Military Conflict and the Rise of Urban Europe*

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Abstract

We present new evidence about the relationship between military conflict and city population growth in Europe from the fall of Charlemagne's empire to the start of the Industrial Revolution. Military conflict was a main feature of European history. We argue that cities were safe harbors from conflict threats. To test this argument, we construct a novel database that geocodes the locations of 1,062 conflicts and 676 cities between 900 and 1799. We find a significant, positive, and robust relationship between conflict exposure and city population growth. Our analysis suggests that military conflict played a key role in the rise of urban Europe.

Keywords: warfare, cities, political and economic development, Europe
JEL codes: C20, O10, N40, N90, P48, R11

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1 Introduction

One thousand years ago, the few towns that existed in Europe were Roman relics (Hohenberg and Lees, 1995, p. 1). Now well over half of Europe's population lives in urban areas (Bairoch, 1988, p. 219). Indeed, scholars argue that cities played a central role in the political and economic rise of Europe.[1]

What explains Europe's dramatic urban growth over the past millennium? This paper tests the role of a key feature of European history: military conflict. Tilly (1992, p. 72) estimates that early modern Europe was at war in 90 percent of all years. To the best of our knowledge, our paper is among the first to systematically test for this relationship.

We argue that historical cities were "safe harbors" from conflict threats (Glaeser and Shapiro, 2002). This argument dates back to at least Pirenne (1925), who saw city origins in fortifications to protect local populations. Section 2 develops our argument and provides historical background.

To test this argument, we construct a novel database that spans the fall of Charlemagne's empire to the start of the Industrial Revolution. We identify the geographic locations of all conflicts fought on land from 900 to 1799 in Europe, the Ottoman Empire, and the Middle East. In total, our data include 1,062 conflicts and 676 cities. To measure city exposure to conflict threats, we geocode conflict and city locations at the local (grid cell) level. Section 3 further describes our data and measurement.

The results of our econometric analysis show a positive, significant, and robust relationship between conflict exposure and city population growth. We find that conflict exposure was associated with a 7-14 percent average increase in city populations per century. To put such magnitudes into perspective, average sample city population growth between 900 and 1800 was 26 percent. Our estimates thus suggest that conflict-related city population growth was responsible for 27-54 percent of actual city population growth over this period, and for 11-22 percent of its standard deviation. The results are robust to a broad range of specifications, controls, and sub-samples, all of which we detail in Sections 4 and 5.

Our paper belongs to the literature that examines the historical roots of current political and economic outcomes (e.g., Acemoglu et al., 2005). Specifically, our paper is related to the literature that examines the political and economic legacy of warfare. To explain the emergence of the modern state in Europe, Tilly (1992), Besley and Persson (2009), Gennaioli and Voth (2012), and Karaman and Pamuk (2013) highlight the role of military com-

[1] See among others Weber (1922), Pirenne (1925), Mumford (1960), Bairoch (1988), Hohenberg and Lees (1995), and Glaeser (2011). Mokyr (1995) and Stasavage (2014) provide critiques of this view.

petition. In a similar manner, Brewer (1989), O'Brien (2011), Hoffman (2011), Rosenthal and Wong (2011), Voigtländer and Voth (2013a,b), and Ko et al. (2014) link military competition in Europe to subsequent global hegemony. Our paper complements this literature by testing the relationship between warfare and urban – rather than national – performance.[2]

Our paper is also related to the literature that examines political and economic development in Europe at the city level, including Bairoch (1988), Guiso et al. (2008), Dittmar (2011), van Zanden et al. (2012), Bosker et al. (2013), Abramson and Boix (2014), Cantoni and Yuchtman (2014), and Stasavage (2014). We complement this literature by bringing the role of military conflicts to bear.[3]

The paper proceeds as follows. The next section develops our argument. Section 3 describes the database and measurement. Section 4 presents the econometric methodology and the main results. Sections 5 tests for robustness. Section 6 concludes.

2 Military Conflict and City Population Growth

City Origins

Scholars trace urbanization in medieval Europe to the ninth-century break-up of Charlemagne's empire (Rosenthal and Wong, 2011, Stasavage, 2011). van Zanden (2009, p. 33) estimates that the number of independent states in Europe grew from less than 10 in 800 to more than 200 by 1300. Political fragmentation created instability and warfare, which van Zanden (2009, p. 34) describes as follows:

> This decentralization of political power often resulted in continuous warfare among the local lords, but at the same time led to an intensification of power at the local level.

Urban fortifications enabled rural populations to escape from some of the most destructive effects of medieval warfare. In a chapter entitled "City Origins", Pirenne (1925, p. 71) writes:

> In the midst of the insecurity and the disorders which imparted so lugubrious a character to the second half of the ninth century, it therefore fell to the towns

[2]Works that test the legacy of historical conflict in other contexts include Scheve and Stasavage (2010), Aghion et al. (2012), Dincecco and Prado (2012), and Besley and Reynal-Querol (2014).

[3]A related antecedent is Glaeser and Shapiro (2002), who study the links between mass violence and urban form. They show cross-country evidence for a positive and significant relationship between terrorism and urbanization over the 1970s.

> to fulfill a true mission of protection. They were, in every sense of the word, the ramparts of a society invaded, under tribute, and terrorized.

Mumford (1960, p. 248) states:

> But from the eighth century to the eleventh, the darkness thickened; and the early period of violence, paralysis, and terror worsened with the Saracen and the Viking invasions. Everyone sought security. When every chance might be a mischance, when every moment might be one's last moment, the need for protection dominated every other concern. Isolation no longer guaranteed safety. If the monastery had conducted the retreat, the city led the counter-attack.

Current scholars also see defense as key to the origins of cities. According to Hohenberg and Lees (1995, p. 31):

> Often, topographical difficulties were actually sought out for their defensive value. A marsh (Venice) or a hilltop (Langres) would serve well. Note, too, that a fortified castle often formed the town nucleus, again pointing up the primacy of strategic factors.

Similarly, Glaeser and Shapiro (2002, p. 208) write:

> The first, and probably most important, interaction between warfare and urban development is that historically cities have provided protection against land-based attackers. Cities have the dual advantages of large numbers and walls and thus, holding the size of the attack constant, it is much better to be in a city than alone in the hinterland. Indeed, the role of cities in protecting their residents against outside attackers is one of the main reasons why many cities developed over time.

Glaeser and Shapiro (2002) call this effect the "safe harbor effect". In medieval Europe, scale advantage was key to military victory. Difficult-to-surmount city walls enabled small groups of defenders to fend off even large groups of attackers. As Mumford (1960, p. 250) states: "Against sudden raids a wall, on guard at all hours, was more useful than any amount of military courage". Furthermore, city walls engendered a scale economy. As city size increased, there was a sharp drop in the required length of wall per person (Glaeser and Shapiro, 2002).

Historical Evidence

Historical evidence provides strong support for the safe harbor effect. Hale (1985, p. 196) writes:

> In terms of personal impact the burdens of war certainly afflicted the rural more than the urban population.

Military campaigns could inflict numerous costs on rural populations. There was the potential for manpower losses in the fields, first because peasants were war recruits and second due to campaign-related deaths (Gutmann, 1980, p. 75). Furthermore, there was the potential for destruction to crops, farms, and homes due to arson. Peasants were responsible for large tax burdens during conflicts and for repair costs for damages to physical infrastructure (Caferro, 2008, p. 187). Because peasants had to billet soldiers, peacetime preparations for future campaigns were also costly (Hale, 1985, p. 197).

Mumford (1960, p. 250) provides several examples of urban safe harbors in response to ninth-century conflict threats by Vikings. The Vikings plundered the monastery of St. Omer in France in 860 and 878. In response, the abbey built walls and was able to defend itself against the Viking attack of 891. By the tenth century, St. Omer had developed into a town. Out of fear of Viking attack, the German city of Mainz also rebuilt its broken Roman walls.

Rural populations sometimes sought urban protection from long distances. Pirenne (1925, p. 70-1) tells the story of monks from St. Vaast who found refuge from Viking invaders at Beauvais (walking distance 307 km) in the late ninth century. To escape from the advancing Ottoman army, a large population of Albanians who became known as the Arberesh crossed the Adriatic sea and relocated to towns in Southern Italy in the fifteenth century (Vickers, 1999, p. 9).

The safe harbor effect was widespread (Mumford, 1960, p. 248-53). According to Rosenthal and Wong (2011, pp. 115):

> By the Renaissance the most urbanized areas of Europe were also those where conflict had raged most often: the band of territories from Flanders to Rome, including the Burgundian estates, western Germany, and northern Italy.

Target Effect

The safe harbor effect suggests that there should be a positive relationship between military conflict and city population growth. By contrast, Glaeser and Shapiro (2002) also identify a "target effect", whereby larger cities were more attractive targets for attackers.

Since urban density facilitates plunder, ceteris paribus, attackers will prefer urban zones to rural ones. If the target effect dominates the safe harbor effect, then we should observe a negative relationship between military conflict and city populations. Our econometric analysis ahead will seek to account for a target effect.

Alternative Explanations

Beyond the safe harbor effect induced by threats of military conflict, scholars highlight other factors that help explain historical urbanization, which we now describe.

Initial conditions are one such factor. Rokkan (1975) argues that key river trade routes led to early urban growth, while Tilly (1992) emphasizes early commercial activities. Abramson and Boix (2014) argue that urban clusters were most likely to form in productive agricultural zones. White (1962) and Andersen et al. (2013) relate the adoption of the heavy plow to greater urbanization in zones with clay soils.

Another strand of literature highlights political factors. De Long and Shleifer (1993), Acemoglu et al. (2005), and van Zanden et al. (2012) link representative government, which they argue protected private property rights, with greater urbanization. By contrast, Stasavage (2014) argues that, due to their oligarchic structures, self-governing cities had negative long-run consequences for urbanization.

Other scholars focus on human and social capital. Dittmar (2011) shows evidence that urbanization was fastest where the moveable type printing press, which promoted new merchant skills, was adopted. Using city-level data for medieval Germany, Cantoni and Yuchtman (2014) find that university training improved legal infrastructure and reduced trade costs. Greif and Tabellini (2010) argue that weak kin relations led to urban growth as a way to facilitate wide-scale cooperation. Guiso et al. (2008) show evidence that the medieval establishment of free cities had consequences for the development of social capital in Italy.

Voigtländer and Voth (2013a,b) study the dynamic interactions between warfare, disease, and urbanization in the aftermath of the fourteenth-century Black Death. They argue that this population shock set off a sequence of events, starting with greater demand for manufactured goods and urbanization, that enabled Europe to emerge from a Malthusian economy.

Our econometric analysis ahead will seek to account for these sorts of economic, geographic, political, and social factors. For example, we will control for physical geography at the city level, and will control for local political institutions.

3 Data and Measurement

Our historical urban population data are from Bairoch et al. (1988), which provides population data for all European cities that ever reached 5,000 inhabitants at century intervals for 800 to 1700 and half-century intervals for 1750 to 1850.[4] To help maintain estimation intervals of equal lengths, we focus our analysis on century (rather than the half-century) intervals. Our sample period runs from 900, just after the fall of Charlemagne's empire, to 1800, just before the start of the Industrial Revolution in Continental Europe.[5] To account for city-level features, we merge the Bairoch et al. data with data from Bosker et al. (2013), which leaves us with an unbalanced panel of 676 cities.[6]

Our historical conflict data are from Bradbury (2004) and Clodfelter (2002).[7] Bradbury (2004) provides data on all military conflicts in the medieval West. The Bradbury data are organized into chapters, each of which covers a different geographical area of medieval warfare. Within each chapter, there is a summary of each military conflict fought, including a description of the conflict's location, approximate date, and type. The Bradbury data end in 1525. For 1500 onward, we use the Clodfelter data, which start that year. The Clodfelter data are organized into chapters by century and geographical area. We focus on military conflicts fought in Europe, the Ottoman Empire, and the Middle East. Like the Bradbury data, the Clodfelter data include factual information about each conflict.

Historical accounts cannot pinpoint the exact geographical locations of military conflicts. We thus approximate conflict locations by the settlement (hamlet, village, town, city) nearest to where they took place. This method is both feasible, given the lack of available historical information, and intuitive, because conflicts were typically named after nearby settlements. To illustrate, the Battle of Mons-en-Pévèle was fought on July 18, 1304 between Philip IV of France and William of Jülich of Flanders. This battle took place near the commune of Mons-en-Pévèle in northern France. We thus assigned the geographical coordinates of Mons-en-Pévèle to it (50° 28′ 49.08″ N, 3° 6′ 11.16″ E).

The Bradbury data typically list individual conflicts along with their approximate locations. However, the Clodfelter data typically list wars, which could span wide geographical areas. To identify the approximate locations in which wars were fought, we

[4]The Bairoch et al. data do not include 1100. De Vries (1984) is an alternative data source for European historical urban populations. However, the De Vries data do not start until 1500.

[5]The nature of warfare changed dramatically over the nineteenth century due to improvements in transport and communications technologies and the rise of the mass army (Onorato et al., 2014).

[6]We updated the urban population data according to Bosker et al. (2013) for Bruges, Cordoba, London, Palermo, and Paris.

[7]Tilly (1992) and Jaques (2007) are two other sources for historical conflict data, both of which support the argument that military conflict was a defining feature of European history.

decomposed all wars into the individual conflicts that comprised them. Table 1 displays an example using the Thirty Years' War (1618-48), which was comprised of 37 recorded conflicts.

Table 2 summarizes the historical conflict data. Military conflict was a key feature of European history: 1,062 land-based conflicts took place from 900 to 1800, for an average of 118 per century. The tenth century saw the least conflict, with 18 recorded conflicts, while the eighteenth century saw the most, with 398. Breaking the data down by modern-day countries, France saw the most conflict over this period, at 161, followed by Italy (137), Britain (131), Germany (103), and the Low Countries of Belgium and the Netherlands (64).

To measure city exposure to military conflicts, we use 150 km x 150 km grid-scale cells.[8] This size of grid cell roughly corresponds with NUTS2 units (e.g., county, province, region), the intermediate division of economic territory devised by Eurostat, the statistical office of the European Union. For example, the Tuscany region in Italy is approximately 150 km x 150 km. There are 192 grid cells in our sample. In line with the approach taken by Besley and Reynal-Querol (2014), we construct a dummy variable for each grid cell that equals 1 if there was a military conflict in that cell for each century from 900 to 1800, and 0 otherwise. Figure 1 maps the 1,062 conflicts between 900 and 1800 along with the 676 cities that we will exploit in this analysis.

4 Econometric Analysis

Methodology

The linear specification that we estimate is

$$P_{i,g,t} = \alpha + \beta C_{i,g,t} + \mu_i + \lambda_t + \gamma' \mathbf{X_{i,g,t}} + \epsilon_{i,g,t}, \tag{1}$$

where $P_{i,g,t}$ is log population for city i in grid cell g at century t, $C_{i,g,t}$ is the conflict dummy that equals 1 for city i if there was a military conflict in grid cell g over the previous century, μ_i and λ_t are fixed effects by city and century, $\mathbf{X_{i,g,t}}$ is a vector of city-level controls that we will include in a robustness check, and $\epsilon_{i,g,t}$ is a random error term. All standard errors are robust, clustered at the city level to account for any within-city serial correlation in the error term.

Table 3 displays the descriptive statistics for the regression variables.

[8]We use a cylindrical equal area map projection with geometric center (longitude, latitude)=(10.00735, 46.76396), near Davos, Switzerland.

Main Results

Table 4 presents our estimates for the relationship between conflict exposure and city population growth. City fixed effects account for initial conditions (economic, demographic, political, social) and local geographical features that may have influenced military conflict patterns. Century fixed effects control for common shocks across time. Column 1 shows the results for this benchmark specification. There is a significant relationship (at the 1 percent level) between military conflicts that took place within the same 150 km x 150 km grid cell in which a city was located and city populations. Conflict exposure was associated with a 13 percent average increase in city populations per century.

Fixed effects by city and century account for unobserved features that were constant for each city and across each century. To control for unobserved factors that had time-varying local consequences for urbanization patterns, column 2 adds grid cell-specific time trends. The result for conflict exposure remains highly significant, although the point estimate falls to 7 percent.

To account for changes over time in country-level variables, including total populations, urbanization rates, economic activity, and nation-state building, column 3 adds country-century interaction effects to the benchmark specification. The estimate for conflict exposure is similar in magnitude and significance as the benchmark case.

City fixed effects control for initial demographic conditions. Grid-cell specific trends and country-century interaction effects control, in different ways, for demographic trends at the local and national levels, respectively. Still, it is possible that cities with larger or smaller initial populations grew at different rates. To further control for pre-existing trends or mean reversion effects, columns 4 to 6 add initial log city population-century interaction effects and re-estimate the first three specifications (Acemoglu et al., 2011). The results are similar in magnitude and significance to the previous cases, with point estimates ranging from 7 to 10 percent.[9]

Including initial log city population-century interaction effects is a demanding way to account for pre-existing trends. To even further address the possibility that city population growth reflected an underlying trend rather than conflict exposure, we create conflict exposure placebos that recode our exposure measure as if conflicts had taken place one or two centuries prior to the actual dates and re-estimate the specification in column 4 (Stasavage, 2014). Column 7 uses the one-century exposure placebo and column 8 uses both the one- and two-century placebos. The placebo coefficients are never significant,

[9] As an alternative, we introduced the lagged dependent variable, $P_{i,g,t-1}$, as a regressor and re-ran the benchmark specification. To ensure consistency, we used GMM estimation (Arellano and Bond, 1991). The result for conflict exposure was similar as before, with a point estimate of 5 percent.

which provides additional evidence that an underlying trend does not drive the positive and significant relationship between conflict exposure and city population growth that we observe.

Overall, Table 4 shows evidence for a significant relationship between conflict exposure and city population growth in Europe from the fall of Charlemagne's empire to the start of the Industrial Revolution. The results are robust to a variety of checks for omitted variable bias and reverse causation. Given that average sample city population growth over the 900-1800 period was 26 percent, our estimates suggest that conflict-related city population growth was responsible for about one-quarter to one-half of actual city population growth over this period, and for 11-22 percent of its standard deviation.

5 Robustness

Geography and Time

City fixed effects account for local geographical features including latitudes and longitudes. To further test whether centrally located cities drive our results, column 1 of Table 5 restricts the sample to cities that lay *outside* the urban belt.[10] By contrast, column 2 restricts the sample to cities *within* the urban belt. Finally, to further control for the influence of early industrialization – beyond country-century interaction effects as in columns 3 and 6 of Table 4 – column 3 excludes British (along with Irish) cities. The results for conflict exposure are robust to these geographical changes to the sample: conflict exposure was associated with a 12-16 percent average increase in city populations per century.

The 1700s saw over 35 percent of all sample conflicts. To further test – beyond century fixed effects – whether eighteenth-century conflicts drive our results, column 4 restricts the sample to conflicts from 900 to 1700. The result for conflict exposure on greater city populations remain unchanged.[11]

Atlantic Trade

Acemoglu et al. (2005) show evidence that Atlantic traders (Britain, France, the Netherlands, Portugal, Spain) saw significantly faster urbanization rates from 1500 onward. To account for the rise of Atlantic trade (beyond country-century interaction effects), column

[10] We exclude all cities in Austria, Belgium, France, Germany, the Netherlands, northern Italy, and Switzerland.

[11] For further robustness, we restricted the sample to 1200-1800. The results for conflict exposure were similar in magnitude and significance as before.

1 of Table 6 interacts Atlantic port cities with century dummies. The result for conflict exposure is robust to the inclusion of these interaction effects.

Heavy Plow

White (1962) and Andersen et al. (2013) argue that the breakthrough adoption of the heavy plow in 1000 led to greater urbanization in European regions with clay soils. To control for technological changes in agriculture (again, beyond country-century interaction effects), column 2 of Table 6 interacts city-level soil quality according to Bosker et al. (2013) with century dummies. The result for conflict exposure is similar in magnitude and significance to the previous specifications.

Ruggedness

Hohenberg and Lees (1995) note that, for defensive purposes, city locations were often in difficult-to-reach places. Column 3 of Table 6 interacts ruggedness, another city-level geographical feature from Bosker et al. (2013), with century dummies. The result for conflict exposure is again similar as before.

Other City-Level Features

We control for several time-varying city-level features according to Bosker et al. (2013). To account for urban networks, we control for the number of cities with populations of at least 10,000 that were located within 100 km. To account for political institutions, we include a dummy variable for whether a city was a self-governing commune. We also control for whether a city was a sovereign capital. To account for education, we include a dummy variable for whether a city hosted a university. To account for religion, we control for whether a city was a bishop or archbishop seat.

Column 4 of Table 6 adds these city-level controls. The estimate for conflict exposure remains highly significant, even if the point estimate falls slightly. Dense urban networks, self-governing communes, sovereign capitals, and university hosts were associated with significant increases in city populations (not reported).

Conflict Type

Battles and sieges comprise over 90 percent of our historical conflict data. To test the relationship between conflict type and city population outcomes, column 1 of Table 7 restricts the conflict sample to battles, of which there were 576 over the 900-1800 period. The coefficient for conflict exposure is positive, but not significant. To account for country-level demographic, economic, and institutional changes over time, column 2 adds country-century interaction effects. Now the coefficient for conflict exposure is significant, with a point estimate of 8 percent. Columns 3 and 4 repeat the previous two specifications for an alternative conflict sample that includes sieges only, of which there were 420. The results for conflict exposure are robust to this change.

Target Effect

Recall that columns 4 to 6 of Table 4 interact initial log city populations with century dummies to control for pre-existing trends or mean reversion effects. In Tables A1 and A2 of the Appendix, we show that the results in Tables 5 and 6 are also generally robust to the inclusion of initial log city population-century interaction effects, with point estimates ranging from 5 to 10 percent. Similarly, recall that columns 7 and 8 of Table 4 perform placebo tests for an underlying trend. These exercises all show evidence against a significant target effect, whereby larger cities made for more attractive targets for attackers.

As another alternative test for a target effect, we regressed our conflict exposure measure on lagged city populations, $P_{i,g,t-1}$, in the column 4 specification from Table 4. The coefficient for $P_{i,g,t-1}$ was not significant. This result provides additional evidence that a target effect does not drive our results.[12]

Summary

Overall, the robustness checks described in this section reinforce the validity of our main result, namely that there is a strong and significant relationship between conflict exposure and city population growth in European history.

6 Conclusion

This paper presents new evidence about the relationship between military conflict and city population growth in Europe from the fall of Charlemagne's empire to the start of the Industrial Revolution. Military conflict was a defining feature of European history. Our

[12] As a different but related test, we regressed lagged city populations, $P_{i,g,t}$, on our conflict exposure measure in the same specification (column 4, Table 4). The safe harbor argument says nothing about this relationship: conflict exposure should influence future, but not past, city populations. In fact, the estimate was not significant. This result provides additional evidence that our results are not spurious.

argument follows a distinguished line of scholars that view historical cities as safe harbors from conflict threats.

To test our argument, we perform an econometric analysis on a novel database that spans 900 years. Our analysis accounts for potential biases from unobserved heterogeneity, omitted variables, and reverse causation. We show evidence for a positive, significant, and robust relationship between conflict exposure and city population growth. Our estimates suggest that conflict-related city population growth was responsible for 27-54 percent of actual city population growth between 900 and 1800.

To the best of our knowledge, our paper is among the first to provide systematic evidence that military conflicts played a key role in the rise of urban Europe. Does the legacy of historical conflict persist? Systematic study of the long-run consequences of historical conflict for urban prosperity in Europe is an exciting topic for future work.

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Table 1: Military Conflicts Comprising the Thirty Years' War

	Conflict Name	Year	Nearest Settlement	Country
1	Sablat	1619	Budweis	Czech Rep
2	White Hill	1620	Prague	Czech Rep
3	Fleurus	1622	Fleurus	Belgium
4	Hochst	1622	Frankfurt am Main	Germany
5	Wimpfen	1622	Bad Wimpfen	Germany
6	Stadtlohn	1623	Stadtlohn	Germany
7	Breda	1624	Breda	Netherlands
8	Bridge of Dessau	1625	Dessau	Germany
9	Lutter	1626	Lutter am Barenberge	Germany
10	Stralsund	1626	Stralsund	Germany
11	Wolgast	1628	Wolgast	Germany
12	Madgeburg	1630-1	Madgeburg	Germany
13	Breitenfeld	1631	Leipzig	Germany
14	Frankfurt (Oder)	1631	Frankfurt (Oder)	Germany
15	Werben	1631	Werben (Elbe)	Germany
16	Lützen	1632	Lützen	Germany
17	Nuremberg	1632	Nuremberg	Germany
18	River Lech	1632	Rain	Germany
19	Nordlingen	1634	Nordlingen	Germany
20	Tornavento	1636	Oleggio	Italy
21	Wittstock	1636	Wittstock	Germany
22	Breda	1637	Breda	Netherlands
23	Leucate	1637	Leucate	France
24	Breisach	1638	Breisach	Germany
25	Fuenterrabia	1638	Hondarribia	Spain
26	Rheinfelden	1638	Rheinfelden	Switzerland
27	Casale	1640	Casale Monferrato	Italy
28	2nd Breitenfeld	1642	Leipzig	Germany
29	Lérida	1642	Lérida	Spain
30	Rocroi	1643	Rocroi	France
31	Freiburg	1644	Freiburg im Breisgau	Germany
32	Allerheim	1645	Allerheim	Germany
33	Jankau	1645	Jankov	Czech Rep
34	Mergentheim	1645	Bad Mergentheim	Germany
35	Lérida	1647	Lérida	Spain
36	Lens	1648	Lens	France
37	Zusmarshausen	1648	Zusmarshausen	Germany

Source: Clodfelter (2002).

Table 2: Military Conflicts, 900-1799

900s	1000s	1100s	1200s	1300s	1400s	1500s	1600s	1700s	Total	Avg
18	61	51	48	60	77	149	200	398	1,062	118

Sources: Bradbury (2004) for 900-1499 and Clodfelter (2002) for 1500-1799.

Note: All land-based conflicts in Europe, Ottoman Empire, and Middle East included.

Table 3: Descriptive Statistics

	Obs	Mean	Std Dev	Min	Max
Log city population	2,876	2.415	0.956	0	6.854
Conflict exposure	2,876	0.373	0.484	0	1
Atlantic port	2,876	0.072	0.258	0	1
Soil quality	2,876	0.727	0.227	0.011	0.999
Ruggedness	2,876	67.634	74.131	0.466	559.450
Urban network	2,876	3.046	3.843	0	27
Commune	2,876	0.526	0.499	0	1
Capital city	2,876	0.069	0.254	0	1
University	2,876	0.125	0.331	0	1
Bishop seat	2,876	0.490	0.500	0	1

Sources: See text.

Table 4: Military Conflict and City Population Growth, 900-1800

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable is log city population							
Conflict exposure	0.127	0.066	0.131	0.075	0.065	0.097		
	(0.034)	(0.030)	(0.034)	(0.030)	(0.028)	(0.030)		
	(0.000)	(0.026)	(0.000)	(0.013)	(0.020)	(0.001)		
Conflict exposure (100-yr placebo)							0.053	0.046
							(0.033)	(0.037)
							(0.114)	(0.209)
Conflict exposure (200-yr placebo)								0.012
								(0.040)
								(0.760)
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid cell time trends	No	Yes	No	No	Yes	No	No	No
Country x century FE	No	No	Yes	No	No	Yes	No	No
Initial log city pop x century FE	No	No	No	Yes	Yes	Yes	Yes	Yes
R-squared	0.263	0.488	0.433	0.478	0.586	0.579	0.365	0.344
Observations	2,876	2,876	2,876	2,876	2,876	2,876	2,203	1,678

Note: Estimation method is OLS. All regressions include fixed effects by city and century. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.

Table 5: Military Conflict and City Population Growth, 900-1800: Robustness

	(1)	(2)	(3)	(4)
	Dependent variable is log city population			
	Outside urban belt	Inside urban belt	Exclude British cities	900-1700 sample
Conflict exposure	0.133	0.118	0.159	0.126
	(0.048)	(0.045)	(0.036)	(0.036)
	(0.006)	(0.010)	(0.000)	(0.000)
City FE	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes
R-squared	0.261	0.302	0.231	0.166
Observations	1,568	1,308	2,574	2,203

Note: Estimation method is OLS. All regressions include fixed effects by city and century. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.

Table 6: Military Conflict and City Population Growth, 900-1800: Robustness

	(1)	(2)	(3)	(4)
	Dependent variable is log city population			
	Atlantic trade	Soil quality	Ruggedness	City controls
Conflict exposure	0.128	0.115	0.121	0.087
	(0.034)	(0.035)	(0.034)	(0.032)
	(0.000)	(0.001)	(0.000)	(0.007)
City FE	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes
Atlantic port x century FE	Yes	No	No	No
Soil quality x century FE	No	Yes	No	No
Ruggedness x century FE	No	No	Yes	No
City-level controls	No	No	No	Yes
R-squared	0.275	0.283	0.270	0.358
Observations	2,876	2,876	2,876	2,876

Note: Estimation method is OLS. All regressions include fixed effects by city and century. City-level controls for urban networks and centuries for which cities were self-governing communes, university hosts, sovereign capitals, or bishop or archbishop seats. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.

Table 7: Military Conflict and City Pop Growth, 900-1800: Robustness

	(1)	(2)	(3)	(4)
	Dependent variable is log city population			
	Battles only		Sieges only	
Conflict exposure	0.046	0.082	0.110	0.091
	(0.037)	(0.037)	(0.045)	(0.045)
	(0.211)	(0.027)	(0.015)	(0.043)
City FE	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes
Country x century FE	No	Yes	No	Yes
R-squared	0.259	0.431	0.261	0.431
Observations	2,876	2,876	2,876	2,876

Note: Estimation method is OLS. All regressions include fixed effects by city and century. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.

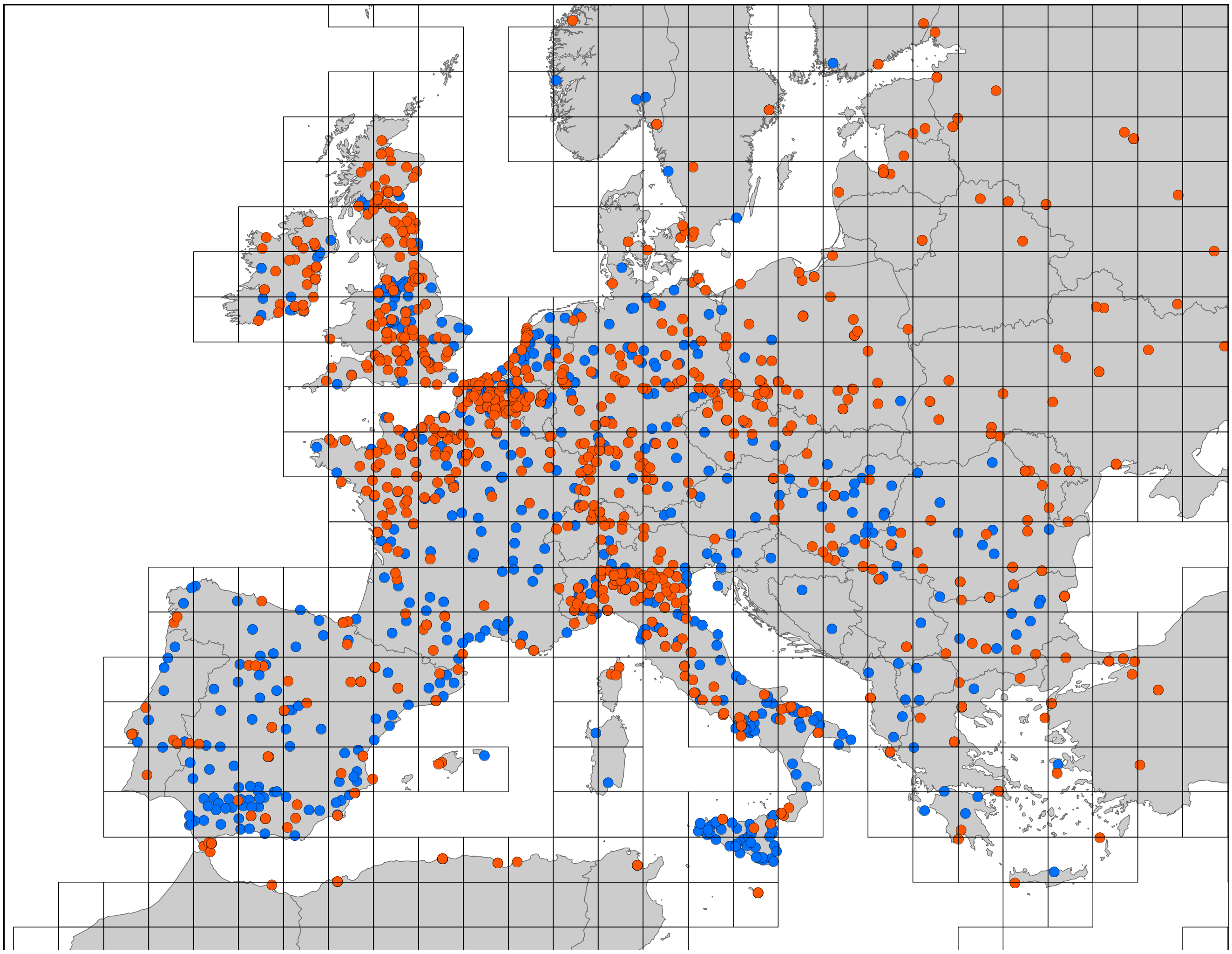

Figure 1: Conflict and City Locations, 900-1800. 1,062 conflicts (red circles) and 676 cities (blue circles) included. Grid-scale cells are 150 km x 150 km.

Appendix

Table A1: Military Conflict and City Population Growth, 900-1800: Further Robustness

	(1)	(2)	(3)	(4)
	Dependent variable is log city population			
	Outside urban belt	Inside urban belt	Exclude British cities	900-1700 sample
Conflict exposure	0.081	0.059	0.096	0.076
	(0.045)	(0.039)	(0.032)	(0.033)
	(0.071)	(0.135)	(0.003)	(0.021)
City FE	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes
Initial log city pop x century FE	Yes	Yes	Yes	Yes
R-squared	0.473	0.514	0.447	0.367
Observations	1,568	1,308	2,574	2,203

Note: Estimation method is OLS. All regressions include fixed effects by city and century. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.

Table A2: Military Conflict and City Population Growth, 900-1800: Further Robustness

	(1)	(2)	(3)	(4)
	Dependent variable is log city population			
	Atlantic trade	Soil quality	Ruggedness	City-level controls
Conflict exposure	0.079	0.069	0.068	0.048
	(0.030)	(0.031)	(0.030)	(0.029)
	(0.009)	(0.025)	(0.025)	(0.091)
City FE	Yes	Yes	Yes	Yes
Century FE	Yes	Yes	Yes	Yes
Initial log city pop x century FE	Yes	Yes	Yes	Yes
Atlantic port x century FE	Yes	No	No	No
Soil quality x century FE	No	Yes	No	No
Ruggedness x century FE	No	No	Yes	No
City-level controls	No	No	No	Yes
R-squared	0.487	0.483	0.481	0.522
Observations	2,876	2,876	2,876	2,876

Note: Estimation method is OLS. All regressions include fixed effects by city and century. City-level controls for urban networks and centuries for which cities were self-governing communes, university hosts, sovereign capitals, or bishop or archbishop seats. Robust standard errors clustered by city in parentheses, followed by corresponding p-values.