From the Persecuting to the Protective State? Jewish Expulsions and Weather Shocks from 1100 to 1800*

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Abstract

What factors caused the persecution of minorities in medieval and early modern Europe? We build a model that predicts that minority communities were more likely to be expropriated in the wake of negative income shocks. We then use panel data consisting of 785 city-level expulsions of Jews from 933 European cities between 1100 and 1800 to test the implications of the model. We use the variation in city-level temperature to test whether expulsions were associated with colder growing seasons. We find that a one standard deviation decrease in average growing season temperature in the fifteenth and sixteenth centuries was associated with a one to two percentage point increase in the likelihood that a Jewish community would be expelled. Drawing on our model and on additional historical evidence we argue that the rise of state capacity was one reason why this relationship between negative income shocks and expulsions weakened after 1600.

Key words: Political Economy, State Capacity; Expulsions; Jewish History; Climate

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1 Introduction

Throughout history, religious and ethnic minorities have been the victims of persecution. Such persecutions were comparatively frequent in the pre-industrial world, particularly in medieval and early modern Europe.[1] In comparison, and with the important exceptions of the genocides of the mid-twentieth century, large-scale killings, massacres, and religious persecutions are rare in the developed world today.[2] How and why did this transition from the persecuting state to the protective state in Europe take place?

We focus on the persecution of the Jews in medieval and early modern Europe, one of the most numerous and best documented minorities throughout European history. Violence against Jews was caused by many factors, but we build on the common claim advanced by historians that Jews were convenient scape-goats for social and economic ills.[3] We establish the following two results. (1) Using data on climatic variation, we identity the effect that negative economic shocks had on minority rights in the preindustrial period. (2) We show that the relationship between climatic shocks and the expulsion or persecution of Jewish communities was strongest in fifteenth and sixteenth centuries and disappeared after 1600.

To clarify our empirical analysis, we develop a model that proposes two channels through which negative economic shocks can increase the likelihood of persecution. (1) Negative economic shocks led to popular unrest and this unrest resulted in the scapegoating of minority groups—i.e. persecution from below. (2) Negative economic shocks also put greater pressure on royal finances and led rulers to expropriate and expel the minority group—i.e. persecution from above. Both of these channels suggest that the effect of negative weather shocks on expulsions should have been greatest in regions with poor quality soil and, therefore, a greater underlying vulnerability to agricultural shocks.

We construct a panel data-set comprising 785 city-level expulsions of Jews from 933 European cities which are recorded as having Jewish populations between the years 1100 and 1800. We also collect data on 614 incidents of violent persecution that fell short of full expulsion. These data on Jewish populations, expulsions and other episodes of organized violence come from the 26-volume Encyclopedia Judaica (2007). We combine this information with data on yearly growing season

[1]It is important to note that even in the middle ages the actual frequency of such events was low. However, it was certainly high in comparison with everyday experience in developed countries today (see Chazan, 2010).

[2]This is especially true when measured on a per capita basis. For evidence and discussion of the decline of mass killings and persecutions see Pinker (2011).

[3]Important historical contributions include Baron (1965*a*,*b*, 1967*a*,*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.

temperature constructed by Guiot and Corona (2010) in order to identify exogenous shocks to agricultural output. As controls, we construct measures of the suitability of a city's surrounding region for agriculture and its proximity to urban areas.

Our identification strategy exploits the variation in city-level temperature to test whether expulsions were associated with colder growing seasons (April to September). Using a fixed effects specification, we find that a one standard deviation, or about one-third of a degree, decrease in average growing season temperature in the fifteenth and sixteenth centuries was associated with a one percentage point increase in the likelihood that a Jewish community would be expelled in any given five-year period. Under our preferred specification in which we take cities with moderate to severe agricultural constraints as our treatment group, we find that this effect increases. As a point of reference, the base probability of an expulsion in our sample during any given five-year period in the fifteenth or sixteenth centuries was about 2.5%.

Our empirical analysis allows us to quantify the decline of the persecuting state and the rise of religious tolerance in the period before democratization or the onset of modern economic growth. We find the relationship between cold weather and Jewish expulsions to be particularly strong in the fifteenth and sixteenth centuries. Furthermore, after 1600 there is no longer a discernible effect of weather on expulsions. There are several possible explanations for the disappearance of this relationship. We present evidence that indicates that the rise of more powerful states was an important factor in explaining why weather shocks ceased to be associated with expulsions after 1600. Medieval states were weak. They were vulnerable to economic shocks and popular unrest, and though they depended on minority groups like the Jews for financial expertise and as a source of revenue, they were willing to sacrifice the rights of those very same minority groups in order to sate popular anger and to meet pressing financial exigencies.[4] The early modern nation states that emerged after 1600, in contrast, succeeded in building fiscal and legal capacity; they were no longer dependent on taxing economically prosperous minorities, and more importantly still, they enjoyed greater political stability and ceased to be responsive to popular unrest and antisemitism.[5]

We follow a number of papers that use weather in order to identify the impact of economic shocks on the political economy of preindustrial or developing economies. In particular, Miguel et al. (2004) argued that rainfall could instrument for short-run variations in income in explaining the causes of civil war in sub-Saharan African economies (but not in other continents).[6] Brückner

[4]As Adam Smith noted: 'In the disorderly state of Europe, during the prevalence of the feudal government, the sovereign was obliged to content himself with taxing those who were too weak to refuse to pay taxes' (Smith, 1776, Bk V. Chap II).

[5]On the rise of strong fiscal states during the seventeenth century, see Tilly (1990) and Johnson and Koyama (2012*b*). For the effect of this on persecution of minority groups see Johnson and Koyama (2011) and Johnson and Koyama (2012*a*).

[6]Note that Ciccone (2011) and Miguel and Satyanath (2011) disagree about the interpretation of the results of

and Ciccone (2011) find that lower rainfall in Africa is associated with political instability and the timing of political transitions from autocracy to democracy and Bai and Kai-sing Kung (2011) shows that weather shocks can generate political instability in agrarian economies. A particularly relevant paper is Chaney (2012) who demonstrates that negative weather shocks created political instability in pre-industrial Egypt; he finds that sharp deviations in the Nile floods strengthened the power of religious leaders who could threaten the political authorities with revolt.[7]

The results we obtain are consistent with Oster (2004) who found that cold weather shocks were associated with witchcraft trials, and Miguel (2005) who studied rainfall in contemporary Tanzania and found that high levels of precipitation were associated with a higher number of witchcraft deaths. They are also consistent with Anderson (2012) who finds that lower temperatures were associated with more severe sentences being passed down by the Portuguese Inquisition.

By establishing what triggered antisemitic policies in preindustrial Europe, our findings complement two important recent contributions on the persistence of antisemitic attitudes: Voigtländer and Voth (2012) and Grosfled et al. (Forthcoming). Voigtländer and Voth (2012) use data from the massacres that followed the Black Death to establish the persistence of antisemitic cultural traits at local level in Germany. These cultural factors were an important precondition for antisemitic violence in the 1920s and for support for the Nazi party. Grosfled et al. (Forthcoming) examine the persistence of anti-market sentiments in the Pale of Settlement where Jews were confined during the eighteenth to nineteenth centuries. They argue that within the Pale, non-Jews developed a set of anti-Jewish and anti-market values which have persisted this day. Our findings are complementary as we can shed light on the timing and trend of antisemitic violence.[8] We find that negative supply shocks often constituted a trigger that led to expropriations and expulsions in societies that were permeated with antisemitism.

Other related contributions include Waldinger (2010, 2012) who examines the consequences of the

Miguel et al. (2004). Barrios et al. (2010) argue that rainfall can have a longer lasting effect, claiming that a decline in average rainfall can account for some of the growth slowdown since the 1960s.

[7]Madesam et al. (2012) find that weather has an effect on the ability of political groups to organize 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. (2011) investigate the negative effects of warm temperatures on developing economies. Fenske and Kala (2013) show that a decrease in temperature in sub-Saharan Africa was associated with lower morality, higher crop yields and therefore higher slave exports. Of particular relevance for our paper, Kelly and Ó Gráda (2010) show that cold weather shocks, as measured by tree ring data, led to crop failures in medieval and early modern England.

[8]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 which 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).

expulsion of Jewish scientists from Nazi Germany. In a historical setting, Barzel (1992) provides a rational choice explanation for why rulers expropriated minority Jewish lenders and Koyama (2010*b*) analyzes why the Jews were expelled from medieval England.[9] Finally, our work contributes to a literature on the economic history of the Jewish people (see, for instance, Kuznets (1960), Brenner and Kiefer (1981), and Acemoglu et al. (2011)). Our paper is particularly related to the work of Botticini and Eckstein (2012) who provide a novel explanation for why Jews specialized as moneylenders during the middle ages. Our theoretical and empirical results complement their account by explaining why this specialization, despite making Jews especially valuable to medieval rulers, ultimately led to the destruction of most Jewish communities in western Europe.

2 Jewish Expulsions and Persecution

Jews in medieval Europe comprised a 'market dominant minority' in the terminology of Chua (2004), who analyzes the similar position of the Chinese in the Philippines and in the rest of South East Asia, the Lebanese in West Africa, and the Ibo in Nigeria.[10] While Jewish communities have existed in southern Europe since Roman times, permanent Jewish communities only appeared in northern Europe in the ninth and tenth centuries. They came for economic purposes as traders and as merchants. Rulers encouraged Jewish settlement in order to encourage commerce, investment, and 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).[11] By 1100 there were a large number of Jewish settlements scattered across England, France and Germany in addition to the large Jewish population in Spain.

[9] More generally, there is a growing literature on the causes of persecution. For example, Glaeser (2005) who studies the incentive politicians have to incite hatred against particular groups; Gregory et al. (2011) who study Stalin's purges; Johnson and Koyama (2011) who examine the relationship between the rise of the French state and the decline in trials for witchcraft; and Vidal-Robert (2011) who studies what factors were associated with more trials by the Spanish Inquisition.

[10] We prefer the term 'economically dominant minority' to 'market dominant minority' since some of the reasons why a minority group is particularly successful in commerce often has to do with regulations and other non-market factors. The concept goes back at least as far as Max Weber (Weber, 1927). Fernand Braudel noted that 'successful merchants who controlled trade circuits and networks often belonged to foreign minorities, whether by nationality (Italians in the France of Philip the Fair or Francjs I, and in Philip II's Spain) or by religion - the Jews, the Armenians, the Banyans, the Parsees, the Raskolniki in Russia or the Christian Copts in Muslim Egypt' (Braudel, 1979, 1982, 165). This theme is also taken by Gellner (1983, 98-105). See also the essays contained in Brezis and Temin (1999) for a survey of the literature on minorities in economic history, especially Landes (1999). In sociology the most influential work on the role of middlemen is Bonacich (1973). Note that Jews have not always been an economically dominant minority. By the early modern period, the vast majority of Jews in Germany and eastern Europe had lost their former economic position.

[11] Chazen notes: 'the objective was to entice new Jewish settlers . . . Early sources tell us of the invitation extended by the Duke of Flanders to Jews to settle in his domain, of the establishment of a Jewish community in London by William the Conqueror, newly installed as king of England' (Chazan, 2010, 6).

Botticini and Eckstein (2012) summarize a large literature that demonstrates that Jews in early medieval Europe specialized as traders, craftsmen, doctors and merchants (Botticini and Eckstein, 2012, 153-200). Over time, however, partly as a consequence of the increasingly strict enforcement of the canonical prohibition on usury, and partly because of comparative advantage associated with high levels of literacy and access to a network that enabled them to share risk, Jewish traders and merchants increasingly became specialized as moneylenders (Botticini and Eckstein, 2012, 201-247).[12]

Moneylending was a lucrative industry in medieval Europe and successful Jewish moneylenders became extremely rich.[13] Thus across much of western Europe Jews had established themselves as a prominent and successful economically dominant minority by 1150. Though Jewish usury was frequently condemned by the Church, it was typically promoted and protected 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. In the middle of the thirteenth century, 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).[14] As Baron wrote: 'Many Jews and Christians alike realized 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, 1967*b*, 198).

Kings across Europe came to see the Jews as 'fiscal sponges' to use a metaphor developed at the time: '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, 1967*b*, 199).[15] Through this process the Jews became de facto tax collectors for the king. According to the theory employed to justify this practice, 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, 1967*b*; Chazan, 2010).[16]

It was in the financial interest of secular rulers to protect their Jewish communities. However,

[12] See Baron (1967*b*, 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 (1973–1974) and Koyama (2010*a*).

[13] The richest moneylender in medieval England was Aaron of Lincoln (see Jacobs, 1898); for the wealth of the Jewish community in England see Stacey (2003, 41). It is important to note that while Jewish communities in high medieval Europe do appear to have been relatively prosperous, this likely reflects a highly skewed distribution of income within Jewish communities rather than the wealth or income of the median community member.

[14] The attitude of the Church to Jewish moneylending is detailed by Grazel (1966).

[15] This policy was perhaps most developed in thirteenth century England as shown by Stacey (1985, 1995) and as analyzed by Koyama (2010*b*).

[16] 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 it followed the massacres of Jews in York and the establishment of the Exchequer of the Jewry in 1194 (Cramer, 1940; Dobson, 2003; Brown and McCartney, 2005; Koyama, 2010*b*).

medieval rulers struggled to make credible promises or commitments and were frequently faced with the temptation to expropriate economically successful and wealthy Jewish communities. In the twelfth and thirteenth centuries medieval rulers experimented with a variety of policies to extract resources out of their Jewish subjects but by the end of the thirteenth century, it became accepted that only by expelling the Jews could all their wealth be seized by the king in one go:

> 'It would take too many administrators and petty officials to organize 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).

For these reasons, 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. In so doing he sacrificed a long-run revenue stream and therefore made the French crown permanently poorer (Jordan, 1989).[17]

It is important not to overstate the frequency with which Jewish communities were threatened with violence and pogroms—many Jewish communities lived in peace with their Christian neighbors for long periods of time.[18] But as an economically dominant minority in poor and largely agrarian economies, and as outsiders in a society that increasingly aggressively defined itself in opposition to infidels and unbelievers, Jews often aroused jealousy and suspicion from others.[19]

[17] Mechoulann (2004) demonstrates that at a discount factor equal to the prevailing 12 percent 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).

[18] See Shatzmiller (1990) for evidence of distinctly philo-semitic attitudes among at least some of the citizens of Marseilles.

[19] 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 anti-semitism that emerged in medieval Europe and which had a variety of sources (see Trachtenberg, 1943; Voigtländer and Voth, 2012). Menache (1985, 1997) analyzes 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

The persecution and eventually expulsions of the Jews paved the way for what R.I. Moore has termed the rise of 'a persecuting society' in medieval Europe (Moore, 1987).[20] The persecution and expulsion of Jews in the medieval period set a powerful precedent for the persecution of other minority groups (lepers, heretics, homosexuals, and witches) that continued into the modern period.

However, during the seventeenth century, although antisemitic massacres and expulsions continued to take place, particularly in central and eastern Europe, some western European states began to readmit Jewish migrants and offer them some measure of toleration and protection. Jews began to migrate to the Dutch Republic 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 in the Netherlands was codified in 1619. Oliver Cromwell invited Jews to return to England in 1655 (Kaplan, 2007, 326). Jews began to resettle in France from 1600 onwards. The first Jewish community to receive recognition was that of Metz in 1595, but in general the legal status of Ashkenazi Jews in France was unclear until 1675 when Louis XIV granted the Jews of Alsace and Lorraine the right of permanent residency. It wasn't until 1723 that the Sephardic Jews in the southwest of France were officially recognized (see Israel (1985, 42) and Kaplan (2007, 321)). Having suffered expulsion in the fifteenth and sixteenth centuries, Jews were gradually admitted back into Prussia by Fredrick William, the Great Elector in the 1660s as part of his project of centralizing and rebuilding the Prussian state and economy (Israel, 1985, 121-122). In the eighteenth century these policies were imitated by other German rulers. These dates mark the beginnings of a broader, extremely gradual but fundamentally important, move from a persecuting to a protective state which began in the period after the Reformation and is still continuing today.

The historical record suggests that the persecution of European Jewish communities in the medieval and early modern period followed an inverted U-shaped pattern, peaking during the fifteenth and sixteenth centuries before decreasing in intensity in the seventeenth and eighteenth centuries. One explanation for this pattern is that fiscally weak cities and states expelled Jews in order to satisfy revenue needs (Elman, 1937; Schwarzfuchs, 1967; Veitch, 1986; Barzel, 1992). Others argue that Jews were expelled in response to heightened religious fervor in the late medieval period (Grazel, 1966; Langmuir, 1990; Stow, 1992; Menache, 1997; Bell, 2001) or as part of a project of constructing a religiously or ethnically homogeneous state (Baron, 1967*a*; Katznelson, 2005; Barkey and Katznelson, 2011); or to a confluence of these factors as Moore (1987) argued in his *Formation of a Persecuting Society*. Alternatively, Poliakov (1955) attributed the decline in the fortunes of

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but not in others.

[20] Jews were an important minority through the Islamic Middle East throughout this period where they also performed an important economic function as middlemen and merchants (Gerber, 1981; Bruade and Lewis, 1982; Kuran, 2004). Jews were subject to occupational restrictions and additional taxes but though they were sometimes subject to persecution in the Middle East (for example, in Fez in 1465), this was much less frequent than in Europe (Cohen, 1994).

European Jewry in the fourteenth century to the series of calamities that befell Europe from the Great Famine of 1315–1322 to the Black Death and numerous individual accounts of specific persecutions or pogroms cite that the role played by economic hardship, natural disasters and bad weather in triggering particular persecutions or expulsions (Barber, 1981*a*; Cohn, 2007; Slavin, 2010; Voigtländer and Voth, 2012).

In the next section we develop a model to help guide us in choosing variables to distinguish between these alternative explanations. In particular, the model will suggest that economic shocks will lead to persecutions, and that this relationship is particularly likely to strong in states that are weak and lack developed tax systems. We will then test the first hypothesis using weather data as an exogenous source of revenue shocks. If our hypothesis, and the historical narrative outlined above, are correct, we would expect weather shocks to increase the likelihood of expulsions during the period in which medieval states were establishing and consolidating themselves but during which they remained fiscally undeveloped and vulnerable to revolt and civil war during the fourteenth through the sixteenth centuries. However, there should be little correlation between persecution of Jewish communities and income shocks as states grew fiscally stronger during the seventeenth and eighteenth centuries.

3 A Model of Protection and Persecution

To explore the relationship between political stability, income shocks, and expulsions, we construct a simple model of the medieval economy. There are two sectors: an agrarian peasant sector and a commercial sector. We assume that the mercantile sector is dominated by the minority (Jewish) community. This assumption is roughly appropriate for much of medieval Europe, particularly if the commercial sector of the economy is identified with moneylending (see Botticini and Eckstein, 2012). Standard models of an autocratic state (e.g., McGuire and Olson (1996)) cannot explain why the King would ever expel a valuable fiscal resource like the Jews. Thus, to understand why expulsions did take place we need a model in which the King cannot credibly commit to protecting the Jews. Our reasoning in what follows below is related to Acemoglu and Robinson (2006) in that there is revolution or revolt constraint that can force the autocrat into undertaking expropriations or expulsions. It is also related to the reasoning developed by Acemoglu (2003) in that Jews cannot make a Coasian bargain with the King in order to avoid expulsion.

There are two mechanisms through which negative weather shocks might lead to antisemitic violence and expulsions. Both are affected by the ability of the state to either protect the revenues it collects from the Jewish community, or, find alternative sources of revenue during difficult economic conditions. The first mechanism operates through popular anger and rebellion. Jews were often scapegoats for economic and social ills and, as economic conditions worsened, it became more likely that existing antisemitic attitudes would be channelled into violence and demands to expel the Jewish community. In this case, expulsions occur because the King is too weak to protect the minority community. The second mechanism involves a 'top-down' expulsion by the King as a means to seize the assets of the Jewish community. The value of the model is that it emphasizes that the strength of both channels depend on the capacities of the state.

We suppose that income in the agrarian sector is determined by inelastically supplied labor inputs l which we normalize to 1, the level of agricultural productivity A, and an exogenous weather shock ω such that $Y^A = A - \omega$ where $\omega > 0$. The King imposes a lump-sum tax $\tau^A \in \mathbb{R}$ on the agricultural sector. There is no storage technology.[21]

Production in the commercial sector takes place over two periods: 1 and 2. Output is determined by investment in capital, k, made in period 1 so that $Y_1^M = f(k_1) - c(k_1)$ where $c(k)$ is the cost of investment, $f'(k) > 0$, and $f''(k) < 0$. Commercial income in period 2 is $Y_2^M = f(k_1)$. Thus, while commercial output is unaffected by agrarian shocks, period 2 output is affected by investments made in period 1. The King imposes a tax on the commercial sector at the end of both periods: τ_t^M where $t = (1, 2)$.

A large realization of ω will in our empirical framework correspond to colder weather during the growing season. Colder weather leads to reduced grain yields and lower peasant incomes. Faced with penury, the peasants have the option of rebelling. If they rebel, the minority community is expropriated, which historically was often synonymous to an expulsion occurring. The peasants are successful with probability γ and if they are successful they obtain Δ. The peasants rebel if and only if the no-rebellion constraint is violated:

$$A - \omega - \tau^A \geq \gamma\Delta \ . \tag{1}$$

Large negative weather shocks (ω) also put pressure on state finances and hence make Royal expulsions more likely, but the mechanism is less direct than that flowing through the peasantry. The King has an incentive to protect the minority community, as they are an important source of revenue. As we shall show, however, he does have an incentive to expel if he faces a need for immediate revenue or a rebellion. In order to capture the inter-temporal nature of this decision, we suppose, for analytical convenience, that the minority community are not modeled as strategic actors. We simply assume that they invest the optimal level of capital, k, in order to maximize profit, π, regardless of the King's policy. Thus, we write $\pi_1 = f(k_1) - c(k_1)$ in period 1 and

[21] McCloskey and Nash (1984) demonstrated that medieval interest rates and the costs of grain storage meant that medieval peasants did not store grain.

$\pi_2^M = f(k_2)$ in period 2.[22] The minority community, therefore, invests $k = k^*$ where k^* is the profit-maximizing level of investment and is given by $f'(k^*) = c'(k^*)/2$.

The King decides what tax rate to impose in each period.[23] His optimal second period tax always expropriates the minority community: $\bar{\tau}_2^M = f(k_1)$. This is by construction. A more general model would involve more periods, however, what we are interested in is the King's choice of tax rate in the first period. The optimal unconstrained first period tax is equal to: $\bar{\tau}_1^M = f(k_1) - \delta c(k_1)$. A King who does not value the future ($\delta = 0$) would set τ_1^M equal to $f(k_1)$ and expropriate the entirety of M's capital while a King who discounts the future at the same rate as the mercantile community ($\delta = 1$) would set a tax that equates marginal revenues in both periods.

The King maximizes total revenue subject to the no-rebellion constraint being satisfied:

$$\begin{aligned} \max_{\tau^A, \tau^M} \quad & \tau^A + \tau_1^M + \delta\tau_2^M \\ \text{subject to} \quad & (A - \omega - \tau^A) \geq \gamma\Delta \quad \text{(no rebellion)} \end{aligned} \tag{2}$$

There are three cases to consider. First, when ω is small, the peasants do not rebel, the King sets τ^A, τ_1^M, τ_2^M so as to maximize total revenue: $\tau^A = A - \omega$, $\tau_1^M = f(k_1) - \delta c(k_1)$ and $\tau_2^M = f(k_1)$. When shocks are small or negative (which in this case means ω is negative), the King only expels the minority community M when he has dire need of immediate revenue: i.e. $\delta = 0$ or for non-economic reasons.

Alternatively, when ω is large relative to γ, the no-rebellion constraint cannot be satisfied. The minority group is expropriated by the peasants or by local elites acting in response to the demands for the peasantry. This corresponds to cases like the massacres of Jews that occurred during the *Pastoureaux* in France in 1320, or the Armleder pogroms in Alsace in 1338-1339.

Note that although we couch our argument in terms of peasant uprisings, our model is also consistent with the fact that anti-Jewish violence was often organized by local elites. This was the case in York in 1190 and in Germany and Italy in the fifteenth centuries as it was often local notables rather than peasants who were in debt to Jewish moneylenders (Cohn, 2007, 23-24). In these cases, it was local elites rather than peasants who demanded the expulsion of the Jews.[24]

[22] It is straightforward to augment our model by allowing the minority community to rationally decide how much to invest or whether or not to migrate based upon their expectations of the King's future tax policy, but it does not change our predictions.

[23] The King discounts second period tax revenues but the minority community do not discount future income. This captures the fact that medieval rulers typically discounted the future more rapidly than did the merchant class.

[24] Also note that the anger that was directed against the Jews could also be directed against other groups who were singled either for having tax privileges like the clergy or because they occupied a distinctive economic niche. Lombards were first expelled from France in 1268 (Kedar, 1996, 179). During the Black Death in Narbonne it was

Finally, intermediate values of ω can put pressure on royal finances and this can induce the King to expropriate the minority community even though it is in his long-term interest not to do so. This occurs when only negative values of τ^A satisfy the no-rebellion constraint, forcing the King to set $\tau_1^M > \bar{\tau}_1^M$, with $\tau_2^M = f(k_1)$ as before. In the limit, as ω approaches (A - $\gamma\Delta - \tau^A$) then τ_1^M equals $f(k_1)$, which is equivalent to expropriating the minority group. This mechanism explains the actions of Henry III of England in the 1240s and 1250s who extracted tremendous amounts of revenues from the Jewish community in order to avoid calling Parliament and thus compromising with his political opponents (Stacey, 1985, 1987; Koyama, 2010*b*).

This framework predicts that the probability of expulsion is increasing in the size of the negative weather shock (ω) (Prediction 1). Bad weather should also be more likely to lead to expulsions in areas which are less fertile or have lower quality soil (lower A) (Prediction 2). Finally, negative shocks are more likely to result in expulsions when the ruler is weak (γ is high) (Prediction 3).[25]

Lastly, the model distinguishes between two different mechanisms through which bad weather might cause expulsions. The first mechanism is the most straightforward: negative weather shocks lead to popular violence against Jews. This is the scapegoating mechanism. The second mechanism is indirect. Medieval states were weak and as a result, negative income shocks put pressure on the revenue streams of medieval rulers; pressure that made them more likely to seek alternative sources of revenue and thus to expel or expropriate Jewish communities.

4 Historical Evidence

4.1 Bad Weather, Popular Uprisings, and Antisemitic Violence

Prediction 1, that periods of economic crisis increased the likelihood of Jews being persecuted, is not original to us nor should it be surprising.[26] A number of the most famous instances of violence against Jews were linked to negative economic shocks, particularly to bad weather and harvest failure. Norman Cohen argued that the locations in which Jews were targeted during the First Crusade in 1095, northeastern France and western Germany, were precisely those where there had been flooding, droughts, and famines (Cohen, 1957, 63). More recent research substantiates this

the English who were blamed for the disease (Breuer, 1988, 142). In the 1391 massacres in Spain 'the targets were not just Jews . . . the insurgents 'threatened to kill all clerics and forced them to pay taxes and other contributions as if they were laymen. Silversmiths, merchants and other rich people were threatened with death' (Cohn, 2007, 33). Cohn further notes 'despite some executions, Barcelona's revolt largely succeeded: taxes were lowered' (Cohn, 2007, 33).

[25] Additionally, expulsions are more likely to occur when the ruler discounts the future heavily ($\delta = 0$). We do not explore this prediction empirically in this paper but, as De Long and Shleifer (1993) discuss, short princely horizons were common: 18 of 31 English monarchs had succession problems.

[26] There is an entire volume entitled *Anti-Semitism in Times of Crisis* (Gilman and Katz, 1991).

view:

> 'there were disastrously dry summers in 1090 in Flanders, Western Germany and Eastern France. In Normandy, the following year was characterized by a dry summer and exceedingly wet winter. In Eastern Germany and Bohemia, the winter of 1091-2 lasted well into April. The fall of 1093 saw abundant downpour in various parts of Germany and Flanders, which extended until April of the following year. In 1095, there was a prolonged drought in Flanders and France. An earthquake is reported in Flanders on 10 September 1095, while one nearly contemporary author states that it was felt all over Northern Europe, from France to Denmark . . . The year of 1090 saw a widespread outbreak of ergotism, or St. Anthonys Fire, in Germany, France and Flanders. But the crisis became especially acute in September 1093, when an unknown disease of disastrous proportions broke out in Germany and the Low Countries, lasting into the following year. Several chronicles also report an outbreak of cattle pestilence around the same time. In France, a harsh drought of spring and summer 1095 brought about a widespread famine, which, in turn, caused starvation and mortality. (Slavin, 2010, 177-178).[27]

Agricultural productivity was low in medieval Europe and successive years of bad weather could easily push large numbers of peasants living on the margins of subsistence into starvation. The economic crisis of the early 1090s manifested itself through soaring grain prices and famine and it generated social unrest as peasants in Flanders and parts of France rose up against landlords and destroyed property (Slavin, 2010, 193). The violence against Jews was one aspect of this general social reaction:

> The widespread starvation and mortality increased not only the religious zeal of the distressed masses, but also their animosity, intolerance and violence towards the 'other'. The most immediate and visible 'other' was the local Jewish communities, which were the first ones to fall victims to this popular violence (Slavin, 2010, 198).

A succession of even more disastrous harvests occurred across northern Europe between 1315 and 1321. Campbell describes it as possibly 'the single worst subsistence crisis, in terms of relative mortality, in recorded European history' (Campbell, 2010, 7). That series of failed harvests were followed by the so-called Great Bovine Pestilence which wiped out sixty percent of livestock on the

[27] The massacres of 1096 are the subject of considerable scholarly debate (see Kedar, 1998). A range of other factors were also at work, including a desire of vengeance against all enemies of Christianity and a messianic attempt to convert the Jews by force and thereby bring about the end of days, but most accounts also emphasize that cash and the desire to loot was also a major motivation in the persecutions (see, for example Riley-Smith, 1986, 52). As Cohen notes: '[d]ifferent explanations for the massacres of 1096 are hardly mutually exclusive' (Cohen, 2004, 2).

continent (Slavin, Forthcoming). These shocks not only generated economic hardship, they also produced civil unrest across swathes of northern Europe. France was shaken by an uprising known as the Shepherds' Crusade, or the *Pastoureaux*, that challenged royal authority and specifically targeted the Jews who had been readmitted into the kingdom in 1315. First in Normandy and the Paris region, they attacked royal castles, 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, 1981*a*, 12).

Several historians have argued that the *Pastoureaux* targeted Jews because of millennial fantasies about the End of Days or because they displaced their anger at the Muslim reconquest of the Holy Land onto the nearer infidel (see Cohen, 1957) and Shepkaru (2012). However, it was also the case that the *Pastoureaux* were supported in their attacks on the Jews by townspeople and others because of widespread resentment against royal policy and royal taxation. In 1320 '[t]he brunt of peasant violence fell upon the Jews, for they were the only non-Christians within reach of the *Pastoureaux* and they could be blamed for the economic hardships which the lower classes had recently been suffering' (Barber, 1981*b*, 163).[28] The conditions under which the Jews had been allowed to return to France in 1315 required them to act as fiscal agents for the crown. Nirenberg argues that 'the shepherds and the townspeople who supported them' understood this relationship, and 'recognized 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 royal attempts to protect them 'they were both attacking a much-resented aspect of administrative kingship and dramatizing the state's inability to protect its agents, the Jews' (Nirenberg, 1996, 50). In terms of the model, both the Peasants' Crusade of 1096 and the rebellion of the *Pastoureaux* correspond to the case where ω is large relative to γ: the King was unable to keep order and as a result the minority group where expropriated by the rebelling peasantry.[29]

4.2 Royal Weakness and Expulsions

Our model suggests that external shocks in conjunction with internal political weakness was responsible for the failure of medieval and early modern European states to protect minority groups such as the Jews (the size of ω relative to γ).[30] As Chazen writes: 'governmental weakness or breakdown posed significant danger to the Jews of medieval western Christendom' because:

[28] 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, 1981*b*, 162-163). Contemporaries also mention that they were incited by debtors of the Jews (Barber, 1981*b*, 146).

[29] The *Pastoureaux* were repressed wherever possible: the official documents that have survived 'reflect the concern of the authorities for public order and tell a story of punitive military action, fines and confiscations, stressing that the *Pastoureaux* were mortal enemies of both the king and the public weal' (Barber, 1981*b*, 157).

[30] Strong rulers like Edward I and Philip IV also expelled Jews. But we expect the relationship between negative economic shocks and expropriations to be particularly strong in weakly governed states.

> ‘[a]t points of governmental breakdown, the power to intercede effectively against popular passions was much reduced, and Jews thus lay exposed to outbreaks of popular violence’ (Chazan, 2010, 179).

This statement is borne out by a discussion of the fate of Jewish communities in fourteenth century Germany.[31] Where the Holy Roman Emperor had authority and power, he typically used it to protect Jews—less out of sentiment, but because he viewed them as an economic asset. This is evident in the response of Charles IV to the massacres that followed the Black Death in 1349. Charles 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 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).[32]

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, 1965*a*, 211). The massacres and expropriations more or less wiped out the Jewish communities in the Electorate.

Similarly, in Bavaria, the Dukes of Wittelsbach were unable to prevent Jews being massacred by peasant and noble uprisings in 1298, in 1338 and in 1349. As the power of the Holy Roman Emperor waned in the fifteenth century, Jews all across Germany suffered persecution and expulsion. In 1420-21, 400 Jews in Styria and Carinthia were executed and the rest of the population expelled. Jews were expelled from other territories in Austria in 1453 and 1455, although they continued to reside in Lower Austria (Baron, 1965*a*, 198-199). The Jews of Augsburg were expelled in 1440 as

[31] Baron (1965*a*) titles a chapter ‘victim of feudal anarchy’ to describe the fate of Jews in Germany.

[32] 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, 1965*a*, 158-159).

were those in Saxony in 1498. And over the course of the fifteenth century, Jews were progressively banished from the cities of Bavaria.[33] The long-standing Jewish community of Ratisbon (Regensburg) was expelled in 1519, an event that had been preceded by a series of expropriations and fiscal exactions (Baron, 1965*a*, 233-234).[34] Together the historical accounts of individual persecutions and expulsions support the prediction that negative economic shocks were associated with persecutions and expulsions (Prediction 1); they do not directly speak to the prediction that the effect of bad weather should be highest in lands with poor soil quality, but they are broadly consistent with it (Prediction 2); and they support the hypothesis that this relationship was likely to be stronger in weakly governed states (Prediction 3).

5 Empirical Analysis

In this section we present data and an empirical strategy which allow us to directly test Predictions 1 and 2. Prediction 1 states that negative weather shocks and persecution of Jews should be positively correlated while according to Prediction 2, this correlation will be stronger in areas with geography less suitable for wheat cultivation since they will be more vulnerable to shocks. To test these, we combine city-level data on the timing of Jewish expulsions and persecutions with data on growing season temperature variation. Since yearly fluctuations in temperature are unrelated to other factors which might trigger an expulsion (such as changing ideology or exogenous political shocks), this provides an ideal test of Prediction 1. In order to test Prediction 2, we combine our data with information on wheat cultivation suitability and investigate if the effect of negative temperature shock on expulsions increases. Since soil quality, elevation, and the other components that go into the calculation of wheat suitability are all exogenous, this provides a clean test of our model.

Our empirical strategy will also allow us to provide indirect evidence for Prediction 3 from the model, which states that weather shocks should be more likely to cause an expulsion when the ruler is weak. We do not have a direct measure of 'weakness', by which we mean both fiscal capacity (the ability to raise revenues) and legal capacity (the ability to enforce rule of law), at the city level. Thus, we cannot test our prediction directly. Instead, our empirical strategy will allow us to describe how the relationship between weather shocks and expulsions varied over time. We

[33] Upper Bavaria 1442, Lower Bavaria in 1450, Eichstädt and Passua in 1477-78, Nuremberg in 1498, and finally from all Bavaria in 1551 (see Baron, 1965*a*, 209).

[34] Baron notes that, '…[r]oyal weakness came clearly to the fore in such incidents as when George Poděbrad admitted several Jewish individuals to settlement in Eger in 1462, promising them, in return for annual payment of 150 Rhenish florins, the enjoyment of all rights of the other Jewish serfs of his Chamber. Yet seven years later a local lord, Henry von Gera, had to appeal to the Eger city council not to confiscate the Jewish communal property in which his subjects had a share. In 1480 the elders of Eger unabashedly rejected King Vladislav's request that they continue to tolerate Jews' (Baron, 1965*a*, 204).

will then compare this temporal relationship to what we know about European state capacity over time to see if it supports Prediction 3.

5.1 Data

We collect city–level data on the presence of a Jewish community in Europe between 1100 to 1800 from the twenty-six volume *Encyclopedia Judaica* (2007). The *Encyclopedia* typically mentions when Jews entered a city, when they were persecuted, when they were expelled, and when they were allowed re-entry. We are interested in all of these pieces of information since in order to model the probability of an expulsion from a city, we need to know when that city had a Jewish population to expel.

The *Encyclopedia* provides a comprehensive measure of Jewish presence, persecution and expulsion for the whole of Europe. It does not contain information on all of the smaller Jewish communities that may have existed and it likely does not contain information on minor persecutions. Voigtländer and Voth (2012) uses more detailed data for Jewish persecutions in medieval Germany. But the two sources they employ only provide data for Germany. The *Encyclopedia Judaica* provides less detail but compensates for this with wider geographic and temporal coverage.

Figure 1 gives a sense for both the geographic coverage of our Jewish city data as well as the distribution of expulsions for the entire period. There are 1,069 cities in our complete data set. We construct three variables based on these data. A dummy variable called 'Expulsion' which is equal to one if there is an expulsion in a city in a given year and zero otherwise. There are 810 expulsions in the complete data set. We also construct a variable 'Expulsion or Persecution' which is equal to one if there is either an expulsion or some lesser form of persecution in a given year. There are 1,471 of these events. Finally, 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. The Data Appendix gives more detail on the construction of these variables.

Our identification strategy relies on exogenous variation in weather. These data are taken from Guiot and Corona (2010) who assemble information from 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

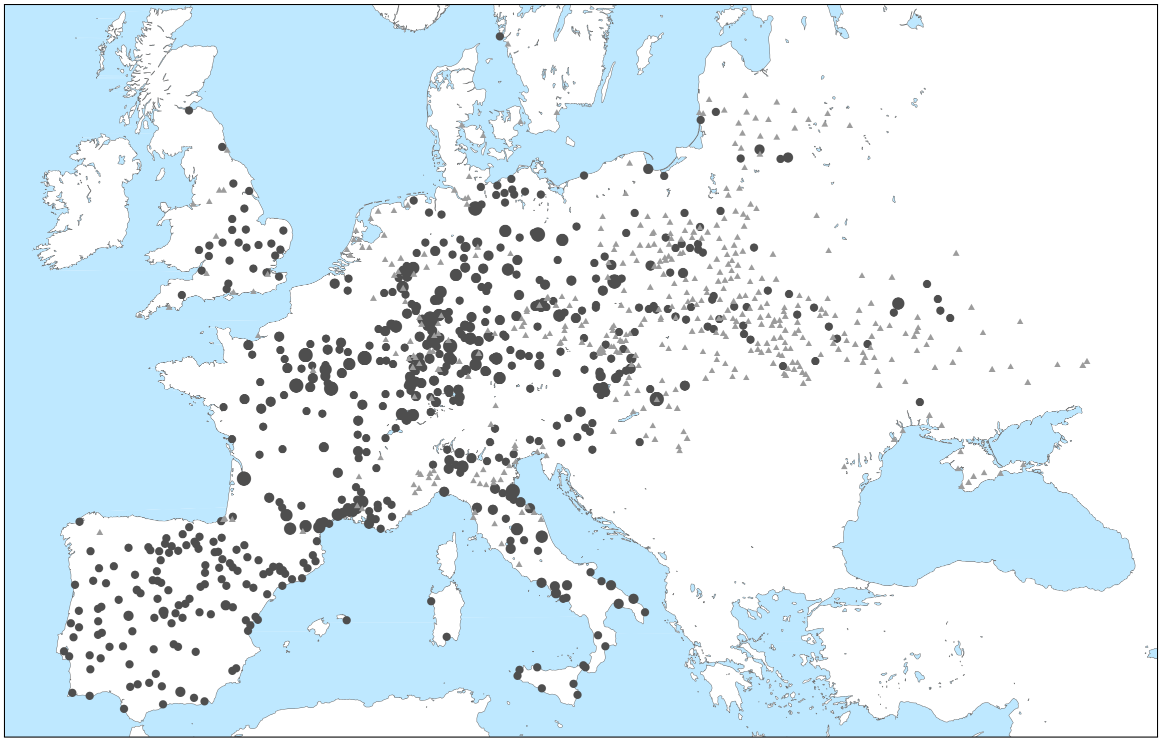

Figure 1: Jewish Cities and Expulsions, 1100-1800. Symbols represent a city that had a Jewish population at some time between 1100 and 1800. Circles represent a Jewish city that has at least one expulsion. Larger circles represent more expulsions. Triangles are Jewish cities in our data that never expel. Source: *Encyclopedia Judaica* (2007).

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 anomalies relative to the 1961–1990 average.

The Guiot and Corona (2010) data match well with known historical 'forcing' events, such as volcanic eruptions, which have been shown to cause colder temperatures. They are also consistent with glacial records. When compared to specific 'known' cold and warm years from the historical record the temperatures are consistent approximately 75% and 65% of the time respectively (Guiot and Corona, 2010, Table 2). We will run some of our regressions using yearly data, but in order to take into account both potential lagged effects and the inherent noisiness of yearly data reconstructed from hundreds of years in the past, our preferred specifications will be based on five-year averaged temperature deviation data. Thus, our primary variable of interest will be the five-year averaged temperature deviation which we will call 'Temp Deviation' in our analysis below. Further details on the construction of the temperature data are contained in the Appendix.

Another important variable in our analysis is the suitability of the area around each city for wheat cultivation. Having these data will allow us to perform a more refined test of our model, since cities with more constrained agriculture are expected to suffer more from negative temperature shocks. We focus on wheat since it was a relatively homogenous staple crop across Europe during this period. Kelly and Ó Gráda (2010) also provide direct evidence that reconstructed growing season temperatures affected wheat yields in late medieval and early-modern England. Our suitability data come from the Food and Agricultural Organization (FAO's) Global Agro-Ecological Zones (GAEZ) 2002 database (Fischer et al., 2002).[35] This provides us with estimates of a region's suitability for wheat cultivation at a resolution of 0.5 degrees by 0.5 degrees, which is a little over fifty by fifty kilometers at the latitude of central France. This seems an appropriate level of resolution for use with our data since most cities would rely on an agricultural sector within roughly fifty kilometers from the city walls.

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, vapor 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 2 shows the resulting suitability of wheat cultivation across Europe. 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 which is either moderately or significantly constrained in its wheat cultivation. This is the main variable 'Poor Wheat Suitability' that we use in our regressions.

One potential concern with our estimates is that the effect of weather shocks on expulsions will interact with either the economic development of a city or the city's access to markets. In order to control for this possibility, and better isolate the effect of state capacity on expulsions, we include a proxy for these factors in our regressions. Estimates of per capita GDP do not exist for the medieval period. Studies of preindustrial Europe, therefore, rely on urbanization data as a proxy for commercial and market development (see De Long and Shleifer, 1993; Acemoglu et al., 2005; Nunn and Qian, 2011, amongst many others). We use data on urban population from Bosker et al. (Forthcoming) as this supersedes previous datasets (e.g. Bairoch (1988)). Bosker et al. provides estimates of urban population for cities with populations greater than 5,000. There are about eight hundred cities included in the Bosker et al. database with population estimates for each century

[35] This is the same data source as is used by Nunn and Qian (2011) and Nunn and Puga (2012).

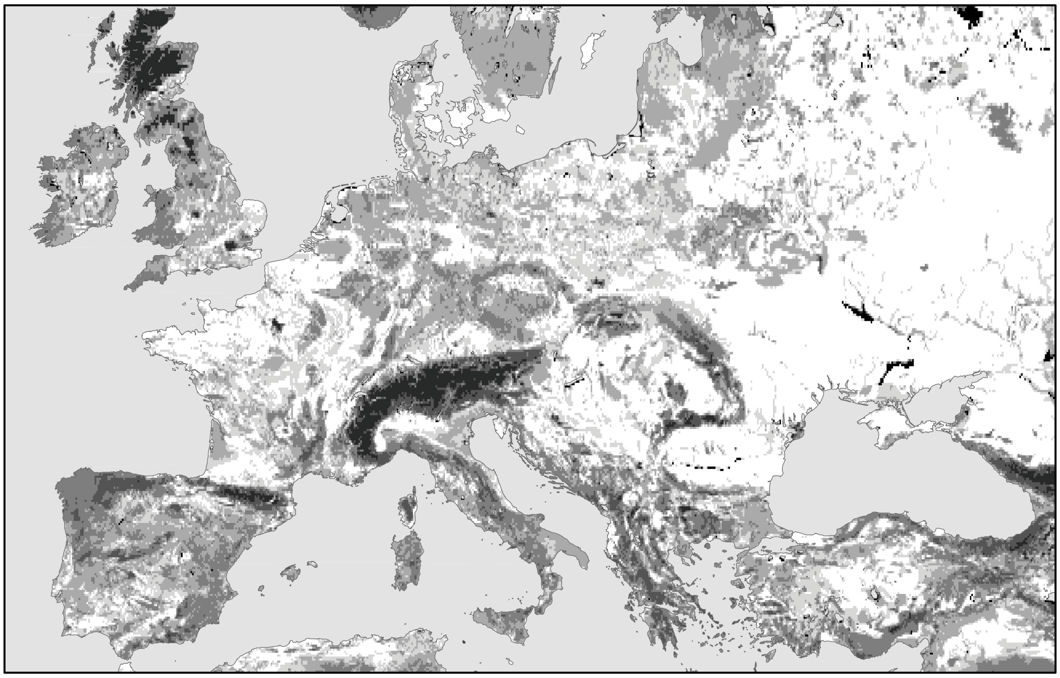

Figure 2: Wheat suitability. A lighter shade indicates that the soil is more suitable for wheat cultivation. Source: Fischer et al. (2002).

from 1100 to 1800 (see Data Appendix for maps and more detail). Since the Bosker et al. cities do not perfectly correspond to our 1,050 Jewish cities, we use geospatial software to create a map of 'average urbanization' for all Jewish cities lying within at least one hundred kilometers of a Bosker et. al. city. Average urbanization is created for each point on the map using the inverse distance-weighted populations of the surrounding Bosker et al. cities that are within at least one hundred kilometers of the point. This results in eight estimates for urban population for 933 or our Jewish cities between 1100 and 1800.[36] We then do a linear imputation between each data point for each city in order to arrive at a time varying measure of urban density. We call the resulting variable 'Urban Density' in our analysis.

We will restrict our analysis to use only the sample of cities that currently have a Jewish population. Thus, in our regressions, cities without a Jewish population will be 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). It also allows us greater flexibility in our estimation of regression models suited for our time varying data, such as our preferred fixed effects specification. Furthermore, our results will also be easier to interpret than

[36] The heat maps for each century are reproduced in the Data Appendix. The 133 cities we lose are all in the far east (mostly present–day Ukraine, Lithuania, and Serbia) and when we re-run the regressions without urban density, but including these cities our regression results are unaffected.

with the alternative Cox hazard models. See the Data Appendix for further discussion.

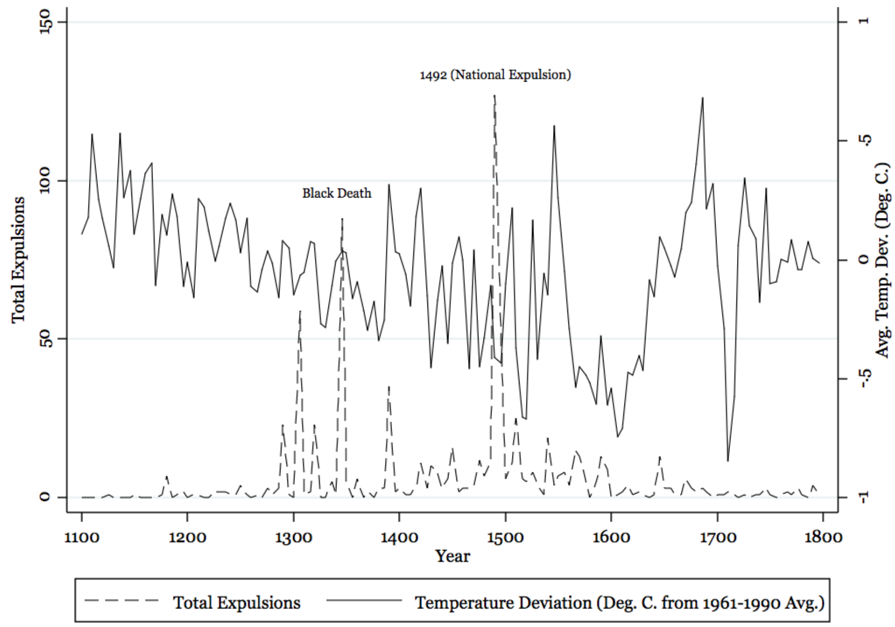

Figure 3: Average Five-Year Temperature Deviation and Expulsions from 1100 to 1800. The temperature deviations are relative to the 1961-1990 average in degrees celsius. The total expulsions variable is the sum of expulsions in every five-year period. Source: See Text.

In Figure 3 we show the time series behavior of average temperature deviation across all cities and total expulsions between 1100 and 1800. There are two prominent outliers in the expulsions data, the period around the Black Death (1346-1355) and the expulsion of Jews from all of Spain in 1492. We discuss national expulsions in more detail in the Data Appendix. But there is no *a priori* reason to exclude national-level expulsions from our analysis, since the mechanism outlined in the model section relating weather shocks to expulsions should apply in these cases. Nonetheless, we will present results with 1492 excluded from our sample to demonstrate that our results are robust to omitting this data point.

The Black Death is another outlier in terms of expulsions. A large number of expulsions and persecutions in the fourteenth century arose as a result of the social upheavals which attended the Plague (Cohn, 2007; Voigtländer and Voth, 2012). The fact that the Black Death triggered antisemitic violence is entirely consistent with our hypothesis and theoretical model. However, given the severity of the plague in Europe and since there is no reason to think there is a relationship between the presence of the plague and the temperature, we will report results below in which we both do and do not control for the years of the Black Death.

5.2 Descriptive Statistics

Our final baseline five-year data set contains 933 Jewish cities that are each in the sample an average of about sixty of the five-year periods (i.e. those cities have a Jewish presence, on average, for three hundred of the years between 1100 and 1800). Table 4 in the Data Appendix provides descriptive statistics for the five-year data set. The average temperature deviation across all years in our regression sample is about -0.057 degrees celsius with a standard deviation of 0.339. Significantly for our analysis, the within standard deviation of temperature is more than three times larger than the between standard deviation. This implies a large amount of correlation in temperature across cities relative to the year-on-year variation.

Across the entire sample, the baseline probability of an expulsion is about 1.4% every five years. The baseline probability of either an expulsion or persecution every five years is about 2.5%. To place this last number in perspective, it implies over a 20% chance of either a persecution or expulsion of a Jewish community over fifty years. Similar to the Temp Deviation variable, the within variation in Expulsions is higher than the between variation by about a factor of four. One plausible explanation for this is the high amount of correlation in temperature shocks across cities. Because of this, we will run our regressions using both a city fixed effects specification as well as some difference-in-differences specifications. We will actually prefer the fixed effects specifications given that most of the variation in weather is in the time series across all cities rather than in the within–city time series.

Figure 4 provides a more nuanced look at the baseline probability of expulsion and how it relates to average temperature deviation over time. During the thirteenth, seventeenth, and eighteenth centuries, the baseline probability of expulsion is around 1% or less. This jumps up to around 2.5% during the fourteenth, fifteenth, and sixteenth centuries. At least in this highly aggregated time series view, there appears to be a strong correlation between the onset of the Little Ice Age during the fourteenth century and an increased probability of expulsion. By contrast, there appears to be little relationship between the period of greatest expulsions and an increase in the variance of temperature. The standard deviation of temperature fluctuations steadily increases throughout our period of study until the eighteenth century when it declines by a small amount.

As further, non-parametric, evidence for a correlation between negative temperature shocks and expulsions, we calculated the average temperature across expelling and non-expelling cities in our baseline regression sample. There are 785 expulsions in this sample and the expelling cities, on average, experience a temperature deviation of -0.16 degrees. By contrast, among the 55,123 non-expelling cities the average temperature deviation was only -0.054. If we control for the Black Death years and the 1492 national expulsions, then expelling cities (of which there are 599) experienced an

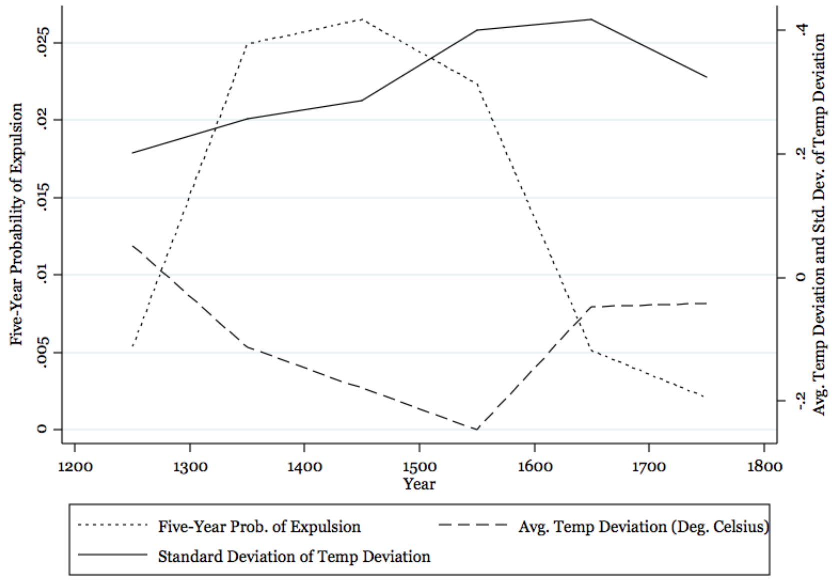

Figure 4: Baseline Probability of Five-Year Expulsion, Average Temperature, and Standard Deviation by Century. Left axis measures the baseline probability of an expulsion of a Jewish community every five years. Right axis measures each century's average temperature deviation from the 1961–1990 average in degrees celsius. Right axis also measures the standard deviation of temperature deviation in the baseline regression sample by century.

average temperature deviation of -0.15 degrees whereas the comparable number for non-expelling cities was -0.05. So, in general, there does seem to be a correlation between cold weather and Jewish expulsions, with expelling cities experiencing temperatures roughly three times colder than non-expelling cities.

5.3 Analysis and Results

We employ a linear probability model where our main dependent variable, Expulsion, takes on a value of 0 or 1.[37] For our preferred baseline specifications we focus on explaining the within variation in expulsion probability and adopt a standard fixed effects framework. Since we do not expect the relationship between weather and expulsions to be constant over time, we run a series of flexible specifications in which we interact our variable of interest with a full vector of century dummies. These specifications take the following form:

[37] When we re-do our analysis using a logit estimator the results are unchanged. We prefer the linear probability model because of the large number of city and time dummies included in most regressions as well as for its ease of interpretation.

$$y_{it} = \sum_{j=1100}^{1700} \beta_j \text{ Temp Deviation}_{it} + \phi_i + \gamma \text{ Urban Density}_{it} + \epsilon_{it} \tag{3}$$

where y_{it} is a dichotomous variable representing either an Expulsion in city i during period t or an Expulsion or Persecution. j indexes the centuries 1100, 1200, 1300, 1400, 1500, 1600, and 1700. We include a full vector of city fixed effects, ϕ_i, as well as controlling for Urban Density in all regressions. In most regressions we will also control for the years of the Black Death by including intercept and slope shift parameters. Our primary variable of interest is β_j which we expect to be negative and significant for centuries when negative temperature shocks increase the probability of an expulsion.

We also estimate a version of specification 3 in which we interact Temperature Deviation with Poor Wheat Suitability so as to refine our estimate of β consistent with Prediction 2 from the model.

$$y_{it} = \sum_{j=1100}^{1700} \beta_j \text{ Temp Deviation}_{it} \cdot \text{Poor Wheat Suitability}_i + \phi_i + \gamma \text{ Urban Density}_{it} + \epsilon_{it} \tag{4}$$

We will also estimate versions of specifications 3 and 4 in which we include a full vector of dummy variables for each five-year period. This will allow us to compare our preferred fixed effects estimates, which uses all the within variation in Expulsions across cities, with the difference-in-difference estimates which only utilize within city variation in Expulsions. Standard errors for the fixed effects specifications are clustered at the modern-country level.[38] The difference-in-differences specifications don't have sufficient rank to cluster at the country level, so we report Huber-White standard errors instead.

Table 1 reports our main regression results using Expulsion as the dependent variable. In column (1) we report β coefficients from estimating equation 3 using the full sample. They indicate that negative weather shocks increased the probability of an expulsion in the fifteenth and sixteenth centuries but, surprisingly, *decreased* the probability during the fourteenth century. In column (2) where we estimate 4 using cities with constrained wheat suitability as our treatment group, we get similar results, except now the coefficients on the fifteenth and sixteenth centuries are larger. One possible explanation for what is driving the positive coefficient for the fourteenth century in our estimates is that the years of the Black Death also happened to be relatively warm, on average (see

[38]This seemed the most reasonable level of hierarchy on which to cluster. When we re-run the specifications clustering at the city level, our standard errors significantly decrease.

	Dep. Variable = Number of Expulsions in Five-Year Period					
	(1)	(2)	(3)	(4)	(5)	(6)
Weather x 1200	-.0168105	-.0103596	-.0143495	-.0081121	-.0049539	.0035553
	(.0151989)	(.0131598)	(.0146603)	(.0125525)	(.0040735)	(.004214)
Weather x 1300	.0309097*	.0307169*	.0171041	.0188263	-.0108265*	-.0008252
	(.0164337)	(.016746)	(.0122849)	(.0124574)	(.0062907)	(.0060798)
Weather x 1400	-.0625417**	-.0657637**	-.0657982***	-.068843***	0.0076556	-.0121578*
	(.0227286)	(.024577)	(.0224599)	(.0241625)	(.0057262)	(.0070193)
Weather x 1500	-.0282092***	-.0396574***	-.0298793**	-.0412817**	-.0238347**	-.0314513***
	(.0147709)	(.017264)	(.0148567)	(.0173182)	(.0119333)	(.0086697)
Weather x 1600	.0011035	.0019727	.0006831	.0015565	.0115263	.0051643
	(.0036283)	(.0055365)	(.0038402)	(.0057462)	(.00706445)	(.0035271)
Weather x 1700	.0001953	-.0002348	-.000132	-.0005066	.0021461	.001066
	(.0019131)	(.0025912)	(.0018581)	(.0025758)	(.0030356)	(.0027763)
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	Yes	Yes
Interacted with Wheat Suitability	No	Yes	No	Yes	No	Yes
Black Death Controls	No	No	Yes	Yes	Yes	Yes
Urban Population	Yes	Yes	Yes	Yes	Yes	Yes
Obs	55908	55908	55908	55908	55908	55908
F-statistic	13.97	29.50	38.48	60.25	9.24	8.61

Table 1: Baseline Results Using Five-Year Average Sample. All regressions include city fixed effects and controls for urban population density. Columns (1), (3), and (5) are estimated based on specification 3 in the text. Columns (2), (4), and (6) are estimated based on specification 4 in the text. All fixed effects regressions are cluster at the modern–country level. Difference-in-differences regressions have Huber-White standard errors reported. *, **, and *** signify statistical significance at the 10%, 5%, and 1% levels respectively.

Figure 3). As such we include intercept and slope shifts for Black Death years for the following regressions.

Columns (3) and (4) of Table 1 are identical to (1) and (2) except they exclude the Black Death years. As expected, the coefficients on the fourteenth century now become indistinguishable from zero. The coefficients on the fifteenth and the sixteenth centuries are negative and economically significant. In column (4), where we restrict our treatment group to cities that have wheat suitability that is moderate to poor the coefficient on the fifteenth century suggests a one standard deviation decrease in the average temperature (one-third of a degree) raises the five-year probability of an expulsion by about 2%. This is relative to a baseline that is also about 2%. In the sixteenth century the comparable effect of a one standard deviation decrease in temperature is an increase in expulsion probability of just over 1% (again, relative to a baseline probability of 2%). Figures 5

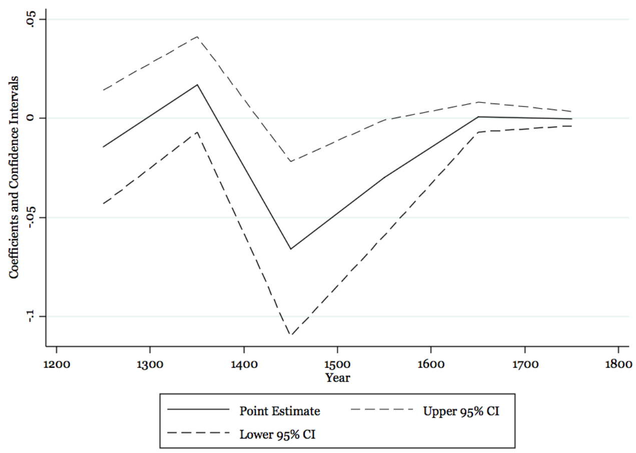

Figure 5: Specification (3) from Table 1. Dependent Variable = Expulsions; Fixed effects estimator. Both good and poor wheat suitability cities included in treatment group.

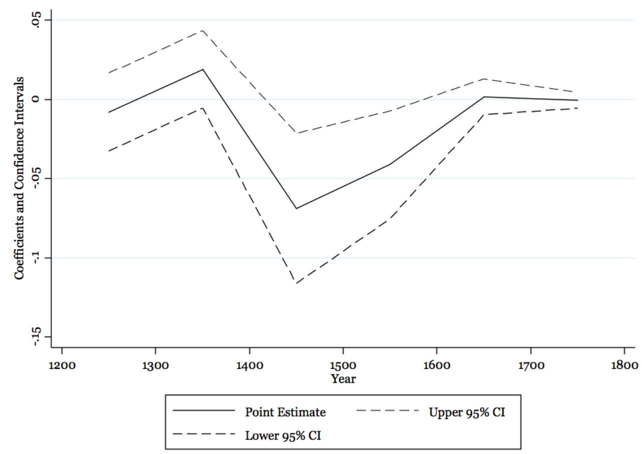

Figure 6: Specification (4) from Table 1. Dependent Variable = Expulsions. Fixed effects estimator. Only poor wheat suitability cities included in treatment group.

and 6 illustrate the results of the regressions in columns (3) and (4) respectively.

In columns (5) and (6) we run regressions identical to those in columns (3) and (4) except we include a full vector of period dummies. These difference-in-differences estimates tell a largely similar story to the fixed effects estimates, except the coefficients shrink in size, consistent with most of the correlation in expulsion probability across cities. In column (5), where the treatment group includes all expelling cities the coefficient on the fourteenth century becomes negative and significant at the 10% level. The coefficient on the sixteenth century shrinks slightly but retains its significance at the 5% level. Somewhat surprisingly, the coefficient on the fifteenth century becomes indistinguishable from zero under the difference-in-differences specification. In column (6) where we focus on a treatment group consisting of cities that have poor wheat suitability the coefficients on the fifteenth and sixteenth centuries are both negative and significant at the 10% and 1% levels respectively, though they shrink in magnitude relative to the comparable fixed effects estimates in column (3). The coefficients from column (6) are graphed in Figure 7.

When focusing on Expulsion as the dependent variable, the regressions in Table 1 tell largely the same story. There is strong evidence that negative temperature shocks during the fifteenth and sixteenth centuries resulted in a both economically and statistically significant increase in the probability of expulsion of Jewish communities from their cities. In addition, none of the estimates on the seventeenth and eighteenth centuries show any evidence whatsoever of an effect of temperature deviation on expulsion probability. Finally, we find weak evidence that there may have also been a negative effect of weather during the fourteenth century (assuming the Black Death years are controlled for). Consistent with the predictions of the model, all of these results become stronger when we control for the suitability of a cities agriculture for wheat cultivation. Overall, the results in Table 1 suggest the mechanisms in our model linking temperature shocks to expulsions began to operate sometime in the fourteenth century, were strong during the fifteenth and sixteenth centuries, and then ceased to operate during the seventeenth and eighteenth centuries.

Robustness Checks

In this section we perform some robustness checks on the main set of results presented above. In the first two regressions in columns (1) and (2) of Table 2 we check whether our main results hold up using yearly data rather than our baseline five-year averaged data. In column (1) where we use city fixed effects and take all expelling cities as being treated by the weather shock, we find a negative and significant effect of weather, consistent with our five-year sample. The coefficient on the fifteenth and sixteenth centuries is -0.004 and significant at the 5% level. Considering that these are the *yearly* rather than the *five-year* probabilities of an expulsion, these estimates are consistent with our baseline results. When we restrict our treated group to cities with poor wheat suitability, then the estimated effect becomes larger for the sixteenth century, in keeping with our predictions and the baseline results.

In column (3) we return to using the baseline five-year sample, but drop the Spanish national expulsions in 1492. Relative to our baseline estimate in Table 1 column (3) the coefficient on the fifteenth century is cut in half, but it retains its significance at the 5% level.

In regressions (4), (5), and (6) of Table 2 we switch from using Expulsion as a dependent variable to using the dichotomous variable 'Expulsion or Persecution'. In Column (4) we replicate our baseline specification from Table 1 using the expelling cities with poor wheat suitability as the treated group. The coefficients on fourteenth and fifteenth century are larger (more negative) and increase in significance relative to our baseline results. When we include period dummies to obtain difference-in-differences results in column (5) we find significant negative effects of temperature deviations for the fourteenth, fifteenth, and sixteenth centuries. The large and negative coefficient on the fourteenth century when including persecutions is not surprising given that over a third of the persecutions in our data are from that century (277 out of 616). Surprisingly, we also find a small positive effect of temperature on Expulsions or Persecutions in the seventeenth century in the difference-in-differences regression. Overall, relative to the comparable regression in Table 1 the impact of temperature decreases is larger across the board. The coefficients in regression (5) from Table 2 are graphed in Figure 8.

	Dep. Var. = Expulsion			Dep. Var. = Expulsion or Persecution		
	(1)	(2)	(3)	(4)	(5)	(6)
Weather x 1200	.0010079	.0014974	-.0024667	-.0227489	-.0112181	.0008427
	(.0022179)	(.0023043)	(.0129189)	(.008956)	(.0081643)	(.0023745)
Weather x 1300	.003887	.00377	.0177618	-.0034819	-.0485703***	.0027172
	(.0032964)	(.0026478)	(.0131363)	(.0328265)	(.0126887)	(.0028544)
Weather x 1400	-.0040768**	-.0040407**	-.033038**	-.0745307***	-.0179271**	-.0060725***
	(0021596)	(.0016006)	(.0120819)	(.0227572)	(.0081674)	(.0018553)
Weather x 1500	-.0040734**	-.0057384**	-.0400745**	-.0382273**	-.0329244***	-.0053963**
	(.002118)	(.0025184)	(.0171641)	(.0179551)	(.0099072)	(.0024539)
Weather x 1600	.0001614	.0004453	.0019525	.0057904	.0110993*	.0006894
	(.0004598)	(.0006805)	(.0058144)	(.0073533)	(.006218)	(.0007698)
Weather x 1700	-6.48e-06	-.0001261	-.0002864	.0012943	.0051672	.0002392
	(.0002255)	(.0003062)	(.0025665)	(.0032718)	(.0045246)	(.0003572)
City Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	Yes	No
Interacted with Wheat Suitability	No	Yes	Yes	Yes	Yes	Yes
Black Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
1492 Dropped	No	No	Yes	No	No	No
Urban Population	Yes	Yes	Yes	Yes	Yes	Yes
Five-Year Sample	No	No	Yes	Yes	Yes	No
Yearly Sample	Yes	Yes	No	No	No	Yes
Obs	270884	270884	55812	55908	55908	276569
F-statistic	57.41	83.44	4.02	13.74	9.85	66.49

Table 2: Robustness regressions using five-year and yearly data. All fixed effects regressions are cluster at the modern–country level. Difference-in-differences regressions have Huber-White standard errors reported. *, **, and *** signify statistical significance at the 10%, 5%, and 1% levels respectively.

Finally, in column (6) of Table 2 we run our baseline fixed effects specification using Expulsion or Persecution as the dependent variable and yearly data. The results are consistent with our baseline results from the five-year data, again keeping in mind that the coefficient estimates are about five times smaller since they now represent yearly probabilities rather than the five-year probability of an expulsion or persecution occurring.

Overall, our empirical results strongly support Predictions 1 and 2 for the fifteenth and the sixteenth centuries (and weakly support them for the fourteenth). (1) A one standard deviation decrease in temperature made expulsions more likely, usually by increasing the five-year probability of expulsion by 1% to 2% relative to a baseline probability of 2%. (2) This effect was larger in cities with an agricultural sector facing greater constraints to growing the staple crop, wheat. However, our results do not shed any direct light on why the relationship between climate and expulsions disappeared after 1600. In the next section we discuss how we interpret the temporal pattern displayed by our

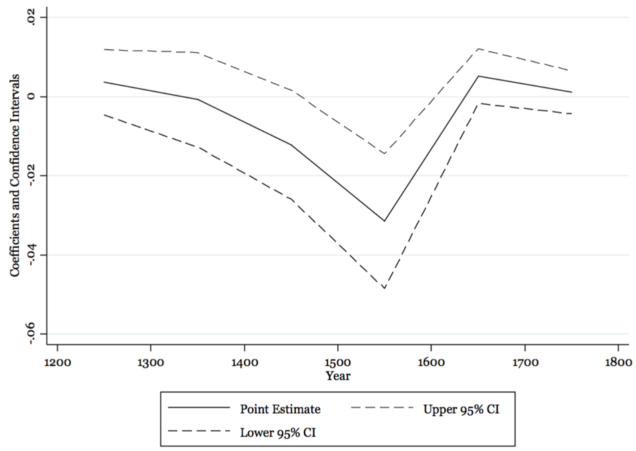

Figure 7: Specification (6) from Table 1. Dependent Variable = Expulsions. Difference-in-differences estimator. Only poor wheat suitability cities included in treatment group.

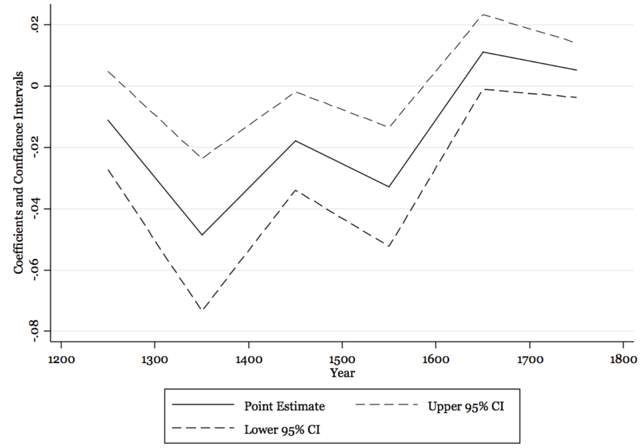

Figure 8: Specification (5) from Table 2. Dep. Variable = Expulsion or Persecution. Difference-in-differences estimator. Only poor wheat suitability cities in treatment group.

regression coefficients in light of Predition 3 from the model.

5.4 Why did the relationship between weather and expulsions break down after 1600?

The number of expulsions diminished after 1600, but the practice did not disappear. Expulsions and persecutions of Jewish communities remained a prominent feature of the European landscape up to the end of the early-modern period. Jews were expelled from Vienna in 1669/70, from Munich in 1715, and from Stuttgart in 1731. Other groups suffered expulsions in this period: the Moriscos of Spain were expelled in 1609; the Revocation of the Edict of Nantes in 1685 resulted in banishment of the large and prosperous French Protestant community; and over 12,000 Protestants were expelled from Salzburg as late as 1731.[39] According to our results, what did change after 1600 was the relationship between weather and expulsions.[40]

There are several possible reasons why the relationship between bad weather and expulsions weakened after 1600. The first possibility is that there were simply fewer Jewish communities to expel by the seventeenth century. During the medieval period Jewish populations had been widely distributed across Europe, but many of these were destroyed by 1600.

[39] Chaney (2008) finds that the expulsion of the Moriscos had a long term negative impact on urbanization and population density.

[40] 1744 Maria Theresa, ruler of the Habsburg empire, expelled the Jews of Prague. But this was one of the last such occurrences in western or central Europe. Other rulers of Europe, including George II of England, pleaded with her to retract the order (Katz (see 1974, 12–13) and Vital (see 1999, 1–4)).

Region	City-Years Before 1600	City-Years After 1600	Expulsions Before 1600	Expulsions After 1600	Expulsions per City Year Before/After 1600
France	25,690	6,530	174	5	8.85
England	3,665	1,420	25	0	inf
Germany	41,710	19,430	202	13	7.24
Italy	30,135	8,680	81	4	5.83
Switzerland	2,950	715	15	2	1.82
Spain	36,390	0	112	0	inf
Portugal	6,195	0	21	0	inf
Austria	4,270	1,435	12	7	0.58
Poland	16,590	24,075	27	17	2.30

Table 3: City-years Jewish community present and expulsions before and after 1600.

Nevertheless, this fact alone does not account for the breakdown in the relationship between weather shocks and expulsions after 1600. In our dataset there were thirty-one recorded persecutions in England in addition to seven city-level expulsions before the general expulsion of all Jews from the country in 1290. In comparison, there are no recorded persecutions or expulsions after 1655. We can see the difference still more clearly by examining the territories that comprise modern France. In our dataset there are fifty-nine city-level persecutions prior to 1600, in addition to numerous expulsions both local and national (a total of 174 cities expelled Jews). To account for the fact that more French cities had Jewish communities in the middle ages than in the seventeenth century, we calculate the total number of city-years associated with a Jewish presence in our data before and after 1600. The number of city-years before 1600 was indeed greater than after 1600 (25,690 years compared to 6,530 years). In our data, however, we find only three persecutions after 1600 relative to the 174 expulsions before.[41] Another way of stating this is that expulsions were almost nine times more likely before 1600 in France than before. Table 3 shows the comparable numbers for Germany, Italy, Switzerland, Spain, Portugal, Austria, and Poland. For Spain and Portugal, the lack of expulsions after 1600 is due to there being no Jews to expel. However, with the exception of Austria, these data strongly suggest that the fall in the number of persecutions in western Europe we observe was not just because there were no Jewish populations to expel.

One possible economic explanation for the reduction in the number of expulsions in western Europe and the breakdown in the relationship between temperature shocks and expulsions is that economic growth and an increase in agricultural productivity led to a gradual relaxation of the subsistence constraint ($\uparrow Y^A$). It is certainly true that from the eighteenth century onwards onwards Malthusian conditions weakened and per capita incomes gradually began to increase. Nunn and Qian (2011) document the role played by the potato in increasing population density and urbanization

[41]This calculation almost certainly understates the difference between the medieval and the early-modern periods since our methodology is likely to undercount earlier persecutions relative to later persecutions.

after 1700. However, these developments occurred too late to explain the breakdown in the relationship between expulsions and weather shocks in a period when the European economy remained Malthusian (Ashraf and Galor, 2011) and agricultural productivity in much of Europe remained low and stagnant.[42]

An alternative explanation of the breakdown in the relationship between economic shocks and expulsions is a reduction in the religious tension and antisemitism. We cannot exclude this argument as no data exists that enable us to measure religious attitudes or tension in the early modern period. Nevertheless, several arguments count against this being a decisive factor in explaining the weakening of the relationship we observe between economic shocks and antisemitic expulsions after 1600.

The Reformation itself did not lead to a decrease in the number of expulsions and persecutions. Both Protestant and Catholic cities continued to expel Jewish communities: there were 123 expulsions in the sixteenth century of which twenty-eight occurred in Protestant cities. Much recent scholarship tends to argue that religious tensions and the potential for religious conflict remained high into the eighteenth century. Kaplan (2007, 337) observes that 'Europe remained sharply divided by faith after 1648. Whatever accommodations and arrangements they made in practice when living together, whatever their daily interactions, on an ideological plane Catholics and Protestants in particular remained committed foes. They hated one another's churches, rites, and dogmas, and this antagonism remained a force in European politics. Leibniz, for one, believed that unless this fundamental division were overcome and the two groups reunited, the Peace of Westphalia would prove to be a mere truce, a temporary respite. The fires of conflict still smoldered beneath the ash, he warned, and would inevitably break out again'.[43]

If a diminution of religious fervor truly did occur after the end of the Thirty Years War, it is difficult to empirically distinguish this hypothesis from our hypothesis that the rise of stronger and more centralized states with better political institutions led to a breakdown in the relationship between climatic shocks and expulsions. In our model, stronger states ($\uparrow \gamma$) are less likely to

[42] Recent research finds evidence that the Malthusian equilibrium weakened in England during the seventeenth century (Crafts and Mills, 2009, see for instance). 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).

[43] The late seventeenth century was marked by the persecution of Catholics in England following the Titus Oates conspiracy in 1678 followed by religiously tinged conflict between the followers of James II and William of Orange in Ireland and Scotland in the wake of the Glorious Revolution. Elsewhere, there was the persecution of Protestants by Louis XIV in France following the Revocation of the Edict of Nantes; the brutal suppression of the Waldensians of Savoy in 1685; and the War of Cévennes in Switzerland and southern France. In general: '[t]hough the first half of the eighteenth century, then, many Europeans continued to suspect religious dissenters of disloyalty and to lash out at them in times of war . . . religious violence—popular, official, military—constituted in many parts of Europe in the late seventeenth and early eighteenth century. The age of religious wars had not yet ended' (Kaplan, 2007, 342-343).

conduct an expulsion in response to a negative economic shock. The main empirical support for this hypothesis comes from the Dutch Republic, England, and France. Jewish communities established in the Netherlands and England in the seventeenth did not suffer any recorded instance of persecution nor did they suffer expulsion. The English Jewish community was initially viewed as a transitory 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 recognized and accepted (Katz, 1994, 140-141 and 188). A similar process took place, albeit more gradually, in France. Cardinal Richelieu played a crucial role 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 'knowingly condoned the shift to Jewish rather than Catholic allegiance in France, a policy subsequently continued by Colbert. It was this government stance which made possible that steady transition from the 1630s down to the 1680s by when the Portuguese communities in France had cast off all remaining pretense and openly organized 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.

Historians and sociologists have documented how 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, 1967*a*; Menache, 1987; Barkey and Katznelson, 2011). This factor was certainly an important one in explaining the expulsion of Jews from England in 1290 and Spain in 1492.[44] However, the increases in state capacity that occurred from 1600 onwards and which are documented by Bonney (1995); Dincecco (2009); Johnson and Koyama (2012*b*) led to the formation of states that were less vulnerable to unrest amongst either the populace or the elite, and better at reducing interfaith and inter-communal violence, all factors that led to fewer persecutions and expulsions. Popular antisemitism survived.[45] But the empirical evidence we present suggests that the new nation states of western Europe were less responsive to it. 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, 2011) and with the argument that the rise of larger and more centralized states led to a gradual increase in bounds of religious toleration in the early modern period (Johnson and Koyama, 2012*a*).

[44]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 (2010*b*). For studies of the expulsion of Jews from Spain see Kamen (1988); Gerber (1992); Roth (1995).

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

Jews continued to suffer persecutions and massacres in early modern Europe but these occurred in the ungoverned periphery of Europe and not in western or central Europe. The worst massacres occurred during the Khmelnytsky Uprising which saw the Ukraine breakaway from Poland-Lithuania in the mid-seventeenth century (Stampfer, 2003). Similarly, the Haidamaks who killed Jews in the Ukraine during the eighteenth century, flourished in lawless and ungoverned parts of the country. It goes without saying that this increase in state capacity was a two-edge sword: it could be used to persecute as well as protect. In the twentieth centuries, 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.[46]

6 Conclusion

This paper examines the effect of negative supply shocks on the treatment of religious or ethnic minorities. 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 an expulsion or persecution. We find a one standard deviation decrease in temperature is associated with approximately a 1% to 2% increase in the probability of expulsion during any given five-year period. The effect of supply shocks on expulsions is larger in areas with poor soil quality for wheat cultivation and more muted in areas with good quality soil.

We interpret these findings using a political economy model which describes the conditions under which rulers will find it rational to expel or expropriate a minority community. Viewed through this lens, our results suggest that temperature shocks put pressure on rulers to expel Jews both as a means to make up lost tax revenue as well as to quell popular violence. The model predicts that more developed states with greater fiscal capacity and greater political stability, were less likely to expel Jewish communities as a result of these shocks.

The relationship between cold weather and expulsions breaks down after 1600. We consider a number of explanations for why this was so and provide supporting historical evidence that the rise of modern states in this period was one factor behind Europe's gradual transition away from being a 'persecuting society'.

[46] Jews achieved full civic rights more gradually. 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).

Descriptive Statistics

Full Five-Year Sample, 1100-1799

		Mean	Std. Dev.	Min	Max	Observations
Expulsion	overall	0.006	0.078	0.000	1.000	N=130620
	between		0.006	0.000	0.050	n=933
	within		0.077	-0.044	0.999	T=140
Temp Deviation	overall	-0.060	0.346	-1.330	1.370	N=130620
	between		0.028	-0.156	-0.001	n=933
	within		0.345	-1.273	1.427	T=140
Expulsion or Persecution	overall	0.011	0.114	0.000	2.000	N=130620
	between		0.011	0.000	0.079	n=933
	within		0.114	-0.068	1.997	T=140
Poor Wheat Suitability	overall	0.705	0.456	0.000	1.000	N=130620
	between		0.456	0.000	1.000	n=933
	within		0.000	0.705	0.705	T=140
Jewish Presence	overall	0.422	0.492	0.000	1.000	N=130620
	between		0.233	0.000	1.000	n=933
	within		0.434	-0.564	1.415	T=140
Urban Density	overall	10.223	12.132	0.000	329.829	N=130620
	between		8.557	1.182	135.521	n=933
	within		8.604	-91.265	267.510	T=140

Main Regression Sample (Jewish Presence=1), 1100-1799

		Mean	Std. Dev.	Min	Max	Observations
Expulsion	overall	0.014	0.118	0.000	1.000	N=55908
	between		0.026	0.000	0.333	n=933
	within		0.116	-0.319	1.007	T-bar=59.9228
Temp Deviation	overall	-0.057	0.339	-1.278	1.370	N=55908
	between		0.096	-0.502	0.293	n=933
	within		0.328	-1.426	1.262	T-bar=59.9228
Expulsion or Persecution	overall	0.025	0.173	0.000	2.000	N=55908
	between		0.035	0.000	0.333	n=933
	within		0.171	-0.308	2.009	T-bar=59.9228

Table 4: Descriptive Statistics for Full Five-Year Sample and Regression Sample. Upper panel shows statistics for five-year data including all possible observations. Lower panel shows statistics for five-year data used in most regressions. Lower panel assumes Jewish Presence=1 and Urban Density is non-missing. See text for variable descriptions.

A Data Appendix

The appendix is available online at https://www.dropbox.com/sh/kf05gu0xgojv1va/6hAW7s-bPA

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