Territorial State Capacity and Elite Violence from the 6th to the 19th century

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Abstract

We present new evidence for elite violence using regicide, the killing of kings, and investigate the role of the state in European violence between the 6th and 19th centuries. First, regicide is critically assessed as a proxy for interpersonal elite violence. Second, we propose 'territorial state capacity' as a measure of states being able to keep or even expand their territories. We find a negative correlation between the changes in territorial state capacity and the changes in elite violence. This could be interpreted in two ways, either that growing territorial state capacity enabled human society to reduce violence, or that a higher regicide rate resulted in lower territorial state capacity. Another possibility would be a bidirectional mechanism that resulted in a co-evolution of the two variables.

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1. Introduction[1]

Pinker (2011) argues that the development of state capacity and stable political institutions have enabled human societies to dramatically reduce interpersonal and interstate violence over centuries (see also Hoffman 2015).[2] In the very long run, the state was able to reduce violent behaviour through policing and educational functions. To give an example, in his study, Pinker investigated two extremely violent periods of modern state behaviour by comparing, on the one side, Germany and Russia (later the Soviet Union) during the early 20th century (characterized by the Holocaust, civil war, and two devastating world wars) to 27 non-state societies where more than 500 people per 100.000 population were killed each year, on the other side. The deadly early 20th century in Germany and Russia led, respectively, to 144 and 135 violent deaths annually per 100.000 people, less than one-third of the 27 non-state societies (Pinker 2011, pp. 52-3, see also Hoffman 2015).

However, in spite of this suggestive evidence for Pinker's hypothesis, our knowledge about early state capacity and early violence has been very limited until now. Hence, this study provides and carefully evaluates a large new dataset on Europe between 500 and 1900 CE, in order to assess the relationship between state capacity and elite violence.

Clearly, war-related and interpersonal violence are challenging topics to study over the very long run. We use regicide – the killing of kings and other rulers – as a proxy indicator for both war-related and interpersonal elite violence (see Eisner 2011). We show that both

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[1] We thank the German Science Foundation for the grant for SFB 1070 "RESOURCECULTURES". Excellent research assistance was provided by Larissa Zimmermann and Sabrina Küspert.

[2] Clearly, there were also many instances when governments became exploitative or totalitarian actors who increased violence by themselves (Acemoglu 2005).

components of overall elite violence are in fact highly correlated. As such, this approach allows us to study more than a millennium of the history of violence and state formation.

How can we measure state capacity for the Middle Ages? One possibility is to use the territorial stability of early polities. During the medieval period, states aimed at keeping their territory or expanding it if possible; there was strong competition between existing principalities and many of them disappeared from the landscape, whereas others kept their territories or even grew. We argue that an important motive for territorial expansion throughout history has been to increase fiscal capacity with the objective to finance fiscal expenditures, for example, for rulers' military security. While this may sound tautological, the situation of military competition in this early period forced rulers to behave this way, as they did not want their dynasties to collapse. We suggest, below, that high territorial state capacity was not only correlated with total tax capacity (which seems undisputed, as more territory results in more taxes, see Besley and Persson 2011) but also that tax capacity on a per capita basis was higher in the better organized states that were able to keep or even expand their territories. Note that we do not interpret 'expansion' as something positive per se, but new territory normally leads to an increase in potential (fiscal) state capacity (Besley and Persson 2011).

Naturally, territorial state capacity is itself determined by different variables. Apart from the ability to organise military action (or successful defence), some ruling families of more successful states were able to arrange marriages strategically in order to acquire valuable territories (Kohler 1994). We carefully account for such factors in multivariate regressions to estimate a (conditional) correlation between state capacity and elite violence, two crucial components of development.

We do not claim causality from our estimates, as the direction of causality can go in both ways: higher territorial state capacity can decrease violence, but higher regicide might also lead to a reduction in territory, as various historical examples suggest (see the examples reported in Keywood and Baten 2020; Bosworth 1996).

Our findings indicate that territorial state capacity has a robust and statistically significant negative correlation with elite violence, measured by regicide. We control for aggregate time- and polity-specific effects as well as a large number of additional regressors. Omitted variable bias and measurement error are also potential sources of endogeneity, hence we assess the bias from potentially omitted variables in Section 6 and systematically analyse possible measurement error by comparing our indicators to alternative proxies.

In sum, we contribute to the literature by providing new evidence on the relationship between state capacity and elite violence. Based on European data since 500 CE, our results contribute, in particular, to a better understanding of the development – or failure – of polities in terms of elite violence and territorial state capacity.[3]

The paper is organized as follows. Section 2 discusses measures of violence, arguing that data on regicide has an important indicator function for elite violence and may be used to measure interpersonal violence. The section also includes a description of the newly collected data. Section 3 describes the regicide data in more detail, focussing on time and regional variation. Section 4 discusses the data availability and the concept of territorial state capacity as well as other right-hand-side variables. The correlation results are presented in Section 5, before Section 6 assesses spatial autocorrelation and potential omitted variable bias. In Section 7, we discuss the two possible interpretations of our results theoretically. Section 8 concludes.

[3] Note that we use the terms “polities” and “principalities” in the following interchangeably, as most polities were principalities and very few were republics.

2. How can we measure violence in the very long run?

Homicide has regularly been used for measuring interpersonal violence, but historical data on homicide before 1800 is only available for major cities – mostly in Western Europe – and a small number of countries. The use of regicide (the killing of rulers) as a proxy for interpersonal violence was first explored by Eisner (2011), who noticed a strong association between the few available European homicide series and regicide rates in Western Europe as far back as the 13th century. Historical chronicles consistently report the killing of rulers, because these were both significant and unusual events within societies. Accordingly, accounts of regicide were consistently collected in early times. Unlike early homicide records, which would have been confounded by poor base rate estimates, since formal population censuses only became widespread during the 19th century, regicide rates are calculated from comprehensive dynastic lists. Hence, the denominator in the 'regicide ratio' can be quantified completely. Documenting all rulers was always deemed important, regardless of whether they were killed.

To assess the potential measurement error of regicide as a proxy indicator for interpersonal violence, we compare it to homicide statistics from Eisner (2014). In the appendix, Figure N.2, we compare our estimates of regicide with homicide records in Germany, Italy, Spain and the United Kingdom. Evidence of the relationship between the two series is evident, as high rates of interpersonal violence are visible from the 13th century, before gradually declining towards modern levels and flattening during the early modern period. At 65-70 homicides per 100,000 people, Italy's 14th-century homicide rate is comparable to that of El Salvador and Honduras today, while Germany, Spain and the UK are comparable to contemporary Columbia, Brazil or South Africa, with about 30 homicides per 100,000 people (UNODC 2019).

In Germany, we see a strong decline in violence from the 13th century, and a similar decline in homicide. The relationship is also clear in Italy until the 18th century when regicide diverges from homicide and increases strongly in the 19th century – due to the assassinations which took place in the build-up to Italy's unification (Morby 1989). In Spain, although fluctuations in regicide appear larger than in homicide, the indicators are highly correlated. Finally, the two series also display a largely common trend in the United Kingdom, despite missing values in the homicide series between 1400 and 1600.

Additional evidence on the relationship between regicide and elite violence can also be obtained through comparisons with the rates of nobilicide (the killing of noblemen), calculated by Cummins (2017; using the proportion of battlefield deaths among noblemen). In Figure N.2 in the appendix, we illustrate how both series, aggregated at the European level, decline from the 6th and 8th centuries, respectively. However, nobilicide also deviates from this downward trend in the 14th century, which coincides with the Mongolian invasions and the beginning of the Hundred Years' War in Western Europe. Furthermore, Figure 1 provides evidence of this relationship disaggregated to the regional levels that were used by Cummins (2017). Nobilicide and regicide are clearly correlated. This is partly caused by the downward trend in both series; however, some cross-sectional correlation is also visible as there are observations of low regicide and nobilicide in earlier periods as well as relatively high regicide and nobilicide in later periods. In sum, the regicide indicator and its overall trends appear plausible in comparison with other indicators. Finally, we also observe a close correlation between interpersonal elite violence and military elite violence (Appendix K).

We built our regicide dataset on the foundations of Eisner's (2011) study[4] and then expanded it using a variety of sources; namely, Morby's (1989) "Dynasties of the World" and Bosworth's (1996) "The New Islamic Dynasties", as well as other individual biographies and encyclopaedia entries. This compilation finally resulted in a dataset of 4,066 rulers, spanning the period 500-1900 CE and covering all European countries. Where conflicts arose between

[4] Eisner's study included 1513 rulers.

our sources, we included all rulers that were mentioned. We also took care to exclude any duplicates which often arose due to translated names or alternative naming conventions.

We included all rulers with the title of King or Queen and any equivalent or higher-ranking position such as Emperor, Tsar or Sultan; as well as any Dukes, Popes, Doges, Counts, or Prince-Bishops if there was evidence that they had some degree of autonomy in high-level decision making. Our dataset is nearly complete for all high-ranking rulers and – although the same level of completeness was not possible for all rulers, in part due to less thorough recordkeeping – they are widely distributed across both space and time, making us confident that ruler ranks do not affect our trends in regicide systematically. Additionally, several controls for ruler status and institutional context are discussed and employed in Section 3.3. When comparing our new evidence with Eisner's (2011) dataset, it becomes clear that we have more observations in Eastern and Western/Central Europe (Table 1). We also observe that the variability of our dataset is lower than his, in general, simply because we have more observations per century. Overall, the standard deviation in the Eisner dataset was 0.14 and is 0.11 in ours. In particular, Eastern Europe's standard deviation is much lower, but this is also true in most other regions of Europe. It is slightly higher in Italy and South-Eastern Europe, because here Eisner only included Italy, whereas our "South-Eastern Europe" region also includes the Balkans, the Caucasus, and the territory of today's Turkey, which is a region of substantial variation in regicide.

Geographically, we include the territories of modern Georgia, Armenia and Turkey, because the capital of the latter, Istanbul (Constantinople, Byzantium) lies mostly in Europe. Additionally, Georgia and Armenia are to the west of the Ural and Caspian Sea border, which is one of the common approaches used to distinguish Europe from Asia. [5]

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[5] Since Europe and Asia form one contiguous land mass, there is still some debate about its definition, but the most widely accepted view is that the border is formed by the Ural Mountains and the Caspian

The reasons for choosing our timeline are also straightforward: we would like to make use of as large a period as possible without skewing our results. Consequently, we begin our analysis in 500 CE to eliminate the (Western) Roman Empire and end in the year 1900, before the two World Wars.[6]

Using these regional and chronological delimiters, we assembled our dataset by accumulating general information such as dates of birth and death, reign dates and the causes of death for 4,066 rulers from across 34 European principalities.

Rulers died in a number of different ways. We used three definitions (broad, intermediate and narrow) before deciding which was the most theoretically appealing. Our most narrow definition is made up of cases where the ruler was clearly assassinated, such as King Canute IV of Denmark who was killed by rebels following a tax revolt, after fleeing from Vendsyssel and hiding in a church in Odense. The rebel group was led by Canute's

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Sea. Georgia and Armenia are also culturally similar to their European neighbours. For example, Christianity was present in Armenia from the 1st century and became Armenia's official state religion in 302 AD under Tiridates III (Parry 2010). Lastly, we included Georgia because of its historical links to Christianity (Parry 2010) and because of the strong self-determination of modern Georgians to be classified as Europeans – as seen in surveys conducted since the collapse of the Soviet Union (Gogolashvili 2009).

[6] We propose that including the Roman Empire would have led to numerous complications as it encompassed a high geographical share of Europe and exhibited famously high rates of regicide. We then end our analysis in 1900, because the 20th century saw drastically shifting borders while European principalities tended to transition either into democracies or dictatorships. Both of these periods would have suffered from a far lower cross-sectional density in observations, as few monarchies remained.

brother, who succeeded him and became King Olaf I. Narrowly defined; we have 442 cases of regicide, or 11.9% of all rulers.[7]

The intermediate definition consists of these clear assassinations as well as deaths described as dubious. We label cases as dubious when historical accounts imply or strongly suggest that a ruler was killed, or if the ruler was poisoned or imprisoned at the time of their death. Deaths during imprisonment seem to make up a small but consistent and widespread proportion of cases and are almost unanimously accompanied by reports of starvation or unlikely ‘accidents’. Likewise, poisonings are also included here, though most cases seem to be clear assassinations. In addition to the 442 narrowly defined cases of regicide, we have another 182 that are labelled dubious, meaning that 624, or 16.8%, of all rulers fall under this intermediate definition.

Finally, we have documented a further 218 cases of death in battle and added these to our intermediate indicator to classify what we term broad regicide. Consequently, 842 rulers fall under this definition, making up 22.7% of the total. In Figure 2, we see that these definitions capture very similar trends at the European level, suggesting that subcategories reflect somewhat consistent proportions of broadly defined regicide. Similarly, across polities, these three definitions are strongly correlated with each other. For example, the correlation coefficient between narrow regicide and intermediate regicide is 0.845 (p=0.000, see Appendix J). Thus, we conclude that the inclusion of dubious cases does not lead to a different picture, compared to the one of narrow regicide.[8] In Appendix K, we find that also military elite violence alone and interpersonal elite violence are modestly correlated. For

[7] Percentages are calculated after subtracting the 348 cases where we have no evidence concerning a ruler’s cause of death.

[8] It could have changed the picture theoretically, if dubious regicide had been clustered in certain regions or periods.

example, in the late medieval and early modern periods, the correlation coefficients are as high as 0.658 and 0.746, respectively (in the earlier periods, lower). We can interpret all three measures as reflecting the general willingness of the elites to use lethal violence.

For the remainder of this study we use the intermediate regicide definition and simply name it ‘regicide’. The reason for including dubious cases in our variable of interest is that, in our opinion, cases of poisoning or death in imprisonment still reflect interpersonal violence and that the benefits of expanding the variability of our dataset by 182 regicide cases outweigh any noise that may be introduced by the possibility of a few false positives. However, the theoretical rationale for our proxy becomes less clear when including deaths in battle, although it would not make a large difference empirically. While civil war accounts for the vast majority of battle deaths and may reflect interpersonal violence in certain instances, international conflicts initiated by a foreign power would have reflected external causes rather than interpersonal violence.[9] The more conservative approach of excluding battle deaths also comes with an advantage: it allows us to use the proportion of rulers killed in battle as a control variable for more organised violence. This may be important due to the possibility of contagion from external conflict to interpersonal violence.

3. Regicide over time and across regions

To describe our regicide indicator further, we also compare trends in regicide with the major economic developments that took place since 500 CE, such as major invasions, episodes of plague and the ‘second serfdom’ in Eastern Europe. When we disaggregate European violence into four regions, we observe interesting patterns in each series (Figure 3).

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[9] We take the more cautious approach of dropping battle deaths from the regicide indicator entirely instead of attempting to separate civil and international conflicts, as any influence that civil conflicts may have on interpersonal violence is not entirely clear.

For example, at the end of the Viking Age, during the High Middle Ages (11^{th} – 12^{th} century), Scandinavia introduced more centralised monarchies, but they initially lacked widespread acceptance and regicide rates were quite high.[10]

Likewise, Eastern Europe experienced increased regicide in the late medieval period of the Mongolian invasions (13^{th} – 14^{th} century), with more persistent consequences than in other European regions. Looking at the significance of the difference between Eastern and Western Europe during this period, as indicated by the error bars in Figure 3, the East became significantly more violent in the late medieval period, compared to the West/Central region. In the following period, the 15^{th} – 19^{th} centuries, Eastern and Southern Europe (including the South-East) remained the most violent regions.

A related development could be the second serfdom in Eastern Europe. The second serfdom was an event through which feudal systems were reintroduced into Eastern Europe – after increased state centralisation had dismantled earlier feudal systems in order to better organise labour in the aftermath of the Great Plague of the 14^{th} century (Ogilvie and Edwards 2000). This period, lasting approximately from the 16^{th} to the late 18^{th} century (although serfdom in Russia was only abolished in 1861 under Tsar Alexander II), is commonly thought to have been the result of the low agricultural output and a high land-labour ratio in Eastern Europe (Acemoglu and Wolitzky 2011). Alternatively, the combination of scarce labour and abundant land resulted in substantially higher wages as a result of increased labour demand, attracting labourers from Western Europe. From the 16^{th} to the 18^{th} century, working conditions increasingly deteriorated and it became difficult for serfs to leave since they had no movable assets. Landlords subsequently grew powerful, in part due to Western Europe-bound exports (Kula 1976; Blum 1957). Figure 3 suggests that the second serfdom might be associated with persistently high rates of regicide. While most European series seem to

[10] This was the setting for Shakespeare's *Hamlet*.

steadily drop toward the low levels of modern violence experienced after the Plague, regicide remains high in Eastern Europe. Eastern European regicide rates settled well above 10% as opposed to the steady declines towards 5% that were experienced in Western and Central Europe by the 19th century.

In sum, after comparing regicide to estimates of homicide and nobilicide, we conclude that there is substantial evidence that regicide measures interpersonal elite violence. This is also confirmed by Baten and Steckel's (2019) comparison of regicide with bio-archaeological evidence (using the share of violent cranial traumata and weapon wounds in Europe). Additionally, we can see some evidence of Europe's historical narrative reflected in the series, encouraging us to proceed with our analysis by using regicide as a proxy for interpersonal elite violence and investigating the role of the state.

4. Data on territorial state capacity and its correlation with elite violence

4.1 State Capacity

The literature on state capacity and development is well established, but strategies to measure state capacity are multi-faceted. Throughout the literature, state capacity is estimated in a multitude of ways, attempting to capture the effects of military capacity, bureaucratic or administrative capacity, and the quality of political institutions (Hendrix 2010). As such, previous measurements include military personnel per capita (Hendrix 2010; Kocher 2010), territorial variation (Soifer 2008), corruption (Fortin 2010), state fragility (Besley and Persson 2011), tax compliance (Ottervik, 2013), road network density (Hanson and Sigman 2011) and the ease of doing business (Cardenas 2010). If the focus is explicitly on fiscal capacity (capacity to raise tax revenue), previous work has often used alternative measures of tax revenue relative to GDP (see, e.g., Besley and Persson 2009).

One key variable in this paper is the territorial retention or expansion of principalities, measured by the percentage changes in their areas. This idea stems from the role that military capacity plays as a core component of state capacity, as well as the assumption that it is always in the interest of states to keep their territories. But it also captures the notion that fiscal capacity – which is needed to finance any state activity – is, crucially, determined by the potential to raise revenue. A territorial expansion will naturally be associated with a larger potential to raise revenue (Besley and Persson 2011). The development of states' territories describes a competitive situation, as in the 9th to 12th centuries, for example, when many smaller principalities disappeared at the expense of others. We use the percentage change in territory to show a relationship between elite violence and the development of state capacity, instead of absolute changes. When using the latter, our results would solely be driven by large territories such as the Holy Roman or Ottoman Empires.

Although state capacity has been estimated using the array of indicators listed above, we are hesitant to refer to state capacity in its entirety and prefer to name our variable an indicator of 'territorial state capacity', emphasizing the capacity to defend territory and expand as opposed to other features of state capacity such as its bureaucratic or administrative capabilities. However, Lake and O'Mahoney (2004) propose that state sizes are determined by a balancing act between military capabilities (required both for defence or conquest) and certain economies of scale in bureaucratic tasks and service provision (geographical limits to tax collection, transportation, communication and state infrastructure, for example).

Additionally, there is a precedent for using territorial expansion to approximate state capacity. Archaeologist and anthropologist Charles S. Spencer (2010) proposed a causal relationship between state capacity and territorial expansion, arguing that bureaucratic capacity is required for states to grow and that larger states cause greater bureaucratic capacity by providing a larger tax base and access to additional mining opportunities. Although this causal claim is heavily criticised (Claessen and Hagesteijn 2012), the correlation itself seems robust.

Furthermore, Rotberg (2002) discusses the interplay between state capacity, territorial changes and interpersonal violence, using global examples from throughout the 20th century. He describes how low capacity states are more likely to lose territory and that this is associated with increased criminal interpersonal violence. Diehl and Goertz (1988) empirically assess global territorial changes between 1816 and 1980 and find that international conflicts are more common if the territories of the belligerents are contiguous (share a land border) and if the difference in state capacity between them is large.[11]

Gennaioli and Voth (2015) clarified that monetary taxation abilities only became important after the military revolution of the "trace italienne" of the 17th century.[12] Hence, before this period, it was less the silver inflow into the central tax boxes, but rather the organizational abilities of the ruling elite to bring together sufficient warriors with a motivation to support the ruler; and the necessary equipment such as horses, swords, and fortifications. Although these goods and services were usually not paid for via taxes, they also represented a form of taxation in kind, as military personnel could not use their time for other economic purposes and knights required horses and other material from their farmers. State capacity had to be strong enough to collect resources from the remaining farm and handicraft population to support the fighting group if they could not obtain goods from plundering an enemy's territory. Moreover, state capacity and institutional power had to be strong enough to maintain law and order at home, as otherwise production processes in the territories not affected by war would have declined drastically (Gennaioli and Voth 2015).

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[11] Congruently, Kocs (1995) observes that wars are more frequent if the existing boundary is not recognised by international law. This is more important for the 20th and 21st centuries, when international law was used for legitimisation, or legal disregard resulted in a loss of state reputation.

[12] The "trace italienne" were large-scale and costly city fortifications, most skilfully done by Vauban in 17th century France. There were also some predecessors in the 16th century.

Our variable for territorial state capacity comes from digitised and georeferenced data that were created using Nüssli's (2010) maps of European principalities since the first century CE. When matched to our regicide data, this leaves 34 principalities over the timespan 500 – 1900 CE. When principalities died and new principalities were formed, these were matched whenever there was internal continuity within the region, as opposed to conquests. For example, West Francia was matched with the Kingdom of France with the rise of the Capetian Dynasty in 987 CE. Dying principalities are unrecorded in the century of disappearance as opposed to assigning them -100% changes in territory. It may be argued that this decision introduces certain selectivity biases, but we decided to focus on gradual changes in territories rather than extreme cases. Likewise, we exclude cases where principalities grew by over 500%, such as 14th century Lithuania – which, according to our calculations, grew by 1055% over the century after merging with Poland. Similarly, no record is provided for emerging principalities. When in doubt, the historical record provided enough information to justify matching principalities.

Did territorial state capacities also correlate with tax capacity increases per capita? Karaman and Pamuk (2013) have estimated the capacity to tax for a European sample of 12 countries. They cover the period from 1500 to the 1790s (though with some gaps). Karaman and Pamuk calculate the capacity to tax per capita in grams of silver, which allows international and intertemporal comparisons. Their data overlap our new indicator of territorial state capacity for 21 cases (by country and century). Hence, this allows us to study whether tax capacity per capita and territorial state capacity correlate for this period. In regression Table 2, we regress tax capacity on our measure of territorial state capacity. We find a significant correlation, even when including time and region fixed effects. In model 1, we excluded the Habsburg Empire since the Habsburgs were famous for their successful marriage strategy, increasing their territory with less war compared to other states, such as Prussia (Kohler 1994). In model 2 we included the Habsburg Empire and assigned an

"Austria felix" dummy variable which in fact turns negative and significant because the tax capacity was substantially lower relative to the territorial gain of the Habsburgs. The results of the regression are confirmed by individual cases, like e.g. Venice (around 1500). Venice had a very high tax capacity of more than 25 grams of silver per capita and was a polity undergoing territorial expansion. In contrast, the UK and France had still modest tax capacities between 10 and 20 grams of silver around 1500, and low territorial expansion in this period. Later this changed for the UK which had the highest tax capacity and a strong territorial expansion in the 18th century (more than 200 grams of silver in 1790). Summing up, we can confirm that there is a substantial correlation between territorial state capacity and tax capacity even in per capita terms (see also the arguments below). This encourages us to interpret territorial state capacity, which can be traced back to the early medieval period, as a proxy indicator for overall state capacity.

Figures 4 to 9 outline the relationship between territorial state capacity and elite violence over time, showing an overall negative relationship and indicating that greater state capacity is associated with lower elite violence levels. For example, Aragon and Venice grew in state capacity over the 12th and 13th centuries and had low regicide rates. This is also visible in the maps from Figures 10 and 11. We demonstrate territorial state capacity and regicide for several polities between 1200 and 1300: the kingdoms of Aragon, Castile, Scotland and the Republic of Venice that kept mostly their territory or expanded.[13] These four polities also achieved relatively low regicide rates, indicating lower elite violence. In contrast, the Kingdom of Denmark and the Second Bulgarian Empire were not able to keep their territory

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[13] Although this was interrupted by temporary historical events in the case of Scotland, when Edward I of England invaded and briefly claimed Scottish dependency (Morby 1989). In the case of the Republic of Venice, it is important that we control for differences in the political systems (which made regicide less attractive), as we do in the regressions below.

between 1200 and 1300 (Figure 10 an 11).[14] These polities also did not succeed in the necessary policing activities and the internalization of low violence among their elites – which is represented by a high regicide level. Most of the other polities of Europe fell between these two groups, as they had more average regicide and only modest changes in territory in the 13th century (see Figure 7). The exception was France, which had a low level of elite violence in 1200 and still no territorial stability between 1200 and 1300 (Figure 7).

In the 14th and 15th centuries, Venice continued its exceptional growth – reflected by its position outside of the confidence intervals – while Denmark recovered (Figure 8). This was consistent with a movement towards low violence in the case of Denmark, and a continuously low level in the Venetian case. In contrast, Granada failed on both accounts in the 14th century. However, investigating sub-periods reveals no relationship before the 10th century and even a negative, although weaker, relationship after 1500 (Figures 5 and 9). The latter negative relationship was mostly caused by the two Austrian outliers of the 16th and 18th centuries when the Habsburgs were particularly successful in consolidating territory.

4.2 Control Variables

As we study the correlation between elite violence and territorial state capacity, we also need to assess whether other economic, environmental and social factors are correlated and might invalidate the correlation. In particular, to come up with estimates of a conditional correlation, we include control variables for income, agricultural productivity and several

[14] In the case of the Second Bulgarian Empire, the Mongolian invasion also added to the loss of territory (which can be seen as an exogenous event, although other polities were similarly confronted with it). However, also “normal neighborhood conflicts” such as the one with Hungary resulted in losses of Bulgarian territory, which reflects the lack of state capability of the Second Bulgarian Empire to mobilize defensive resources (Morby 1989).

measures of institutional quality. We further control for factors such as battles and political fractionalisation. We also include 'elite controls' that may be important in estimating regicide but are not necessarily important determinants of elite violence. All these right-hand-side variables are described in greater detail in Appendix H.

Higher income has been hypothesised as reducing violence as well as elite violence (Baten et al. 2014). Many recent economic history studies use urbanisation rates as a reliable proxy of income among early societies where alternative GDP measurements are unavailable (Bosker et al. 2013; De Long and Shleifer 1993; Acemoglu et al. 2005; Nunn and Qian 2011; Cantoni 2015; Cantoni and Yuchtman 2014). We expect higher income to be negatively related to interpersonal violence, as outside options to violent conduct arise with financial freedom. In our regressions, we sometimes include urbanisation to avoid omitted variable bias, but we also exclude it in other specifications to make sure that our results are not driven by a "bad control" issue (Angrist and Pischke 2008).

We also make use of temperature data to proxy for agricultural output. Temperature is a well-established determinant of agricultural production (Waldinger 2019). Agricultural output is a dimension of income that is less reflected by urban growth, but it could still determine the opportunity costs of violence for elites. This is particularly important in the context of the 'Little Ice Age'. The 'Little Ice Age' was a period of general cooling throughout the Northern Hemisphere and particularly in Europe – accompanied by frequent famines – between about 1300 and 1850, with its most severe period in the 16th and 17th centuries (Mann 2002, Baten and Steckel 2019).

The impact of nomadic invasions from Central Asia on violence is also considered in our regressions. In this case, the direction of causality is clear because the main driving force were droughts in Central Asia (Bai and Kung 2011). The invasions of the Hungarians, Mongols and other nomadic groups had large effects on Europe's military violence environment, possibly causing spillovers to interpersonal violence (Keywood and Baten 2020).

Institutional factors related to the system of governance could also potentially play a role. We therefore define autonomy as a ruler's unhindered ability to make decisions and to dictate policy. For instance, Transylvania is not considered a completely autonomous state while it was subject to tributes to the Ottoman Empire. We control for autonomy under the hypothesis that a ruler is more likely to be killed if their successor is able to act autonomously (and gain power and riches).[15]

Since the majority of rulers were killed by family members hoping to take the throne, we also control for mode of succession (Eisner 2011). Under electoral systems, these power-hungry relatives would have had a lower chance of being elected, decreasing the probability of regicide. We split this indicator into three levels: hereditary systems, ceremonial electoral systems and de facto electoral systems.

Religion is represented by an indicator variable for the majority religion in each polity, under the categories: Catholicism, Orthodoxy, Protestantism, Islam and Other. The 'Other' category includes Paganism and tribal religions from times before each polity adopted one of Europe's largest four modern religions. Admittedly, we do not have a theoretical expectation for the differences in religion, but we prefer to control for the cultural differences that might be related to it.

In contrast, religious diversity may have led to conflict (Keywood and Baten 2020). Religious transition could have caused violence due to opposing forces trying to preserve old orders or instil new ones. Furthermore, we introduce a dummy variable for whether a country had a significant Jewish minority; as Jews were often the targets of numerous forms of

[15] Alternatively, in a few cases, rulers of subservient principalities may have been more likely to be killed by their overlords who would then be able to install more cooperative leaders.

persecution throughout Europe during this period, there might be spillover effects to elite violence.

We also control for political fractionalisation, measured as three or more principalities overlapping with a particular modern country. Borcan et al. (2018) suggested using modern boundaries as a benchmark for historical polity size in their study on state history and economic development.

Since some studies describe a relationship between geographical factors and violence, we include certain geographical controls here, such as ruggedness, soil fertility and coastal access (Nunn and Puga 2012).

Lastly, we use three dummy variables in order to capture the effects of periods in which major societal transformations took place; the Justinian Plague (6^{th} – 8^{th} century), the Great Plague (14^{th} century) and the second serfdom in Eastern Europe (16^{th} – 18^{th} century).

5. Results of the conditional correlation analysis

Our main objective is to test whether the variable 'territorial state capacity' has a significant relationship with 'regicide'. Let us denote territorial state capacity by TSC_{it} and regicide by RC_{it}. The indices i and t indicate that these variables are measured at the state(polity)-i level and vary over time t. We particularly aim to estimate the following relationship:

$$RC_{it} = \alpha_i + \gamma_t + \beta_1 TSC_{it} + \boldsymbol{\beta}_k \boldsymbol{X}_{it} + \psi_{it} + \varepsilon_{it} \qquad (1)$$

The vector of control variables $\boldsymbol{X}_{it}$ includes measures of *temperature*, *urbanisation* and *battle*, for example, on which we estimate the vector of k coefficients, $\boldsymbol{\beta}_k$. We discuss these (and a number of other) controls in more detail in the following section. However, the inclusion of such measures is crucial as to ensure that the relationship between RC_{it} and TSC_{it} is not biased. There are, of course, many other (observed) factors which may be important as well (see the discussion below). Apart from additional control variables, note that we also condition on a full set of fixed effects: γ_t denote aggregate century effects; α_i is included to account for any omitted variable bias that may be caused by the absence of any relevant time-invariant variables at the level of principalities. Finally, in (1), ε_{it} denotes the error term. We postulate a negative relationship between *TSC*, as a measure of state capacity, and *RC*, as a measure of elite violence.

Table 3 provides an overview of the variables. Based on equation (1) above, Table 4 shows the results of the fixed effects regressions. Immediately, we can see that territorial state capacity enters all regressions both significantly and negatively, with a stable coefficient of around -0.08. This means that a one standard deviation increase in state capacity (0.69) is associated with a 5.5 percentage point decrease in regicide, which is a substantial effect (given that the mean of *RC* is 0.17, and the standard deviation is also 0.17). This order of magnitude represents one-third of the standard deviation effect relative to the standard deviation of the dependent variable, elite violence, which is quite a substantial share. We should note that this correlation also applies to the other potential direction of causality, from regicide to territorial state capacity.

The fixed effects specification offers two additional interesting insights. First, principalities where Orthodox Christianity is the majority religion seem to be about 20 percentage points more violent, on average. This holds even after conditioning on polity fixed effects. Second, the regression provides some evidence that fractionalisation is negatively related to regicide, which contradicts the theory of competing groups enacting violence against one another, although this is only significant at the 10% significance level.

We intensively studied whether the results might be driven by time trends. Our results prove robust to the inclusion of a linear time trend (Appendix L). We estimate a coefficient (standard error) of -0.085 (0.034) for TSC. Including a quadratic term leads to a TSC coefficient of -0.081 (0.037). We decided only to report the regressions conditional on century dummies in Tables 4-6 because this is the most flexible approach (it can control for non-linear shocks over time, not just a linear or quadratic trend). The variables for the time trends are not statistically significant and the results of the other regressors are not substantially different from the other regression specifications.

For a robustness check against spurious correlation that may arise from variables that follow a unit root process, we also perform tests where we first difference equation 1 (see Table 5). First differencing, like fixed effects, has the advantage of eliminating omitted variable bias caused by absent time-invariant variables, but it is also effective in eliminating spurious correlations from time trends (Wooldridge 2012). However, it naturally comes at a cost as differencing removes much of the variation in the variables, attenuating standard errors and potentially leading to type-2 errors (Wooldridge 2012).

$$\Delta RC_{it} = \beta_1 TSC_{it} + \boldsymbol{\beta}_k \Delta \boldsymbol{X}_{it} + \varepsilon_{it} \quad (2)$$

Again, we see that the coefficient on *TSC* is negative and significant, and slightly larger than under the fixed effects specification, approximately -0.095, on average. Therefore, a one standard deviation increase in territorial state capacity is associated with approximately a 6.6 percentage point decrease in regicide (see Appendix F on unit root tests). Again, the same applies to the other direction of causality as we assess only the conditional correlation here.

Aside from *TSC*, the only other variable which enters significantly when first differencing the data is religious transition. On average, changes in majority religion are associated with an 11-percentage point higher regicide rate. Some of the strongest examples of these periods occurred during the protestant reformation, where our data shows France and England to have undergone the strongest transition effects.

We also run a random effects model (Table 6). One advantage of this is that we can include a time-invariant variable for the proximity to Central Asia, from where the most serious invasions came in the $9^{th}/10^{th}$ century and in the $13^{th}/14^{th}$ century. Initially, there is a significant positive relationship between invasion proximity and *RC*, but this disappears mostly once *TSC* enters the model. This either suggests that territorial state capacity was more important for elite violence than the invasions, or that the invasions affected elite violence through territorial state capacity. Although the coefficient for *TSC* remains stable at between -0.06 and -0.07, only weak evidence of relationships between other right-hand-side variables and regicide exist.

Perhaps somewhat surprisingly, the urbanization and temperature variables which proxy income were never statistically significant. This might be caused by the fact that these were either less accurate indicators for the earliest periods, or that the influence was very limited, especially after controlling for territorial state capacity and other variables.

Overall, the evidence from Tables 4 to 6 points towards a robust inverse relationship between territorial state capacity and regicide. We interpret this finding as a conditional correlation rather than a causal relationship.[16]

[16] There may be concerns that estimates are biased because of the bounded nature of the dependent variable. However, implementing a fixed effects fractional response approach, following Papke and Wooldridge (2008), our results remain fully robust. We estimate an average partial effect of -0.118** (0.059) on TSC, which is slightly bigger compared to the estimated coefficient on TSC in the OLS model.

6. Assessing spatial autocorrelation and bounding the potential omitted variable bias

Spatial autocorrelation may be a concern, which we address in the following. Similar to temporal autocorrelation, in which the previous period might have an impact on the current behaviour of a variable (independent of the explanatory variables), the behaviour in a region might be influenced by the behaviour in one of the adjacent regions (again independent of explanatory variables). An econometric technique to take this into account is to calculate Conley standard errors, a standard procedure for cross-sectional data (Conley 2008). For panel data, in which temporal autocorrelation might also play a role, Hsiang (2010) developed another method (see notes to Table 7, for details). We applied this method using plausible bandwidths for distances of 250, 500, or 750 kilometres. We find that spatial autocorrelation does not make our general results invalid, as all three bandwidths result in standard errors for TSC that imply statistical significance at the 5% level.

Moreover, although we do not claim causality at this stage, we can clarify the severity of potential identification issues by bounding the omitted variable bias. Altonji et al. (2005) have suggested a method to assess the selection on unobservables relative to the selection on observables. This approach relies on the assumption that selection on observables and unobservables has roughly proportional effects on reducing the coefficient size of the variable of interest. Hence, the basic question is ‘How large does the effect of unobservables have to be in order to eliminate the effect of the variable of interest’? In most multiple regressions, the coefficient of the main explanatory variable declines as more (observable) control variables are added. Hence, the Altonji–Elder–Taber (AET) ratio compares the size of the coefficient of interest (state capacity) in a restricted regression including only a constant (and, in our case, polity fixed effects), $ß_{restr}$, to the coefficient of a regression with many controls ($ß_{full}$). In our case, the effect of unobservables reducing the TSC effect would need to be at least eleven times larger – relative to the 16 observable controls – to invalidate our main result (Table 8).

Oster (2019) suggested that it is not only the stability of coefficients which matters for the detection of omitted variable biases but also the importance of the observable control variables, relative to the importance of potential unobserved control variables. Oster provides an intuitive scenario to illustrate this: if, for example, a researcher regressed individual wages on years of schooling, two orthogonal variables of ability might both be relevant controls. In Oster's scenario, one of these two controls can be observed, the other one not. If the observed control variable has a higher variance and hence a higher R-square contribution to explaining wages, applying the AET method (without taking relevance into account) will lead to a high estimate of omitted variable (OV) bias caused by the unobserved ability variable. The change of the coefficient of schooling between the models with and without this important control will be large. If, on the other hand, the low variance ability control with its smaller R-square contribution to explain wages is the observable control variable, the OV bias will be underestimated. The change in the coefficient of schooling will be small. This does not mean that the OV bias is small, but the reason is simply that less of the wage outcome is explained by this control variable.

Hence, it is crucial not only to consider the stability of coefficients, but also the importance of the control variables in explaining part of the variation of the dependent variable. In our regression Table 4, it becomes immediately visible that the R-square increases substantially with including the observable control variables, from 0.23 in Column 1 to 0.31 in Column 10. This is similar for the first difference regressions, in which the R-square doubled after including the controls (from 0.11 to 0.22 in Columns 1 and 10). Oster (2019) suggested the Oster delta statistic as a measure for this. Her critical threshold is the absolute value of 1, i.e. if the Oster delta is larger than 1 (in absolute terms), the importance of the controls is not a problematic issue. In our case, we observed an Oster delta of 3.02, hence this indicates that lacking relevance of controls is not an issue. Table 8 reports the relative degree of selection on unobservables such that the effect of TSC is totally eliminated, while taking into account R^2 movements as well. The Oster delta reflects how strongly correlated the unobservables would have to be with regicide, relative to the joint effect of the 16 observables, to account for the full size of the TSC coefficient. Given that the Oster Delta is much larger than |1|, it is unlikely that unobservables would be much more related to regicide than the observable controls. As a caveat, we would like to mention that if the unobservables could be imagined to be eleven times more influential than the observables, this bias could still remove the observed correlation. In conclusion, the Altonji–Elder–Tabor ratio and Oster delta calculated above, suggest that the identification strategy applied here is not likely to be affected by omitted variables bias. Again this supports the conditional correlation between territorial state capacity and regicide, but it does not imply the direction of causality.

7. The two possible directions of causality

Our findings indicate that territorial state capacity has a robust and statistically significant negative correlation with elite violence, measured by regicide, even though we control for aggregate time- and polity-specific effects as well as a large number of additional regressors. At least two interpretations are possible. In the following, we will discuss what might be behind the co-movements observed above. We emphasize the possibility that the causality may run both ways.

(1A) One possible direction of causality would run from a lower level of elite violence to a correspondingly higher territorial state capacity, because elite violence often results in higher trust levels, and trust might build state capabilities. For example, many European societies developed “cultures of revenge” in high elite violence scenarios, in which taking revenge was more important than trust among the elites (Pust 2019). A lack of trust, in turn, makes it very difficult to build higher state capabilities, as transactions and activities work better if trust reduces transaction costs (Tabellini 2008, Pinker 2011). For example, if a ruler needs to convince his nobility to contribute resources to a military effort, trust can result in a more efficient outcome, because the different noblemen might trust that others will also carry their burdens and risks to achieve the joint aim. In a situation of high elite violence, a lack of trust might reduce state capabilities, including territorial state capabilities.

(1B) Considering the same direction of causality, but a different mechanism, is the hypothesis that the killing of a ruler directly impacted the stability of the polity, and could have resulted in the loss of territory if a neighbour with sufficient military resources took the opportunity. However, securing immediate succession was a primary concern of many medieval elite families following the death of the ruler (violent or non-violent) (Morby 1989).

(2A) An alternative direction of causality is that increasing state capability could have resulted in a reduction of elite violence. A higher fiscal capacity might be hypothesized to reduce elite violence, because policing functions could be executed; and the elites gradually internalized the benefits of lower elite violence. This hypothesis would be consistent with the arguments in Pinker (2011) as well as Fearon and Laitin (2003) – that state capacity and the policing function associated with it help to contain interpersonal violence among the elite.

An important motive for territorial expansion throughout history has been to increase fiscal capacity with the objective to finance fiscal expenditures, for example, to achieve military security (Gennaioli and Voth 2015). While this may sound tautological, the situation of military competition in this early period forced rulers to behave this way, as they did not want their dynasties to collapse. Above, we found that high territorial state capacity was not only correlated with total tax capacity (which seems undisputed, as more territory results in more taxes, (see Besley and Persson 2011) but also that tax capacity on a per capita basis was higher in the better-organized states, which were able to keep or even expand their territories (on taxation see Karaman and Pamuk 2013).

Let us interpret this hypothesis 2A in light of a recent literature in political economy. This literature is concerned with the relationship between investments in fiscal capacity and economic development (Besley and Persson 2009; Besley and Persson 2010; Besley, Ilzetzki, and Persson 2013), where fiscal capacity is understood as a government's potential capability to generate tax revenue. Note that this notion of fiscal capacity is very much in line with using *TSC* as a measure thereof. Changes in *TSC* clearly reflect changes in a state's potential to tax.[17] The papers mentioned above explain how institutions and politics determine investments in fiscal capacity, particularly factors such as political stability and polarization. Related to the mechanism we are interested in, the analysis in Besley and Persson (2010) explicitly allows for violent internal conflict (unlike Gennaioli and Voth 2015, or the seminal work of Tilly 1975, where the focus is on external military conflict). While Besley and Perssons' (2010) findings support a negative relationship between violent conflict (e.g., civil war) and state capacity, their theoretical discussion suggests that poor fiscal capacity (in terms of tax revenue) and a high probability of conflict have roots in the same underlying fundamentals (such as natural resource rents), which makes identification challenging. However, if legal and fiscal capacity go hand in hand, then a large investment in fiscal capacity may allow countries to escape the "conflict trap" (see the discussion in Besley and Persson, 2010, p. 22).

(2B) Another interpretation of the direction of causality from territorial state capacity to regicide is that if one polity loses a military conflict, the territory is often reduced and the ruler might sometimes be killed. Hence, in this case, territorial state capacity would have

[17] Apart from our historical analysis of the tax-per-capita–TSC analysis above (Table 2), we can also support this view using more recent data which shows that measures of (territorial) country size, tax revenue and government expenditure are clearly positively correlated (see Appendix M. All data for this exercise are taken from the World Bank's World Development Indicators database or from the IMF's World Economic Outlook database). This also holds when looking at per capita revenues and expenditures, which is consistent with the argument in Buettner and Holm-Hadulla (2013), that an efficient level of (per capita) public expenditure rises with a jurisdiction's population size.

influenced elite violence. This is certainly an important possibility and it probably took place in some cases, although medieval and early modern historians usually emphasize that war was considered by many rulers as “the sport of the kings” (Gennaioli and Voth 2015). As a consequence, they normally did not kill the opposite ruler, but they rather captured a part of the territory and left the ruler alive.[18]

In sum, the four hypotheses make clear that the two directions of causality are possible, each direction supported by at least two possible mechanisms. At the current stage of our knowledge, we cannot identify which direction of causality is the more relevant. Another possibility would be a bidirectional mechanism that resulted in a co-evolution of territorial state capacity and declining elite violence, as the four mechanisms (1A, 1B, 2A, 2B) might have all been at work during the period under study. The four mechanisms together might have gradually moved some European regions towards a situation of lower violence and higher territorial state capacity, which was an important element of European economic development in the long run (Keywood and Baten 2020).

8. Conclusion

We provide new evidence on the history of elite violence by measuring regicide and identifying relationships between European homicide and regicide between the 6th and 19th centuries CE (following Eisner 2011). This link is motivated by the close relationship in measures of regicide, homicide and nobilicide. Moreover, interpersonal and military elite violence are also substantially correlated.

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[18] If they killed the ruler, this would increase the likelihood that they would be killed themselves in a subsequent conflict with the same power or with another, hence a behavioural codex developed that killing the ruler after a military success was seldomly done (the invasions from Central Asia represented exceptions, see Keywood and Baten 2020).

When comparing Eastern and Western Europe, we see that Eastern Europe clearly had higher rates of regicide than Western and Central Europe over the initial and the latter parts of our period of study. We then see a clear divergence of Eastern Europe during the Mongolian invasion period, whereas the south (including the southeast) diverged during the 15th to 19th centuries. We also present new evidence on state capacity, developing a new proxy indicator, namely territorial state capacity. We find that this new measure is correlated with tax capacity per capita, encouraging us to interpret territorial state capacity, which can be traced back to the early medieval period, as a proxy indicator for overall state capacity.

Fixed effects estimation methods were used to analyse the relationship between territorial state capacity and long run interpersonal elite violence in Europe between the 6th and 19th centuries. Our findings indicate that there is a negative and robust conditional correlation. We also carefully assess omitted variable bias, spatial autocorrelation and trend correlation, and find that this does not invalidate the results. The relationship appears to be driven by the period between the 10th and 15th centuries. We do not claim that the results are causal, nor that a certain direction of causality is implied. Rather, our conditional correlation is compatible with at least two possible interpretations: (1) elite violence hindered the development of territorial state capacity and the killing of rulers also directly resulted in a more likely loss of territory. And (2) state capacity, reflected by territorial state capacity, could be hypothesized to have had a restraining effect on interpersonal violence. This would be consistent with Pinker's (2011) view that modern state capacity leads to a reduction in violence, both interpersonal and in terms of military conflict. Moreover, a bidirectional mechanism would also be possible and result in a co-evolution of the two variables.

The negative correlation between territorial state capacity and regicide also contributes to the literature about the emergence of modern tax states and Tilly's (1975) hypothesis that "war generated states".[19] Interestingly, the most widely accepted theory about the early formation of state capacity is that interstate war was responsible for initiating a strong move toward states implementing tax systems with higher state capabilities. North (2000), following Tilly (1975), told the story of France in the Hundred Years' War, when the English occupation threatened the independent French Kingdom. The king and his ruling elite demanded consistent and permanent taxation, which would allow a permanent standing army to be financed. The French nobility, which had always opposed such an extension of state capacity, agreed in this exceptional situation. Hence, the inter-state war with England increased French state capability. North (2000) reports several other examples that demonstrated similar developments, such as the Netherlands and the UK in the 16th and 17th centuries. If these observations could be generalized, we would expect a positive correlation between early inter-state-conflict intensity and state capacity.

As we find that a specific measure of state capacity (territorial state capacity) and elite violence are negatively correlated – both in war and peace – we hypothesize that the Hundred Years' War in France and similar events were probably triggers rather than underlying determinants of state capacity expansion, because our evidence suggests that France had already achieved a continuous development of state capabilities and relatively low violence levels in the 13th century, by international comparison. In this situation, the conflict triggered the next step in France's development (Keywood and Baten 2020). In contrast, Bulgaria, for example, would not have been able to expand its state capability in a comparable military conflict scenario during the 13th and 14th centuries (Ibid.).

[19] Basically, the threat of war lead to changes in tax capacity. Similarly, the threat of violence and revolution increased the acceptance of democratization in the 19th century, as Aidt and Franck (2015, 2019) recently found.

A negative correlation between expanding state capability and lower interpersonal violence among the elite is also plausible, because the expansion of state capacity and territorial state capacity, in particular, often enabled an increase in the defensive abilities of governments (on the following Keywood and Baten 2020). Britain did not suffer from many invasions after the Norman Conquest in the 11th century, but rather led most of its interstate conflicts on foreign soil. Likewise, France fought many of its conflicts on German territory and in other neighbouring countries between the 15th and late-19th centuries. Similarly, the maritime power of the Netherlands notably increased its state capacity during the 16th and early-17th centuries; and it mostly succeeded in initiating maritime wars that did not increase the number of victims on Dutch soil. These states with high tax capacities did not suffer as much from war in terms of human victims, nor did their elites.

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10. Tables and Figures

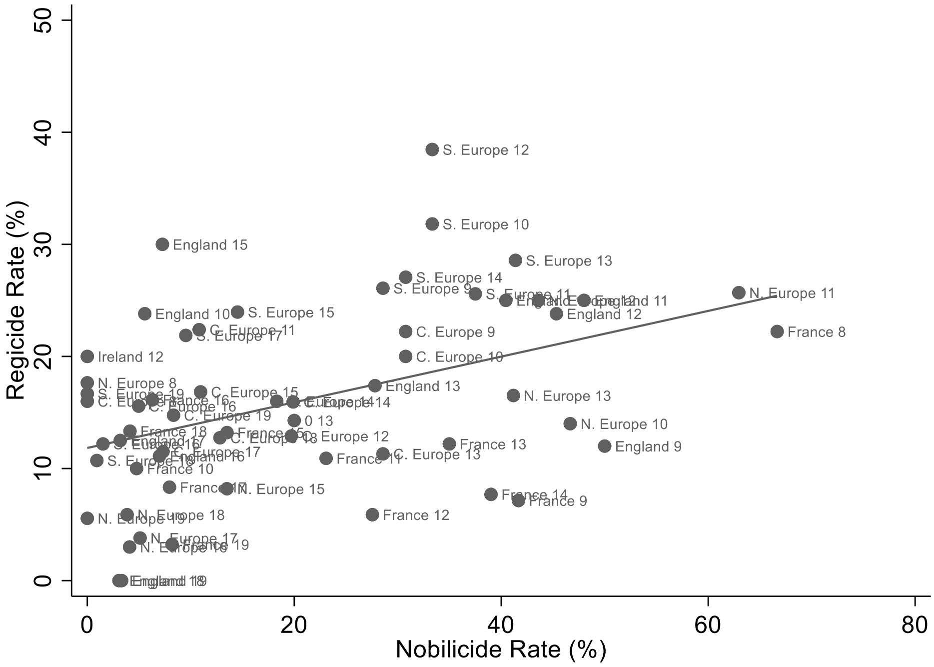


Figure 1: The Correlation between Regicide and Nobilicide (Nobilicide from Battles)

Note: Centuries are rounded up and abbreviated, i.e. 15 refers to the 15th century. Regional disaggregation follows Cummins (2017) where S. Europe refers to Southern Europe, C. Europe refers to Central Europe and N. Europe refers to Northern Europe. *Source*: Nobilicide data from Cummins (2017). On regicide, see appendix A.

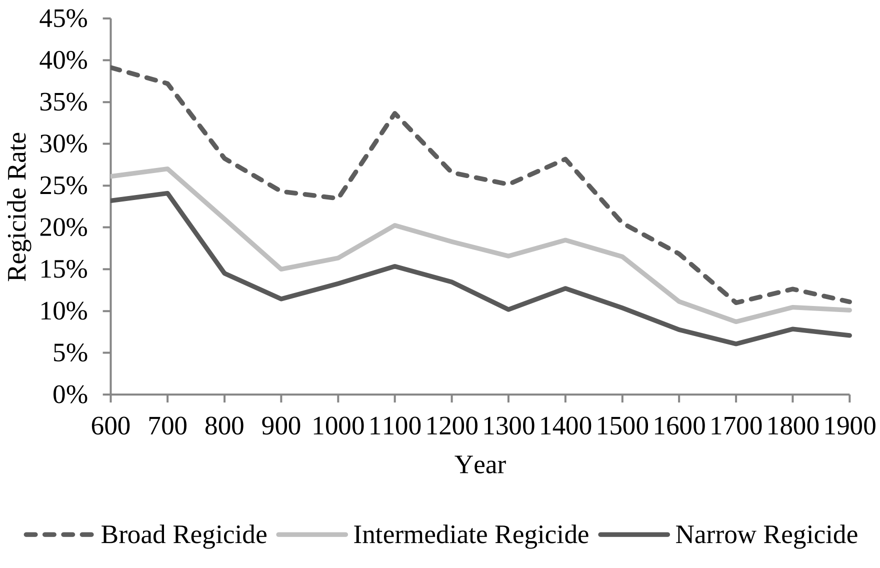


Figure 2: Defining Regicide

Note: centuries are rounded up, i.e. 1500 refers to the 15th century. Narrow: clearly murdered ruler; Intermediate: we added events in which the death looked suspicious (typically in case of poisoning or death in prison, in most cases this was probably regicide); Broad regicide also includes battle deaths (military regicide). These three definitions are strongly correlated, both over time and across polities.

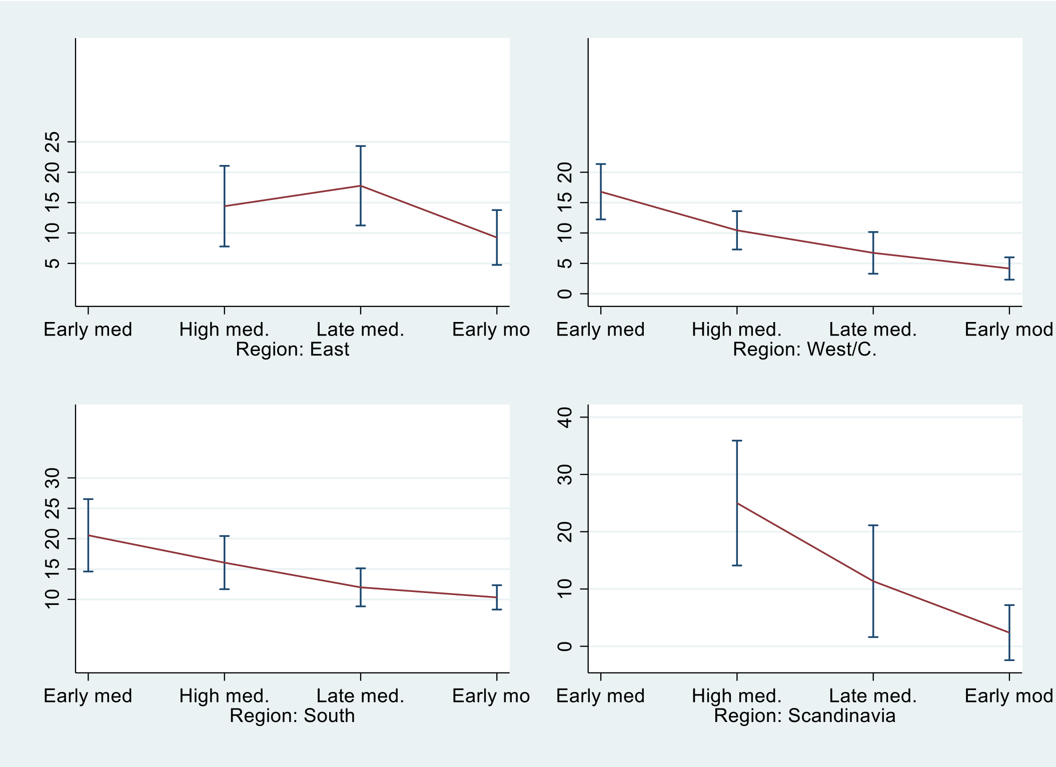


Figure 3: Regicide and the Second Serfdom

Note: Regicide for the early medieval period in Eastern Europe was omitted here, as its 50% regicide rate relies on small N and would have blurred the illustration. The narrow definition of regicide was used.

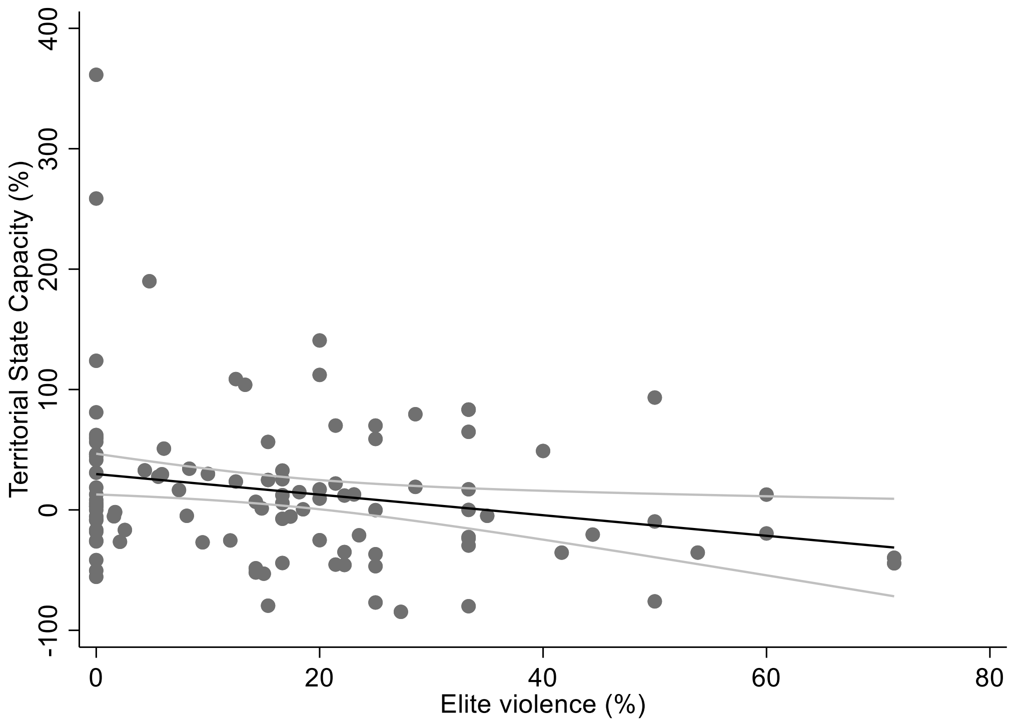


Figure 4: Territorial State Capacity and Elite violence (6th to 19th Century CE)

Note: Elite violence is measured by the *proportion of killed rulers.* TSC is the retention or expansion of a polity's territory. The confidence intervals reflect 95%.

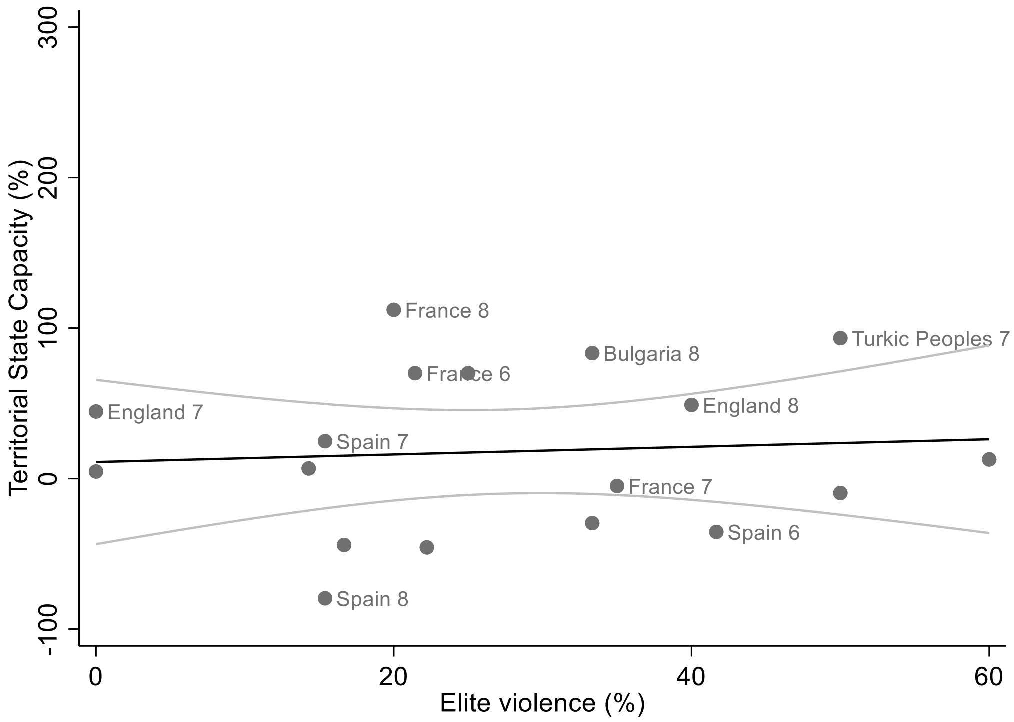


Figure 5: Territorial State Capacity and Elite violence (6th to 9th Century CE)

Note: Centuries are rounded up, i.e. 1500 refers to the 15th century. Elite violence is measured by *proportion of killed rulers.* TSC is the retention or expansion of a polity's territory. The confidence intervals reflect 95%.

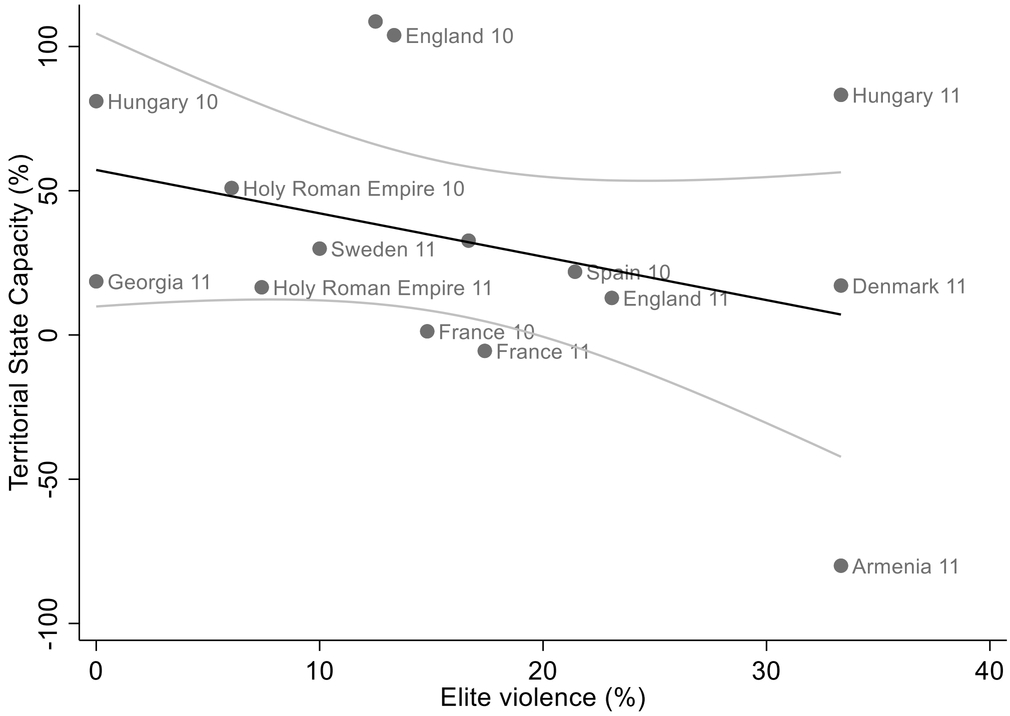


Figure 6: Territorial State Capacity and Elite violence (10th to 11th Century CE)

Note: Centuries are rounded up, i.e. 1500 refers to the 15th century. Elite violence is measured by *proportion of killed rulers.* TSC is the retention or expansion of a polity's territory. The confidence intervals reflect 95%.

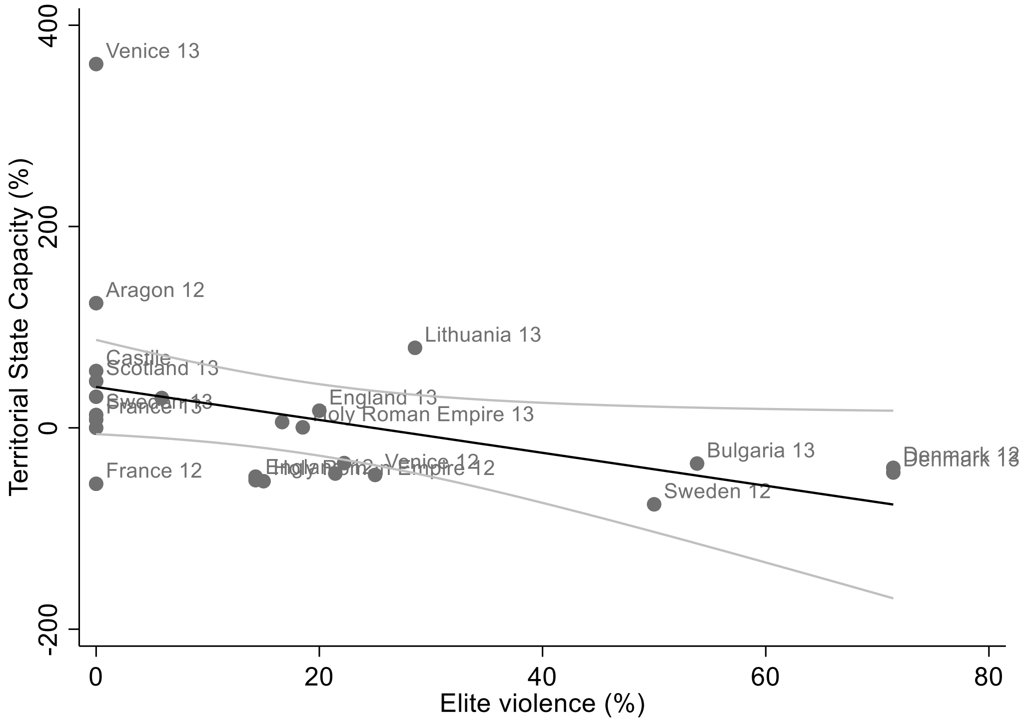


Figure 7: Territorial State Capacity and Elite violence (12th to 13th Century CE)

Note: centuries are rounded up, i.e. 1500 refers to the 15th century. Elite violence is measured by *proportion of killed rulers.* TSC is the retention or expansion of a polity's territory. The confidence intervals reflect 95%..

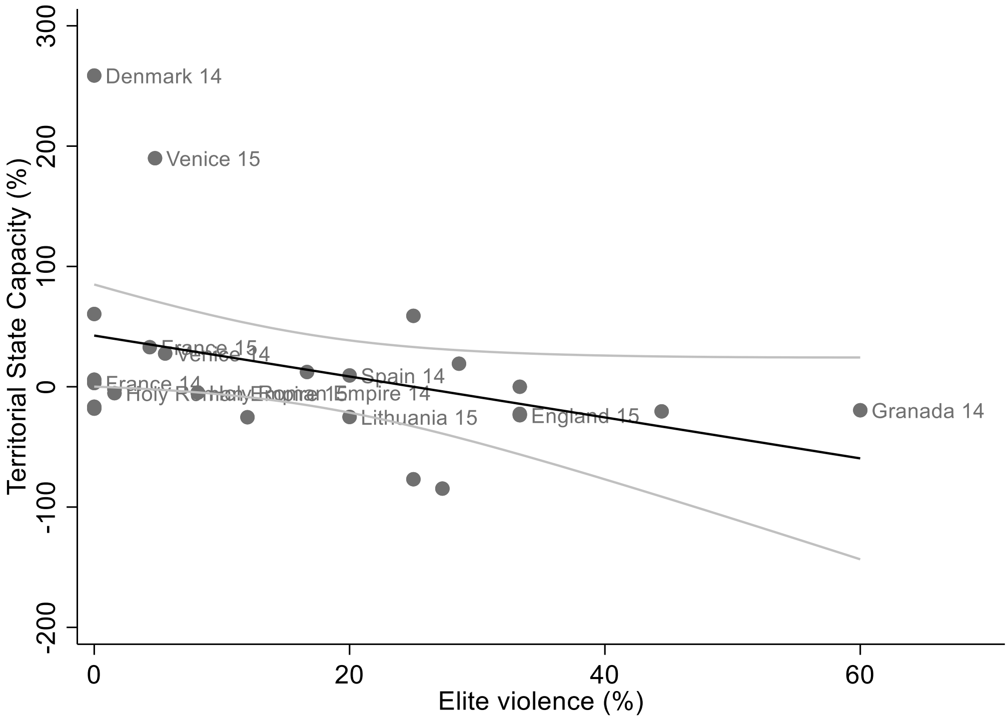


Figure 8: Territorial State Capacity and Elite violence (14th to 15th Century CE)

Note: centuries are rounded up, i.e. 1500 refers to the 15th century. Elite violence is measured by *proportion of killed rulers*. TSC is the retention or expansion of a polity's territory. The confidence intervals reflect 95%.

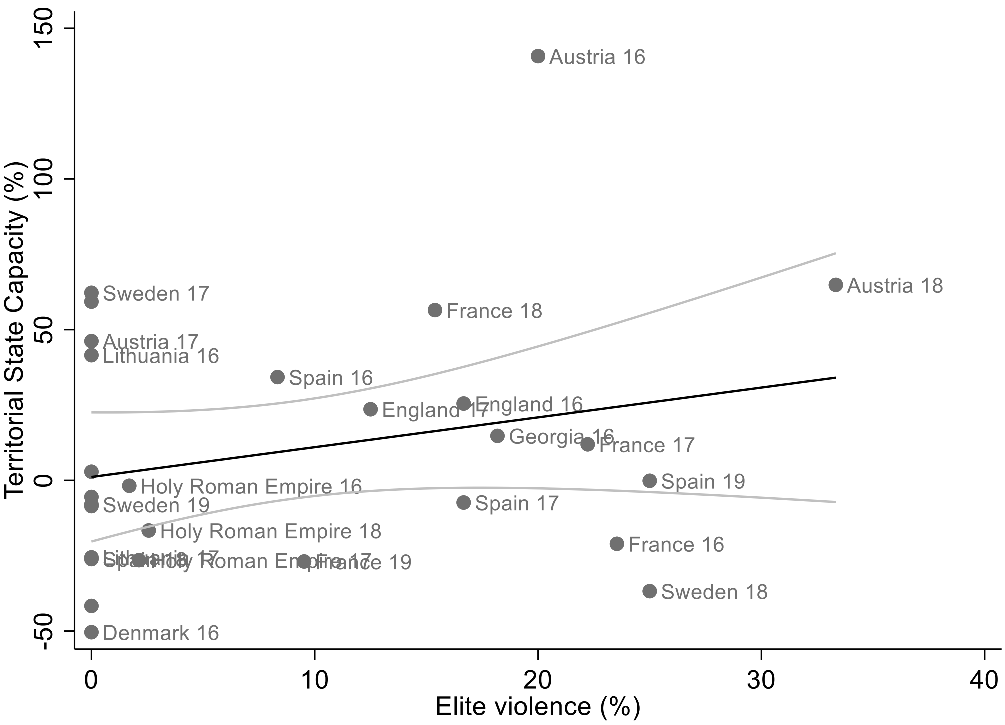


Figure 9: Territorial State Capacity and Elite violence (16th to 19th Century CE)

Note: centuries are rounded up, i.e. 1500 refers to the 15th century. Elite violence is measured by *proportion of killed rulers*. TSC is the retention or expansion of a polity’s territory. The confidence intervals reflect 95%.

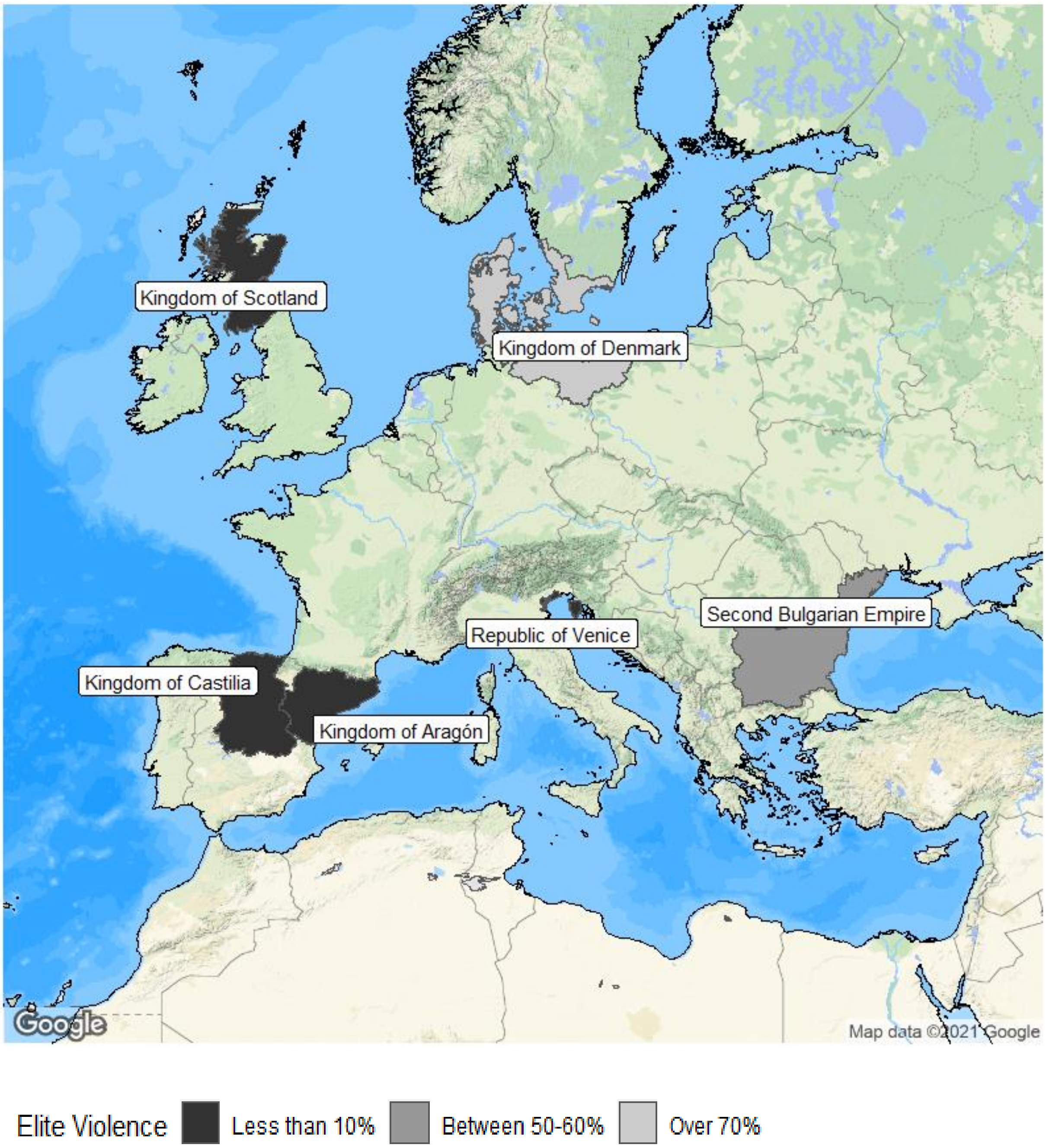


Figure 10: Regicide and territorial extent of selected European polities around 1200

Figure 11: Regicide and territorial extent of selected European polities around 1300

Region	Total number Eisner (2011)	New evidence	Increase in %	Standard deviation Eisner (2011)	New Evidence
West/C.	319	1168	266.1	0.07	0.08
East	214	1347	529.4	0.16	0.06
Iberia	218	327	50.0	0.15	0.13
Italy & SE	390	703	80.3	0.05	0.12
Scandinav.	129	156	20.9	0.20	0.14
UK&Ireland	243	390	60.5	0.10	0.08
Total	1513	4091	170.4	0.14	0.11

Table 1: Comparison of the Eisner dataset with this study's new evidence

Notes: Abbreviations: West/C. = West and Central Europe. Italy &SE= Italy and Southeastern Europe. We used Eisner's regional structure of six European regions to make the two datasets comparable. The standard deviation is calculated for each individual region. It informs about the variation over the centuries. A higher variation can be caused by stronger heterogeneity of the included countries (that is the case for the "Italy and South Eastern Europe" region of our dataset that also includes Turkey, Georgia and other countries. If this heterogeneity is not different, it indicates how volatile the trend is. The volatility seems overall larger for the Eisner dataset, because he could include only one third of the observation.

	(1)	(2)
Countries excluded	Habsburg	None
Territorial state capacity	128.3***	126.9***
	(19.63)	(20.19)
Habsburg ("Austria felix")		-177.6*
		(83.54)
Time fixed effects	Y	Y
Region fixed effects	Y	Y
Constant	30.26	30.87
	(63.52)	(64.22)
Observations	19	21
R-squared	0.578	0.580

Table 2: Regression of tax capacity per capita on estimates of territorial state capacity.

Notes: Cluster robust standard errors in parentheses (clustered by principalities). *** p<0.01, ** p<0.05, * p<0.1. We regress tax capacity per capita on territorial state capacity (approximated with the retention or expansion of territory, which is correlated with tax capacity per capita). The unit of observation is polity (kingdom/dukedom) and century. For tax capacity, we use Karaman and Pamuk's (2013) estimates. We take their values of 1500 and 1600 for the 16th century, 1600 and 1700 for the 17th century, 1700 and 1790 for the 18th century. If 1790 had no data, we replaced it in two cases with 1770 or 1780. Evidence on 1500 is taken to approximate the 15th century.

Variable	Observations	Mean	Standard Deviation	Min	Max
Autonomy	110	0.8818	0.3243	0	1
Battle	109	0.0562	0.0759	0	0.3333
Territorial State Capacity	**110**	**0.1787**	**0.6921**	**-0.8464**	**3.6140**
Fractionalisation	110	0.2545	0.4376	0	1
Great Plague	110	0.1364	0.3447	0	1
Invasion Proximity	110	0.00019	0.00001	0.00017	0.00021
Jewish Minority	110	0.3364	0.4746	0	1
Justinian Plague	110	0.0182	0.1342	0	1
Mode of Succession	110	0.6545	0.9030	0	2
Regicide	**109**	**0.1689**	**0.1692**	**0**	**0.7143**
Religion	110	1.8364	1.3377	1	5
Religious Diversity	110	0.3818	0.4881	0	1
Religious Transition	110	0.1727	0.3797	0	1
Second Serfdom	110	0.0364	0.1881	0	1
Temperature	107	0.0136	0.2216	-0.5894	0.5834
Urbanisation	110	0.0854	0.0973	0	0.4708

Table 3: Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

	Regicide	Regicide	Regicide	Regicide	Regicide	Regicide	Regicide	Regicide	Regicide	Regicide
Territorial State Capacity	**-0.0781*** **	**-0.0772*** **	**-0.0752** **	**-0.0786** **	**-0.0754** **	**-0.0744***	**-0.0746***	**-0.0803** **	**-0.0857*** **	**-0.0803** **
	(0.0266)	(0.0251)	(0.0285)	(0.0319)	(0.0340)	(0.0366)	(0.0369)	(0.0347)	(0.0270)	(0.0347)
Temperature		-0.0722	-0.0721	-0.0622	-0.0824	-0.118	-0.118	-0.0774		-0.0774
		(0.132)	(0.133)	(0.137)	(0.139)	(0.136)	(0.136)	(0.134)		(0.134)
Urbanisation			-0.0663	-0.0406	-0.0282	-0.00776	-0.00634	-0.0497		-0.0497
			(0.201)	(0.281)	(0.283)	(0.253)	(0.249)	(0.327)		(0.327)
Mode of Succession (Base=Hereditary)										
● Partially Elected				0.0281	0.0200	0.00787	0.00803	-0.00244		-0.00244
				(0.0587)	(0.0621)	(0.0488)	(0.0503)	(0.0700)		(0.0700)
● Fully Elected				-0.0523	-0.0672	-0.0506	-0.0502	-0.0471		-0.0471
				(0.0510)	(0.0526)	(0.0539)	(0.0556)	(0.0747)		(0.0747)
Battle						0.434	0.436	0.192		0.192
						(0.338)	(0.344)	(0.321)		(0.321)
Autonomy							-0.00594	-0.0430		-0.0430
							(0.0472)	(0.0354)		(0.0354)
Fractionalisation					-0.0634	**-0.0613***	**-0.0609***	-0.0616		-0.0616
					(0.0377)	(0.0341)	(0.0351)	(0.0529)		(0.0529)
Religion (Base=Catholic)										
● Islamic								-0.0285	-0.0263	-0.0285
								(0.0824)	(0.0541)	(0.0824)
● Orthodox								**-0.178** **	**-0.200*** **	**-0.178** **
								(0.0780)	(0.0610)	(0.0780)
● Protestant								-0.0912	-0.107	-0.0912
								(0.0774)	(0.0719)	(0.0774)
● Other								-0.0708	-0.0902	-0.0708
								(0.111)	(0.0717)	(0.111)
Jewish Minority								0.0162	-0.00807	0.0162
								(0.0612)	(0.0552)	(0.0612)
Religious Diversity								0.0207	0.0254	0.0207
								(0.0500)	(0.0491)	(0.0500)
Religious Transition								0.0101	0.0194	0.0101
								(0.0578)	(0.0543)	(0.0578)
Black Plague	0.00245	0.00289	0.00119	-0.00543	-0.00328	-0.0166	-0.0160	-0.0289	-0.0157	-0.0289
	(0.0541)	(0.0535)	(0.0536)	(0.0553)	(0.0553)	(0.0548)	(0.0555)	(0.0612)	(0.0620)	(0.0612)
Justinian Plague	0.0837								0.102	
	(0.108)								(0.0995)	
Second Serfdom	0.0386	0.0399	0.0367	0.0893	0.0987	0.0670	0.0662	0.0541	0.0388	0.0541
	(0.111)	(0.111)	(0.113)	(0.116)	(0.114)	(0.110)	(0.110)	(0.0865)	(0.0810)	(0.0865)
Constant	**0.279*** **	**0.293*** **	**0.294*** **	**0.316*** **	**0.354*** **	**0.330*** **	**0.335*** **	**0.386*** **	**0.307*** **	**0.386*** **
	(0.0834)	(0.0952)	(0.0962)	(0.0905)	(0.0750)	(0.0714)	(0.0884)	(0.0952)	(0.107)	(0.0952)
Observations	109	106	106	106	106	106	106	106	109	106
Within R^2	0.231	0.209	0.210	0.222	0.231	0.260	0.260	0.308	0.313	0.308
Number of Principalities	34	34	34	34	34	34	34	34	34	34
Polity FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 4: Fixed Effects Regressions

Notes: Cluster robust standard errors in parentheses (clustered by principalities). *** p<0.01, ** p<0.05, * p<0.1. We regress elite numeracy (measured as regicide, the share of killed rulers) on territorial state capacity (approximated with the retention or expansion of territory, which is correlated with tax capacity per capita) and other variables. The unit of observation is kingdom/dukedom and century. We use the fixed effects least square estimator.

	(1) ΔRegicide	(2) ΔRegicide	(3) ΔRegicide	(4) ΔRegicide	(5) ΔRegicide	(6) ΔRegicide	(7) ΔRegicide	(8) ΔRegicide	(9) ΔRegicide
Territorial State Capacity	**-0.097****	**-0.093****	**-0.085***	**-0.082***	**-0.085****	**-0.090****	**-0.089****	**-0.107****	**-0.103****
	(0.043)	(0.046)	(0.047)	(0.045)	(0.041)	(0.044)	(0.043)	(0.044)	(0.045)
ΔTemperature		-0.0129	-0.0254	-0.0202	-0.0212	-0.0461	-0.0465		-0.0829
		(0.117)	(0.121)	(0.115)	(0.112)	(0.113)	(0.114)		(0.125)
ΔUrbanisation			-0.317	-0.322	-0.380	-0.342	-0.347		-0.336
			(0.238)	(0.244)	(0.241)	(0.241)	(0.245)		(0.342)
Mode of Succession (Base=Hereditary)									
● Partially Elected				-0.056	-0.069	-0.083	-0.084		-0.083
				(0.120)	(0.125)	(0.130)	(0.131)		(0.144)
● Fully Elected				-0.0212	-0.033	-0.027	-0.027		-0.003
				(0.056)	(0.061)	(0.061)	(0.061)		(0.070)
Fractionalisation					0.068	0.0712	0.0703		0.0688
					(0.060)	(0.062)	(0.064)		(0.072)
ΔBattle						0.346	0.343		0.363
						(0.294)	(0.294)		(0.294)
Autonomy							0.011		-0.004
							(0.106)		(0.098)
Black Plague	-0.018	-0.016	-0.041	-0.039	-0.055	-0.064	-0.065	-0.001	-0.045
	(0.084)	(0.094)	(0.106)	(0.098)	(0.099)	(0.099)	(0.100)	(0.088)	(0.101)
Justinian Plague	-	-	-	-	-	-	-	-	-
Religion (Base=Catholic)									
● Islamic								-0.081	-0.125
								(0.099)	(0.104)
● Orthodox								-0.046	-0.066
								(0.057)	(0.075)
● Protestant								-0.109	-0.065
								(0.100)	(0.125)
Jewish Minority								0.008	0.034
								(0.057)	(0.062)
Religious Diversity								0.017	0.012
								(0.050)	(0.054)
Religious Transition								**0.110***	**0.119***
								(0.065)	(0.060)
Constant	0.011	0.006	0.015	0.027	0.017	0.022	0.012	0.002	-0.001
	(0.028)	(0.028)	(0.032)	(0.041)	(0.041)	(0.040)	(0.103)	(0.044)	(0.103)
Observations	62	59	59	59	59	59	59	62	59
Number of Principalities	16	16	16	16	16	16	16	16	16
R-squared	0.113	0.112	0.122	0.128	0.147	0.169	0.169	0.159	0.220
Polity FEs	NO	NO	NO	NO	NO	NO	NO	NO	NO
Time FEs	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 5: First Differences Regressions

Notes: Cluster robust standard errors in parentheses (clustered by principalities). *** p<0.01, ** p<0.05, * p<0.1. We regress elite numeracy (measured as regicide, the share of killed rulers) on territorial state capacity (approximated with the retention or expansion of territory, which is correlated with tax capacity per capita) and other variables. The unit of observation is kingdom/dukedom and century. We use a first difference least square regression model.

	(1) Regicide	(2) Regicide	(3) Regicide	(4) Regicide	(5) Regicide	(6) Regicide	(7) Regicide	(8) Regicide	(9) Regicide	(10) Regicide	(11) Regicide	(12) Regicide
Invasion Proximity	8.599**	6.070	5.798	5.538	4.212	3.384	3.553	3.733	4.996	6.921	16.85**	12.14
	(5.018)	(5.315)	(5.232)	(5.246)	(5.359)	(5.633)	(5.915)	(5.994)	(7.092)	(7.173)	(7.581)	(8.304)
Territorial State Capacity		-0.070***	-0.068***	-0.063**	-0.062**	-0.061**	-0.062**	-0.062**	-0.064**	-0.062**	-0.062**	-0.066**
		(0.025)	(0.024)	(0.026)	(0.029)	(0.030)	(0.031)	(0.031)	(0.031)	(0.032)	(0.025)	(0.033)
Temperature			-0.0538	-0.0547	-0.0417	-0.0527	-0.0602	-0.0611	-0.0424	-0.0650		-0.0437
			(0.132)	(0.132)	(0.136)	(0.136)	(0.134)	(0.135)	(0.131)	(0.136)		(0.131)
Urbanisation				-0.201	-0.236	-0.186	-0.163	-0.157	-0.205	-0.217		-0.250
				(0.155)	(0.194)	(0.198)	(0.192)	(0.191)	(0.246)	(0.194)		(0.239)
Mode of Succession (Base=Hereditary)												
● Partially Elected					0.0997*	0.0932	0.0880	0.0884	0.105	0.0929		0.0891
					(0.0567)	(0.0587)	(0.0622)	(0.0668)	(0.0652)	(0.0653)		(0.0583)
● Fully Elected					-0.0278	-0.0331	-0.0326	-0.0318	-0.0212	-0.00820		0.00509
					(0.0347)	(0.0378)	(0.0390)	(0.0411)	(0.0512)	(0.0417)		(0.0511)
Fractionalisation						-0.0317	-0.0323	-0.0320	-0.0358	-0.0333		-0.0389
						(0.0428)	(0.0432)	(0.0443)	(0.0413)	(0.0433)		(0.0425)
Battle							0.108	0.124	0.0450	0.190		0.136
							(0.268)	(0.270)	(0.256)	(0.280)		(0.272)
Autonomy								-0.0169	-0.0191	-0.0269		-0.0313
								(0.0526)	(0.0541)	(0.0561)		(0.0566)
Religion (Base=Catholic)												
● Islamic									0.0241		-0.0311	-0.00364
									(0.0662)		(0.0722)	(0.0651)
● Orthodox									-0.0514		-0.0766	-0.0813
									(0.0697)		(0.0611)	(0.0613)
● Protestant									-0.0399		0.0343	-0.0312
									(0.0677)		(0.0570)	(0.0675)
● Other									0.0456		-0.0247	0.0234
									(0.125)		(0.113)	(0.119)
Jewish Minority									-0.00934		-0.0421	-0.0142
									(0.0534)		(0.0402)	(0.0523)
Religious Diversity									0.0125		0.0373	0.0287
									(0.0405)		(0.0431)	(0.0448)
Religious Transition									0.00742		-0.0209	-0.00741
									(0.0561)		(0.0581)	(0.0581)
% Within 100 km. of ice-free coast										0.0007	0.0010	0.0009
										(0.0006)	(0.0007)	(0.0007)
% Fertile soil										0.0027	0.0023	0.0031
										(0.0017)	(0.0017)	(0.0022)
Ruggedness										0.0009	0.0002	0.0006
										(0.0011)	(0.0009)	(0.0011)
Black Plague	0.0441	0.0392	0.0414	0.0390	0.0400	0.0433	0.0402	0.0376	0.0491	0.0378	0.0703	0.0421
	(0.0622)	(0.0549)	(0.0552)	(0.0553)	(0.0573)	(0.0556)	(0.0554)	(0.0548)	(0.0582)	(0.0559)	(0.0640)	(0.0608)
Justinian Plague	0.0277	0.0373									0.0773	
	(0.113)	(0.0929)									(0.0899)	
Second Serfdom	-0.00387	0.0181	0.0190	0.00650	0.0454	0.0490	0.0468	0.0457	0.0368	0.0191	0.0351	0.00640
	(0.0936)	(0.104)	(0.104)	(0.100)	(0.0966)	(0.0989)	(0.101)	(0.1000)	(0.0757)	(0.0986)	(0.0850)	(0.0775)
Constant	0.291***	0.308***	0.325***	0.327***	0.333***	0.345***	0.340***	0.355***	0.351***	0.134	0.0743	0.0960
	(0.0656)	(0.0679)	(0.0796)	(0.0795)	(0.0773)	(0.0737)	(0.0789)	(0.0982)	(0.100)	(0.153)	(0.161)	(0.179)
Observations	109	109	106	106	106	106	106	106	106	106	109	106
Between R-squared	0.3455	0.3025	0.3218	0.3355	0.3545	0.3318	0.3062	0.3001	0.3217	0.3453	0.3644	0.3489
No. Principalities	34	34	34	34	34	34	34	34	34	34	34	34
Polity FEs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Time FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 6: Random Effects Regressions

Notes: Cluster robust standard errors in parentheses (clustered by principalities). *** p<0.01, ** p<0.05, * p<0.1. We regress elite numeracy (measured as regicide, the share of killed rulers) on territorial state capacity (approximated with the retention or expansion of territory, which is correlated with tax capacity per capita) and other variables. The unit of observation is kingdom/dukedom and century. Since distance is invariant and fixed effects regressions cannot be run with time-invariant regressors, we only include this proximity variable in a random effect least square specification (Table 5). However, using a Hausman (1978) test and comparing the results to those from an alternative random effects specification, which mirrors the fixed effects model in Table 3, we contend that no bias is introduced when running the regressions without the fixed effects.

	Least Squares
Territorial State Capacity	-0.0582
Spatial std. error, 250 km	(0.0244)**
Spatial std. error, 500 km	(0.0248)**
Spatial std. error, 750 km	(0.0239)**
Observations	106
Time FEs	YES
Region FEs	YES
Controls included	YES

Table 7: Assessing spatial autocorrelation

Notes: *** p<0.01, ** p<0.05, * p<0.1. We regress elite numeracy (measured as regicide, the share of killed rulers) on territorial state capacity (approximated with the retention or expansion of territory, which is correlated with tax capacity per capita) and other variables. The unit of observation is kingdom/dukedom and century. We calculate Conley standard errors using the distance of 250, 500 and 750 km. As we use panel data, we apply the autocorrelation procedure suggested by Hsiang (2010).
Controls: we control for temperature, urbanisation, battle, whether the successor was elected or not, and whether the region was autonomous or fractionalised. Furthermore, we control for the religion, religious diversity and transition, as well as for Jewish minority. Finally, we control regional factors like the closeness to the coast, the ruggedness and the type of soil.

	Test statistic
Altonji–Elder–Tabor ratios	11.04
Oster Delta	3.02

Table 8: Bounding the omitted variable bias.

Notes: We calculate Altonji–Elder–Tabor and Oster ratios to assess potential omitted variable bias. Under the assumption that selectivity from observables and unobservables are proportional, we can estimate that the effect of unobservables needs to be at least eleven times stronger than the one of observables to eliminate the coefficient of main interest (here: territorial state capacity). The unrestricted model is the one of Column 1 if Table 4, the restricted model is based on the 16 control variables of Column 10 of Table 4. For the estimation, we included Polity fixed effects and used the areg function, as our dataset for the least square dummy variable estimate contains many categorical polity variables. Including these control variables leads to a substantially higher R-square (0.31 instead of 0.23), hence the importance of the control variables is given. Consequently, the value of Oster's delta (which takes the R-square into account) is much higher than the critical value of |1| suggested by Oster (2019). The Oster delta reflects how strongly correlated the unobservables would have to be with regicide, relative to the joint effect of the 16 observables, to account for the full size of TSC coefficient. Given that the Oster Delta is much larger than |1|, it is unlikely that unobservables would be much more related to regicide than the observable controls.

Appendices (all online)

Appendix A: List of polities included

We built our regicide dataset on the foundations of Eisner's (2011) study[20] and then expanded it using a variety of sources; namely, Morby's (1989) "Dynasties of the World" and Bosworth's (1996) "The New Islamic Dynasties" as well as other individual biographies and encyclopaedia entries. This compilation finally resulted in a dataset of 4066 rulers, spanning the period 500-1900 CE and covering all European countries. Where conflicts arose between our sources, we included all rulers that were mentioned. We also took care to exclude any duplicates which often arose due to translated names or alternative naming conventions.

Note: The titles of rulers changed frequently, hence we sometimes listed these rulers as "House of" or their polity as "Principality of". Moreover, some of the names were translated into English from German, French, Italian, Arabic etc., so the exact spelling varies between sources. France had Europe's largest population until quite late, hence we included some counts of the large French counties, who were similarly powerful to dukes elsewhere.

Central Europe

Archdukes of Austria
Dukes of Austria
Dukes of Bavaria
Dukes of Braunschweig-Lueneburg
Dukes of Hesse
Dukes of Hohenzollern
Dukes of House of Zaehringen in Baden
Dukes of House Wettin
Dukes of Luxembourg
Dukes of Palatinate
Dukes of Wuerttemberg
Elder House of Luxembourg
Emperors, Holy Roman Empire
House of Bourbon
House of Habsburg
House of Habsburg-Lorraine
House of Hohenstaufen
House of Luxembourg-Limburg
House of Luxembourg-Namur
House of Orange-Nassau
House of Valois-Burgundy
Kings and Dukes of Bohemia
Kings and Dukes of Prussia
Kings of Westphalia
Margraves of Austria

[20] Eisner's study included 1513 rulers.

Eastern Europe (esp. Northeastern)

Duchy of Courland and Semigallia
Duchy of Moskow
Duchy of Prussia
Dukes and Kings of Poland and Poland-Lithuania
Dukes of Vladimir
Dukes of Kievan Rus
Grand Duchy of Lithuania
Inner Horde (Bukey)
Kingdom of Galicia-Volhynia
Kingdom of Khazaria
Kings of Hungary
Kings of the Huns
Old Great Bulgaria
Principality of Crimean Tatars
Principality of Galicia-Volhynia
Principality of Halych
Principality of Minsk
Principality of Polotsk
Principality of Slutsk
Principality of Turov-Pinsk
Principality of Vitebsk
Principality of Vladimir-Susdal
Principality of Volhynia
Teutonic Order
Tsardom of Russia

Scandinavia

Asbirningar family clan
Haukdaelir family clan
Kings of Denmark
Kings of Norway
Kings of Sweden
Sturlungar family clan

Southern Europe

Caliphate of Cordoba
Doges of Genoa
Doges of the Republic of Venice
Dukes (Ducato di) and Kings of Savoia
Dukes (Ducato di) Ferrara
Dukes (Ducato di) Mantova
Dukes (Duchi di) Modena e Reggio Emilia
Dukes and Kings of Castile

Dukes of Milan
Dukes of Perugia
Dukes of Romagna (House Rimini)
Dukes of Tuscany
Dukes of Urbino
Emirate of Sicily
First Citizens of Bologna
House Lunigiana, Massa & Carrara
House of Este in Ferrara and Modena
Kings (and Dukes) of Portugal
Kings of Aragon
Kings of Asturias
Kings of Leon und Castile
Kings of Naples and Sicily
Kings of Navarre
Kings of Spain
Kings of the Ostrogoths
Lombard Kingdom
Marquis of Monferrato
Marquis of Saluzzo
Popes
Principality of Barcelona
Sultanate of Granada
Visigoth Kingdom

Southeastern Europe

Banate of Bosnia
Byzantine Empire
County Palatine of Cephalonia and Zakynthos
Despotate of Dobruja
Despotate of Epirus
Despotate of Morea
Despots of Arta
Duchy of Athens
Duchy of Durazzo
Duchy of Naxos
Dukes of Transylvania
Dukes of Valona
Dukes of Wallachia
Dukes of Zeta
Emirate of Aydin
Empire of Trebizond
First Bulgarian Empire
Greater Armenia
Independent Kingdom of Imereti
Khans of the Second Bulgarian Empire

Kingdom of Armenia
Kingdom of Cilicia
Kingdom of Cyprus
Kingdom of Georgia
Kingdom of Serbia
Kings and Princes of Albania
Kings of Bosnia
Kings of Croatia
Kings of Greece
Kings of Romania
Lordship of Serbia (Under Habsburg Rule)
Lordship of Serbia (Under Ottoman Rule)
Ottoman Empire
Pirincipality of Moldavia
Prince of Gjirokaster
Prince-Bishopric of Montenegro
Princes of Arbanon
Princes of Berat
Princes of Dukagjini
Princes of Kastrioti
Principality of Achaea
Principality of Bulgaria
Principality of Duklja
Principality of Iberia
Principality of KaKheti
Principality of Kartli
Principality of Kartli and Imereti
Principality of Kartli and Kakheti
Principality of Montenegro
Principality of Samos
Principality of Serbia
Principality of the March of Carniola and Istria
Sultanate of Rum
Tsars of Kazakh Khanate

Western Europe

Counts and Dukes of Anjou
Counts of Artois
Counts of Burgundian and Habsburg Netherlands
Counts of Champagne (Troyes)
Counts of Flanders
Counts of Hainaut
Counts of Holland
Counts of Holland and West Frisia
Counts of Leuven, Brussels and Brabant

Counts of Provence
Counts of Toulouse
County of Namur
Dukes of Aquitaine
Dukes of Bourbonnais
Dukes of Brabant
Dukes of Brittany
Dukes of Burgundy
Dukes of Limburg
Dukes of Lothringia
Dukes of Lower Lothringia
Dukes of Normandy
Frankish Emperors
High Kings of Ireland
Kingdom of Great Britain and Ireland
Kingdom of the Isles
Kingdom of the Picts
Kings of Belgium
Kings of Deira and Northumbria
Kings of England
Kings of France
Kings of Frisia
Kings of Gwynedd and Wales
Kings of Mercia
Kings of Scotland
Kings of the Netherlands
Kings of Upper Burgundy
Kings of Wessex
Majordomi of the Palace of Austrasia
Majordomi of the Palaces of Austrasia, Neustria and Burgundy
Prince-Bishops of Liege
Principality of Monaco

Appendix B: Sampling and Proxy Measurement Error

One of the advantages of using regicide as an indicator of interpersonal violence over homicide is that we have access to nearly complete dynastic lists, so that selectivity is not an issue. However, small sample sizes may induce strong deviations in regicide and misrepresent the relationship between regicide and interpersonal violence. Figure B.1 indicates the total number of rulers per century and shows that there were hundreds of rulers across all time periods. The lowest numbers are available for the early Middle Ages in Eastern Europe (about

30 per century). This means that low observation density is unlikely to have caused spurious conclusions when conducting analyses on European or on regional levels. Since the trends that we study are disaggregated to the regional or European level, and since our regressions take all of Europe into account, we see no reason why this potential for error in approximating interpersonal violence would lead to systematic biases. Nevertheless, as a precaution against this kind of measurement error, we require a minimum of five rulers per polity, per century in all of our analyses.

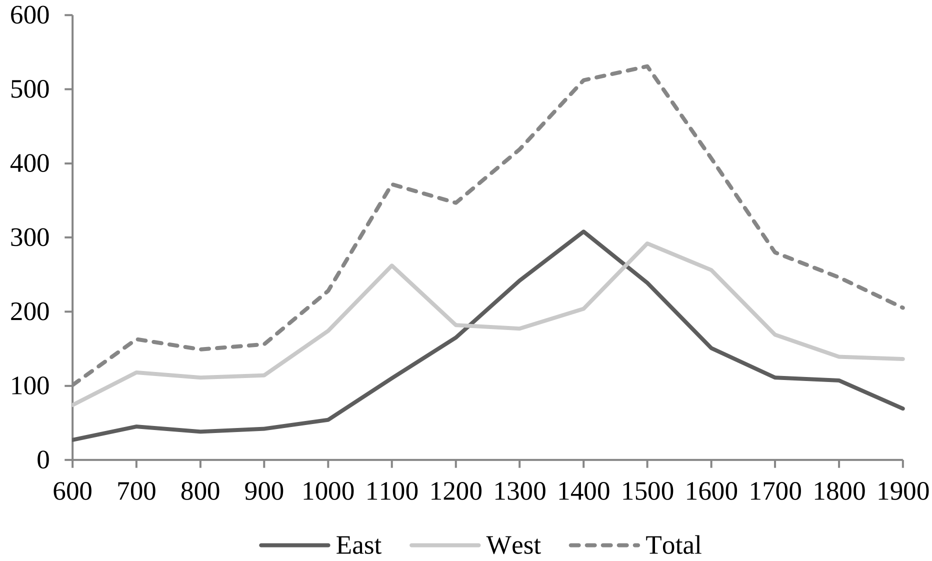


Figure B.1. Rulers per Century

Note: centuries are rounded up, i.e. 1500 refers to the 15th century.

Appendix C: Female Rulers

Considerable research has shown that women display lesser violent tendencies than men (Lussier et al. 2012; Steffensmeier and Allan, 1996). Consequently, female rulers may have provoked fewer rivals looking to obtain the throne, as they may have caused fewer disputes leading to regicide. As a result, we also considered investigating whether female rulers were killed as often as their male counterparts. Unfortunately, our entire dataset only contains 138 female rulers from across all countries and periods, so we are not able to construct a meaningful female regicide rate. It is also not possible to use the proportion of female rulers as a regressor. Further, we should keep in mind that most early societies were patriarchal organisations. The presence of female rulers may reflect then the effect of improved institutional quality rather than any gender specific effect on violence. In our sample, only ten female rulers (7.25%) were killed, five of which fall under the dubious regicide classification. Although this is less than half the overall regicide rate of 16.78%, the number of observations provides limited statistical evidence that violence levels were lower under the authority of female rulers. Table C.1 lists all female rulers in our dataset that were killed.

Ruler	Polity	Regicide	Dubious	End of Reign
Amalasuintha	Ostrogoths	1	0	534
Joanna	Duchy of Durazzo	0	1	1368
Joanna I	Naples	1	0	1382
Maria I	Hungary	0	1	1385
Margaret I	Denmark	0	1	1412
Chiara Zorzi	Duchy of Athens	1	0	1454
Blanche II	Navarre	0	1	1464
Lady Jane Grey	England	1	0	1553
Bona Sforza d'Aragona	Milan	0	1	1557
Mary I	Scotland	1	0	1567

Table C.1. Regicide among Female Rulers

Appendix D: Smoothing Temperature Data

To convert the annual temperature records into centennial estimates in order to suit the periodicity of our data, we apply a Hodrick-Prescott filter with a lambda value of 500 000. This extracts the longer run trends from each series, removing any noise which is due to the relatively high frequency of the data. Though $\lambda = 500\,000$ is a much higher value than that recommended by Ravn and Uhlig (2002) for annual periodicity, we argue that a 1400 year series is exceptionally long and that it consequently displays characteristics of higher frequency data; requiring more smoothing than is usual for time series estimates. Additionally, the trends obtained using this parameter provide a balance between the noisy estimates of the annual data and what could be identified as over-smoothing. Finally, we take a simple average of this long run trend for each century.

Appendix E: Regicide Maps with Battle Deaths

In order to show that the discussion of regional trends in Section 2.4 is not biased by using our intermediate definition of regicide (unambiguous and dubious assassinations) as opposed to our broad definition (the intermediate definition plus battle deaths), we compare the intermediate- and broad regicide maps here.

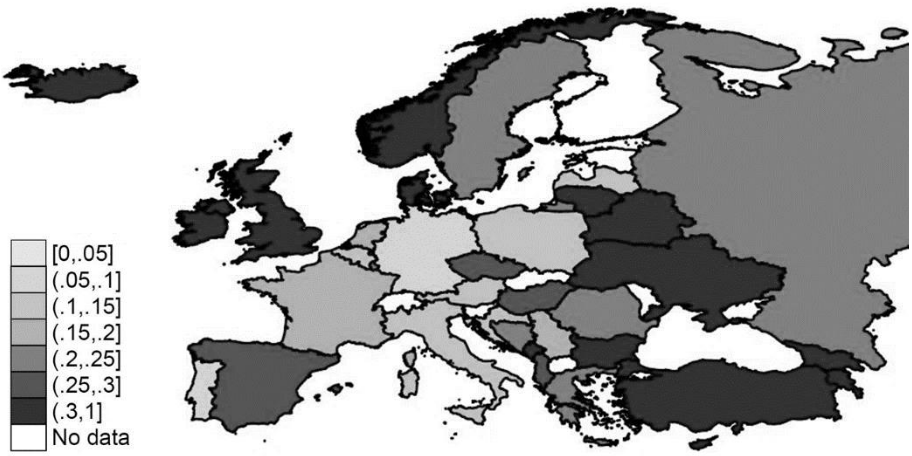
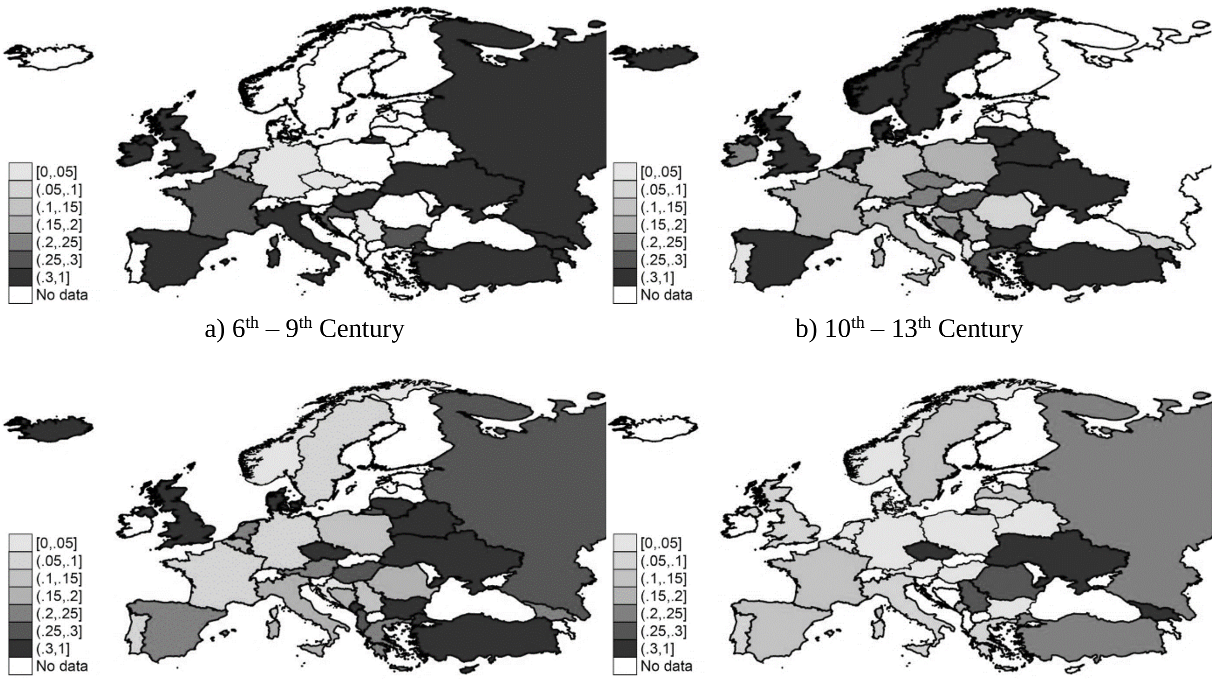


Figure E.1. European Regicide and Battle Deaths: 6th – 19th Century

The broadly defined map of the entire sample period is almost identical to the intermediate case. Aside from many countries increasing by one level of regicidal intensity, the only striking difference is that Scandinavia, the United Kingdom and Ireland become vastly more violent. Likewise, Austria, Germany and Poland seem somewhat more violent when battle deaths are included, but these countries are still among the least violent that we study.

In the period 500–900 (Figure E.2, panel a), the differences are also very small. When battle deaths are included, the United Kingdom and Spain increase in regicidal intensity by one level, whereas Croatia and Turkey experience decreases of one level each.

Battle deaths in the High Middle Ages (panel b) are the root cause of the differences in the maps that cover the entire sample period, with northern Europe becoming far more violent. As mentioned, the Vikings and Norsemen had a disproportionately high ratio of battle deaths to intermediate regicide, resulting in much higher levels of broad regicide and distorting the northern countries in our map. Aside from the northern countries – and Austria, Germany and Poland – the increases in regicidal intensity that occur after including battle deaths appear quite uniform.



a) 6th – 9th Century

b) 10th – 13th Century

c) 13th – 15th Century

d) 15th – 19th Century

Figure E.2. European Regicide and Battle Deaths by Period

In the late Middle Ages (panel c), the lower number in Norwegian and Swedish battle deaths during the formation of the Kalmar Union (1397) largely reduced the disparities between the regicide maps under the two definitions. However, battle deaths in the United Kingdom and Iceland remain disproportionately high, as they do in Germany.

During the early modern period (panel d), the inclusion of battle deaths seems to have increased regicidal intensity in the Czech Republic, Georgia and Serbia, while decreasing it in Romania and particularly in Ukraine. Other than these geographically diverse examples, the maps under the two definitions are markedly similar.

Appendix F: Unit Root Tests

To ensure that our results are not driven by common trends, we run panel unit root tests. We use the Phillips–Perron test since it is one of the few panel tests that is able to circumvent the duel problems of unbalanced panels and gaps in the time-series; which arise where principalities were dissolved and later resurfaced, e.g. Norway before and after the Kalmar Union. Table F.1 outlines the results, showing that only the urbanisation variable with zero lags follows a unit-root process. Therefore, our inclusion of time fixed effects and the first difference model should rule out any adverse effects of unit roots.

Lags	Regicide	Territorial State Capacity	Temperature	Urbanisation	Battle
	P-Value	P-Value	P-Value	P-Value	P-Value
0	0.0000	0.0000	0.0124	**0.2393**	0.0000
1	0.0000	0.0000	0.0000	0.0005	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000

Phillips–Perron Panel Unit Root Test

Table F.1. Panel Unit Root Test

Appendix G: Hausman Test

To motivate the random effects specification with the proximity-to-invasion variable in Table 3, we compare Table 1's results to an equivalent random effects specification (Table G.2) using Hausman tests. These tests conclude that the random effect assumption – the individual specific effects being uncorrelated to the independent variables – holds in all ten cases. Therefore, the results which include the new proximity indicator in table 3's random effects specification should not be subject to omitted variable bias from omitted, time-invariant factors. Additionally, the remaining results from Tables 3 and G.2 are also nearly identical, suggesting that no other right-hand-side variables (other than Orthodox Christianity) are correlated to invasion proximity.

		Hausman Tests		
Model	Degs. Freedom	χ^2	P-Value	Conclusion
1	10	3.45	0.9688	RE
2	10	3.95	0.9496	RE
3	11	4.50	0.9530	RE
34	13	4.62	0.9826	RE
5	14	4.41	0.9924	RE
6	15	6.95	0.9590	RE
7	16	6.48	0.9820	RE
8	23	28.11	0.2115	RE
9	9	6.52	0.6868	RE
10	23	13.88	0.9301	RE

Table G.1. Hausman Tests

	(1) Regicide	(2) Regicide	(3) Regicide	(4) Regicide	(5) Regicide	(6) Regicide	(7) Regicide	(8) Regicide	(9) Regicide	(10) Regicide
Territorial State Capacity	**-0.074*** **	**-0.072*** **	**-0.067*** **	**-0.066** **	**-0.065** **	**-0.065** **	**-0.065** **	**-0.064** **	**-0.066** **	**-0.069** **
	(0.024)	(0.023)	(0.026)	(0.028)	(0.029)	(0.031)	(0.031)	(0.030)	(0.019)	(0.031)
Temperature		-0.0565	-0.0571	-0.0429	-0.0558	-0.0645	-0.0651	-0.0511	-0.0744	-0.0601
		(0.129)	(0.130)	(0.135)	(0.135)	(0.133)	(0.134)	(0.130)	(0.136)	(0.132)
Urbanisation			-0.190	-0.212	-0.156	-0.140	-0.136	-0.223	-0.174	-0.235
			(0.162)	(0.202)	(0.202)	(0.193)	(0.192)	(0.250)	(0.196)	(0.257)
Mode of Succession (Base=Hereditary)										
● Partially Elected				**0.093***	0.084	0.080	0.081	**0.115***	0.090	0.107
				(0.055)	(0.058)	(0.061)	(0.065)	(0.064)	(0.067)	(0.066)
● Fully Elected				-0.0349	-0.0407	-0.0390	-0.0384	-0.0252	-0.0239	-0.0122
				(0.0337)	(0.0363)	(0.0371)	(0.0388)	(0.0471)	(0.0416)	(0.0513)
Fractionalisation					-0.0374	-0.0378	-0.0377	-0.0398	-0.0405	-0.0464
					(0.0407)	(0.0410)	(0.0415)	(0.0381)	(0.0429)	(0.0424)
Battle						0.126	0.138	0.0392	0.207	0.129
						(0.264)	(0.266)	(0.251)	(0.280)	(0.267)
Autonomy							-0.0135	-0.0200	-0.0192	-0.0232
							(0.0525)	(0.0543)	(0.0555)	(0.0571)
Religion (Base=Catholic)										
● Islamic								0.0401		0.0206
								(0.0683)		(0.0678)
● Orthodox								-0.0271		-0.0433
								(0.0697)		(0.0658)
● Protestant								-0.0358		-0.0320
								(0.0667)		(0.0686)
● Other								0.0630		0.0548
								(0.126)		(0.127)
Jewish Minority								-0.00323		-0.000188
								(0.0500)		(0.0523)
Religious Diversity								0.00958		0.0191
								(0.0395)		(0.0421)
Religious Transition								0.0112		0.00334
								(0.0570)		(0.0577)
Black Plague	0.0302	0.0323	0.0301	0.0302	0.0344	0.0323	0.0307	0.0505	0.0271	0.0373
	(0.0533)	(0.0535)	(0.0535)	(0.0548)	(0.0531)	(0.0531)	(0.0528)	(0.0582)	(0.0546)	(0.0593)
Justinian Plague	0.0430									
	(0.0912)									
Second Serfdom	0.0401	0.0412	0.0291	0.0695	0.0701	0.0652	0.0642	0.0481	0.0509	0.0433
	(0.0964)	(0.0958)	(0.0937)	(0.0867)	(0.0891)	(0.0897)	(0.0894)	(0.0693)	(0.0882)	(0.0688)
% Within 100 km. of ice-free coast									0.000342	0.000408
									(0.000602)	(0.000629)
% Fertile soil									0.00235	0.00215
									(0.00157)	(0.00185)
Ruggedness									0.00133	0.00102
									(0.00119)	(0.00107)
Constant	**0.325*** **	**0.342*** **	**0.342*** **	**0.346*** **	**0.359*** **	**0.353*** **	**0.365*** **	**0.361*** **	0.188	0.195
	(0.0693)	(0.0803)	(0.0804)	(0.0781)	(0.0734)	(0.0766)	(0.0957)	(0.0990)	(0.131)	(0.155)
Observations	109	106	106	106	106	106	106	106	106	106
Between R-squared	0.266	0.285	0.299	0.320	0.300	0.273	0.268	0.324	0.300	0.322
No. Principalities	34	34	34	34	34	34	34	34	34	34
Polity FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Cluster robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table G.2. Comparative Random Effects Regressions for the Hausman Test

Appendix H: Data Appendix for Right Hand Side Variables

1. Nomadic Invasion

In an attempt to capture some of the effects of invasions on elite violence we use the distance to Central Asia as another right-hand-side variable. Of course, not all of the nomadic invasions that Europe experienced originated in the same place, but as a simplification we use the inverse distance from each polity to Avarga, Mongolia, the location of the first capital of the Mongolian Empire.

Does this simply proxy east–west differences? We saw in Figure 5 that it was mostly the period of the Mongolian invasion when North-Eastern Europe developed a higher elite violence level, whereas before this period elite violence was lower than in the Mediterranean. Keywood and Baten (2020) assessed the east-west patterns and found that the difference only developed from the 12th century onwards.

2. Income

We constructed our urbanisation variable using Bosker et al.'s (2013) estimates of urban populations – urban centres defined as cities with a population of at least 5000 inhabitants – and calculated urbanisation rates using McEvedy and Jones' (1978) measurements of country populations by century. As Bosker et al.'s (2013) urban population estimates end in 1800; these were then augmented with urbanisation rates from the Clio Infra database for the 19th century.

Recent studies in historical climatology have provided economic historians with a plethora of long run temperature series from a variety of sources. These include evidence from tree rings, corals, ice-core isotopes and pollen assemblages, comparing them to the existing anecdotal evidence where possible (Guiot and Corona 2010). These sources also tend to be exceptionally consistent regardless of which indicators are used (Guiot and Corona 2010).

To estimate agricultural output, we employ temperature reconstructions from Guiot and Corona (2010), who consider all of the above methods to reconstruct annual summer temperatures for all of Europe in a 5x5 degree grid pattern over the last 1400 years. These are then applied to each of our polity units based on the grid nodes closest to their historical capitals. These temperature series are measured as the deviation in degrees Celsius from the 1961–1990 mean at each node (Guiot and Corona 2010) (see the appendix for a note on smoothing).

3. Autonomy

We define autonomy as a ruler's unhindered ability to make decisions and to dictate policy. For example, Transylvania would not be considered a completely autonomous state while it was subject to tributes to the Ottoman Empire. We control for autonomy under the hypothesis that a ruler is more likely to be killed if their successor is able to act autonomously. Alternatively, rulers of subservient principalities may have been more likely to be killed by their overlords who would then be able to install more cooperative leaders.

Since the majority of rulers were killed by family members hoping to take the throne, we also control for mode of succession. Under electoral systems, these power-hungry relatives would have had a lower chance of being elected, decreasing the probability of regicide. We split this indicator into three levels: hereditary systems, ceremonial electoral systems and de facto electoral systems.

The reason for this is because many principalities held elections among a group of the elite but then simply voted for the direct heir of the previous ruler – possibly out of fear of retribution from the ruling family, due to political ties or for continuance in policy. For example, this was the case in the Holy Roman Empire between 1453 and 1740, where a member of the House of Habsburg was always elected. However, even the ceremonial existence of elections reveals some kind of preference for shared decision making, which may have been associated with more inclusive institutions than under completely hereditary systems of succession. Consequently, we use a three-part indicator variable rather than a dummy.

4. Religion, fractionalisation, geography, pandemics, and serfdom

Religion is represented by an indicator variable for the majority religion in each polity, under the categories: Catholicism, Orthodoxy, Protestantism, Islam and Other. The 'Other' category includes Paganism and tribal religions from times before each polity adopted one of Europe's largest four modern religions. Additionally, we include dummy variables for religious diversity and religious transition. Religious diversity may have led to conflict and transition may have caused violence due to opposing forces trying to preserve old orders or instil new ones. Furthermore, we introduce a dummy variable for whether a country had a significant Jewish minority, as Jews often held above average income and human capital, despite being the targets of numerous forms of persecution throughout Europe over our timeline.

We also control for fractionalisation, measured as three or more polities overlapping with a particular modern country. Borcan et al. (2018) suggested using modern boundaries as a benchmark for historical polity size. In this manner, we also aim to control for conflict between principalities that may be driven by fractionalisation that is not explained by the other independent variables.

Since some studies describe a relationship between geographical factors and violence, we include certain geographical controls here such as ruggedness (Nunn and Puga 2012), soil fertility and coastal access. For example, Bohara et al. (2006) describes how more rugged terrain protects instigators of violent insurgencies, while Nunn and Puga (2012) assert that ruggedness protected certain West African regions from the Atlantic slave trade. Pinker (2011) also argued that mountainous terrain inhibits policing functions. Therefore, we include Nunn and Puga's (2012) ruggedness measure. As discussed, access to agricultural resources could have an impact on violence, so we also include Nunn and Puga's (2012) measures of fertile soil distribution as an additional control for agricultural productivity. Further, access to agricultural trade via sea could also have been important, so we also include their measure of the percentage of each country that lies within 100 km of ice-free coast. Since these geographical variables are time-invariant, they are only included in the random effects specification (Table 3).

Lastly, we use three dummy variables in order to capture the effects of periods in which major societal transformations took place; the Justinian Plague, the Great Plague and the second serfdom. The Great Plague and its devastation of Europe's population in the 14th century has been thoroughly researched, and the subsequent societal upheaval could have played a role in impacting interpersonal violence through societal fear and resource scarcity. Scarcity would also have been compounded in cities, as they would have received limited imports, particularly as agricultural industries collapsed from a depleted labour force. The Justinian Plague could also have had a similar impact as it killed approximately 50 million people – an estimated 15% of the world's population – in what is now Turkey and throughout the Mediterranean states between the 6th and 8th centuries (Caspermeyer 2016). Finally, we use the second serfdom as a case study in order to test whether inequality has had a significant impact on regicide and interpersonal violence. We assess the second serfdom using a dummy variable for Eastern European countries in the 16th, 17th and 18th centuries, and in Russia for the 19th century; as serfdom in Russia was only abolished under Tsar Alexander II in 1861.

Appendix I: Comparison of the trends of regicide between Eisner and new evidence:

If we compare the trends for Eastern Europe and central/western Europe using both Eisner's dataset and our new dataset, which is almost three times as large, we observe some differences which justified a differentiation of additional data. First of all, for Eastern Europe is the region in which we have the largest difference in sample size. The levels of regicide are roughly comparable, but Eisner's series is much more volatile; showing extreme spikes in the 7th and 10th centuries and zero violence in the 15th and 16th centuries. In contrast, our series is smoother while also reflecting the general movements, with a short-time peak in the 10th century and another modest increase in the 13th and 14th century. Both series display in general a downward trend for Eastern Europe. For central/western Europe, the level of violence in our dataset is slightly lower on average, especially after the 7th century, as we could include more principalities of the slightly less violent central European region. Again, the data is less volatile than Eisner's. In comparison, the new data with a larger number of cases is probably more reliable.

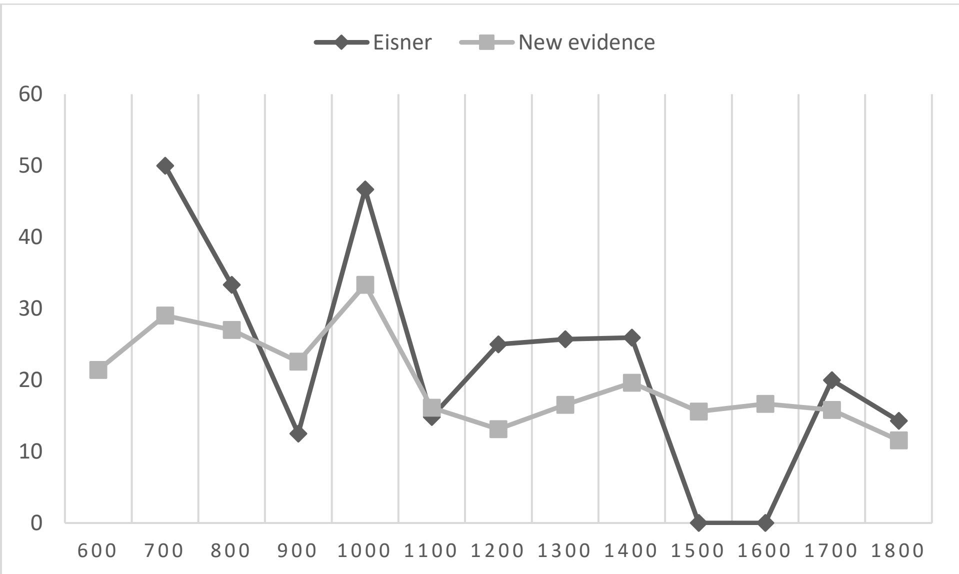


Figure I.1: Comparison for Eastern Europe of Eisner's (N=214) dataset and our new data (N=1347)

Note: The Eisner dataset was recollected by us, following his list of principalities

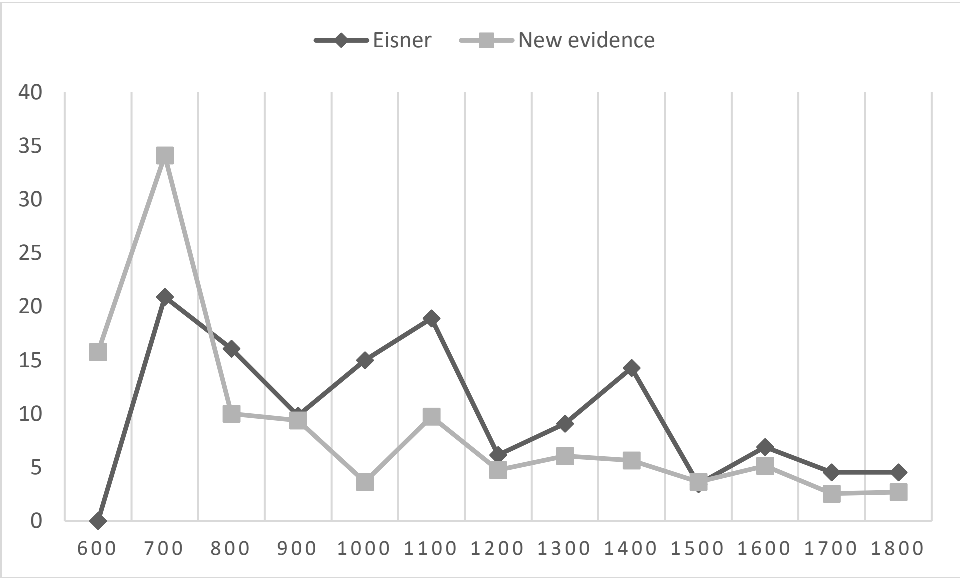


Figure I.2: Comparison for Central and Western Europe of Eisner's (N=319) dataset and our new evidence (N=1168)

Note: The Eisner dataset was recollected by us, following his list of principalities

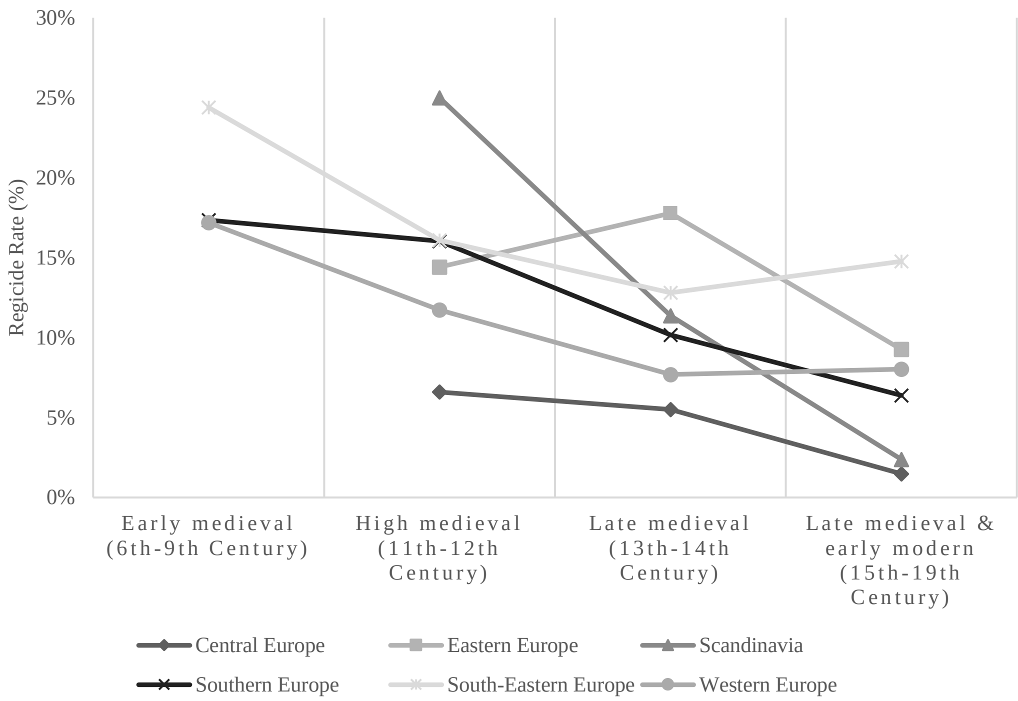


Figure I.3 The trends of regicide of our new data, spliced into six smaller regions

Appendix J: How closely correlated are the narrow and intermediate definitions of regicide?

We studied the correlation between narrow regicide, in which the historical sources stated that a ruler was murdered, and the intermediate regicide, typically cases in which there was suspicion about a ruler being killed by poison or if a ruler died in prison. We use polity-century units of observation. Overall, the two definitions of regicide correlate very closely with a coefficient of 0.84 (p-value=0.000, see appendix Table J.1).

If we restrict the timeframe to the early medieval period, the correlation is even closer for the 16 cases, being as high as 0.97 (p=0.000). For the high medieval period, the correlation is 0.81. For the late medieval period, it is slightly lower at 0.78; and for the modern period, (16th and 17th century) it is again a very close correlation of 0.92. In conclusion, we can say that it is not very relevant which definition – narrow or intermediate – we use, as both concepts of measuring regicide yield very similar results. This is not surprising, as both contain the cases of narrow regicide, but it could be the case that the dubious regicide cases might distort the picture if they were clustered in specific regions or periods.

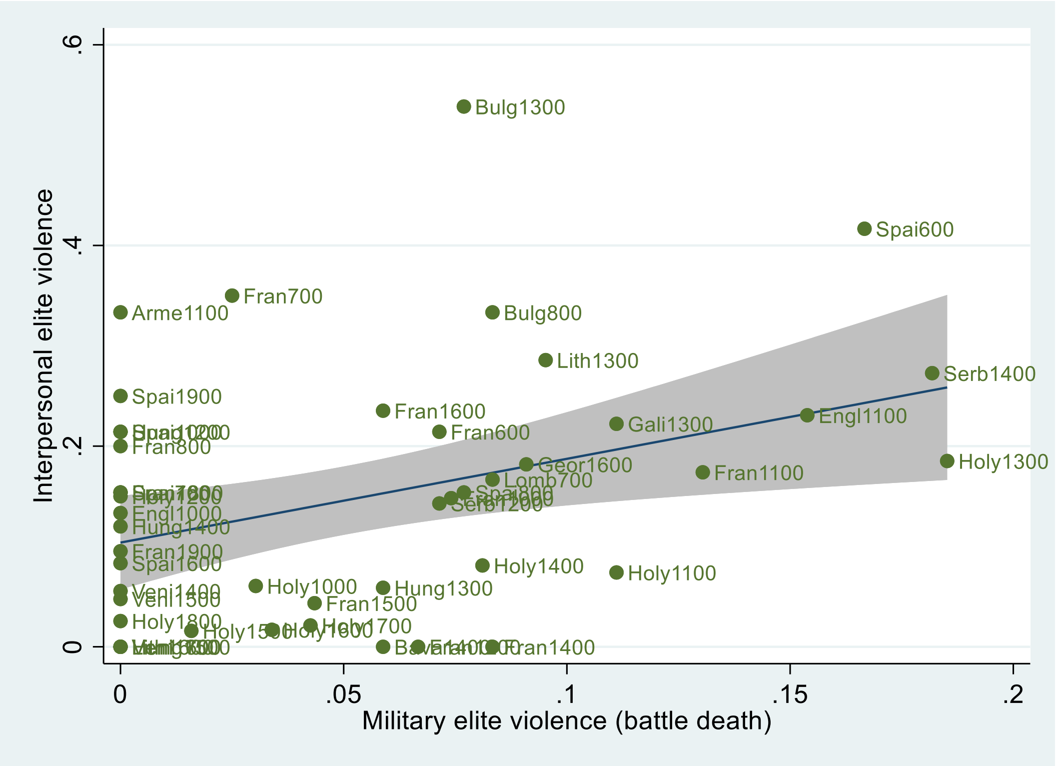
Appendix Table J.1: how closely correlated is narrow and intermediate definition of regicide?

Period	Correlation	p-value	Number of cases
5th – 10th century	0.968	0.000	16
11th – 13th century	0.808	0.000	15
14th – 15th century	0.775	0.000	88
16th – 17th century	0.917	0.000	59

Appendix K: How close is the correlation between interpersonal elite violence and military elite violence?

We also assess whether there is a correlation between interpersonal elite violence and military elite violence(with a minimum number of 10 observations) (appendix Figure K.1). Although there are a number of cases with military elite violence of 0, the remaining cases suggest a positive correlation with higher violence in both categories: for example, in Spain in the 6th century, Serbia in the 14th century and England in the 11th century. In the 13th century, Bulgaria is a modest outlier with more interpersonal than military violence. If we restrict the observations to 20 and more observations, the noise of measurement in the military elite violence variable is notably reduced (but at the cost of a smaller N, see appendix Figure K.1). Between the two, we observe a correlation coefficient of 0.37 for the case in which the threshold is up to 10 observations, and a correlation of 0.43 if the threshold is increased to 20 observations. Both correlations are statistically significant.

We also studied in which time periods the correlation was closer and in which it was less close. We observe a positive correlation of 0.52 in the early medieval period up to the 10th century, although there are only 12 observations. We observe no correlation for the high medieval period between 1000 and 1400. We observe a quite close correlation for the high and late medieval period (14th and 15th century), as well as a particularly close correlation for the 16th and 17th century (although there are only 8 observations.).



Appendix Figure K.1: Scattergram of Military violence (rulers killed in battle) and Interpersonal violence, with N>10

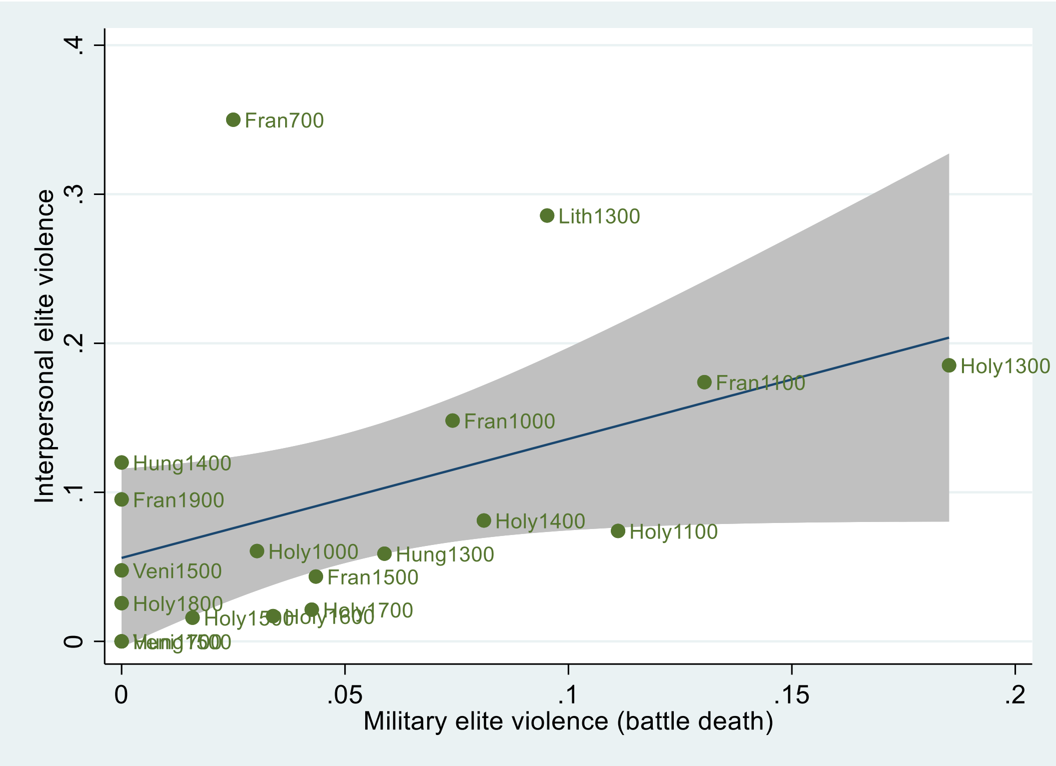


Figure: Scattergram of Military violence (rulers killed in battle) and Interpersonal violence, with N>20

In order to assess whether including a time trend (or a squared trend) would change the results, we used two-century units for the trend variables in the regressions below.

```
xtreg reg_dub pc_conquer  temperature urbanisation i.electedsuccessor battle autonomy
fractionalised  i.religion jewish_minority religious_diversity religious_transition
plague_black s_serfdom time, fe vce(cluster king)

Fixed-effects (within) regression               Number of obs      =        106

Group variable: king                            Number of groups   =         34


R-sq:                                           Obs per group:

     within  = 0.2702                                         min =           1

     between = 0.0078                                         avg =         3.1

     overall = 0.0893                                         max =          12


                                                F(18,33)           =    6431.21

corr(u_i, Xb)  = -0.3403                        Prob > F           =     0.0000
```

```
                                           (Std. Err. adjusted for 34 clusters in king)
--------------------------------------------------------------------------------------
                     |               Robust
             reg_dub |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+----------------------------------------------------------------
          pc_conquer |  -.0849047   .0339477    -2.50   0.018    -.1539718   -.0158376
         temperature |  -.0484592   .0660124    -0.73   0.468    -.1827625    .0858441
        urbanisation |    .078263   .2992768     0.26   0.795    -.5306202    .6871462
    electedsuccessor |
                  1  |  -.0455111    .094764    -0.48   0.634    -.2383099    .1472876
                  2  |  -.0441379    .078164    -0.56   0.576    -.2031637    .1148878
              battle |   .1033651    .248407     0.42   0.680    -.4020228     .608753
            autonomy |  -.0365254   .0336604    -1.09   0.286    -.1050081    .0319573
      fractionalised |  -.0444816    .053483    -0.83   0.412    -.1532936    .0643303
            religion |
            islamic  |  -.0200705   .0814969    -0.25   0.807    -.1858771    .1457361
           orthodox  |   -.178281   .0653985    -2.73   0.010    -.3113353   -.0452267
              other  |  -.0635912   .1179925    -0.54   0.594    -.3036487    .1764663
         protestant  |  -.1207827   .0871563    -1.39   0.175    -.2981036    .0565382
     jewish_minority |   .0299474   .0636064     0.47   0.641    -.0994608    .1593556
 religious_diversity |    .021369   .0516402     0.41   0.682    -.0836938    .1264318
religious_transition |   .0048958   .0552148     0.09   0.930    -.1074395    .1172311
        plague_black |  -.0210618   .0609024    -0.35   0.732    -.1449686    .1028449
    plague_justinian |          0  (omitted)
           s_serfdom |   .0294589   .1138653     0.26   0.797    -.2022018    .2611195
                time |  -.0001289   .0000967    -1.33   0.191    -.0003256    .0000677
               _cons |   .4137379   .1319544     3.14   0.004     .1452747    .6822011
---------------------+----------------------------------------------------------------
             sigma_u |   .1765044
             sigma_e |  .15033821
                 rho |  .57954761   (fraction of variance due to u_i)
--------------------------------------------------------------------------------------
```

```
gen  twocent_sq = twocent*twocent

xtreg reg_dub pc_conquer  temperature urbanisation i.electedsuccessor battle autonomy
fractionalised  i.religion jewish_minority religious_diversity religious_transition
plague_black s_serfdom time time_sq, fe vce(cluster king)
```

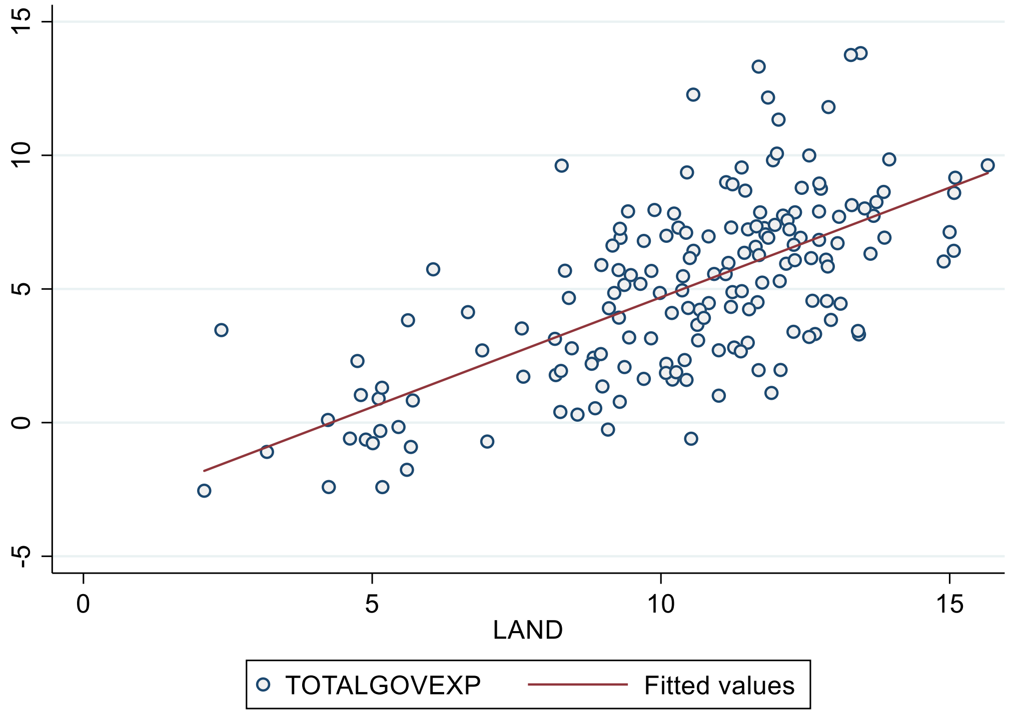
```
Fixed-effects (within) regression               Number of obs     =        106
Group variable: king                            Number of groups  =         34
```

```
R-sq:                                               Obs per group:
     within  = 0.2800                                             min =          1
     between = 0.0245                                             avg =        3.1
     overall = 0.1077                                             max =         12

                                                    F(18,33)          =          .
corr(u_i, Xb)  = -0.3487                            Prob > F          =          .

                                         (Std. Err. adjusted for 34 clusters in king)
-------------------------------------------------------------------------------------
                     |               Robust
             reg_dub |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+---------------------------------------------------------------
          pc_conquer |  -.0808527   .0374047    -2.16   0.038    -.1569532   -.0047522
         temperature |  -.0430922   .0738671    -0.58   0.564     -.193376    .1071916
        urbanisation |  -.0113555   .3676208    -0.03   0.976    -.7592856    .7365746
                     |
    electedsuccessor |
                  1  |  -.0427661   .0936487    -0.46   0.651    -.2332957    .1477636
                  2  |  -.0480515   .0773311    -0.62   0.539    -.2053828    .1092798
                     |
              battle |   .1427807   .2863021     0.50   0.621    -.4397054    .7252668
            autonomy |  -.0405272   .0362188    -1.12   0.271    -.1142149    .0331605
      fractionalised |  -.0550243   .0415935    -1.32   0.195     -.139647    .0295984
                     |
            religion |
            islamic  |  -.0148052    .078316    -0.19   0.851    -.1741402    .1445299
           orthodox  |  -.1714783   .0668417    -2.57   0.015    -.3074688   -.0354878
              other  |  -.0654677   .1164411    -0.56   0.578    -.3023689    .1714335
         protestant  |   -.130781    .084104    -1.55   0.129    -.3018919    .0403299
                     |
     jewish_minority |   .0330245   .0605394     0.55   0.589    -.0901438    .1561927
 religious_diversity |   .0156429   .0528972     0.30   0.769    -.0919774    .1232631
religious_transition |   .0076015   .0567744     0.13   0.894    -.1079068    .1231099
        plague_black |  -.0189479   .0649826    -0.29   0.772    -.1511559    .1132602
    plague_justinian |          0  (omitted)
           s_serfdom |    .006071   .1105167     0.05   0.957     -.218777     .230919
                time |  -.0004959   .0005412    -0.92   0.366    -.0015969    .0006051
             time_sq |   1.58e-07   2.32e-07     0.68   0.500    -3.14e-07    6.30e-07
               _cons |   .6215547   .3057408     2.03   0.050    -.0004797    1.243589
```

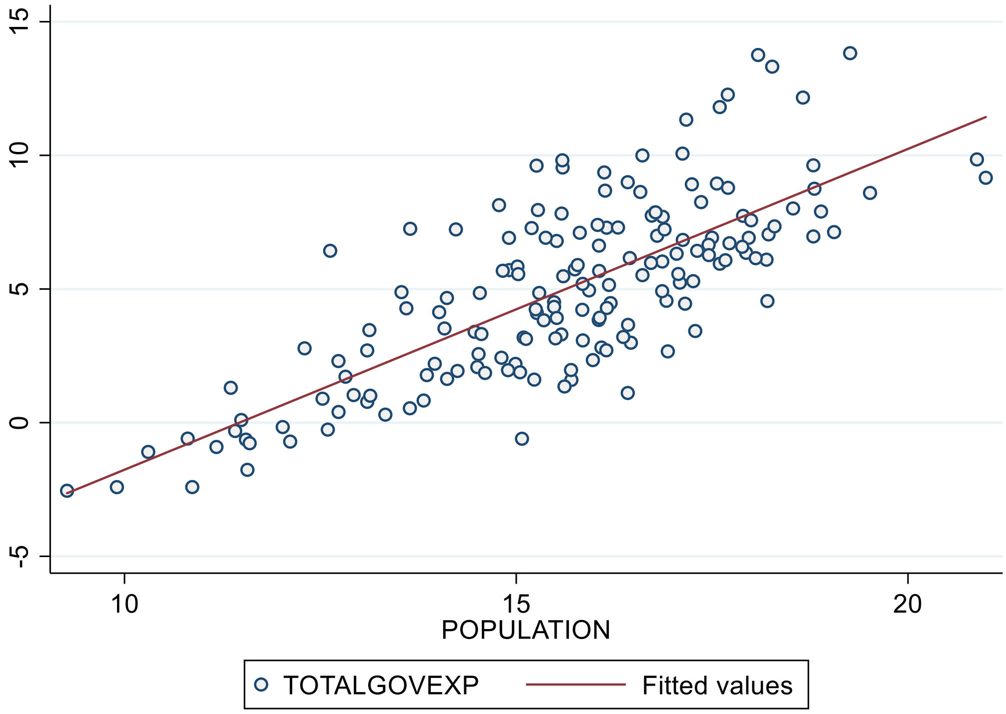
```
---------------------+----------------------------------------------------------------
             sigma_u |   .17370586
             sigma_e |   .15072493
                 rho |   .57048096   (fraction of variance due to u_i)
--------------------------------------------------------------------------------------
```

Appendix M: Comparison of total and per capita tax rates with area in 2010

We present some additional correlations that `territorial state capacity' (which is basically a measure of a country's size) is highly correlated with alternative measures of fiscal capacity (using more recent data provided by the World Bank and the IMF, see above). To be specific, based on information from the year 2010 and more than 160 countries, we examine how measures of a country's size (total population and land area of a country) are correlated with measures of fiscal capacity (total government expenditures, total government tax revenue). The correlations are displayed in six scatter plots:



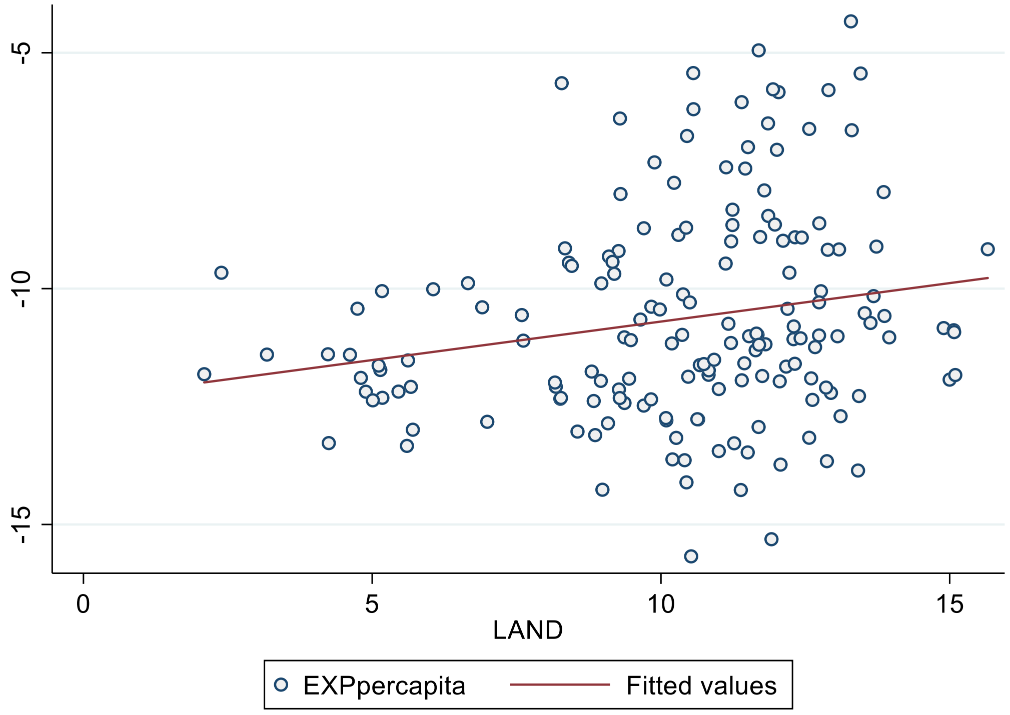
Notes: **TOTALGOVEXP** denotes the log of Total Government Expenditure (the variable is provided by the IMF: General government total expenditure, national currency (Billions)), **LAND** denotes the log of Land area in mi^2 (the variable land area is defined as the aggregate of all land within international boundaries and coastlines, excluding water area; it is taken from Wikipedia).



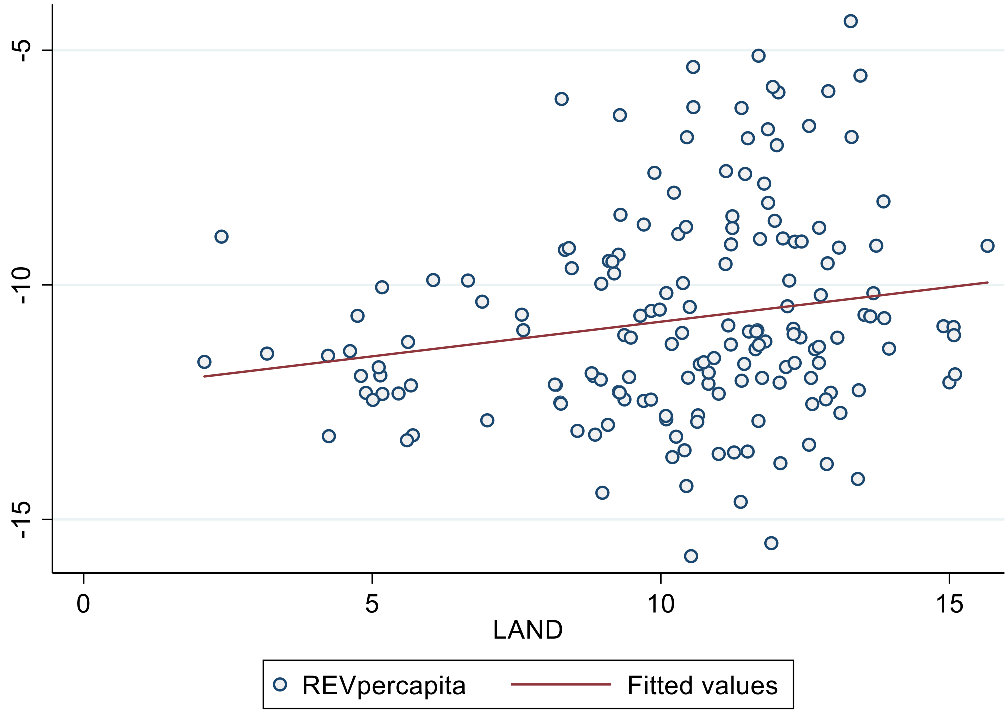
Notes: **TOTALGOVEXP** denotes the log of Total Government Expenditure (the variable is provided by the IMF: General government total expenditure, national currency (Billions)), **POPULATION** denotes the log of total population of a country (the variable is taken from the world bank's WDI database).

Notes: **REVENUE** denotes the log of Total Tax Revenue (the variable is provided by the IMF: total tax revenue (in USD, Billions)), **LAND** denotes the log of Land area in mi^2 (the variable land area is defined as the aggregate of all land within international boundaries and coastlines, excluding water area; it is taken from Wikipedia).

Notes: **REVENUE** denotes the log of Total Tax Revenue (the variable is provided by the IMF: total tax revenue (in USD, Billions)), **POPULATION** denotes the log of total population of a country (the variable is taken from the world bank's WDI database).



Notes: **EXPpercapita** denotes the log of Total Government Expenditure per capita (calculated as the log of Total Government Expenditure divided by Population, using the variables from above), **LAND** denotes the log of Land area in mi^2 (the variable land area is defined as the aggregate of all land within international boundaries and coastlines, excluding water area; it is taken from Wikipedia).



Notes: **REVpercapita** denotes the log of Total Tax Revenue per capita (calculated as the log of Total Tax Revenue divided by Population, using the variables from above), **LAND** denotes the log of Land area in mi^2 (the variable land area is defined as the aggregate of all land within international boundaries and coastlines, excluding water area; it is taken from Wikipedia).

Appendix N:

One criticism of these simple comparisons could be that both regicide and homicide follow a common declining trend which may expose a spurious relationship. The observed correlation suggests that regicide is a plausible indicator for violence (and probably even for overall violence) in a society. Keywood and Baten (2020) already found a high correlation with Central Asian invasions. In appendix Figure N.1, we also identify cases were the two series increase simultaneously. Indeed, every instance of increasing violence in these four countries is followed by both indicators, aside from Italy in the 19th century and in Germany, where the discrepancies reflect differences in periodicity.

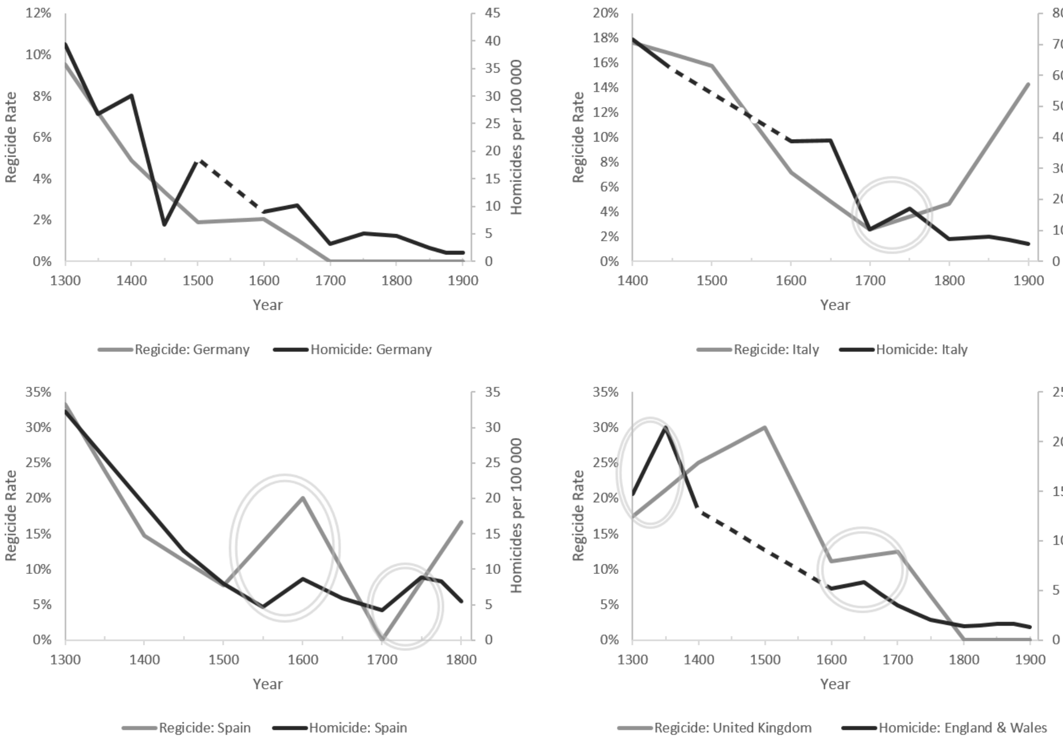


Figure N.1: Regicide and Homicide in four European Regional Units, 1200 – 1900.

Note: Centuries are rounded up, i.e. 1500 refers to the 15th century. Dashed lines indicate interpolations where homicide data is unrecorded. Grey circles indicate simultaneous increases. *Sources*: Homicide data from Eisner (2014). Regicide: See appendix A.

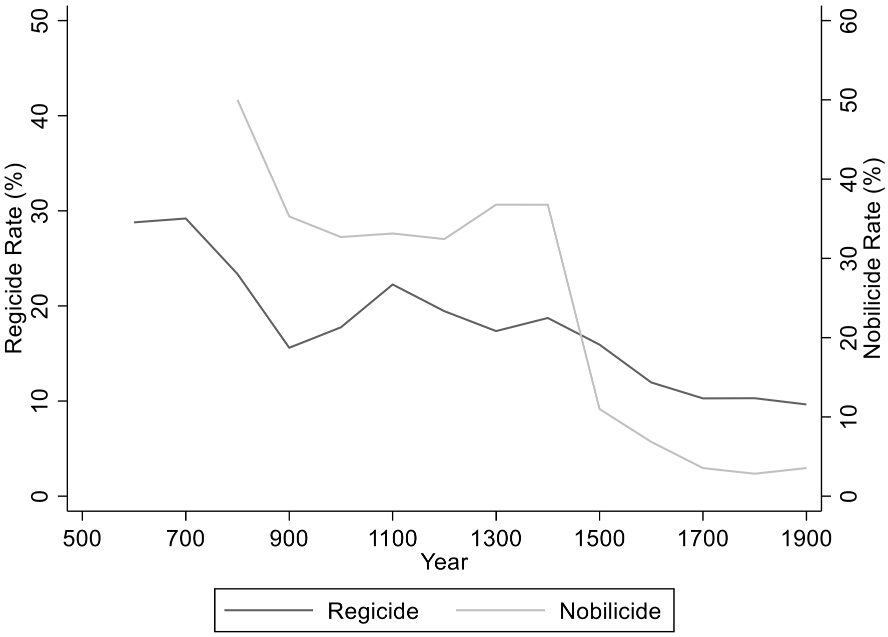


Figure N.2: Timeline of Regicide and Nobilicide (Nobilicide from Battles)

Note: Centuries are rounded up, i.e. 1500 refers to the 15th century. Sources of nobilicide: Cummins (2017). On regicide, see appendix A.

Appendix O: Maps of regicide

We allocated principalities to countries based on the locations of their capitals. Although somewhat anachronistic, we decided to use modern borders and modern country names. We use the location of historical capitals or geographic centres of rule within modern boundaries as a criterion for how to assign them. The rulers mostly lived in the capitals or central places, and their violent behaviour as well as that of the elites around them, can therefore be assigned to this geographic unit.[21] We could also formulate our findings as the "trend of elite regicide in all capitals that are situated within the boundaries of modern France", for example. Since this would be too long for each sentence, the country name is used as an abbreviation, but it must be noted that each name constitutes a geographic unit and not a modern nation. This country border research strategy has a number of advantages and a large number of studies in economic history have referred to modern countries, because this allows the tracing of long-run determinants. For example, Maddison (2001) traced post-soviet countries back into Soviet times. The Clio-Infra database also allows the study of countries using their modern boundaries back in time. Even though the boundaries of certain countries changed quite substantially over time, the insights gained by understanding the long-term development of these territorial units far outweigh the costs. If there were more rulers (in smaller principalities, for example) within modern country borders, we assigned them to the modern country, according to where their capital was located. Several smaller principalities within a modern country are actually an advantage for our analysis, as they sometimes

---

[21] The alternative, assigning elite numeracy values to grid cells across Europe, also leads to measurement error because we do not have measurements for all grid cells, only for those containing each capital city. Thus, we cannot measure any difference between grid cells containing capitals and those without.

allowed the minimum observation number of five rulers per century to be reached (we dropped all century-polity units that had less than five rulers).[22]

In addition to European trends, country-specific trends in regicide also allow us to detect certain events throughout Europe's history. The maps in Figures 6 and 7 show the distribution of violence over time, grouped by countries as opposed to principalities for the purpose of allowing intertemporal comparisons. The figures that follow describe the respective states of regicide during four periods of European development.

Bulgaria, Armenia, Turkey and Cyprus – in that order – exhibit the highest rates of regicide over our entire period of study, all above 30% (Figure 6). Conversely, the central European countries of Germany, Austria and Poland – along with Portugal – display the lowest rates, all under 8%. Broadly, Europe seems to have had a peaceful centre with violent frontiers. Until the end of the High Middle Ages, Ireland and parts of Scandinavia all saw comparatively higher levels of regicide with considerable numbers of deaths in battle. As such, the notion of a peaceful centre with violent frontiers becomes even clearer when including battle deaths in the periodic maps (appendix E, Figures E.1 and E.2).

During the early Middle Ages (Figure 7, panel a), violence was extreme and nine of the eighteen countries for which we have data exhibit regicide rates of over 25%. At the same time, principalities within Germany, the Czech Republic and Serbia had low regicide rates.

During the 10th to 13th centuries northern European regicide increased due to the forced introduction of not-yet fully accepted monarchic governance styles. This shift becomes particularly clear when examining the map including battle deaths, as a disproportionate number of Scandinavian rulers died in battle (Figure E.2, panel b). Indeed, the ratio of battle deaths to regicide is 1.75 for Norway and 2 for Iceland as opposed to the average ratio of 0.49 across all countries and periods.

---

[22] Fortunately, in almost all cases, we have substantially more rulers per unit.

At this time, the Second Bulgarian Empire was the main power within South-Eastern Europe, although it was under constant pressure due to ceaseless invasion attempts by the Mongols, Byzantines, Hungarians and Serbs (Wolff 1949). Meanwhile, Georgia transitioned from one of the most violent regions in the early Middle Ages to one of the most peaceful in the High Middle Ages (from 42.9% to 5%). This period coincides with the so-called 'Golden Age' of Georgia which followed the earlier conflicts that the Kingdom of Iberia had fought against the Persians and Byzantines (de Waal 2011). This so-called 'Golden Age' saw Georgia control the entire south Caucasus region before much of it was conquered by the Mongols in the late 13th century.

The 13th to 15th centuries are characterised by near universal downward trends in regicide in Western and Central Europe, while Eastern Europe's violence levels persist or even increase in the cases of Romania, Georgia and Hungary. Here, a strong case can be made for divergence between the east and west. Indeed, the only Western European country that still exhibits a 'very high' level of regicide in this period is Denmark which, along with the United Kingdom, is the only western country to sustain a regicide rate above 20%. Conversely, Bulgarian regicide remains fairly high during the Ottoman expansion while Lithuania, Belarus and Ukraine constitute a region of substantial conflict as the rulers of Poland and Lithuania first fought off the Mongols during the early 14th century before the Ottomans conquered much of Ukraine's Black Sea coastline during the 1470s, including Crimea.

The early modern period (panel d) then saw drastic declines in regicide, with only Ukraine and Romania displaying rates comparable to those in earlier periods. However, despite these widespread declines in violence we can still identify a clear east-west divide, as regicide in Spain and Luxembourg become the only western countries with regicide rates over 10%.

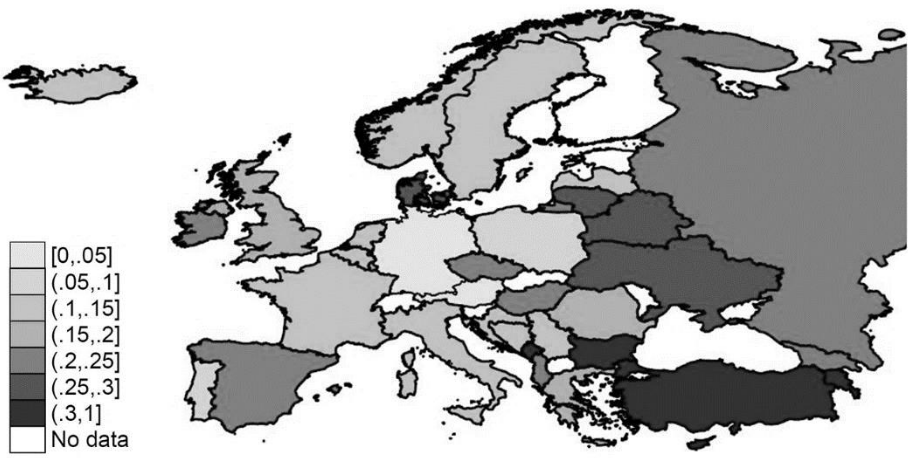
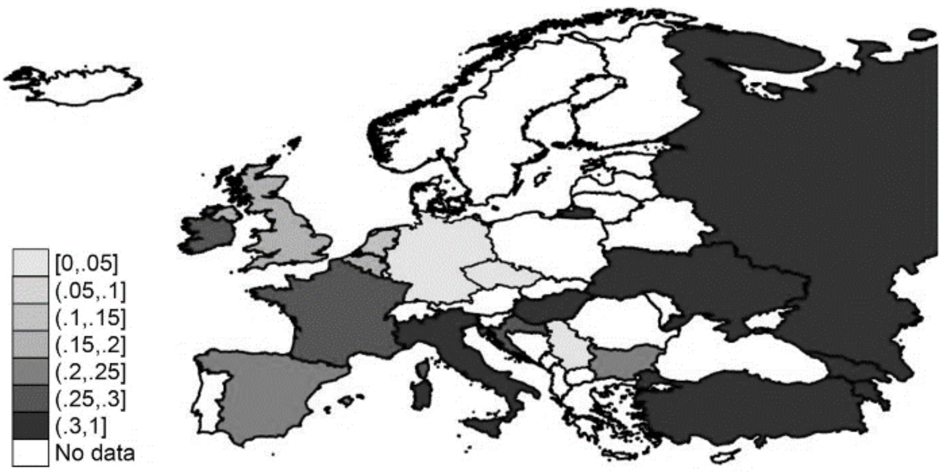


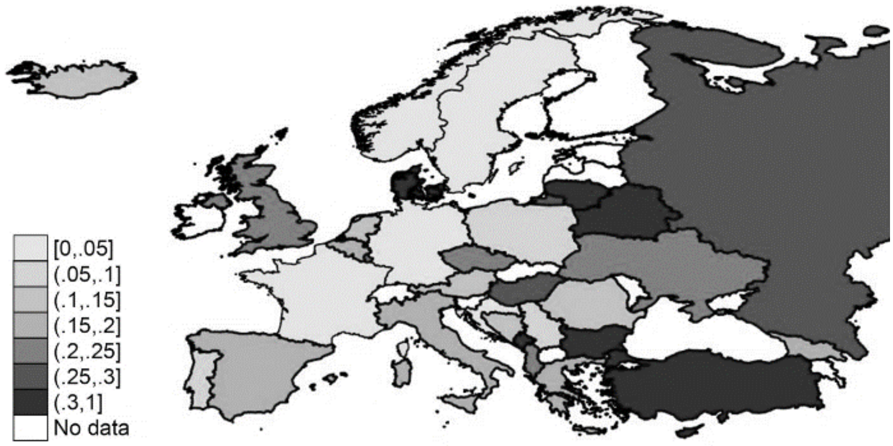
Figure O.1: European Regicide: 6th – 19th Century

Note: The darker colours demonstrate greater elite violence.

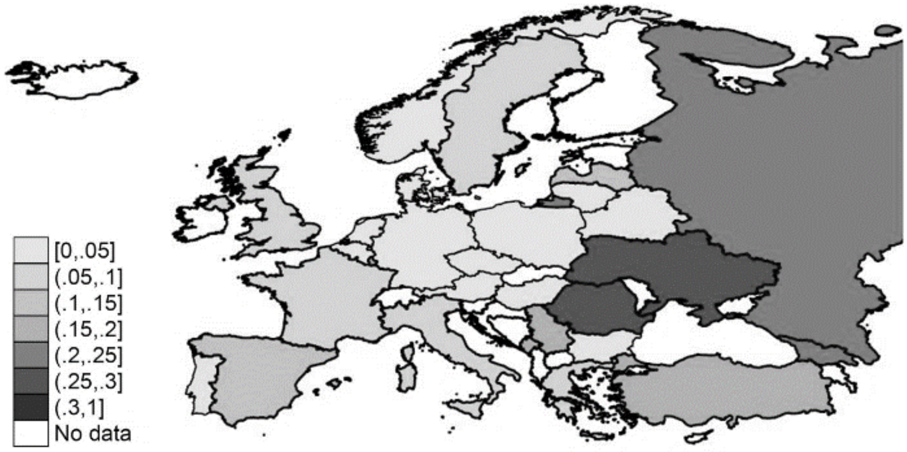


Panel A) 6th – 9th Century

Panel B) 10th – 13th Century



Panel C) 13th – 15th Century



Panel D) 15th – 19th Century

Figure O.2: European Regicide by Period

Note: The darker colours demonstrate greater elite violence.