Violence against religious and ethnic minorities remains a major problem in many developing countries today (Horowitz, 2001; Chua, 2004; Yanagizawa-Drott, 2015). In contrast, religious persecution in the developed world is much less common than it used to be.[1] This paper investigates why some states persecuted minorities more than others in preindustrial Europe and why this persecution gradually decreased between 1500 and 1800.

To answer these questions, we focus on the persecution of the Jews in medieval and early modern Europe. Violence against Jews was caused by many factors, including religiously

*mkoyama2@gmu.edu. Center for Study of Public Choice, Carow Hall, George Mason University, VA 22030. Corresponding author. We are grateful to Megan Teague and Michael Szpindor Watson for research assistance. We benefited from comments from Martin Cripps, four anonymous referees as well as Ran Abramitzky, Daron Acemoglu, Quamrul Ashraf, Dean Phillip Bell, Pete Boettke, Tyler Cowen, Carmel Chiswick, Melissa Dell, Dan Bogart, Markus Eberhart, James Fenske, Joe Ferrie, Raphäel Franck, Oded Galor, Avner Greif, Philip Hoffman, Larry Iannaccone, Remi Jedwab, Garett Jones, James Kai-sing Kung, Pete Leeson, Yannay Spitzer, Stelios Michalopoulos, Naomi Lamoreaux, Jason Long, David Mitch, Joel Mokyr, Johanna Mollerstrom, Robin Mundill, Steven Nafziger, Jean-Laurent Rosenthal, Jared Rubin, Gail Triner, John Wallis, Eugene White, Larry White, and Ekaterina Zhuravskaya. We'd also like to thank seminar participants at Chapman University, George Mason University, King's College, London, Stanford University, the Elliott School for International Affairs, the 2013 All UC Conference, the Clio World Congress at the University of Hawaii, Rutgers University, Northwestern University, the Conference on Diversity and Culture sponsored by HSE, Moscow, the Deep Determinants of Economic Growth Conference at Brown, and Colby College. All remaining errors are the fault of the Authors. We are grateful to Jane Perry for proof-reading the paper.

[1]Excepting, of course, the large-scale killings associated with the genocides of the mid-twentieth century. The decline in religious persecution is especially evident when measured on a per capita basis. For a detailed discussion of the decline of mass killings and persecutions over time see Pinker (2011).

This article is protected by copyright. All rights reserved

motivated antisemitism. We choose, however, to build on the claim advanced by historians that Jews were convenient scape-goats for social and economic ills.[2] To test this hypothesis, we exploit variation in reconstructed city-level temperature to investigate whether persecutions against Jews were associated with colder temperatures. We do this using panel data comprising 1,366 city-level persecutions of Jews from 936 European cities that are recorded as having Jewish populations between the years 1100 and 1800 in the 26-volume *Encyclopaedia Judaica* (2007) and data on yearly growing season temperature (April to September) constructed by Guiot and Corona (2010).

We find that a one standard deviation decrease in average growing season temperature (about one-third of a degree celsius) raised the probability that a community would be persecuted from a baseline of about 2% to between 3% and 3.5% in the subsequent five-year period. This effect is larger in cities with poor quality soil and with weak states.

To clarify our empirical analysis, we develop a conceptual framework that outlines the political equilibrium under which premodern rulers would tolerate the presence of a Jewish community. We show why this equilibrium was vulnerable to shocks to agricultural output and why this vulnerability may have been greater in locations with poor quality soil and in weak states that were more susceptible to popular unrest. Consistent with our theoretical framework, we find the empirical relationship between temperature shocks and persecutions was strongest in regions controlled by weak states and with poor soil quality.

A growing literature attributes the emergence of modern political and economic institutions to the transition from closed to open access institutions between 1500 and 1800 (North et al., 2009; Acemoglu and Robinson, 2012). We provide new evidence concerning this transition. In extractive societies, toleration for minority groups was always conditional; negative economic shocks led to the unraveling of this toleration and to persecutions and expulsions. Our analysis shows that the relationship between negative economic shocks and the persecution of Jews was weaker in stronger states and diminished as markets became better integrated. We support these results with extensive narrative evidence consistent with the hypothesis that more centralised

[2]Important historical contributions include Baron (1965a,b, 1967a,b, 1975); Chazan (2006, 2010); Israel (1985); Jordan (1989, 1998); Mundill (1998, 2010); Poliakov (1955); Richardson (1960); Roth (1961); Stow (1981, 1992) and many others.

Author Manuscript

This article is protected by copyright. All rights reserved

states as well as better integrated markets played an important role in reducing the vulnerability of minority groups to economic shocks and in shaping Europe's gradual transition from closed to open access institutions.

We follow a number of papers that use weather to identify the impact of economic shocks on violence and conflict in preindustrial or developing economies. Oster (2004) finds that cold weather shocks were associated with witchcraft trials in early modern Europe. Miguel (2005) finds that extreme levels of precipitation were associated with a higher number of witchcraft deaths in modern Tanzania. In a historical context, both Zhang et al. (2006) and Tol and Wagner (2010) find a connection between colder weather and warfare in preindustrial China and Europe respectively. Bai and Kai-sing Kung (2011) examine the relationship between climate and conflicts between nomads and the state on the borders of premodern China. Jia (2014) examines the effect weather-induced harvest failure had on civil conflict and revolts in Imperial China. Chaney (2013) provides evidence that sharp deviations in the Nile floods strengthened the power of religious leaders who could threaten the political authorities with revolt. Fenske and Kala (2013) show that positive climate shocks (a decrease in temperature in this context) in sub-Saharan Africa increased slave exports and thus had a perverse effect on economic performance and welfare.[3] Waldinger (2014) uses temperature data similar to those we employ to study the effect of colder temperatures between 1500 and 1750 on urban growth in Europe.

By establishing temperature shocks as a potential trigger for persecutions of Jews in preindustrial Europe, our findings also complement two important recent contributions on the persistence of antisemitic attitudes: Voigtländer and Voth (2012) and Grosfeld et al. (2013). Voigtländer and Voth (2012) use data from the massacres that followed the Black Death to establish the persistence of antisemitic cultural traits at the local level in Germany. They show these cultural factors were an important precondition for antisemitic violence in the 1920s and for support

[3]Dell et al. (2014) surveys the literature on climate and economics. Hsiang and Burke (2014) and Hsiang et al. (ming) survey a range of quantitative studies that find a causal link between climate change and social conflict. Madesam et al. (2013) find that weather has an effect on the ability of political groups to organise in the modern US. In addition there are several recent papers which investigate the effect of weather on economic outcomes. For example, Jones and Olken (2010) look at the effect of weather on exports, Maccini and Yang (2009) investigate the effect of weather shocks on children's health, and Dell et al. (2012) investigate the negative effects of warm temperatures on developing economies. Durante (2009) explores the relationship between climatic variability in the past and trust today across European countries. Anderson (2012) finds that lower temperatures were associated with more sentences being passed down by the Portuguese Inquisition.

Author Manuscript

This article is protected by copyright. All rights reserved

for the Nazi party. Grosfeld et al. (2013) examine the persistence of anti-market sentiments in Imperial Russia's Pale of Settlement where Jews were confined from the end of the eighteenth through to the early twentieth century. They argue that within the Pale, non-Jews developed a set of anti-Jewish and anti-market values which have persisted to this day. Our findings are complementary to these studies as we shed light on the timing and causes of antisemitic violence across Europe between 1100-1800.[4] We delineate the circumstances under which negative supply shocks were more likely to trigger expropriations and expulsions in societies that were permeated with antisemitism and thus contribute to a growing literature on the causes of persecution.[5]

Finally, our findings are related to a growing literature on the economic history of the Jews in medieval and early modern Europe. Barzel (1992) and Koyama (2010b) study why the Jews were expelled from medieval England. Pascali (2015) examines the consequences of Jewish expulsions from Italy in the early modern period. He finds that cities that had either Jewish pawn banks or *Monti di Pietà* charitable Christian lending institutions are significantly more financially developed today while those parts of Italy that were ruled by Spain and expelled their Jewish communities in 1541 remain comparatively underdeveloped. Botticini and Eckstein (2012) provide a novel explanation for why Jews specialised as moneylenders during the middle ages. Our theoretical and empirical results complement their account by explaining why this specialisation, despite making Jews especially valuable to medieval rulers, ultimately placed Jewish communities in a political equilibrium in which they were vulnerable to persecution and expulsion.

[4] Antisemitism is a nineteenth century term. Nevertheless, following Langmuir (1990), it has also been used by medieval historians to describe the rise of virulent anti-Jewish hatred and violence after 1100, a development that was based upon a common set of tropes, which sought to blame Jews for personal misfortunes and tragedies (i.e., in the case of ritual murder accusations) or for general social ills (i.e., in the charges of host desecration, well poisoning, coin-clipping, or diabolism). See Moore (1992, 42-43) and Stacey (2000, 163-166).

[5] For example, Glaeser (2005) studies the incentives politicians have to incite hatred against particular groups; Mitra and Ray (2013) provides a theory of ethnic conflict and applies it to Hindu-Muslim violence in India; Johnson and Koyama (2014b) examine the relationship between the rise of the French state and the decline in trials for witchcraft; Vidal-Robert (2011) studies what factors were associated with more trials by the Spanish Inquisition; and Acemoglu et al. (2011) estimate the economic costs of the Holocaust in Russia.

Author Manuscript

This article is protected by copyright. All rights reserved

1 Weather Shocks and Jewish Persecutions

Jews in early medieval Europe specialised as merchants and moneylenders (Botticini and Eckstein, 2012, 153-200). Rulers encouraged Jewish settlement in order to promote economic development. The Bishop of Speyer in 1084 wrote: 'When I wished to make a city out of the village of Speyer, I Rudiger, surnamed Huozmann, bishop of Speyer, thought that the glory of our town would be augmented a thousandfold if I were to bring Jews' (quoted in Chazan, 2010, 101).

A political equilibrium emerged that enabled European rulers to benefit financially from the presence of Jewish communities but which left the Jews themselves vulnerable to persecution and the threat of expulsion. Over time, Jews specialised as moneylenders (Botticini and Eckstein, 2012, 201-247).[6] Jewish usury was frequently condemned by the Church, but it was promoted by secular rulers both because credit was understood to be crucial to the medieval economy and because it provided rulers with an accessible tax base. The Diet of Mainz proclaimed that, 'as loans are necessary and Christians prohibited to lend on profit, the Jew must be allowed to fill the gap' (Stein, 1956, 144).[7]

As outsiders in a society that defined itself in opposition to unbelievers, Jews aroused suspicion from others.[8] But it was in the long-run interest of secular rulers to protect their Jewish communities. According to medieval political theory: Jews were serfs of the exchequer because, in return for protection against violence, they had submitted to the king and could therefore be taxed at his discretion (Baron, 1967b). Rulers exploited Jews as 'fiscal sponges' to use a

[6] See Baron (1967b, 135). Emery (1959); Lipman (1967); Mundill (1991) and Botticini (1997) provide excellent empirical studies of how medieval Jewish moneylenders operated. For analysis of the tightening of the usury prohibition see Chazan (1974) and Koyama (2010a).

[7] As Baron wrote: 'Many Jews and Christians alike realised that, next to the religious tradition, the main reason for the former's toleration in western lands was the rulers' self-interest in the revenue derived from them' (Baron, 1967b, 198).

[8] See Moore (2008, 26-42). This hostility could manifest itself among elite groups as well as among peasants. In Renaissance Italy, Jewish moneylenders lent to the poor and were often championed by them, and were typically, instead, opposed by city elites (Botticini, 2000). It is important to stress that we do not attempt to provide an economic or rational choice explanation for the virulent antisemitism that emerged in medieval Europe and that had a variety of sources (see Trachtenberg, 1943; Voigtländer and Voth, 2012). For example, Menache (1985, 1997) analyses the importance of the blood libel myth in generating an atmosphere conducive to expulsion. What we do attempt to explain is why negative economic shocks led to the expulsion and expropriation of Jewish communities in some polities but not in others.

Author Manuscript

This article is protected by copyright. All rights reserved

contemporary metaphor: 'No sooner did they suck up the money [from the population through their usury], than the overlords proceeded to squeeze it out of them into their own pockets' (Baron, 1967b, 199).[9] The major problem with this arrangement was that medieval rulers struggled to make credible commitments. They were often unable to protect Jewish communities from unrest or anti-semitic violence and frequently faced the temptation to expropriate Jewish communities for short-term gain.

The Pastoureaux or Shepherds' Crusade of 1320 illustrates how temperature shocks disrupted the political equilibrium that protected Jews in medieval states. The Jews were allowed to resettle in France in 1315 on the condition that they act as moneylenders and fiscal agents for the crown. Unfortunately, a succession of disastrous harvests ensued between 1315 and 1321. Campbell describes this as possibly 'the single worst subsistence crisis, in terms of relative mortality, in recorded European history' (Campbell, 2010, 7).[10] These shocks produced civil unrest across swathes of northern Europe. In France, a movement arose known as the *Pastoureaux*. The *Pastoureaux* first attacked royal castles in Normandy and the Paris region, then they moved south where they persecuted Jews throughout Languedoc in cities like Saintes, Verdun, Grenade, Castelsarrasin, Toulouse, Cahors, Lézat, Albi, Auch, Rabastens and Gaillac (Barber, 1981a, 12). The 'brunt of peasant violence fell upon the Jews, for they . . . could be blamed for the economic hardships which the lower classes had recently been suffering' (Barber, 1981b, 163).[11]

The king protected the Jews where possible, but massacres occurred wherever royal authority was weak. This example illustrates the connection between a subsistence crisis, political unrest

[9]In France, this implicit agreement first appears to have been stated in 1198 when the Jews were readmitted into the Royal Domain by Philip Augustus (Moore, 2008, 41). In England, where it was perhaps most fully developed, it followed the massacres of Jews in York and the establishment of the Exchequer of the Jewry in 1194 (Cramer, 1940; Stacey, 1985, 1995; Dobson, 2003; Brown and McCartney, 2005; Koyama, 2010b).

[10]It was followed by the so-called Great Bovine Pestilence, which wiped out 60% of livestock on the continent (Slavin, 2012).

[11]Tension had been building for some time as a result of the poor harvests, and the peasants undertook religious demonstrations and parades aimed at ending the famine (Barber, 1981b, 162-163). Contemporaries also mention that they were incited by debtors of the Jews (Barber, 1981b, 146). Nirenberg argues that 'the shepherds and the townspeople who supported them' understood this relationship, and 'recognised that the heavy taxes placed on Jews were a form of indirect taxation on Christians' (Nirenberg, 1996, 48). When the *Pastoureaux* attacked Jews and looted their possessions in face of the royal attempts to protect them 'they were both attacking a much-resented aspect of administrative kingship and dramatising the state's inability to protect its agents, the Jews' (Nirenberg, 1996, 50). Note that this is an instance of peasants attacking Jews; in other cases, townspeople targeted the Jews. This means that it is difficult to generalise about which economic strata would have the strongest incentive to expropriate the Jewish community in the event of a negative shock to the agrarian economy.

Author Manuscript

This article is protected by copyright. All rights reserved

and antisemitic violence in a state that was unable to protect its Jewish minority. There are many other examples of persecutions that follow this pattern of weak polities being unable to credibly commit to their agreements with Jewish communities in the face of economic shocks. In the next section we develop a framework that clarifies the mechanisms that connected temperature shocks to subsistence crises and political unrest and then to antisemitic violence.

2 A Conceptual Framework

In this section we develop a simple framework to explore the relationship between colder temperature, income shocks, state capacity, and persecutions. Standard models of autocratic states struggle to explain why rulers would ever expel or destroy a valuable fiscal resource like the Jews. To understand why expulsions occurred, therefore, we need to consider cases where the sovereign cannot credibly commit to protect a vulnerable minority.[12]

Consider an economy in which agriculture is the predominant source of income. Agricultural output is a function of temperature as well as social quality, labor inputs and a host of other variables. In Europe colder growing season temperatures reduce agricultural output. In particular several successive years of below optimal temperature could cause significant hardship and pressure on resources especially if a dearth caused peasants to consume their seed-corn. We will refer to such episodes as temperature shocks.[13] In sub-Saharan Africa high temperatures adversely affect agricultural output, but in Europe wheat and other grains can survive cold winter temperatures but are strongly affected by cold and wet weather during the growing season.[14]

We assume that the Jews play an important role in the commercial sector of the economy and that they are a valuable source of revenue to the ruler. In normal times, therefore, the ruler imposes a tax on the Jewish community that maximises discounted future tax revenue subject

[12]We build on the reasoning developed by Acemoglu (2003) in our assumption that the Jewish community cannot make a Coasian bargain with the ruler in order to avoid persecution.

[13]In general, there is an optimal temperature, say T^*, that solves: $Q = F(T; \mathbf{X})$ where Q is agricultural output and $\mathbf{X}$ a vector of other inputs. Deviations from the optimal temperature $|T - T*|$ lower agricultural output. A temperature shock is a deviation that is large relative to the standard deviation of temperature fluctuations.

[14]Numerous studies argue that there is a strong relationship between cold temperature and reduced agricultural output in western Europe (see Galloway, 1986, for a survey of this literature). According to Porter and Gawith (1998) wheat has a lethal low temperature of $-17.2 \pm 1.2°C$, and a lethal high temperature of $47.5°C$. They note that the optimal temperature for wheat cultivation over the course of the growing season is between $17 - 23°C$ (Porter and Gawith, 1998, 25).

Author Manuscript

This article is protected by copyright. All rights reserved

to the costs of collection and enforcement. In exchange for these taxes, he promises to offer protection to the Jewish community from either elite or popular antisemitism.

Consider a simple political economy framework in which temperature shocks lower agricultural output and incomes and hence cause political unrest. This unrest can be driven by either peasants or elites. Low incomes can cause peasants to rebel directly. But low agricultural output could also cause a crisis of 'surplus extraction' among elites (as low agricultural output reduces the amount of income they can extract via rents, taxes or feudal dues). In these situations Jews were often targets—either because they were held to be directly responsible for the misfortune of the population or because they were vulnerable targets and perceived to possess large amounts of wealth. As a result, this framework predicts that periods of colder temperature will be associated with a higher probability of persecution.

Rulers of states with high state capacity can quell such rebellions relatively easily. In contrast, rulers of states with low capacity are highly vulnerable to either popular or elite unrest. Stronger rulers will therefore be able to credibly commit to protecting their Jewish community regardless of the income shocks that they face. Weaker rulers, however, will not be able to make such a commitment. Moreover, rulers of states with less developed fiscal capacity will be more likely to face a fiscal crisis as a result of periods of sustained low harvests, whereas rulers of states with greater fiscal capacity will have more access to alternative sources of revenue and revenue-smoothing technologies. For states with low fiscal capacity, on the other hand, the easily appropriable wealth of the Jewish community will be a more temping target in periods of fiscal distress. As a result, weaker rulers are more likely to expropriate Jewish communities themselves, in anticipation of antisemitic violence or unrest. A second prediction from this analysis is that the relationship between colder temperatures and Jewish persecution will be stronger in areas governed by weak states.

Finally, our framework suggests several other factors that could mediate the relationship between temperature shocks and persecutions. There is evidence that regions with poorer quality soil might be more vulnerable to periods of colder temperature as better soil quality mitigates the negative effect of a temperature shock.[15] However, areas with poorer quality soil might also

[15]There are several reasons why we expect regions with poor quality soil to be more vulnerable to climatic

Author Manuscript

This article is protected by copyright. All rights reserved

have higher demand for the lending services provided by Jewish communities. Therefore, rulers might have a stronger incentive to protect Jewish communities in these regions. A priori it is unclear which effect would dominate. Second, market integration and access to urban markets could dampen the effect of local temperature shocks on agricultural outcome and food price. It should be noted, however, that there were limits to the ability of markets to smooth shocks to output in the preindustrial world as it was expensive to transport foodstuffs.[16] Moreover, spatial correlation in temperature shocks limited the ability of markets and trade to smooth volatility in the price of food staples. Nevertheless, in areas closer to well-developed markets we expect the relationship between cold temperatures and persecutions to be weaker.

3 Empirical Analysis: The Effect of Temperature Shocks on Jewish Persecutions

Our main empirical specification is as follows:

$$y_{it} = \beta T_{i,t-1} + \eta_i + \mu_t + \mathbf{X_{it}\Omega} + \varepsilon_{it} \quad , \tag{1}$$

where y_{it} is a binary variable measuring whether a persecution or expulsion occurred in city i during period t. When we include all violent acts against Jews in the dependent variable we call this measure *Persecutions*. When we only include expulsions, this variable is labeled *Expulsions*. $T_{i,t-1}$ is a measure of the average temperature for city i in the period preceding the persecution expressed as the degrees celsius deviation from the 1961-1990 average. We report both estimates in which we include a full vector of city fixed effects, η_i, as well as the DID estimates, which include time dummies, μ_t. In our baseline regressions we use five-year averaged data so that each period t refers to an average of temperatures over the years in that period

shocks. Higher quality soil is more robust to extreme variations in temperature (Porter and Semenov, 2005). Consistent with this, Malik and Temple (2009) find that regions with poor soil quality appear to experience greater volatility in agricultural output. In this case, a population in an area with poor soil quality might be more vulnerable to colder temperatures than a population in an area with high quality soil, even if their levels of per capita income were similar.

[16]Masschaele provides estimates of transport costs for fourteenth century England. On average, transporting wheat by land would increase the price by 0.4 % per mile—doubling the price of grain for every 250 miles traveled. A ten mile journey raised the price by 4 % (Masschaele, 1993, 274). Other evidence suggests that transporting grain was much more expensive in most of continental Europe.

Author Manuscript

This article is protected by copyright. All rights reserved

e.g. 1535-1539; consequently we have 140 observations for each city.[17] We do this primarily because of potential measurement error in both the persecutions data and the temperature variable (Guiot and Corona, 2010).[18] As such, if the the persecution is recorded as occurring in 1541, we use the data on temperature from 1535 to 1539 to explain it in the five-year data. We focus on temperature during the preceding five-year period rather than temperature during the contemporaneous period in order to reduce measurement error and because historians argue that successive bad harvests placed the greatest strain on agricultural societies.[19] In Section 4 we show our results are robust to using yearly data with city fixed effects and year dummies.[20] All regressions include controls for the ten years surrounding the Black Death in Europe (1346-1355) and a measure of urban density around city i at time t.[21] We use a linear probability model as our main specification. We prefer the linear probability model as non-linear models with fixed effects suffer from the incidental parameter problem and this can bias asymptotic standard errors downwards (Greene, 2004).

Data

In order to measure violence against Jews, we use city–level data on the presence of a Jewish community in Europe between 1100 to 1800 taken from the twenty-six volume Enc (2007). There are 1,069 cities in our complete data set. This number falls to 936 after we introduce our urban density control variable.[22] Figure 1 illustrates the geographic coverage of our Jewish city data and the distribution of persecutions for the entire period. The *Encyclopedia* typically mentions when Jews entered a city, when they were expelled, when there was some other violent act perpetrated against them, and when they were allowed re-entry (if ever). We are interested in

[17]That is, seven centuries of data times twenty five-year periods in each century.

[18]For instance, several medieval edicts of expulsion allowed the Jews a period of time of up to six months to leave the city. Thus, for several cities, different sources record different dates of expulsion for a single event e.g. the city of Cologne decided not to renew the permit it granted Jews to reside in the cities in 1423 but only enforced the expulsions of the Jewish community itself in 1424.

[19]These claims are robustly supported by our placebo regressions which we report in Section 4. There we find effects of negative temperature on persecution probability up to eight years preceding the event. Reassuringly, we find no evidence that future temperature affects persecution probability.

[20]In the yearly regressions, for example, the persecution in 1541 is explained using temperature data in the 5 year period prior to the persecution i.e. 1537 to 1541.

[21]See Appendix D for a discussion of the Black Death and violence against Jews. See Appendix C for further description of the population density measure.

[22]We lose some cities in eastern Europe. Excluding the urban density control and including these cities doesn't change our results.

Author Manuscript

This article is protected by copyright. All rights reserved

all of these pieces of information since in order to model the probability of violence against Jews, we need to know when that city had a Jewish population.[23]

Using these data, we construct a variable called 'Jewish Presence,' which is equal to one during all the years there is a known Jewish community in the city and zero otherwise. There is a Jewish community present in the average city about 40% of the time. Our dependent variable *Persecution* is binary and measures whether there is either an expulsion or other major violent act (i.e. a pogrom) against Jews in a city in a given five-year period. There are 1,366 such events in our base data set: 821 expulsions and 545 pogroms. Our other dependent variable is *Expulsion* and measures whether there is an expulsion or not in the city during the five-year period.

We restrict our analysis to use only the sample of cities that currently have a Jewish population. Cities without a Jewish population are treated as missing variables. This approach is consistent with a conventional strategy used in discrete-time survival analysis as discussed by Box-Steffensmeier and Jones (2004) and Yamaguchi (1991). Furthermore, our results will also be easier to interpret than with the alternative Cox hazard models.

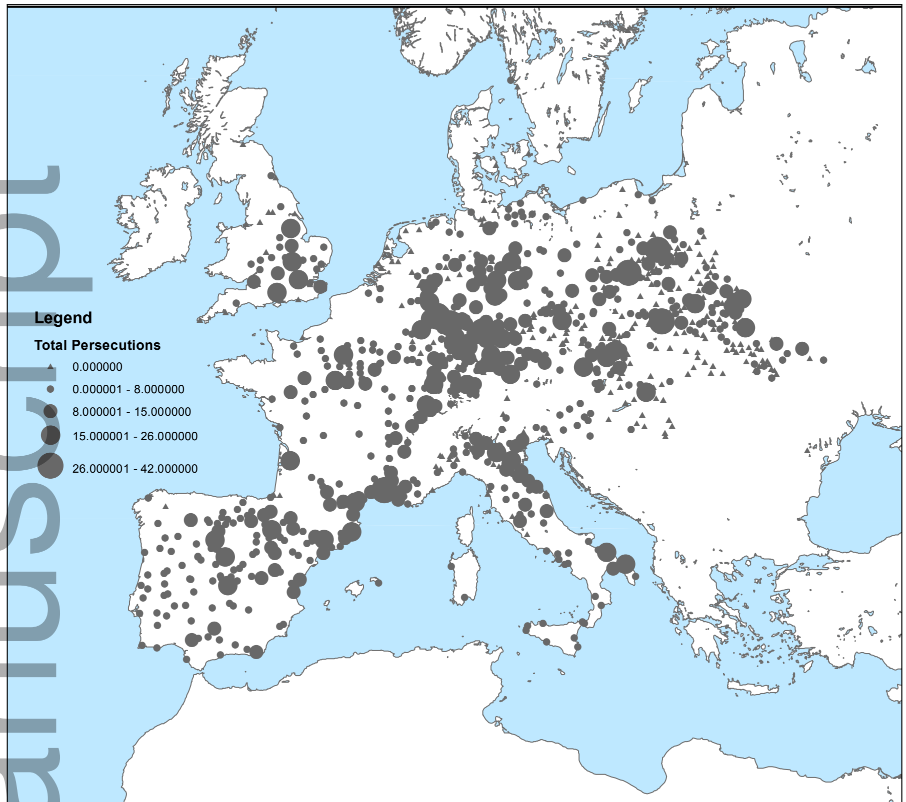
In order to measure temperature shocks we employ data on reconstructed temperature for medieval and early modern Europe provided by Guiot and Corona (2010). Guiot and Corona (2010) collect information from numerous proxy sources including ninety-five tree ring series, sixteen indexed climatic series based on historical documents, ice-core isotopic series, and pollen-based series to construct a thirty-two point grid of reconstructed temperature during the growing season (April to September) for all of Europe between 900 and the present-day. Their historical temperature reconstructions are based on a model mapping proxies into growing season temperatures. This model is calibrated using actual temperature data from 1850–2007. We use geospatial software to interpolate the temperature for the area between the grid points so that we have a smooth map for each year. Finally, we extract the yearly temperatures for each of our cities. We follow Guiot and Corona (2010) in expressing the temperature data in terms of differences relative to the 1961–1990 average.

[23]A more detailed description of all our data is contained in Appendix C.

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 1:
Jewish persecutions, 1100-1800.



Circles represent a Jewish city that has at least one persecution. Larger circles represent more persecutions. Triangles are Jewish cities in our data that never persecute. Source: Enc (2007).

Author Manuscript

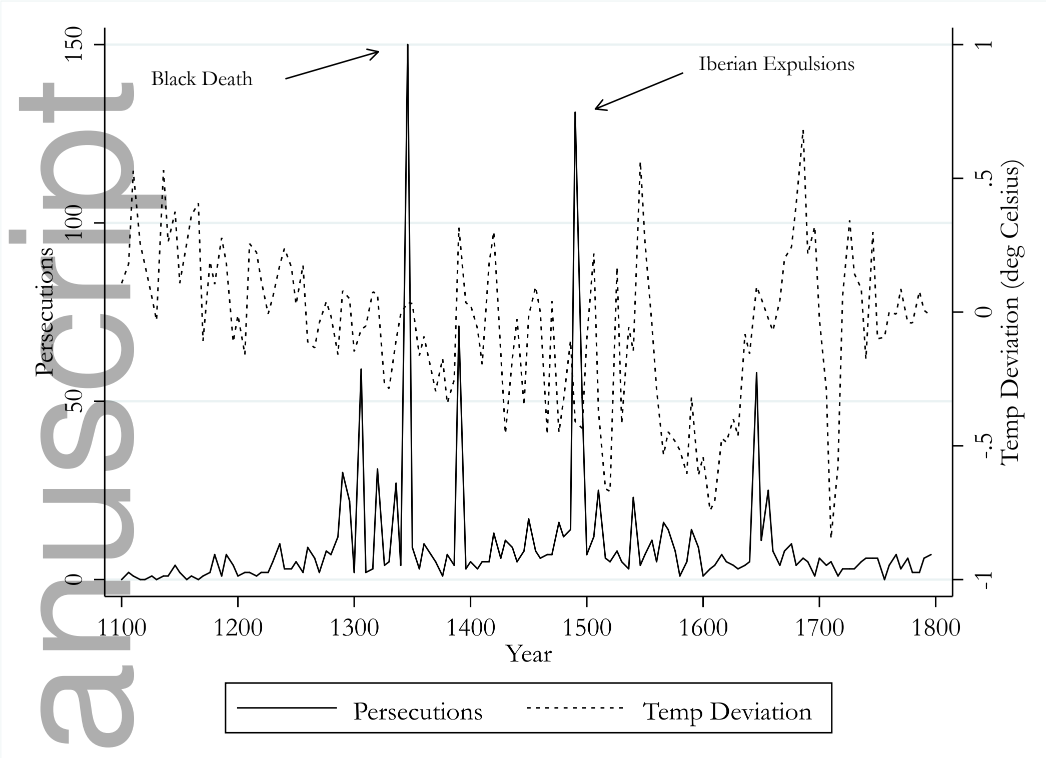
To address potential bias stemming from unobserved economic development of a city or its access to markets, we construct a measure of urban density. This approach is consistent with other work on early modern Europe that relies on urbanisation data in lieu of estimates of per capita GDP or market development.[24] Our urban density variable is called *PopDensity* and is based on the Bosker et al. (2013) dataset of cities. As our Jewish cities do not correspond perfectly to the Bosker et al. cities, we use geospatial software to create a population heat map for every century based on all Bosker et al. cities with populations greater than 5,000. Each point on the map is assigned a population number based on the inverse distance-weighted value of all Bosker et al. cities within 1 degree of the point (about 100 kilometres depending on the

[24]See De Long and Shleifer (1993); Acemoglu et al. (2005) and Nunn and Qian (2011) among many others.

This article is protected by copyright. All rights reserved

latitude).[25]

Figure 2:
Jewish persecutions and temperature deviations.



Source: Enc (2007) and Guiot and Corona (2010).

Author Manuscript

One other potential source of bias in our estimates is the disproportionate effect of the Black Death on Jewish persecutions in the years immediately following its arrival in Europe in 1348. Figure 2 shows how average temperature and the total number of persecutions varied over time. The Black Death is an obvious outlier.[26] Jewish communities faced unprecedented levels of persecution during the first wave of the plague—as they were singled out as scapegoats and easy targets of expropriation and popular violence as the existing social order weakened (see Voigtländer and Voth, 2012). Since we do not want to identify the effect of temperature on antisemitic violence using a disproportionate number of observations associated with epidemiological causes,

[25]We provide more details about the construction of this and other variables in Appendix C and descriptive statistics are in Appendix A.

[26]Another potentially influential set of data points are associated with the Iberian national expulsions at the end of the fifteenth century. We will exclude these from our regressions in Panel B of Table 1 to demonstrate the robustness of our baseline results.

This article is protected by copyright. All rights reserved

we choose to control for the Black Death years by allowing both the intercept and the slope in all specifications to vary for the years 1346-1355.

3.1 Baseline Results

In Panel A of Table 1 we report the results of estimating Equation 1 using *Persecution* as the dependent variable in columns (1)-(3) and *Expulsion* as the dependent variable in columns (4)-(6). Robust standard errors clustered on the nearest temperature grid point from Guiot and Corona (2010) are reported in parentheses.[27] We multiply all coefficients by 100 for ease of interpretation.

In specification (1) we report the β under OLS regression with controls included but with no fixed effects. The negative sign implies that colder temperature raises the probability of a persecution of Jewish communities. The size of the coefficient implies a one degree decrease in five-year average temperature leads to a 1.91 percentage point increase in the probability of a major act of violence against Jews over the subsequent five years. When we include city fixed effects in specification (2), this probability increases to 2.52 percentage points. Including five-year time dummies in specification (3) increases the DID estimate to 3.19 percentage points.

Although a one degree decrease in temperature is convenient to consider, it is also quite large. Under the DID specification in column (3), a one standard deviation decrease, or 1/3 of a degree, in temperature increases five-year persecution probability by 1 percentage points which is equal to 50% of the sample mean of the dependent variable (2.22). Restricting our attention to explaining just expulsions in columns (4)-(6) of Panel A of Table 1 yields similar results.

Panel B of Table 1 replicates the results in Panel A, after excluding the Iberian national expulsions. In general, the sizes of the coefficients we obtain are smaller but they retain statistical significance. Our preferred DID estimator suggests that a one degree decrease in the temperature of the previous five years is associated with a 1.6 percentage points increase in the probability of persecution. A one standard deviation decrease in temperature increases the probability of persecution by a half a percentage point (0.34*1.6). Overall, our main results are robust to the exclusion of the Iberian expulsions.

[27]These grid points are reproduced as the red dots in Appendix C, Figure 13. Cities closer to a given grid point receive more correlated temperature shocks. In contrast, temperature shocks are a random walk over time, thus the temperature-grid seems the appropriate level of clustering.

This article is protected by copyright. All rights reserved

Author Manuscript

Table 1:
Baseline Results.

Panel A: Baseline Effects of Temperature on Persecutions and Expulsions

	Persecutions			Expulsions		
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Temperature}_{i,t-1}$	-1.91***	-2.52***	-3.19***	-1.59***	-2.06***	-2.31***
	(0.625)	(0.740)	(1.04)	(0.447)	(0.512)	(0.891)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
City Dummies	No	Yes	Yes	No	Yes	Yo
Time Dummies	No	No	Yes	No	No	Yes
N	55698	55698	55698	55698	55698	55698
F	5.202	5.609	6.695	4.741	5.705	5.108
p-values	0.0029	0.0019	0.0006	0.0048	0.0017	0.0012

Panel B: Excluding the Iberian National Expulsion

	Persecutions			Expulsions		
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Temperature}_{i,t-1}$	-1.08***	-1.57***	-1.60***	-0.751***	-1.10***	-0.667*
	(0.259)	(0.382)	(0.527)	(0.132)	(0.232)	(0.380)
No Iberian National	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
City Dummies	No	Yes	Yes	No	Yes	Yes
Time Dummies	No	No	Yes	No	No	Yes
N	55253	55253	55253	55253	55253	55253
F	6.759	6.604	6.214	9.128	6.837	3.566
p-values	0.0006	0.0007	0.0012	0.0001	0.0006	0.0284

Standard errors clustered at the climate grid level n parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Coefficients are multiplied by 100 to represent percentage points. Observations are at the city x five-year level between 1100 and 1799. In both panels the dependent variable is either *Persecution* (0 or 1 if either an expulsion or other violent acts against Jews occurs) or *Expulsion*. Panel A uses the full sample. In Panel B the Iberian national expulsions in 1492 (Spain) and 1497 (Portugal) are excluded. All regressions include as controls a dummy and slope variable for the ten years surrounding the Black Death and a measure of population density (see the Data Appendix). Coefficients are reported with standard errors clustered at the temperature-grid level.

The results in Table 1 provide strong empirical support for the first prediction of our model: colder temperature disrupted the political equilibria of pre-industrial European societies and increased the likelihood that minority communities would be persecuted. However, on their own, these regressions do not shed light on the economic, institutional, and political mechanisms

Author Manuscript

This article is protected by copyright. All rights reserved

connecting negative temperature shocks to Jewish persecutions.

3.2 Mechanisms

Our conceptual framework suggests that the effect of temperature shocks on Jewish persecutions should be greatest in societies with weak political institutions. It also provides some reason for expecting differential results in areas with poorer quality soil. Areas with worse quality soil might be more vulnerable to temperature shocks. But the value of Jewish moneylending to a ruler might also be more valuable in such regions. In this section we explore these predictions by estimating a series of specifications based on:

$$y_{it} = \alpha T_{i,t-1} + \beta M_{it} + \zeta M_{it} \cdot T_{i,t-1} + \eta_i + \mu_t + X_{it}^{'}\Omega + \varepsilon_{it} \ , \qquad (2)$$

where y_{it} is our measure of persecution or expulsion in city i in period t. $M_{i,t}$ is one of our mechanism such as a measure of soil suitability or state capacity for city i in period t. For consistency and ease of interpretation we code the mechanism variable to be either a 0 or 1 such that 1 corresponds to our theoretically predicted higher probability of a persecution (e.g. poor soil or low state capacity).[28] $M_{i,t} \cdot T_{i,t-1}$ is an interaction variable of the mechanism with the lagged temperature shock. η_i and μ_t are city and time dummies respectively, X_{it} is a vector of control variables, and ε_{it} is an i.i.d. error term. We are interested in three quantities: the effect of temperature on persecution probability in cities where the mechanism is not present, α; the indirect effect of the mechanism on persecution probability, ζ; and the total effect of temperature on persecution probability in cities where the mechanism binds, which is given as, $\frac{\partial y_{i,t}}{\partial T_{i,t-1}} = \alpha + \zeta \cdot M_{i,t}$, with $M_{i,t}$ evaluated at 1.

The first mechanism we investigate in Table 2 is whether cities surrounded by low quality soil were more likely to persecute their Jewish communities. In columns (1) and (2) we test this hypothesis using our preferred measure of agricultural productivity—wheat suitability taken from the FAO (Fischer et al., 2002). This database is constructed by combining characteristics of wheat (optimal growing temperature, soil type, etc.) with highly disaggregated climatic and geographic data covering variables such as precipitation, cloud cover, ground-frost frequency, soil

[28]In Appendix Table 10 we provide results using continuous measures of both soil quality and state antiquity.

Author Manuscript

This article is protected by copyright. All rights reserved

types and slope characteristics. The data have a spatial resolution of 0.5 degree x 0.5 degree (or about 60 x 60 kilometres at 45 degrees latitude, typical for France).[29] We extract the wheat suitability for each of our cities using geospatial software and then follow a similar strategy as Nunn and Qian (2011) in creating a dummy variable equal to one if a city has an agricultural sector that is either moderately or significantly constrained in its wheat cultivation. This is the main variable *Low Wheat* that we use in our regressions.

Regressions (1) and (2) show that cities with soil unsuited for agriculture were more likely to persecute Jews. In the fixed effects regression in column (1) the coefficient on ζ is 2.77 and statistically significant.[30] This accounts for more than half of the overall effect of temperature on persecutions reported at the bottom of the column as 3.98. Under the DID specification in column (2), the coefficients on the indirect effect of temperature through soil suitability is not statistically significant. Nonetheless, the overall effect is precisely estimated and economically significant with a value of 3.66.[31]

We next test whether persecutions were more likely in cities associated with comparatively weak polities. To do this we employ the disaggregated data from the State Antiquity Index of Bockstette et al. (2002). These data include a measure for modern-day countries of whether that area was a stable state for fifty year intervals from 1 B.C. to the present-day. Specifically, every modern-day country, in each fifty year period, is assigned three numbers. The first is a one if there was a government above tribal level and a zero otherwise. The second number is a one if the government is locally based, 0.50 if it is foreign based, and 0.75 if in between. The third number measures how much of the territory of the modern government was ruled by the polity during the fifty year period.[32] These scores are then multiplied by each other and then by 50. This results in a panel of scores for present-day countries measuring in every fifty year period whether it was an autonomous nation (a score of 50) if it had a tribal level of government

[29]We assume 'intermediate' inputs. Appendix C describes these data in more detail.

[30]The direct effect of *Low Wheat* is not reported since it is a time-invariant variable and thus absorbed by the fixed effects.

[31]We also run our mechanism regressions for soil quality using continuous versions of these variables in Appendix B. The results for soil quality clearly show a statistically significant effect for low quality soil and zero effect for high quality soil.

[32]The values for this last measure are 1 point if over 50%, 0.75 points if between 25% and 50%, 0.5 points if between 10% and 25%, 0.3 points if less than 10%.

Author Manuscript

This article is protected by copyright. All rights reserved

(score of 0) or something in between. Bockstette et al. (2002) then aggregate these data to get a single score for state antiquity of modern countries. We are interested in the disaggregated historical data, however. Thus, after interpolating between fifty-year periods, we extract their values for each of our cities using geospatial software. We then create a dummy variable for each city equal to one if that region has a score less than the average for the rest of the sample and zero otherwise. We call this dummy *Low State Antiquity*.[33]

The regression results in columns (3) and (4) of Table 2 support our theoretical prediction that cities in regions with weaker states will be more likely to persecute Jewish populations. The coefficient on the indirect effect of *Low State Antiquity* are negative and statistical significant in both the FE and the DID specifications. Furthermore, when compared to the total effects reported at the bottom of the table, the estimates suggest that being in a low state capacity region accounts for something on the order of half of the increased probability of persecution due to negative temperature shocks. The estimated effect size of 2.34 in the DID specification suggests in states with low antiquity the effect of cold temperature on the probability of a persecution was approximately twice as high as in the baseline. The coefficients on the direct effect of *Low State Antiquity* are positive, which suggests that regardless of temperature, Jewish communities in low state capacity regions were more likely to be persecuted.

[33]Descriptive statistics are in Appendix A. As a robustness check we also code our state antiquity variable as a continuous variable. We report these regressions in Appendix B.

Author Manuscript

This article is protected by copyright. All rights reserved

Author Manuscript

Table 2:
Mechanisms

	Dependent Variable: Persecutions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{Temperature}_{i,t-1}$	-1.21**	-2.53***	-1.38***	-2.20***	-2.75**	-3.59***	-3.03**	-3.30**
	(0.485)	(0.876)	(0.429)	(0.738)	(1.01)	(1.24)	(1.36)	(1.64)
Low Wheat × $\text{Temperature}_{i,t-1}$	-2.77**	-1.13						
	(1.29)	(0.731)						
Low State Antiquity			0.760	2.09***				
			(0.454)	(0.524)				
Low State Antiquity × $\text{Temperature}_{i,t-1}$			-2.92**	-2.34***				
			(1.18)	(0.78)				
Low Constraints					-1.43**	0.321		
					(0.611)	(0.699)		
Low Constraints × $\text{Temperature}_{i,t-1}$					1.29	1.36*		
					(1.02)	(0.758)		
Low Capital Protection							-1.63*	0.259
							(0.89)	(0.626)
Low Capital Protection × $\text{Temperature}_{i,t-1}$							0.876	0.113
							(1.26)	(1.04)
$\text{Temperature}_{i,t-1}$ + Interaction	-3.98***	-3.66***	-4.30***	-4.54***	-1.46***	-2.23***	-2.16***	-3.19***
	(1.2)	(1.2)	(1.20)	(1.26)	(0.37)	(0.69)	(0.6)	(0.83)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	Yes	No	Yes	No	Yes	No	Yes
N	55698	55698	55698	55698	55698	55698	55698	55698
F	6.857	15.65	5.891	6.254	11.36	4.275	4.351	5.664
p-values	0.0003	0.0000	0.0000	0.0005	0.0000	0.0052	0.0032	0.0010

Standard errors clustered at the climate grid level n parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Observations are at the city x five-year level between 1100 and 1799. The dependent variable is *Persecution* (0 or 1 if either an expulsion or other violent acts against Jews occurs). All Mechanism variables are 0 or 1. See text and the Data Appendix for descriptions of the Mechanism variables. All regressions include as controls a dummy and slope variable for the ten years surrounding the Black Death and a measure of population density. *Temperature + Interaction* is the total effect of temperature on persecution probability measured as the sum of the coefficient of *Temperature* plus that of the relevant Mechanism interaction term. Coefficients

This article is protected by copyright. All rights reserved

Our conceptual framework suggests that it was strong and stable states, not necessarily states with constraints on the executive or rules protecting capital that were more likely to be able to commit to rent-seeking arrangements with Jewish communities in the medieval and early modern period. Therefore we want to disentangle the effect of state capacity from the effects of constraints on the executive or protection of property rights.

To do this, columns (5)-(8) of Table 2 test whether the Acemoglu et al. (2005) measures of constraint on executive and protection of capital predict persecutions. We re-code their constraints variables so as to be comparable to our *Low State Antiquity* variable by turning them into dummy variables where countries with constraints below the sample average get a one and high constraint countries are zeroes. We then interpolate these values between centuries and extract their values for each city (descriptive statistics are in Appendix A). We measure (lack of) constraints on the executive using *Low Constraints*. The variable measuring (lack of) protection of capital is *Low Capital Protection*.

The regression results showing the effect of *Low Constraints* on persecution probability are in columns (5) and (6). The fixed effects specification indicates that cities located in regions with less constraint were *less* likely to persecute Jews. The interaction of *Low Constraints* with $Temperature_{i,t-1}$ is statistically insignificant. Under the DID specification, the level of the *Low Constraints* variable has the wrong sign.

When we look at our measure of capital protection in columns (7) and (8), the results are similar. The sign on the direct effect of *Low Capital Production* is negative in our fixed effects specification indicating that less constraint in an area is associated with less persecution. The sign on the interaction is positive though insignificant. Under the DID specification in column (8) the coefficient on *Low Capital Protection* is consistent with zero. Overall, these regressions support our argument that it was state capacity that determined whether a Jewish community would be persecuted during times of economic crisis.

The empirical findings we report in Table 2 provide evidence in support of our hypothesis that the effects of colder weather would be greater in weak states. They also provide some albeit less robust evidence that the effects of colder weather were greater in areas with lower quality soil.

This article is protected by copyright. All rights reserved

Author Manuscript

There is no evidence that constraints on the executive and protection of capital were associated with protection of minorities in the medieval or early modern period. As we discuss below, these results are consistent with a body of historical research that suggests that while, in the long-run, state capacity and constraints on the executive are complements (Besley and Persson, 2011), in the medium-run, investments in state capacity often preceded the imposition of constraints on the executive (Dincecco, 2009; Johnson and Koyama, 2014a). In the next section we investigate the robustness of these results.

4 Robustness

4.1 Results with Yearly Data

In the previous section, our empirical results were all based on five-year periods. In this section, we explore how robust our results are to using yearly data.

Table 3 shows the results from estimating equation 1 using yearly data. Our main variable of interest is the average temperature for the years t_{-1} to t_{-5}.[34] To maintain symmetry with the analysis above, in the tables we refer to this variable as $Temperature_{i,t-1}$. In column (1) we report the specification with city fixed effects. Our coefficient of interest is negative, and implies that a series of one degree colder growing seasons are associated with a 0.46 percentage points higher probability of persecution. The DID specification in column (2) is smaller than the FE coefficient and less precisely estimated (p-value = 0.174).[35]

Table 4 reports the results from estimating equation 2 testing the effect of our hypothesized mechanisms using the yearly data. Wheat suitability does not have a precisely estimated effect on persecution probability when we employ yearly data (cols. 1–2). However, the overall effect of wheat suitability and temperature remains large. Our measure of state antiquity remains robust. Our largest estimate for the effect of weather on persecutions is in the FE regression in column

[34]If the persecution is in 1541, for example, then we use temperature data in the 5 year period of 1536 to 1540 to explain it.

[35]The coefficients using the one-year data are typically about a fifth of those using the five-year average data, though the interpretation of the effect size is similar. A typical coefficient from the five-year DID regressions is -1.25. This means a one degree decrease in temperature during the previous 5 years leads to a 1.25% increase in persecution probability over the next 5 years (or about 0.25% each year). The coefficient of -0.272 in Column 3 of revised Table 3 means a 1 degree decrease in temperature during the previous 5 years leads to about a quarter of a percentage increase in persecution probability in just the next year (as opposed the next five years).

Author Manuscript

This article is protected by copyright. All rights reserved

(3).

Table 3:
Baseline Results Yearly Data

Baseline Effects of Temperature on Persecutions and Expulsions						
	Persecutions			Expulsions		
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Temperature}_{i,t-1}$	-0.346***	-0.464***	-0.272	-0.272***	-0.360***	-0.150
	(0.104)	(0.124)	(0.174)	(0.075)	(0.0837)	(0.130)
Controls	Y	Y	Y	Y	Y	Y
City dummies	N	Y	Y	N	Y	Y
Time dummies	N	N	Y	N	N	Y
N	276359	276359	276359	276359	276359	276359
F	4.682	5.726	2.444	4.758	6.148	1.340
p-values	0.005	0.002	0.129	0.005	0.001	0.256

Standard errors clustered at the climate grid level in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Observations are at the city x one-year level between 1100 and 1799. Otherwise controls are the same as those employed in Table 1.

Author Manuscript

This article is protected by copyright. All rights reserved

Table 4:
Yearly Mechanism Regressions

	Dependent Variable: Persecutions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{Temperature}_{i,t-1}$	-0.292**	-0.168	-0.276**	-0.156	-0.479***	-0.284	-0.577***	-0.278
	(0.114)	(0.168)	(0.310)	(0.687)	(0.657)	(1.343)	(0.728)	(1.064)
Low Wheat × $\text{Temperature}_{i,t-1}$	-0.432*	-0.212						
	(0.227)	(0.136)						
Low State Antiquity			0.174*	0.481***				
			(0.395)	(0.455)				
Low State Antiquity × $\text{Temperature}_{i,t-1}$			-0.485**	-0.269				
			(0.868)	(0.554)				
Low Constraints					-0.300**	-0.284		
					(0.130)	(0.200)		
Low Constraints × Lag $\text{Temperature}_{i,t-1}$					0.171	0.045		
					(0.201)	(0.156)		
Low Capital Protection							-0.378*	-0.010
							(0.214)	(0.549)
Low Capital Protection × $\text{Temperature}_{i,t-1}$							0.190	0.010
							(0.178)	(0.205)
$\text{Temperature}_{,t-1}$ + Interaction	-0.724***	-0.380*	-0.761***	-0.426*	-0.308***	-0.240	-0.387***	-0.268*
	(0.210)	(0.211)	(0.202)	(0.213)	(0.096)	(0.150)	(0.107)	(0.150)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	Yes	No	Yes	No	Yes	No	Yes
N	276359	276359	276359	276359	276359	276359	276359	276359
F	9.988	1.797	4.945	8.611	9.240	0.945	4.616	1.087
p-values	0.000	0.184	0.002	0.001	0.000	0.432	0.002	0.371

Standard errors clustered at the climate grid level n parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Observations are at the city x one-year level between 1100 and 1799. All controls and variable details are otherwise the same as in Table 2

This article is protected by copyright. All rights reserved

.

Author Manuscript

4.2 The Iberian Expulsions

One potential objection to our results is that the expulsions of Jews from Spain in 1492 and Portugal in 1497 represent a large proportion of the variation in the outcome. The traditional explanations for the timing of the Spanish expulsions of 1492 is that Ferdinand and Isabella were driven by nationalist and religious motives and that the timing of the expulsions simply followed from the unification of Spain following the conquest of Granada.[36] Revisionist accounts also emphasise the importance of local elites in demanding the expulsion in return for supporting the monarchy (Haliczer, 1973). When we exclude the Iberian expulsions the size of our coefficients shrink by roughly a half. A one standard deviation decrease in temperature now increases the baseline probability from 2 % to 2.5 %. Therefore in qualitative terms our results are robust to exclusion of the Iberian expulsions.

4.3 Placebo Regressions

An assumption of our identification strategy is that the temperature data are random and, thus, unrelated to unobservables that could potentially lead to bias in our estimates. We perform a placebo test in order to test this assumption.

We reestimate equation 1 replacing the value for a city's current temperature with those from previous years and for future years. Figure 3 depicts the coefficients that we obtain from this regression using yearly data. It demonstrates that the coefficient on temperature is significant and fairly large up to about 5 lags thereby justifying our use of $\text{Temperature}_{i,t-1}$ as our main explanatory variable. Importantly, it shows that the effects of future temperature are indistinguishable from zero.

4.4 Spatial and Serial Correlation

Temperature is highly spatially correlated. To ensure that our results are not biased due to spatial spillovers, in Table 11 in Appendix B we replicate our baseline and mechanism regressions controlling for spatial and serial correlation using the method suggested by Conley (2008) and implemented in Stata code by Hsiang (2010). These results corroborate our main analysis.

4.5 Rainfall and Persecution

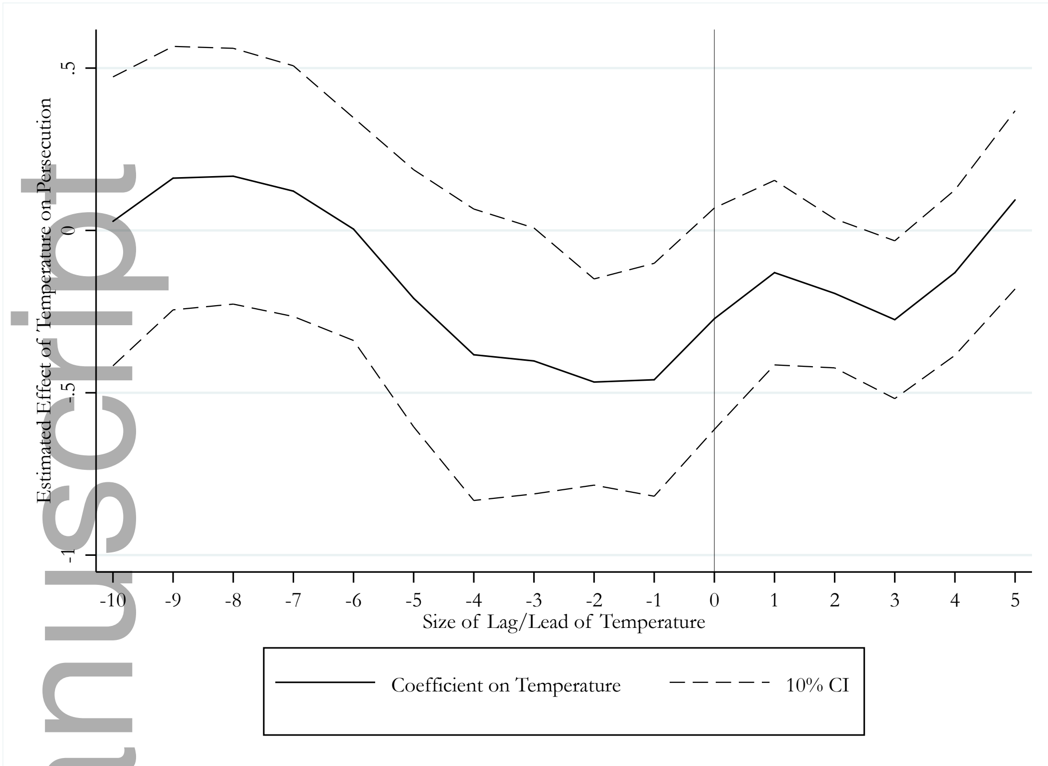
As a check on the robustness of our claim that supply shocks caused Jewish persecution, we also compile data on rainfall between 1500 and 1799 to re-estimate our main regressions.

[36] For studies of the expulsion of Jews from Spain see Kamen (1988); Gerber (1992); Roth (1995).

This article is protected by copyright. All rights reserved

Author Manuscript

Figure 3:
Placebo Regressions Using One-Year Data



Notes Dotted lines are 10% confidence intervals. Vertical line marks t = 0.

For dry soil farming, wheat requires at least 60 cm of annual rainfall. Higher levels of rainfall are particularly important for increasing yields during the growing season as the the demand for water increases with leaf growth which peaks between July and August.[37] Estimates for historical levels of rainfall at a disaggregated level only exist from 1500 onwards therefore we do not include these data in our main regressions. In the Appendix B, Tables 12 and 13 we report both our baseline and mechanism regressions for the period 1500-1799 using data from Pauling et al. (2006). Table 12 provides evidence that too little rainfall during the growing season resulted in a higher probability of persecution. The OLS regression in Column 1 suggests a 10% decrease in rainfall raises the probability of a persecution in the subsequent five year period by 2%.[38] In Column (3) where we report the OLS effect with an interaction for the period before

[37]Abnormally low summer temperatures are often associated with excess rainfall and this combination would be expected to lower yields. In generally, however, too little rainfall was much more likely to reduce agricultural output.

[38]The rainfall variable is constructed in a similar manner to the temperature variable in our baseline five-year regressions. The only difference is that we express it in logs.

This article is protected by copyright. All rights reserved

Author Manuscript

1600, the overall effect increases such that a 10% decrease in rain raises persecution probability by 5.8% Under the DID specifications in Columns (2) and (4), the effect of decreased rain is still present, though statistically insignificant. However, when we allow the city fixed effects to be different before and after 1600, then effect is again robustly negative with a 10% reduction in rain leading to a 7% increase in persecution probability. Overall, the rainfall regressions support our main finding that negative supply shocks induced Jewish persecutions in the early-modern period. The fact that the rainfall data are generated from a completely different source than the temperature series we use and we can show effects even though there are only 100 years of data during the period we believe supply shocks mattered most for Jewish communities (pre-1600) is encouraging support for our hypothesis.

Overall, our findings identify two forces that appear to have played a significant role in persecution probability. First, temperature shocks appear to have had greater effect in locales with relatively unproductive agriculture. Second, Jewish communities located in relatively weak polities were more likely to be persecuted during colder periods. This provides evidence in favour of our argument that in the face of negative economic shocks, weak rulers were less able to uphold the extractive rent-seeking arrangements that protected Jewish communities. In the next section, we discuss additional evidence supportive of this explanation as well as assessing other hypotheses that may explain why Jewish persecutions declined during the later early-modern period.

5 Discussion: The Decline of Jewish Persecutions

We have documented a robust relationship between periods of colder temperature and Jewish persecutions. After around 1600, however, the relationship between colder temperature and the likelihood of persecution disappeared. This can be seen in Figure 4 which depicts the coefficients from our baseline regression (Table 1) estimated by century (the 12th century is the excluded category).[39] The data suggest that Jewish persecutions were particularly intense in late medieval

[39] We estimate the following regression:

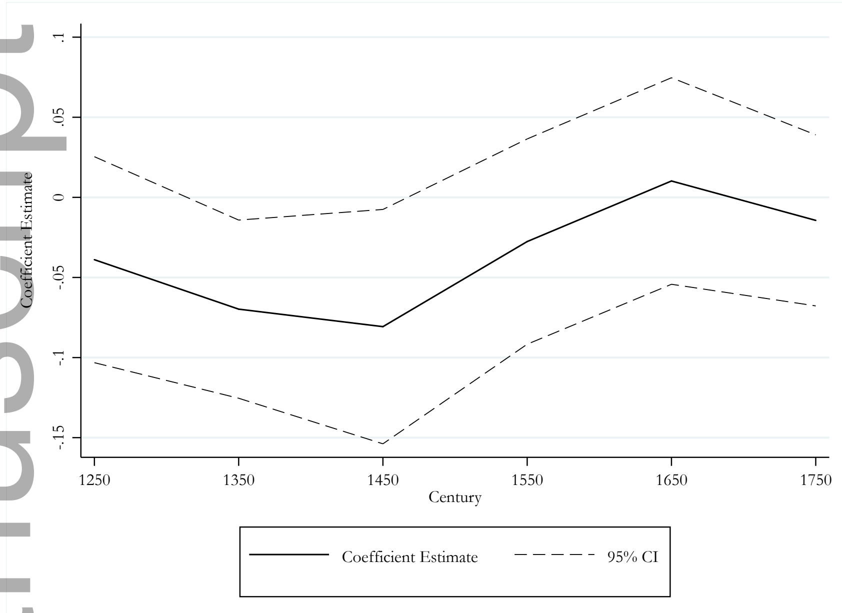
$$y_{it} = \sum_{c=13th}^{18th} \beta_c T_{i,t-1it} \cdot \ \mathbf{I}_c + \eta_i + \mu_t + \mathbf{X}_{\mathbf{it}}^{'}\mathbf{\Omega} + \varepsilon_{\mathbf{it}} \ , (3)$$

Author Manuscript

This article is protected by copyright. All rights reserved

and Renaissance Europe and often triggered by supply shocks. After 1600, however, colder temperatures ceased to be associated with a greater risk of persecution.

Figure 4:
The Effect of Temperature on Persecution Probability Over Time



Notes. Plots coefficients estimate by century of the baseline DID regression. Specification discussed in the text.

In this section we discuss in greater detail five possible reasons for the decline in Jewish persecutions: (1) that there were simply fewer Jewish communities to persecute by the seventeenth century; (2) that improved agricultural productivity, or, better integrated markets could have reduced vulnerability to temperature shocks; (3) that the rise of stronger states could have led to more robust protection for religious and ethnic minorities; (4) that there were fewer negative temperature shocks. Finally, while our data do not directly address it, (5) it is possible that the impact of the Reformation and the Enlightenment may have reduced antisemitic attitudes.

5.1 *The Decline of Western and Central European Jewry?*

The change in the geographic distribution of Jewish communities after 1500 may partially account for the breakdown in the relationship between temperature shocks and Jewish persecutions. There was a definite move eastwards as Jewish communities, persecuted first in Germany

where $\mathbf{I}_c$ is a vector of dummies for each of the 13th through 18th centuries (the 12th century is the excluded category). Standard errors are clustered at the climate grid level.

Author Manuscript

This article is protected by copyright. All rights reserved

and then later in Spain and Portugal, fled to either eastern Europe or the Ottoman Empire.[40]

The political equilibrium that governed the coexistence of Jews and Christians differed in eastern Europe. Whereas in western Europe, Jews specialised as moneylenders and came to be exploited as fiscal resources by medieval rulers, this did not occur to the same extent in medieval or early modern Poland. Historians note that the condition of the Jews in Poland was therefore relatively favourable compared to western Europe and remained so until the seventeenth century. Weinryb notes that 'Jews themselves, both within the country and abroad, looked upon Polish Jews as living in security' (Weinryb, 1972, 51). This reflected deeper institutional differences between Poland and the rest of Europe along a range of margins: Poland was also comparatively tolerant to heretics during the sixteenth century (see Tazbir, 1973). One reason for this was that the economic underdevelopment of Poland meant that the possibilities for economic specialisation were also limited. As the division of labor was not as well defined, Jews continued to play a number of important economic roles in the Polish economy throughout the medieval and early modern period; they were not restricted to their role as moneylenders as was the case in western Europe after 1200 (Dubnow, 1975).[41] For this reason, it is likely that some of the migration to Poland may have been driven by its reputation as a relatively safe haven.

In Table 5 we calculate the number of city-years that a Jewish community was present in various countries in our data before and after 1600. In the case of Spain and Portugal, the reason they stopped persecuting Jewish communities after 1600 is because they did not have any openly acknowledged communities after the national expulsions of 1492 and 1497.[42] However, Spain and Portugal are extreme cases. The data in Table 5 show that, while there was definitely a movement of Jewish communities eastward towards countries like Poland after 1600, there were still many Jews in most of the countries in our sample. Furthermore, the last column of Table 5 shows that, even if we express persecution probability in per city-year terms, there was a marked decline in Jewish persecution after 1600 for most countries.

[40]We do not discuss the Ottoman Empire, as the institutions governing the toleration of Jews in Ottoman territories were very different to those in Christian Europe.

[41]Consistent with this claim is the observation of Dubnow (1975) that there was antisemitic agitation in the cities of western Poland as conditions there were more hospitable to Jews in the more rural parts of central and eastern Poland.

[42]The Inquisition conducted intense persecutions of *conversos*. We discuss this issue in Appendix C.

Author Manuscript

This article is protected by copyright. All rights reserved

Table 5:
City-Years Before and After 1600

Country	City-Years Before 1600	City-Years After 1600	Persecutions Before 1600	Persecutions After 1600	Persecutions Per City Year Before/After 1600
Austria	4,223	1,402	19	7	0.90
England	3,530	1,414	55	0	∞
France	25,346	6,477	233	6	9.92
Germany	41,080	19,254	335	24	6.54
Italy	29,847	8,654	108	19	1.65
Poland	16,012	21,814	47	66	0.97
Portugal	5,734	0	21	0	∞
Spain	36,065	0	204	0	∞
Switzerland	2,890	697	25	2	3.02

Notes. Data source: Enc (2007).

5.2 *Greater Agricultural Productivity or Increased Market Integration?*

Another possible explanation for the reduction in the number of Jewish persecutions in western Europe and the breakdown in the relationship between temperature and persecutions is that an increase in agricultural productivity, or increased market integration, made European economies less vulnerable to supply shocks. This is certainly one of the explanations that our conceptual framework suggests. From the eighteenth century onwards, Malthusian conditions weakened and *per capita* incomes gradually increased. Nunn and Qian (2011), for example, document the role played by the potato in increasing population density and urbanisation after 1700. However, the frequency of Jewish persecutions markedly declined from around 1600—a period when the European economy remained Malthusian and agricultural productivity was low.[43] Thus the Columbian Exchange occurred too late to explain the decline of Jewish persecutions.

Nevertheless, better market integration might be responsible for temperature shocks having a weaker impact on Jewish persecutions. To assess this, we use a panel of wheat prices from Allen and Unger. This dataset contains grain prices for 193 cities worldwide. We use wheat prices from

[43]Recent research finds evidence that the Malthusian equilibrium weakened in England during the seventeenth century (see, for instance, Crafts and Mills, 2009). But the overwhelming consensus is that agricultural productivity remained low outside England and the Netherlands throughout the seventeenth century (see Allen, 2000, amongst many others).

Author Manuscript

This article is protected by copyright. All rights reserved

Table 6:
Grain Price Regressions

	Dependent Variable: Wheat Prices (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
Temperature	-8.96***	-4.43***	-1.68**	-6.51***	-1.81	-0.89
	(1.127)	(1.520)	(0.817)	(1.369)	(1.598)	(0.944)
Pre-1600*Temperature				-18.34***	-7.866***	-2.451
				(2.834)	(6.190)	(2.791)
Pre-1600				-59.11***	-164.4***	-68.78***
				(6.530)	(7.225)	(4.297)
Temperature + Interaction				-24.86***	-9.67*	-3.344
				(1.996)	(5.202)	(2.333)
Lag Grain Prices	No	No	Yes	No	No	Yes
Market Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	Yes	Yes	No	Yes	Yes
N	16171	16171	15193	16171	16171	15193
Adjusted R^2	0.008	0.594	0.771	0.219	0.594	0.771

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Observations are at the city x year level between 1100 and 1799. The dependent variable is the log of wheat prices in silver equivalents. Coefficients are multiplied by 100 and reported with standard errors clustered at the city level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels respectively.

the 98 European cities in this dataset.[44] In Table 6 we run a series of regressions of *Temperature* on the log of wheat prices in the cities in this unbalanced panel. Columns (1) and (2) report our fixed effects and DID estimates using the entire panel. Because we expect a bad harvest due to colder temperature to raise grain prices in the same year, we focus on contemporaneous grain prices.

These regressions support our hypothesis that negative temperature shocks adversely affect grain markets. The coefficient on *Temperature* in specification (1) implies a one degree celsius decrease in temperature increases wheat prices by about 9%. This estimate is halved in the DID regression. In column (3) we include a lag of the dependent variable to account for potential serial correlation and the estimate shrinks further while retaining the negative sign and its significance.[45] Temperature shocks affected agricultural output as measured by grain prices.[46]

[44] Figure 15 in Appendix C shows their locations. Descriptive statistics are in Appendix A.

[45] A Fisher-type unit root test on the data convincingly rejects the null of a unit root. This implies the inclusion of the lagged dependent variable term is unnecessary. Nonetheless, we include it as a cautionary measure.

[46] While these coefficients are small, they are also consistent with what we know about medieval and early

Author Manuscript

This article is protected by copyright. All rights reserved

In columns (4)-(6) we assess whether temperature shocks affected grain prices less after 1600 than before by interacting temperature with a dummy variable for all periods before 1600. The fixed effects specification implies that a one degree centigrade decrease in average temperature is associated with a 24% increase in grain prices (col. 4) before 1600. This suggests that increased market integration after 1600 reduced vulnerability to climatic shocks. Similar to the regressions on the whole sample, when we include time dummies and a lag of the dependent variable, these effect sizes shrink considerably. Overall, these results suggest that better markets and improvements in agricultural technology did mean that European economies were less vulnerable to climate shocks after 1600. Nevertheless, while the effect of climate on agricultural prices weakened after 1600, it did not disappear. Therefore, improvements in market integration are unlikely to be solely responsible for the marked decline in Jewish persecutions that occurred in the early modern period.

5.3 Greater State Capacity?

Our conceptual framework suggests that in societies with greater state capacity the relationship between temperature shocks and Jewish persecutions should be weaker. We also find significant support for this proposition from the results we obtain using our *Low State Antiquity* variables. These regressions indicate that the link between persecution and colder temperatures was strongest in states of more recent origin. Unfortunately, it is difficult to test this hypothesis more directly since reliable and continuous data on tax revenues and other measures of state capacity are only available for the major European states after 1500 (and in some cases 1650) (Dincecco, 2009; Karaman and Pamuk, 2013).[47] The point at which systematic data becomes available unsurprisingly coincides with the rise of strong centralised states. Furthermore, estimates of tax revenues generally do not exist for the many city-states and smaller political units that comprise much of our data.

Significant narrative evidence supports our argument that increases in fiscal capacity in western Europe were linked to the decision to admit and protect Jewish communities. Figure

modern agriculture. Grain market prices were highly regulated and local governmental authorities provisioned cities during periods of scarcity so adjustment to exogenous shocks was often through quantity rather than through price (for a discussion of the French case see Kaplan (2013)).

[47] In Appendix D Figure 19 depicts the rise in tax revenues (measured in silver) for the seven largest European states between 1500 and 1800.

Author Manuscript

This article is protected by copyright. All rights reserved

5a depicts the rise of state capacity in England as measured by tax revenue and the increase in legislative activity by Parliament. For example, Oliver Cromwell invited Jews to return to England in 1655—a period during which state capacity was expanding in England (Kaplan, 2007, 326). The English Jewish community was initially viewed as a transient group of alien merchants with limited rights. Their position was uncertain and in 1660 a petition came before Parliament to expel them. This petition was ignored, but it was only after the Glorious Revolution that the permanent status of Jews in England was fully recognised and accepted (Katz, 1994, 140-141 and 188). Despite the unpopularity of the English Jewish community, they were no longer subject to persecutions and violence after this official recognition.[48]

In the English case, it is difficult to disentangle the importance of state capacity in protecting the Jews from persecution from the role Parliament may have played in protecting them. However, this is not the case in France where a similar process took place under the auspices of an absolutist monarchy. Figure 5b traces the dramatic increase in the capacity of the central state after around 1630 using tax revenues and counts of royal edicts issued. Cardinal Richelieu played a crucial role in establishing the French tax state and in protecting Portuguese crypto-Jews from being persecuted as heretics because of their value as merchants and financiers. Israel describes this as 'a classic instance of *raison d'État* politics and mercantilism' the result of which was to have 'made possible that steady transition from the 1630s down to the 1680s by when the Portuguese communities in France had cast off all remaining pretence and openly organised as Jewish congregations with rabbis and services in Hebrew' (Israel, 1985, 96-97). By 1722 the right of all French Jews to openly practice their religion was recognized in law.

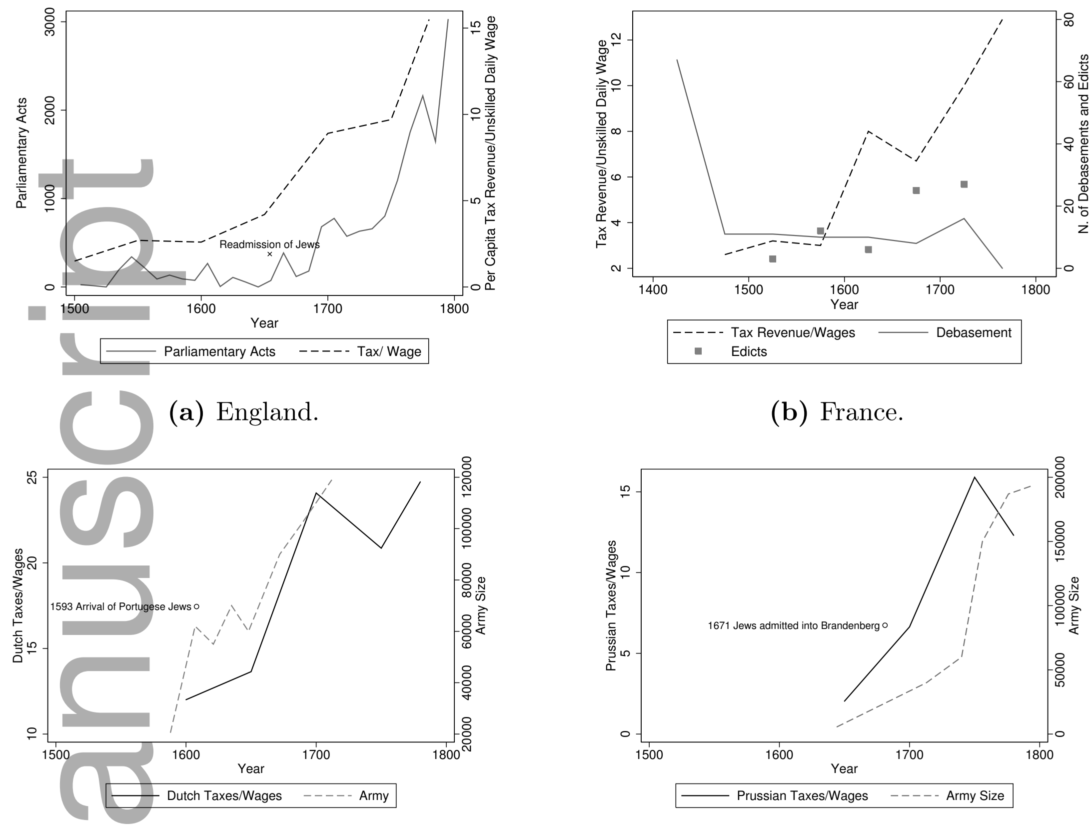
The Dutch Republic offered permanent protection to Jews after its declaration of independence from Spain, with large numbers of so-called crypto-Jews arriving in 1593. The rights of Jews to practice their religion was codified in 1619. Figure 5c plots the relationship between toleration offered to the Jews and the rise of the Dutch state as measured by taxation per capita over real wages and by the wartime strength of the Republic's armed forces. Figure 5d depicts similar data for Prussia. While there had been a long history of Jewish settlement in lands controlled by

[48]For details on the survival of antisemitic stereotypes and attitudes in England after the re-admittance of Jews into the country see Poliakov (1955, 203-209) and Felsenstein (1999).

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 5:
The Rise of State Capacity in Early Modern Western Europe



(a) England. **(b)** France.

(c) Dutch Republic. **(d)** Prussia.

Notes. Tax revenue data is from Karaman and Pamuk (2013); data on English Parliamentary Acts is from Bogart and Richardson (2011). Data on Royal Edicts is from Johnson and Koyama (2014a); data on debasements is from Shaw (1896). Army size data is from van Nimwegen (2006).

Prussia, it was only in the late seventeenth century that Frederick William (1650-1688) gave the Jews a charter, which established their permanent residency. This occurred at the same time as the Elector invested in fiscal capacity and built a professional standing army that would propel Prussia to the status of a major European power.

There can be no doubt that popular antisemitism survived the emergence of stronger nation states in the early modern period.[49] But the evidence suggests that these new states were less responsive to it. The increases in state capacity that occurred from 1600 onwards, documented

[49] There is little evidence of a lessening in antisemitic attitudes. *Judensau*—woodcut images denigrating Jews—remained common in Germany until 1800. Poliakov (1955, 174-202) examines a large number of antisemitic treatises published in France during the seventeenth century that suggest that antisemitism was widespread and conventional in both elite and popular circles.

Author Manuscript

This article is protected by copyright. All rights reserved

by Dincecco (2009); Karaman and Pamuk (2013) and Johnson and Koyama (2014a), led to the formation of polities that were less vulnerable to political unrest, and better at reducing interfaith violence, all factors that led to fewer persecutions and expulsions.[50] This is consistent with the findings that stronger states were responsible for ending the European witch-hunts in the late seventeenth century (Levack, 1996; Johnson and Koyama, 2014b) and with the argument that the rise of larger and more centralised states led to a gradual increase in bounds of religious toleration in the early modern period (Johnson and Koyama, 2013).[51]

Jews continued to suffer persecutions and massacres in early modern Europe but these occurred in the ungoverned periphery and not in the new nation states of western Europe. The worst massacres occurred during the Khmelnytsky Uprising, which saw the Ukraine breakaway from Poland-Lithuania in the mid-seventeenth century (Stampfer, 2003). It goes without saying that this increase in state capacity was a two-edged sword: it could be used to persecute as well as protect. In the twentieth century, the capacity of modern states made possible the industrial horrors of the Holocaust. But in the period between 1600 and 1800 it was associated with a reduction in violence against minority groups.

5.4 *Colder Temperature?*

The period 1400 to 1800 is known as the Little Ice age. This name is perhaps slightly misleading as there was a lot of variation in climate within this long period. For example, Crowley and Lowery (2000) notes that the medieval warm period comprised three distinct and temporal separate peaks in temperature: 1010-1040, 1070-1105, and 1155-1190 and that average temperatures in the medieval warm period were only 0.2°C warmer than during the Little Ice Age. Consequently, some scholars have questioned the value of terms such as the 'medieval warm period' or the 'Little Ice Age' because within period variation is often much larger than

[50]Historians and sociologists have also argued that the birth of new nation states in the late medieval period was often accompanied by the expulsion of the Jews and other 'alien' populations (Baron, 1967a; Menache, 1987; Barkey and Katznelson, 2011). However, this was not in general true of medieval persecutions or expulsions. For studies of the expulsion of Jews from England see Leonard (1891); Elman (1937); Ovrut (1977); Menache (1987); Stacey (1997, 2000); Mundill (1998); Katznelson (2005); Koyama (2010b).

[51]According to Hecksher: 'The same tendency is manifested in the fact that the Jews were placed on a new footing in the 17th century in most western and central European countries. This should certainly not be regarded as a general pro-Jewish feeling on the part of mercantilists. No such sentiment was ever felt among those in power . . . this much is clear, that the leaders of mercantilist policy wished to extend toleration even to the Jews, and that this toleration was determined primarily by commercial considerations' (Heckscher, 1955, 305).

Author Manuscript

This article is protected by copyright. All rights reserved

between-period variation (see Kelly and Gráda, 2014).[52]

In our data, average temperatures in Europe between 1400 and 1600 were between 0.10 and 0.20 degrees cooler than during the surrounding centuries. Nevertheless, even though the decline in mean temperature was modest, the period after 1400 saw greater temperature volatility. In particular, 'bad weather—heavy rainfall, cool and wet summers, severe floods—became much more frequent during the last two centuries of the Middle Ages, and suggest that, at least in north-western Europe, climatic disasters were in fact more numerous and severe than they had been earlier. This is supported by other evidence: the extension of the glaciers in the Alps; the lowering of the upward limits of cultivation and of tree growth in hilly areas; the inundation of the coastal lowlands in the Netherlands, and the increasing soil moisture in the valley of central Europe, where, in some instances, cultivation had to be abandoned' (Pounds, 1974, 136).

Does an improvement in temperature account for the decline in persecutions? In our data summer growing conditions improved in the seventeenth century but the late seventeenth century again saw extremely cold winters due to a decline in solar activity known as the Maunder Minimum. Indeed, many scholars have argued that cold weather and particularly low winter temperatures during this period were associated with the political turbulence known as the crisis of the seventeenth century (Parker, 2013). Certainly, a sustained improvement in climatic conditions did not begin until the eighteenth century. Thus, it is unlikely that improving climatic conditions can explain the decline in Jewish persecutions.

5.5 Changes in Values and Beliefs?

A final factor we do not consider in detail is the importance of changing cultural values and beliefs as emphasised by Mokyr (2002, 2009). The Reformation did not lead to a marked decline in religious tension or antisemitism. Erasmus, the leading advocate of Christian humanism, is viewed by historians as an advocate of greater religious toleration, at least for Trinitarian Christians (see Zagorin, 2003, 50-63). However, he did not favour religious pluralism and 'would have had no patience with the the modern, enlightened idea of of toleration—of individual rights that extend to every race and creed' (Oberman, 1981, 39). In particular, his lenient attitude

[52]Kelly and Gráda (2014) contend that there was no decrease in temperature during the late middle ages. However, their argument remains contested by climate scientists and historians (Büntgen and Hellmann, 2014; White, 2014).

Author Manuscript

This article is protected by copyright. All rights reserved

towards other Christians did not mean that he favoured extending better treatment to Jews for whom he had an 'unbound hatred' suspecting them of a 'collective conspiracy' and viewing them as 'culpable as the wirepullers of the German Peasant's War (Oberman, 1981, 38).[53] Martin Luther expressed increasingly antisemitic views once he realised that the Reformation would not win over large numbers of Jewish converts; he penned the book *The Jews and their Lies* in 1543 and railed against them for usury: 'they [the Jews] are nothing but thieves and robbers who daily eat no morsel and wear no thread of clothing which they have not stolen and pilfered from us by means of their accursed usury'. He was also an advocate of expulsion: 'eject them forever from this country. For, as we have heard, God's anger with them is so intense that gentle mercy will only tend to make them worse and worse, while sharp mercy will reform them but little' (Luther, 1553).

From the end of the seventeenth century onwards, however, the Enlightenment may have played a role in reducing antipathy towards Jews at least among elites (Kamen, 1967; Grell and Porter, 2000). Data do not exist that shed light on the role played by the Enlightenment in increasing religious toleration. Certainly, by deemphasising the importance of revealed religion, the Enlightenment created a religiously neutral sphere where Christians and Jews could meet on an equal footing (Low, 1979). Nevertheless many Enlightenment figures including Voltaire, Edward Gibbon and Edmund Burke voiced anti-Jewish views (see Sutcliffe, 2000). John Locke was in favour of granting toleration to Jews, but this was because he believed it would encourage their conversion to Christianity (Matar, 1993). Voltaire described the Jewish nation as 'the most detestable ever to have sullied the earth'. It was only in the late eighteenth century that Enlightenment views began to exert a decisive influence on the treatment of Jews in Europe, generating the move towards Jewish emancipation. This intellectual movement, shaped by Moses Mendelssohn (1729–1786), Gotthold Lessing (1729–1781), and Christian von Dohm (1751–1820), and many others, came too late to help explain the end of large-scale Jewish persecutions in western and central Europe.[54] Moreover, when Jewish emancipation did arrive at the end of the

[53]Whether Erasmus's anti-Judaism is sufficiently virulent to represent antisemitism is a subject of scholarly debate (see Markish, 1986).

[54]Mendelssohn, however, did play a role in preventing an expulsion of Jews from Endlingen and Lengnau by writing to Johann Kaspar Lavater in 1774 (Hochman, 2014).

Author Manuscript

This article is protected by copyright. All rights reserved

eighteenth century it was shaped as much by the desire of rulers to make better economic use of their Jewish populations as it was by Enlightenment philosophy.[55]

6 Conclusion

This paper examines the effect of negative supply shocks on the treatment of religious or ethnic minorities. We develop a simple conceptual framework to study the conditions under which rulers find it beneficial to expel or expropriate a minority community. In our empirical analysis, we exploit the fact that the economies of medieval and early modern Europe were predominantly agrarian and use exogenous variation in temperature during the growing season to identity the effect of supply shocks on the probability of a Jewish community suffering persecution. A one standard deviation decrease in average temperature increased the probability of a Jewish community being persecuted from a baseline of 2% every five years to between 2.5% and 3%.

We argue that more developed states with greater fiscal capacity and greater political stability were less likely to expel Jewish communities as a result of periods of cold temperature. Our results support this hypothesis: the effect of supply shocks on persecutions was greater in societies with lower state capacity. Persecutions peaked in the fourteenth to sixteenth centuries. Increased agricultural productivity, greater market integration, and the rise of centralised states can help account for Europe's gradual transition from extractive to inclusive economic and political institutions during this period and in the establishment of a degree of protection for religious minorities.

University of Michigan–Dearborn

George Mason University

Author Manuscript

[55]The Habsburg emperor Joseph II began the process of granting Jews civic rights in 1782. But it was the French Revolution and the subsequent invasion of Germany by French armies that led to the imposition of Jewish emancipation in central Europe (Berkovitz, 1989; Vital, 1999). After the defeat of France, these reforms were partially reversed but the movement towards Jewish emancipation resumed and culminated with the removal of all disabilities on Jews in Austria-Hungary in 1868 and Germany in 1870 (see Katz, 1974; Mahler, 1985; Sorkin, 1987; ?).

This article is protected by copyright. All rights reserved

References

(2007). *Encyclopedia Judaica* (2nd ed.). Macmillan Reference.

Acemoglu, D. (2003). Why not a political Coase Theorem? Social conflict, commitment and politics. *Journal of Comparative Economics 31*(4), 620–652.

Acemoglu, D., T. A. Hassan, and J. A. Robinson (2011). Social structure and development: A legacy of the Holocaust in Russia. *The Quarterly Journal of Economics 126*(2), 895–946.

Acemoglu, D., S. Johnson, and J. Robinson (2005, June). The rise of Europe: Atlantic trade, institutional change, and economic growth. *American Economic Review 95*(3), 546–579.

Acemoglu, D. and J. A. Robinson (2012). *Why Nations Fail*. New York: Crown Business.

Allen, R. C. (2000, April). Economic structure and agricultural productivity in Europe, 1300–1800. *European Review of Economic History 4*(01), 1–25.

Allen, R. C. and R. W. Unger. Global commodity prices database.

Anderson, R. W. (2012). Measuring the Portuguese Inquisition. Memo.

Bai, Y. and J. Kai-sing Kung (2011, August). Climate shocks and Sino-nomadic conflict. *The Review of Economics and Statistics 93*(3), 970–981.

Barber, M. (1981a). Lepers, Jews and Moslems: The plot to overthrow Christendom in 1321. *History 66*(216), 1–17.

Barber, M. (1981b). The Pastoureaux of 1320. *The Journal of Ecclesiastical History 32*(2), 144–166.

Barkey, K. and I. Katznelson (2011). States, regimes, and decisions: why Jews were expelled from medieval England and France. *Theory and Society 40*, 475–503.

Baron, S. W. (1965a). *A Social and Religious History of the Jews*, Volume IX: Under Church and Empire. New York: Columbia University Press.

This article is protected by copyright. All rights reserved

Author Manuscript

Baron, S. W. (1965b). *A Social and Religious History of the Jews*, Volume X: On the Empire's Periphery. New York: Columbia University Press.

Baron, S. W. (1967a). *A Social and Religious History of the Jews*, Volume XI: Citizen or Alien Conjurer. New York: Columbia University Press.

Baron, S. W. (1967b). *A Social and Religious History of the Jews*, Volume XII: Economic Catalyst. New York: Columbia University Press.

Baron, S. W. (1975). *Economic History of the Jews*. Jerusalem: Keter Publishing House. edited by Nachum Gross.

Barzel, Y. (1992). Confiscation by the ruler: The rise and fall of Jewish lending in the Middle Ages. *Journal of Law and Economics 35*, 1–13.

Beinart, H. (2002). *The Expulsion of the Jews from Spain*. Oxford: The Littman Library of Jewish Civilization. translated by Jeffrey M. Green.

Berkovitz, J. A. (1989). *The Shaping of Jewish Identity in Nineteenth-century France*. Detroit: Wayne State University Press.

Bertrand, M. E. D. and S. Mullainathan (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics 119*(1), 249–75.

Besley, T. and T. Persson (2011). *Pillars of Prosperity*. Princeton, New Jersey: Princeton University Press.

Bockstette, V., A. Chanda, and L. Putterman (2002, December). States and markets: The advantage of an early start. *Journal of Economic Growth 7*(4), 347–69.

Bogart, D. and G. Richardson (2011). Property Rights and Parliament in Industrializing Britain. *Journal of Law and Economics 54*(2), 241 – 274.

Bosker, M., E. Buringh, and J. L. van Zanden (2013). From Baghdad to London: unravelling urban development in Europe and the Arab world 800-1800. *Review of Economics and Statistics 95*(4), 1418–1437.

Author Manuscript

This article is protected by copyright. All rights reserved

Botticini, M. (1997). New evidence on Jews in Tuscany, CA. 1310–1435: The 'friends & family' connection again. *Zakhor. Rivista di Storia degli Ebrei d'Italia 1*, 77–93.

Botticini, M. (2000). A tale of 'benevolent' governments: Private credit markets, public finance, and the role of Jewish lenders in Medieval and Renaissance Italy. *Journal of Economic History 60*, 164–189.

Botticini, M. and Z. Eckstein (2012). *The Chosen Few.* Princeton, New Jersey: Princeton University Press.

Box-Steffensmeier, J. and B. Jones (2004). *Event History Analysis: A Guide for Social Scientists.* Cambridge: Cambridge University Press.

Brambor, T., W. R. Clark, and M. Golder (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis 14*(1), 63–82.

Breuer, M. (1988). The "Black Death" and Antisemitism. In S. Almog (Ed.), *Antisemitism Through the Ages*, Oxford, pp. 139–151. Vidal Sassoon International Center for the Study of Antisemitism: Pergamon Press.

Brown, R. B. and S. McCartney (2005). The exchequer of the Jews revisited: The operation and effect of the Saccarium Judeorum. *The Medieval History Journal 8*, 303–321.

Büntgen, U. and L. Hellmann (2014). The little ice age in scientific perspective: cold spells and caveats. *Journal of Interdisciplinary History 44*(3), 353–368.

Campbell, B. M. (2010). Nature as historical protagonist. *Economic History Review 63*(2), 281–314.

Carvalho, J.-P. and M. Koyama (2011). Development and religious polarization: The emergence of reform and ultra-Orthodox Judaism. Economics Series Working Papers 560, University of Oxford, Department of Economics.

Chaney, E. (2013). Revolt on the Nile: Economic shocks, religion and political power. *Econometrica 81*(5), 2033–2053.

Author Manuscript

This article is protected by copyright. All rights reserved

Chazan, R. (1973–1974). Anti–usury efforts in thirteenth century Narbonne and the Jewish response. *Proceedings of the American Academy for Jewish Research 41*, 45–67.

Chazan, R. (2006). *The Jews of Western Christendom*. Cambridge: Cambridge University Press.

Chazan, R. (2010). *Reassessing Jewish Life in Medieval Europe*. Cambridge: Cambridge University Press.

Chua, A. (2004). *World on Fire: How Exporting Free Market Democracy Breeds Ethnic Hatred and Global Instability*. New York: Anchor Books.

Cohen, M. (1994). *Under Crescent and Cross*. Princeton, New Jersey: Princeton University Press.

Cohn, S. K. (2007). The Black Death and the burning of Jews. *Past & Present 196*(1), 3–36.

Conley, T. G. (2008). Spatial econometrics. In S. N. Durlauf and L. E. Blume (Eds.), *The New Palgrave Dictionary of Economics*. Palgrave Macmillan.

Crafts, N. and T. C. Mills (2009, March). From Malthus to Solow: How did the Malthusian economy really evolve? *Journal of Macroeconomics 31*(1), 68–93.

Cramer, A. C. (1940). The Jewish Exchequer, an inquiry into its fiscal function. *The American Historical Review 45*(2), 327–337.

Crowley, T. J. and T. S. Lowery (2000). How warm was the medieval warm period? *Ambio 29*(1), pp. 51–54.

De Long, J. B. and A. Shleifer (1993, October). Princes and merchants: European city growth before the industrial revolution. *Journal of Law & Economics 36*(2), 671–702.

Dell, M., B. Jones, and B. Olken (2012). Temperature shocks and economic growth: Evidence from the last half century. *American Economic Journal: Macroeconomics 4*(3), 66–95.

Dell, M., B. F. Jones, and B. A. Olken (2014). What Do We Learn from the Weather? The New Climate-Economy Literature. *Journal of Economic Literature 53*(3), 740–798.

Author Manuscript

This article is protected by copyright. All rights reserved

Dincecco, M. (2009). Fiscal centralization, limited government, and public revenues in Europe, 1650-1913. *Journal of Economic History 69*(1), 48–103.

Dobson, B. (2003). The medieval York Jewry reconsidered. In P. Skinner (Ed.), *The Jews in medieval Britain: historical, literary, and archaeological perspectives*, New York, pp. 145–156. Boydell and Brewer.

Dubnow, S. M. (1975). *History of the Jews in Russia and Poland*, Volume I. Ktav Publishing House. translated by I. Friedlaender.

Durante, R. (2009, October). Risk, cooperation and the economic origins of social trust: an empirical investigation. MPRA Paper 25887, University Library of Munich, Germany.

Elman, P. (1937). The economic causes of the expulsion of the Jews in 1290. *The Economic History Review 7*, 145–154.

Emery, R. W. (1959). *The Jews of Perpignan in the Thirteenth Century: An Economic Study Based on Notoral Records*. New York: Columbia University Press.

Felsenstein, F. (1999). *Anti-Semitic Stereotypes: A paradigm of otherness in English popular culture, 1660–1830*. Baltimore: John Hopkins University Press.

Fenske, J. and N. Kala (2013, January). Climate, ecosystem resliience and the slave trade. memo.

Fischer, G., H. van Nelthuizen, M. Shah, and F. Nachtergaele (2002). *Global Agro-Ecological Assessment for Agriculture in the 21st Century: Methodology and Results*. Rome: Food and Agriculture Organization of the United Nations.

Galloway, P. R. (1986). Long-term fluctuations in climate and population in the preindustrial era. *Population and Development Review 12*(1), pp. 1–24.

Gerber, J. S. (1992). *The Jews of Spain: A history of the Sephardic experience*. New York: The Free Press.

Glaeser, E. L. (2005, January). The political economy of hatred. *The Quarterly Journal of Economics 120*(1), 45–86.

Author Manuscript

This article is protected by copyright. All rights reserved

Golb, N. (1998). *The Jews in Medieval Normandy*. Cambridge: Cambridge University Press.

Greene, W. (2004). The behaviour of the maximum likelihood estimator of limited dependent variable models in the presence of fixed effects. *The Econometrics Journal 7*(1), 98–119.

Grell, O. P. and R. Porter (2000). Toleration in enlightenment Europe. In O. P. Grell and R. Porter (Eds.), *Toleration in Enlightenment Europe*, Cambridge, pp. 1–23. Cambridge University Press.

Grosfeld, I., A. Rodnyansky, and E. Zhuravskaya (2013, August). Persistent anti-market culture: A legacy of the Pale of Settlement after the Holocaust. *American Economic Journal: Economic Policy 5*(3), 189–226.

Guiot, J. and C. Corona (2010, April). Growing season temperature in Europe and climate forcings over the past 1400 years. *Plos One 5*(4), 1–15.

Haliczer, S. H. (1973). The Castilian urban patriciate and the Jewish expulsions of 1480–92. *The American Historical Review 78*(1), 35–62.

Heckscher, E. F. (1955). *Mercantilism*, Volume II. London: George Allen & Unwin LTD. translated by E.F. Soderlund.

Hochman, L. (2014). *The Ugliness of Moses Mendelssohn: Aesthetics, Religion, and Morality in the Eighteenth Century*. London: Routledge.

Horowitz, D. (2001). *The Deadly Ethnic Riot*. Berkeley: University of California Press.

Hsiang, S. and M. Burke (2014). Climate, conflict, and social stability: What does the evidence say? *Climate Change 123*, 39–55.

Hsiang, S., M. Burke, and E. Miguel (Forthcoming). Quantifying the influence of climate on human conflict. *Science 341*(6151).

Hsiang, S. M. (2010). Temperatures and cyclones strongly associated with economic production in the Caribbean and Central America. *Proceedings of the National Academy of Sciences 107*(35), 15367–15372.

Author Manuscript

This article is protected by copyright. All rights reserved

Huscroft, R. (2006). *Expulsion, England's Jewish Solution*. Stroud, Gloucestershire: Tempus Publishing Limited.

Iannaccone, L. R. (1992, April). Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of Political Economy 100*(2), 271–91.

Israel, J. (1985). *European Jewry in the Age of Mercantilism, 1550–1750*. Oxford: Oxford University Press.

Jia, R. (2014). Weather shocks, sweet potatoes and peasant revolts in historical China. *Economic Journal 124*(575), 92–118.

Johnson, N. D. and M. Koyama (2013). Legal centralization and the birth of the secular state. *Journal of Comparative Economics 41*(4), 959–978.

Johnson, N. D. and M. Koyama (2014a). Tax farming and the origins of state capacity in England and France. *Explorations in Economic History 51*(1), 1–20.

Johnson, N. D. and M. Koyama (2014b). Taxes, lawyers, and the decline of witch trials in France. *Journal of Law and Economics 57*(1), 77–112.

Jones, B. and B. Olken (2010). Climate shocks and exports. *American Economic Review: Papers and Proceedings*.

Jordan, W. C. (1989). *The French Monarchy and the Jews: From Philip Augustus to the Last Capetians*. Philadelphia: University of Pennsylvania Press.

Jordan, W. C. (1998). Jews, regalian rights, and the constitution in Medieval France. *AJS Review 23*, 1–16.

Kamen, H. (1967). *The Rise of Toleration*. New York: World University Library.

Kamen, H. (1988). The Mediterranean and the expulsion of Spanish Jews in 1492. *Past & Present 119*, 30–55.

Kaplan, B. (2007). *Divided by Faith*. Cambridge, M.A.: Harvard University Press.

Author Manuscript

This article is protected by copyright. All rights reserved

Kaplan, S. (2013). *Bread, Politics and Political Economy in the Reign of Louis XV: Anthem European Studies.* Anthem Other Canon Economics Series. Anthem Press.

Karaman, K. and Ş. Pamuk (2013). Different paths to the modern state in Europe: The interaction between warfare, economic structure and political regime. *American Political Science Review 107*(3), 603–626.

Katz, D. S. (1994). *The Jews in the History of England, 1485–1850.* Oxford: Clarendon Press.

Katz, J. (1974). *Out of the Ghetto.* Cambridge, MA.: Harvard University Press.

Katznelson, I. (2005). "To give counsel and to consent": Why the king Edward I expelled his Jews (in 1290). In *Preferences and Situations*, New York, pp. 88–126. Russell Sage Foundation.

Kelly, M. and C. Ó. Gráda (2014). The waning of the little ice age: climate change in early modern Europe. *Journal of Interdisciplinary History 44*(3), 301–325.

Koyama, M. (2010a). Evading the 'taint of usury': The usury prohibition as a barrier to entry. *Explorations in Economic History 47*(4), 420–442.

Koyama, M. (2010b, December). The political economy of expulsion: The regulation of Jewish moneylending in medieval England. *Constitutional Political Economy 21*(4), 374–406.

Langmuir, G. I. (1990). *Toward a Definition of Antisemitism.* Berkeley: University of California Press.

Leonard, G. H. (1891). The expulsion of the Jews by Edward I an essay in explanation of the Exodus, A.D. 1290. *Transactions of the Royal Historical Society 5*, 103–146.

Levack, B. P. (1996). State-building and witch hunting in early modern Europe. In J. Barry, M. Hester, and G. Roberts (Eds.), *Witchcraft in Early Modern Europe*, Cambridge, pp. 96–118. Cambridge University Press.

Levenson, A. T. (2012). *The Wiley-Blackwell History of Jews and Judaism.* London: Wiley-Blackwell.

Author Manuscript

This article is protected by copyright. All rights reserved

Lipman, V. D. (1967). *The Jews of medieval Norwich*. London: Jewish Historical Society of England. Edited by A.M. Habermann. With an appendix of Latin documents from the Westminster Abbey Muniment Room; and the Hebrew Poems of Meir of Norwich (edited by A.M. Habermann).

Low, A. F. (1979). *Jews in the Eyes of Germans: from the Enlightenment to Imperial Germany*. Michigan: Institute for the study of Human Issues.

Luther, M. (1553). *The Jews and their lies*. Los Angeles: Christian Nationalist Crusade.

Maccini, S. and D. Yang (2009, June). Under the weather: Health, schooling, and economic consequences of early-life rainfall. *American Economic Review 99*(3), 1006–1026.

Madesam, A., D. Shoag, S. Veuger, and D. Yanagizawa-Drott (2013). Do political protests matter? evidence from the tea party movement. *Quarterly Journal of Economics 128*(4), 16633–1685.

Mahler, R. (1985). *Hasidism and the Jewish Enlightenment*. Philadelphia: The Jewish Publication Society of America. translated from Yddish by Eugene Orenstein, translated from Hebrew by Aaron Klein and Jenny Machlowitz Klein.

Malik, A. and J. R. Temple (2009, November). The geography of output volatility. *Journal of Development Economics 90*(2), 163–178.

Malkiel, D. (2001). Destruction or conversion: Intention and reaction, Crusaders and Jews, in 1096. *Jewish History 15*(3), 257–280.

Markish, S. (1986). *Erasmus and the Jews*. Chicago: University of Chicago Press.

Masschaele, J. (1993). Transport costs in medieval England. *The Economic History Review 46*(2), 266–279.

Matar, N. I. (1993, 1). John Locke and the Jews. *The Journal of Ecclesiastical History 44*, 45–62.

Mechoulan, S. (2004). The expulsion of the Jews from France in 1306: A modern fiscal analysis. *Journal of European Economic History 33*(3), 555–584.

Author Manuscript

This article is protected by copyright. All rights reserved

Menache, S. (1985). Faith, myth, and politics: The sterotype of the Jews and their expulsion from England and France. *The Jewish Quarterly Review 75*, 351–374.

Menache, S. (1987). The king, the Church and the Jews: Some considerations on the expulsions from England and France. *Journal of Medieval History 13*, 223–236.

Menache, S. (1997). Mathew Paris's attitudes toward Anglo–Jewry. *Journal of Medieval History 23*, 139–162.

Miguel, E. (2005, October). Poverty and witch killing. *Review of Economic Studies 72*(4), 1153–1172.

Mitra, A. and D. Ray (2013, May). Implications of an economic theory of conflict: Hindu-Muslim violence in India. NBER Working Papers 19090, National Bureau of Economic Research, Inc.

Mokyr, J. (2002). *The Gift of Athena: Historical Origins of the Knowledge Economy*. Princeton, New Jersey: Princeton UP.

Mokyr, J. (2009). *The Enlightened Economy*. New Haven: Yale University Press.

Monter, E. W. (1994). The death of coexistence: Jews and Moslems in Christian Spain, 1480-1502. In R. B. Waddington and A. H. Williamson (Eds.), *The Expulsion of the Jews: 1492 and after*, New York, pp. 1–5. Garland Publishing.

Moore, R. I. (1992). Anti-Semitism and the Birth of Europe. *Christianity and Judaism*, 33–57.

Moore, R. I. (2008). The war against heresy in medieval Europe. *Historical Research 81*(212), 189–210.

Mundill, R. R. (1991). Lumbard and Son: The businesses and debtors of two Jewish moneylenders in late thirteenth–century England. *The Jewish Quarterly Review 82*, 137–170.

Mundill, R. R. (1998). *England's Jewish Solution: Experiment and Expulsion, 1262–1290*. Cambridge: CUP.

Author Manuscript

This article is protected by copyright. All rights reserved

Mundill, R. R. (2010). *The King's Jews: Money, Massacre and Exodus in Medieval England*. London: Continuum.

Nirenberg, D. (1996). *Communities of Violence*. Princeton, New Jersey: Princeton University Press.

North, D. C., J. J. Wallis, and B. R. Weingast (2009). *Violence and Social Orders: a conceptual framework for interpreting recorded human history*. Cambridge: Cambridge University Press.

Nunn, N. and N. Qian (2011). The potato's contribution to population and urbanization: Evidence from a historical experiment. *The Quarterly Journal of Economics 126*(2), 593–650.

Oberman, H. A. (1981). *The Roots of Anti-Semitism*. Philadelphia: Fortress Press. translated by James I. Porter.

Oster, E. (2004, Winter). Witchcraft, weather and economic growth in renaissance Europe. *Journal of Economic Perspectives 18*(1), 215–228.

Ovrut, B. D. (1977). Edward I and the expulsion of the Jews. *The Jewish Quarterly Review 67*, 224–35.

Parker, G. (2013). *Global Crises: War, Climate Change and Castastrophe in the Seventeenth Century*. New Haven: Yale University Press.

Pascali, L. (2015). Banks and development: Jewish communities in the Italian Renassiance and current economic performance. *Review of Economics and Statistics Forthcoming*.

Pauling, A., J. Luteracher, C. Casty, and H. Wanner (2006). Five hundred years of gridded high-resolution precipitation reconstructions over europe and the connection to large-scale circulation. *Climate Dynamics 26*(4), 387–405.

Pinker, S. (2011). *The Better Angels of Our Nature: Why Violence has Declined*. London: Viking.

Poliakov, L. (1955). *The History of Anti-Semitism*, Volume 1. Philadelphia: University of Pennsylvania Press. translated by Richard Howard.

Author Manuscript

This article is protected by copyright. All rights reserved

Porter, J. R. and M. Gawith (1998). Temperatures and the growth and development of wheat: a review. *European Journal of Agronomy 10*, 23–36.

Porter, J. R. and M. A. Semenov (2005). Crop responses to climatic variation. *Philosophical Transactions of the Royal Society 360*, 2021–2035.

Pounds, N. (1974). *An Economic History of Medieval Europe*. London: Longman.

Richardson, H. (1960). *The English Jewry under Angevin Kings*. London, UK: Methuen and Co Ltd.

Roth, C. (1961). The economic history of the Jews. *The Economic History Review 14*, 131–135.

Roth, N. (1995). *Conversos, Inquisition, and the Expulsion of the Jews from Spain*. Madison, Wisconsin: The University of Wisconsin Press.

Rubin, M. (2004). *Gentile Tales: The Narrative Assault on Late Medieval Jews*. Philadelphia: University of Pennsylvania Press.

Ruiz, T. F. (2007). *Spain's Centuries of Crisis: 1300 - 1474*. Oxford: Basil Blackwell.

Shaw, W. (1896). *The History of Currency, 1252 to 1894* (Second ed.). New York: Burt Franklin.

Slavin, P. (2012). The Great Bovine Pestilence and its economic and environmental consequences in England and Wales, 1318–50. *The Economic History Review 65*(4), 1239–1266.

Sorkin, D. (1987). The genesis of the ideology of emancipation: 1806-1840. *Leo Baeck Institute Yearbook 32*(1), 11–40.

Stacey, R. C. (1985). Royal taxation and the social structure of medieval Anglo-Jewry : the tallages of 1239-1242. *Hebrew Union College Annual 56*, 175–249.

Stacey, R. C. (1995). Jewish lending and the medieval English economy. In R. H. Britnell and B. M. Campbell (Eds.), *A Commercialising Economy, England 1086 to c. 1300*, Manchester, pp. 7–27. Manchester University Press.

Author Manuscript

This article is protected by copyright. All rights reserved

Stacey, R. C. (1997). Parliamentary negotiation and the expulsion of the Jews from England. *Thirteenth Century England VI*, 77–103.

Stacey, R. C. (2000). Antisemitism and the medieval English state. In J. R. Maddicott and D. M. Palliser (Eds.), *The Medieval State: essays presented to James Campbell*, London, pp. 163–177. Hambledon Press.

Stampfer, S. (2003). What actually happened to the Jews of Ukraine in 1648? *Jewish History 17*(2), 207–227.

Stark, R. (1996). *The Rise of Christianity: How the Obscure, Marginal Jesus Movement Became the Dominant Religious Force in the Western World in a Few Centuries*. Princeton, N.J.: Princeton University Press.

Stasavage, D. (2011). *States of Credit*. Princeton, N.J.: Princeton University Press.

Stein, S. (1956). Usury and the medieval English church courts. *Journal of Semitic Studies 1, 2*, 141–162.

Stow, K. R. (1981). Papal and Royal Attitudes toward Jewish Lending in the Thirteenth Century. *AJS Review 6*, 161–184.

Stow, K. R. (1992). *Alienated Minority, the Jews of Medieval Latin Europe*. Cambridge, MA: Harvard University Press.

Sutcliffe, A. (2000). Can a Jew be a Philosophe? Isaac de Pinto, Voltaire, and Jewish participation in the Enlightenment. *Jewish Social Studies 6*(3), 31–51.

Taitz, E. (1994). *The Jews of Medieval France: The Community of Champagne*. Westport, Conn.: Greenwood Press.

Tazbir, J. (1973). *A State without States*. Panstowowy Instytut Wydawiczy: The Kościuzko Foundaton Twayne Publishers.

Tol, R. S. and S. Wagner (2010). Climate change and violent conflict in Europe over the last millennium. *Climatic Change 99*(1-2), 65–79.

Author Manuscript

This article is protected by copyright. All rights reserved

Trachtenberg, J. (1943). *The Devil and the Jews*. Philadelphia: The Jewish Publication Society.

van Nimwegen, O. (2006). *The Dutch Army and the Military Revolutions, 1599-1688*. Woodbridge: The Boydell Press. translated by Andrew May.

Vidal-Robert, J. (2011, October). An economic analysis of the Spanish Inquisition's motivations and consequences. memo.

Vital, D. (1999). *A People Apart, The Jews in Europe 1789–1939*. Oxford: Oxford University Press.

Voigtländer, N. and H.-J. Voth (2012). Persecution perpetuated: The medieval origins of Anti-Semitic violence in Nazi Germany. *Quarterly Journal of Economics 127*(3), 1–54.

Waldinger, M. (2014, August). The economic effects of long-term climate change: Evidence from the little ice age, 1500–1700. memo.

Weinryb, B. D. (1972). *The Jews of Poland*. Philadelphia: Jewish Publication Society of America.

White, S. (2014). The real little ice age. *Journal of Interdisciplinary History 44*(3), 327–352.

Yamaguchi, K. (1991). *Event History Analysis*. Newbury: Sage Publications, Inc.

Yanagizawa-Drott, D. (2015). Propaganda and conflict: Evidence from the Rwandan Genocide. *The Quarterly Journal of Economics Forthcoming*.

Zagorin, P. (2003). *How the Idea of Religious Toleration Came to the West*. Princeton, New Jersey: Princeton University Press.

Zhang, D. D., C. Jim, G. Lin, Y.-Q. He, J. J. Wang, and H. F. Lee (2006). Climatic change, wars and dynastic cycles in China over the last millennium. *Climatic Change 76*(3-4), 459–477.

Author Manuscript

This article is protected by copyright. All rights reserved

Appendices for Online Publication Only

A Descriptive Statistics

Table 7:
Descriptive Statistics: Five-Year Data

Variable		Mean	Std. Dev.	Min	Max	Observations
Persecution	overall	2.242	14.806	0.000	100.000	N = 55698
	between		3.062	0.000	33.333	n = 933
	within		14.643	-31.091	101.523	T-bar = 59.6977
Expulsion	overall	1.409	11.788	0.000	100.000	N = 55698
	between		2.579	0.000	33.333	n = 933
	within		11.670	-31.924	100.685	T-bar = 59.6977
Lag1Weather	overall	-0.054	0.340	-1.278	1.370	N = 55698
	between		0.099	-0.544	0.452	n = 933
	within		0.330	-1.437	1.257	T-bar = 59.6977
LowAntiquity	overall	0.380	0.485	0.000	1.000	N = 55698
	between		0.409	0.000	1.000	n = 933
	within		0.285	-0.588	1.363	T-bar = 59.6977
LowSuitability	overall	0.477	0.499	0.000	1.000	N = 55698
	between		0.495	0.000	1.000	n = 933
	within		0.000	0.477	0.477	T-bar = 59.6977
LowCapital	overall	0.777	0.416	0.000	1.000	N = 55698
	between		0.378	0.000	1.000	n = 933
	within		0.200	-0.120	1.767	T-bar = 59.6977
LowConstraint	overall	0.411	0.492	0.000	1.000	N = 55698
	between		0.405	0.000	1.000	n = 933
	within		0.294	-0.498	1.398	T-bar = 59.6977
PopDensity	overall	11.766	13.001	0.000	329.829	N = 55698
	between		11.029	0.000	130.915	n = 933
	within		8.032	-88.051	230.363	T-bar = 59.6977

Notes. See text and Appendix C for descriptions of data. Statistics for in-sample cities (cities with Jewish community present).

Author Manuscript

This article is protected by copyright. All rights reserved

Table 8:
Descriptive Statistics: One-Year Data

Variable		Mean	Std. Dev.	Min	Max	Observations
Persecutions	overall	0.470	6.832	0.000	100.000	N = 276359
	between		0.701	0.000	10.000	n = 933
	within		6.816	-9.531	100.325	T-bar = 296.205
Expulsions	overall	0.285	5.322	0.000	100.000	N = 276359
	between		0.597	0.000	10.000	n = 933
	within		5.311	-9.716	100.138	T-bar = 296.205
$\text{Temperature}_{i,t-1}$	overall	-0.055	0.342	-1.388	1.370	N = 276359
	between		0.098	-0.508	0.370	n = 933
	within		0.332	-1.434	1.257	T-bar = 296.205
LowAntiquity	overall	0.380	0.485	0.000	1.000	N = 276359
	between		0.409	0.000	1.000	n = 933
	within		0.285	-0.600	1.376	T-bar = 296.205
LowSuitability	overall	0.429	0.495	0.000	1.000	N = 276359
	between		0.492	0.000	1.000	n = 933
	within		0.000	0.429	0.429	T-bar = 296.205
PopDensity	overall	0.777	0.416	0.000	1.000	N = 276359
	between		0.379	0.000	1.000	n = 933
	within		0.199	-0.126	1.774	T-bar = 296.205

Notes See text and Appendix C for descriptions of data. Statistics for in-sample cities (cities with Jewish community present).

Author Manuscript

This article is protected by copyright. All rights reserved

Table 9:
Descriptive Statistics: Grain Prices

Variable		Mean	Std. Dev.	Min	Max	Observations
Wheat Price (log)	overall	-54.82	98.44	-409.44	650.32	N = 16171
	between		88.83	-247.94	580.03	n = 108
	within		46.27	-306.95	186.80	T-bar = 149.731
Temperature	overall	-0.15	0.48	-2.01	1.47	N = 16171
	between		0.14	-0.43	0.23	n = 108
	within		0.47	-2.03	1.39	T-bar = 149.731

Notes. See text and Appendix C for descriptions of data.

Author Manuscript

This article is protected by copyright. All rights reserved

B Further Robustness Tests

As we describe in the main paper, we run several additional robustness tests on our data. This Appendix provides further details for the most informative of these.

We run the mechanism regressions for soil suitability and state antiquity using the continuous versions of those variables (as opposed to the dichotomous variables we use in our baseline regressions) in Table 10. Interpreting the size and significance of the interactions in Table 10 is non-trivial since it requires visualising these statistics over a range of values for the interacted variable. As such, we follow the suggestion of Brambor et al. (2006) and graph the DID regressions (cols. 2 and 4) in Figures B and B. The Figures plot out the overall effect of temperature on persecution probability – that is $\frac{\partial persecution}{\partial temperature} = \beta + \zeta \cdot Mechanism$. The 95 % confidence intervals for these Figures are also included and appropriately take into account the covariance between the coefficients on temperature and the interaction term (see Brambor et al. (2006)). The Figure illustrating the soil quality regressions clearly shows that for higher quality soil (value less than 4) there is no relationship between temperature and Jewish persecution. However, as we would expect, as soil quality deteriorates (value > 4) the effect of temperature becomes negative and statistically significant. We get similar, though somewhat stronger results using the continuous version of state antiquity (which we re-code so that higher values of the variable indicate more recent states).

One potential source of bias in the standard errors of our regressions stems from serial or spatial correlation (Bertrand and Mullainathan, 2004; Conley, 2008). In Table 11 we control for these potential biases using the method suggested by Conley (2008) and implemented in Stata code by Hsiang (2010). We take into account spatial influence of all cities within a 300km circle surrounding each city. We also assume an AR(2) process. Our estimates are unaffected although our standard errors increase somewhat.

We extracted rainfall data contained in Pauling et al. (2006) for our cities between 1500 and 1799.[56] We extracted the data in a very similar way to how we created the city-year temperature data. Figure 14 illustrates the data grid and contour map we created for summer 1500 showing

[56] We use the series on summer rainfall amounts.

Author Manuscript

This article is protected by copyright. All rights reserved

rain accumulations in centimetres. As a robustness check on our findings, we expect that extreme values of rainfall, like extreme temperature, would lead to lower agricultural output and therefore produce the kind of subsistence crises that made persecutions more likely. The rainfall data largely confirm this hypothesis. Table 12 shows the effect of running our baseline specifications using the log of 5-year lag of average rainfall as the variable of interest. Using the sample covering all the years for which rainfall data are available (1500-1799) we get mixed support.

The OLS regression in column yields a coefficient of -2.04 which suggests that a one standard deviation in rainfall (0.28) increases persecution probability by about half of a percentage point. However, this coefficient shrinks considerably and loses statistical significance once we introduce city fixed effects and time dummies.

We know from our earlier analysis that the relationship between supply shocks and persecution of Jews weakened over the course of the early modern period as states developed more fiscal and legal capacity. Recognising this fact, we introduce an interaction term for the period before 1600. These are reported in columns (3)-(5) of Table 12. We obtain significantly larger coefficients for years prior to 1600 indicates that the relationship between rainfall and persecutions was indeed stronger in this period. Column (3) suggests that the combined effect of a one standard deviation decrease in rainfall would raise persecution probability by 1.6 percentage points (0.28*5.84). Due to the small number of observations that we have for the period before 1600, and the fact that the time dummies absorb a lot of variation, we do not obtain statistically significant coefficients in our DID regression. However, when we use a flexible specification that allows each city to have its own intercept we do obtain an estimate that is comparable in magnitude to the coefficient that we obtain in the OLS regression.

In Table 13 we run our mechanisms regressions using the rainfall variable during the sixteenth and seventeenth centuries. The results largely mirror what we find using temperature. The DID estimate of the interaction between poor soil quality and rainfall on persecution probability is large and statistically significant. The overall effect of low rainfall on persecution probability ($\frac{\partial Persecution}{\partial Rainfall}$) suggested by the estimates in Column (2) is -5.23. In other words, a one standard deviation decrease in rainfall increases persecution probability by 1.5% relative to the baseline

Author Manuscript

This article is protected by copyright. All rights reserved

probability of 2.2% in areas with low soil quality. In contrast, in areas with good soil quality, the effect of a one standard deviation decrease in rainfall leads only to a 0.45% increase in persecution probability (and this effect is statistically insignificant). The overall effect of the state antiquity variable is similarly large with a one standard deviation decrease in rainfall leading to a 1.3% increase in persecutions in cities within more recently developed states. Older states, which presumably also possess greater legal and fiscal capacity, exhibit no statistically or economically significant relationship between rainfall and persecutions. Finally, consistent with the temperature mechanisms regressions, rainfall exhibits no significant relationship between capital protection or constraints on the executive. This is, again, in keeping with our overall story that the breakdown in the relationship between supply shocks and Jewish persecution was driven more by increases in state capacity than by constraints on the power of rulers.

Overall, the rainfall analysis support our baseline analysis using temperature shocks. This is provides us with considerable confidence concerning the validity of our findings as the rainfall data come from a completely different source than our temperature data. In fact, there is very little statistical relationship between the two measures. During the sixteenth and seventeenth centuries, the correlation between rainfall and temperature is only -0.047.

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 6:
The Effect of Colder Temperature in Areas with Lower Quality Soil Using a Continuous Measure of Soil Quality

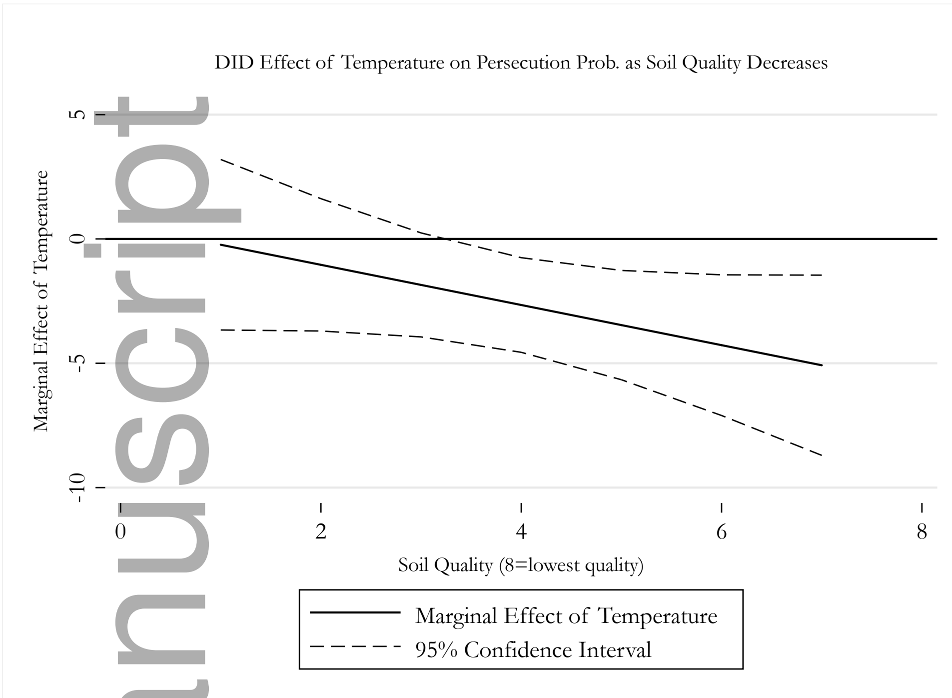
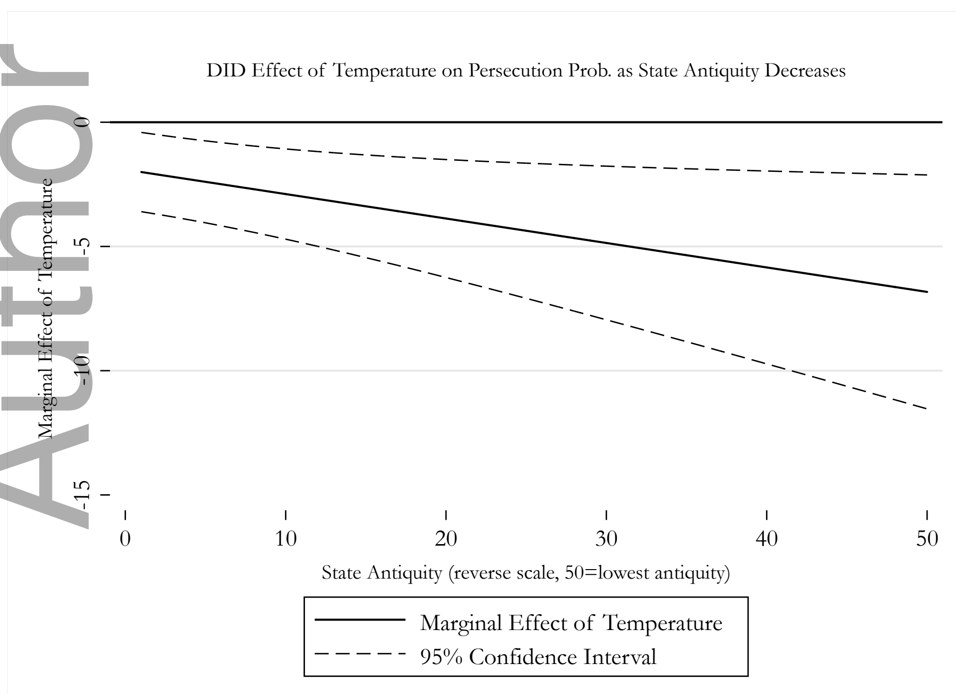


Figure 7:
The Effect of Colder Temperature in Areas with Lower State Antiquity Using a Continuous Measure of State Antiquity



Author Manuscript

This article is protected by copyright. All rights reserved

Table 10:
Continuous Wheat Suitability and Continuous State Antiquity Variable

	(1)	(2)	(3)	(4)
	Dependent Variable: Persecutions			
$\text{Temperature}_{,t-1}$	6.426*	0.575	-0.980	-1.91**
	(3.227)	(2.15)	0.625)	(0.798)
Low Cont. Wheat × $\text{Temp}_{,t-1}$	-2.002**	-0.808		
	(0.805)	(0.496)		
Low Cont. Antiquity			-0.00156	0.0407**
			(0.0347)	(0.0184)
Low Cont. Antiquity × $\text{Temp}_{,t-1}$			-0.115*	-0.0984**
			(0.0674)	(0.0445)
Controls	Yes	Yes	Yes	Yes
City Dummies	Yes	Yes	Yes	Yes
Time Dummies	No	Yes	No	Yes
N	55696	55696	55696	55696
F	7.18	17.60	5.944	5.329
p-values	0.0002	0.0000	0.0004	0.0015

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes. Controls are the same as in Table 1. Details about our measures of wheat suitability and state antiquity are in the main text.

Author Manuscript

This article is protected by copyright. All rights reserved

Author Manuscript

Table 11:

Mechanism regressions controlling for spatial and serial correlation

	Dependent Variable: Persecutions									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Temperature$_{,t-1}$	-2.52***	-3.19**	-1.22**	-2.53**	-1.38***	-2.20*	-2.76**	-3.59**	-3.07*	-3.30*
	(0.89)	(1.51)	(0.475)	(1.27)	(0.52)	(1.15)	(1.20)	(1.65)	(1.82)	(1.89)
Low Wheat			-0.414	-1.65						
			(0.29)	(1.67)						
Low Wheat × Temperature$_{,t-1}$			-2.76	-1.13						
			(1.72)	(0.9)						
Low State Antiquity					0.757	2.09***				
					(0.5)	(0.5)				
Low State Antiquity × Temperature$_{,t-1}$					-2.91	-2.34*				
					(1.94)	(1.34)				
Low Constraints							-1.38**	0.321		
							(0.56)	(0.5)		
Low Constraints × Temperature$_{,t-1}$							1.28	1.36		
							(1.1)	(0.8)		
Low Capital Protect									-1.50	0.259
									(2.12)	(1.63)
Low Capital Protect × Temperature$_{,t-1}$									0.91	0.11
									(1.90)	(1.9)
Temperature$_{,t-1}$ +			-3.98**	3.66**	-4.30**	-4.54**	-1.48***	-2.23*	-2.17***	-3.19**
Interaction			(1.71)	(1.74)	(1.93)	(2.12)	(0.54)	(1.27)	(0.79)	(1.33)
Correct for Spatial Dep	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Correct for Serial Corr	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	55698	55698	55698	55698	55698	55698	55698	55698	55698	55698
adj. R^2	0.056	0.123	0.057	0.124	0.057	0.126	0.057	0.124	0.056	0.123

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Coefficients are multiplied by 100. We control for spatial and serial correlation using the method suggested by Conley (2008) and implemented in Stata code by Hsiang (2010). We take into account spatial influence of all cities within a 500km circle surrounding each city. We also assume an AR(2) process. ***, **, and * indicate significance at the 1%, 5%, and 10% levels respectively.

This article is protected by copyright. All rights reserved

Table 12:
Baseline Rainfall Regressions

	Dependent Variable: Persecutions				
	(1)	(2)	(3)	(4)	(5)
Rainfall_{t-1}	-2.04***	-0.488	-0.107	-0.417	0.0861
	(0.494)	(0.795)	(0.325)	(0.772)	(0.983)
Pre-1600			32.97***	0.0991	0.0991
			(5.378)	(3.882)	(11.28)
Pre-1600*Rainfall_{t-1}			-4.376**	-0.745	-4.429**
			(6.842)	(5.361)	(5.361)
Rainfall_{t-1} + Interaction			–5.840***	-0.897	-7.115**
			(1.200)	(1.306)	(2.891)
Controls	Yes	Yes	Yes	Yes	Yes
City Dummies	No	Yes	No	Yes	Yes
Time Dummies	No	Yes	No	Yes	No
City-Specific Intercept	No	No	No	No	Yes
N	23094	23094	23094	23094	23094
F	11.15	3.752	16.04	3.696	3.081

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Coefficients are reported with standard errors clustered at the city level. Controls refer to urban population. Columns (1)-(2) report the baseline effect of rainfall on persecution probability. Columns (3)-(5) include an interaction term with a pre-1600 dummy. Column (5) allows each city its own intercept.

Author Manuscript

This article is protected by copyright. All rights reserved

Table 13:
Mechanism Regressions with Rainfall Data

	Dependent Variable: Persecutions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rainfall_{t-1}	0.674	-1.61	0.968	-0.667	-0.435	-3.22*	-4.29*	-5.79**
	(1.21)	(1.56)	(1.13)	(1.58)	(1.26)	(1.79)	(2.29)	(2.45)
Low Wheat × Rainfall_{t-1}	-3.55*	-3.62*						
	(1.98)	(1.96)						
Low State Antiquity			20.7**	20.6*				
			(9.92)	(10.80)				
Low State Antiquity × Rainfall_{t-1}			-3.70**	-3.93**				
			(1.78)	(1.95)				
Low Constraints					0.0443	-5.24		
					(11.3)	(12.3)		
Low Constraint × Rainfall_{t-1}					-0.138	0.863		
					(2.09)	(2.26)		
Low Capital Protection × Rainfall_{t-1}							4.57*	3.75
							(2.50)	(2.42)
Rainfall_{t-1} + Interaction	-0.0288*	-0.0523***	-0.0273*	-0.0460**	-0.00573	-0.0236	0.0028	-0.0204
	(0.0160)	(0.0197)	(0.0151)	(0.01832)	(0.0163)	(0.01874)	(0.0107)	(0.0149)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	Yes	No	Yes	No	Yes	No	Yes
N	13065	13065	13065	13065	13065	13065	13065	13065
F	7.654	3.243	6.303	3.240	5.035	3.139	7.903	3.306
p-values	0.0001	0.0000	0.0001	0.0000	0.0005	0.0000	0.0000	0.0000

Standard errors clustered at the city-level in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Controls are the same as those employed in Table 2. We do not report coefficients for the effect of Low Capital because of insufficient variation in this variable for the period 1500-1799.

Author Manuscript

This article is protected by copyright. All rights reserved

C Data Appendix

Data on Jewish presence in cities is taken from city entries in the *Encyclopedia Judaica* 2007. The *Encyclopedia Judaica* typically mentions when Jews entered a city, when they were persecuted, when they were expelled, and when they were allowed re-entry. Using this information a database was created of 1,069 cities that had a Jewish presence at some point from 1000 to 1800. Figure 1 plots every city in our full database. In our empirical analysis we utilise the 933 cities for which we can obtain urbanisation data.

The Existence of a Jewish Community

Our dataset includes all cities that are recorded as having a permanent Jewish population in the period under consideration. As we note in the text, we explicitly code whether or not a Jewish community is present for every between 1100 and 1800. We do this on the basis of the information contained in the Encyclopedia Judaica. We are able to do this because for many communities the Encyclopedia explicitly mentions the date when a Jewish community is first recorded. For example, in Florence the first Jewish community was officially established in 1437. Alternatively, in other cases the Encyclopedia mentions the first date at for which we know for certain that there is a Jewish community. For example, in the entry for Trier, the Encyclopedia notes that 'The first definitive evidence for the presence of a Jewish community dates from 1066, when the Jews were saved from an attempted expulsion on the part of Archbishop Eberhard through his sudden death at the altar'. The entry for Burgus gives 974 as the data in which we know there was a Jewish community. Often the data of first entry is a rough estimate. The York entry records that Jews settled in the middle of the twelfth century. We therefore code a community as present from 1150 onwards. Similarly, we are told that Jews moved to Drogobych, Ukraine to work as contractors in the salt mines in the beginning of the fifteenth century, so a date of 1410 was used.

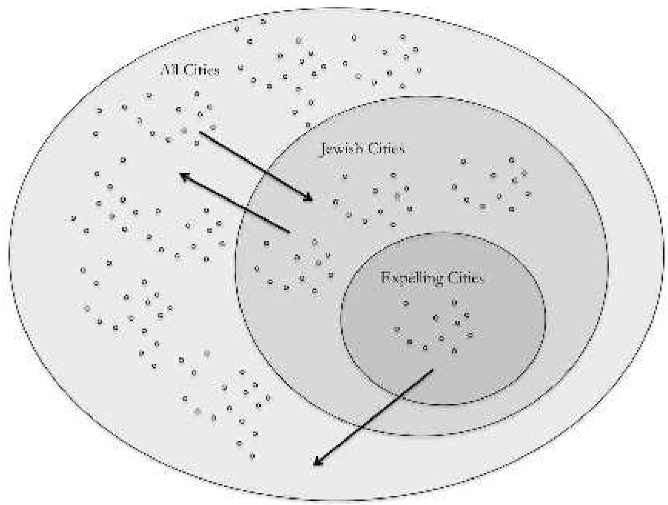
There are some communities for which the first information we have concerning a community is information on a pogrom. To overcome this problem we assume that a community has to have been present for either 50 years before the pogrom is mentioned. For example, Jews in Chomutov (Czech Republic) were first mentioned as being massacred in 1421, so the dates 1371

Author Manuscript

This article is protected by copyright. All rights reserved

was used as the main date of entry. We also consider 1, 25, 75 and 100 year internals prior to a communities prior to first mention in the Encyclopedia. These robustness checks do not change our baseline reasons and are available upon request.

Figure 8:
Cities in Our Dataset



Notes. All the 1069 cities in our database contain Jewish communities at some point between 1100 and 1800. In any given year a city either has a Jewish community or not. Only cities with Jewish communities are included in our sample as countries liable to conduct an expulsion.

Figure 8 provides a visual representation of our data. All of the 1,069 cities in our full database possessed Jewish communities at some point between 1100 and 1800. But expulsions could only occur in cities with a Jewish population in that year. A city that had expelled its Jewish population the year previously cannot expel them again unless the Jewish community in question had returned in the meantime. Thus, our regressions use only the sample represented by the two darker sets of cities.

Data on Persecutions

There are 1,366 persecutions in our full database: 785 expulsions and 614 pogroms. We have omitted all instances of persecution that cannot be dated. But we have included the cities in question in the sample if they had a documented Jewish population. The direction of this measurement error biases our coefficients downwards.

Author Manuscript

This article is protected by copyright. All rights reserved

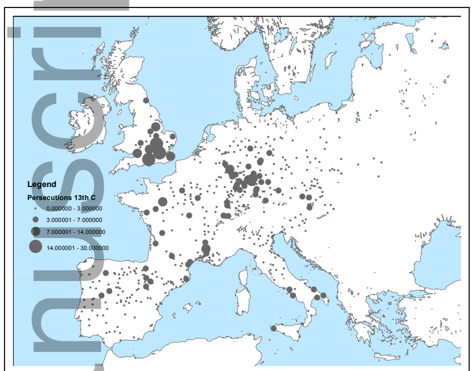
For example, Bonn is in our database as it had a Jewish community prior to 1100. This community was expelled and massacred in 1348 but is recorded as having returned to the city by 1381. There was also an expulsion in the fifteenth century that we omit because it is not dated. Occasionally, Jews left a city or a region for voluntary reasons. We have noted this in our database and these do not count such an observation as an expulsion even when the reasons for their leaving often had to do with the imposition of discriminatory taxes on Jews or the threat of popular violence. Figure 1 in the main text shows the distribution of expulsions across the cities in our database.

Figures 9a to 9f plot the number of persecutions per century. Our main empirical result is the strong causal link between negative temperature shocks and persecutions in the fifteenth and sixteenth centuries. Figures 9c and 9d show that the cities that drive this result are clustered in Spain, Portugal, and Germany during the fifteenth century. Persecuting cities cluster in Germany, Italy, and to a lesser extent eastern Europe in the sixteenth century.

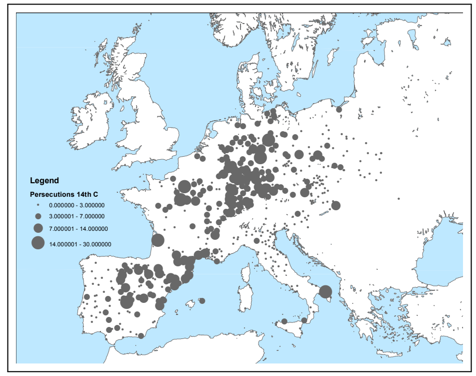
Author Manuscript

This article is protected by copyright. All rights reserved

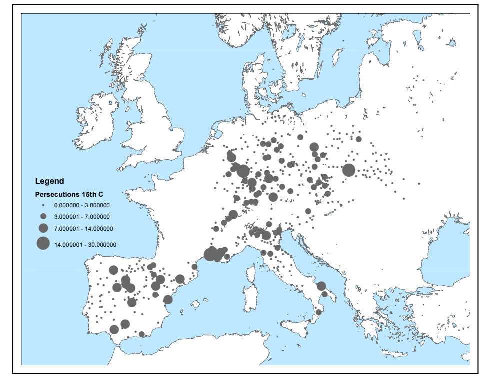
Author Manuscript



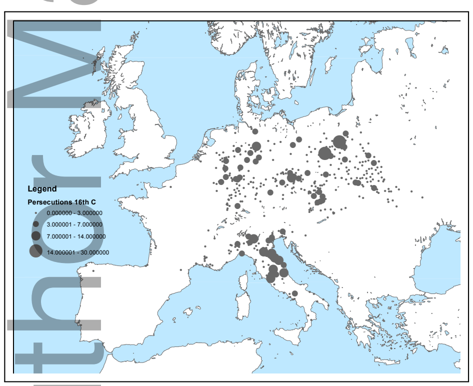
(a) 13th Century Expulsions.



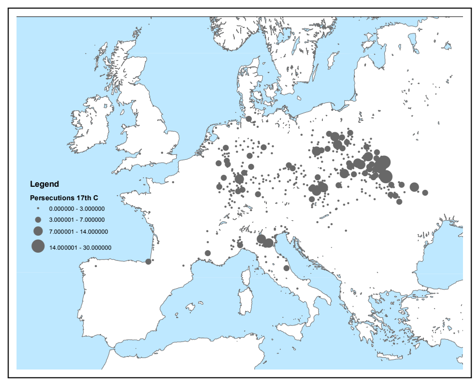
(b) 14th Century Expulsions.



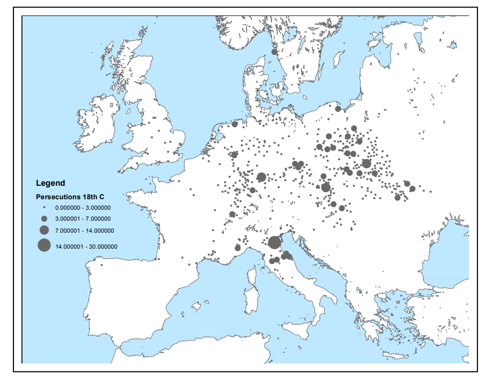
(c) 15th Century Expulsions.



(d) 16th Century Expulsions.



(e) 17th Century Expulsions.



(f) 18th Century Expulsions.

This article is protected by copyright. All rights reserved

The Decision to Establish a Jewish Community

The majority of Jewish communities in western Europe were established between 900 and 1200. This is before the major period of Jewish expulsions and persecutions. Jewish settlement was largely driven by the expansion of the European economy known as the Commercial Revolution. There is no evidence that the decision to establish a Jewish community in this period was influenced by the likelihood of expulsion or persecution. We therefore treat initial Jewish settlement as exogenous.

There is more concern that Jewish settlement in the period after 1300 was affected by the fear of persecution or expulsion. However, the available historical evidence mitigates this concern somewhat. For example, we know from documentary evidence that the Jews of England settled in France following their expulsion in 1290 as this was the geographically closest and culturally most similar Jewish community (the Jews of England spoke French) despite the fact that Jews in that country had suffered numerous local persecutions and expulsions and would in fact be expelled *en masse* by Philip IV in 1306 (Huscroft, 2006; Mundill, 2010). Similarly, the Jews of France were willing to return to France after this expulsion as they indeed did in 1315 even though they faced the threat of similar events occurring in the future.

This does not mean that Jews were irrational or that they failed to perceive the threat of persecution. On the contrary, they frequently negotiated contracts that guaranteed their protection with secular rulers as a condition of settlement. However, as we argue, the contracts typically proved unenforceable in the face of large negative shocks (such as those associated with bad harvests or the Black Death) (see Baron, 1965a, 1967a). Nor was there any location where Jews could go where they would be free from persecution; persecutions were less common in the Islamic Middle East but they still did take place on occasion (see Cohen, 1994). A factor that cannot be discounted was Jewish religious tradition, which encouraged Jews to see the period of exile following the destruction of the Second Temple as a period of necessary and inevitable suffering.

Finally, there were also sound economic reasons for this behaviour. Jewish commercial networks required Jewish communities to be spread across a wide geographical area. This

Author Manuscript

This article is protected by copyright. All rights reserved

enabled them to diversify across space and smooth idiosyncratic shocks (see Botticini, 1997). Moreover, the prohibition of lending at interest meant that the demand for Jewish moneylending services was highest precisely in areas that did not have a Jewish community. This was an important factor in encouraging Jewish communities to spread across western and central Europe.

Conversion

In medieval and early modern Europe Jewish identity was both a religious and an ethnic identity. In our analysis we assume that Jewish identity is fixed. In reality of course, Jewish religious, if not ethnic, identity was a choice variable that could respond endogenously to political and economic incentives. In this section we aruge that treating Jewish identity and fixed in short-term is appropriate.

Jewish religious identity evolved in the long-run in response to economic and political incentives. After Judaism became a literate religion there is strong evidence suggesting that it only flourished in regions with a commercial economy and some level of urbanisation while it declined in predominantly agrarian economies (see Botticini and Eckstein, 2012).

However, there is little evidence that the adherents to Judaism varied in response to short-run political variables. This is unsurprising for several reasons. First, there is a large amount of evidence that suggests that persecuting members of a particular religion tends to strengthen their belief (Stark, 1996, Chapter 8).[57] Certainly, the threat of expulsion or persecution clearly limited the attraction of converting to Judaism in the medieval period.[58] But with a few notable exceptions it did not induce Jews to convert to Christianity in large numbers. Monter observes that Islam and Judaism have never 'yielded many voluntary converts to Christianity: the history of futile Christian programs to convert Jews cannot be treated adequately without superhuman erudition and Voltairean wit' (Monter, 1994, 6).

Second, converted Jews were often not accepted into mainstream Christian society and faced hostility from both Jewish and Christian communities. A large number of conversions occurred in Spain in the aftermath of the massacres that took place in 1391. These conversions did not end Christian hostility to Jewish converts. Converted Jews—known as conversos—faced persecutions

[57] This is what one would expected from the economics of religion literature, notably (Iannaccone, 1992).

[58] While the Church taught that Jews should be tolerated as 'witnesses,' Christians who converted to Judaism were typically treated as heretics and executed.

Author Manuscript

This article is protected by copyright. All rights reserved

in Toledo and León in 1449, while between 1459 to 1464 there was unrest against conversos in Burgos. In the 1460s they were attacked in Jaén. Persecutions occurred in Seville, Toledo and Burgos throughout the 1460s while in 1473 conversos were massacred in Cordoba, Montoro, Bujalance, Adamar, La Rabla, Santaella, Ecija, Andújar, Ubeda, Baeza, Almódovar del Caomp and Jaén (Ruiz, 2007, 156). As is well known, this persecution of the conversos intensified after the mass expulsion of Jews from the Iberian peninsula at the end of the fifteenth century.

Third, Jews were typically given the option to convert only after or in the aftermath of a persecution of expulsion. Malkiel (2001), for example, argues that Jewish chroniclers had an incentive to elevate the choice between apostasy and death in a heroic act. However, in instances like the massacres that accompanied the First Crusade in 1096, there is little evidence that this was the case. He suggests that the crusaders murdered Jews because that was their 'primary intention' and not because 'the Jews refused conversion' (Malkiel, 2001, 259). The possibility that Jews converted to Christianity in the wake of a persecution or expulsion does not affect our theoretical or empirical analysis. And the evidence suggests that conversions rarely occurred in anticipation of a persecution.

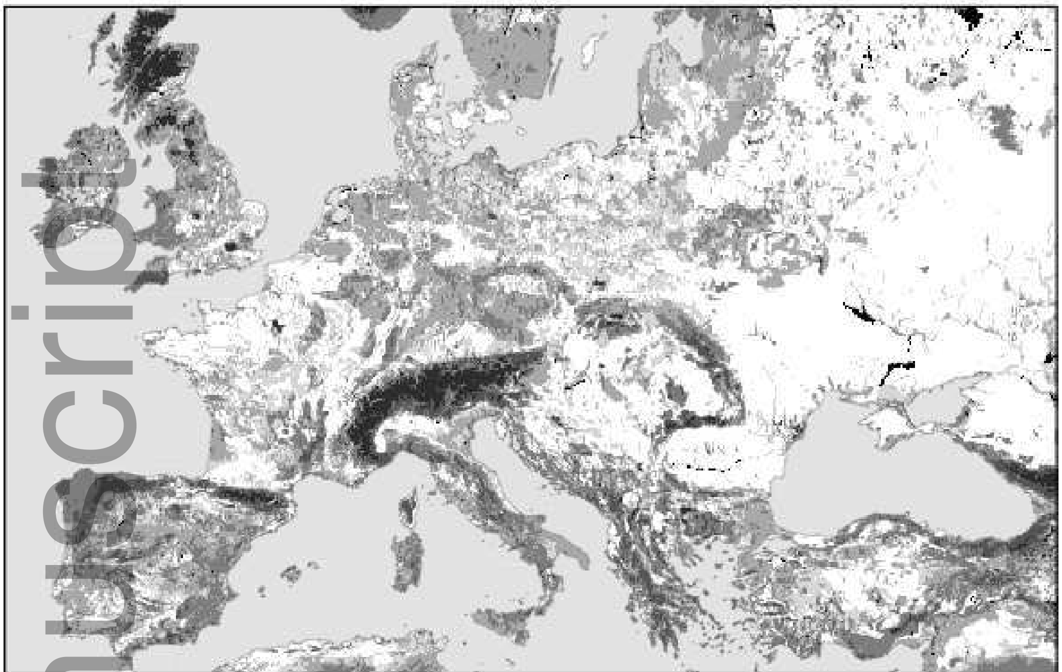
Soil Quality

Our preferred measure of soil quality is wheat suitability from the FAO. The FAO database is constructed using two types of information. Detailed information on the characteristics of 154 crops is compiled to determine what sorts of geographic and climatic conditions are optimal for growing each plant. This information is combined with climatic and geographic data collected on a very disaggregated level. The climate data include measures of precipitation, frequency of wet days, mean temperature, daily temperature range, vapour pressure, cloud cover, sunshine, ground-frost frequency, and wind speed. The geographic data include information on soil types and slope characteristics. The FAO combines these data to construct potential yields for each crop in each grid cell under different levels of inputs and management. We assume a 'moderate' level of inputs to wheat cultivation. This is consistent with farmers who produce primarily for home consumption, but with some market orientation. Figure 10 shows the resulting suitability of wheat cultivation across Europe. We extract the wheat suitability for each of our cities using geospatial software and create a dummy variable equal to one if a city has an agricultural sector

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 10:
Wheat Suitability



Notes. A lighter shade indicates that the soil is more suitable for wheat cultivation. Source: Fischer et al. (2002).

that is either moderately or significantly constrained in its wheat cultivation. This is the main variable 'Low Wheat' that we use in our regressions.

Urban Density

Our urban density variable is based on the Bosker et al. (2013). Figure 11 shows the location of the eighteenth century Bosker et al. cities relative to all of our Jewish cities. The Bosker et al. cities are shown as open circles whereas the Jewish cities are points. The weakest coverage of Bosker et al. cities is in eastern Europe, particularly, Lithuania and Ukraine.

We use geospatial software to create a heat map for every century based on population of all Bosker et al. cities with populations greater than 5,000. Each point on the map is assigned a population number based on the inverse distance-weighted value of all Bosker et al. cities within 1 degree of the point (about 100 kilometres depending on the latitude of the point). The maps for each century are reproduced below as Figures 12d to 12f.

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 11:
The Distribution of Bosker et al. (2013) cities and Jewish cities.

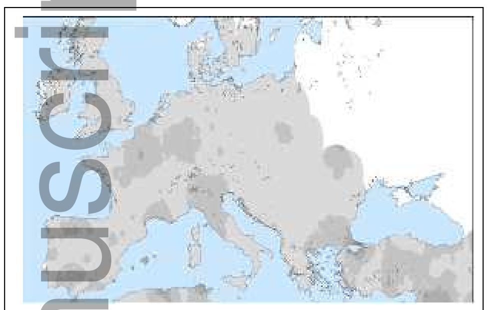
Notes. Open circles represent Bosker et al. cities. Points represent Jewish cities in our database. Source: Enc (2007) and Bosker et al. (2013).

.

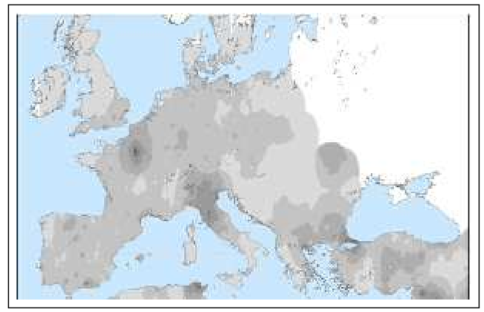
Author Manuscript

This article is protected by copyright. All rights reserved

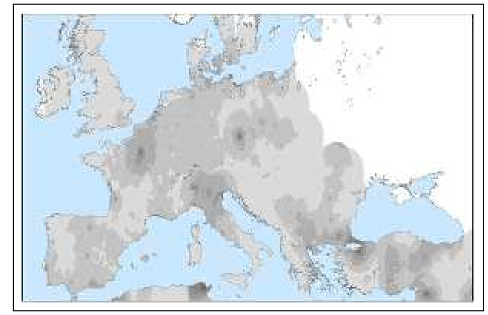
Author Manuscript



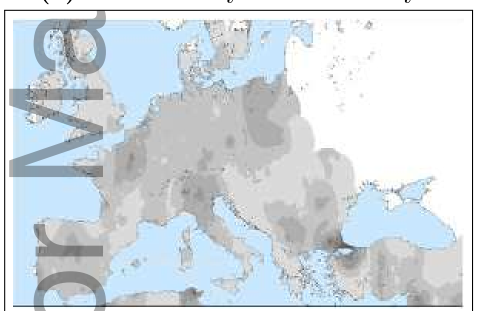
(a) 13th Century Urban Density.



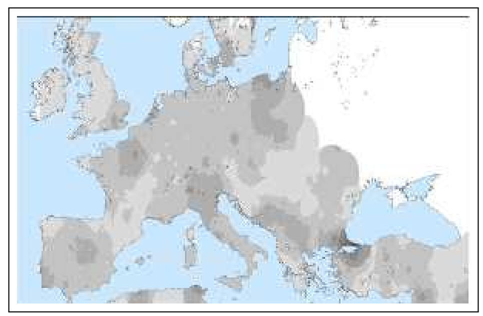
(b) 14th Century Urban Density.



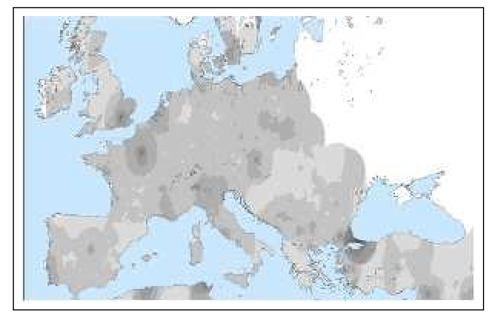
(c) 15th Century Urban Density.



(d) 16th Century Urban Density.



(e) 17th Century Urban Density.



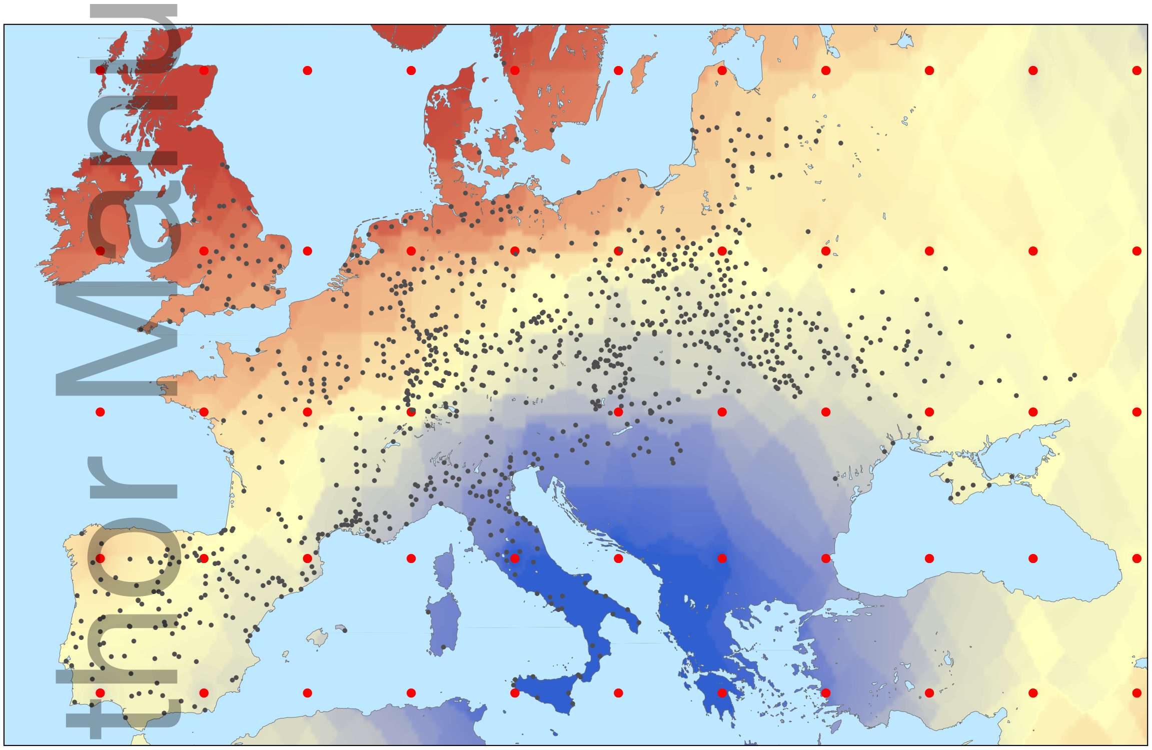
(f) 18th Century Urban Density.

This article is protected by copyright. All rights reserved

Temperature Data

We use the temperature data of Guiot and Corona (2010) as our main variable of interest. The process for creating the city-level temperatures was as follows: First, we created a thirty-two point grid of temperatures on the map of Europe for every year between 1100 and 1799. An example of this grid for 1100 is reproduced in Figure 13 as the dark red circles. We then used geospatial software to fill in the temperature at all the points on the map using the inverse distance-weighted average of the temperature of the surrounding twenty-four grid points. Figure 13 shows the resulting heat map of temperature deviations for 1100. Finally, we extracted the temperature for each of our 1,069 cities for each of the 700 years in our data set.

Figure 13:
Distribution of Jewish Cities



Notes. The distribution of Jewish cities cities overlaid with the Guiot and Corona (2010) temperature grid and the corresponding heat map of average temperature during the growing season in 1100

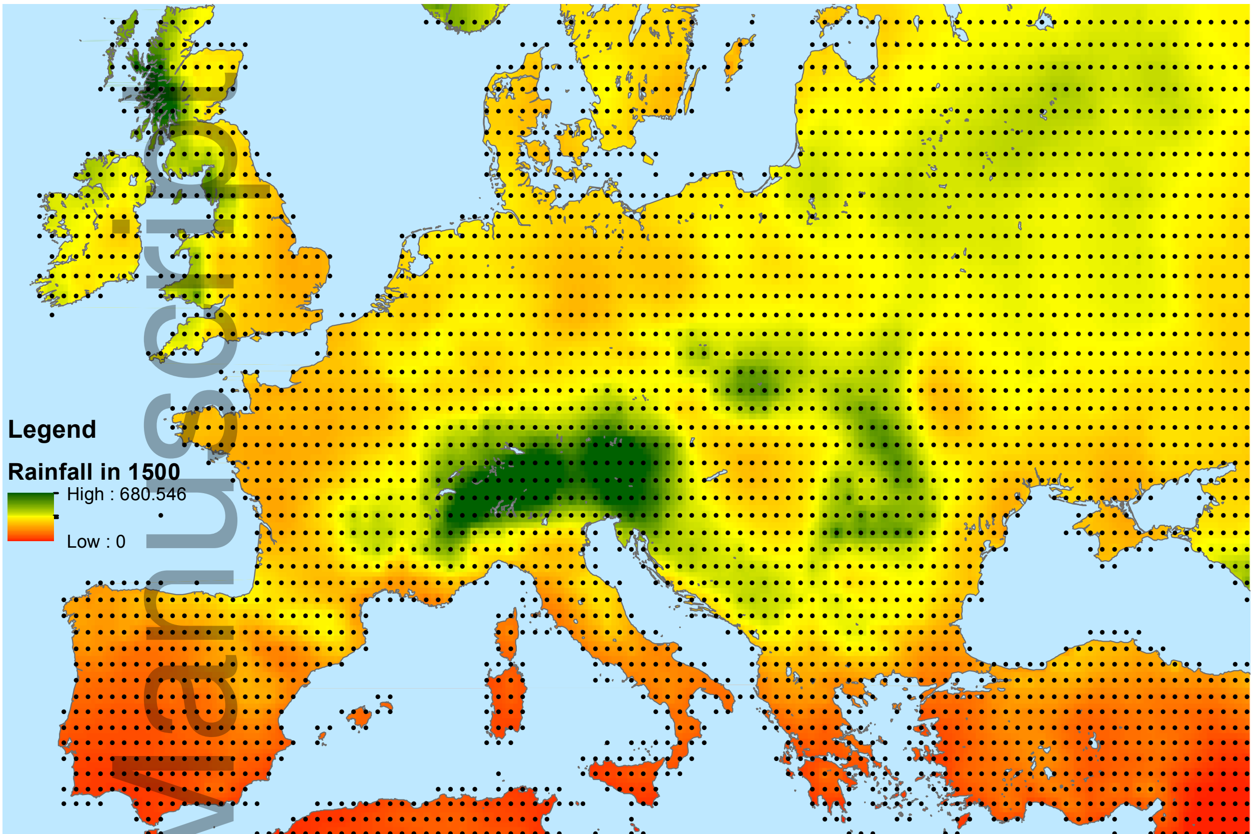
Author Manuscript

Temperature is an important determinant of agricultural production. According to Porter and Gawith (1998) the optimal temperature for wheat cultivation over the course of the growing season is between $17-23°C$ (Porter and Gawith, 1998, 25).

This article is protected by copyright. All rights reserved

Rainfall Data

Figure 14:
Rainfall in Summer 1500



Agricultural Production and Prices

Our wheat prices series come from Allen and Unger (Allen and Unger). This dataset contains grain prices series for 98 European cities. Figure 15 shows the location of these cities, though not all cities are in the panel for the entire period. The average price of wheat across all in-sample cities between 1100 and 1800 is shown in Figure 16. It clearly shows the effect of the Black Death in the second half of the fourteenth century as well as the effect of silver imports from the New World during the sixteenth century.

Author Manuscript

This article is protected by copyright. All rights reserved

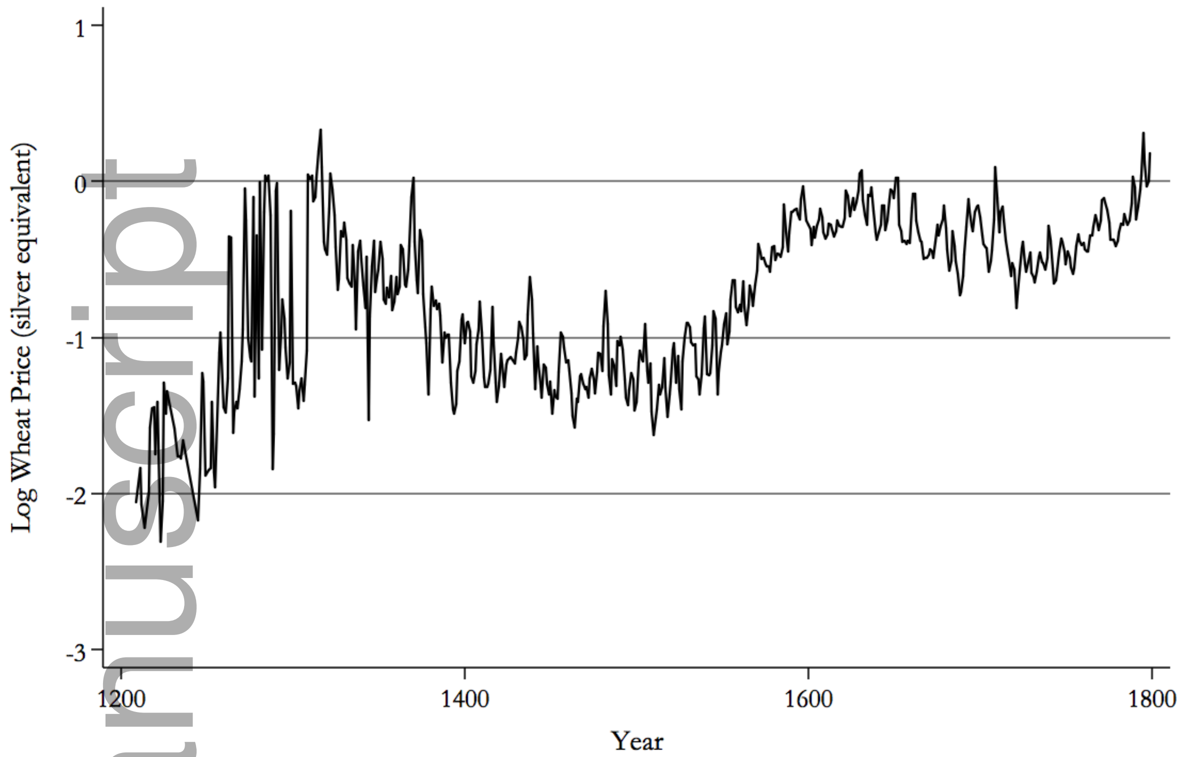
Figure 15:
Grain Price City Locations

Notes. Source: Allen and Unger (Allen and Unger).

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 16:
Grain Price Time Series



Notes. Source: Allen and Unger (Allen and Unger).

Author Manuscript

This article is protected by copyright. All rights reserved

Author Manuscript

D Additional Historical Evidence and Discussion

In the main text we provide an example of a negative temperature shock leading to harvest failures and popular unrest and ultimately to violence against Jewish communities. Here we can provide more detail on several other examples that illustrate the causal mechanisms we identify in our empirical analysis.

The Black Death

A large number of expulsions and persecutions accompanied the Black Death (1348-1350) (Cohn, 2007; Voigtländer and Voth, 2012). The fact that the Black Death triggered antisemitic violence is entirely consistent with our hypothesis.

The 1340s were in fact a period of warm summers. However, the years 1348-1350 saw 'three very rainy summer seasons. As a result, hunger was rife in Europe, and poverty spread extensively throughout the society. The frightful scenes of the "Black Death" were preceded by the phenomenon of drought and the distress of famine. There were places, in Breslau in Germany, for example where Jews were killed not by the plague, which had not yet reached there, but as a result of starvation, for hungry people in their distress turned upon the Jews' (Breuer, 1988, 140).

Jews were blamed for the plague across Germany. Both the Pope and the Holy Roman Emperor spoke against this libel and the Emperor tried to protect Jews where and when he was able—less out of sentiment, but because he viewed them as an economic asset. Charles IV protected Jews in Prague and in other areas where his authority was strong, but elsewhere he was prepared to let his subjects burn Jews.

> 'When the plague was at its height and the bands of flagellants were sweeping across the country, he 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. In exchange for all of these payments, the Jews could expect one thing: that the king, the nobles, and the city councils who had benefited from their monies would protect them. Undoubtedly, they were legally and morally obligated to do so and there is no reason to doubt that they would indeed have preferred to protect the lives of their Jews in order to

This article is protected by copyright. All rights reserved

> continue to benefit from their money. However, under the circumstances we have described it appeared that they would not be successful, they decided to turn the destruction of the Jews to their best advantage' (Breuer, 1988, 146-147).[59]

The worst massacre was in Strasbourg where 2000 Jews were burned to death. In Brandenburg, where Louis I was faced with a rebellion, initial attempts to protect Jews from accusations of well-poisoning 'broke down under the frenzy of the populace, whose good will the embattled margrave could not afford to lose' and in 1351 Louis allowed Jews to be burnt in Königsberg (Baron, 1965a, 211). The massacres and expropriations more or less wiped out the Jewish communities in the Electorate.

The Armleder Massacres

One example comprises the series of persecutions that occurred in Alsace and Franconia between 1336 and 1339 and that are known to historians as the Armleder persecutions. They began when Arnold von Uissigheim, a knight turned highway robber, instigated an 'economically motivated social uprising' that turned against the Jews (Levenson, 2012, 188). He led a group of peasants with leather patches affixed to their arms and he became known as Rex Armleder. Uissigheim was arrested and executed by Count Gottfried of Hohenlohe. But other individuals took up the cause and the massacres continued across Bavaria and Alsace until 1338, destroying more than 100 Jewish communities (Rubin, 2004, 55-57).

Historians propose various explanations for the massacres. One contemporary explained that Uissigheim's brother had been killed by Jews. Others attributed it to resentment against usury. In some areas, antisemitism had been stirred up by prior allegations of host desecration. However, these events are also highly consistent with our theoretical framework.

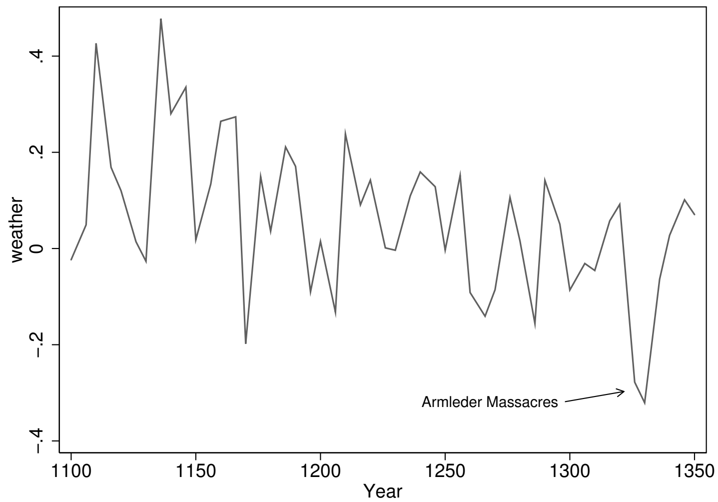
As Figure 17 illustrates, the Armleder massacres occurred during a period particularly cold temperature. The town of Kitzingen saw its Jewish community massacred during this episode and is in our dataset. The average temperature deviation in Kitzingen from 1100 to 1339 was 0.059 with a standard deviation of 0.16. The two coldest five-year periods were between 1325

[59]Charles IV subsequently forgave the perpetrators of the massacres, noting 'that the populace had been "animated by vulgar prejudice, bad advice, and reprobate feelings" when it attacked Jews and thus caused much damage to the royal Treasury, he nevertheless accepted the regrets and satisfaction offered him by the city elders' (Baron, 1965a, 158-159).

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 17:
Temperature Deviations (Five-Year Averages) in Kitzingen 1100–1350



Notes. The Armleder pogroms (1336-1338) followed a period of extremely cold temperature in Alsace and Franconia.

to 1335, which were two standard deviations below the mean. While temperature from 1335 to 1339 improved, it was still three quarters of a standard deviation below average.

Political scientists have argued that a band of weak political authority created by the dismemberment of the Carolingian empire at the Treaty of Verdun in 843 shaped European history throughout the medieval and early modern period. In particular Stasavage (2011) argues that the lands known as Lotharingia, which lie between the historical boundaries of France and Germany, were areas of weak state authority and fragmentation. The Armleder massacres thus occurred in a region where γ_t was low.

The Haidamack Massacres

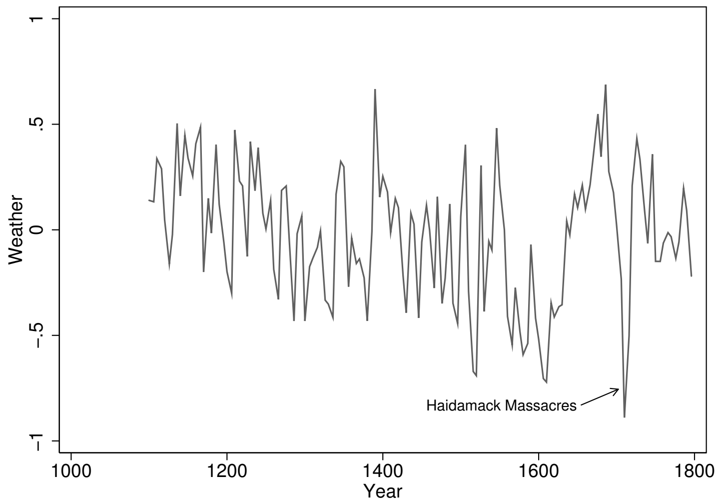
While persecutions and expulsions of Jews became less and less common in western Europe after 1600, they continued to take place in eastern Europe where the Polish state remained weak. The Haidamack Massacres refers to a series of pogroms that occurred throughout the eighteenth century in Poland and Ukraine.

Figure 18 shows the temperature deviations for Zbarazh from 1100 to 1800. The figure depicts that a period of extremely cold temperature occurred at the turn of the eighteenth century. The first massacres occurred in Belaya Tserkov and Satanov in 1703, and in Zbarazh and Izyaslav in

Author Manuscript

This article is protected by copyright. All rights reserved

Figure 18:
Temperature Deviations (Five-Year Averages) in Zbarazh, Ukraine 1100–1350



Notes. The Haidamack Massacres began in the early eighteenth century during a period of cold temperature.

1708. The worst killings occurred in 1734, 1750, and 1768. Hence the timing and location of the Haidamack massacres is highly consistent with our theory and overall argument.

National Expulsions

There are five 'national' expulsions in our database:

1. England 1290
2. France 1306; 1394
3. Spain 1492
4. Portugal 1497

Rulers conducted national level expulsions for a range of reasons including the need for immediate revenue. The French king Philip IV (1285-1314) decided on a policy of expulsion as an expeditious way of getting his hands on as much Jewish wealth and property as possible.[60] He realised that

[60]According to one historian: 'During the period 1301-1306, the king imposed similar taxes on the Jews of Normandy as elsewhere in France. The war against the Flemish was renewed in 1302 and resulted in the imposition of new taxes on the entire population . . . The seizure of Jewish goods, the detention of the Jews, and their expulsion from France in the summer of 1306 are events manifestly connected with this situation. On June 21, just two weeks after the statement on sound money, the king sent letters to his officials all over France secretly directing "the accomplishment of the mission the king charged them with *viva voce*". The following month was

This article is protected by copyright. All rights reserved

Author Manuscript

> '[i]t would take too many administrators and petty officials to organise the arrest of French Jews and confiscate all of their property, and most importantly, their loan records. At any point in the process, problems could arise which would translate to less revenue for the king. Local officials could quietly confiscate Jewish moveable property themselves, selling it off for their own profit. Or they might agree to accept bribes in return for allowing Jews to leave with at least some of their goods. Jews in close relationship with nobles, and government officials, might possibly hear of the plan and arrange to leave before it was carried out, or hide their valuables. Finally, the townspeople could discover that the Jews were being expelled and preempt the confiscation, taking for themselves Jewish property and the records that revealed their own indebtedness' (Taitz, 1994, 220-221).

In so doing he sacrificed a long-run revenue stream and therefore made the French crown permanently poorer (Jordan, 1989).[61]

State Capacity

Figure 19 depicts tax revenues per capita from Karaman and Pamuk (2013). It shows the dramatic rise in fiscal capacity that took place in the leading western European states from around 1600 onwards.

marked by detention and seizure. A contemporary chronicler writes that the confiscators left the Jews only the clothes they were wearing, that their apparel and furniture were sold for very little, and that cartloads of silver and gold from their houses were brought to the king day and night. On August 17, the king ordered that treasure found in Jewish houses belonged to him, threatening the usual penalties for those who ignored the order' (Golb, 1998, 536-537).

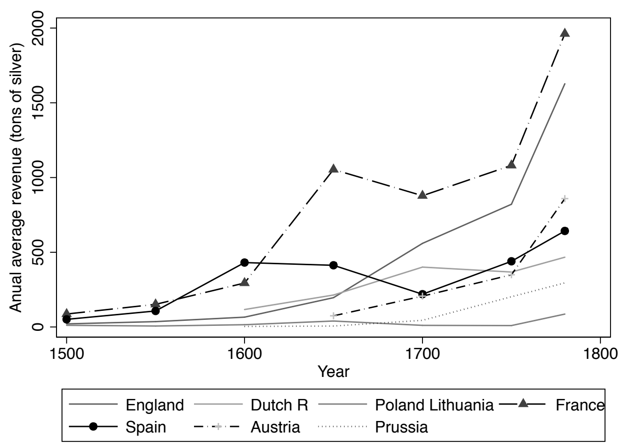
[61] Mechoulan (2004) demonstrates that at a discount factor equal to the prevailing 12% interest rate this decision may well have been the correct one for Philip IV given the political and fiscal situation he faced. Subsequent expulsions followed this pattern and involved some form of expropriation with minor variations. In 1492 the Jews of Spain were allowed to take their private possessions with them but forbidden from taking gold, silver, or minted coins while their communal property was distributed to local town councils (Beinart, 2002, 55-56).

Author Manuscript

This article is protected by copyright. All rights reserved

Author Manuscript

Figure 19:
State Capacity



Notes. Karaman and Pamuk (2013) based on data from the European State Finance Database .

This article is protected by copyright. All rights reserved