MPRA
Munich Personal RePEc Archive

Negative Shocks and Mass Persecutions: Evidence from the Black Death

Jebwab, Remi and Johnson, Noel D and Koyama, Mark

George Washington University, George Mason University, George Mason University

March 2017

Online at https://mpra.ub.uni-muenchen.de/78630/
MPRA Paper No. 78630, posted 21 Apr 2017 07:38 UTC

Negative Shocks and Mass Persecutions: Evidence from the Black Death

Remi Jedwab and Noel D. Johnson and Mark Koyama*

March 6, 2017

Abstract

In this paper we study the Black Death persecutions (1347-1352) against Jews in order to shed light on the factors determining when a minority group will face persecution. We develop a theoretical framework which predicts that negative shocks increase the likelihood that minorities are scapegoated and persecuted. By contrast, as the shocks become more severe, persecution probability may actually decrease if there are economic complementarities between the majority and minority groups. We compile city-level data on Black Death mortality and Jewish persecution. At an aggregate level we find that scapegoating led to an increase in the baseline probability of a persecution. However, at the city-level, locations which experienced higher plague mortality rates were less likely to engage in persecutions. Furthermore, persecutions were more likely in cities with a history of antisemitism (consistent with scapegoating) and less likely in cities where Jews played an important economic role (consistent with inter-group complementarities).

JEL Codes: J15; D74; Z12; N33; N43; O1; R1

Keywords: Ethnic Conflict; Religious Conflict; Minorities; Persecutions; Massacres; Libels; Black Death; Jewish Economic History; Middle Ages; Epidemics; Cities; Trade

*Corresponding author: Mark Koyama: Department of Economics, George Mason University, mkoyama2@gmu.edu. Remi Jedwab: Department of Economics, George Washington University, jedwab@gwu.edu. Noel Johnson: Department of Economics, George Mason University, njohnsoL@gmu.edu. We are grateful to seminar audiences at ASREC, Ben Gurion, Florida State, George Mason, George Washington, Hebrew, Hitsubashi, Pontificia Universidad Católica de Chile, Rutgers, the SEA Meetings (Washington), the Washington Area Economic History Workshop (George Mason) and Yale. We gratefully acknowledge the support of the Institute for International Economic Policy at George Washington University and the Mercatus Center at George Mason University.

What factors make minorities vulnerable to persecution? We answer this question by studying Jewish communities during the Black Death. The Black Death was the greatest demographic shock in European history: approximately 40% of the population died between 1347 and 1352 (Benedictow, 2005; Christakos et al., 2005). As such, it had broad-ranging social effects. In particular, historians and economists point to the Black Death as a direct cause of unprecedented scapegoating and persecution of Jewish communities (Cohn, 2007; Voigtländer and Voth, 2012). We use data on city-level Black Death mortality rates and Jewish persecution to show that, contrary to conventional wisdom, the higher mortality was in a city, the less likely was a persecution to occur. Furthermore, we find this effect was attenuated in cities with a history of anti-Semitism and accentuated in places where Jews played an important economic role.

Understanding the causes of the Black Death persecutions is important in its own right. These pogroms were "the most monumental of medieval Jewish persecutions" (Cohn, 2007). A recent survey describes the massacres as "precursor(s) of the Holocaust" (Goldhagen, 2013, 38). Other research shows that they left a legacy of antisemitism that was associated with 20th century violence against Jews (Voigtländer and Voth, 2012, 2013a). Furthermore, studying this episode is important because it sheds light on other episodes of intergroup violence. Minorities indeed remain targets of violence across many parts of the world (see Chua, 2004; Jha, 2013; Yanagizawa-Drott, 2014). But why are minorities protected in some places but not in others?

In the wake of the Holocaust a large literature arose in philosophy, political science, psychology, and sociology investigating the importance of scapegoating as a cause of violence (Dollard, 1939; Girard, 1978; Allport, 1979; Staub, 1992; Glick, 2009). According to the scapegoating theory, members of a majority experiencing negative shocks settle on a specific target to blame for their problems. Another potential mechanism determining the likelihood of persecution focuses on the extent of economic complementarities between the majority and the minority. This thesis argues that patterns of economic complementarity and substitutability determine the ability of two groups to coexist (Jha, 2007, 2013). When the economic activities of the two groups complement each other, shocks may lead the majority to protect the minority because of its economic value.

We first introduce a simple theoretical framework to help us analyze how a negative shock affects the decision by a majority, or *ingroup*, to persecute a minority group—the *outgroup*. In our set-up, the shock decreases the utility level of the ingroup which, as it approaches the subsistence utility level, increases the likelihood of a persecution. The way we define subsistence, however, depends on the preferences of the ingroup as well as economic inter-group complementarities. When the ingroup manifests a low preference for diversity, it blames the outgroup for the shock, and the persecution probability increases with mortality. We call this the *scapegoating* effect. On the other hand, when the ingroup needs the outgroup to cope with the shock, the persecution probability decreases with mortality. We call this the *complementarities* effect.

To illustrate the mechanisms highlighted in the theoretical framework, we compile city-level data on the virulence and spread of the Black Death along with information on the locations and

characteristics of Jewish communities and persecutions across all of Western Europe during the Black Death period (1347-1352) as well as for the surrounding centuries (1000-1700). Among the 1,869 cities in Western Europe during this period, 363 had a Jewish community at the onset of the Black Death. We have direct reports of Black Death mortality rates for 263 localities. Our main sample is the intersection of these two samples, which consists of the 124 cities that had a Jewish community in 1347 and for which we know their mortality rates.

We show that, while the Black Death shock provided the initial impetus for antisemitic violence in Europe, it was primarily patterns of economic complementarity that explain local variation in persecution. About one half of cities with a Jewish community suffered a persecution during the Black Death. However, we find that cities which experienced more severe plague outbreaks—as measured by higher mortality rates—were *less* likely to persecute their community.

We believe these results are causal. (i) We provide evidence that the virulence of the plague was due to factors largely exogenous to persecutions. (ii) The parallel trends assumption is verified as, prior to 1347, there was no difference in persecutions between the cities most affected and those comparatively unaffected by the Black Death. (iii) Results are robust to the inclusion of geographic and institutional controls, as well as controls for community size and past persecutions. (iv) Our results hold when we implement an instrumental variables (IV) strategy premised on the fact that the Black Death entered Europe through the Sicilian port of Messina and that it was more virulent in earlier periods. The first IV we construct is market access to Messina conditional on market access to all cities, as it was the specific connectedness to Messina and not the connectedness to other important trading cities that mattered for the virulence of the plague. The second IV is based on the number of months between the year-month the city was infected and October 1347 (the date of first contact). This last IV relies on the randomness of the timing of infection for identification.

Using the insights from the theoretical framework, we shed light on the pathways that explain both why the overall level of persecution was high and why cities with higher mortality rates—i.e. a more negative shock—persecuted less. We find that, conditional on the size of the mortality shock, Jews were more likely to be persecuted in towns where people were antisemitic or inclined to believe that Jews had caused the plague, i.e. the *scapegoating* effect was stronger. Starting with the First Crusade (1096) to free Jerusalem from non-Christians, persecutions were increasingly perpetrated against Jews. From the 12th century onwards Jews were accused of ritually murdering Christian children during Easter and of host desecration—the defiling of the sacred wafer of the mass associated with the body of Jesus. During the Black Death Jews were tortured into confessing to have caused the plague by poisoning wells. We find that the protective effect of high mortality was attenuated for towns closer to where such accusations were made. It was also weaker in cities first infected in January or April-May—months when Christians were inclined to blame Jews for the death of Jesus (Epiphany and Easter)—and stronger for December or February–March—months when Christians were doing penance for the Advent and Lent seasons.

Conversely, Jews were less likely to be persecuted at higher plague mortality rates in cities

where they could offer specialized economic services, i.e. where the *complementarities* effect was stronger. Conditional on the size of the mortality shock, we find a lower probability of persecution in cities where Jews were offering moneylending services or services to the trading sector. In addition, cities with a Jewish community grew relatively faster than cities without in the centuries before the Black Death and cities that persecuted their community during the Black Death grew relatively slower in the following centuries. We provide evidence that the complementarities effects may have been strong enough to contribute to the persecution probability being lower in high-mortality cities concerned with their demographic and economic survival.

Our paper contributes to several literatures. First, it adds to recent work on the economics of mass killings (Easterly et al., 2006; Montalvo and Reynal-Querol, 2008; Caselli et al., 2015). Esteban et al. (2015) explain that the decision by a majority group to eliminate its minority group can be seen as the outcome of strategic and rational economic calculation: The majority group starts a genocide if the net present value of expected pay-offs is positive, which depends on the size of the winnable surplus and the productivity losses from conflict.[1] Conversely, Yanagizawa-Drott (2014) and Rogall (2015) highlight the role of societal forces in mass killings.

Second, we contribute to the literature on the relationship between shocks and the persecution of minorities. There are studies on the effects of climate shocks on the persecution of witches (Oster, 2004; Miguel, 2005) and Jews (Anderson et al., 2016; Grosfeld et al., 2016).[2] With the exception of Mitra and Ray (2014), these papers are mostly atheoretical and only Grosfeld et al. (2016) study how the shock-persecution relationship varies with characteristics of the groups. They find that pogroms were more likely during a hot growing season if Jews were creditors.

Third, we add to a recent literature that emphasizes the role played by economic complementarities between groups. Jha (2007) has developed a model of the importance of inter-group complementarities on the decision to tolerate minorities. Jha (2013) tests this theory by studying the toleration of Muslims in, majority Hindu, Indian cities and shows how this depends on the substitutability of the services they provide. There is also an extensive literature on the economic role played by Jews historically (see Botticini and Eckstein, 2012; Johnson and Koyama, 2017). Becker and Pascali (2016) study post-Reformation Germany and show that persecutions were more likely in Protestant than in Catholic areas as it was in the former that there were individuals who could substitute for the role of moneylenders that Jews had previously played.[3]

[1]Our paper is also related to the literature on ethnic diversity and conflict (Montalvo and Reynal-Querol, 2005; Esteban and Ray, 2008, 2011; Esteban et al., 2012; Caselli and II, 2013; Rohner et al., 2013a,b; Arbatli et al., 2015; Ray and Esteban, 2016; Mayoral and Ray, 2016; Michalopoulos and Papaioannou, 2016) and public policies (Easterly and Levine, 1997; Alesina et al., 1999; Alesina and Ferrara, 2005; Fernandez and Levy, 2008; Bandiera and Levy, 2011; Alesina and Zhuravskaya, 2011; Alesina et al., 2016). This literature shows that conflict takes place along ethnic lines, because: (i) ethnicity is not easily disguisable (Caselli and II, 2013); (ii) conflict requires both economic resources and conflict labor, which can both be found within a same ethnic group but not within a same class (Esteban and Ray, 2008); and (iii) ethnicity proxies for income if ethnic groups are professionally specialized (Esteban and Ray, 2011). Our context fits these characteristics, as Jews in medieval Europe were economically specialized and often wore distinctive clothing.

[2]There is a literature showing that shocks are associated with increased conflict (Miguel et al., 2004; Chassang and Miquel, 2009; Bai and Kai-sing Kung, 2011; Dell, 2012; Chaney, 2013; Köïnig et al., 2015; Iyigun et al., 2017).

[3]Researchers find that women have made greater gains in terms of political rights and employment opportunities in

Lastly, we contribute to the literature on antisemitism, the bulk of which has focused on its economic consequences (Waldinger, 2010, 2012, 2016; Acemoglu et al., 2011; Grosfeld et al., 2013; D'Acunto et al., 2014; Pascali, 2016). There are then several papers on the determinants of pre-modern era pogroms, studying Germany (Finley and Koyama, 2015; Becker and Pascali, 2016), or Russia (Grosfeld et al., 2016), and across Europe (Anderson et al., 2016). In a seminal paper on the legacy of medieval antisemitism, Voigtländer and Voth (2012) use data on the Black Death pogroms (but not on Black Death mortality rates) to explore the local persistence of antisemitic cultural traits from the 14th century through to the 20th century in Germany.[4]

Our study has several novel features as Europe during the Black Death provides an uniquely well suited setting to explore the causes of mass killings. We have many cities, in more than one country, with two well-identified groups. Christians obtained utility by persecuting Jews, who comprised a small share of the population but provided non-substitutable economic services. We exploit city-level data along with a shock that was massive, highly variable, and plausibly random. Our IV strategies are based on market access and epidemiological factors, two relatively novel sources. Furthermore, our focus on the pre-modern era, when there was no international community able to intervene to prevent persecution, insulates us from a significant source of endogeneity. Our context of decentralized polities with weak state capacity, is also similar to that observed in poor countries today, where minorities often face violence. As our data cover all of Europe, we can exploit the rich variation in initial conditions across cities and study how the shock-persecution relationship varies with economic and other social institutions. By contrast, many studies are constrained to focus on only one set of institutions at a time due to more limited character of their data. Finally, we study the long-run impact of the persecutions.

1. Theoretical Framework

We now describe how a shock can affect the probability that a minority group is persecuted. We consider a location consisting of a majority group, or "ingroup", i, and a minority group, or "outgroup", o. The ingroup observes the shock and then decides whether to persecute the outgroup. We assume the outgroup is small enough that it cannot prevent a persecution.

The utility level U of ingroup i is defined as:

$$U_i(L_i) = U_i(Y_i(L_i), \overline{T_i}/L_i, G_i(L_i), \theta_{io}(L_i)) \ , \tag{1}$$

and depends on: (i) per capita income $Y_i(L_i)$, which depends on population L_i; (ii) a fixed endowment per capita $\overline{T_i}/L_i$, where $\overline{T_i}$ is the total value of real and personal property of the ingroup; (iii) the population size of the ingroup (L_i), which represents a preference for higher

environments where they provide an important economic service (Goldin, 1991; Acemoglu et al., 2004; Fernandez et al., 2004; Doepke et al., 2015). Likewise, anti-immigrant sentiment is stronger when immigrant workers are substitutes for native-born workers (Mayda, 2006; Facchini and Mayda, 2009). Other papers have studied the impact of high-skilled minorities on economic growth (e.g. Johnson and Koyama, 2017; Nunn et al., 2017).

[4]Relatedly, there is a literature on the origins of Nazism and the persistence of antisemitic attitudes in Germany (Voigtländer and Voth, 2012, 2013a, 2014, 2015; Adena et al., 2015; Satyanath et al., 2017). There is also a new but still sparse literature in economics on the role of "fake news" (Allcott and Gentzkow, 2017) and media bias (Enikolopov et al., 2011; Adena et al., 2015) in affecting political behaviors.

survival rates of other ingroup members, with G_i determining how this matters over the range of L_i; and (iv) preferences for diversity ($\theta_{io}(L_i)$), i.e. how much the ingroup values the outgroup.

Per capita income is defined as $Y_i(L_i) = W_i(L_i) + R_{io}(L_i)$, where $W_i(L_i)$ is the wage and $R_{io}(L_i)$ the revenue extracted from the outgroup. Production Q_i uses ingroup labor: $Q_i = F_i(L_i)$. Wages are equal to the marginal productivity of labor: $W_i(L_i) = F_i'(L_i)$. Revenue from the presence of the outgroup is $A_{io}(L_i)$, weighted by a factor $\rho_{io}(L_i)$; both factors depend on the ingroup population: $R_{io}(L_i) = \rho_{io}(L_i)A_{io}(L_i)$. $\rho_{io}(L_i)$ represents the extent to which the externality from the presence of the outgroup is internalized by the ingroup.[5]

1.1. The Effects of the Shock on Utility

In order to describe the effects of a shock, we need to give the utility function more structure. For the sake of simplicity, we assume a linear utility function of the form:

$$U_i(L_i) = \omega_Y[F_i'(L_i) + R_{io}(L_i)] + \omega_T\overline{T_i}/L_i + \omega_G G_i(L_i) + \omega_\theta\theta_{io}(L_i) \ , \tag{2}$$

with each ω determining the weight of each component in the utility function.[6] Suppose there is a negative shock to the size of the ingroup population, i.e. $\Delta L_i < 0$. After rearranging, the total derivative of utility with respect to the shock is equal to:

$$\Delta L_i \times U_i'(L_i) = \Delta L_i \times [\omega_Y F_i''(L_i) - \omega_T\overline{T_i}/L_i^2 + \omega_G G_i'(L_i) + \omega_Y R_{io}'(L_i) + \omega_\theta\theta_{io}'(L_i)] \ . \tag{3}$$

To further elucidate the effect of the shock we consider two periods: period 0 before the shock, and period 1 after the shock. In period 0, U_i is equal to $U_i(L_{i,0})$. Assuming the pre-shock population $L_{i,0}$ is given, we have $\overline{U}_{i,0} = U_i(\overline{L}_{i,0})$. Post-shock utility in period 1 is: $U_{i,1}(L_i) = \overline{U_{i,0}} + \Delta L_{i,1} \times U_i'(L_i)$. Using equation 3, post-shock utility can then be rewritten as:

$$U_{i,1}(L_i) = \overline{U_{i,0}} + \Delta L_{i,1} \times [\omega_Y F_i''(L_i) - \omega_T\overline{T_i}/L_i^2 + \omega_G G_i'(L_i) + \omega_Y R_{io}'(L_i) + \omega_\theta\theta_{io}'(L_i)] \ . \tag{4}$$

1.2. The Effect of the Shock on the Decision to Persecute

The ingroup's decision probability to persecute the outgroup, P_{io}, depends on the gap between their current utility level U_i and a fixed "subsistence" utility level $\overline{U_i^*}$:

$$P_{io}(L_i) = P_i(U_i(L_i) - \overline{U_i^*}). \tag{5}$$

We posit that the persecution probability $P_{io}(L_i)$ increases when the gap between current and subsistence utility becomes more negative. Since $\overline{U}_i^*$ is fixed, the persecution probability is decreasing in $U_i(L_i)$. Combining equations 4 and 5, and rearranging, we obtain an explicit expression for the probability of persecution for period 1:

$$P_{io,1}(L_i) = P_i(\overline{U}_{i,0} + \Delta L_{i,1} \times [\omega_Y F_i''(L_i) - \omega_T\overline{T_i}/L_i^2 + \omega_G G_i'(L_i) + \omega_Y R_{io}'(L_i) + \omega_\theta\theta_{io}'(L_i)] - \overline{U_i^*}) \tag{6}$$

[5] Alternatively, were we to consider utility and its components as present discounted values, $\rho_{io}(L_i)$ could be considered as the discount factor at which the future revenue gains from the outgroup's presence are valued.

[6] Our qualitative results should be unaffected were we to consider a non-linear utility function (e.g., of the Cobb-Douglas form). We use a linear form simply to avoid mathematical complications.

To understand how the shock affects the decision to persecute the outgroup, we split 6 into two components: (i) post-shock *ingroup-based utility*, $V_{i,1}(L_i)$; and (ii) post-shock *outgroup-based subsistence utility*, $V^*_{io,1}(L_i)$. We define $V_{i,1}(L_i)$ and $V^*_{io,1}(L_i)$ such that $P_{io,1}(L_i) = P_i(V_{i,1}(L_i) - V^*_{io,1}(L_i))$. *Ingroup-based utility* is given by:

$$V_{i,1}(L_i) = \overline{U}_{i,0} + \Delta L_{i,1} \times [\omega_Y F''_i(L_i) - \omega_T \overline{T}_i / L_i^2 + \omega_G G'_i(L_i)] \ . \tag{7}$$

Given that $\overline{U}_{i,0}$ is fixed, $V_{i,1}(L_i)$ only varies when the shock changes the components of the utility function that do not depend on the presence of the outgroup. These components are the wage, the endowment per capita, and the population of the ingroup.

The second term, *outgroup-based subsistence utility*, only changes when the shock affects the components of the utility function that depend on the presence of the outgroup. These components are the preference for diversity and the revenue extracted from the outgroup.

$$V^*_{io,1}(L_i) = \overline{U}^*_i - \Delta L_{i,1}[\omega_\theta \theta'_{io,1}(L_i) + \omega_Y R'_{io,1}(L_i)] \ . \tag{8}$$

Using equations 7 and 8, we can now discuss the effects of the shock. For example, imagine that the shock decreases ingroup-based utility. Even if the marginal productivity of labor is decreasing, one could imagine that the shock disrupts economic relations to such an extent that people work less and productivity drops. As a result, earnings decrease overall. This decrease, in turn, should increase the probability of a persecution. However, whether a persecution occurs also depends on how the outgroup-based subsistence utility changes with the shock. If the shock increases the preference for diversity or the economic usefulness of the outgroup, one may not occur.[7]

1.3. Theoretical Effects of the Black Death

We now describe the effects of the Black Death on the decision by non-Jews to persecute Jews. Given a mortality rate M_i ($0 \leq M_i \leq 1$), the shock is equal to $\Delta L_{i,1} = \overline{L}_{i,0} \times (-M_i) \leq 0$. The initial population is fixed at $\overline{L}_{i,0}$ so the shock can be expressed as a function of mortality only.

Effects on Ingroup-Based Utility. Equation 7 suggests four potential effects of mortality on ingroup-based utility ($V_{i,1}(M_i)$): (1) a *Mortality effect*: People have relatives/friends that die/are ill leading to utility falling; (ii) an *Economic disruption effect*: Due to the number of deaths production collapses causing incomes and utility to decrease; (iii) a *Labor shortage effect* which leads to wages and utility increasing; (iv) an *Endowment effect* as survivors obtain the dead's property causing utility increases. As we will describe below, the historical record suggests that the utility-decreasing mortality and disruption effects dominated the utility-increasing labor shortage and endowment effects over the period relevant for explaining the Black Death persecutions.

Effects on Outgroup-Based Subsistence Utility. Equation 8 suggests two effects of mortality on outgroup-based subsistence utility ($V^*_{io,1}(M_i)$), via the ingroup's preference for diversity ($\overline{L}_{i,0} \times (-M_i) \times \theta'_{io,1}(M_i)$) or their valuation of the benefits brought by the Jews ($\overline{L}_{i,0} \times (-M_i) \times R'_{io,1}(M_i)$):

[7] While we consider a population shock that has economic consequences, one could easily apply this framework to an economic shock with no demographic consequences, for example a change in wages/endowments.

- *Scapegoating effect*: People accuse the outgroup of being responsible for the shock and the preference for diversity decreases. For example, if the Jews were accused of poisoning wells and causing the Black Death then this raises the utility members of the ingroup get from persecuting them. Our theoretical framework can also encompass other relationships. For example, if mortality is high and non-Jews see Jews dying, they may discard their prior that Jews were responsible for the plague. Also, if many non-Jews die, the survivors value having more people around, even if these are Jews, and/or cannot organize themselves to persecute the Jews, thus raising their *de facto* preference for diversity.
- *Complementarities effect*: If the economic value of the outgroup to the ingroup increases as a result of the shock, there is an incentive to protect them. Note it is also possible that if a large number of people die suddenly due to an inexplicable disease, people may become more present-biased and thus internalize less the long-term externality of having Jews around. In this case the incentive to persecute and expropriate the Jews may increase.

1.4. Comparative Statics

We now need to be more explicit about the respective functional forms of ingroup-based utility, outgroup-based subsistence utility, and how these translate into a persecution probability.

Scapegoating. Figure 1(a) shows three possible relationships between the scapegoating effect (θ) and mortality (M). While $\theta_1(M)$ shows the constant case, $\theta_2(M)$ describes a situation where the preference for diversity is decreasing and concave up, implying that Jews are more than proportionally blamed when mortality increases. $\theta_3(M)$ describes a situation where the preference for diversity is initially decreasing with mortality, but as mortality further increases, non-Jews revise their prior that Jews are to blame for the plague or cannot coordinate to persecute them. Eventually, the preference for diversity increases beyond the constant level.

Figure 1(c) shows the ingroup-based utility level (abbreviated to V), which we assume to be decreasing and concave up. This implies that utility less than proportionally decreases as mortality increases. While other utility functions are possible, we believe that it makes the most sense. The utility-decreasing economic disruption and mortality effects must have been disproportionately strong at lower mortality rates. Likewise, the utility-increasing labor shortage and endowment effects must have been disproportionately strong at higher mortality rates. The figure also shows what the outgroup-based subsistence utility would look like. $V_1^*(M)$ is constant. $V_2^*(M)$ is increasing and concave down because $\theta_2(M)$ is decreasing and concave up. $V_3^*(M)$ is increasing and then decreasing because $\theta_3(M)$ is decreasing and then increasing.

Figure 1(e) shows how the persecution probability (P) would vary with mortality. For the sake of simplicity, we assume that the persecution probability increases linearly in the gap between ingroup-based utility and outgroup-based subsistence utility.[8] Here, $(V_1(M) - V_1^*(M))$, and thus $P_1(M)$, increase concavely. If the scapegoating effect is strong, $(V_2(M) - V_2^*(M))$, and thus $P_2(M)$,

[8] Assuming that P is non-symmetrical, with the persecution probability only increasing when the ingroup-based utility is below the outgroup-based subsistence utility, would not dramatically change the graphical results.

increase as mortality increases. If the scapegoating effect is more than offset as mortality increases, $(V_3(M) - V_3^*(M))$, and thus $P_3(M)$, first increases and then decreases with mortality.

Another possibility is that in each town the populace and the ruler may have had different incentives to persecute the Jews. We thus assume that the persecution probability is the combined probability of persecution probability for the populace and the persecution probability for the ruler. For example, if the populace strongly believes that Jews are responsible for the plague, their persecution probability would follow the pattern shown by $P_2(M)$. On the contrary, if the ruler does not believe that Jews are responsible, especially as Jews also die en masse, their persecution probability would follow the pattern shown by $P_3(M)$. In that case, in Figure 1(e), the combined persecution probability $P_2(M) * P_3(M)$ will be increasing from 0 to $P_2(M_{23}) * P_3(M_{23})$ at which mortality $= M_{23}$, and then equal to $P_2(M)$ if $P_3(M)$ is equal to the maximum probability $= 1$, thus producing a skewed inverted-U curve between the combined probability and mortality.

Complementarities. Figure 1(b) shows three possible relationships between the discounted economic value of having Jews around (R) and mortality (M). $R_1(M)$ shows the constant case. $R_2(M)$ describes a situation where Jews are more than proportionally needed when mortality increases. $R_3(M)$ describes a situation where non-Jews are more than proportionally willing to expropriate Jews when mortality increases. Figure 1(d) and Figure 1(f) show the corresponding subsistence utilities and persecution probabilities. The persecution probability for the populace could follow the pattern $P_2(M)$, with people not internalizing the long-term externality of having Jews around. The probability for the ruler might follow the pattern $P_3(M)$ if she fully internalizes the externality. In that case, there is also a skewed inverted-U curve between the combined persecution probability $P_2(M) * P_3(M)$ and mortality (see Figure 1(f)).

To summarize, the shock-persecution relationship ultimately depends on the scapegoating and complementarity effects. Below, we will use the insights from this framework when exploring econometrically the mechanisms explaining the observed shock-persecution relationship.

2. Data

This section presents our data (see Web Appendix for more details).

Black Death Mortality. Data on cumulative Black Death mortality for the period 1347-1352 come from Christakos et al. (2005) who compile information from a wide array of historical sources. These data yield estimates of mortality for 263 localities in 13 countries in Western Europe.[9] Figure 2 shows the locations of the 263 localities and their mortality rates.

For 166 of these 263 localities we have a percentage estimate of the mortality rate. For example, Venice had an estimated mortality rate of 60%. In other cases the sources report more qualitative estimates: (i) For 49 towns Christakos et al. (2005) provide a literary description of mortality. We rank these descriptions based on the supposed magnitude of the shock and assign each one

[9] We checked these data by consulting Ziegler (1969), Russell (1972), Gottfried (1983), and Benedictow (2005). The 13 countries are: Austria, Belgium, the Czech Republic, France, Germany, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

of them a numeric mortality rate: 5% for "spared" or "escaped", 10% for "partially spared" or "minimal", 20% for "low", 25% for "moderate", 50% for "high", 66% for "highly depopulated", and 80% if the town is "close to being depopulated" or "decimated"; (ii) For 19 towns we know the mortality rate of the clergy. Christakos et al. (2005) provide evidence that clergy mortality was on average 8% higher than general mortality, so we divide the clergy mortality rates by 1.08 to obtain the mortality rate for these 19 towns; and (iii) For 29 towns we know the desertion rate, which includes both people who died and people who never came back. Following Christakos et al. (2005, 154-155) who show that the desertion rate is on average 1.2 times higher than the mortality rate, we divide desertion rates by 1.2 to obtain the mortality rate for these 19 towns. Since the mortality data generated for the towns of (i), (ii) and (iii) required us to make some assumptions, we will show that our results are robust to using only numerical estimates.

Jewish Presence, Jewish Persecution, and Main Sample. We use the *Encyclopedia Judaica* which comprises 26 volumes and provides comprehensive coverage on Jewish life for all of Europe to determine which towns had Jewish communities (Berenbaum and Skolnik, 2007a). This is the same source used by Anderson et al. (2016). We supplement these data where possible with other sources including the *Jewish Encyclopedia* (Adler and Singer, eds, 1906). Among the 1,869 Western European towns that reached 1,000 inhabitants at one point between 800 and 1850 in the Bairoch (1988) database and/or belong to the Christakos et al. (2005) database of mortality rates, we have identified 363 towns in which Jews were present at the onset of the Black Death in 1347. Of these 363 Jewish communities, we can match 124 locations to our database of mortality rates.

Our main sample thus consists of 124 towns with a Jewish community at the onset of the Black Death (circa 1347) and for which we know the Black Death mortality rate (%, 1347-1352). Figure 3 depicts these 124 towns. In addition, we also know for the full sample of 1,869 towns which town had a Jewish community in each year from 1000 to 1700. Note that data do not exist on the size of all Jewish communities in the 14th century. For 31 out of the 124 towns of the main sample, however, we do have estimates of the share of Jews in the total population of the town.

Our dependent variable is whether a community was persecuted. We focus on the Black Death period (1347-1352), but we have these data for each town with a Jewish community from 1100 to 1600. Our definition of a persecution encompasses both a pogrom (an organized or semi-organized act of violence against Jews) or an expulsion (the forcible ejection of a Jewish community from a town or territory). For our main sample, and during the Black Death period only, we use additional information when available on the date of the persecution, the number of victims, whether the community was annihilated—i.e. the community disappeared after a pogrom—whether at least one Jew was burned, whether a mob was involved in the persecution, and whether the authorities successfully or unsuccessfully prevented the persecution.

Black Death Spread. We use the raw data from Christakos et al. (2005) to obtain for 95 of the 124 towns the year and month of first infection. For the other 29 towns, we rely on information for neighboring towns in the data, maps of the epidemic spread available in Christakos et al. (2005,

Figures 3-4), as well as extra sources to impute the year-month of first infection.[10] Information is sparser for the year-month of last infection.

Controls. Geographic controls include mean growing season temperature in 1500-1600 (no comparable data before), elevation, soil suitability for cereal production and pastoral farming, dummies for whether the town is within 10 km from a coast or river, and longitude and latitude.[11]

To control for factors related to trade, we employ data on populations in 1300 from Jebwab et al. (2016), who combine data from both Bairoch (1988) and Chandler (1987). The last two sources represent attempts to collect information on populations for all towns with at least 1,000 inhabitants. For the towns for which population is not available, we believe that it must be less than 1,000 and thus arbitrarily assume that their population was 500. We also control for the the presence of major and regular Roman roads (and their intersections) using the GIS data from McCormick et al. (2013), medieval trade routes (and their intersections) after digitizing the map from Shepherd (1923), and two dummies capturing the presence of medieval market fairs and membership in the Hanseatic league based on information from Dollinger (1970). We also calculate market access for every town to the 1,869 towns of the full sample in 1300. Market access for town i is defined as $MA_i = \Sigma_j \frac{L_j}{\tau_{ij}^{\sigma}}$, with L_j being the population of town $j \neq i$, τ_{ij} the travel time between town i and town j, and $\sigma = 3.8$, as in Donaldson (2017). We compute the least cost travel paths via four transportation modes—sea, river, road and walking—using the data from Boerner and Severgnini (2014) who estimate the speed that the Black Death traveled.

Our human capital controls include a dummy for whether a town possessed a university (Bosker et al., 2013) and for whether a town was within 10 km from a Roman aqueduct (Talbert, ed, 2000). To control for institutions, we distinguish between towns that were located in monarchies and self-governing cities which include either city republics or cities which had *de facto* self-governance around 1300 such as Imperial Free Cities (Bosker et al., 2013; Stasavage, 2014). We also control for whether the town was a state capital around 1300. We measure parliamentary activity during the 14th century using data from van Zanden et al. (2012) and control for whether a city was located within 100 km of a battle that took place between 1300 and 1350.

Lastly, for some of our robustness checks we collect information on: (i) whether the town had a Jewish cemetery, a Jewish quarter, or a synagogue; (ii) the first year there have ever been Jews in the town ; and (iii) the Euclidean distances to Chillon (the location from which the rumor Jews had poisoned wells spread), the Rhine (along which the rumor spread), and the path of the flagellants.

Mechanisms. We collect information on: (i) whether the town belonged to the Holy Roman Empire in 1300; (ii) whether the town was the seat of the papacy, a bishopric, or an archbishopric; (iii) the Euclidean distance of the town from the pogroms committed by the First Crusade (1096);

[10]For example, for Landshut in Germany we learn from Benedictow (2005, 190) that the epidemic went from Mühldorf to the neighboring town of Landshut (50 km). From Christakos et al. (2005), we know that Mühldorf and Regensburg were first infected in June and July 1349, respectively. Since Landshut is about one-half of the way between Mühldorf and Regensburg, it must have been infected in June or July 1349, but most probably in June 1349.

[11]We use 10 km for the coast and river dummies and some controls described below, due to measurement error.

(iv) whether the town was within the area of Ashkenazi settlement in the 13th century; (v) the Euclidean distance to major financial centers in the early 14th century; (vi) whether Jews were lending to commoners, or the ruler or contributed special taxes, before the Black Death; and (vii) whether Jews were working as craftsmen, doctors, or merchants in the town.

3. Historical Setting

The Black Death. The Black Death arrived in Europe in October 1347. Over the next five years it spread across the continent killing between 30% and 50% of the population.[12] Recent discoveries in plague pits across Europe have corroborated the hypothesis that the Black Death was Bubonic plague. The bacterium *Yersinia Pestis* was transmitted by the fleas of the black rat (*rattus rattus*). Fleas infected by *Yersinia Pestis* suffer from a blocked esophagus. These "blocked" fleas are unable to sate themselves and continue to bite animals (rats) or humans, regurgitating the bacterium into the bite wound thereby infecting animals (rats) or humans. Within less than a week, the bacteria is transmitted from the bite to the lymph nodes producing the buboes from which bubonic plague is named. Once infected, death occurred within ten days with 70% probability.[13]

While the vector for bubonic plague is infected fleas, fleas cannot spread the disease far in the absence of black rats. The spread of the plague was rapid and its precise trajectory was largely determined by chance. One important means of transmission depended on which ship an infected rat got on. It was largely coincidence that the plague spread first from Kaffa in the Black Sea to Messina in Sicily in October 1347 rather than elsewhere as the ships carrying the plague could have stopped at other ports in the Mediterranean, for example, Genoa. Similarly, it was partly coincidental that the plague spread first from Messina to Marseilles, rather than say Barcelona, Lisbon, or Antwerp. The early arrival of the plague in Marseilles ensured its speedy transmission through much of western Europe in the year 1348 (Theilmann and Cate, 2007). From the various coasts where infected ships docked the plague then spread inland along rivers, roads, and paths, as boats and carts were inadvertently carrying infected rats and fleas. The local spread of the plague thus also depended on the local populations of black rats. Since black rat populations are territorial, their numbers were not correlated with population density (Benedictow, 2005). For example, similar death rates are recorded in urban and in rural areas (Herlihy, 1965).

For mostly epidemiological reasons, virulence was greater in towns affected earlier on (Christakos et al., 2005, 212-213). Initially, epidemics spread exponentially, as more and more animals or humans are infected. Eventually, epidemics run out of victims, which forces the disease to mute, favoring more benign pathogens. According to Berngruber et al. (2013): "Theory predicts that selection for pathogen virulence and horizontal transmission is highest at the onset of an epidemic but decreases thereafter, as the epidemic depletes the pool of susceptible hosts [...] In the early

[12]Conventionally the overall death rate was estimated at 1/3. Recent studies suggest that the death rate was higher than this (see Benedictow, 2005, 2010; Aberth, 2009). In our sample of 263 towns for which we know the mortality rate and our main sample of 124 towns the population-weighted average is 37.6% and 38.0% respectively.

[13]See Benedictow (2005, 2010). The importance of blocked fleas as the main vector of transmission is currently under debate. Other vectors such as lice may also have been at work. The literature agrees, however, that person-to-person transmission was probably rare and cannot account for the diffusion of the plague (Campbell, 2016, 235).

stage of an epidemic susceptible hosts are abundant and virulent pathogens that invest more into horizontal transmission should win the competition. Later on, the spread of the infection reduces the pool of susceptible hosts and may reverse the selection on virulence. This may favor benign pathogens after the acute phase of the epidemic." People may also develop immunities and pathogen mutation may increase individual memory immune responses due to, "contacted individuals becoming infected only if they are exposed to strains that are significantly different from other strains in their memory repertoire" (Girvan et al., 2002). In other words, pathogen mutation and natural immunization may eventually cause an epidemic to end.

Once an outbreak began in a town, mortality rates increased rapidly before peaking two to three months after the date of first infection and then declining (Christakos et al., 2005, 212-213). Consistent with this, when we use available data on the year and month of first and last infection for 39 towns out of the 124 towns of our main sample, the average duration of the plague was about 5 months. Figure 4(a) shows the kernel distribution of the duration of the epidemic for this restricted sample of 39 towns, with both the mean and median equal to 5 months.

Based on the historical and epidemiological facts described above, it is apparent that the spread, and thus the local virulence, of the plague had a significant random component. When studying variation in mortality rates across space, historical accounts have been unable to rationalize the patterns in the data (Ziegler, 1969; Gottfried, 1983; Theilmann and Cate, 2007; Cohn and Alfani, 2007). To illustrate, Venice had high mortality (60%) while Milan escaped comparatively unscathed (15% mortality). Highly urbanized Sicily suffered heavily from the plague. Equally urbanized Flanders, however, had relatively low death rates, while the more rural northern Netherlands was devastated. Southern Europe and the Mediterranean were hit especially hard, but so were the British Isles and Scandinavia.[14] Similarly, some scholars have argued that death rates from the plague were lower in mountainous regions, but mortality rates in mountainous Savoy were high whereas "despite Switzerland having the most rugged terrain in Europe, the Black Death reached almost every inhabited region of the country, resulting in an average mortality of about 40%" (Christakos et al., 2005, 150). Consistent with this, Figure 5(a) illustrates the lack of a relationship between mortality rates and city population in 1300. Likewise, Figure 5(b) shows that there is no relationship between mortality rates and city market access in 1300.

The Black Death affected all segments of the population, rulers and commoners, rich and poor, adults and children, men and women. Prior to the Black Death there had been no major outbreak of epidemic disease since the 6th century and as a result neither the medical profession nor authorities were able to respond effectively. Medical knowledge was rudimentary: Boccaccio (2005, 1371) wrote that "all the advice of physicians and all the power of medicine were profitless and unavailing". Individuals, regardless of wealth, were unable to protect themselves from the disease. Institutional measures of prevention were nonexistent: the practice of quarantine was not employed until late in the 14th century. Venice did attempt to delay ships coming into port to stop

[14]Variation in sanitation does not explain this pattern. Gottfried (1983, 69) notes "it would be a mistake to attribute too much to sanitation" given the "failure of Venice's excellent sanitation to stem the deadly effect of the plague".

the spread of the disease but this proved ineffective (Christakos et al., 2005, 215).[15]

Overall, there are two important epidemiological and historical features of the Black Death that we will use to identify causal effects: (i) The disease was more virulent initially, so towns that were randomly infected earlier should have higher mortality rates; and (ii) The disease spread from Messina initially. Therefore, we should expect towns that were better connected to Messina—but not necessarily better connected overall—to have higher mortality rates.

The Economic Role Played by Jewish Communities. Jews played an important role in the economy of medieval Europe. Among the full sample of 1,869 towns, 363 of them had a Jewish community in 1347, i.e. almost 20% of towns. Jews tended to live in larger cities, which explains why towns with a Jewish community in 1347 actually comprise an even higher share, 64%, of Europe's urban population in 1300. The 124 towns with a Jewish community and for which we have data on mortality accounts for 43% of Europe's urban population.

The most important economic role played by Jews at the time of the Black Death was as moneylenders which was due to their high levels of human capital (Botticini and Eckstein, 2012) and the restrictions on lending money at interest issued by the Church and enforced by secular rulers (Koyama, 2010). Jews also played an important role as doctors and merchants. The value of Jewish communities was clearly perceived at the time (Chazan, 2010).[16]

The Black Death Persecutions. The Black Death caused widespread misery. People were distressed to see relatives and friends die around them (Ziegler, 1969) (*mortality* effect). It led to economic collapse as fields lay fallow and trade networks were severely disrupted. Prices rose quickly due to this negative supply shock and this resulted in an immediate fall in real incomes (Munro, 2004) (*economic disruption* effect). It was only several years later that the *labor shortage* effect emphasized by Allen (2001), Pamuk (2007) and Voigtländer and Voth (2013b) was realized in rising wages. Lastly, it is likely that the *endowment* effect was small. Property rights were feudal at this time and, as such, most property was owned by elites. While the Black Death did improve the bargaining position of peasants in Western Europe (e.g. Acemoglu and Robinson, 2012), it took decades for contractual obligations to be renegotiated.

The immediate outbreak was accompanied by outbreaks of crime, and sexual and religious excess and by widespread persecutions of Jewish communities (Ziegler, 1969; Gottfried, 1983; Aberth, 2009). Figure 6(a) plots all the persecutions in our dataset between 1100 and 1600. Figure 6(b) focuses on the Black Death era (1347-1352), for our main sample. During that period, 58 out of the 124 towns — or 46.8% of the sample — saw a persecution (53 pogroms and 13 expulsions). The majority of persecutions took place in 1348-1349 and to a lesser extent in 1350.

[15]The term quarantine was first used in Ragusa, part of the Venetian empire in 1377. It was only adopted as a standard policy by Venice in 1423 Gensini et al. (2004, 257).

[16]Historians observe that throughout Europe "rulers concerned with attracting Jews offered promises of security and economic opportunity to potential Jewish settlers" (Chazan, 2010, 103). This is also evident in numerous entries of the *Encyclopedia Judaica* (Berenbaum and Skolnik, 2007a).

4. The Effect of Black Death Mortality on Jewish Persecutions

4.1. Specification and Main Results.

We estimate a series of regressions based on:

$$P_{i,1347-52} = \alpha + \beta \mathrm{M}_{i,1347-52} + \mathbf{X}_i^{'}\gamma + \varepsilon_i \ , \tag{9}$$

where $P_{i,1347-52}$ is a dummy equal to one if there is a persecution in town i between 1347-1352, and $M_{i,1347-52}$ is the cumulative Black Death mortality rate (%) in town i over the period 1347-1352. $\mathbf{X}_i$ is a vector of town-specific controls. Our main sample consists of 124 towns.

As discussed in Section 3., the plague lasted on average 5 months in each town. Thus, mortality in 1347-1352 measures *cumulative* mortality over a period of a few months only (and not 5 years). Cumulative mortality was strongly correlated with *monthly* mortality, which increased quickly after the first infection before decreasing to 0. With a plague duration of 5 months, monthly mortality most likely peaked after 2 months. Most persecutions also took place during these 5 months. The cumulative mortality rate in 1347-1352 is thus a good proxy for the monthly mortality rate that people were facing at the time when a persecution occurred.

Row 1 of Table 1 presents our baseline result. The constant is 0.831*** which reflects the fact that, on average, there was a very high probability of a persecution in 1347-1352. The effect of mortality on the persecution probability, however, is large and negative, at -0.009***. This effect is strong, since a one standard deviation increase in mortality ($\approx$ 0.18) is associated with a 0.34 standard deviation reduction in the likelihood of a persecution. Figure 4(b) depict this result non-parametrically. The persecution probability increases to 0.8 when mortality reaches 20%, and then decreases to 0 as mortality increases to 80%.[17] Therefore, there is clear evidence that high mortality reduced the probability of a persecution. Rows 2-4 then explore the long-run impact of the plague on persecutions. We find an effect that is half the size of our baseline coefficient in 1353-1400 (row 2, -0.04*) but no effect in the following centuries (rows 3-4). Therefore, the Black Death had some long-run effects on the persecution probability, but these faded over the course of 50 years.

4.2. Investigating Causality.

Section 3. suggests that the intensity of the plague was not explained by characteristics of the towns affected. We now provide further evidence that the impact of the Black Death was likely exogenous to the likelihood of a persecution during the period 1347-1352.

A downward bias is more problematic than an upward bias as we would then be overestimating the "protective" effect of the plague locally. The effect is biased downward if towns where persecutions would have occurred anyway during that specific period were also non-coincidentally affected by lower mortality rates. An upward bias is less of an issue since we then underestimate the protective effect (the true effect is more negative than our estimated effect). We

[17] One town with a mortality rate of 0% did not persecute its community. However, since we use a bandwidth of 5 percentage points of mortality for the local polynomial smooth plot, the mean persecution rate at the origin is 0.4.

discuss below several potential biases and how our identification strategies minimize them.

Exogeneity Assumptions. In Table 2, we show that Black Death mortality rates were largely exogenous to town characteristics that could also have caused persecutions in 1347-1352. We define our town level characteristics according to whether they proxy for geography (1), trade and human capital (2) or institutions (3). While several variables are significant in columns (1)-(3), latitude and longitude are the only variables significantly associated with mortality once we include all the controls altogether (see (4), -1.90** and 1.09** respectively). The Black Death indeed spread from the South-East (see Figure 3), more precisely from Messina in Sicily, and the plague was initially more virulent due to epidemiological reasons.[18]

Parallel Trends. Rows 5-8 in Table 1 show that mortality is not associated with persecution probability in the period prior to the Black Death, whether we use: 1341-1346 (6 years before 1347, as the Black Death lasted 6 years), 1321-1346 (25 years), 1300-1346 or 1200-1346.

Size of Jewish Community. The fact that we capture Jewish presence via a dummy could bias our estimates. If mortality is lower in towns with larger communities and the probability of a persecution is higher in towns with larger communities, simply because they are larger, then this creates a downward bias. Conversely, if mortality is higher in towns with larger communities and persecutions are less likely in such towns because larger communities are better able to defend themselves against potential persecutions, this also creates a downward bias.

Jews may have been less exposed to the plague if they had better hygiene practices or lived in isolated areas within towns. This is a potential source of bias as towns with more Jews should then have had lower aggregate mortality rates. At the same time, Jewish areas were often overcrowded as they had to live in the few streets that were reserved for them by the town authorities. If this was the case, towns with more Jews could have had higher mortality rates.

We do not believe that these biases are significant for the following reasons. First, it is unlikely that Jews experienced differential mortality during the Black Death. The plague was mostly bubonic, which limited the role that characteristics of the community could play.[19] Second, Jews comprised only a small population share of the towns, minimizing the effect of any differential mortality between Jews and non-Jews on aggregate town mortality.[20] Third, Table 3 shows that our results hold if we add proxies for the size of the community and the socio-spatial organization of the town (rows 2-6). Row 1 reproduces the baseline results (-0.009***). Row 2 drops the towns for which we know that Jews accounted for more than 5% of the population. This assumes that towns for which

[18]The R-squared terms are not exactly equal to 0 when studying the correlation between mortality and trade and human capital (see (2), 0.12) or institutions (see (3), 0.15). This is because some of the variables are also correlated with latitude and longitude. For example, Roman Roads were more dense in the South.

[19]For example, in Marseille, the mortality rate of the Jewish population was 50% during the Black Death versus 55% for the whole city (Sibon, 2011). The argument that the Jewish practice of ritual bathing would lead to lower mortality rates is not well grounded as ritual baths often used stagnant water (see van Straten, 2007, 47) and, contrary to common mythology, bathing was common among the Christian populations of medieval Europe.

[20]For 31 towns in our main sample of 124 towns we have some information on the size of their community and the median population share of Jews was only 6.3% (mean: 7.5; min = 0.9; max = 40.0).

the information on population share is missing, lack the data precisely because their community is small. Row 3 adds dummies for whether the town had a Jewish cemetery, a Jewish quarter, and a synagogue circa 1347. Communities with a Jewish cemetery and a synagogue were potentially larger, whereas towns with a Jewish quarter were more segregated. Row 4 controls for the first year Jews were present and the last year of reentry in the town before 1347 (in case they had left before) as towns that have had Jews for a long time may have a larger community. Row 5 controls for a Jewish centrality index that measures to what extent the town is surrounded by other towns with a community. This indicates whether Jews are well-established and have large communities in the region.[21] In row 6, we simultaneously implement the tests of rows 2-5.

A second, related, question is whether our mortality rates fail to include the deaths due to persecutions, thus mechanically causing an upward bias. However, an upward bias is less concerning for us. Moreover, Jews generally comprised only a small population share of the towns. In row 7, we drop 8 towns for which we know that a significant number of Jews were persecuted, which could have then affected overall mortality rates.[22]

Third, towns with more persecutions in the past may have had a smaller community by 1347. Furthermore, towns with a history of persecutions may have had more antisemitic residents, which would then raise the Black Death persecution rate. Conversely, towns with more persecutions in the past may have been less likely to persecute their community during the Black Death if there are fewer Jews left to persecute. In rows 8-11 we control for previous persecutions using a dummy indicating any persecution or the number of years with a persecution, whether one generation (1321-1346, ≈25 years) or two generations (1300-1346, ≈50 years) before.

Outliers. In row 12, we drop the towns with the 25% highest and the 25% lowest mortality rates to ensure that our results are not driven by outliers that may have had high, or low, mortality rates for specific reasons. In general, no community was prepared to deal with the Black Death. It was attributed to the "vengeance of God" or the "'conjunction of certain stars and planets" (Horrox, ed, 1994, 48-49).[23] Therefore, there was little variation in a town's ability to deal with the plague. Historians report that some towns had either natural baths or tried to take action in response to the plague. For example, the low mortality experienced by Nuremberg is speculatively attributed to their natural baths (Ziegler, 1969). Baden-Baden is another city known for its baths. In Venice after the onset of the plague there was an attempt to separate out barges for plague victims and prohibit incoming vessels (Gottfried, 1983, 48). Results hold when we drop these towns (row 13).

Controls. A downward bias is possible if any of the characteristics proxying for geography, trade,

[21] For town i, and other towns $j \in J$ (363 towns with a Jewish community circa 1347) or $j \in A$ (all 1,869 towns), the Jewish centrality index is equal to $\sum_{j \in J} D_{ij}^{-\sigma} \div \sum_{j \in A} D_{ij}^{-\sigma} * 100$ with D_{ij} the travel time between city i and city j. If all surrounding towns have a Jewish community, it will be close to 100, and 0 otherwise.

[22] We do not know how many Jews were persecuted in other towns. However, the fact that we could not find the number of victims for these other persecutions suggests that the numbers were not as high as for the 8 towns dropped as persecutions involving more victims should have been better documented than persecutions with fewer victims.

[23] Cohn (2007, 10) notes that "doctors turned either to the stars and other 'reported causes' of the plague or in utter despondency to God, claiming that human intervention was of little use".

human capital, or institutions listed in Table 2 simultaneously increase (decrease) the mortality rate and decrease (increase) the probability of a persecution. For example, if being on a trade route was positively correlated with mortality and negatively correlated with a town's propensity to persecute, this would be a source of downwards bias. Alternatively, if being located in more rugged terrain made a town less susceptible to the plague but more likely to persecute Jews, this would be a source of upwards bias. Table 2 has already shown, however, that mortality is not significantly correlated with most of these characteristics. Only latitude and longitude have any relationship since the plague came from the South-East and was more virulent initially. In row 14, we include all our control variables in a regression. However, with only 124 observations, including 27 controls significantly reduces the degrees of freedom and the variation we can exploit (for example, with mortality being correlated with latitude and longitude). The size of our coefficient remains negative and statistically significant though smaller in size (-0.005*).

IV1: Proximity to Messina The plague followed a specific path from the point of first infection in Europe, Messina. The spread of the plague appears to be exogenous to town-level characteristics, including a town's market access (see Table 2 and Figure 5(b)). Market access to Messina, however, should predict plague virulence. We therefore construct an instrumental variable based on a town's log market access to Messina (see Figure 7(a)), conditional on a town's log market access to all 1,869 towns (see Figure 7(b)).[24] As shown in row 15, the first stage of this instrument is strong (31.0). The second stage yields a coefficient estimate that is negative and similar in magnitude to our baseline estimate (-0.016***, not significantly different from -0.009***). To ensure that our instrument is not picking up additional unobservables correlated with the probability of persecution we control for latitude and longitude and latitude and longitude squared (row 16). The first stage estimate is now weaker (4.3) but we still obtain a negative coefficient that is not significantly different from -0.009*** (albeit slightly larger in magnitude).

IV2: Month of First Infection. Another source of exogenous variation in mortality is timing of first infection. The relevance of this instrument stems from epidemiological evidence that plague virulence was correlated with the time of infection. Towns that were affected earlier, all else equal, tended to experience higher death rates. Figure 8 provides support for this IV strategy. For the 124 towns of the main sample it plots mortality rates against the date that the town was first infected (here, the number of months since October 1347). Towns infected later, indeed, had lower mortality rates. Using the number of months since October 1347 as an IV we obtain a coefficient of -0.028*** (row 16 of Table 3, F-statistic of 33.2). This is precisely estimated, however, this estimate is also significantly larger than our OLS coefficient (-0.009). In row 17, we also control for latitude and longitude and latitude and longitude squared in order to rely more on the random component of the spread of the plague. The F-stat decreases to 7.3, and the coefficient is less precisely estimated (and not significantly different from -0.009***).

We combine both instruments in row 19. In so doing we exploit the exogenous variation from

[24]Market access to Messina m for town i is defined as $MA_{im} = \Sigma(L_m \div \tau_{im}^{\sigma})$, with L_m being the population of Messina in 1300, τ_{im} the computed travel time between town i and Messina, and $\sigma = 3.8$.

both market access to Messina—conditional on market access to all towns and the timing of the infection—and the timing of the infection— conditional on market access to both Messina and all towns—as well as latitude, longitude and their squares. The coefficient estimate is then -0.019* (F-statistic of 4.4), also not significantly different from -0.009***.

Placebo IVs. We show the reduced-form effect of the IVs on persecution probability during the Black Death (1347-1352, see rows 20 and 23), but then verify that the IVs are unrelated with persecution probability in both the preceding generation (1321-1346, see rows 21 and 24) and the preceding half-century (1300-1346, see rows 22 and 25).

Overall, our analysis of exogeneity assumptions, parallel trends, Jewish community size, outliers, controls, and the two IV strategies suggest that the baseline OLS effect is likely causal. In the rest of the analysis we will employ our OLS estimates as our baseline.

4.3. Robustness

Preventive Persecutions. Historians note that "In most cities the massacres took place when the Black Death was already raging but in some places the mere news that the plague was approaching was enough to inflame the populace" (Ziegler, 1969, 103). Some communities heard accusations that the Jews were poisoning the wells and took action to kill or expel their Jews prior any outbreak of plague. These "preventive persecutions" raise several potential problems for our analysis. First, our hypothesis is that people and local authorities observe how many other people are dying in their town and then decide to persecute or protect their community. If most of the persecutions in our sample were preventive persecutions, our results would be coincidental. Second, preventive persecutions were likely to occur in the later years of the Black Death (1347-1352). But places that were infected later also had lower mortality rates, as the disease became less virulent over time. Preventive persecutions could then lead to a downward bias.[25]

Table 4 considers the issues raised by these potential preventive persecutions. Baseline results are shown in row 1. We first add a dummy for towns which were first hit by the plague after September 1348 as they are the only towns that were liable to preemptively persecute their Jews (row 2). Indeed, September 1348 is the month when a group of Jews were tortured at the Castle of Chillon in Switzerland and forced to admit to poisoning wells which, in turn, started the rumor that Jews had caused the disease. Herman Gigas, a Franciscan Friar in Franconia reported that "some say that it was brought about by the corruption of the air; others that the Jews planned to wipe out all the Christians with poison and had poisoned wells and springs everywhere. And many Jews confessed as much under torture: that they had bred spiders and toads in pots and pans, and had obtained poison from overseas" (quoted in Horrox, ed, 1994, 68). In the analysis below the 10 possible preventive persecutions in our sample all took place after September 1348.

Second, we control for the log Euclidean distance to Chillon and its interaction with the post-

[25]Preventive persecutions also reduced the size of Jewish communities before the Black Death hit. If having a larger community lowers mortality rates thanks to better hygiene practices and segregation, preventive persecutions will increase mortality rates, and cause an upward bias, which works against out main findings.

September 1348 dummy in order to control for the effects of the diffusion of the rumor from Chillon after that month. Next, we include a control for the log distance to the Rhine and its interaction with the post-September 1348 dummy as it was along the Rhine valley that rumors of the Jews spreading the plague diffused. Lastly, we control for the log distance to the path of the Flagellant movement and its interaction with the post-September 1348 dummy as they are alleged to have massacred Jews in their attempts to ward off the plague (Nohl, 1924). None of these factors significantly affects our estimates (which decrease but retain their precision).

We also drop towns where we suspect persecutions may have preceded the plague itself. In rows 6 and 7 we drop the towns where it is likely or possible that a persecution preceded the plague based on our knowledge of the year that the persecutions occurred.[26] In rows 8 and 9 we drop towns where data on the year and month of first infection and year and month of persecution suggest that these persecutions were likely to have been preemptive or were possibly preemptive.

Alternative Outcomes. In Table 5, we explore whether there were differences in the intensity of persecution as a result of the Black Death. Our results are stronger for pogroms than for expulsions (rows 2-3). In terms of magnitude, a 1 standard deviation increase in mortality is associated with a 0.28 standard deviation or a 0.21 standard deviation reduction in the likelihood of a pogrom or an expulsion respectively. The fact that the effect is slightly larger for pogroms may reflect the fact that pogroms were violent actions that involved the killing of Jews. Expulsions, by contrast, were more orderly events and often involved the Jews being expelled from a city into the nearby countryside from which they could easily return. In this case, if a higher mortality rate increases the economic value of Jews, a town may prefer to expel its community instead of killing its members at high mortality rates, which would give rise to the patterns seen in the data.

Among the 58 towns with a persecution we investigate in row 4 if the persecution led to Jews being expelled or all Jews being killed ("Annihilation"). We find a negative effect of mortality on the probability of an exit. This implies that if the mortality rate is high the populace and/or the authorities prefer to kill a few Jews rather than losing its entire Jewish community. This is in line with our baseline result that towns persecute Jews "less" at higher mortality rates.

Among the 45 towns with a pogrom, we then study if the pogrom was particularly violent, for example whether the community was annihilated (row 5), whether some Jews were burned alive (row 6), or whether the pogrom was perpetrated by a mob (row 7). We find that a higher mortality rate led to a lower "intensity" of the pogrom, as it reduces the likelihood of an annihilation (row 5, -0.008*) and a mob being involved (row 7, -0.010***). We find a negative, but not significant, effect for burning. Lastly, the pogrom was overall "less" violent when mortality was high (row 8, -0.010**). If towns disproportionately need Jews at high mortality rates, but still decide to kill

[26]The first four towns are Erfurt, Magdeburg, Nuremberg, and Würzburg. Their persecution took place in 1349, but the Black Death did not hit these towns before 1350 according to Christakos et al. (2005). However, it is possible that these were not preventive persecutions if the year of first infection was measured with error. The four other towns are Bielefeld, Bremen, Frankfurt an der Oder, and Muenster, which were first infected in 1350, but whose persecutions took place in either 1349 or 1350, although we cannot be sure of the year due to conflicting sources.

some of them, it appears that they do it in a somewhat "less" violent way.

Lastly, we know if the local authorities attempted to prevent a persecution and whether they succeeded or failed in this attempt. In row 9, we show our baseline effect remains the same if we consider as a persecution any persecution that was successful or unsuccessful. Likewise, in row 10, we show that our results hold if we consider as a persecution only the persecutions where no prevention attempt was made. In row 11, among the 61 towns with a successful or unsuccessful prevention, we show that there is a positive but not significant correlation between a dummy equal to one if there has been any attempt to prevent the persecution and mortality.[27]

Measurement Concerns. Row 1 of Table 6 reports our baseline estimate for comparison purposes. In row 2 we report our estimates using a sample based solely on the *Encyclopedia Judaica*. As there may be measurement error in our variable recording the presence of a Jewish community we drop 12 observations where we cannot be entirely certain that there was a Jewish community intact in 1347 (row 3). We also drop 20 observations where we cannot be entirely certain about the fate of the community during the Black Death period (row 4).[28] We drop (i) mortality estimates based on literary rather than numerical descriptions (row 5); (ii) estimates which are based on data on desertions rather than death rates (row 6); (iii) estimates based on numerical estimates of mortality (row 7). In row 8 we only use numerical based estimates. To alleviate possible concerns about the "heaping" of mortality estimates we also drop mortality rates of 50% in row 9. Another approach to measurement error in mortality rates is to focus only on those cities that are either in the bottom 25% of least affected cities or in the top 25% of most affected cities, since measurement errors are more likely when comparing towns with mortality rates around 50% (for example, when comparing two towns with a mortality rate of 45% and 55%) (row 10). The fact that our estimates are consistent across specifications (rows 5-10) suggests that measurement error in the mortality data is not a source of bias. In row 11 we analyze all 263 cities for which we have mortality estimates. We implement this test because it is possible that some of the towns that we classify as not having Jews actually had Jews in 1347. Then, as we do not have death rates for every Jewish community we also create estimates of mortality based on spatial extrapolation. In row 12, we use these extrapolated estimates to show that our analysis holds for the full sample of 363 Jewish communities. This confirms that our results are not driven by sample selection.[29]

5. Discussion of the Mechanisms

We now shed light on the mechanisms that could explain both why plague mortality caused more persecutions overall and why the persecution probability was relatively lower in higher-mortality

[27] For the 32 towns with an "exit" due to an annihilation or an expulsion, we study the relationship between the year of reentry after the Black Death and mortality. We find no correlation (results available upon request).

[28] The 12 observations of row 3 include 8 French towns for which information is sparse following the general expulsions of 1306, 1315 and 1322, and 3 Tuscan towns in which Jews settled in the 14th century but for which we cannot be sure of the year. The 20 observations of row 4 include towns for which one or several sources mentioned a persecution during one of the Black Death years, but without providing corroborating details about it.

[29] Our results are also robust to systematically dropping towns located within different modern country borders (rows 13-17): France, Germany, Italy, Portugal and Spain. Other countries only contribute 7 towns or less. In row 18 we employ Conley standard errors (distance threshold of 100 km) to control for spatial auto-correlation.

towns. The theoretical framework predicts that a negative utility shock like the Black Death can produce two effects: (i) a scapegoating effect and (ii) a complementarities effect. The scapegoating effect suggests that a more intense negative shock should lead to a lower preference for diversity, and thus a higher probability of persecution. The complementarities effect suggests that if the economic value of the outgroup community disproportionately increases with the shock then the probability of persecution may be decreasing in the intensity of the shock. Based on this framework, there are potentially two alternative ways to explore the mechanisms in our context.

One approach is to compare towns with *different* mortality rates, and observe how the preference for diversity—i.e. antisemitism—and the economic valuation of having Jews around differ across these towns. Obviously, no data exist on both the level of antisemitism and the economic value of the services provided by Jews for each town during the specific months in which the town was infected. In other words, we only observe actions. However, since actions reveal preferences, we can still use our theoretical framework, our econometric results, and qualitative evidence, to discuss which patterns of the scapegoating and complementarities effects makes the most sense in our context. We follow this approach in Subsection 5.1. below.

Another approach is to compare towns with *similar* mortality rates but different characteristics that may affect the relative strength of the scapegoating and complementarities effects. This approach, which we follow in Subsection 5.2., allows us to quantify the importance of the effects.

5.1. Qualitative Evidence on the Mechanisms

To explain the patterns seen in the data (see Figure 4(b) and Table 1)—a high persecution probability overall, but a lower persecution probability in high-mortality towns (and close to 0 for mortality rates close to 80%)—it must be the case that: (i) at low levels of plague mortality, the scapegoating effect dominates any economic complementarities effect, so that the persecution probability is high (relative to the case with no mortality, i.e. the pre-plague period); and (ii) at high levels of plague mortality, the scapegoating effect is offset by an economic complementarities effect that reduces the likelihood of a persecution when mortality increases. We now review the qualitative evidence that suggests that both mechanisms were relevant.

Scapegoating. Figure 1(a) showed three possible relationships between the scapegoating parameter (θ) and mortality (M). The Black Death persecutions provide a classic example of ideological scapegoating. The Jews were directly blamed for spreading the disease via poisoning wells (Cohn, 2007; Aberth, 2009). In particular, the chroniclers accounts suggest that it was the sheer scale and devastating impact of the Black Death that made contemporaries feel that it was either the wrath of God or part of a grand conspiracy and the responsibility of the antichrist or his followers (e.g. Nohl, 1924; Horrox, ed, 1994). Routine diseases and epidemics could not easily be blamed on minority groups. Rather, it was the apocalyptic scale of the plague that made individuals who already suspected Jews of conspiring against Christians blame the Jews for causing the plague (Moore, 1987). In line with the theory of ideological scapegoating, this suggests that the probability of persecuting the Jews was likely to increase with the virulence

of the plague (Glick, 2002, 2005). Thus, our results are consistent with $\theta(M) = \theta_2(M)$, which describes a situation where the preference for diversity is decreasing and concave up, implying that Jews are more than proportionally blamed when mortality increases.

An alternative pattern for the scapegoating parameter is $\theta_3(M)$, which describes a situation where the preference for diversity is initially decreasing with mortality, but as mortality further increases, non-Jews revise their prior that Jews are to blame for the plague.[30] We believe it to be highly unlikely. First, were non-Jews indeed more likely to discard their prior that Jews were responsible for the plague if Jews were also dying? In September 1348, Pope Clement VI issued a Bull contradicting the libel against the Jews (Chazan, 2010, 153-154). He observed that

> "Were the Jews, by any chance, to be guilty or cognizant of such enormities a sufficient punishment could scarcely be conceived; yet we should be prepared to accept the force of the argument that it cannot be true that the Jews, by such a heinous crime, are the cause or occasion of the plague, because throughout many parts of the world the same plague, by the hidden judgement of God, has afflicted and afflicts the Jews themselves" (Horrox, ed, 1994, 222).

However, his Bull did not prevent the 42 persecutions in our data after September 1348. One reason for this was that the authority of Papacy had been greatly weakened in many parts of Europe by the relocation to Avignon and the perception that the Pope was the puppet of the French king (Mollat, 1963; Renouard, 1970). It is therefore unlikely that the Bull had any major dampening effect beyond Avignon. Lastly, remember that our effects were unchanged when controlling for whether the town had a Jewish quarter or not (row 3 of Table 3). The results are thus not driven by non-Jews directly observing whether Jews were dying at similar rates.

Second, were Christian townsfolk less able to organize themselves to persecute the Jews at higher mortality rates? Indeed, if many non-Jews were ill, or had to take care of the sick, they may have not been able to commit a persecution. Medieval sources are sparse on the organization of the Black Death pogroms but records indicate that a small group of townsfolk and villagers armed with axes, knives, pitchforks or wooden sticks were often sufficient to carry one out. For example, in Tarrega, "a mob broke into the houses of Jews, killing them with lances, stones, bows and arrows" (Aberth, 2009, 173). Unlike the Holocaust, these persecutions required almost no organization. Jews comprised only a very small population share of the towns, were easily identifiable, often lived in specific areas and, more importantly, were forbidden to bear arms.[31] In addition, the plague lasted on average 5 months in each town. The period was thus long enough for people to organize themselves to commit these persecutions that took place over one or two days. People were also not dying all at once, even at high cumulative mortality rates. Lastly, if it was true that organizational costs were high enough to prevent persecutions at high mortality

[30] The constant case $\theta_1(M)$ was shown for illustrative purposes mostly.

[31] The statues that governed Jewish settlement that Jews in medieval Europe often specified that Jews were not allowed to bear arms. This was an important condition of their status as serfs of the king (see Baron, 1967). This was, for instance, explicitly stated in the German law code of the 1220 Sachenspeigel.

rates, this should especially affect our results when comparing places with very low and very high mortality rates. However, we showed that the protective effect was even stronger when dropping the towns with the 25% highest and the 25% lowest mortality rates (see row 12 of Table 3).[32]

Complementarities. Figure 1(b) showed three possible relationships between the complementarities parameter (R) and mortality (M). Towns internalized the potential economic benefits brought by Jews. Rulers frequently "anticipated Jewish contribution to the economy" (Chazan, 2010, 102). In the 11th century the Bishop of Speyer argued that "the glory of our town would be augmented a thousandfold if I were to bring Jews" (quoted in Chazan, 2010, 101). Similarly, peasants in Tuscany petitioned for the admission of Jewish lenders to make credit more abundant (Botticini, 2000). Even during the Black Death period, historians note that the "economic importance" of certain communities enabled them to weather persecutory storms. This is the case of Regensburg where Jews conducted "Moneylending to secular and ecclesiastic princes, in addition to the merchants of the city, was conducted on a large scale" and which survived "the Rindfleisch (1289), Deggendorf (1338), and Black Death persecutions (1348/49) and to reach new heights of prosperity by offering asylum to rich refugees" (Wasserman, 2007, 188). Jews were also frequently given tax breaks and other encouragements to resettle in the aftermath of a pogrom. Jews returned to Nuremberg soon after the plague persecutions (Berenbaum and Skolnik, 2007b). In Aragon, where the impact of the plague was severe, King Pedro strove to protect the Jews and in the wake of the plague "was determined to restore the Jewish *aljamas* to a healthy economic state". He barred creditors from bringing lawsuits against Jews or collecting debts against them for a year while individuals who moved into settle land left empty due to the mortality associated with the plague were forced to inherit the debts owed to the Jews (Shirk, 1981, 363). More generally, the important role Jews played as moneylenders is documented by numerous historians (Roth, 1961; Baron, 1967; Botticini and Eckstein, 2012). Pascali (2016) has shown that a legacy of Jewish moneylending is associated with higher levels of financial development today. Examining the role Jews played as moneylenders in post-Reformation Germany, Becker and Pascali (2016) find that persecutions were less frequent in Catholic parts of Germany in comparison to Protestant parts of Germany and interpret this as consistent with patterns of economic complementarities and substitutability.

Qualitative evidence suggests that our results are consistent with $R(M) = R_2(M)$, which describes a situation where Jews are more than proportionally needed when mortality increases and incomes decrease. An alternative pattern $R(M) = R_3(M)$ is theoretically possible. Indeed, we could imagine that as a large number of people die suddenly due to an inexplicable disease, people and rulers become more present-biased and thus internalize less the long-term externality of having Jews around. In this case the incentive to persecute and expropriate the Jews increases. However, qualitative evidence suggests that this externality was highly internalized. In addition, given that the preference for diversity is likely to be decreasing with mortality, i.e. Jews were more than proportionally blamed when mortality increases, the lower persecution probability

[32] Likewise, our results hold when dropping only the 25% highest mortality rates, since the high organizational costs should disproportionately affect high-mortality towns (available upon request).

observed at higher mortality rates can only be explained by a complementarities effect increasing with mortality. In other words, the incentive to plunder the Jewish community must have been strictly dominated by the incentive to protect them at higher mortality rates.

5.2. Quantitative Evidence on the Mechanisms

To investigate these channels quantitatively, we interact the Black Death mortality rate with various pre-Black Death town characteristics and look at how the effects of mortality on the overall and local levels of persecution were accentuated or attenuated depending on these characteristics. More precisely, we estimate a series of regressions based on:

$$P_{i,1347-52} = \alpha + \beta \mathrm{M}_{i,1347-52} + \gamma \mathbf{X}_i + \delta \mathrm{M}_{i,1347-52} * \mathbf{X}_i + \epsilon_i \ , \tag{10}$$

where $P_{i,1347-52}$ is a dummy equal to one if there is a persecution in town i in 1347-1352, $M_{i,1347-52}$ is the cumulative mortality rate (%) in town i over the period 1347-1352, and $\mathbf{X}_i$ is a dummy variable proxying for a pre-plague town characteristic. Here, γ measures to what extent towns with this characteristic had higher persecution rates overall, whereas δ is our main coefficient of interest and captures whether the protective effect of higher mortality was accentuated or attenuated in towns with this characteristic. As we control for the mortality rate, we are comparing towns with the same mortality rate, but different pre-shock characteristics, and thus potentially different persecution responses to a same mortality shock.

A few points need to be made. First, we use our main sample of 124 towns. Second, Table 7 reports the effects of the mortality rate times the dummy variable proxying for the characteristic (δ), as well as the significance (measured by stars) of the combination of the effect of the mortality rate (β) and the interacted effect of the mortality rate and the dummy (δ), to see if the interacted effect is strong enough to offset the protective effect of mortality. Third, the dummies that start as "Close to ..." are equal to one for the towns that are in the bottom 10% of the Euclidean distance to the described location. Lastly, note the interacted effect of mortality and the dummy is not necessarily causal, as the characteristic may be correlated with other characteristics of the town.

5.2.1. The Well Poisoning Libel.

Chillon and the Rhine Valley. Proximity to Chillon Castle, the place of origin of the well-poisoning libel, and to the Rhine valley, along which the rumor spread, reduce the protective effective of mortality (rows 1-2, 0.016* and 0.017**). In other words, towns most likely to associate the plague with the presence of Jews in their town are relatively more likely to persecute them when mortality is high (*scapegoating* effect). Historians have also traditionally held the flagellants responsible for massacring Jews. However, we find no evidence that the path of the flagellant movement was systematically associated with either persecutions or with the relationship between plague intensity and persecution probability (row 3).

Doctors. Jews played an important role as doctors throughout European society, particularly in southern Europe where one historian notes "one can hardly find at least one community that did not count at least one medical doctor among its members" (Shatzmiller, 1994, 1). While non-Jews

may have believed that Jewish doctors deliberately poisoned the wells, the fact that non-Jews also needed medical treatment could explain why the protective effect is accentuated in towns with high mortality rates. However, this effect is not significant (row 4, -0.013).

Recent Migrants. In rows 5-6, we control for how long a Jewish community had existed prior to the plague. We find that in towns where Jews were recent migrants (less than five years), the protective effect of higher mortality was attenuated (row 5, 0.015***). Speculatively, this may be because people made a direct association between the recent arrival of Jews and the plague (*scapegoating* effect). We do not find the same effects when considering older entries (row 6).

5.2.2. Political and Religious Institutions.

The Holy Roman Empire. Charles IV, Emperor of the Holy Roman Empire denounced the well poisoning libel. However, the authority of the Emperor was weak and local authorities had the leeway to perpetrate persecutions against their Jewish community (see Finley and Koyama, 2015). The individual coefficient of the Holy Roman Empire dummy is 0.491** (not shown), thus indicating that the overall level of persecution was higher in the Holy Roman Empire (consistent with *scapegoating* effect being stronger in German-speaking Europe). Nevertheless, we find that the protective effect of higher mortality was, in fact, slightly stronger in the Holy Roman Empire (-0.007†, only significant at 15%). This suggests that the decision to persecute Jews was sensitive to local economic conditions due to the level of political decentralization in the Holy Roman Empire.

Religious and Political Institutions. We find some evidence that the protective effect of higher mortality was strengthened, but only marginally, in the seats of the Pope, bishops, or archbishops (row 8, -0.007†, only significant at 15%). This is in line with a smaller *scapegoating* effect.[33] The effect is unchanged regardless of whether the city was governed by a monarchy (row 9), its level of parliamentary activity (row 10), or whether it was a self-governing city (row 11).

5.2.3. Latent Antisemitism.

Past Pogroms. Rows 12-19 use data on persecutions prior to the Black Death as a potential measure of latent antisemitism. If a culture of antisemitism was a prerequisite for the Black Death to increase the probability of persecution, then we expect some of the coefficients to be positive (e.g., Trachtenberg, 1943). When we include an interaction with a dummy for if there had been a persecution in the 6 years (1340-1346) prior to the Black Death period (which also lasted 6 years), we find a positive and significant effect (row 12, 0.039*). However, this effect is weaker if the past persecution dummy is defined for a past period of 25 years in 1321-1346 (row 13, 0.012†), and nil if it is defined for a past period of about 50 years in 1300-1346 (row 14). This suggests that a recent history of persecutions, i.e. of antisemitic violence committed by ones' parents, made a difference and diminished the "protective effect" (hence a stronger *scapegoating* effect).

Crusades. The First Crusade (1096) saw a marked intensification of antisemitism and a "wholly

[33] This reflects the position of the Papacy and higher clergy across all of Europe. In the Holy Roman Empire, where archbishops and bishops were also secular rulers able to profit from expropriating Jewish wealth, Finley and Koyama (2015) find that persecutions of Jews were more severe overall.

fantastic image of the Jew suddenly gripped the imagination of the new masses at the time of the first crusades" (Cohen, 1957, 77). The call for a crusade to recapture Jerusalem from the Muslims in 1096 elicited tremendous popular religious passion and anger against the enemies of Christ who included not only the Muslims who were harassing pilgrims to the Holy Land, but also the Jews who were close-by and convenient targets (Eidelberg, 1977; Chazan, 1987). The first group of crusaders gathered in France and marched through Germany on their way to Jerusalem. While they were not supposed to intervene in the affairs of the Christian countries of Europe, many crusaders attacked Jewish communities on their way. For example, Schwarzfuchs (2007, 311) writes: "The sight of the wealthy Rhenish communities acted as an incentive to the crusaders, who decided to punish 'the murderers of Christ' wherever they passed, before their encounter with their official enemies, the Muslims". We indeed find that in towns close to a First Crusade-era pogrom, the protective effect of mortality is wiped out (row 15, 0.016**).[34]

Ritual Murder. Historians have documented how the rise of virulent antisemitic tropes over time led to an intensification of animosity over the course of the middle ages (Trachtenberg, 1943; Rubin, 2004). Blood libel accusations began in England in the 12th century and spread through Europe gradually (Stacey, 1998). The libel involved the story that an organized group of Jews had murdered Christian children in order to obtain blood for the Passover. These libels were "another form of the belief that Jews had been and still were responsible for the passion and crucifixion of Jesus Christ, the divine child" (Ben-Sasson et al., 2007, 74). The myth of the blood libel was spread by preachers and reinforced when Jews were tortured into confessing to the alleged crime. As such, the idea of Jews organizing to kill innocent children became "embedded, through miracle tales, in [the popular] imagination and beliefs" (Ben-Sasson et al., 2007, 76). When we interact the mortality rate with a dummy for towns close to the alleged location of a ritual murder in the 13th century, we find that the protective effect of higher mortality is attenuated (row 16, 0.016**). No differential effect is found for such allegations in the first half of the 14th century (row 17).

Host Desecration. Another source of antisemitism were accusations of host desecration. As the belief that the consecrated eucharist contained the body of Christ became more important in the 12th and 13th centuries, stories of Jews desecrating the host began to circulate in parts of Europe (Rubin, 1992, 2004). Stacey writes: "we begin to see Jews taking on a new role, as enemies not only of the body of Christ on the cross and of the body of Christ in the Church, but also as the enemies of the body of Christ in the eucharist. This is the notion that lies behind the host desecration charge—that Jews would torture and seek to destroy consecrated eucharistic hosts if only they could get their hands on them" (Stacey, 1998, 13). By desecrating the host, the Jews were imagined to be reenacting the suffering of Christ. Such charges often inspired acts of antisemitic violence. We find that accusations of host desecration in the first half of the 14th century (but not earlier) eliminate any protective effect of mortality (rows 18-19, 0.011** in row 19). The results on Crusades, ritual murders, and host desecrations are all in line with the *scapegoating* effect.

[34]We also collected data on the pogroms that took place during the Crusades of 1147 and 1189 but the later Crusades were not characterized by large-scale antisemitic violence (results not shown but available upon request).

5.2.4. The Liturgical Calendar.

Advent. Advent, the period before Christmas, is the beginning of the liturgical year. During that period, Christians are encouraged to fast and do penance to prepare for the birth and coming of Christ. Indeed, in towns where December was the month of first infection, we find that the protective effect of Black Death mortality was reinforced (row 20, -0.022**).

Christmastide. In contrast, the period from Christmas Day (December 25th), when the birth of Jesus is commemorated, until the Feast of the Presentation of the Lord (February 2nd) was Christmastide. According Matthew's Gospel (2:1-23), after the birth of Jesus, magi visited Herod the Great, the King of Jews, to inquire about the location of the "one having been born king of the Jews", so as to pay him homage. Herod, who felt threatened by this newborn, ordered the death of all male babies in Bethlehem and its vicinity, an event which came to be known as the Massacre of the Innocents. The commemoration of the massacre was historically connected with the Feast of the Epiphany, on January 6th. During the Feast, Christians celebrated the martyrdom of the Innocents "who died so that Christ might live and die in turn for them" (Archer, 1984, 47).[35]

Throughout the middle ages Jews were thus viewed as "Christ-killers" who had rejected the Messiah and approved of his execution. The charge of deicide was at the heart of much antisemitism up until modern times (Freudmann, 1994; Friedländer, 1997; Donaldson, 2010). This made Christmas a period of heightened tensions between Christians and Jews. In some cities Jews had to pay special taxes on Christmas Day. This was the case in Trier where Jews gave six pounds of pepper and silks for his clothing to the archbishop and two pounds of pepper to the chamberlain. In Öttingen, each Jew over the age of twelve had to pay a gulden to the emperor on Christmas day (Adler and Singer, eds, 1906). Consistent with this, in towns where January was the month of first infection, higher mortality conferred no protective effect (row 21, 0.016**). $Singer06$

Lent. Lent, which usually starts in February or the first week of March (February 16th in 1348), was a 40-day period of restraint when Christians are supposed to fast and to reflect on their sins and do penance. Consistent with this, in towns where February or March was the month of first infection, higher mortality conferred no protective effect (row 22, -0.014***).

Easter. Another period with heightened antisemitism was the period between Easter, in April according to the Julian calendar (e.g., April 20th in 1348), and the Ascension of Christ (40 days later, or May 30th in 1348). Easter celebrations such as the dramatic reenactments of the passion of Christ made the alleged role of the Jews in the death of Christ more salient. These passion plays incited antisemitic sentiments as medieval tradition blamed the Jews for the death of Christ. During Easter Christ was expected to rise and to triumph over his enemies. A favorite Easter sermon from St. Augustine provided a fictitious antisemitic account of Jesus's death: "The Jews held him: the Jews insulted him; the Jews bound him; they crowned him with thorns, dishonored

[35] Archer observes that "At a period in which the individual child was not looked upon with particular tenderness, parental sentiment found a communal channel in the idolization of the Christ child and of the Innocents, the baby boys butchered in the first attempt to kill Jesus by Herod, the Jewish King" (Archer, 1984, 47).

him by spitting on him; they scourged him; they heaped abuse on him . . . " (Freudmann, 1994, 300). Just as hostility to Jews at Christmas-time manifested itself with the association of Jews with Herod, so at Easter they were closely associated with Judas and the betrayal of Christ.[36]

This was reflected in local institutions. The Fourth Lateran Council prohibited Jews from going forth in public on the three days before Easter as this was seen as a grave insult to Christ (see Chanes, 2004, 86). Christians were forbidden from interacting socially with Jews during this period and in some cities Jews paid a special tax on Easter to atone for the crime of killing Christ (e.g. Gottheil and Kahn, 1906). This institution sometimes involved public humiliation. In Toulouse there was a tradition whereby the Jewish community had to choose a member of the community every year to be publicly slapped in the face on Good Friday. In the middle ages this ritual was waived on the condition that the Jews pay a special fee to the town (Blumenkranz et al., 2007). As such, there were many cases of pogroms occurring during Easter.[37] Freudmann (1994) notes that "the annual paschal pogrom became a Christian rite of spring" (Freudmann, 1994, 300). Consistent with this, in towns where April or May was the month of first infection, higher morality conferred no protective effect (row 23, 0.011*).[38]

Overall, the results are all inline with the *scapegoating* effect. Jews are persecuted more in months when sermons invited Christians to hold Jews responsible for the death of Jesus.

Agricultural Calendar. An alternative interpretation of some of our seasonal results is based on the agricultural calendar as April and October were the main months of planting (for the spring and winter grains respectively) and April-May were the lean months when farmers had to borrow money from Jewish moneylenders to buy new seeds and sometimes food that would last them until the next harvest (July).[39] These farmers often had to repay their loan six months later (since a significant share of loans lasted 6 months) around October and sometimes extending an existing loan from the same Jewish moneylenders to buy seeds for the winter planting season. For example, Ramirez (2010, 64) writes for the region of Savoy in which Chambéry is located

[36] As moneylenders, Jews were associated with Judas who sold out Jesus for thirty pieces of silver (Archer, 1984, 49).

[37] The tensions around the month of April were further heightened by the fact that Passover typically coincides with Easter and Jews were accused of ritually murdering and sacrificing Christian children as part of this festival (Rubin, 2004). Numerous studies suggest that this was a factor during the Black Death. The Jewish community of Toulon were massacred on 12-13 April 1348, at the same time as the plague reached the city (Cremieux, 1930).

[38] We also investigate the effect for each month individually, by regressing the persecution dummy on the mortality rate, 12 "month of first infection" dummies, and the 12 interactions of these dummies with the mortality rate. The individual and interacted effects of one month, in our case June, are omitted. The coefficient of the mortality rate then captures the effect of mortality in June, whereas the interacted dummies capture the relative effect of mortality in the 11 other months compared to June. By adding the effect for June and the interacted effects, we then obtain the absolute effect of each month, and finally test whether this effect is significantly different from our baseline effect of -0.009*** (row 1 of Table 1). The effects shown in Figure 9 confirm that the protective effect of mortality was accentuated in February, March and December, and attenuated in January, May (only significant at 15%) and October. Note that there is no clear effect for April now (remember that Easter took place in late April in 1348).

[39] In ancien regime France, the passage of time was defined by almost official "agro-liturgical calendars" (Moriceau, 2010). These calendars provide information about the agricultural cycles of the late medieval period. The agricultural cycle depends on whether one considers a town in the North or the South of Europe. In our sample, the mean latitude and longitude are 45.7 and 6.0, close to Chambéry. In France, December and February were "idle" months, January was the month fields had to be plowed for the spring sowing, March-April and October were the months of planting, April-May were the "lean" months, and July and October were the months of grain and grape harvesting.

(translated from French): "Most of the loans [given by Jews] take place in the Spring and the Fall (65% of loans) during the planting season and during the lean season." The smaller protective effect of higher mortality in April-May (row 23, 0.011*) and October (row 24, 0.011***) could be consistent with the desire to expropriate Jews rather than repay these loans.

5.2.5. Moneylending and Taxes.

Jews played a crucial role as moneylenders. To test this we construct a measure of access to financial markets based on distance to major financial centers at that time: Cahors, Florence, Genoa, Milan, Sienna and Venice.[40] For cities close to a financial center, we find that the protective effect was attenuated when mortality was high (row 25, 0.008***). In regions where the financial services offered by Jewish communities were less important due to the presence of Christian moneylenders (i.e. the *complementarities* effect was weaker). Jews were substitutes and hence more vulnerable. Next, we collect data on whether Jews are mentioned as moneylenders in the *Encyclopedia Judaicia*. Moneylending is mentioned for 62 towns in our sample and for 53 towns Jews are specified as providing general moneylending services (rather than lending to the ruler). Where Jews are mentioned as lending money to the people, we find that when mortality is high, the protective effect is reinforced (row 26, -0.009**). This is consistent with a positive *complementarities* effect. In towns where Jews were moneylenders, they may have become more valuable in the wake of the plague. Finally, when Jews lent to the ruler (row 27), or contributed special taxes (row 28), the protective effect does not change.

5.2.6. Jewish Community Characteristics

Jewish Structures. We consider whether the presence of a Jewish cemetery, quarter, or synagogue had an effect on persecution probability. The presence of a Jewish cemetery and synagogue suggests that the Jewish community was well established. In that case, we would expect the protective effect to be accentuated if it means that it is more socially integrated. The protective effect would be attenuated if non-Jews resent the fact that Jews have their own buildings and plots of land (*scapegoating* effect). The existence of a Jewish quarter meant that Jews were physically separated from Christians. This may have prevented non-Jews from seeing that Jews were also dying and thus were unlikely to be guilty of causing the plague (weakening the *scapegoating* effect). However, it might also have reflected the larger size of a Jewish community (living apart from non-Jews facilitated adherence to Jewish law). We find no effects for these characteristics of Jewish communities (row 29). We also find no effect if we separately investigate the role of synagogues, cemeteries and quarters (not shown). Note that we also find no evidence of a differential effect in the towns that first received a Jewish community a long time ago (row 30).

Ashkenazi Communities. Arbath et al. (2015) argue that conflict and violence can be partly explained by underlying cultural and genetic differences between and within populations. Recent genetic studies suggest that Jews share DNA with many southern European populations but

[40] Florence was the most important financial center in 14th century Europe (de Roover, 1963). Genoa, Milan, Sienna and Venice were also important financial and banking centers (Mueller, 1997). Cahors in southern France was a city known for its Christian moneylenders (Noonan, 1957). Cahorsins are explicitly mentioned alongside "Lombards" as direct substitutes for Jewish lenders (see, e.g. the entry for "Switzerland"' in the *Encyclopedia Judaica*).

are genetically distinct from northern European populations. In particular, while all Jewish communities share a common genetic legacy that can be traced back to the Levant, there are distinguishable differences between Jewish communities. Ashkenazi Jews share a number of genetic markers and were characterized by an extremely low rate of admixture (0.5% per generation) for the past 80 generations suggesting that they remained a genetically distinct population since their founding (Behar et al., 2010). In contrast, Askhenazi (as well as Sephardic) Jews share more genetic markers in common with southern European populations than they do with northern Europeans (Seldin et al., 2006). Therefore, Ashkenazi Jewish communities were likely to have been culturally more distant from their Christian neighbors than was the case for Sephardic Jews in southern Europe. Consistent with this in row 31, we find that Black Death mortality conferred less of a protective effect on Ashkenazi Jewish communities than it did on Sephardic Jewish communities (0.015**).[41]

5.2.7. Trade and Urbanization

City Size and Market Access. Mean mortality was 39.3%. Many towns, however, lost an even higher share of their population and their economies initially collapsed. There is evidence that these towns—and especially town authorities—were concerned about their demographic and economic survival in the wake of the Black Death. Given the conditions facing these towns, it made sense for rulers to protect their community as Jews had occupational skills and financial capital useful to their economic resurgence, hence, the accentuation of the protective effects observed in rows 32-33 (-0.013*** and -0.010***) (consistent with a positive *complementarities* effect).

Trade Networks. We find no relationship between plague intensity and persecution probability and other economic characteristics of Jewish communities such as whether Jews worked as craftsmen or traders (row 34). This is unsurprising as the historical literature agrees that the importance of Jewish merchants had waned by the 14th century (Botticini and Eckstein, 2012).[42]

However, there is evidence that the presence of Jews may have been more important for land-based trade rather than sea-based trade. Credit was vital for trade in medieval Europe as it was highly costly to move bullion over long distances. Merchants relied on credit to fund trade (see Spufford, 1988). From the 12th century, merchants began to innovate contractual forms to evade the prohibition on usury, many of which facilitated borrowing money for seaborne trade (Koyama, 2010). The sea-loan, or *foenun nauticum*, allowed lenders to earn a return about the principle to compensate for the risks involved in sea voyage (Hoover, 1926).[43] Thus, the relative importance

[41] Ashkenazi Jews coalesced as a distinct population in France and Germany towards the end of the first millennium AD. There is some evidence that in comparison to the Jews of the Iberian peninsula they maintained a stricter religious life and kept themselves distinct from the nearby Christian populations.

[42] Roth (1961) argues that guilds pushed Jews out of trade and manufacturing into moneylending. However, Botticini and Eckstein (2012, 238) argue that guilds cannot explain the shift towards moneylending because "by the time the guilds became powerful, the Jews in western Europe had entered and then become specialized and prominent in moneylending for at least two centuries". Instead Botticini and Eckstein (2012) argue that Jews shifted away from trade to due to their comparative advantage in moneylending. For our purposes the precise cause of this shift is irrelevant.

[43] Similarly, bills of exchange made possible exchange contracts in which the debt was repaid at a future date in a different currency thereby disguising any interest charged (de Roover, 1944).

of the financial intermediation provided by the Jews would have been lower in cities engaged in long-distance seaborne trade. In these cities, merchants had sophisticated financial contracts that would enable them to lend and borrow without reliance on Jewish traders. This was not yet the case for inland trade where trade routes remained in the hands of less sophisticated local merchants who still relied on Jewish moneylenders for credit.

Consistent with this, we find no differential effects for towns along the coast or rivers (rows 35-36). But the protective effect of higher mortality is accentuated for towns at the intersection of two medieval routes (row 37. -0.009*). Interestingly, we also find a negative effect for towns at the intersection of two major Roman roads (row 38, -0.007), but this effect is not significant. We find evidence of a stronger protective effect in Jewish communities that were better connected to other communities, using our Jewish centrality index (row 39, -0.010**). We do not find the same protective effect for towns that were part of the Hanseatic League—an important league of cities that dominated trade in the Baltic region (row 40). This is unsurprising since Jews were not involved in this trading network. These results corroborate a positive *complementarities* effect.

5.3. Economic Consequences of Persecutions

We now study the correlation between town population growth—in the absence of income data at the town level—and the presence of Jews in, or their disappearance from, the town.

Jewish presence and growth. For town i in year t, we regress log change in population ($\Delta logL$) in period $[t\text{-}1; t]$ on a dummy equal to one if Jews are present at one point (J) in period $[t\text{-}1; t]$, for the centuries before and during the Black Death:

$$\Delta \log L_{i,t} = \alpha_t + \beta_t J_{i,[t-1;t]} + \gamma_t \log L_{i,t-1} + \delta_t \Delta \log L_{i,t-1} + \mu_{i,t} \ . \tag{11}$$

We control for initial log population ($logL_{i,t-1}$), and thus mean reversion, and the log change in population in the previous period ($\Delta logL_{i,t-1}$) to capture the effect of Jewish presence on deviations from the past growth trend. We also use town population in the initial year as weights in order to reduce the noise coming from small towns that grow fast simply because they are small. As we do not need to control for mortality, we use the full sample of 1,869 towns.

In row 1 of Table 8, Panel A, we show that towns with a Jewish community were growing 10-36% faster (over a period of one century) before the 14th century. The point estimates remain the same but are less significant if we control for whether there was a Jewish community in period $[t\text{-}1; t\text{-}2]$ (row 2). In that case, the Jewish presence dummy in period $[t\text{-}1; t]$ captures the effect of a change in Jewish presence, either because Jews entered the town or disappeared from the town. These effects should, however, be interpreted with caution as Jewish presence is likely endogenous.[44]

Black Death persecution and growth. Using the same specification as equation (11), we regress

[44]Measurement errors should attenuate the effects. Jewish presence is defined by a dummy for the whole century, without considering whether Jews were there at the beginning of the century or entered the town at its end. Our results hold, however, if the variable of interest is the number of years Jews have been present in the century (not shown). In a separate paper, Johnson and Koyama (2017) use several identification strategies to further investigate the role of Jews in European city growth in 1400-1850, and find similar growth effects of 30% per century.

the log change in population between 1353 and $t = \{1400, 1500, 1600, 1700\}$ on a dummy equal to one if there was a persecution/pogrom/expulsion during the Black Death (1347-1352). Instead of estimating the effect of having a Jewish community in the town, these coefficients reflect the effect of having fewer or no Jews. Similarly, we control for initial log population in 1353 and past log population growth in 1200-1353, as well as the log of the mortality rate, since the Black Death had long-term effects on city growth as shown by Jebwab et al. (2016). Note that the population of the town in 1353 is estimated by multiplying its population in 1300 by (100 - mortality rate)/100.[45] We restrict our sample to 363 towns with a Jewish community in 1347.[46] Lastly, note that the effects discussed below are not necessarily causal since the occurrence of a persecution once we control for mortality is still endogenous to future town growth, as suggested by Tables 7 and 8.[47]

In row 1 of Table 8 Panel B, we show that towns where Jews were persecuted in 1347-1352 grew relatively slower in the following centuries. However, the negative correlation only becomes significant after 1500. By 1700, the cumulative effect is -33%, about -9% per century. This is smaller than the effect of Jewish presence, but still quite high. Estimates remain similar if we control for non-extrapolated mortality instead (row 2). The negative correlation between persecution and future town growth is then especially apparent when the persecution is a pogrom (rows 3-4), and less so when it is an expulsion (rows 5-6). By expelling instead of annihilating their community, some towns may have been better able to attract Jewish settlement in the future, thus potentially explaining why expulsions may have had both smaller and insignificant effects.

In summary, the persecution of the Jews had long-run economic consequences. Consistent with the *complementarities* effect, cities with Jewish communities grew faster in the pre-plague period and cities which persecuted their Jewish population grew more slowly later on.

6. Concluding Discussion

We use the exogenous shock of the Black Death to study how a major demographic and economic shock affected the incentive to persecute Jewish communities in medieval Europe. In our theoretical framework, negative shocks can increase both the incentive to persecute a minority and simultaneously raise their economic value. Ultimately, the decision to persecute the minority depends on how the magnitude of the shock interacts with the utility one derives from persecution and the economic benefits associated with the presence of the minority. New city level data on the intensity of the Black Death shock and the presence of Jewish communities allows us to test these predictions. In line with the scapegoating hypothesis, we find that the Black Death led to the largest massacres of Jews prior to the Holocaust. However, at the micro-level, the intensity of the shock had a strong counter-veiling effect. Cities that were hit especially hard faced a demographic and economic crisis and were less likely to persecute their Jewish communities. We provide evidence that this micro-level variation can be explained in terms of (i) a town's cultural

[45] Results generally hold if we use 1300 or 1400 as the initial year (not shown).

[46] Since mortality is only a control variable, we use extrapolated mortality to avoid losing observations. However, we also report the effects when only using non-extrapolated mortality for 124 towns. Our results also hold if we control for the number of plague reoccurrences in each period based on Biraben (1975) (not shown but available upon request).

[47] Note that mortality is not a valid instrument for persecutions since it also affects city growth.

inheritance and hence ideological predilection to scapegoat Jews and (ii) the economic role Jews played in a town. Where (i) was strong, a higher mortality rate made communities more likely to persecute but where (ii) was important towns were less likely to destroy their economically useful Jewish communities. These results suggest that when there are latent biases against minorities, shocks can lead to these biases manifesting in persecution. However, when the minority and majority communities engage in economically complementary activities, then these relationships may be a powerful way to reduce inter-group violence.

REFERENCES

Aberth, John, *From the Brink of the Apocalypse: Confronting Famine, War, Plague, and Death in the Later Middle Ages*, London: Routledge, 2009.

Acemoglu, Daron and James A. Robinson, *Why Nations Fail*, New York: Crown Business, 2012.

__ , David H. Autor, and David Lyle, "Women, War, and Wages: The Effect of Female Labor Supply on the Wage Structure at Midcentury," *Journal of Political Economy*, June 2004, *112* (3), 497–551.

__ , Tarek A. Hassan, and James A. Robinson, "Social Structure and Development: A Legacy of the Holocaust in Russia," *The Quarterly Journal of Economics*, 2011, *126* (2), 895–946.

Adena, Maja, Ruben Enikolopov, Maria Petrova, Veronica Santarosa, and Ekaterina Zhuravskaya, "Radio and the Rise of The Nazis in Prewar Germany," *The Quarterly Journal of Economics*, 2015, *130* (4), 1885–1939.

Adler, Cyrus and Isidore Singer, eds, *The Jewish Encyclopedia* Funk and Wagnalls New York 1906.

Alesina, Alberto and Ekaterina Zhuravskaya, "Segregation and the Quality of Government in a Cross Section of Countries," *American Economic Review*, August 2011, *101* (5), 1872–1911.

__ and Eliana La Ferrara, "Ethnic Diversity and Economic Performance," *Journal of Economic Literature*, September 2005, *43* (3), 762–800.

__ , Reza Baqir, and William Easterly, "Public Goods and Ethnic Divisions*," *The Quarterly Journal of Economics*, 1999, *114* (4), 1243.

__ , Stelios Michalopoulos, and Elias Papaioannou, "Ethnic Inequality," *Journal of Political Economy*, 2016, *124* (2), 428–488.

Allcott, Hunt and Matthew Gentzkow, "Social Media and Fake News in the 2016 Election," NBER Working Papers 23089, National Bureau of Economic Research, Inc January 2017.

Allen, Robert C., "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War," *Explorations in Economic History*, 2001, *38*, 411–447.

Allport, G. W., *The Nature of Prejudice*, Cambridge, MA: Perseus Books, 1979.

Anderson, R. Warren, Noel D. Johnson, and Mark Koyama, "Jewish Persecutions and Weather Shocks 1100–1800," *Economic Journal*, 2016, *Forthcoming.*

Arbath, Cemal Eren, Quamrul H. Ashraf, and Oded Galor, "The Nature of Conflict," CESifo Working Paper Series 5486, CESifo Group Munich 2015.

Arbatli, Cemal Eren, Quamrul H. Ashraf, and Oded Galor, "The Nature of Conflict," NBER Working Papers 21079, National Bureau of Economic Research, Inc April 2015.

Archer, John, "The Structure of Anti-Semitism in the "Prioress's Tale"," *The Chaucer Review*, 1984, *19* (1), 46–54.

Bai, Ying and James Kai-sing Kung, "Climate Shocks and Sino-nomadic Conflict," *The Review of Economics and Statistics*, August 2011, *93* (3), 970–981.

Bairoch, Paul, *Cites and Economic Development, from the dawn of history to the present*, Chicago: University of Chicago Press, 1988. translated by Christopher Braider.

Bandiera, Oriana and Gilat Levy, "Diversity and the power of the elites in democratic societies: Evidence from Indonesia," *Journal of Public Economics*, 2011, *95* (11), 1322–1330.

Baron, Salo, *A Social and Religious History of the Jews*, Vol. XI: Citizen or Alien Conjurer, New York: Columbia University Press, 1967.

Becker, Sascha O. and Luigi Pascali, "Religion, Division of Labor and Conflict: Anti-Semiticsm in German Regions over 600 Years," Technical Report 288, Centre for Competitive Advantage in the Global Economy April 2016.

Behar, Doron M., Bayazit Yunusbayev, Mait Metspalu, Ene Metspalu, Saharon Rosset, Jü Parik, Siiri Rootsi, Gyaneshwer Chaubey, Ildus Kutuev, Guennady Yudkovsky, Elza K. Khusnutdinova, Oleg Balanovsky, Ornella Semino, Luisa Pereira, David Comas, David Gurwitz, Batsheva Bonne-Tamir, Tudor Parfitt, Michael F. Hammer, Karl Skorecki, and Richard Villems, "The genome-wide structure of the Jewish people," *Nature*, Jul 08 2010, *466* (7303), 238–42.

Ben-Sasson, Haim Hillel, Yehuda Slutsky, and Dina Porat, "Blood Libel," in Michael Berenbaum and Fred Skolnik, eds., *Encyclopedia Judaica*, Vol. 17 Macmillan Reference New York 2007, pp. 774–780.

Benedictow, Ole J., *The Black Death 1346–1353: The Complete History*, Woodbridge: The Boydell Press, 2005.

__ , *What Disease was Plague? On the Controversy over the Microbiological Identity of Plague Epidemics of the Past*, Leiden: Brill, 2010.

Berenbaum, Michael and Fred Skolnik, *Encyclopedia Judaica*, 2nd ed., USA: Macmillan Reference, 2007.

__ and __ , "Nuremberg," in Michael Berenbaum and Fred Skolnik, eds., *Encyclopaedia Judaica*, Vol. 15 Macmillan Reference 2007, pp. 346–348.

Berngruber, Thomas W., Rmy Froissart, Marc Choisy, and Sylvain Gandon, "Evolution of Virulence in Emerging Epidemics," *PLoS Pathog*, 03 2013, *9* (3), 1–8.

Biraben, Jean-Noël, *La Peste dans l'Histoire: Les Hommes et la Peste en France et dans les Pays Européens et Méditerranéens*, Vol. I, Mouton, Paris, 1975.

Blumenkranz, Bernhard, David Weinberg, and Georges Levitte, "Toulouse," in Michael Berenbaum and Fred Skolnik, eds., *Encyclopaedia Judaica*, Vol. 20 Macmillan Reference New York 2007, pp. 73–74.

Boccaccio, Giovanni, *The Decameron*, London: Dodo Press, 2005, 1371. Translated by J.M. Rigg.

Boerner, Lsrs and Battista Severgnini, "Epidemic Trade," 2014. LSE Economic History Working Paper No. 212/2014.

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

Botticini, Maristella, "A Tale of 'Benevolent' Governments: Private Credit Markets, Public Finance, and the Role of Jewish Lenders in Medieval and Renaissance Italy," *Journal of Economic History*, 2000, *60*, 164–189.

__ and Zvi Eckstein, *The Chosen Few*, Princeton, New Jersey: Princeton University Press, 2012.

Campbell, Bruce M.S., *The Great Transition: Climate, Disease and Society in the Late-Medieval World*, Cambridge: Cambridge University Press, 2016.

Caselli, Francesco and Wilbur John Coleman II, "On The Theory Of Ethnic Conflict," *Journal of the European Economic Association*, 01 2013, *11*, 161–192.

__ , Massimo Morelli, and Dominic Rohner, "The Geography of Interstate Resource Wars," *The Quarterly Journal of Economics*, 2015, *130* (1), 267–315.

Chandler, Tertius, *Four Thousand Years of Urban Growth*, Lewiston, NY: St David University Press, 1987.

Chanes, Jerome A., *Antisemitism*, Denver, Colorado: Contemporary World Issues, 2004.

Chaney, Eric, "Revolt on the Nile: Economic Shocks, Religion and Political Power," *Econometrica*, 2013, *5* (5), 2033–2053.

Chassang, Sylvain and Gerard Padro i Miquel, "Economic Shocks and Civil War," *Quarterly Journal of Political Science*, October 2009, *4* (3), 211–228.

Chazan, Robert, *European Jewry and the First Crusade*, Berkeley: University of California Press, 1987.

__ , *Reassessing Jewish Life in Medieval Europe*, Cambridge: Cambridge University Press, 2010.

Christakos, George, Richardo A. Olea, Marc L. Serre, Hwa-Lung Yu, and Lin-Lin Wang, *Interdisciplinary Public Health Reasoning and Epidemic Modelling: The Case of Black Death*, Berlin: Springer, 2005.

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

Cohen, Norman, *The Pursuit of the Millenium, revolutionary millenarians and mystical anarchists of the middle ages*, London: Pimilco, 1957.

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

__ and Guido Alfani, "Households and Plague in Early Modern Italy," *The Journal of Interdisciplinary History*, 2007, *38* (2), pp. 177–205.

Cremieux, A., "Les Juifs de Toulon au Moyen Age et le massacre du 14 Avril 1348," *Journal of Jewish Studies*, 33–72 1930, *89*.

D'Acunto, Francesco, Marcel Prokopczuk, and Michael Weber, "Distrust in Finance Lingers: Jewish Persecution and Households' Investments," June 2014. memo.

de Roover, Raymond, "What is Dry Exchange? A Contribution to the Study of English Mercantilism," *The Journal of Political Economy*, 1944, *52* (3), 250–266.

__ , *The Rise and Decline of the Medici Bank, 1397–1494*, Cambridge, MA: Harvard University Press, 1963.

Dell, Melissa, "Path dependence in development: Evidence from the Mexican Revolution," 2012. Mimeo.

Doepke, Matthias, Moshe Hazan, and Yishay D. Maoz, "The Baby Boom and World War II: A Macroeconomic Analysis," *Review of Economic Studies*, 2015, *82* (3), 1031–1073.

Dollinger, Philippe, *The German Hansa*, London: MacMillan, 1970. translated and edited by D.S. Ault and S.H. Steinberg.

Donaldson, Dave, "Forthcoming."Railroads of the Raj: Estimating the impact of transportation infrastructure.","," *American Economic Review*, 2017.

Donaldson, Terence L., *Jews and Anti-Judaism in the New Testament*, Causton Street: Baylor University Press, 2010.

Doob, Leonard W; Miller Neal E; Mowrer Orval Hobart; Sears Robert Dollard John;, *Frustration and Aggression*, New Haven, CT: Yale University Press, 1939.

Easterly, William and Ross Levine, "Africa's Growth Tragedy: Policies and Ethnic Divisions*," *The Quarterly Journal of Economics*, 1997, *112* (4), 1203.

__ , Roberta Gatti, and Sergio Kurlat, "Development, democracy, and mass killings," *Journal of Economic Growth*, 2006, *11* (2), 129–156.

Eidelberg, Shlomo, *The Jews and the Crusades*, Madison, Wisconsin: The University of Wisconsin Press, 1977.

Enikolopov, Ruben, Maria Petrova, and Ekaterina Zhuravskaya, "Media and Political Persuasion: Evidence from Russia," *American Economic Review*, December 2011, *101* (7), 3253–85.

Esteban, Joan and Debraj Ray, "On the Salience of Ethnic Conflict," *American Economic Review*, December 2008, *98* (5), 2185–2202.

__ and __ , "Linking Conflict to Inequality and Polarization," *American Economic Review*, June 2011, *101* (4), 1345–1374.

__ , Laura Mayoral, and Debraj Ray, "Ethnicity and Conflict: An Empirical Study," *American Economic Review*, June 2012, *102* (4), 1310–1342.

__ , Massimo Morelli, and Dominic Rohner, "Strategic Mass Killings," *Journal of Political Economy*, 2015, *123* (5), 1087–1132.

Facchini, Giovanni and Anna Maria Mayda, "Does the Welfare State Affect Individual Attitudes toward Immigrants? Evidence across Countries," *The Review of Economics and Statistics*, May 2009, *91* (2), 295–314.

Fernandez, Raquel, Alessandra Fogli, and Claudia Olivetti, "Preference Formation and the Rise of Women's Labor Force Participation: Evidence from WWII," NBER Working Papers 10589, National Bureau of Economic Research, Inc June 2004.

__ and Gilat Levy, "Diversity and redistribution," *Journal of Public Economics*, 2008, *92* (5?6), 925 – 943.

Finley, Theresa and Mark Koyama, "Plague, Politics, and Pogroms: The Black Death, Fragmented states, and the persecution of Jews in the late Holy Roman Empire," June 2015. memo.

Freudmann, Lillian C., *AntiSemitism in the New Testament*, Lanham: University Press of America, 1994.

Friedländer, Saul, *Nazi Germany and the Jews*, Vol. I, New York: Harper Collins, 1997.

Gensini, Gian Franco, Magdi H. Yacoub, and Andrea A. Conti, "The concept of quarantine in history: from plague to SARS," *Journal of Infection*, 2004, *49* (4), 257 – 261.

Girard, René, *Things Hidden Since the Foundation of the World*, Stanford, CA: Stanford University Press, 1978.

Girvan, Michelle, Duncan S. Callaway, M. E. J. Newman, and Steven H. Strogatz, "Simple model of epidemics with pathogen mutation," *Phys. Rev. E*, Mar 2002, *65*, 031915.

Glick, Peter, "Sacrificial Lambs Dressed in Wolves' Clothing," in Leonard S. Newman and Ralf Erber, eds., *Understanding Genocide,*, Oxford University Press Oxford 2002.

__ , "Choice of Scapegoats," in John F. Dovidio, Peter Glick, and Laurie A. Rudman, eds., *On the Nature of Prejudice: 50 Years after Allport,*, Blackwell Malden, MA 2005, pp. 244–61.

__ , *When Neighbors Blame Neighbors: Scapegoating and the Breakdown of Ethnic Relations*, Blackwell Publishing Ltd.,

Goldhagen, Daniel, *The Devil That Never Dies*, New York: Little Brown and Company, 2013.

Goldin, Claudia, "The Role of World War II in the Rise of Women's Employment," *American Economic Review*, September 1991, *81* (4), 741–56.

Goldstein, Phyllis, *A Convenient Hatred: The History of Antisemitism*, Brookline, MA: Facing History and Ourselves, 2012.

Gottfried, Robert S., *The Black Death: Natural and Human Disaster in Medieval Europe*, New York: The Free Press, 1983.

Gottheil, Richard and S. Kahn, "Grenoble," in Isidore Singer, ed., *Jewish Encyclopedia*, 1906, pp. 91–92.

Grosfeld, Irena, Alexander Rodnyansky, and Ekaterina Zhuravskaya, "Persistent Antimarket Culture: A Legacy of the Pale of Settlement after the Holocaust," *American Economic Journal: Economic Policy*, 2013, *5* (3), 189–226.

__ , Seyhun Orcan Sakalli, and Ekaterina Zhuravskaya, "Middleman Minorities and Ethnic Conflict: Evidence from Pogroms," 2016. Mimeo.

Herlihy, David, "Plague and Social Change in Rural Pistoia, 1201-1430," *The Economic History Review*, 1965, *18* (2), 225–244.

Hoover, Calvin B., "The Sea Loan in Genoa in the Twelfth Century," *The Quarterly Journal of Economics*, 1926, *40* (3), 495–529.

Horrox, Rosmery, ed., *The Black Death* Manchester University Press Manchester 1994.

Iyigun, Murat, Nathan Nunn, and Nancy Qian, "Winter is Coming: The Long-Run Effects of Climate Change on Conflict, 1400-1900," NBER Working Papers 23033, National Bureau of Economic Research, Inc January 2017.

Jebwab, Remi, Noel D. Johnson, and Mark Koyama, "Bones, Bacteria and Break Points: The Heterogeneous Spatial Effects of the Black Death and Long-Run Growth," June 2016. Working Paper.

Jha, Saumitra, "Maintaining peace across ethnic lines: New lessons from the past," *Economics of Peace and Security Journal*, 2007, *2* (2), 89–93.

__ , "Trade, complementaries and religious tolerance: evidence from India," *American Journal of Political Science*, 2013, *107* (4).

Johnson, Noel D. and Mark Koyama, "Jewish Communities and City Growth in Preindustrial Europe," *Journal of Development Economics*, 2017, *Forthcoming.*

Köïnig, Michael, Dominic Rohner, Mathias Thoenig, and Fabrizio Zilibotti, "Networks in Conflict: Theory and Evidence from the Great War of Africa," CEPR Discussion Papers 10348, C.E.P.R. Discussion Papers January 2015.

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

Mayda, Anna Maria, "Who Is Against Immigration? A Cross-Country Investigation of Individual Attitudes toward Immigrants," *The Review of Economics and Statistics*, August 2006, *88* (3), 510–530.

Mayoral, Laura and Debraj Ray, "Groups in Conflict: Size Matters, But Not In The Way You Think," 2016. Mimeo.

McCormick, Michael, Guoping Huang, Giovanni Zambotti, and Jessica Lavash, "Roman Road Network," 2013. DARMC Scholarly Data Series 2013-5. Center for Geographic Analysis, Harvard University, Cambridge MA 02138.

Michalopoulos, Stelios and Elias Papaioannou, "The Long-Run Effects of the Scramble for Africa," *American Economic Review*, July 2016, *106* (7), 1802–48.

Miguel, Edward, "Poverty and Witch Killing," *Review of Economic Studies*, October 2005, *72* (4), 1153–1172.

__ , Shanker Satyanath, and Ernest Sergenti, "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," *Journal of Political Economy*, 2004, *112* (4), 725–753.

Mitra, Anirban and Debraj Ray, "Implications of an Economic Theory of Conflict: Hindu-Muslim Violence in India," *Journal of Political Economy*, 2014, *122* (4), 719–765.

Mollat, G., *The Popes at Avignon: The "Babylonian Captivity" of the Medieval Church*, New York: Harper Touch Books, 1963.

Montalvo, Jose G. and Marta Reynal-Querol, "Ethnic Polarization, Potential Conflict, and Civil Wars," *American Economic Review*, June 2005, *95* (3), 796–816.

__ and __ , "Discrete Polarisation with an Application to the Determinants of Genocides," *Economic Journal*, November 2008, *118* (533), 1835–1865.

Moore, Robert, *The Formation of a Persecuting Society: power and deviance in Western Europe, 950–1250*, Oxford: Blackwell, 1987.

Moriceau, Jean-Marc, *Chroniques paysannes: du Moyen Âge au XXe siècle*, France Agricole Editions, 2010.

Mueller, Reinhold C., *The Venetian Money Market, banks, panics, and the public debt, 1200–1500*, Baltimore, Maryland: The Johns Hopkins University Press, 1997.

Munro, John H., "Before and after the Black Death: money, prices, and wages in fourteenth-century England," MPRA Paper 15748, University Library of Munich, Germany December 2004.

Nohl, Johannes, *The Black Death: A Chronicle of the Plague*, George Allen & Unwin LTD, 1924. translated by C.H. Clarke.

Noonan, John T., *The Scholastic Analysis of Usury*, Cambridge, Massachusetts, U.S.A: Harvard University Press, 1957.

Nunn, Nathan, Nancy Qian, and Sandra Sequeira, "Migrants and the Making of America: The Short- and Long-Run Effects of Immigration during the Age of Mass Migration," January 2017.

Oster, Emily, "Witchcraft, Weather and Economic Growth in Renaissance Europe," *Journal of Economic Perspectives*, Winter 2004, *18* (1), 215–228.

Pamuk, Şevket, "The Black Death and the origins of the 'Great Divergence' across Europe, 1300-1600," *European Review of Economic History*, 2007, *11* (3), 289–317.

Pascali, Luigi, "Banks and Development: Jewish Communities in the Italian Renaissance and Current Economic Performance," *Review of Economics and Statistics*, 2016, *98* (1), 140–158.

Ramirez, Olivier, *Les Juifs et le credit en Savoie au XIVe siècle*, Vol. 38, Centre Europeen d'Etudes Bourguignonnes, 2010.

Ray, Debraj and Joan Esteban, "Conflict and Development," 2016. Mimeo.

Renouard, Yves, *The Avignon Papacy*, Hamden, Connecticut: Archon Books, 1970. translated by Denis Bethell.

Rogall, Thorsten, "Mobilizing the Masses for Genocide," 2015. Mimeo.

Rohner, Dominic, Mathias Thoenig, and Fabrizio Zilibotti, "Seeds of distrust: conflict in Uganda," *Journal of Economic Growth*, September 2013, *18* (3), 217–252.

— , — , and — , "War Signals: A Theory of Trade, Trust, and Conflict," *Review of Economic Studies*, 2013, *80* (3), 1114–1147.

Roth, Cecil, "The Economic History of the Jews," *The Economic History Review*, 1961, *14*, 131–135.

Rubin, Miri, "Desecration of the Host: The Birth of an Accusation," *Studies in Church History*, 1992, *29*, 169–185.

— , *Gentile Tales: The Narrative Assault on Late Medieval Jews*, Philadelphia: University of Pennsylvania Press, 2004.

Russell, Josiah Cox, *Medieval Regions and their Cities*, Newton Abbot, Devon: David & Charles, 1972.

Satyanath, Shanker, Nico Voigtländer, and Hans-Joachim Voth, "Bowling for fascism: Social capital and the rise of the Nazi Party in Weimar Germany, 1919-33," 2017. Forthcoming in the *Journal of Political Economy*.

Schwarzfuchs, Simon R., "Crusades," in Michael Berenbaum and Fred Skolnik, eds., *Encyclopedia Judaica*, Vol. 17 Macmillan Reference New York 2007, pp. 310–315.

Seldin, Michael F, Russell Shigeta, Pablo Villoslada, Carlo Selmi, Jaakko Tuomilehto, Gabriel Silva, John W Belmont, Lars Klareskog, and Peter K Gregersen, "European Population Substructure: Clustering of Northern and Southern Populations," *PLOS Genetics*, 09 2006, *2* (9), 1–13.

Shatzmiller, Joseph, *Jew, Medicine, and Medieval Society*, Berkeley: University of California Press, 1994.

Shepherd, William R., *Historical Atlas*, New York: Henry Holt and Company, 1923.

Shirk, Melanie V, "The Black Death in Aragon, 1348–1351," *Journal of Medieval History*, 1981, *7* (4), 357–367.

Sibon, Juliette, *Les juifs de Marseille au XIVe siècle*, Paris: CERF, 2011.

Spufford, Peter, *Money and its use in Medieval Europe*, Cambridge: CUP, 1988.

Stacey, Robert C., "From Ritual Crucifixion to Host Desecration: Jews and the Body of Christ," *Jewish History*, 1998, *12* (1), 11–28.

Stasavage, David, "Was Weber Right? The Role of Urban Autonomy in Europe's Rise," *American Political Science Review*, 5 2014, *108*, 337–354.

Staub, Ervin, *The Roots of Evil: The Origins of Genocide and Other Group Violence*, Cambridge, MA: Cambridge University Press, 1992.

Talbert, Richard J. A, ed., *Barrington Atlas of the Greek and Roman World* Princeton University Press Princeton 2000.

Theilmann, John and Frances Cate, "A Plague of Plagues: The Problem of Plague Diagnosis in Medieval England," *The Journal of Interdisciplinary History*, 2007, *37* (3), 371–393.

Trachtenberg, Joshua, *The Devil and the Jews*, Philadelphia: The Jewish Publication Society, 1943.

van Straten, Jits, "Early Modern Polish Jewry The Rhineland Hypothesis Revisited," *Historical Methods*, 2007, *40* (1), 39–50.

Voigtländer, Nico and Hans-Joachim Voth, "Persecution Perpetuated: The Medieval Origins of Anti-Semitic violence in Nazi Germany," *Quarterly Journal of Economics*, 2012, *127* (3), 1–54.

— and — , "Married to Intolerance: Attitudes toward Intermarriage in Germany, 1900-2006," *American Economic Review*, May 2013, *103* (3), 79–85.

— and — , "The Three Horsemen of Riches: Plague, War, and Urbanization in Early Modern Europe," *Review of Economic Studies*, 2013, *80* (2), 774–811.

— and — , "Highway to Hitler," ECON - Working Papers 156, Department of Economics - University of Zurich May 2014.

— and — , "Nazi indoctrination and anti-Semitic beliefs in Germany," *Proceedings of the National Academy of Sciences*, 2015, *112* (26), 7931–7936.

Waldinger, Fabian, "Quality Matters: The Expulsion of Professors and the Consequences for PhD Student Outcomes in Nazi Germany," *Journal of Political Economy*, 2010, *118* (4), 787–831.

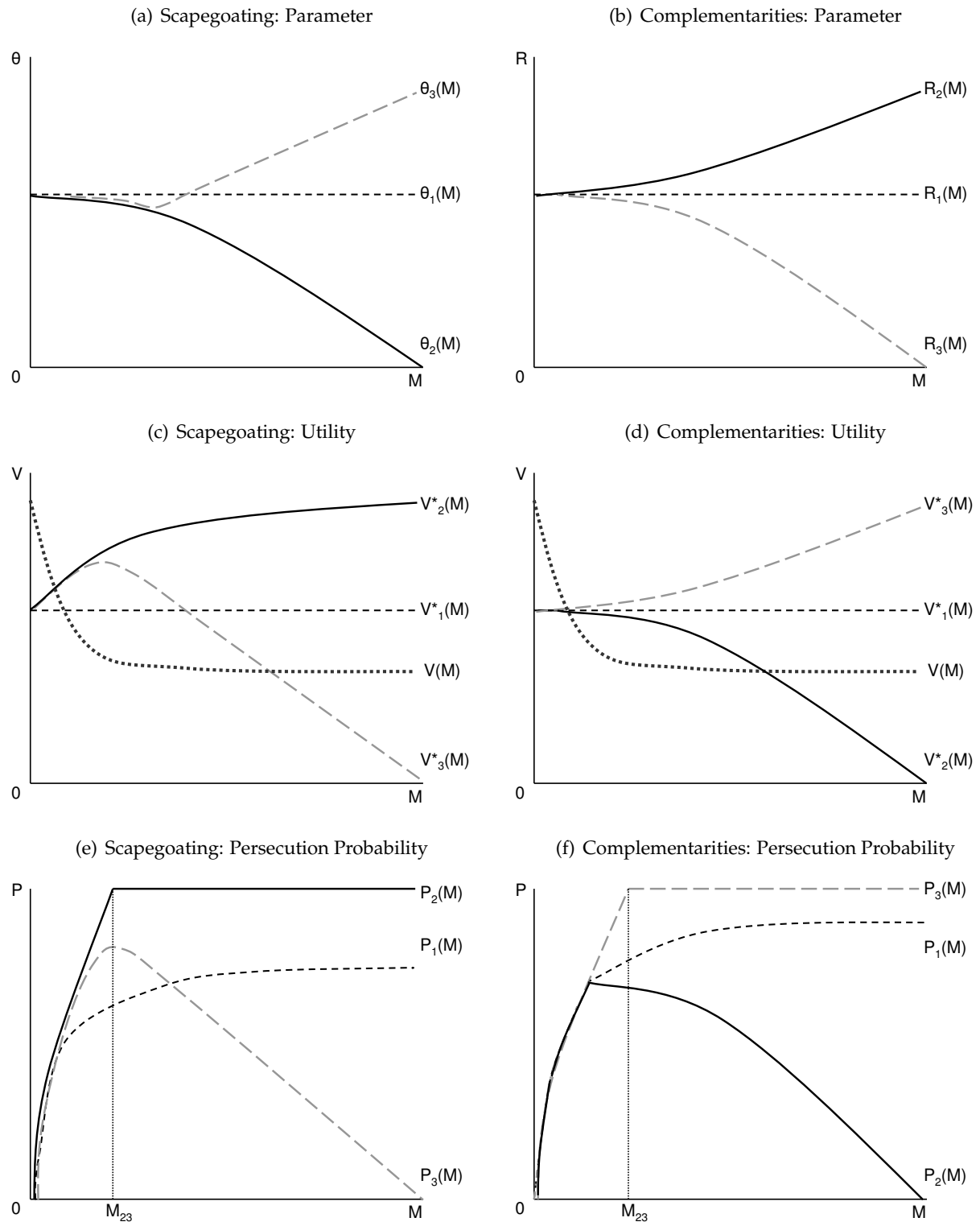
— , "Peer Effects in Science: Evidence from the Dismissal of Scientists in Nazi Germany," *Review of Economic Studies*, 2012, *79* (2), 838–861.

— , "Bombs, Brains, and Science: The Role of Human and Physical Capital for the Creation of Scientific Knowledge," *The Review of Economics and Statistics*, December 2016, *98* (5), 811–831.

Wasserman, Henry, "Regensburg," in Michael Berenbaum and Fred Skolnik, eds., *Encyclopedia Judaica*, Vol. 17 Macmillan

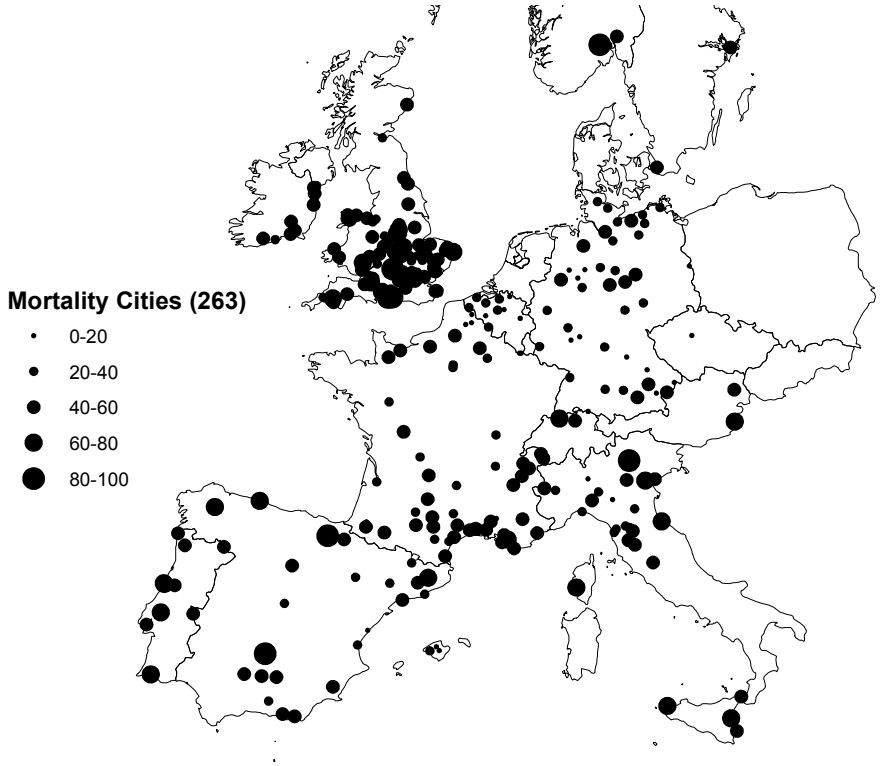
Reference New York 2007, pp. 188–189.
Yanagizawa-Drott, David, "Propaganda and Conflict: Evidence from the Rwandan Genocide," *The Quarterly Journal of Economics*, 2014, *129* (4), 1947–1994.
Zanden, Jan Luiten Van, Eltjo Buringh, and Maarten Bosker, "The Rise and Decline of European Parliaments, 1188–1789," *Economic History Review*, 08 2012, *65* (3), 835–861.
Ziegler, Philip, *The Black Death*, London: Collins, 1969.

Figure 1: Theoretical Framework: Comparative Statics



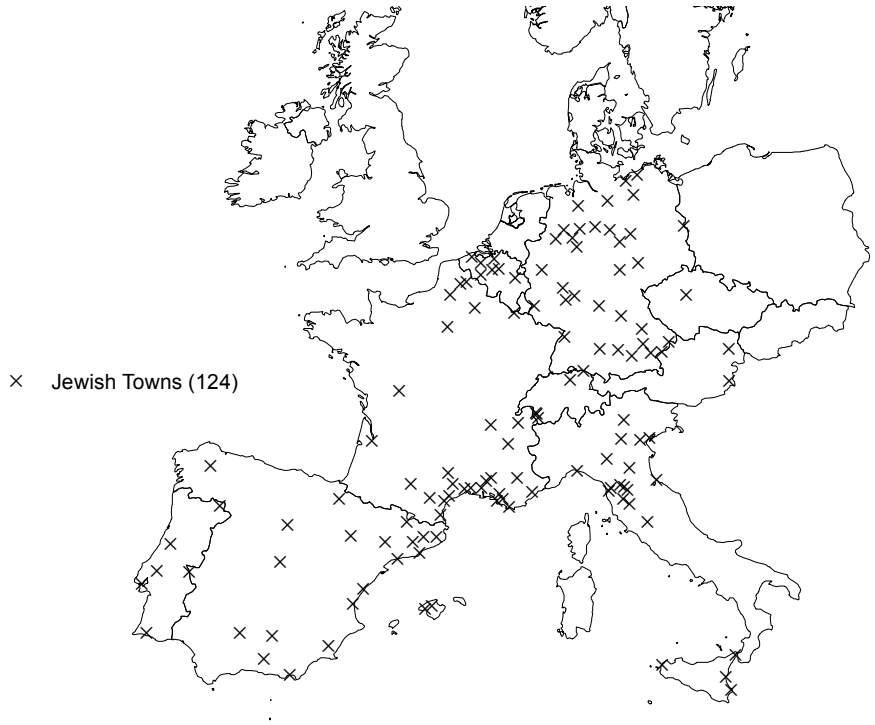
Notes: Subfigures 1(c) and 1(e) and Subfigures 1(d) and 1(f) show how ingroup-based current utility (V), outgroup-based subsistence utility (V^*) and the persecution probability (P) vary with the scapegoating (θ) and complementarity (R) parameters shown in Subfigure 1(a) and Subfigure 1(b), respectively.

Figure 2: Cumulative Black Death Mortality Rates (%) in 1347-1352



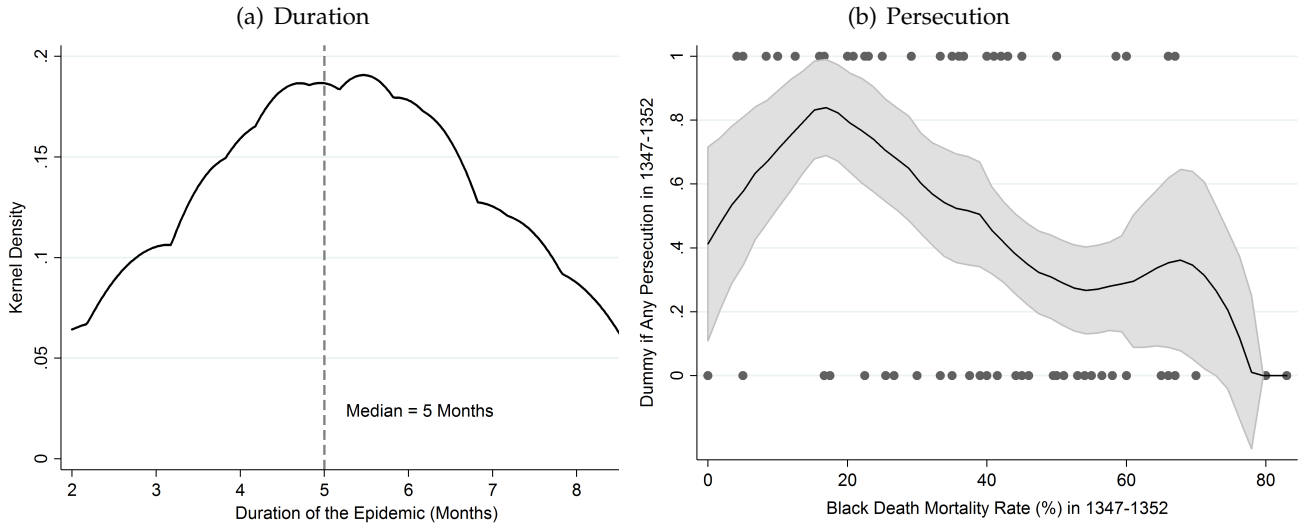
Notes: This map depicts Black Death mortality rates (%, 1347-1352) for 263 localities. The main source for the mortality data is Christakos et al. (2005). See Web Appendix for more details on data sources.

Figure 3: Main Sample of 124 Towns with a Jewish Community and Mortality Data



Notes: This map shows the 124 towns of our main sample, i.e. the towns with Jews present at one point in 1347-1352 and for which we know the cumulative Black Death mortality rate (%, 1347-1352). These 124 towns belong to 9 countries using today's boundaries: Austria, Belgium, the Czech Republic, France, Germany, Italy, Portugal, Spain and Switzerland. See Web Appendix for more details on data sources.

Figure 4: Distribution of the Duration of the Black Death, and Relationship between Cumulative Black Death Mortality and the Likelihood of a Persecution in 1347-1352.

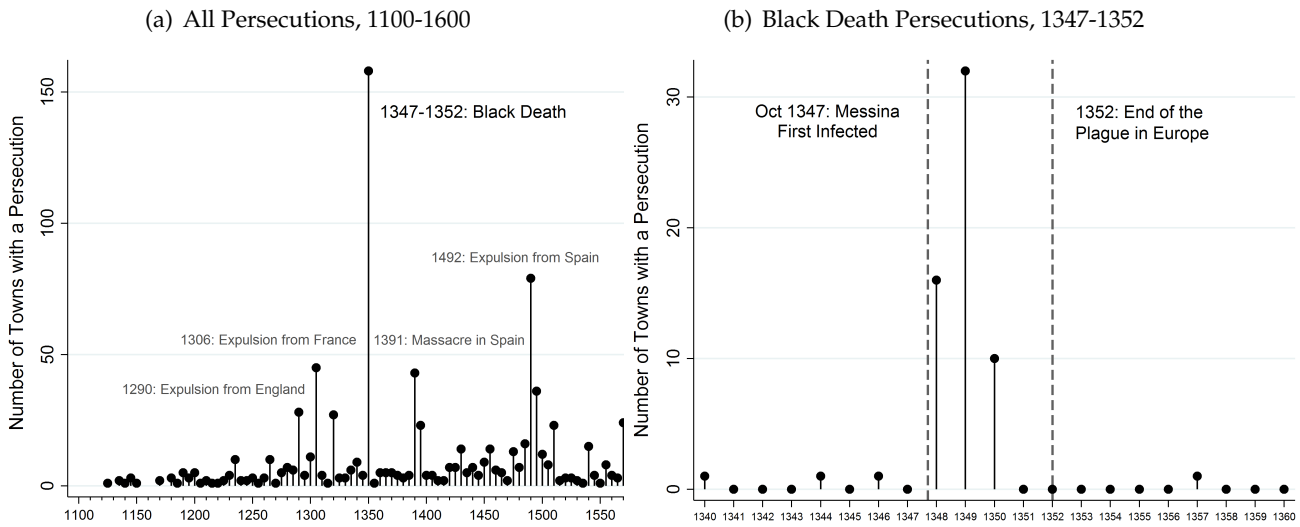


Notes: Panel (a) shows the Kernel distribution of the duration of the Black Death in each city—i.e. the time difference between the month of the first infection in the city and the month of the last infection in the city (information available for 39 out of the 124 towns of the main sample). The mean and median durations were 5 months. Panel (b) shows that for the main sample of 124 Jewish towns for which we have data on Black Death mortality there is a positive and then negative correlation between the likelihood of a persecution and the mortality rate in 1347-1352 (local polynomial smooth plot with a bandwidth of 5 percentage points of mortality). See Web Appendix for more details on data sources.

Figure 5: Cumulative Black Death Mortality, Locality Size, and Market Access in 1300

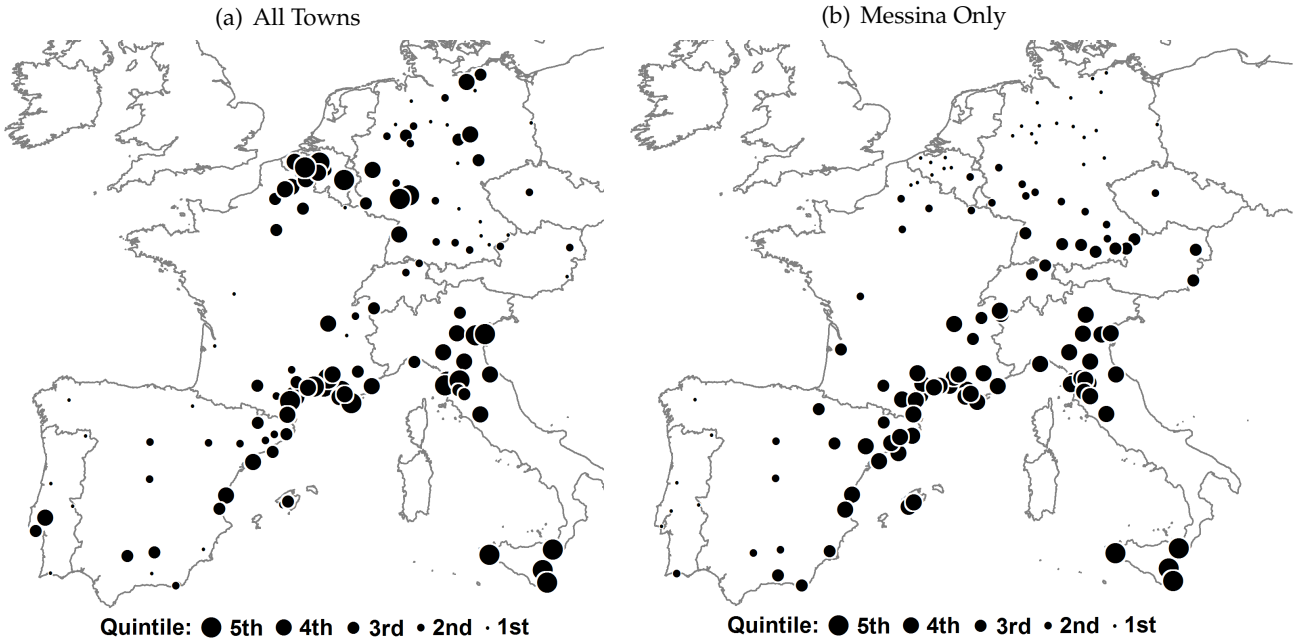
Notes: Panel (a) depicts the relationship between mortality rates (%, 1347-1352) and log population size in 1300 for our main sample of 124 Jewish towns (Y = 40.36*** -0.55 X; Obs. = 124; R2 = 0.00). Panel (b) depicts the relationship between mortality rates (%, 1347-1352) and log market access to all 1,869 towns in 1300 for our main sample of 124 Jewish towns (Y = 38.45*** +0.85 X; Obs. = 124; R2 = 0.01). Market access for city i is defined as $MA_i = \Sigma_j \frac{P_j}{D_{ij}^{\sigma}}$, with P_j being the population of town $j \neq i$, D_{ij} the travel time between city i and city j, and $\sigma = 3.8$. To obtain the travel times, we compute the least cost travel paths via four transportation modes — by sea, by river, by road and by walk — with the transportation speeds from Boerner & Severgnini (2014). See Web Appendix for more details on data sources.

Figure 6: Total Number of Jewish Persecutions in 1100-1600 and 1347-1352



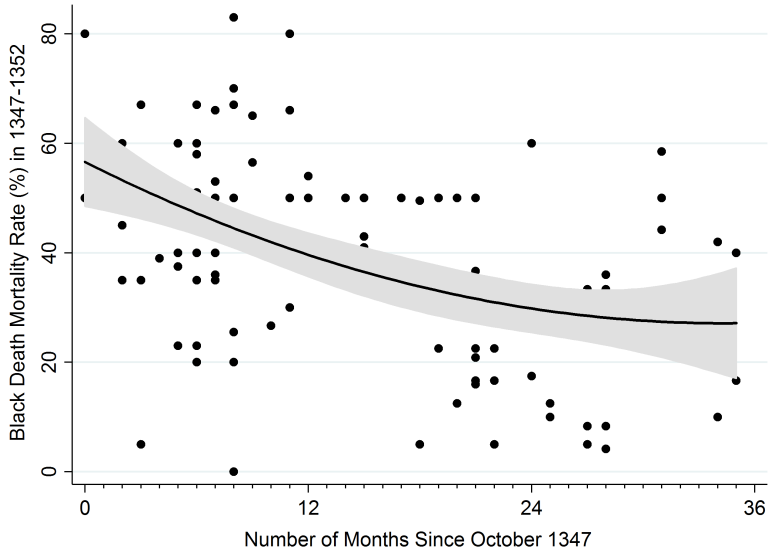
Notes: Panel (a) depicts all persecutions recorded in the full sample of 1,869 towns when the year is rounded to the nearest decade (year ending in 0) or mid-decade (year ending in 5). It shows that the Black Death period (1347-1352, rounded in 1350) witnessed the greatest number of persecutions in medieval European history (here, 1100-1600). Panel (b) focuses on the 124 towns of the main sample and on persecutions that took place within the Black Death period and seven years before or after (here, 1340-1360). See Web Appendix for more details on data sources.

Figure 7: Market Access to All Towns vs. Market Access to Messina Only, 1300.



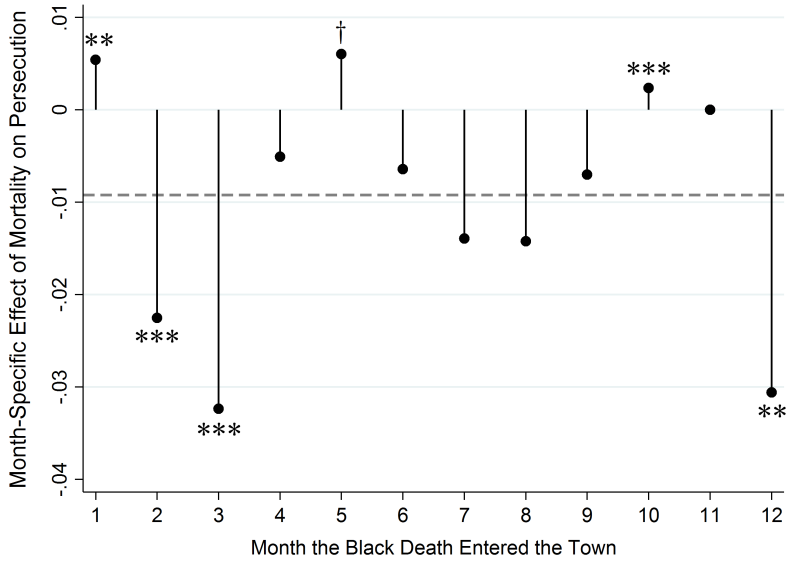
Notes: Panel (a) shows for the 124 towns of the main sample their log market access to all towns in 1300. Panel (b) shows for the same 124 towns their log market access to Messina in 1300. See notes under figure 5(b) for details on how market access is calculated. We use as an instrument log market access to Messina, conditional on log market access to all towns. See Web Appendix for more details on data sources.

Figure 8: Timing of the Onset of the Black Death and Black Death Mortality



Notes: This figure shows for the 124 towns of the main sample the relationship between cumulative Black Death mortality rates (%) in 1347-1352 and the specific timing of the onset of the Black Death in the town. Number of months is measured since October 1347, the date Messina—the port of entry of the Black Death in Europe—was first infected. Towns which were infected earlier had higher mortality rates (Y = 52.01*** -0.87*** X; Obs. = 124; R2 = 0.22). See Web Appendix for more details on data sources.

Figure 9: Effects of the Black Death Mortality Rate by Month of First Infection



Notes: This figure shows for each month of first infection the effect of the Black Death mortality rate (%) on persecution probability. These effects are conditional on the individual effects of the month of first infection on the persecution dummy (see text for details). We test whether each coefficient is significantly different from the average effect across all months, i.e. the baseline effect of -0.009*** (see Row 1 of Table 1): Robust SE's: † p<0.15, * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for more details on data sources.

Table 1: BLACK DEATH MORTALITY RATES AND JEWISH PERSECUTIONS, 1100-1600

Dependent Variable: Dummy if Any Jewish Persecution in Period [t-1; t]:						
	Mortality in 1347-1352		Constant		Obs.	R2
1. [t-1; t] = [1347-1352]	-0.009***	[0.002]	0.831***	[0.104]	124	0.12
2. [t-1; t] = [1353-1400]	-0.004*	[0.002]	0.404***	[0.098]	122	0.02
3. [t-1; t] = [1353-1500]	-0.000	[0.002]	0.640***	[0.099]	124	0.00
4. [t-1; t] = [1353-1600]	0.000	[0.002]	0.724***	[0.088]	127	0.00
5. [t-1; t] = [1341-1346]	0.001	[0.000]	-0.004	[0.004]	122	0.01
6. [t-1; t] = [1321-1346]	-0.001	[0.001]	0.144**	[0.068]	126	0.01
7. [t-1; t] = [1300-1346]	-0.001	[0.002]	0.255***	[0.082]	131	0.00
8. [t-1; t] = [1200-1346]	-0.003	[0.002]	0.370***	[0.090]	132	0.02

Notes: This table shows the constant α_t and the effect β_t of the Black Death mortality rate (%) in 1347-1352 on a dummy equal to one if there has been any persecution in various periods [t-1; t], for the towns for which we have mortality data and in which we know that Jews were present in period [t-1; t]. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 2: TOWN CHARACTERISTICS AND BLACK DEATH MORTALITY RATES

Dependent Variable:	Black Death Mortality Rate (%, 1347-1352)							
	(1)		(2)		(3)		(4)	
Average Temperature 1500-1600 (d)	-0.23	[0.68]					0.26	[0.83]
Elevation (m)	-0.01	[0.01]					-0.00	[0.01]
Cereal Suitability Index	-2.28*	[1.28]					-2.52	[1.52]
Pastoral Suitability Index	4.58	[5.25]					-0.87	[6.49]
Coast 10 Km Dummy	-6.67	[4.98]					-8.94	[5.82]
Rivers 10 Km Dummy	-3.15	[3.08]					-4.26	[3.85]
Latitude (d)	-2.39***	[0.58]					-1.90**	[0.79]
Longitude (d)	0.62**	[0.30]					1.09**	[0.42]
Log Town Population in 1300			-1.41	[1.23]			-1.56	[1.57]
Maj.Roman Rd (MRR) 10 Km Dummy			0.49	[8.48]			-4.74	[6.30]
MRR Intersection 10 Km Dummy			9.67*	[5.71]			8.62	[5.65]
Any Roman Rd (ARR) 10 Km Dummy			6.78	[9.23]			10.39	[7.57]
ARR Intersection 10 Km Dummy			-5.54	[5.53]			-2.15	[5.49]
Medieval Route (MR) 10 Km Dummy			1.07	[4.42]			-1.73	[4.06]
MR Intersection 10 Km Dummy			-3.04	[5.14]			-3.94	[5.41]
Market and Fair Dummy			-5.14	[4.38]			-0.97	[5.16]
Hanseatic League Dummy			-1.03	[6.30]			7.20	[6.88]
Log Market Access in 1300			0.51	[1.00]			-0.07	[1.06]
Aqueduct 10 Km Dummy			3.19	[4.22]			-0.33	[4.66]
University Dummy			3.88	[6.47]			4.43	[7.02]
Monarchy in 1300 Dummy					3.18	[5.44]	6.85	[5.51]
State Capital in 1300 Dummy					7.06	[6.43]	2.01	[7.45]
Parliamentary Activity in 1300-1400					5.08	[4.66]	-0.32	[4.59]
Log Distance to Nearest Parliament					4.49**	[1.95]	0.59	[2.09]
Self-Governing City in 1300 Dummy					-5.30	[4.04]	2.04	[4.38]
Battle w/i 100 Km in 1300-1350 Dummy					-3.59	[3.85]	-6.48	[4.31]
Obs.; R^2	124; 0.27		124; 0.12		124; 0.15		124; 0.36	

Notes: Each column is a separate regression. The variables in (1), (2) and (3) proxy for physical geography, trade and human capital, and institutions, respectively. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 3: MORTALITY RATES AND PERSECUTIONS, INVESTIGATION OF CAUSALITY

Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:					
	Mortality 1347-1352		Constant		Obs.
1. Baseline (Row 1 of Table 1)	-0.009***	[0.002]	0.831***	[0.104]	124
2. Drop if Jews $\geq$ 5% of Town Population	-0.008***	[0.002]	0.779***	[0.113]	107
3. Controls for Jewish Cemetery, Quarter and Synagogue	-0.009***	[0.002]	0.808***	[0.117]	124
4. Controls for Years of First Entry and Last Reentry	-0.009***	[0.002]	0.814***	[0.197]	124
5. Control for Jewish Centrality Index	-0.009***	[0.002]	0.814***	[0.197]	124
6. Row 2 + Row 3 + Row 4 + Row 5	-0.009***	[0.003]	0.478*	[0.279]	107
7. Drop if Known Number of Victims	-0.009***	[0.002]	0.775***	[0.111]	115
8. Dummy if Persecution in 1321-1346	-0.009***	[0.002]	0.812***	[0.107]	124
9. Dummy if Persecution in 1300-1346	-0.009***	[0.002]	0.816***	[0.108]	124
10. Control for Number of Persecutions in 1321-1346	-0.009***	[0.002]	0.812***	[0.107]	124
11. Control for Number of Persecutions in 1300-1346	-0.009***	[0.002]	0.836***	[0.106]	124
12. Drop Top and Bottom 25% in Mortality	-0.015**	[0.007]	1.049***	[0.295]	71
13. Drop if Natural Baths or Response	-0.009***	[0.002]	0.812***	[0.106]	121
14. All Controls of Table 2	-0.005*	[0.003]	1.373	[1.344]	124
15. IV1: Log MA to Messina, Control for Log MA (F: 31.0)	-0.016***	[0.005]	1.134***	[0.184]	123
16. IV1 + Latitude, Longitude and their Squares (F: 4.3)	-0.023*	[0.014]	8.356*	[4.606]	123
17. IV2: #Months between Oct 1347 and First Infection (F: 33.2)	-0.028***	[0.006]	1.567***	[0.240]	124
18. IV2 + Latitude, Longitude and their Squares (F: 7.3)	-0.029**	[0.015]	6.116	[5.522]	124
19. IV1 + IV2 + Latitude, Longitude and Squares (F: 4.4)	-0.019*	[0.011]	8.652**	[4.239]	123
20. Reduced-Form Effect of Log MA to Messina, Ctrl for Log MA	-0.071***	[0.002]	-0.192	[0.200]	123
21. Row 20, for Dummy if Any Jewish Persecution in 1321-1346	-0.001	[0.007]	0.061	[0.076]	121
22. Row 20, for Dummy if Any Jewish Persecution in 1300-1346	-0.003	[0.013]	0.103	[0.136]	121
23. Reduced-Form Effect of #Months btw Oct 1347 and 1st Inf.	0.024***	[0.004]	0.113	[0.069]	124
24. Row 23, for Dummy if Any Jewish Persecution in 1321-1346	-0.002	[0.002]	0.108**	[0.047]	122
25. Row 23, for Dummy if Any Jewish Persecution in 1300-1346	-0.004	[0.004]	0.207***	[0.007]	122

Notes: Row 2: Dropping if we know that Jews accounted for more than 5% of the population. Row 3: Adding dummies for whether there was a Jewish cemetery, quarter and synagogue circa 1347. Row 4: Controlling for the first year Jews have ever been present and the last year of reentry before 1347. Row 5: Adding for the Jewish centrality index. Row 7: Dropping if we know the number of victims. Rows 8-11: Adding controls for whether there has been at least one persecution or more than one persecutions for the current generation (25 years before 1347) or the last two generations (50 years). Row 12: Dropping the top and bottom 25% mortality rates. Row 13: Dropping 2 cities that had natural baths and 1 city that tried to divert boats. Row 14: Adding the same controls as in Table 2. Rows 15-16: Instrumenting by log market access to Messina, controlling for log market access to all 1,869 towns (IV1). Rows 17-18: Instrumenting by the number of months between the Oct 1347 and the month of first infection (IV2). Rows 20-25: Showing the reduced-form effects of IV1 and IV2 in 1347-1352, 1321-1346 and 1300-1346, respectively. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 4: MORTALITY RATES AND PREVENTIVE PERSECUTIONS

Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:					
	Mortality 1347-1352		Constant		Obs.
1. Baseline (Row 1 of Table 1)	-0.009***	[0.002]	0.831***	[0.104]	124
2. Add Dummy if Year-Month of Infection $\geq$ Sept. 1348	-0.007***	[0.002]	0.601***	[0.138]	124
3. Row 2 + Log Dist. to Chillon + Dummy x Log Dist.	-0.007***	[0.002]	-0.251	[0.899]	124
4. Row 2 + Log Dist. to Rhine + Dummy x Log Dist.	-0.005**	[0.003]	-0.972	[0.773]	124
5. Row 2 + Log Dist. to Flagellants + Dummy x Log Dist.	-0.007***	[0.002]	0.499***	[0.133]	124
6. Drop if Likely Preventive Based on Year	-0.009***	[0.002]	0.806***	[0.107]	121
7. Drop if Possibly Preventive Based on Year	-0.009***	[0.002]	0.788***	[0.109]	119
8. Drop if Likely Preventive Based on Year-Month	-0.008***	[0.002]	0.754***	[0.111]	115
9. Drop if Possibly Preventive Based on Year-Month	-0.008***	[0.002]	0.763***	[0.112]	114

Notes: Row 2: We add a dummy if the town was first infected after September 1348 (incl.). Rows 3-5: We also control for the log Euclidean distance to Chillon, the Rhine, and the path of the flagellants, and their interaction with the post-September 1348 dummy. Rows 6-9: We drop the towns where it is likely/possible that the persecution preceded the Black Death, based on the year/month of first infection in the town. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 5: MORTALITY AND PERSECUTIONS, ALTERNATIVE OUTCOMES

Dependent Variable: Dummy if ...	Mortality 1347-1352		Constant		Obs. (Sample)
1. Baseline: Persecution (N = 58)	-0.009***	[0.002]	0.831***	[0.104]	124 (All)
2. Pogrom (N = 53)	-0.007***	[0.002]	0.720***	[0.105]	124 (All)
3. Expulsion (N = 13)	-0.004**	[0.001]	0.244***	[0.077]	124 (All)
4. Expulsion or Annihilation (N = 32)	-0.009**	[0.004]	0.837***	[0.137]	58 (Persecution)
5. Annihilation (N = 19)	-0.008*	[0.004]	0.694***	[0.166]	45 (Pogrom Only)
6. Burning (N = 8)	-0.003	[0.002]	0.178	[0.108]	45 (Pogrom Only)
7. Mob Involved (N = 11)	-0.010***	[0.003]	0.556***	[0.160]	45 (Pogrom Only)
8. Annihilation, Burning or Mob (N = 28)	-0.010**	[0.004]	0.844***	[0.157]	45 (Pogrom Only)
9. Persecution + Successful Prevention (N = 61)	-0.009***	[0.002]	0.857***	[0.103]	124 (All)
10. Persecution - Failed Prevention (N = 50)	-0.009***	[0.002]	0.751***	[0.103]	124 (All)
11. Any Attempt to Prevent (N = 11)	0.003	[0.003]	0.075	[0.086]	61 (Row 9)

Notes: Row 4: Annihilation dummy equal to one if all Jews are killed. Row 6: Burning dummy equal to one if at least one Jew is burned. Row 7: Mob dummy equal to one if the persecution is initiated by a mob. Rows 9-10: We know if the local authority tried to prevent a persecution, and succeeded in doing so. Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 6: MORTALITY AND PERSECUTIONS, MEASUREMENT AND SAMPLING

Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:					
	Mortality 1347-1352		Constant		Obs.
1. Baseline (Row 1 of Table 1)	-0.009***	[0.002]	0.831***	[0.104]	124
2. Use Encyclopedia Judaica Only	-0.013***	[0.002]	0.933***	[0.106]	97
3. Drop if Unsure about Jewish Presence	-0.011***	[0.002]	0.935***	[0.104]	112
4. Also Drop if Unsure about Jewish Persecution	-0.012***	[0.002]	0.957***	[0.109]	92
5. Drop Description-Based Mortality Data	-0.011***	[0.003]	0.927***	[0.110]	97
6. Drop Desertion-Based Mortality Data	-0.006**	[0.003]	0.624***	[0.131]	99
7. Drop Number-Based Mortality Data	-0.010***	[0.003]	0.921***	[0.138]	52
8. Use Only Number-Based Mortality Data	-0.007**	[0.003]	0.704***	[0.159]	72
9. Drop if Mortality Rate = 50%	-0.009***	[0.002]	0.828***	[0.103]	96
10. Keep Top and Bottom 25% in Mortality	-0.008***	[0.002]	0.813***	[0.117]	53
11. Use All Towns with Mortality Data	-0.007***	[0.001]	0.533***	[0.070]	263
12. Use Extrapolated Mortality	-0.015***	[0.002]	0.963***	[0.075]	363
13. Drop if France Today	-0.012***	[0.002]	0.984***	[0.098]	95
14. Drop if Germany Today	-0.006**	[0.003]	0.574***	[0.134]	91
15. Drop if Italy Today	-0.007**	[0.003]	0.804***	[0.114]	104
16. Drop if Portugal Today	-0.009***	[0.002]	0.824***	[0.106]	118
17. Drop if Spain Today	-0.010***	[0.002]	0.887***	[0.108]	103
18. Conley standard errors (100 km)	-0.009***	[0.002]	0.831***	[0.112]	124

Notes: Row 2: Information from *Encyclopedia Judaica* only. Rows 3-4: Dropping if unsure about the presence of Jews and the occurrence of a persecution. Rows 5-7: Dropping towns with description-based, desertion-based or number-based mortality data. Row 8: Using number-based mortality data only. Row 9: Dropping if mortality = 50%. Row 10: Keeping the top and bottom 25% mortality rates. Row 11: Assuming Jews are present in all towns with mortality data (N = 263). Row 12: Using extrapolated mortality rates (based on 263 towns with any mortality data) to use the full sample of Jewish towns. Rows 13-17: Dropping specific countries. Row 18: Accounting for spatial autocorrelation by using Conley SE's (100 km). Robust SE's: * p<0.10, ** p<0.05, *** p<0.01. See Web Appendix for data sources.

Table 7: MORTALITY AND PERSECUTIONS, EVIDENCE ON MECHANISMS

Dependent Variable: Dummy if Any Jewish Persecution in 1347-1352:			
Dummy Equal to 1 if:	Interacted Effect of Mortality x Dummy (δ)		Significance of $\beta + \delta$
1. Close to Chillon Castle (Origin of Rumor)	0.016*	[0.009]	
2. Close to Rhine Towns (Path of Rumor)	0.017**	[0.007]	
3. Close to Path of Flagellants	-0.01	[0.010]	**
4. Some Jews in the Town are Doctors	-0.013	[0.011]	**
5. Very Recent Entry ($\leq$ 5 Years)	0.015***	[0.005]	
6. Less Recent Entry ($\leq$ 50 Years)	0.004	[0.005]	*
7. Holy Roman Empire in 1300	-0.007†	[0.004]	***
8. Seat of Papacy, Bishopric or Archbishopric ca. 1347	-0.007†	[0.005]	***
9. Centralized Monarchy in 1300	0.005	[0.005]	
10. Parliamentary Activity in 1300-1400	0.006	[0.004]	
11. Self-Governing City in 1300	0.001	[0.005]	*
12. Very Recent Persecution in 1340-1346	0.039*	[0.021]	
13. Recent Persecution in 1321-1346	0.012†	[0.008]	
14. Less Recent Persecution in 1300-1346	0.003	[0.007]	
15. Close to Pogrom 1st Crusade (1096)	0.016**	[0.007]	
16. Close to Alleged Ritual Muder 13th Century	0.016**	[0.008]	
17. Close to Alleged Ritual Muder 1st Half 14th Century	-0.002	[0.006]	**
18. Close to Alleged Host Desecration 13th Century	-0.006	[0.007]	**
19. Close to Alleged Host Desecration 1st Half 14th Century	0.011**	[0.005]	
20. Month of First Infection is December (Advent)	-0.022**	[0.009]	***
21. Month of First Infection is January (Christmastide)	0.016**	[0.007]	
22. Month of First Infection is February or March (Lent)	-0.014***	[0.003]	***
23. Month of First Infection is April or May (Easter)	0.011*	[0.006]	
24. Month of First Infection is October (Second Planting)	0.011***	[0.004]	
25. Close to Major Financial Centers	0.008***	[0.002]	
26. Jews in the Town Lend Money to the People	-0.009**	[0.004]	***
27. Jews in the Town Lend Money to the Ruler	0.002	[0.009]	
28. Jews in the Town Contribute Special Taxes	0.000	[0.005]	**
29. Jewish Cemetery, Quarter or Synagogue ca. 1347	0.000	[0.005]	**
30. Bottom 10% Year of First Entry Ever	-0.003	[0.006]	**
31. Ashkenazi Settlement 13th Century	0.015**	[0.007]	
32. Top 10% Town Population in 1300	-0.013***	[0.004]	***
33. Top 10% Overall Market Access in 1300	-0.010***	[0.004]	***
34. Some Jews in the Town are Craftsmen or Traders	-0.002	[0.006]	**
35. Coast 10 Km	0.002	[0.007]	
36. Rivers 10 Km	-0.004	[0.005]	***
37. Medieval Route Intersection 10 Km	-0.009*	[0.005]	***
38. Major Roman Road Intersection 10 Km	-0.007	[0.005]	***
39. Top 10% Jewish Centrality Index	-0.010**	[0.004]	***
40. Hanseatic League	0.005	[0.005]	

Notes: This table shows the respective interacted effects (δ) of the mortality rate times a dummy variable shown in each row 1-40 on a dummy equal to one if there has been any Jewish persecution in 1347-1352, for the main sample of 124 Jewish towns. It also shows the significance (measured by stars) of the combination of the effect of the mortality rate (β) and the interacted effect of the mortality rate and the dummy (δ), to see if the interacted effect is strong effect to offset the protective effect of mortality. The characteristics proxy for factors that may shift the scapegoating and complementarity parameters of the town (θ and R in Figures 1(a) and **??**).

Table 8: JEWISH PRESENCE, PERSECUTIONS, AND TOWN GROWTH

Dependent Variable: Log Change in Town Population in Period [t-1; t]:					
	(1)	(2)	(3)	(4)	
Panel A: Coefficient of Jewish ... in Period [t-1; t]	1000-1100	1100-1200	1200-1300	1300-1400	Obs
1. *Presence*; No Additional Control	0.36*	0.10*	0.29***	0.03	1,869
	[0.21]	[0.05]	[0.10]	[0.05]	
2. *Presence*; Control for Jewish Presence in [t-2; t-1]	0.28†	0.10†	0.45***	0.03	1,869
	[0.17]	[0.07]	[0.20]	[0.12]	
Panel B: Coefficient of Jewish ... in 1347-1352	1353-1400	1353-1500	1353-1600	1353-1700	Obs
1. *Persecution*; Control for Log Extrapol. Mortality	-0.03	-0.13	-0.23*	-0.33**	363
	[0.11]	[0.14]	[0.14]	[0.16]	
2. *Persecution*; Control for Log Mortality	-0.06	-0.11	-0.18	-0.30*	124
	[0.14]	[0.18]	[0.17]	[0.16]	
3. *Pogrom*; Control for Log Extrapol. Mortality	-0.08	-0.18	-0.24*	-0.40**	363
	[0.11]	[0.14]	[0.14]	[0.16]	
4. *Pogrom*; Control for Log Mortality	-0.10	-0.15	-0.15	-0.31*	124
	[0.14]	[0.18]	[0.18]	[0.16]	
5. *Expulsion*; Control for Log Extrapol. Mortality	0.07	0.01	-0.18	-0.38	363
	[0.08]	[0.14]	[0.16]	[0.28]	
6. *Expulsion*; Control for Log Mortality	0.14	0.15	-0.08	-0.14	124
	[0.10]	[0.17]	[0.20]	[0.18]	
Control for Initial Log Town Population	Y	Y	Y	Y	
Control for Past Log Change in Town Population	Y	Y	Y	Y	

Notes: Panel A shows the effect of the Jewish presence dummy on the log change in town population for various periods [t-1; t]. We control for log town population in the initial year t-1 (e.g., 1000 for 1000-1100) as well as the log change in town population in the previous period [t-2; t-1] (e.g., 900-1000 for 1000-1100). *Panel B* shows the effect of a dummy equal to one if there has been a Jewish persecution/pogrom/expulsion during the Black Death period (1347-1352) on the estimated log change in town population for various periods [1353; t]. Town population in 1353 is estimated by multiplying town population in 1300 by (100 - the Black Death mortality rate)/100. We control for the estimated log town population in the initial year 1353, as well as the estimated log change in town population in 1200-1353. Extrapolated mortality is available for all towns and based on the 263 towns for which we have non-extrapolated mortality data. Robust SE's: *** p<0.01, ** p<0.05, * p<0.10, † p<0.15. See Data Appendix for data sources.