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## POLITICAL GEOGRAPHY AND PRE-INDUSTRIAL DEVELOPMENT: A THEORY AND EVIDENCE FOR EUROPE 1000-1850

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# POLITICAL GEOGRAPHY AND PRE-INDUSTRIAL DEVELOPMENT: A THEORY AND EVIDENCE FOR EUROPE 1000-1850


## Abstract

We present a theory of the drivers, and a measurement of the patterns, of the evolution of historical sovereign polities over time and space in Europe, and we study their impact on pre-industrial urban development. We model changing state capacity and rule of law over space as resulting from strategic interactions between ruling elites. We characterize the endogenous evolution of equilibrium number, size, borders and type of polities. The framework characterizes the timing and location of appearance (and disappearance) of city states and the transition from domain reigns to modern territorial states. The model predicts the emergence of hard borders and a reversal in the role of locations' centrality for development. We measure the territorial evolution of sovereign polities by assembling geo-referenced yearly panel data on the political geography of each location in Europe for the period 1000-1850 and we investigate its implications for pre-industrial urban growth. Results document a changing role of polity size and type and a reversal of centrality from across to within polities which is associated to increasing importance of domestic market potential after the XVII century.



JEL Classification: N/A

Keywords: Sovereign Polities, Pre-Industrial Development, Space and Territorial Control, Centrality and Location, Borders, market potential



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# Political Geography and Pre-Industrial Development: A Theory and Evidence for Europe 1000-1850*


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We present a theory of the drivers, and a measurement of the patterns, of the evolution of historical sovereign polities over time and space in Europe, and we study their impact on pre-industrial urban development. We model changing state capacity and rule of law over space as resulting from strategic interactions between ruling elites. We characterize the endogenous evolution of equilibrium number, size, borders and type of polities. The framework characterizes the timing and location of appearance (and disappearance) of city states and the transition from domain reigns to modern territorial states. The model predicts the emergence of hard borders and a reversal in the role of locations' centrality for development. We measure the territorial evolution of sovereign polities by assembling geo-referenced yearly panel data on the political geography of each location in Europe for the period 1000-1850 and we investigate its implications for pre-industrial urban growth. Results document a changing role of polity size and type and a reversal of centrality from across to within polities which is associated to increasing importance of domestic market potential after the XVII century.



Keywords: Sovereign Polities, Pre-Industrial Development, Europe 1000-1850, State Capacity, Rule of Law, Space and Territorial Control, Centrality and Location, Borders, Market Potential, Domain States, City States, Territorial Nation States, Theory, Empirics.

JEL Codes: D71; F02; N13; O40; P16; P26



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The task is "*to explain the structure and performance of economies over time. (..) By 'structure' I mean those characteristics of a society which we believe to be the basic determinants of performance. Here I include the political and economic institutions, technology, (..). 'Through time' means that economic history should explain temporal changes in structure and performance. Finally, 'explanation' means explicit theorizing and the potential for refutability*". North, 1981

"*What accounts for the roughly concentric pattern of state-formation in Europe as a whole (..) [with] a central band of city-states, principalities, federations, and other varieties of intensely fragmented sovereignty that only after 1790 consolidate into larger states?*" Tilly, 1990

When "*studying population history on a European scale, national or regional differences do not render useless a highly aggregated approach because similar forces were acting over a broad geographic area and the units in the system were influencing each other.*", Jones, 1981

# 1 Introduction

Governments should have enough capacity to favor and protect productive investments, but also sufficient constraints so that they cannot engage in wasteful expropriation. This argument received increasing empirical support in the last decades (especially after North and Weingast, 1989).[1] Understanding the role of political institutions ultimately requires locating the drivers of their emergence, which in Europe were closely intertwined with the evolution of sovereign polities in pre-industrial times.[2] The national country system emerged at the dawn of the industrial revolution after centuries of competition between polities with very different size and political organization, ranging from domain states ruled by absolute monarchs to the self-governed medieval republics, which materialized in the emergence and disappearance of political entities with frequent changes in borders (Strayer, 1970, and Tilly, 1990). This fragmented and heterogenous political landscape arguably affected the prospects of growth of the territories exposed to the rule of these polities (Epstein, 2000), and has been considered at the root of the rise of Europe (Jones 1981 and 2003, Mokyr 1992 and 2016, and Fukuyama, 2011). Formal analysis of the evolution of pre-industrial polities is nonetheless very limited, as discussed further in Section 2.

This project offers an analysis of the drivers, and a measurement of the patterns, of the evolution of historical polities in Europe over time and over space and an empirical exploration of their role for historical development. We propose a simple theory that characterizes the endogenous evolution

[1] This echoes much earlier arguments by Botero (1588), Montesquieu (1748) and Smith (1776) that, discussing the causes of prosperity in cities, medieval republics and pre-industrial Holland and England respectively, similarly advocated the importance to secure entrepreneurship and limit despotism. See also North and Thomas (1973) more specifically on the protection of property rights and Tilly (1990) on state capacity.

[2] Formal, theoretical and empirical, analysis of the role of political institutions for development have mostly focused on modern countries for the last decades. This leaves open the question of the sources of uneven development patterns that exist still today at the sub-national level and that, particularly for Europe, are the likely legacy of local pre-industrial history (De Long and Shleifer, 1993 and Tabellini, 2010).

of polities and their borders until the emergence of modern states, and delivers testable predictions on the changing patterns of local development both across polities and within the territories exposed to their rule. Predictions are empirically explored digitizing a novel geo-localized panel dataset assembled from a variety of sources. The data, with information at yearly frequency over the period 1000-1850, records the political history in each location (grid cell) in Europe by tracking the sequence of polities ruling over each territory, their type and geographical size, and, crucially, the changing patterns of centrality across and within polities. The resulting database allows a first systematic measurement of the changing geography of the European political landscape and an exploration of its role in shaping population growth in pre-industrial times.

Our modelling of pre-modern polities crucially rests on the explicit consideration of the role of imperfect territorial control. This perspective follows well documented, and generally not disputed, historical facts, discussed further in Section 2. Compared to modern countries, pre-industrial polities had limited military and fiscal capacity and, crucially, territorial control was declining in geographic distance from the centers of power. Increasing the degree of territorial control required a costly scale-up in military, fiscal and administrative apparatus, whose financing ultimately rested on the ability to extract resources from ruled territories. Motivated by these facts, we depart from a monolithic conceptualization of political entities and incorporate the role of space and physical distance. In our theory, sovereign polities are characterized by a "state apparatus", granting military and fiscal control over the territory (state capacity), and by "political institutions", which determine rulers' limits to rent extraction. The capability and the strategic incentives of pre-industrial rulers to invest in state capacity, and to accommodate or oppose forms of rule of law, depend on their territorial control, on the geographic size of their polity, and on other rulers' choices.

In Section 3, we develop a simple model that incorporates established insights from the political economics literature. We study investments in fiscal and military capacity (Besley and Persson, 2009 and Gennaioli and Voth, 2015), as well as the trade-off between rent extraction and productive governance (Acemoglu, 2008), and the changing attitudes of ruling elites (Lizzeri and Persico, 2004 and Galor and Moav, 2006), among others. We extend the scope of these analyses by introducing a novel modeling of the territorial dimension of both state capacity and rule of law, and their decay in space. Territorial borders are determined in equilibrium (Alesina and Spolaore, 1997 and Alesina, Spolaore and Wacziarg, 2000). We focus on prototypical polities labeled domain, city and modern states. We characterize equilibria as resulting from non-cooperative strategic choices by ruling elites (of initially existing polities) and by the populations in the locations under their rule, which can invest to gain independence and self-government.

We propose and formalize a conceptualization of the drivers of state capacity and rule of law that is based on the changing role of territorial size of polities. We develop the argument with the controlled thought experiment of an exogenously higher productive potential over time which is line with historical evidence (as discussed below). This allows isolating the role of increasing economic returns to the rule of law for the broad patterns of evolution of sovereign polities. In the model, the limited territorial capacity of existing domain states is initially sufficient to grant their rulers positive rents, but also limits their incentive and capability to accommodate forms of productive governance. Rule of law initially emerges in response to increasing productive potential, but only in the territories at the periphery of domain states that gain independence as city states. The small territorial size allows these polities to sustain both territorial control and rule of law but, crucially, only locally. Larger polities are eventually favored when the returns to productive governance are large enough, and it is precisely their extended territory that allows sustaining a costly scale-up in state apparatus. Competition for territorial control eventually leads to the emergence of modern territorial countries. Equilibria where rulers accept the emergence of rule of law, can be sustained as best response to other rulers doing the same (although this is not a dominant strategy for any ruler). In the end, the temporary advantage of polities with small territorial size, which initially allows the best balance between local state capacity and rule of law, is eventually lost and their territories are absorbed into the emerging, more powerful, modern nation states.

The model delivers a set of implications and some testable predictions. A monotonic increase in returns to the rule of law should be associated to a highly non-monotonic process of political fragmentation, with the emergence of independent city states, followed by a subsequent political agglomeration, with he emergence of modern states. The model also delivers testable predictions on the growth effect of different types of polity, in particular of city states, and on the changing role of territorial size.[3] Specific predictions concern the changing economic impact of centrality within polities and of distance to other polities. Peripheral areas, i.e., locations further away from capitals, should have a growth advantage under the rule of extractive domain states, but eventually face a disadvantage in the context of modern states, in which economic benefits are increasingly concentrated around capitals.

The panel database of the polities ruling the European territory in the period 1000-1850 is presented in Section 4. The database is built by digitizing and geo-localizing historical information from several sources, with units of observations at three levels: sovereign polities, small grid cells and locations hosting historical cities. The data allows exploring the main stylized facts on the evolution of sovereign polities. We find dynamic patterns that are broadly in line with the predictions of the conceptual framework, particularly in terms of location, territorial evolution and disappearance of city states, and in terms of the non-monotonic patterns in the number and size of polities and the changing shape of the aggregate size distribution.

We reconstruct the political history of each location (grid cell) by tracking the sequence of polities

[3] The model predicts an initial increase, and then a decrease, in the number of polities, with the distribution of their size shifting from unimodal to bimodal and back. The small city states should fare better in the early phase of their emergence, and polities with larger but intermediate territorial size should be the ones that maximize average growth after the emergence of modern countries.

ruling in each area and each year. We measure local political geography in terms of size of the ruling polity, years spent under the rule of a city state, changes in the identity of rulers, distance to capitals and exposure to other polities. Using information on changing borders we also build measures of domestic and foreign market potential. The predictions on political geography and the changing role of centrality are explored in Section 5 exploiting variability in urban population over time in regressions that condition on location, time and polity fixed effects. The results document several interesting novel patterns that broadly align with the theoretical insights. In particular, we document the existence of an optimal territorial size of polities during the emergence of modern states, the rise and subsequent decline of city states, and a systematic reversal in the patterns of centrality across and within polities after the XVI century. Finally, we document the increasing importance of internal as compared to external market potential. The evidence is broadly in line with the argument that peripheral areas of domain states, and locations exposed to external trade with other polities, fared better during the Middle Ages. The rise of modern states eventually favors locations that are central within their territories, rather than across polities. The findings align, in reduced form, with the argument of increased territorial control, emergence of harder borders and the creation of national markets. The results are robust to a wide array of sensitivity and robustness checks.

The paper is organized as follows. Section 2 discusses the literature, the historical background of pre-industrial Europe and the related scholarly arguments. Section 3 presents the theory. Section 4 presents the historical political geography database and the stylized facts. Section 5 presents the empirical results for pre-industrial development and Section 6 concludes. Proofs and analytical derivations, presentation of the data sources, construction of variables, summary statistics, robustness checks and further results are reported in the Appendix.

# 2 Literature and Historical Background

This paper offers a conceptualization, measurement and empirical exploration of the evolution of pre-industrial sovereign polities in Europe and their role for the spatial patterns of urban growth. The analysis contributes to several strands of the theoretical and empirical economics literature discussed in Section 2.1. The historical background and related scholarly arguments and evidence in economic history and political science are discussed in Section 2.2.

## 2.1 Economics Literature

We contribute to the recent stream of literature, sometimes labeled quantitative economic history, that aims at providing tractable and testable models of the change in relevant trade-offs during the process of long-term development. Theoretical insights on the role and evolution of pre-industrial European economic and political institutions are offered, in particular, by Greif (2006), Tabellini

(2008), Greif and Tabellini (2010), Voigtländer and Voth (2012), Gennaioli and Voth (2015) and de le Croix, Doepke and Mokyr (2018). As mentioned above, we incorporates insights on the increasing returns to both state capacity, Besley and Persson (2009, 2010, and 2019), rule of law, Acemoglu (2008), and on the changing trade-off faced by historical elites, Lizzeri and Persico (2004) and Galor and Moav (2006). A different and novel element of our framework is the modeling of both state capacity and rule of law over space. We propose an argument on the changing role of territorial size and geography in explaining changes in the balance between state capacity and rule of law. This allows deriving predictions on the joint evolution of sovereign polities and political institutions, and on their role for development, both across polities and within polities across space.

A theoretical literature has studied the number and size of modern countries, following Bolton and Roland (1997) and Alesina and Spolaore (1997), see also the review in Alesina (2003). We offer a tractable model that considers the emergence of different types of polities, their interaction and disappearance, exploring the role of a spatial decay in territorial fiscal and military capacity. The analysis provides novel insights on the evolution of the number and types of pre-industrial polities offering, in particular, a rationale for the emergence and location of a belt of small city states and for the changing role of territorial size for long-term development.[4] With decaying military control, equilibrium borders are pinned down by the strength of territorial control of ruling elites rather than by the preferences of the population in each location (see also Alesina and Spolaore, 2005). The emergence of independent medieval city states relates to the argument on the emergence of city charters in medieval England by Angelucci, Meraglia and Voigtländer (2017) although our focus is on studying the role of territorial control and the emergence of sovereign polities. Given the focus on pre-industrial polities, we characterize equilibria as shaped by choices and preferences of ruling elites, rather than by those of the ruled population, as expressed through voting in mass democracies. This delivers interesting insights on the mismatch between the interests of the elites and those of the ruled population. For instance, the theory predicts that the territorial size that maximizes average welfare in the territories ruled by modern countries should not be expected to emerge as a natural outcome of the historical process of state formation, since ruling elites are predicted to have incentives to extend the size of their countries as much as possible. The predictions offer background support and complement the insights on theories of secessions in modern countries like Esteban, Flamand, Morelli, Rohner (2018).

The results contribute to the literature studying the long-run interactions between geography and economic integration. Alesina, Wacziarg and Spolaore (2000), Spolaore and Wacziarg (2005),

[4]Our theory incorporates the framework by Alesina and Spolaore (1997) as a special case that is obtained in modern states with perfect territorial control. By documenting the existence of a hump-shaped effect of polity size on local development since 1600, our results also provide evidence for a so far untested implication of Alesina and Spolaore's (1997) model. We predict and provide evidence, however, that this is a specific feature of modern countries and that during the earlier period, in which domain and city states coexisted, polities with smaller territorial size grew faster.

Gancia, Ponzetto and Ventura (2016) focus on the process of political and economic integration. Galor and Mountford (2008) study the interactions between trade and population growth, while Pascali (2017) studies the changing role of geographic location, technology and trade. Relative to these studies, which focus on globalization in the context of the industrial revolution or thereafter, we instead consider the patterns of political and economic integration in the pre-industrial period. The theory predicts the emergence of harder borders with the formation of modern states. The empirical results provide supportive reduced-form evidence by showing that domestic, rather than foreign, market potential is increasingly important only after the XVII century. The evidence on the early growth of city states in medieval times and their subsequent decline relates to the argument on the importance of trade for small countries made by Alesina, Spolaore and Wacziarg (2000, 2005) for the post-industrial period. Taken together, the existing findings suggest a highly non-monotonic process of economic integration from year 1000 until today, associated to an equally non-monotonic role of territorial size.[5]

We predict and document a reversal of the role of centrality across polities and within their territories. We find evidence that cities located at the periphery of domain states, and closer to other polities, fared better during the Middle Ages, but after 1600 locations closer to the capitals grew faster. Modern Age patterns align with insights from the quantitative spatial literature on the centrality of economic activity and trade, see Redding and Rossi-Hansberg (2017) and Allen and Donaldson (2018), and also with the prediction on the emergence of hard borders. Medieval patterns result from a mismatch between political and economic centrality, with the latter being mostly related to foreign trade, across polities. The focus on the role of location and spatial competition, respectively, for pre-industrial development is also shared with Ashraf, Özak and Galor (2010) and Desmet, Greif and Parente (2018), although we look at endogenous political institutions and not at technology per se. We also highlight that countries with intermediate territorial size tend to display the highest economic performance, with some exceptions such as small city states in their heydays.

Our analysis focuses on the interaction between history, geography and institutions in shaping long-term economic development, a topic that has received increasing attention in the literature on long-term development, see the extensive discussions in Nunn (2009, 2014), Spolaore and Wacziarg (2013) and Michalopoulos and Papaioannou (2018) for a specific focus on spatial patterns. We look at centralized pre-modern and sub-national political institutions as in Gennaioli and Rainer (2007), Michalopoulos and Papaioannou (2013a, 2013b), although we focus on the peculiarities of the process of state formation in pre-industrial Europe. We push the logic of the analysis by De Long and Shleifer (1993) and Tabellini (2010) by tracking the evolution of political borders over time. We share with de la Croix, Docquier, Fabre, and Stelter (2019) the focus on the role of geography and distances for long-term development and the use of data on a broad European scale for pre-industrial times.

[5]Our analysis suggests a progressive reduction in economic integration from year 1600 until 1850, which according to existing studies was followed by a wave of globalization.

Our results align with their documented patterns of scientific production in the city state belt. We contribute to this literature a novel and potentially valuable geo-referenced database with a rich set of information on changing patterns of historical political geography for each location (grid cell) in Europe, including distances to capitals and other polities, territorial stability and (for locations hosting historical cities) domestic and foreign market potential. Several works, including Stasavage (2010, 2014), Guiso Sapienza Zingales (2016) and Serafinelli and Tabellini (2019), among others look at the role of communes and free cities. By accounting for the changing borders of the territories controlled by city states we contribute evidence that complements, and extends, the existing evidence on their role for historical outcomes.

The analysis contributes to the empirical investigations of the drivers of city growth in pre-industrial Europe, which in a Malthusian perspective measures the level of economic development, Ashraf and Galor (2011). A tangible contribution to this literature is the creation of a geo-localized historical panel dataset on political geography over the period 1000-1850. Methodologically, the regression analysis, by controlling for city, time and polity fixed effects, exploits variation over time in political geography and development within location and within polity, allowing to isolate the effects of political geography from other polity-specific drivers of development (that are common to all cities ruled by the same polity). The dataset incorporates information and insights from existing works, in particular Acemoglu, Johnson and Robinson (2005), Nunn and Qian (2011), Voigtländer and Voth (2012, 2013) and Bosker, Buringh and van Zanden (2013). Recent works focus attention to the role of local shocks in shaping urban growth. Dincecco and Onorato (2016) and Schönholzer and Weese (2019) explore the effect of conflicts and the related changes in the control of cities, respectively while Jedwab, Johnson and Koyama (2019) study the role of the intensity of black death shocks. We account for their insights and find that our empirical findings are stable and robust to accounting for such shocks and other time-varying covariates. Becker, Ferrara, Melinder and Pascali (2019) study the role of conflicts, fiscal capacity and representative institutions using highly disaggregated city panel data for Germany. While not looking at the role of territorial control of sovereign polities, their results align with our predictions and can be taken as a complementary piece of evidence on the theoretical insights. The results extend the scope of existing studies of pre-industrial development by deriving novel testable predictions and a first systematic evidence on the changing role of political geography, locations within and across polities and of the changing patterns of foreign and domestic market potential that were not hitherto investigated.

## 2.2 Historical Background and Scholarly Arguments

Around year 1000, few sovereign polities ruled over the majority of European lands (e.g. Holy Roman Empire, Byzantine Empire, etc.) in the context of largely stagnating economies and limited productivity. Rulers were absolute monarchs with exploitative attitudes but with a comparatively small ability to extract rents and faced rapidly declining military and administrative territorial control (e.g. Hohenberg and Lees, 1995).[6] The stratified allocation of power and regalia between kings and local vassals allowed, at least initially, a sufficient indirect military control over extensive territories (see e.g. Tilly, 1990, Tilly and Blockmans, 1994 and Finer, 1999). These polities have also been labeled "domain states" since rents came primarily from the territory under their stricter control of the ruler (Fukuyama, 2011). In the peripheral territories monarchs had a limited ability to extract revenues (Hoengberg and Lees, 1995, and Dincecco and Katz, 2016).[7] Domain states did not supply relevant public goods or produce sizable benefits for economic activities, particularly in terms of security and protection of property rights. Resources were directed to rulers' benefits (e.g., court consumption and military campaigns for the pursuit of personal power and prestige). The capitals of these polities have been portrayed as "parasite" or "consumer" cities, home to landlords and courts but offering limited benefits to the population (Bairoch, 1985, De Long and Shleifer, 1993). In our conceptualization we consider territorial (military and fiscal) control that declines with distance to the centers of power and we model these polities as relatively unbalanced in favor of state capacity and against rule of law.

From the eleventh century self-governed territories emerged, in particular, in the belt stretching from the Italian peninsula to the German lands and in the Low Countries and in peripheral coastal areas. While lacking territorial control over multiple regions, these polities are described as "City States" since they were effectively sovereign although only locally within the walls of their cities and in the immediate hinterlands (Chittolini 1990, Epstein 1999, and Hohenberg and Lees 1995).[8] The emergence of city states took place in the context of a generalized increases in productivity. These have been associated to the widespread adoption of technological advances in agriculture (see Lopez, 1976, on the spread of e.g. heavy plow, three crops rotation, oxen and horse collars and other "made in the manor" innovations) and to particularly favorable climatic conditions (see Campbell, 2016, on the "medieval climate anomaly"). See also Jones (1981). In our model, the trade-off between absolute power and rule of law is initially resolved against rent extraction only in the new small polities. Extensive evidence documents the innovative institutions and productive policies implemented by the city states.[9] See Waley (1968) for a detailed account of the mechanisms

[6]Military capacity was drawn from vassals and militias owning personal services to the rulers and, in a later stage, also from mercenary forces (rather than from stable armies and professionalized troops).

[7]"If we define sovereignty as a bundle of 'public' or collective property rights over a given territory, the most salient feature of pre-modern political arrangements was the fact that most absolutist states did not have clearly defined and enforceable public property rights of taxation", Epstein (2000).

[8]Relevant exceptions were the Italian Maritime Republics, most notably Venice, which had hybrid features being eventually endowed with powerful armies (particularly in terms of fleet) and a comparatively large extractive capacity and ability to produce surpluses related to sea trade.

[9]For instance, "[In Italy] cities strove systematically to eliminate all intermediary and indirect forms of government and to organize their territories into lower-level districts run by officials from the city (*podestà, vicari*); the law, lower-level legislation, and the fiscal, juridical, and administrative rules of the city were extended to [the countryside headed

of implementation of limits on the exercise of power and the provision of local public goods, see also Putnam et. al. (1994).[10] City states had inferior state capacity and generally less developed administrative apparatus than modern states but in our conceptual framework they share with modern countries a better balancing between state capacity and rule of law as compared to domain states. In this respect we would interpret city states as small scale precursors of modern territorial countries, see Epstein (1999) for arguments supporting this view.

In the model, the emergence of city states depends on the changing interests and ability of the local communities to afford the (military or economic) costs of self-government. We interpret for simplicity the cost of independence as the cost of gaining territorial and military control, although historically it sometimes also involved costs of negotiated settlements.[11] The small territorial size of city states has been linked to a comparatively large monitoring of the administration of public resource, see Levi (1988) and Stasavage (2011). We also emphasize the limited ability to forcefully extract resources (related to e.g. spatial competition associated to local mobility of people) as a further implication of the small territorial size. This implies that accommodating forms of rule of law can be interpreted also as a way to induce the populace to contribute to the financing of the local state capacity. This aligns with the argument by Botero (1588) that cities had to provide "utility" to their citizens in order to gain and maintain independence. Further in line with this, Van Zanden and Prak (2006) note that "citizens were prepared to pay relatively high taxes in return for the public goods they desired [from protection of property rights to education and health services], because they were more or less able to monitor the political process". Also, given their limited territorial size, city-states initially relied on local citizenry for military defense (particularly for building fortifications) and had limited expansionary aims.[12]

by the city]. Strict economic control paralleled the territorial administration" extending to commercial and industrial policy and management of agricultural and land property (Chittolini, 1990).

[10] "Elaborate legal codes were promulgated to confine the violence of the overmighty", Waley (1968). "In this sense, the structure of authority in the communal republics was fundamentally more liberal and egalitarian than in contemporary regimes elsewhere in Europe", Putnam et. al. (1994).

[11] Rights of self-administration of regulation of economic activity and trade, tax collection and law enforcement, while not materializing in full sovereign independence, were sometimes granted through different types of charters. In this respect the cost of independence can be interpreted as involving all the costs faced by the local citizenry to e.g. build the city walls and pay rents to the kings in exchange of the right of self-administration. In Germany cities had to confront stronger potentatoes, so to preserve their economic and political interests they often aimed at maintaining the de facto liberties in terms of ability organize economic activity and trade rather than gaining formal independence. Even in more politically cohesive environment, like England, forms of delegation of control to cities took place through charters that allowed cities to retain rents from economic efforts and trade. See also Angelucci, Meraglia and Voigtländer (2017) for an economic analysis of the implications of these experiences for the emergence of a constitutional monarchy in England.

[12] This is in line with historical evidence as summarized by Lopez (1976), that argues that "we cannot linger on the intricate details of political and military history, but the outstanding, early success of the Commercial Revolution in Italy hinged partly on that of the bourgeois armies and navies that backed persuasion and entrepreneurship with

Scholars debate about the drivers of the peculiar location of the city states, see Tilly (1990). The literature has interpreted the emergence of a belt of city states as resulting from the advantages of trade, see e.g. Hicks (1969): "the core of the City State, regarded as trading entity, [was] a body of specialised traders engaged in external trade".[13] In our theory only locations facing a sufficiently slack territorial control by domain rulers could afford intensive forms of self-government.[14] We clarify the argument on the role of centrality and territorial control, studying the emergence of a city state belt without the need of agglomeration externalities. This emphasizes that trade networks can be interpreted also as a consequence, and not necessarily only as a driver, of the emergence of these polities. Some works emphasize the role of trade for the subsequent resilience of city states that insured their survival after the black death and well beyond, see Wickham (2016). Stasavage (2014) emphasizes that, after giving large impulse to economic activities, city states stopped being centers of economic development, although several cities could retain large de facto independence well into the era of territorial states thanks to capital concentration and favorable access to credit. See also Konvitz (1985). Our empirical results align with existing evidence on the persistence of small polities, see Abramson (2017), although we exploit data at higher level of temporal disaggregation and restrict attention to the highest level of sovereignty.

Historically, from around the XVII century, pre-modern polities left the path to the emergence of territorial polities that eventually ruled over the vast majority of European territory in the form of modern national states.[15] In the model we link further increases in productive potential after the XVII century to the changing incentives for rulers of large territorial states to scale up both state capacity and rule of law even before the industrial revolution. These features of modern states, in comparison to domain rulers, are well documented and not generally disputed by economic historians.[16] The emergence of territorial states required a centralization and internalization of administrative, fiscal and military apparatus. Administration was directly implemented through large state bureaucracies

physical power".

[13]Extensive descriptions can be found also in Epstein (2000) on the network of connected traders across Italy, France and Northern Europe.

[14]We also have specific predictions, and a first shred of evidence, on the specific location of emergence of city states that emerge initially in the interior of domain states (far enough from the capitals but not too far) and the eventual formation of a belt of city states around former borders of domain states.

[15]Several scholarly arguments emphasize (in different ways) the key role of warfare for the emergence of modern states, Tilly (1975). In a later work, Tilly (1990) famously stated that "states made war, and war made states", see also Downing (1992). Other, not necessarily mutually exclusive, arguments emphasize the changing relative power of factors of production (see e.g. North and Thomas, 1973), and the interaction between the monopoly of protection and taxation, North (1981).

[16]Scholars disagree on several questions ranging from the drivers of the different modes of state formation (e.g. England versus France or Spain) and the timing (e.g. the delays in Italy and Germany) of the process of state formation within these group of polities. In this paper we abstract from heterogenous paths and timing within modern states to concentrate attention to the broad evolution of the different types of polities in a long run perspective ranging from domain states, city states and modern states.

limiting, or eliminating, the use of intermediaries and contractors. Rulers progressively "[absorbed] armies and navies directly into the states administrative structure, eventually turning away from foreign mercenaries and hiring or conscripting the bulk of their troops from their own citizenries" (Tilly and Blockmans, 1994). North (1981) argues that "a state is an organization with a comparative advantage in violence, extending over a geographic area whose boundaries are determined by its power to tax constituents." The substantial scale-up in fiscal capacity has been sometimes described in terms of the transformation from "domain states" into "tax states", see Fukuyama, (2011). See also Dincecco (2015) and Dincecco and Katz (2016).

Scholars debate the drivers of the scale-up in state capacity and rule of law.[17] On the latter, Tilly (1989) argues that rulers were forced following "continuous bargaining with capitalist and other classes for credit, revenues, manpower and the necessities of war".[18] The emergence of territorial national states with centralized administration allowed raising taxes, but also permitted increasing regulation and protection of economic activities and trade, and providing services that benefited the population at large (Dincecco and Katz, 2016), over extensive territories (Johnson and Koyama, 2017). We emphasize that the trade-off between rent extraction and constraints on the executive faced by ruling elites also changed with rising economies of scale. As a result, the joint scale-up in territorial control and rule of law can also be interpreted as being in the interests, and strategic interactions, between ruling elites. Finally, the endogenous increase in territorial control in the theory predicts the emergence of hard borders. This in line with the evidence from e.g. Federico, Schulze, and Volckart (2018) on the differential patterns of wheat prices from the XVII century. We complement existing evidence by measuring and exploring the role of domestic and foreign market potential that we was not explored in the literature.

# 3 Theoretical Framework

## 3.1 Setup

We model a simple geography that allows formalizing the concepts of territorial size and distance. Consider a world composed of a continuum of locations on a compact set of size $q > 1$, say the $[0, q]$ segment, each endowed with one unit of income. Each location (point on the segment) can be ruled by at most one sovereign polity. The ruling elite of a polity is identified for simplicity with the population in the capital, which is located in the middle of its territory. This allows interpreting in a spatial perspective the conflict of interest between elites and ruled populations. Denote by $S$ the

[17] Gennaioli and Voth (2015) question the argument by Tilly (1985) and emphasize the role of the military revolution in explaining the interaction between fiscal and military capacity rather than the latter alone.

[18] Our extended interpretation of territorial control relate to the late arguments by Tilly (2010) on the interactions between coercion, capital and commitment.

territorial size of a polity and by $d$ the distance of each location to its capital.[19]

**State Capacity.** Polities exert some degree of military and fiscal control over their territory, determined by the military strength rulers can exert in a location and by the resources they can forcefully extract from it. Both military and fiscal capacity decline with distance from the capital. We consider a linear formulation of such decay because it yields closed form solutions.[20]

- **Military capacity.** The force that can be mobilized in locations at distance $d$ from the capital is denoted by $m(d) \in [0,1]$, with $m'(\cdot) \leq 0$. We specify this as $m(d) = \max\{0, \nu - \mu d\}$, where $\nu \in [0,1]$ is military strength in the capital and $\mu \geq 0$ is its rate of decay over distance. Higher military capacity is associated to higher $\nu$ and lower $\mu$.

- **Fiscal capacity.** The share of a dominated location's income that the ruling elite is able to extract is $\psi(d) \in [0,1]$, with $\psi'(\cdot) \leq 0$. We specify this as $\psi(d) = \max\{0, 1 - \varphi d\}$, with $\varphi \geq 0$. Higher fiscal capacity is associated to lower $\varphi$.

The state apparatus has a cost $K > 0$, which is increasing in the level of state capacity: to achieve higher levels of military and fiscal capacity, a higher cost must be incurred. Rulers, located in the capital, have a budget constraint and must cover such cost through own income and fiscal revenues.

**Political Institutions: "Rent Extraction or Rule of Law".** We follow the literature discussed above and consider the trade-off faced by the elites between rent seeking and productive governance. For analytical tractability we consider an extreme, dichotomous representation, in which the political system is either characterized by the absence of limits to wasteful rent extraction (absolute exercise of political power) or by their presence (rule of law). In the former case rulers enjoy for their exclusive benefits the rents extracted through fiscal capacity (net of paying for the state apparatus). In the latter case there are no net rents, fiscal resources are only used to run the state apparatus and the fiscal burden is spread evenly among all locations ruled by a polity. The productive benefits of "rule of law" also decline with distance from the capital, reflecting heterogeneous preferences or a differential ability of rulers to respond to the needs of the various locations under their rule (see also Alesina and Spolare (1997) for a discussion of decays in benefits from public governance). Again, for tractability we adopt a linear formulation.

- **Rule of law.** The benefits from productive governance, i.e. rule of law, enjoyed by a location at distance $d$ from the capital are denoted $g(d) \geq 0$, with $g'(\cdot) \leq 0$. We specify this as

[19] If we allowed ruling elites to choose where to settle the capital, all of them would locate it in the middle of the territory. The only exception is constituted by the two polities at the extremes of the $[0, q]$ segment, but such exception would disappear if locations were on a circle rather than on a segment.

[20] A linear decay implies that state capacity vanishes beyond a certain distance. We will initially make assumptions granting that such distance is higher than world size $q$, but the key insights are general, as discussed below.

$g(d) = \max\{0, \gamma(1 - \alpha d)\}$, where $\gamma \geq 0$ is the return to the rule of law in the capital and $\alpha \geq 0$ captures its decay over distance.

As mentioned above, the economic value of limiting rent extraction and enforcing the rule of law depends on the productive potential, which varied substantially through history. The variable $\gamma$ will thus play a central role for the thought experiment that underlies our main comparative statics analysis.

**Equilibrium Borders.** For any possible configuration of polities, each with given state capacity, we assume that borders are determined as follows.

- Each location is ruled by the sovereign polity that is able to mobilize the highest military capacity over it.
- (Tie-break rule) In case two (or more) polities have the same military capacity over a location, this is ruled by the polity that grants it the highest level of consumable income.[21]

## 3.2 Types of Sovereign Polities

We specialize the general setup to restrict attention to the three polity prototypes discussed in Section 2: Domain, Modern and City States.

**Domain States, $D$.** Military control and rent extraction decline relatively sharply with distance from the capital, but unconstrained and extractive elites still extend their rule (territorial control) over multiple locations. Within the setup of Section 3.1, D-states extract rents in the absence of rule of law, and the decline of state capacity in distance from the capital is characterized by parameters $\nu_D,\ \mu_D,\ \varphi_D \in (0, 1)$. The cost of these polities is denoted by $K_D > 0$. The ruling elite's payoff is $u^e_D(S) = 1 + R(S) - K_D$, where $R(S) = 2\int_0^{S/2} \psi_D(x)\,\mathrm{d}x = S - \varphi_D \frac{S^2}{4}$ is gross rent extraction from a (convex) D-state of size $S$ with positive extractive capacity until the border. A ruled location at distance $d$ from the capital has a payoff equal to endowment net of the rents forcefully extracted by the rulers, $u_D(d) = \varphi_D d$.[22]

**Modern States, $M$.** Compared to domain states, these territorial polities feature higher state capacity and limits to the absolute exercise of political power (rule of law). Within the setup of Section 3.1, we consider as benchmark the extreme case of perfect fiscal and military territorial

[21] This tie-break rule follows the arguments by Friedman (1977) and implies that, in case all polities have the same military capacity, borders are determined as in the decentralized equilibrium of Alesina and Spolaore (1997). Specifying who rules over indifferent locations is immaterial for the analysis and can thus be safely omitted.

[22] More generally, allowing for zero extractive capacity over some parts of a D-state's (possibly non-convex) territory $\Omega \subseteq [0, q]$, gross rents are $\int_\Omega \psi_D(x)\,\mathrm{d}x$, and payoff at distance $d$ from the capital is $u_D(d) = \min\{1, \varphi_D d\}$.

control, with no decay in space, so that $\nu_M = 1$, $\mu_M = 0$ and $\varphi_M = 0$. Even in M-states the benefits from the rule of law are heterogeneous, reaching the highest level $\gamma$ in the capital and declining over distance with decay parameter $\alpha_M \in (0, 1)$. The higher state capacity requires comparatively larger costs $K_M > K_D$ that are financed by sharing the cost of state apparatus across all locations. Locations at distance $d$ from the capital, ruled by an M-state of size $S$, thus have a payoff $u_M(d, S) = 1 + g_M(d) - \frac{K_M}{S}$, where $g_M(d) = \max\{0, (1 - \alpha_M d)\gamma\}$ and the last term is the equal share of the state apparatus cost borne by each location. The ruling elite in the capital cannot extract extra fiscal rents (beyond the resources needed to finance the state apparatus). We consider the extreme, conservative scenario, in which also the elites contributes to the cost of the state (essentially assuming a complete demise of ruling elites) so that their benefits are given by $u^e_M(S) = u_M(0, S) = 1 + \gamma - \frac{K_M}{S}$.[23]

**City States, $C$.** City states resemble (in fact have historically anticipated) modern states in terms of the existence of some form of rule of law, and, relative to D and M-states, have a comparatively small state apparatus, which limits their ability to control extensive territories. Within the setup of Section 3.1, C-states have comparatively low military capacity, $0 < \nu_C < \nu_D$, and a sharp decay over space of both state capacity and returns to the rule of law (which in the capital are worth $\gamma$): for tractability, we assume extreme decays $\mu_C = \infty$, $\varphi_C = \infty$ and $\alpha_M = \infty$, so that in practice they only rule over the location hosting the capital (i.e., they have mostly defensive military capacity and very local fiscal capacity). The light political organization of city states implies $0 < K_C < K_D$. To simplify expressions and without loss of generality we normalize $K_C = 1$ so that the ruling elite of a C-state, formed by the population in the capital location, obtains $u^e_C = 1 + \gamma - K_C = \gamma$, and there are no dominated territories at positive distance from the capital.

**Payoffs.** Since there is no risk of confusion, we relabel as $\varphi$, $\mu$ and $\alpha$ what above is denoted by $\varphi_D$, $\mu_D$ and $\alpha_M$. The next table summarizes the payoffs earned by ruling elites in capital locations (in polities of size $S$) and by ruled populations in dominated locations (at distance $d$ from the capital).[24]

This spatial modeling of state capacity and the benefits of political institutions has several important implications, which are worth emphasizing briefly.

1. The payoff enjoyed by the ruling elites of multi-location polities depends on territorial size $S$.

[23] This assumption puts us in the most conservative scenario to highlight the change in trade-off faced by the elites in response to higher returns to rule of law. With this formulation the modeling of M-states exactly coincides with the familiar representation of nation states by Alesina and Spolaore (1997). While they do not explicitly model state capacity, their formulation is equivalent to assuming perfect military and fiscal capacity in our framework.

[24] These payoffs refer to convex polities with strictly positive rent extraction (for D-states) and benefits of rule of law (for M-states) over the entire territory. The generalization to other cases is immediate. For out of equilibrium calculations, we also specify that a failed elite, one that pays the fixed cost of the state apparatus but ends up being dominated by another ruler with higher military capacity, earns the payoff a ruled location minus the fixed cost.

Payoffs

| | **Domain State** | **City State** | **Modern State** |
|---|---|---|---|
| Ruling Elite | $u_D^e(S) = 1 + S - \varphi S^2/4 - K_D$ | $u_C^e(S) = \gamma$ | $u_M^e(S) = 1 + \gamma - K_M/S$ |
| Dominated Locations | $u_D(d) = \varphi d$ | – | $u_M(d, S) = 1 + (1 - \alpha d)\gamma - K_M/S$ |

(a) In D-states, rulers' payoff increases in territorial $S$ as long as fiscal capacity is positive. Once extraction capacity is exhausted, which happens when the state passes a given territorial size, rulers' payoff remains constant and becomes independent of $S$. D-state rulers do not have any economic incentive to expand their territories beyond that size.[25]

(b) In M-states, a scale effect associated to the financing of state apparatus across all locations implies that the rulers' payoff is strictly increasing in $S$. Rulers of these territorial states always have an incentives to expand their territories as much as possible.

2. The payoff of ruled locations depends on their distance from the capital, $d$.

   (a) In D-states, the payoff of ruled locations' is increasing in $d$ since the declining fiscal capacity of domain limits their rent extraction far from capitals. Thus in D-states peripheral locations enjoy higher net returns than central ones.

   (b) In M-states, the payoff of ruled locations is instead decreasing in $d$ due to the decline in benefits from productive governance. In M-states peripheral locations have lower returns than central ones.

3. The average payoff of ruled locations depends on territorial size $S$.

   (a) In D-states, it is increasing in $S$, due to the progressive decline in rent extraction.

   (b) In M-states, it is hump-shaped in $S$. As in Alesina and Spolaore (1997), returns to scale (size) are initially increasing (due to the sharing of the fixed fiscal burden) and then decreasing (due to lower returns to productive governance in peripheral locations). This implies that M-states have an intermediate "optimal" size.[26]

These observations highlight the reversal in the relative benefits from centrality (hence in the core-periphery relationship) in D-states and M-states, and the existence of a conflict of interest over (the

[25]Extraction capacity is positive in a convex D-state as long as $S \leq 2/\varphi$, in which case the ruling elite's payoff is the one reported in the payoff table. For $S > 2/\varphi$, we have $u_D^e(S) = 1 + 1/\varphi - K_D$. In the baseline analysis below we initially focus on conditions granting that $S < 2/\varphi$, so that D-state rulers would like to expand as much as possible and are only constrained by the military power of other states.

[26]The average payoff in a convex D-state of size $S < 2/\varphi$ is $\frac{2}{S}\int_0^{S/2} u_D(x)\,\mathrm{d}x = \varphi\frac{S}{4}$, which is increasing in $S$ (it is still increasing for $S > 2/\varphi$, although the expression is different). The average payoff in an M-state is $\frac{2}{S}\int_0^{S/2} u_M(x)\,\mathrm{d}x = 1 + \gamma(1 - \alpha\frac{S}{4}) - \frac{K_M}{S}$, which is a hump-shaped function of $S$.

preferred) polity size between rulers and ruled territories in territorial states (interests are aligned, by assumption, only in C-states). The assumption that choices are taken by the elites (and not by majority voting) implies that the optimal (intermediate) size of M-states that maximizes average welfare should not be expected to emerge as a natural outcome of the process of state formation, as it does not coincide with the size preferred by ruling elites.[27]

### 3.3 Equilibrium Sovereign Polities

We illustrate the characterization of the evolution of sovereign polities through a sequence of two games, labeled "Independence Game" and "Modern State Formation Game", that are played one after the other (so that the equilibrium of the first constitutes the initial conditions of the second). We first characterize the equilibria of each game under some parametric restrictions, then in Section 3.4 we discuss the generalization of the results to the joint consideration of the two games and to the full parameter space.

As mentioned in Section 1 and discussed in the historical background in Section 2, the comparative statics is conducted considering an exogenous increase in $\gamma$ (interpreted as taking place over time, although the two games are static). This controlled thought experiment disciplines our argument by characterizing the different equilibrium configurations as a function of only one parameter of interest: the economic returns to the rule of law. We thus isolate its implications for the historical evolution of polities and for the geographic distribution of development across and within polities. All formal derivations and Proofs are reported in Appendix 1.

**Emergence of City States: An "Independence Game".** Consider an initial configuration with $N > 0$ symmetric D-states.[28] Each ruled location can choose whether or not to pay the fixed cost $K_C$ to attempt becoming an independent C-state. A strategy profile is a collection of $k_i \in \{0, K_C\}$, for all non-capital locations $i \in [0, q] \setminus \mathcal{C}_D$, where $\mathcal{C}_D$ is the set of D-state capitals. To simplify illustration we first restrict attention to the case in which the spatial decay of D-rulers' state capacity is not too sharp. In particular let us assume that even at distance $q$ (which is the size of the world) from the capital D-rulers display some positive military power and, if a location at that distance were under their rule, they would be able to extract some positive rents from it. This assumption makes it costly for ruled locations to be under a D-ruler and avoids dealing with stateless territories.[29]

[27] This is a main difference from existing studies that, along the lines of Alesina and Spolaore (1997), investigate equilibrium number and size of modern democratic countries from the perspective of a population of voters rather than from that of ruling elites (as we do).

[28] This may be endogenously obtained as an equilibrium of a Domain State Formation Game, whose analysis we do not report for the sake of space.

[29] Formally, we assume that (i) $\varphi < 1/q$, and (ii) $\mu < \nu_D/q$, so that, at any distance $d \in [0, q]$, ruled locations pay positive rents to their rulers, $u_D(d) < 1$, and face rulers with positive military capacity, $m_D(d) > 0$.

There exists a minimum distance from the capital, given by $\underline{d} \equiv (\nu_D - \nu_C)/\mu$, at which independence from a D-state is militarily feasible, implying

**Lemma 1.** ***(Emergence of C-states)*** *In the independence game, starting from an initial configuration with N symmetric D-states, C-states can emerge in equilibrium only if* $\underline{d} \leq \frac{q}{2N}$*, where* $\frac{q}{2N}$ *is the initial distance between the borders of D-states and their capital.*

This Lemma simply states that a necessary condition for the emergence of C-states is that D-states are sufficiently few and large (relative to the size of the world and to the military technology available to the two types of state) to make independence feasible for some locations. Recalling that military capacity decays over distance, if D-states are too many, and hence too small, their military control over their territory is too strong. By contrast, if they are sufficiently large, independence becomes militarily feasible for locations at their periphery, far enough from the capital.

Notice next that independence, even when feasible, is not necessarily convenient for the ruled locations, as it involves a trad-off between costs and benefits. The cost of independence is $K_C > 0$ and its benefits take the form of higher returns ($\gamma$) and saved rents ($1-\varphi d$), which are otherwise paid to D-rulers. As rent extraction decreases in distance, so does the incentive to become independent. The higher the extra returns from self governance, the higher is the maximum distance from the capital, at which independence is convenient.

Denote by $\tilde{d}(\gamma) \equiv \gamma/\varphi$ such maximum distance. Let us define the two thresholds $\underline{\gamma} \equiv \varphi \underline{d}$ and $\bar{\gamma} \equiv \frac{\varphi q}{2N}$, such that $\tilde{d}(\underline{\gamma}) = \underline{d}$ and $\tilde{d}(\bar{\gamma}) = \frac{q}{2N}$ (recall that $\underline{d}$ is the minimum distance at which independence is feasible and $\frac{q}{2N}$ is the distance between the borders of D-states and the capital); and let $\bar{d}(\gamma) \equiv \min\{\frac{\gamma}{\varphi}, \frac{q}{2N}\}$. Notice that the condition of Lemma 1 is equivalent to $\bar{\gamma} \geq \underline{\gamma}$.

For any value of $\gamma$, the independence game has a unique (up to the choice of a finite number of possibly indifferent locations) pure strategy Nash equilibrium, characterized in

**Proposition 1.** ***(Equilibrium Location of C-states)*** *Let the condition of Lemma 1 hold.*

1. *C-states do not emerge if* $\gamma < \underline{\gamma}$*;*
2. *C-states emerge in all locations at a distance* $d \in [\underline{d}, \bar{d}(\gamma)]$ *if* $\gamma \geq \underline{\gamma}$*;*
   (a) *Distance* $\bar{d}(\gamma)$ *falls short of the border, and D-states are territorially disconnected and host positive masses of contiguous C-states in the strict interior of their territory, if* $\gamma \in [\underline{\gamma}, \bar{\gamma})$*;*
   (b) *Distance* $\bar{d}(\gamma)$ *coincides with the initial border, and D-states are separated from one another by a connected mass of C-states extending from* $\underline{d}$ *to the border, if* $\gamma \geq \bar{\gamma}$*.*

Provided that a ruled location is far enough from the capital for independence to be militarily feasible, it actually becomes independent only if it is at the same time close enough to the capital for independence to be convenient. If $\gamma$ is sufficiently high, the set of locations that can afford independence and find it convenient is non-empty and some location invest in local state capacity and become independent city state. For intermediate levels of $\gamma$, this is the case only for locations strictly within the borders of D-states, while for higher returns a belt of C-states emerges around the former borders of D-states.

**Emergence of Territorial Polities: A "Modern State Formation Game".** Let us now consider a modern state formation game, in which $N$ elites ruling over D-states choose whether to remain D-rulers, become M-rulers or give up and become dominated by other polities. A strategy profile is a collection of $k_i \in \{0, K_D, K_M\}$, one for each ruling elite $i \in \mathcal{C}_D$. For D-rulers, building an M-state has costs and benefits, the former associated to lost rent extraction and the more expensive state apparatus, and the latter to the economic gains granted by the rule of law and the possibility to have all locations participating equally to the financing of the state apparatus. Optimal strategies may crucially depend on choices by other rulers, which affect borders and the size of the territory controlled by each ruler in equilibrium.

Focusing on symmetric pure strategy equilibria, there exists a threshold $\hat{\gamma} \equiv \frac{N^2 K_M}{2\alpha}$ such that we can state

**Lemma 2.** ***(Emergence of M-states)*** *In the modern state formation game, M-states can emerge in equilibrium only if* $\gamma \geq \hat{\gamma}$.

To simplify illustration, we make four assumptions that involve parametric restrictions. First, we focus attention on the case in which the game is played when the independence process characterized above is complete, so that there are $N$ symmetric D-states separated from one another by a mass of C-states.[30] Second, we consider a situation in which building M-states is sufficiently costly to make the possibility of their emergence depend on $\gamma$.[31] Third, we restrict attention to the case in which the cost of maintaining D-states is sufficiently low to make D-rulers enjoy positive net rents whenever they are in power.[32] Fourth, we assume that the initial number of D-states is not too large.[33] These assumptions essentially imply restricting attention to the case in which net rents in D-states are not too low, and the costs of M-states are sufficiently high, so that, unless returns to the rule of law are very high, investing in M-states is not a dominant strategy (and hence an obvious choice).

The modern state formation game can feature two possible types of pure strategy symmetric Nash equilibria: a modern and a domain equilibrium, respectively defined as a strategy profile in which all D-state ruling elites invest in building an M-state, and as one in which they all choose to remain D-rulers. There exists a threshold $\tilde{\gamma} \equiv \frac{K_M}{q} + R(2\underline{d}) - K_D$, which under our assumptions satisfies $\tilde{\gamma} > \hat{\gamma} > \bar{\gamma}$, such that we can state

[30] This requires the condition of Lemma 1 to hold, together with $\gamma \geq \bar{\gamma}$.

[31] We assume $K_M > \alpha\varphi(\frac{q}{N})^3$, which is equivalent to $\hat{\gamma} > \bar{\gamma}$.

[32] In the initial condition, and (as shown below) whenever D-rulers are in power in equilibrium, D-state size is $2\underline{d}$, gross rents are $R(2\underline{d}) = 2\underline{d} - \varphi\underline{d}^2$, and net rents are positive if $R(2\underline{d}) > K_D$, which we assume.

[33] Specifically, we assume that $N^2 \leq 2\alpha q$.

**Proposition 2.** ***(Domain and Modern Equilibria)*** *Let the condition of Lemma 1 hold and consider an initial configuration with $N > 1$ D-states coexisting with a belt of C-states, as characterized in Proposition 1, 2(b).*

- *Only a domain equilibrium exists if $\gamma < \hat{\gamma}$.*
- *Both a domain and a modern equilibrium exist if $\hat{\gamma} \leq \gamma \leq \tilde{\gamma}$;*
- *Only a modern equilibrium exists if $\gamma > \tilde{\gamma}$.*

This Proposition characterizes the possible equilibrium configurations after the completion of the process of emergence of C-states (that is for $\gamma \geq \bar{\gamma}$). If returns to the rule of law are either too low or too large, then the (symmetric) equilibrium is unique: for $\gamma < \hat{\gamma}$ and $\gamma > \tilde{\gamma}$, D-rulers respectively never and always invest in the creation of an M-state, independently of what other elites do. In the intermediate range, for $\hat{\gamma} \leq \gamma \leq \tilde{\gamma}$, there are multiple equilibria created by strategic complementarity: each elite prefers to remain a D-ruler as long as the other elites do the same, but it also prefers scaling-up to an M-state to being conquered by other M-states, if other elites modernize their polities and therefore threaten its territorial sovereignty. This multiplicity of equilibria is interesting, as it gives room for strategic interactions and historical accidents (possibly associated to the choices of specific rulers) in triggering a broad process of scale-up in state capacity and rule of law, which eventually leads to the emergence M-states with well defined territories. Moreover, since when M-states appear, D and C-states disappear, the joint consideration of the two games explains in a natural way why the experience of city states had a start and an end, and predicts its evolution over time and space.

**Evolution of Sovereign Polities: Comparative Statics.** Before discussing the role of specific assumptions and the testable predictions, let us summarize the insights on the evolution of sovereign polities through a simple comparative statics exercise.

Propositions 1 and 2 jointly imply that a monotonic increase in the potential for economic activities, and in the associated returns to rule of law $\gamma$, should materialize in a highly non monotonic evolution of sovereign polities. The rule of law initially emerges in the new sovereign polities characterized by a small territorial size and located at a sufficient (intermediate) distance from the main centers of power. The number of such polities should progressively increase until a belt of independent city states surrounds the former border between domain states. It is precisely the small territorial size of city states, and the limited territorial control of domain states, that provide incentives for rule of law in the former even at lower values of $\gamma$ than those necessary to induce a scale-up in state capacity and the adoption of the rule of law in the latter. The reason is twofold. First, due to imperfect territorial control, providing rule of law on an extended territory is more costly than on a small one. Second, extended territorial control grants higher net rents to domain rulers, and higher returns to rule of law are required to make them willing to give them up. When returns are sufficiently high, the scale advantage of large territorial states over smaller ones favors a transition from domain to modern states. Modern states can emerge as either (optimal) responses to a scale-up in state capacity by other rulers or, eventually, they may represent a dominant strategy for all former domain state rulers, once the potential for economic activity and hence the returns to rule of law are sufficiently large.

Limiting attention to this simple comparative statics is, obviously, not motivated by the perception that other relevant parameters did not change over the very long period of interest. It is rather a way of imposing intellectual discipline by performing a controlled though experiment, and an attempt to isolate the role of improvements in technology and potential returns to economic activity already before the Industrial Revolution.

It is worth noting that the predictions on the appearance, territorial location, stabilization and disappearance of independent city states (with the emergence of modern states), and hence on the initial increase and subsequent decline in the number of sovereign polities, are not just a mechanical consequence of the illustrative sequence of the two games. Characterizing the equilibria of the two games (independence and modern state formation) separately is a matter of simplicity of exposition. Adding to the independence game the possibility for D-rulers to strategically invest in building an M-state would complicates exposition, but does not affect the logic of the argument and leaves the proofs of Propositions 1 and 2 essentially unaffected.

## 3.4 Discussion

The analysis presented above rests on some parametric assumptions, which simplify illustration. Relaxing them does not change the broad argument and results, but delivers some valuable insights and side predictions that are useful to read the historical evidence through the lenses of the theory.

**Stateless Territories.** Domain states have been assumed to have sufficiently large levels of territorial control, so that their rulers have the ability and the incentive to expand their territories as much as they can. For lower levels of state capacity, domains state rulers would lack the military capability and/or the economic interest to control territories that are too far away from the capital. This might give rise to stateless territories in equilibrium, located just outside the borders of (some) domain states. As state capacity increases, the size of stateless territories should decrease over time, and in the limit case of modern state (with perfect territorial control) no stateless territories should exist.[34]

**Existence of City States.** Considering the two games jointly, a necessary condition for the emergence of city states is that the military capacity of domain states is sufficiently declining over space

[34]As discussed below, the panel dataset that we assemble allows looking at the territorial evolution of stateless territories.

(see Lemma 1). Provided this, a sufficient condition is that the cost of the state apparatus of modern states is large enough, so that the latter emerge only after city states (i.e., for higher values of $\gamma$).[35] Outside these conditions, no city states would emerge (or the process of their formation could be interrupted before its maximum expansion). The joint consideration of the necessary and sufficient condition therefore conceptualizes the historical emergence of city states (in the peripheral areas of domain states) as following a demand for economically enhancing political institutions, in a contest in which the territorial control of domain rulers was limited and sufficiently expensive to improve.[36]

**Bankrupt Domain Rulers.** We restricted attention to domain states with positive equilibrium rents, even at the peak of the expansion of city states, when the ability of D-rulers to extract resources reaches its minimum. The model can also feature configurations in which equilibrium net rents are negative (that is, gross rents are insufficient to cover the cost the of the state apparatus), and rulers' losses are either covered by their own income or (extending the budget constraint) they generate sovereign default on debt obligations. These configurations can be an equilibrium if, for domain rulers, the alternatives to running a state that generates negative net rents are even worse than the equilibrium state of affairs: either being dominated by other rulers, who would extract high rents or impose high taxes and provide little benefit, or running an even more costly but still too little productive modern state. The model therefore predicts that, prior to the transition to modern states, rulers of domain states face a period of reduction in net rent extraction, possibly associated with negative equilibrium rents (or bankruptcies).

**Disappearance of Some Domain States.** In the modern state formation game we restricted attention to pure strategy symmetric Nash equilibria, and to parameter configurations such that at least one, and possibly two, such equilibria exist. Under alternative configurations, one might have that no pure strategy symmetric equilibria exist for an intermediate range of $\gamma$. Still, a mixed strategy or asymmetric Nash equilibrium would exist, and the model would predict that the emergence of modern states is accompanied by a process of territorial expansion, leading to the conquest and thus the disappearance of some of the old domain states.[37] This possibility is interesting per se, but even more so in light of the possible bankruptcy of domain rulers discussed above.

[35] As mentioned in Section 2, both the assumption that domain states had declining territorial control and that building modern states involved a sizable scale-up in the cost of state apparatus are broadly in line with historical evidence.

[36] It is also clear that relaxing the extreme hypothesis that city states can only have state capacity over the capital does not change the main predictions, but for the fact that city states would control a small but non-atomistic territory around their capital.

[37] If the number of domain states is high, one has $\tilde{\gamma} < \hat{\gamma}$, and no pure strategy symmetric Nash equilibrium exists for $\gamma \in (\tilde{\gamma}, \hat{\gamma})$. In a mixed strategy equilibrium, domain rulers randomize between modernizing their state and being ruled; in an asymmetric equilibrium, some of them modernize their state and other ones accept being ruled.

**Co-existence of Domain and Modern States.** In reality, modern states obviously did not appear all at once. Their emergence was a long and articulated process, faster in some polities and slower in other ones. The baseline model simplifies the predicted process through the postulated perfect state capacity of modern states, which implies that, once at least one such state exists, no other type of polity can survive. This extreme assumption is very convenient, since it greatly simplifies the characterization of equilibria and the formulation of the main predictions. Relaxing it would allow studying asymmetric equilibria, in which modern states co-exist with other types of state. This might open the way to potentially interesting dynamics, but it would also make the analysis substantially more complicated, without affecting the main predictions on the role of increasing values of $\gamma$, which eventually favor the transition to modern states. While such investigation is beyond the scope of this paper, it represents an interesting direction for a future research specifically focused on the consolidation of territorial modern states.

**Trade, Agglomeration Externalities and City States.** In our thought experiment we studied the role of changes in productive potential over time, maintaining the assumption that, at a given point in time, the value of $\gamma$ is the same for all locations, so that heterogeneity is entirely due to political geography. It is useful to briefly comment on the role of other sources of location-specific heterogeneity in productive potential, such as those related to trade networks and agglomeration externalities (the idea that a city is more productive if it is close to other productive cities). Their consideration would not affect the qualitative prediction that, as returns to the rule of law increase, city states should emerge in the peripheral areas of domain states. Yet, it would alter the timing of this prediction: within the belt of locations for which independence is militarily feasible, those with higher productive potential should become independent earlier; moreover, agglomeration externalities would speed up the emergence of new city states next to one another; finally, locations in the center of the belt of city states would enjoy higher benefits than those at the border with domain states. This would reinforce, but not alter qualitatively, the prediction that city states should appear in clusters. A similar argument holds for the timing of the scale-up of domain rulers to modern states. Rulers of territorial polities facing higher economic and trade potential, e.g., those exposed to the Atlantic Trade after 1500, should have higher incentives and capability to invest in state capacity and rule of law, and should thus build modern states earlier.

**Hard Borders and National Markets.** In the theory the degree of rulers' territorial control at the borders is high for modern states and low for domain states. This feature delivers two insights that are in line with historical evidence. First, before the emergence of modern states borders should be interpreted more as areas of influence than as clear demarcations of territorial power. Small perturbations of military power across polities may materialize in sizable changes in borders and polity size, without substantial effects on the economy of locations shifting from a domain ruler to another. Second, in modern states borders are harder, in the sense that they are characterized by equally sizable and substantial territorial control by part of the polities on both sides. In terms of the role of trade discussed above, these considerations imply that, before the emergence of modern states, with soft borders, there should be no conceptual difference between domestic and foreign trade, whereas domestic trade should become more important with the emergence of modern countries, with their hard borders and national markets.

## 3.5 Summary of Testable Predictions.

The outlined model generates a number of specific predictions and insights on the evolution of sovereign polities and on the political geography of development, both in terms of the number, type and location of sovereign polities and in terms of the distribution of the benefits across the territories under their rule. Not all of them can be formally tested due to the lack of systematic historical data, but the database presented in Section 4 allows exploring the main predictions on the evolution of polities and on the changing role of centrality. Let us briefly summarize these predictions.

**Evolution of Sovereign Polities.** The model predicts an initial process of political disaggregation, followed by a subsequent consolidation.

[1.1] The *number* of sovereign polities increases (with the emergence of city states), stabilizes and then decreases (with the emergence of modern states); average *territorial size* does the opposite.

[1.2] The *size distribution* changes from uni-modal to bi-modal and back.

[1.3] *City states* emerge only at a sufficient distance from centers of power: initially in the interior of domain states and eventually they stabilize in a "belt" around former borders; the experience of city states is also limited in time: they appear, expand, and eventually disappear.

These predictions are broadly in line with scattered historical narratives, but have not been systematically subject to measurement and empirical exploration.

**Political Geography and Local Development.** The model has specific predictions on how economic development depends on polity size and type, and on centrality within a given territorial polity. Moreover, it generates insights on the role of exposure to domestic and foreign markets.

**Optimal Polity Size and Type.**

[2.1] The average payoff is increasing in *territorial size* in D-states, and hump-shaped in M-states;

[2.2] *C-states* fare better than any location ruled by *D-states*, when they co-exist.

The prediction of an optimal intermediate polity size for modern states has not been empirically explored. The initial advantage of city states is, in turn, in line with extensive narratives and some scattered evidence discussed below.

**Reversal of "Centrality" and Markets.**

[3.1] The *capital* of a territorial state fares better than the locations under its rule.

[3.2] The *periphery* of D-states fares better than the core; the *core* of M-states fares better than the periphery.

The predictions on the reversal of centrality follow from the postulated decay rent extraction in D-states, coupled with the decay in the benefits from the rule of law in M-States. The expected change in the role of centrality is reinforced by the emergence of harder borders with modern countries, which reduces the benefits from foreign trade for peripheral locations and strengthens those from domestic trade to central locations.

# 4 Historical Political Geography Dataset, 1000-1850

To explore the empirical insights of the conceptual framework we build a panel database of all sovereign polities ruling the European territory in every year during the period 1000-1850. A tangible contribution to the empirical literature is production of a panel database at yearly frequency with novel political geography information at the level of grid cells and cities.[38] The database is built by collecting, digitizing and geo-localizing historical information from several sources at three levels of observation: sovereign polities, small grid cells and locations hosting historical cities.

First, we track the evolution of sovereign polities and their centers of power over time and space. The outcome of this part of the database is information at the level of sovereign polities in terms, for instance, of timing of appearance and disappearance, evolution of territorial control and size, types, changing locations of capitals, etc. Second, the European territory is divided in small grid cells used as stable units of observation to build a yearly panel data. For each location in Europe we construct several variables that are informative of their political history including the polity ruling each location in each year and time-varying information on their size, type, etc. We also build a set of variables that allows exploring the predictions on the changing patterns of territorial political control, centrality and emergence of hard borders exploiting information on the history of polities ruling over the different locations. We suggestively label these as measures historical "political geography". Finally, we merge information on political geography with population data (and a set of time-varying co-variates) for the locations eventually hosting pre-industrial cities. This third step also allows us to exploit the evolution of borders and construct measures of domestic and foreign market potential.

We next briefly discuss the database and present the main variables of interest. Appendix 2 reports details on the construction of the database, on variables' definition and sources as well as report further visual illustrations of the data and descriptive statistics for the different samples used

[38] The resulting yearly panel data at the level of locations also allows to flexibly build further measures of historical political geography and can be re-aggregated at different levels (e.g. regions, administrative units, etc) for further applications. See Appendix 2 for a discussion of the methodology.

for the estimation analysis.

## 4.1 Data

### 4.1.1 Sovereign Polities

Political sovereignty was a stratified concept in the Middle and early Modern Ages, much more than it is in today's national territorial states. This makes the very definition of a sovereign polity not always straightforward, particularly from a *de jure* perspective. Geo-coded information on sovereign polities in pre-industrial times from Euratlas (Nussli, 2010) can be used for a preliminary exploration, but not to test our predictions, since it is only available at century frequencies. To track the political history of Europe, we construct a novel geo-referenced database based on information from the Centennia Historical Atlas of Europe (Reed, 2014) (henceforth Centennia). The data has the advantage of a conceptually consistent classification of polities over time, since it restricts attention to the maximum level of *de facto* sovereignty, based on "effective power and control, that is 'power on the ground', rather than internationally-sanctioned or treaty-driven relationships". This classification is in line with our conceptual modeling of polities, which is also based on effective territorial control.[39]

Our theory classifies polities on the basis of state capacity and political institutions, focusing on three prototypes. Their empirical identification requires some discussion. In line with both our model and historical and politological literature, we identify city states as polities that gain independence from former rulers and control comparatively small territories.[40] This category includes, for instance, the Italian medieval republics, as well as the polities of free-imperial cities and any polity for which we could find historical evidence that these criteria are satisfied. Despite substantial differences among them, city states generally had larger levels of de facto rule of law and provided more productive services compared to the absolute monarchs of domain states, at least until the fifteenth or sixteenth century. Tracking information on variations in the degree of rule of law across and within city states is difficult both conceptually, due to the variety of institutional differences, and empirically for the lack of systematic information on institutions. We thus rely on extensive margin information and focus on the emergence and disappearance of city states. While some unavoidable degree of arbitrariness still remains, for instance because some city states at some point reached non-negligible territorial extensions or witnessed reductions in the rule of law (think of some Italian lordships, *signorie*), this choice makes their empirical identification more conservative.

Similar considerations also hold for the empirical identification of domain and modern states. There is general agreement that the large polities before the sixteenth century did not present the

[39]Euratlas also codes as sovereign some polities that were formally independent but de facto under the control of other entities. As result the number of polities tends to be larger in Euratlas than in Centennia. The broad patterns of evolution over time as discussed below and reported in the Appendix.

[40]Data were collected using several sources including, among others, De Agostini (2007) and Ertman (1997).

specific characteristics of modern territorial states in terms of state capacity and rule of law and can, therefore, be interpreted in our conceptual modeling of domain states. A fine tuned classification of the full set of territorial polities after that period is nonetheless substantially harder and, again, would be to some degree arbitrary, due to the great variety in state capacity and rule of law both across polities and over time. For instance, while it is generally agreed that England was a forerunner in both state capacity and rule of law, whether and when other territorial polities can be classified as domain or modern states would be substantially more controversial. Since the main testable predictions refer to the patterns of emergence of city states and to the changing role of centrality in the transition to modern states, we explore the broad insights of the conceptual framework by adopting a conservative strategy. We do not attempt discriminating on the intensity of state capacity and rule of law within territorial polities after 1600, but we look at whether the predicted patterns gradually emerge along the transition from the Middle to the Modern Age.

We also track the coordinates of the centers of power by geo-referencing the changing location of the capital of each polity in each year including temporary changes in capital cities and periods of interruptions. The reconstruction of the changing locations of capitals requires tracking the emergence and disappearance of each polity. Also, particularly for domain polities, the location of capitals often changed depending on the ruling dynasties and historical accidents.[41] This information is exploited at the location (cell) and city level to build the measures of political geography as explained in more details in the following section. Appendix 2.1.1 reports some statistics on the sovereign polities dataset.

### 4.1.2 Political Geography

We construct variables at yearly frequency that are informative on several aspects of political geography emphasized by the theory and that are presented below (see also Appendix 2.2 for details).

**Polity Size and Type.** Tracking the territorial size of each polity allows considering the effects of polity size from different angles. In absolute terms, we calculate the size of the polity ruling over a location in each year or, since locations often faced changes in rulers, we calculate the average size

[41]For example, the Holy Roman Empire did not have a stable capital city (the capital at each point in time corresponded to the residence of the emperor so it varied depending on the city where he was prince). However, Vienna can be considered one of the main emperors' residences and cities in the empire, therefore in the period 1000-1314 we consider Vienna as the capital city for the Holy Roman Empire. In 1315 the Habsbourgs are reported as a separate sovereign political entity from the Empire, having as capital city Vienna, therefore among the imperial residences we have selected Frankfurt as it was one of the most important cities in the empire (where the Emperor was mostly elected) and the most central. From 1346 to 1437 the capital of the Empire is Prague as the emperor Charles IV explicitly set the imperial seat there. From 1438 to 1555 (Peace of Augsburg, after which German princes gain more formal religious and political sovereignty on their territories) we again consider Frankfurt as the major center of power for the empire.

over multiple years, e.g. in each century or half-century. In relative terms, we classify locations in tertiles of the full distribution of polity size in space over the period 1000-1850 and compute the share of years a location was ruled by a polity with log territorial size in the second tertile. This is the measure of territorial size on which we focus the most, as it allows considering the non-linear effects of polity size predicted by the theory and exploiting the intensive margin of the length of rule by medium-sized polities. As mentioned above, for each location, we also record whether in a given year it was ruled by a city state and the share of years spent under the rule of city states in a given time span (e.g., the previous century).

**Power and Stability.** We track whether a location was the seat of a capital in each year or was ever a capital in a given period. Ruler changes may be concomitant with changes in polity size and type, but might affect city growth on their own. As baseline measure of stability of political control we record the (number of) changes in the identity of rulers over a given period. In doing this we consider changes in the sovereign polity ruling over a location but not changes in dynasties within the same sovereign polity.[42]

**Location and Centrality.** Changes over time in the sovereign polity ruling over a location and in the coordinates of its capital city allow tracking each location's (time-varying) distance to the capital in each year. We also measure the changing centrality across, in the network of, polities in terms of the number of polities within a given distance from each location (with a baseline of 50 kms).

**Polity Dummies.** We record a full set of yearly sovereign polity dummies in each location. This allows conditioning the estimates on the inclusion of polity fixed effects for each and all the polities ruling over a location in a given time span, e.g., in the previous century (see Appendix 2.2.1 for details). The measure also allows exploring the sensitivity of the results to specific polities and rulers and identifying the role of political geography variables above and beyond the identity of each ruler, by exploiting within polity variation over time.

### 4.1.3 Cities

**Population.** Local development is measured, in a Malthusian perspective, in terms of population growth over time. Following the literature, baseline information on population is obtained from Bairoch, Batou, and Chèvre (1988) that provide estimates between year 800 and 1850 (at century

[42]For example, when Bologna emerges as a political entity becoming de facto (and also de jure) independent from the Holy Roman Empire in 1211, we record a change in rulers (from the Holy Roman Empire to Bologna) for all the locations controlled by the new polity. By contrast, when in August 1400 the Holy Roman Emperor Wenceslaus of Luxembourg was dethroned in favor of Rupert of Wittelsbach (involving a change in the ruling house) we do not record any change of rulers for the territories under the Holy Roman Empire.

frequency until 1700 and every 50 years thereafter). Given the role of political geography and distances we have updated the database with city coordinates with decimals up to four digits to increase precision in the geo-localization. We incorporate updated population estimates for some cities based, in particular, on Voigtländer and Voth (2012b) and Bosker, Buringh and Van Zanden (2013). We use as baseline the resulting database for all European cities that ever reached 5,000 inhabitants by 1850 and we track population in each location whenever it is above 1,000 inhabitants. Regression analysis exploits information on urban population data over the period 1100-1850 (for which can build political geography variables referred to the previous century).[43] The baseline sample is an unbalanced panel of 1,940 cities for a total of 8,549 observations.

For robustness we replicate the analysis on the sub-sample of bigger cities that ever reached 10,000 inhabitants, for which we have additional time-varing covariates at century frequency from Bosker, Buringh and Van Zanden (2013). We refer to this as the restricted sample: it includes 673 cities for a total of 6,784 observations from 1100 to 1800. We also check the robustness of the patterns assembling an alternative database with updated estimates for the bigger cities from Malanima (2010) who incorporates data from several additional sources, including De Vries (1984). To explore the robustness to the role of entry (and exit) of cities in the database we also exploit two different balanced samples. The first one is obtained by imputing 500 inhabitants to cities with missing population data in the baseline sample, while the second one is obtained exploiting only the cities that are always in the baseline sample since year 1600. Appendix 2.3 discusses in more details the urban population data and reports descriptive statistics.

**Political Geography.** For each city we construct information on the following city-specific time-varying variables. All the location-specific political geography variables discussed above, including information on size and type of polities ruling each location, capital city and change of rulers, and changes in centrality in terms of distance to capitals and location in the network of polities, are matched with population data (see Appendix 2.2).

**Domestic and Foreign Market Potential.** Exploiting information on the changing urban network and the evolution of borders we construct two variables that are informative on the change over time in market potential in each location by discriminating between internal (domestic) and external (foreign) market access. Since the model predicts a change in centrality, which is a relative rather than an absolute concept, we also compute the location-specific time-varying information on the share of domestic to total market potential that captures the composition of market exposure rather the role of changes in absolute levels of potential market access.

[43] We drop cities located in today's Russia because the territory of this country and the polities ruling over it in the period 1000-1850 often go beyond the spatial coverage the historical Atlases for Europe. We also drop the cities of Ponte del Gada, La Valletta and St. Peter's Port because they are located on small islands not captured by the maps in the historical atlases.

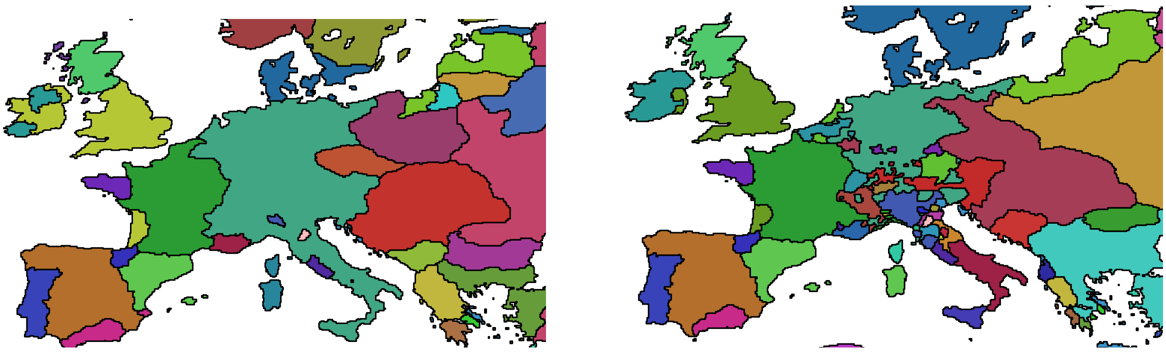
**Covariates.** The empirical analysis finally conditions on a large set of time-varying covariates following, and extending in some dimensions, the recent literature. These include, in particular, information on cities on the Atlantic coast as in, among others, Acemoglu, Johnson and Robinson (2005), on the occurrence of wars and civil conflicts from Dincecco and Onorato (2016) integrated digitizing and geo-referencing data from Jaques (2007)), on the occurrence of epidemics in the area hosting the city extracted from Biraben (1975). For a subset of cities we can also condition on information on whether a city was plundered, hosted an active parliament or a bishop, or whether it was a commune, from Bosker, Buringh and Van Zanden (2013). See Table A.2 in Appendix 2.3.1 for further details.

## 4.2 Sovereign Polities: Stylized Facts

We next provide a first visual illustration of some of the patterns that emerge from the historical political geography dataset. This serves several purposes. First, it allows to illustrate the underlining data. Second, it provides a measurement of the main moments of the evolution of pre-industrial sovereign polities over time and space. Third, by visualizing the stylized facts, it offers a reduced form exploration of the broader predictions of the conceptual framework. The next Section will present the formal empirical investigation of the more specific predictions by looking at the panel data at the level of cities.

**Number, Size Distribution and Types of Polities.** Figure 1 offers a snapshot of the raw data by depicting the borders of sovereign polities at two selected points in time, in 1250 and 1400. These years capture the period of maximum territorial expansion of the Holy Roman Empire, and the period in which the process of its disaggregation fully gained momentum.

Figure 1: BORDERS OF POLITIES IN YEARS 1250 AND 1400



(a) Europe in 1250 (b) Europe in 1400

Note: The figure shows the boundaries of political entities at the highest level of sovereignty in Europe in 1250 (Panel a) and 1400 (Panel b).

Figure 2 depicts the evolution over time of some moments of the distribution of polity size.[44] For

[44]We compute the distribution of polity size excluding locations under the rule of the Mongolian, Ottoman, Seljuk

comparability with the estimation sample used in the empirical analysis in Section 5, it considers the distribution over the set of locations that ever hosted a city between 1100 and 1850.[45]

Panel (a) depicts the evolution of the number of polities and their (log average) territorial size. In line with conceptual insights (see Prediction [1.1]) the number of sovereign polities increased (due to the emergence of city states), reaching a maximum around year 1400, and then gradually declined, reaching a minimum during the Thirty Years War, when the territory of current Germany was occupied by Sweden. After the Peace of Westphalia (1648) the number of polities stabilized around 35 until 1850 (except for a short fall during Napoleon's conquests), while the average polity size reached the dimension of today's Germany.[46] The experience of smaller polities has been stable for a while, but they eventually disappeared and gave way to modern states. While the extreme assumption we made on modern states' territorial control implies an immediate transition to a modern equilibrium, and does not allow for the observed gradualism of the consolidations process, the model captures well the final and stable phase of the transition to modern states.

Panel (b) presents another way of looking at changes in the distribution of polity size. The solid line shows the evolution of the boundaries of the second tertile of log polity size in each year's distribution from 1000 AD to 1850, across city locations. The dashed lines illustrate the process of disaggregation and re-aggregation of political entities by looking at the distribution in three key subperiods: 1000-1300 (large empires and kingdoms), 1300-1600 (city- and regional-states co-exist with larger polities) and 1600-1850 (modern nation states).

Consistently with the theory (see Prediction [1.2]), the distribution of polity size is first unimodal, then bimodal and then again unimodal. Figure 3 shows the kernel distribution of the logarithm of polity size across city locations in three key years (see Figure A.8 in Appendix 2.2.2 for the kernel distributions at all century years). In year 1000 (Panel a) the distribution is unimodal with a peak around 13.2 (about 540,000 squared Km, roughly today's France). With the birth of city and regional states in the continent (Panel b) the distribution becomes bimodal with a long tail on the left and the first peak around 10.7 (44,000, roughly today's Netherlands) and the second peak around 12.5. The distribution again gradually becomes smoother towards a unique higher peak by the end of our period of interest in 1850 (Panel c).

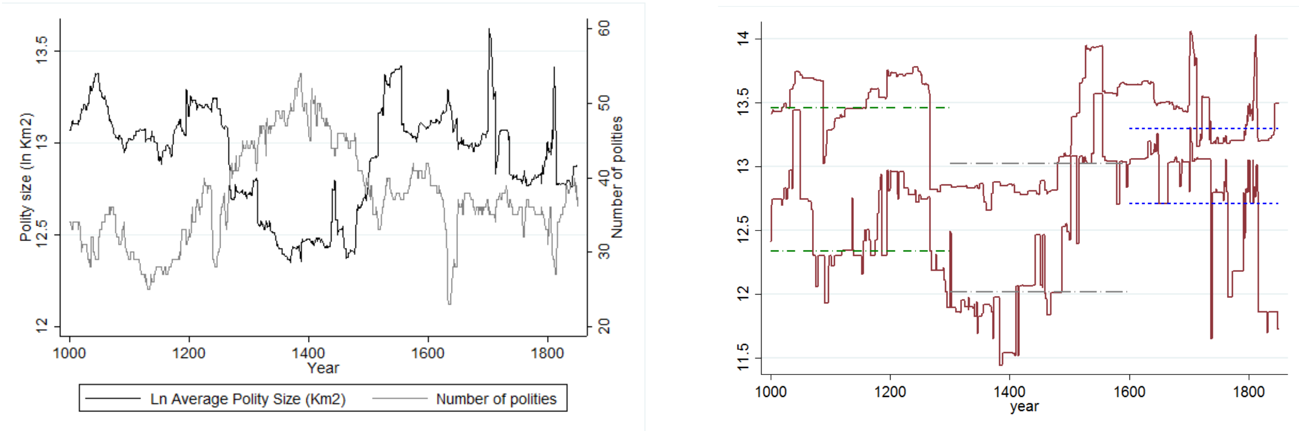
We further explore the disaggregation phase by specifically focusing on city states. Figure 4, Panel (a), depicts the evolution of the number of locations ruled by city states, showing a gradual increase, a peak around year 1450, and a gradual decline afterwards. In the model city states emerge

and Russian Empires since their territories were largely spanning out of the European continent and out of the spatial coverage the historical Atlas for Europe. As a result their size cannot be computed.

[45]This choice is made for the sake of illustration and comparability, but notice that it over-weights, by construction, the territorial size of polities eventually hosting many cities. We report the evolution of the logarithm of the average size computed over the sample of polities in Figure A.3 in Appendix 2.1.1.

[46]In today's Europe there are around 45 states, whose average territorial size roughly corresponds to that of the United Kingdom.

Figure 2: Number and Size of Polities 1000-1850

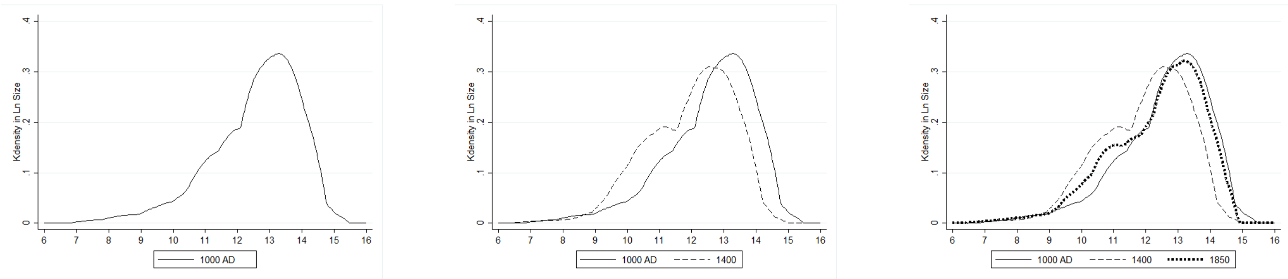



(a) Number and Average Size

(b) Tertiles of the Full Distribution

Note: Panel (a) depicts the evolution of the logarithm of average polity size (darker line) and the number of polities in each year from 1000 to 1850 (lighter line). Panel (b) presents the evolution of the boundaries of the second tertile of each year's distribution of log polity size. The pattern of disaggregation and reaggregation of political entities in the period of interest is illustrated by depicting the average boundaries in three sub-periods: 1000-1300, 1300-1600 and 1600-1850. Both panels rely on the sample of locations ever hosting a city in the period 1000-1850, based on the Political Geography Dataset.

Figure 3: Distribution of Ln Polity Size in 1000, 1400 and 1850




(a) Year 1000

(b) Years 1000 and 1400

(c) Years 1000, 1400 and 1850

Note: The figure depicts the Kernel distribution of the logarithm of polity size in selected years. For comparability with the analysis below, it plots the distributions based on the Political Geography Dataset.

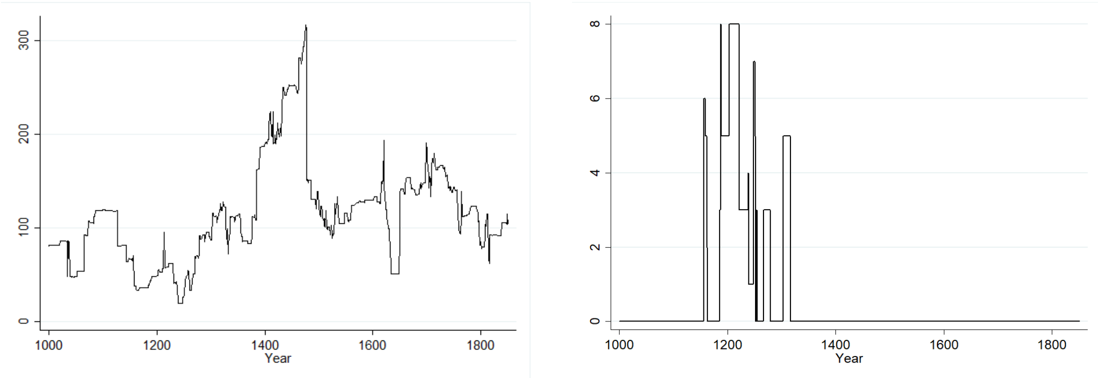
only at sufficient distance from centers of power, initially only in the interior of domain states and subsequently in their periphery, where they stabilize before eventually disappearing (Prediction [1.3]). This picture finds support both in Panels (a) and (b). The latter reports the evolution over time of the number of locations in new city states that emerge in the interior of larger polities (and are "labelled interior City States") which peaks in the initial period of the disaggregation phase.

Figure 5 depicts summary statistics of stability and centrality, respectively. Some periods are associated to more extensive changes in the identity of rulers.[47] The average distance to the capital (Panel b) reaches a minimum when many locations were ruled by city states around 1400, then rises

[47]Notable peaks of rulers' change appear in 1556 after the Peace of Augsburg (as German Princes took over the sovereignty of their territories from the Holy Roman Empire), in 1708 after the Austrian Habsburg occupied the Kingdom of Naples when ruled by France, and during the Napoleonic wars (1803-1815).

again, but declines towards the end of the period as many new cities appear in locations close to the capitals of modern states. In line with this, in Panel (c) the average number of polities within 50 km gradually increases until about 1400, remains high during the dissolution of the Holy Roman Empire and during the XVII century, and again tends to declines by the end of the XVII century, but without reaching the lowest levels of the Middle Age.

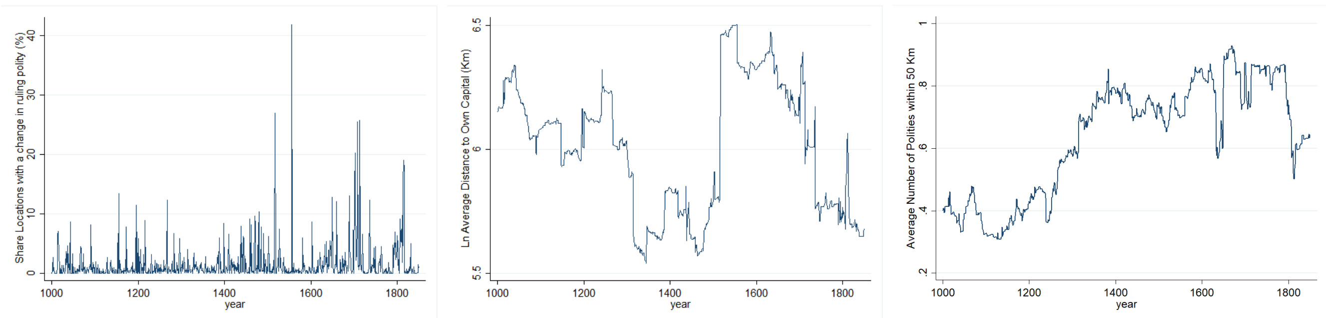
Figure 4: Internal Polities and City States, 1000-1850.




(a) City States (b) Interior City States

Note: Panel (a) reports the evolution over time of the total number of locations ruled by city states; Panel (b) shows the number of new locations ruled by city states that emerged in the interior of domain states in each year. We defined city states according to historical documentation and narratives as discussed in more details in Section 4.1.1. Both panels rely on the sample of European locations ever hosting a city in the period 1000-1850 based on the Political Geography Dataset.

Figure 5: Stability and Centrality




(a) Rulers' Turnover (share) (b) Ln Mean Capital Distance (c) Mean N. Polities w/50 Km

Note: Panel (a) reports the evolution over time of the share of locations experiencing a change of ruler. Panel (b) shows the logarithm of the average distance to the capital. Panel (c) shows the average number of polities within 50 Km. All panels rely on the sample of locations ever hosting a city in the period 1000-1850 based on the Political Geography Dataset.

# 5 Political Geography and Pre-Industrial Development

In this section we explore the role of political geography for city growth in pre-industrial Europe which, in a Malthusian perspective, represents the best available proxy of local development.

## 5.1 Empirical Strategy

The baseline empirical strategy exploits variation over time within locations in regressions of the form

$$y_{it} = \alpha + \mathbf{X}_{it}'\boldsymbol{\beta} + \mathbf{Z}_{it}'\boldsymbol{\zeta} + \gamma_i + \delta_t + \eta_{J_{it}} + \varepsilon_{it}, \tag{1}$$

where $y_{it}$ is the *Log Population* in city $i$ in year $t$. Vector $\mathbf{X}_{it}$ collects political geography time-varying variables, including information on size and type of polities, centrality within them and domestic and foreign market potential. Vector $\mathbf{Z}_{it}$ includes further time-varying covariates, while $\gamma_i$ and $\delta_t$ denote city and year fixed effects. This estimation model, which is otherwise standard in the literature, is extended in some specifications with the inclusion of sovereign polity fixed effects, denoted by $\eta_{J_{it}}$, which account for the full set of sovereign polities, $J_{it}$, that ruled over the city in the previous period (century). The error term $\varepsilon_{it}$ allows for heteroskedasticity and spatial clustering.

This baseline specification will be adjusted, as discussed below, to test specific predictions and to perform robustness and sensitivity checks. In particular, to explore the predicted time-changing role of political geography in the transition from domain to modern states, we allow the coefficients of the variables of interest to be time-specific.

## 5.2 Polity Size

According to our theoretical framework, as summarized by Prediction [2.1], along the process of emergence of modern states, polities with intermediate territorial size should deliver the highest average payoff to locations (cities) under their rule, since they offer the best trade-off between increasing and decreasing returns to scale.[48] While intuitive, this broad prediction has not been empirically explored so far.

To investigate it, we look at several measures of absolute and relative territorial size. Baseline findings are reported in Table 1, where the dependent variable is log city population and we compare different datasets and specifications.[49]

The first four columns focus on absolute territorial size and adopt a linear and quadratic specification, considering log polity size at the beginning of each century with data from Euratlas in columns (1) and (2), and log average polity size over the previous period, calculated from yearly data from Centennia, in columns (3) and (4). The last two columns turn to relative size measures, based on Centennia. Column (5) isolates the effect of being ruled by polities in the first and third tertile of the distribution of log polity size as compared to the second tertile (omitted category).

[48] In the model, as in the literature on the number and size of nations, increasing returns are due to the fixed cost of governance through the rule of law and decreasing returns to the spatial decay in its benefits.

[49] Here we use all available observations, from year 1000 to 1850, the majority of which come from the Modern Age. In Sections 5.3 and 5.4 we also restrict attention to the Modern Age and further explore the different predictions for domain and modern states.

Table 1: Polity Size (Baseline)

| Dependent Variable | Ln City Population 1000-1850 | | | | | |
|---|---|---|---|---|---|---|
| Data Polities | Euratlas | | Centennia Historical Atlas | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Log Size | 0.001 | 0.542*** | 0.025* | 0.190 | | |
| | (0.014) | (0.091) | (0.010) | (0.125) | | |
| Log Size Squared | | -0.561*** | | -0.168 | | |
| | | (0.097) | | (0.129) | | |
| Log Size in 1st Tertile (DV) | | | | | -0.172*** | |
| | | | | | (0.021) | |
| Log Size in 3rd Tertile (DV) | | | | | -0.075*** | |
| | | | | | (0.018) | |
| Median Log Size (Shares of Years) | | | | | | 0.071*** |
| | | | | | | (0.010) |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N. of cities | 1773 | 1773 | 1940 | 1940 | 1940 | 1940 |
| Observations | 5,252 | 5,252 | 8,549 | 8,549 | 8,549 | 8,549 |
| R-Squared | 0.627 | 0.630 | 0.670 | 0.670 | 0.674 | 0.673 |

The dependent variable is the log of city population. Baseline sample of all European cities with positive population estimates between 1100 and 1850. See text and Appendix on details of variable construction. OLS Estimates with standardized variables (not for dummies). Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

Column (6) extends measurement by accounting for intensive-margin information: it looks at the duration of exposure, namely the share of years in the previous period a city was ruled by a polity of median size (in the second tertile).[50] The results provide a first shred of systematic evidence that cities tend to grow faster when they are ruled by sovereign polities of intermediate (absolute and relative) territorial size. In terms of magnitude, looking e.g. at column (6), a one-standard-deviation increase in the share of years under a polity of median size is associated to a population increase by 7% of a standard deviation.

The finding that development peaks at some intermediate polity size is robust to several sensitivity checks. Notice that in Table 1 time-invariant omitted drivers of city growth (such as geography and past history) and common (possibly non-linear) patterns over time are accounted for by exploiting within-location variation in two-way fixed effects regressions. The potential role of time-varying factors, which is generally less straightforward to evaluate, is first addressed as in the literature by conditioning on a large set of potentially relevant covariates. The results of these extended specifications are reported in Table 2. Columns (1) and (2) show that the baseline patterns are robust, and in fact are little affected by controlling for the full set of time-varying covariates available for the baseline and the restricted sample.

[50]With Euratlas data, periods are centuries between 1000 and 1800; with Centennia data they are centuries between 1000 and 1700 and half centuries between 1700 and 1850.

Table 2: Polity Size (Extended Specification)

| Dependent Variable | Ln City Population 1000-1850 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Median Log Size (Share of Years) | 0.078*** | 0.067*** | 0.108*** | 0.076** |
| | (0.010) | (0.017) | (0.015) | (0.026) |
| *Covariates Baseline Sample* | Yes | Yes | Yes | Yes |
| *Covariates Restricted Sample* | No | Yes | No | Yes |
| City Fixed Effects | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes |
| N. of cities | 1940 | 673 | 1940 | 673 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 |
| R-Squared | 0.678 | 0.605 | 0.729 | 0.666 |

The dependent variable is the log of city population. The Table extends the specification of Table 1 Column (6). See text and Appendix for details on construction of covariates. *Covariates Baseline Sample* include a dummy variable taking value 1 since 1500 AD if the city is located within 50Km from a coast with access to the Atlantic Ocean, and the number of conflicts and of epidemics outbreaks within 100Km. *Covariates Restricted Sample* include dummy variables taking value 1 if the city was plundered, had an active parliament, or was a Commune, a Muslim city, or the seat of a Bishop or an Archbishop. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

Columns (3) and (4) replicate the analysis by including a full set of sovereign-polity fixed effects for all the sovereign polities that ruled over a city during the previous century. The analysis effectively exploits within-location and within-polity variations in exposure to intermediate territorial size. It identifies the effect by looking at different cities that are ruled by the same polity (potentially for a different duration) in a given period. This specification, which is made possible by the high level of disaggregation of the data over time and space, also constitutes a relevant methodological contribution since it allows to implicitly control for time-varying polity-specific omitted determinants of city growth.[51]

Concerns of reverse causation, from city growth to intermediate polity size, are conceptually attenuated by the non-linearity of the effect of polity size (which makes it not straightforward to think of relevant sources of statistical bias), by the lag structure of the panel data, and by the fact that territorial size refers to polities ruling over multiple locations and is determined by an equilibrium of power with neighboring polities. Reverse and placebo regressions are reported in Table A.5 in Appendix 3.1.1 and provide additional reassuring evidence that results are unlikely to be driven by

[51] In particular, this allows isolating the effect of being ruled by polities with intermediate size from the effect of being ruled by a specific polity of a specific size. In further sensitivity checks reported in the Appendix in Figure A.13, we control for exposure to each polity in isolation. While different rulers have different (average) effects on city growth, the beneficial effect of intermediate polities is consistently confirmed. We also computed the variance of polity size for each period and explored its relationship with city population. Variance of size is generally not significant, and accounting for this variable in the empirical analysis does not change results, so we do not report it.

reverse causation.[52]

## 5.3 Political Geography

We next consider additional measures of political geography beyond polity size. Table 3 extends the specification of Table 2 by including them, and also reports estimates for the 1500-1850 sub-period (Modern Age), which is the most relevant to explore predictions on modern states. The results show some patterns that are worth highlighting.

A first observation is that the positive effect of being ruled by polities of intermediate size is robust to controlling for the additional political geography variables that might be relevant confounders, including the intensity of city state experience and the number of ruler changes.[53] Most importantly, the effect is consistently detected when restricting to the Modern Age sub-sample.[54]

Second, in line with the conceptual framework (see Prediction [2.2]) when they co-exist, city states fare better than domain states over the full period, but not in the Modern Age. The effect remains marginally significant at conventional levels when including polity fixed effects (particularly in the restricted sample which focuses on cities with higher average population). This is noteworthy since these specifications are particularly demanding, as they exploit within-polity residual variation in territorially small polities. Again in line with the theory (Prediction [3.1], capitals fare better than the rest of territorial states), we find that centers of power, in terms of locations hosting capital cities, tend to grow faster, although their advantage loses significance when restricting attention to the Modern Age, suggesting as further explored below that the change in their role takes place before or around that date.

Third, while the point estimates of some variables, such as intermediate polity size, are robust to the inclusion of polity fixed effects, other variables display more unstable patterns. For instance, the role of rulers' turnover passes from negative (and mostly significant) to positive (and not significant) upon accounting for polity fixed effects.

Fourth, on average we do not detect any systematic pattern in the role of centrality, whereas market potential tends to be beneficial and its composition, measured by the share of domestic over total market potential also matters. In view of the predicted reversal of centrality (see Prediction [3.2]) we postpone further comments to the analysis of time-varying coefficients presented below.

[52]This reassuring evidence is reinforced by the inclusion of additional controls, such as those for capitals and city states discussed below. This further alleviates reverse causation concerns, especially if one expects the link from local development to intermediate polity size to be specifically driven by the expansion of city states.

[53]Changes in polity type and territorial size are often associated to changes in the identity of rulers across different locations, as well as in the location of the capital, which may have an independent effect on local development.

[54]The unbalanced nature of the city population sample and the resulting limited amount of time series observations (on average for each location), especially in pre-modern centuries, implies that the residual variation over time within cities (and polities) in the panel prevents a meaningful attempt to estimate the fully conditioned specification for the 1000-1500 sub-period.

Table 3: Political Geography and Market Potential (Extended Specification)

| Dependent Variable | Ln City Population | | | | | |
|---|---|---|---|---|---|---|
| Panel | 1000-1850 | | | | 1500-1850 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Polity Size and Type*: | | | | | | |
| Median Log Size (Share Years) | 0.074*** | 0.110*** | 0.091*** | 0.105*** | 0.059*** | 0.067*** |
| | (0.011) | (0.018) | (0.015) | (0.027) | (0.012) | (0.016) |
| City State (Share Years) | 0.049*** | 0.104*** | 0.023 | 0.071** | 0.016 | 0.002 |
| | (0.010) | ( (0.019) | (0.014) | (0.026) | (0.011) | (0.015) |
| *Power and Stability*: | | | | | | |
| Capital Dummy | 0.343*** | 0.909*** | 0.325*** | 0.872*** | 0.077 | 0.096 |
| | (0.069) | (0.110) | (0.074) | (0.116) | (0.077) | (0.089) |
| Rulers' Turnover | -0.023** | -0.015 | 0.031 | 0.022 | -0.040*** | 0.036 |
| | (0.008) | (0.016) | (0.022) | (0.037) | (0.008) | (0.023) |
| *Location and Centrality*: | | | | | | |
| Neighbor Polities | 0.026 | -0.024 | -0.033* | -0.078** | 0.019 | 0.016 |
| | (0.014) | (0.025) | (0.017) | (0.030) | (0.019) | (0.019) |
| Capital Distance | -0.008 | 0.001 | -0.025 | -0.022 | -0.007 | -0.018 |
| | (0.016) | (0.027) | (0.017) | (0.025) | (0.013) | (0.015) |
| *Market Potential*: | | | | | | |
| Domestic | 0.191*** | 0.203*** | 0.150*** | 0.113* | 0.166*** | 0.129*** |
| | (0.017) | (0.040) | (0.017) | (0.048) | (0.016) | (0.017) |
| Foreign | 0.114*** | 0.264*** | 0.110*** | 0.135 | 0.107*** | 0.201*** |
| | (0.021) | (0.054) | (0.028) | (0.076) | (0.019) | (0.027) |
| Domestic Share | 0.159*** | 0.101** | 0.078** | 0.024 | 0.279*** | 0.255*** |
| | (0.018) | (0.031) | (0.024) | (0.042) | (0.021) | (0.031) |
| *Covariates Baseline Sample* | Yes | Yes | Yes | Yes | Yes | Yes |
| *Covariates Restricted Sample* | No | Yes | No | Yes | No | No |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes | No | Yes |
| N. of cities | 1940 | 673 | 1940 | 673 | 1936 | 1936 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 | 6,784 | 6,784 |
| R-Squared | 0.706 | 0.610 | 0.739 | 0.661 | 0.799 | 0.821 |

The dependent variable is the log of city population, all coefficients in the table have been standardized according to respective sample means (except for dummies). See text and Table 2 for details on the covariates (in the baseline and restricted samples) and the Appendix for details on the construction of the variables and the data sources. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

**Further Robustness and Sensitivity Checks.** The main patterns reported in Tables 1, 2 and 3 are robust to a set of further sensitivity checks. The patterns are not driven by the specific set of political geography variables and covariates included in the specification.[55] The analysis is replicated with the alternative sample that accounts for the updates of population estimates by Malanima (2010) who provides revised data for bigger cities. The results, reported in the in Appendix 3.2, essentially confirm the findings and in fact deliver quantitatively stronger patterns particularly for polity size and city states. We also check robustness to entry and exit of cities using two different balanced samples. The first one is obtained by imputing 500 inhabitants for cities with missing data points in the baseline sample (imputed balanced sample), while the second one is obtained exploiting only the cities that are always in the baseline sample from year 1600 (non-imputed balanced sample). Descriptive statistics and regression results for both balanced samples are available in Table A.4 in Appendix 2.3.2 and Appendix 3.3. Adjusting inference accounting for clustering of standard errors at the city level and for spatial clustering with Conley standard errors (not reported) do not change the results.

## 5.4 Changing Patterns: Centrality, Borders and Market Potential

A specific novel prediction of the theory is that the role of political geography variables should change over time during the process of transition from domain to modern states. The linear specification of Table 3, while suggestive about some changes from Middle to Modern Age, does not allow to fully explore these predictions. We next allow for time-varying point estimates, obtained by estimating the period-specific role of each of the political geography variables (interacted with year dummies) in the specification with year, city and polity fixed effects. For comparability, we report standardized coefficients based on the baseline sample, conditioning on city, time and polity fixed effects.[56] To visualize the patterns we report the point estimates in graphs that include conventional limit significance at ten percent levels by indicating the confidence intervals around point estimates.

**Polity Size and Type.** The hump-shaped effect of territorial size is predicted appear with the emergence of modern states (see Prediction [2.1]). The productive advantage of city states is mostly in comparison to domain states when they co-exists (see Prediction [2.2]). The results reported in Figure 6 broadly align with these insights. The magnitude of the positive effect of being ruled by polities with intermediate size sharply increases, and becomes more robustly significant only since the XVI century.[57] Locations ruled by city states tend to grow faster in the XII and XIII century, which

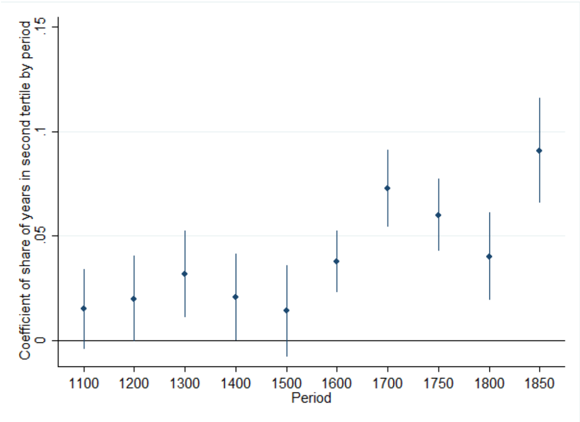
[55] Unreported results show that the patterns are robust to either removing all time-varying baseline covariates or introducing political geography variables one at a time. Table A.7 in Appendix 3.1 reports results of regressions including political geography variables separately and confirm the main patterns.

[56] This represents a conservative set-up since time-varying patterns tend to be more marked and more precisely estimated in specifications that do not condition on polity fixed effects or that exploit the balanced sample.

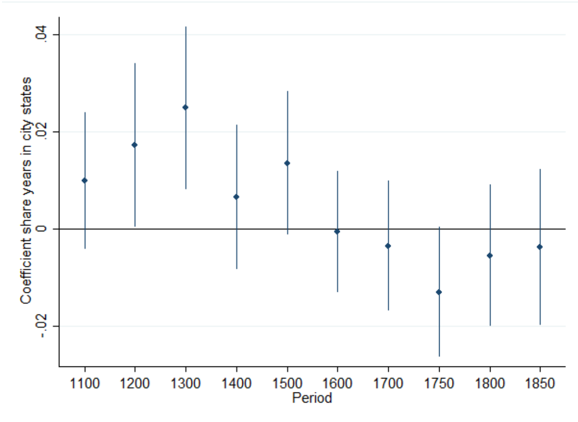
[57] This relationship holds also if we look at the extensive margin (city presence in the sample) as displayed in Figure A.14 in 3.1.3.

are the heyday of their historical development, but this impulse loses momentum and, if something, tends to become negative with the Modern Age.[58]

Figure 6: Polity Size and Type (City States)




(a) Median Log Size (Share Years)




(b) City State (Share Years)

**Centers of Power and Rulers' Turnover.** Figure 7 (a) documents that locations hosting capital cities grew significantly faster only in the Modern Age with a sizable acceleration in the XVII century and a stabilization afterwards (see Prediction [3.1]). Figure 7 (b) shows that locations that are subject to more changes in the identity of their rulers tend, if something, to grow faster during the Middle Age, but this effect decreases over time (and eventually turns negative). This finding broadly aligns with the possibility that the emergence of new polities, and the associated change in rulers, might have offered opportunities for development during the period of disaggregation of domain states. Political instability and contestability tend to be harmful, however, towards the end of the period in the context of the process of modern state formation.[59] The overall patterns do not appear, however, clear-cut.

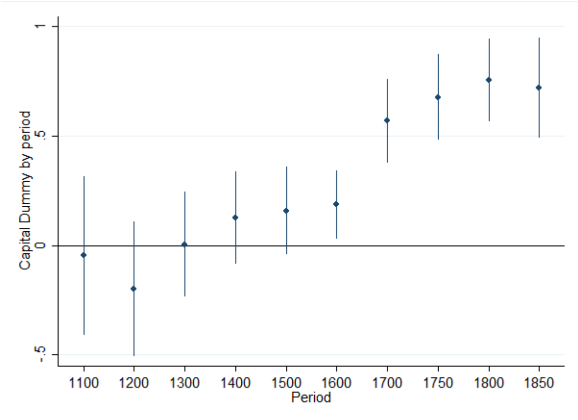
**Location and Centrality.** The theory implies the novel prediction that the transition from domain to modern states should be associated to a reversal in the role of centrality (see Prediction [3.2]).[60]

[58]This is coherent also with the argument of an initial advantage of city states for development, followed by a subsequent loss of comparative advantage in the context of the formation of national states and markets. The finding also align with the results by Stasavage (2014) that are based on a sample of 173 large cities. The results show that the same pattern systematically emerges even in smaller cities and accounting for the full sample of nearly 2.000 historical cities.

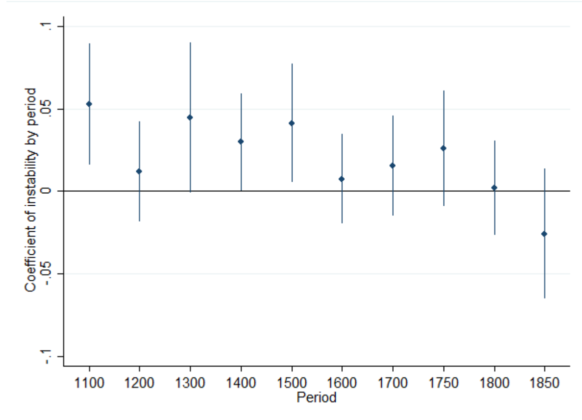
[59]A similar overall picture is obtained running the same regression without polity fixed effects. Unreported results show that rulers' turnover has no significant impact on local development in the Middle Age but a negative, and significant, effect in the Modern Age.

[60]Recall that a key element in the modeling of domain states is their essentially unproductive and extractive nature, which, coupled with imperfect territorial control, implies that peripheral locations are better off compared to

Figure 7: Capitals and Ruler's Turnover



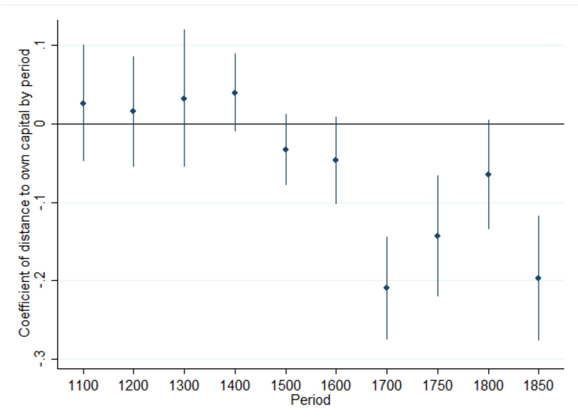

(a) Capital Cities



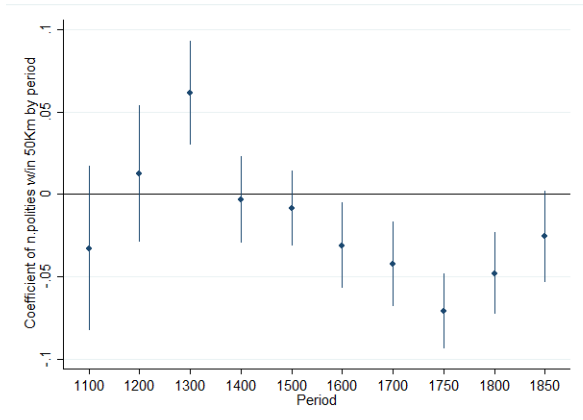

(b) Rulers' Turnover (Num. Changes)

Exploring these patterns represents a reduced-form test of the broad mechanism postulated in the conceptual framework. The results in Figure 8 show that the impact of distance from the capital turns from positive to negative and becomes significant since the XVII century. The number of neighbor polities within 50 km has a positive effect in the XIII century, which aligns with the evidence on the role of city states and is compatible with historical narratives that locate one of the potential advantages of city states in their location within the network (the belt of city states). This effect becomes significantly negative in the Modern Age, again suggesting a change in the role of centrality, since it implies that cities that are more closely exposed to other polities suffer a comparative growth slowdown during the process of modern state formation.

Figure 8: Location and Centrality




(a) Distance from the Capital



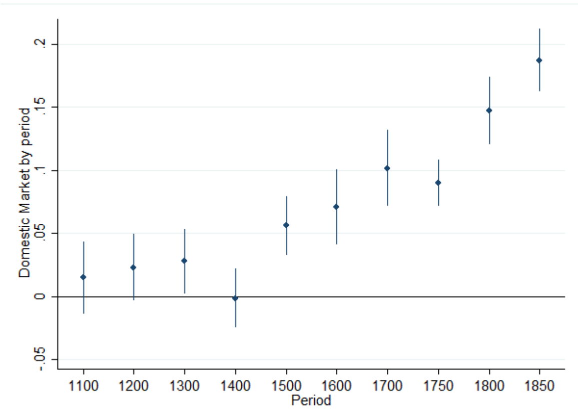

(b) Neighbor Polities in 50 kms

those under rulers' stricter and closer control. The modeling of modern states in contrast features productive political institutions, which yield benefits that are distributed across the territory, but are more concentrated in central locations around the capital.

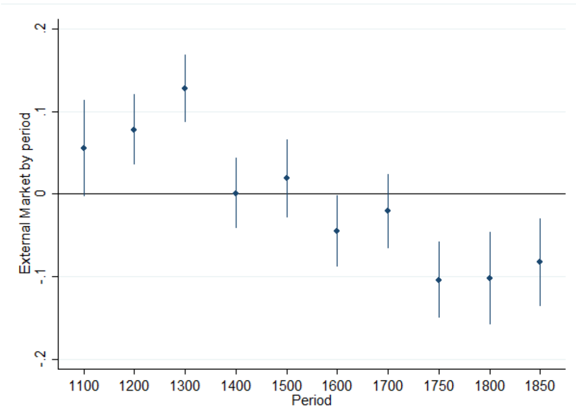
**Domestic and Foreign Market Potential.** A final specific prediction of the model is the emergence of relevant territorial control and the emergence of hard border in modern states. Accordingly we should expect that measures of market potential, that indirectly proxy for access to trade as in the existing literature, should play a similar role prior to the emergence of modern states irrespective of the presence of borders. We should thus expect foreign or domestic market potential to play similar role before the modern age. Thereafter, however, the emergence of hard borders implies that a location should benefit domestic more than foreign market potential.

These predictions, that indirectly relate to the emergence of national markets, are explored in Figure 9. Panel (a) shows that cities with larger domestic market potential tend to grow faster during all periods, with the magnitude of the effect increasing over time and becoming robustly statistically significant only since the XV century. Panel (b) displays a very different pattern for foreign market potential, which is positive for growth in the Middle Age (peaking in the XIII century), but negative in the Modern Age (significantly so since the XVIII century). The joint consideration of the two figures implies that higher potential is generally beneficial until 1500, irrespective of whether it comes with or without borders, but after 1500 it is mostly domestic market potential that drives city growth.

Figure 9: Domestic and Foreign Market Potentials




(a) Domestic Market Potential



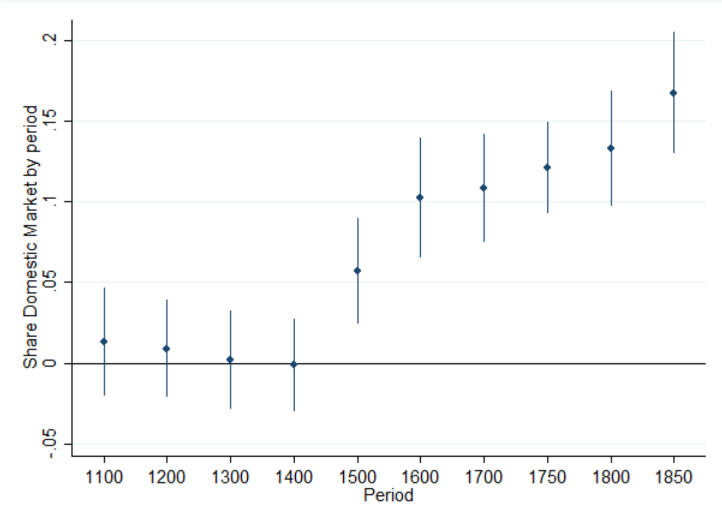

(b) Foreign Market Potential

To explore the role of scale effects in driving these patterns, Figure 10, looks at the composition of market potential, measured by the share of domestic over total market potential. In the Middle Age the type of market potential did not matter whereas in the Modern Age the share of domestic market potential becomes a significant driver of city growth.[61]

These results are broadly coherent with the emergence of domestic markets along the process of formation of modern states, which provided regulation and protection over their territories and made

[61] The evolution over time of average domestic and foreign market potential are depicted in Figure A.12 in the Appendix. The patterns document an intermediate reduction in the share of domestic over foreign market potential from 1200 to 1600 which is in line, in reduced form, with the view that most of the foreign market potential was initially exploited in polities located in the city belt.

Figure 10: Type of Market Potential




(a) Share of Domestic to Total Market Potential

borders harder and more economically relevant, eventually reversing the balance between domestic and foreign trade. Together with the results on distance to capitals and other polities, the findings suggest that with the Modern Age the importance of location and centrality shifted from across polities to within polities.

# 6 Concluding Remarks

We have offered a simple model of investment in fiscal and military capacity, highlighting their spatial dimension and their role in shaping the strategic incentives of ruling elites and ruled population in pre-industrial times. While stylized, the framework delivers a rich set of insights. The model rationalizes observed changes in the political landscape of pre-industrial Europe, including the emergence and disappearance of city states, and emphasizes the importance of strategic interaction among domain rulers in the transition to modern territorial states. We investigate the role of limited territorial control in medieval and pre-modern polities, which is well documented by economic historians but whose implications have not systematically explored in existing works. The framework delivers a set of novel insights and some testable predictions, not yet explored in the existing literature.

In the model, increasing productive potential in pre-industrial Europe affects the patterns of territorial competition and the role of polity size, location's centrality and other political geography measures for the spatial distribution of development. Emerging small polities have an early advantage due to the incentives of local elites to accept more balanced forms of state capacity and rule of law. Further increases in productive potential deliver a scale advantage to larger polities. This has implications for territorial competition in Europe and for the associated process of political fragmentation and subsequent consolidation. Modern states can emerge in equilibrium not only when the productive benefits of the rule of law are so high that ancient ruling monarchs find it in their best interest to unilaterally accept constraints to rent extraction, but also when this is not the case, and yet investing in state capacity and rule of law is a best response to similar investments by part of other rulers. Accepting constraints to their power may in fact be necessary for rulers to avoid being conquered and losing their power altogether. The process of emergence of hard borders associated to the birth of modern states and the specific features of the different polities imply the prediction of a reversal in the role of location's centrality.

A yearly panel database for the period 1000-1850 is assembled digitizing and geo-referencing information from a variety of sources. The emerging empirical patterns document a highly non-monotonic process of political disaggregation and aggregation, the early emergence of city states in the interior of the territory of domain states, and the initial advantage of city states for urban growth, which is progressively lost. Our regression analysis allows to detect the emergence of an optimal intermediate polity size in the Modern Age. We find evidence for the reversal in the role of centrality for development predicted by the model and associated to the emergence of hard borders. These findings are robust to a large set of checks, including the use of multiple samples and data on city growth, and consistently emerge also when exploiting variation over time conditioning on location, period and polity fixed effects.

We focus our attention to the role of increasing economic and market potential for the long-term patterns of change of the political landscape including the loss of territorial control of domain rulers in favor of new small sovereign polities prior to the emergence of modern territorial states. To this end the modeling of different polities and the characterization of their strategic interactions rested on some simplifying assumptions required for analytical tractability. Our framework and data offer basis for a more articulated analysis of political geography and lay the ground for a systematic investigation of its changing role for economic and political development in Europe. The analysis offer a basis, in particular, for a more articulated investigation of the details of the strategic interactions generating the evolution over time and space building of state capacity and emergence of rule of law within the process of modern state formation. While this requires the development of a dedicated framework and a substantial scale-up in data collection it appears a fruitful direction for future research.

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# Political Geography and Pre-Industrial Development: A Theory and Evidence for Europe 1000-1850

# SUPPLEMENTARY APPENDIX*


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**Abstract**

This Appendix reports the derivation of theoretical results and proofs, details on the Database, variable description, robustness checks and further results that are mentioned in the main body.



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# 1 Proofs of the theoretical model

**Proof of Lemma 1 and Proposition 1.**
For a location at distance $d$ from the capital, independence from its D-ruler is militarily feasible if

$$m_C(0) \geq m_D(d) \iff \nu_C \geq \nu_D - \mu d \iff d \geq \underline{d}, \tag{1}$$

where $\underline{d} \equiv \frac{\nu_D - \nu_C}{\mu}$. In turn, independence is convenient when its cost (the cost $K_C = 1$ of building a C-state) is lower than the public goods benefit plus the rents extracted by the D-ruler:

$$u_C^e \geq u_D(d) \iff \gamma \geq \varphi d \iff d \leq \frac{\gamma}{\varphi}. \tag{2}$$

With $N$ symmetric D-states, each has size $\frac{q}{N}$ and the the distance between the capital and the border is $\frac{q}{2N}$. A necessary condition for independence to be militarily feasible for some dominated location is that $\underline{d} \leq \frac{q}{2N}$, i.e., $N \leq \frac{q}{2\underline{d}}$. Since each dominated location strictly prefers the status quo to a failed independence attempt, if $N > \frac{q}{2\underline{d}}$, no location invests in independence. This proves Lemma 1.

Consider now $N \leq \frac{q}{2\underline{d}}$. The set of dominated locations for which independence is both feasible and convenient is then $[\underline{d}, \bar{d}(\gamma)]$, where $\bar{d}(\gamma) \equiv \min\{\frac{\gamma}{\varphi}, \frac{q}{2N}\}$. If $\gamma < \varphi \underline{d}$, such set is empty and there is no independence, because $\bar{d}(\gamma) < \underline{d}$. If $\gamma \in [\varphi \underline{d}, \frac{\varphi q}{2N})$, then locations at distance $d \in [\underline{d}, \frac{\gamma}{\varphi}]$ from the capital become C-states, creating disconnected D-states because $\bar{d}(\gamma) \in [\underline{d}, \frac{q}{2N})$. Clearly, in such case the mass of C-states increases in $\gamma$. If $\gamma \geq \frac{\varphi q}{2N}$, then locations at distance $d \in [\underline{d}, \frac{q}{2N}]$ from the capital become C-states, so D-states witness the independence of a belt of locations on both sides of the capital, extending from distance $\underline{d}$ to the initial borders. This proves Proposition 1.

Notice that this pure strategy equilibrium is unique up to the choice of a finite number of possibly indifferent locations. Specifically, in case of indifference, we assume with no loss of insight that a location for which independence is feasible invests in it. For some parameter constellations each dominated location has a strictly dominant strategy, whereas for other ones there is a finite set of locations, of cardinality equal to $2N$, which are indifferent between the two pure strategies. Details about their specific choice in such cases are irrelevant for aggregate outcomes in terms of the mass and spatial distribution of C and D-states. Hence, focusing on pure strategy Nash equilibria is not restrictive.

**Proof of Lemma 2 and Proposition 2.**
The superior military capacity of M-states over C and D-states implies that, as soon as an M-state appears, C-states and D-states disappear. Moreover, since it is strictly better to be dominated without paying any state-building costs than upon paying the cost of a failed state-building attempt, it follows that once an elite pays $K_M$, no other elite would be willing to pay $K_D$. Hence, there can be only two types of symmetric Nash equilibria: a domain one, in which all elites choose $K_D$, and a modern one, in which they all choose $K_M$.[1]

In a modern equilibrium, there are $N$ M-states, each of size $\frac{q}{N}$, and the payoff of modern elites is $u_M^e(\frac{1}{N}) = 1 + \gamma - \frac{N}{q} K_M$. Now consider an individual deviation to $k_i = 0$ from such equilibrium (provided $N > 1$, we only need to consider this deviation, as it dominates that to $k_i = K_D$ in presence of M-states).[2] The deviating elite would be conquered by one of its neighboring capitals (it

[1] Formally, a strategy profile is a collection of $k_i \in \{0, K_D, K_M\}$ for $i \in \mathcal{C}_D$, thus a vector $\mathbf{k} \in \{0, K_D, K_M\}^N$. We follow standard notational conventions and, denoting $\mathbf{k} = (k_i, k_{-i})$ and payoffs $u_i(k_i, k_{-i})$, say that $\mathbf{k}$ is an equilibrium if for all $i \in \mathcal{C}_D$ and for all $k_i' \in \{0, K_D, K_M\}$ with $k_i' \neq k_i$, $u_i(\mathbf{k}) \geq u_i(k_i', k_{-i})$.

[2] If $N = 1$, the relevant deviation from a 'modern equilibrium' is instead to $k_i = K_D$, which dominates $k_i = 0$ because net rents are positive. Yet, with $N = 1$ one has a decision problem, rather than a game. In any case, a 'world emperor' builds an M-state if and only if $\gamma \geq \frac{K_M}{q} + q - \frac{\varphi q^2}{4} - K_D$. We consider henceforth $N > 1$.

is indifferent which one, in case there are two), so it would find itself at distance $\frac{q}{N}$ from the capital of its new ruler. If the deviating elite is located between two M-states, the size of its new state will be $\frac{3q}{2N}$; and if it is located between an M-state and one extreme of the $[0, q]$ segment, such size will be $\frac{2q}{N}$. Ordering elites by their location on the segment, and labeling them by natural numbers, these two cases materialize for $i \in \{2, ..., N-1\}$, and $i \in \{1, N\}$, respectively. Since $u_M(d, S)$ is increasing in $S$, we only need to check that deviating to $k_i = 0$ is not profitable for $i \in \{1, N\}$. Since $u_M(\frac{q}{N}, \frac{2q}{N}) = 1 + (1 - \frac{\alpha q}{N})\gamma - \frac{NK_M}{2q}$, there is no profitable deviation when $u_M(\frac{q}{N}, \frac{2q}{N}) \leq u^e_M(\frac{q}{N}) \iff \gamma \geq \hat{\gamma}$, where $\hat{\gamma} \equiv \frac{N^2 K_M}{2\alpha q^2}$ is the minimum value of public goods that makes the first (or the last) elite prefer investing in an M-state to being dominated, provided that all other elites do the same. Hence, a modern equilibrium exists if and only if $\gamma \geq \hat{\gamma}$. Notice that $\hat{\gamma} > \bar{\gamma}$ if and only if $K_M > \alpha\varphi(\frac{q}{N})^3$, which we assumed. This proves Lemma 2.

In a domain equilibrium, there are $N$ D-states, each of size $2\underline{d}$, separated by a belt of C-states, and the payoff of D-rulers is $u^e_D(2\underline{d}) = 1 + R(2\underline{d}) - K_D$, where $R(2\underline{d}) = 2\underline{d} - \varphi\underline{d}^2 > K_D$ by assumption. Deviating to $k_i = 0$ is never profitable, because it implies giving up positive net rents and being conquered by the next D-state, which extracts positive rents: since $\varphi q < 1$ and $N \geq 1$, it always holds that $u_D(\frac{q}{N}) = \frac{\varphi q}{N} < 1 < u^e_D(2\underline{d})$. Deviating to $k_i = K_M$ leads to conquering the world, with payoff $u^e_M(q) = 1 + \gamma - \frac{K_M}{q}$. Such deviation is profitable if and only if $\gamma > \tilde{\gamma}$, where $\tilde{\gamma} \equiv \frac{K_M}{q} + R(2\underline{d}) - K_D$, so a domain equilibrium exists if and only if $\gamma \leq \tilde{\gamma}$. This proves Proposition 2.

Notice that the assumptions made on D-states grant that, under the condition of Lemma 1, for any value of $\gamma$, D-rulers earn positive net rents in equilibrium, whether or not C-states are present. Gross rents in a connected D-state of size $S$ are $R(S) = S - \varphi S^2/4$, whose maximum is $R(2/\varphi) = 1/\varphi$. The assumption that D-rulers are able to extract some rents at any possible distance from the capital, even at distance $d = q$, namely $\varphi q < 1$, grants that $R(S)$ is a strictly increasing function for any $S \in [0, q]$. The minimum equilibrium size of D-states is $S = 2\underline{d}$. Equilibrium rents in D-states, whether connected or not, are thus greater or equal to $R(2\underline{d}) = 2\underline{d} - \varphi\underline{d}^2$. The assumption that $R_D < 2\underline{d} - \varphi\underline{d}^2$ thus grants that D-rulers' net rents are positive in equilibrium, independently of $\gamma$.[3]

Notice that $\frac{N^2}{2\alpha q} \leq 1$, i.e., $q \geq \frac{N^2}{2\alpha}$, which we assumed, implies $\hat{\gamma} \leq \frac{K_M}{q} < \tilde{\gamma}$. Moreover, if $N \geq 4\alpha\underline{d}$, then this assumption also implies that the condition of Lemma 1, which can be re-written as $q \geq 2\underline{d}N$, always holds. Notice as well that the presence of C-states in the initial condition of the modern state formation game does not affect the proposition, but for the value of $\tilde{\gamma}$, which in their absence would be defined by $\tilde{\gamma} \equiv \frac{K_M}{q} + R(\frac{q}{N}) - K_D$.

**Proof of Testable Predictions.**

Results on the number and size of polities immediately follow from Propositions 1 and 2.

The average payoff in D-states is $\frac{2}{S}\int_0^{S/2} u_D(x)\,\mathrm{d}x = \varphi\frac{S}{4}$, which is increasing in $S$.[4]

The average payoff in M-states is $\frac{2}{S}\int_0^{S/2} u_M(x)\,\mathrm{d}x = 1 + \gamma(1 - \alpha\frac{S}{4}) - \frac{K_M}{S}$, which is a hump-shaped function of $S$, with point of maximum in $S^* = \sqrt{\frac{4K_M}{\alpha\gamma}}$. Since in a modern equilibrium $\gamma \geq \hat{\gamma} = \frac{N^2 K_M}{2\alpha q^2}$, one has that $S^* < \sqrt{\frac{4K_M}{\alpha\hat{\gamma}}} = \frac{q}{N}\sqrt{8} < \frac{3q}{N}$, so that, for $N \geq 3$, it holds that $S^* < q$.

C-states fare better than D-states ($u^e_C > u_D(d)$ for all $d > 0$) because their existence implies $u^e_C \geq$

[3]Given $\varphi q < 1$, for a D-state of size $S \in [0, q]$, net rents are positive if and only if $S > \bar{S}$, where $\bar{S} \equiv 2(1 - \sqrt{1 - \varphi K_D})/\varphi$ is the smallest real root of $R(S) = K_D$ (which exist only if $K_D < 1/\varphi$). It is easy to verify that, as we assumed $K_D > 1$ (because $K_D > K_C = 1$), it holds that $\bar{S} > 1$. Moreover, since $R(S) < S$ for any $S \in (0, q]$, it also holds that $\bar{S} > K_D$, and the assumption that $R_D < R(2\underline{d})$ thus implies $2\underline{d} > \bar{S} > K_D > 1$. Since the condition of Lemma 1 can be re-written as $2\underline{d} \leq \frac{q}{N}$, an immediate implication is that $q/N > 1$, that is, $N < q$. Finally, $K_D < 2\underline{d} < q/N \leq q < 1/\varphi$, implies $K_D < 1/\varphi$, so that existence of the real root $\bar{S}$ is granted.

[4]If $\varphi > 2N/q$, then D-states may have no extractive capacity in their periphery. This happens if $S > 2/\varphi$. In such case, the average payoff in a connected D-state is $\frac{2}{S}\int_0^{S/2} u_D(x)\,\mathrm{d}x = 1 - \frac{1}{\varphi S}$, which is again increasing in $S$.

$u_D(\underline{d})$, and for all $d \in (0, \underline{d})$, $u_D(d) < u_D(\underline{d})$.
The fact that the capital of a D-state fares better than the rest of the state (in the equilibrium of the independence game or in a domain equilibrium of the modern state formation game), follows from the assumptions that $\varphi < 1/q$ and $R(2\underline{d}) > K_D$, and from the observation that for any equilibrium size $S \in [2\underline{d}, \frac{q}{N}]$ (the size of D-states at their minimum and maximum territorial expansion), rents satisfy $R(S) \geq R(2\underline{d})$: this implies that $u_D(d) < 1 < u^e_D(S)$ for any $S \in [2\underline{d}, \frac{q}{N}]$ and for any $d \in (0, \frac{q}{2N}]$.
The fact that $u_M(d, S)$ is decreasing in $d$ explains why the core of M-states fares better than the periphery and, as a special case since $u^e_M(S) = u_M(0, S)$, why the capital of an M-state fares better than the rest of the state.
The relationship between welfare in the core and in the periphery of D-states is reversed (compared to M-states) because $u_D(d)$ is increasing in $d$.

# 2 Data

The construction of the three-level database (polities, cells, cities) on the evolution of political institutions in the period 1000-1850 involves several steps, as described in this section.

The first step requires the creation of a sequence of yearly geo-referenced maps. Several historical atlases (digital or on paper) report non-georeferenced maps of Europe that can be used to build the database. As main source of a-spatial graphic maps we use digital images of the borders of sovereign polities manually extracted as PNG files from the *Centennia Historical Atlas of Europe* (Reed, 2014).

The 850 images are subsequently transformed into shape files by programming a Python 2.7 code exploiting the package ArcPy, which allows us to systematically run the software ArcGIS 10.3. We adopt the WGS 1984 spatial reference. The subsequent steps undertaken by the code are the following:

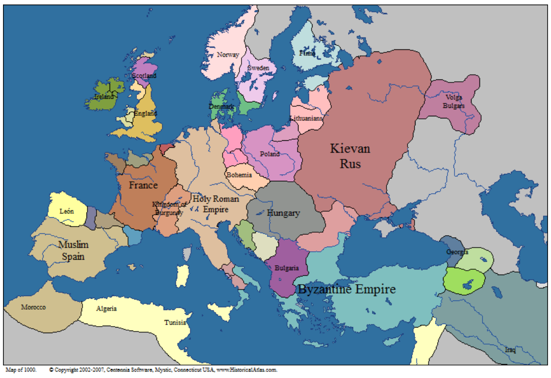
1. Geo-reference the bands composing the PNG file and application of the WGS84 coordinate system to each image;
2. Generate a raster file for each year.
3. Transform rasters in polygon shapefiles. This requires excluding pixels belonging to borders and water bodies such as lakes and river and stretching polygons in order to fill the empty spaces where previous items were present;
4. Superimpose a fishnet with cells 0.0833X0.08333 degrees (roughly 10x10 Km grid cells at the Equator, as stable unit of observation);
5. Sample the identifier of the ruling political entity in the centroid of each cell, together with the size of the associated political entity;
6. Export the table containing, for each cell, the unique identifier of the political entity, and latitude and longitude of the cell's centroid.
7. The procedure is iteratively repeated for all 850 years.

A yearly panel dataset is build in Stata by associating the political entities to the unique identifier for each year×cell.

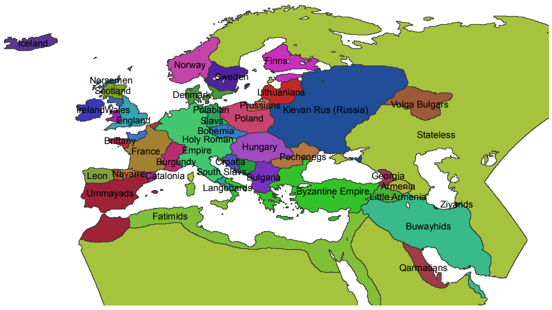
In Figure A.1 panel (a) shows an example of the non-georeferenced maps we used, the year 1000 AD is reported. Panel (b) shows the geo-referenced map with the unique identifier for each polity in that year, that is the yearly unit of observation of the Sovereign Polities Database. Detailed information on this first-level dataset is reported below in Section 2.1. Figure A.1, panel (c), shows the 5x5 arcminutes gridded map imposed on the European territory to build the yearly panel database tracking the polity ruling in each cell at each point in time, we zoom on Sicily in 1000 for ease of visualization. This second-level database allows building several measures of "political geography" as described in more details below in Section 2.2.

Finally, to build the city-level database we matched the coordinates of historical cities to the intersecting cell and constructed city-level political geography and centrality variables of interest. More details on this third-level dataset are reported below in Section 2.3. Figure A.1, panel (d), shows, for example, the locations of cities in the year 1000 AD.

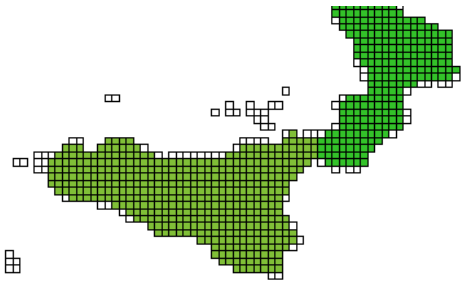
Figure A.1: The process of constructing the three-levels database



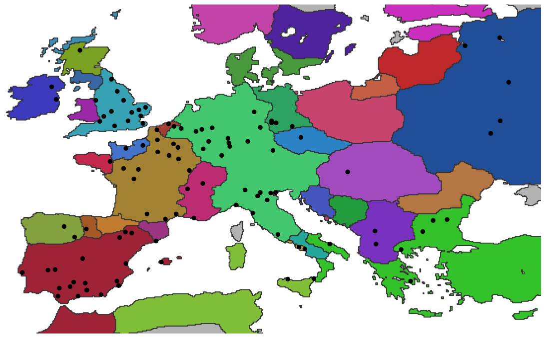

(a) Centennia Historical Atlas: Europe 1000




(b) Geo-referenced map of polities: Europe 1000



(c) Gridded map: Sicily 1000



(d) Processed polities with city locations: Europe 1000

Note: The figure depicts the four steps undertaken to construct the data, for instance for the year 1000 AD. Panel (a) shows the maps used to identify polity borders in Europe. Panel (b) shows the georeferenced map where each polity is identified. Panel (c) zooms over Sicily and shows the grid exploited to extract data on the polity ruling each 10x10 squared Km cell. Panel (d) shows the location of cities in the georeferenced map. To capure the century statistics of political geography variables for each city we matched city locations with correspondent grid cells.

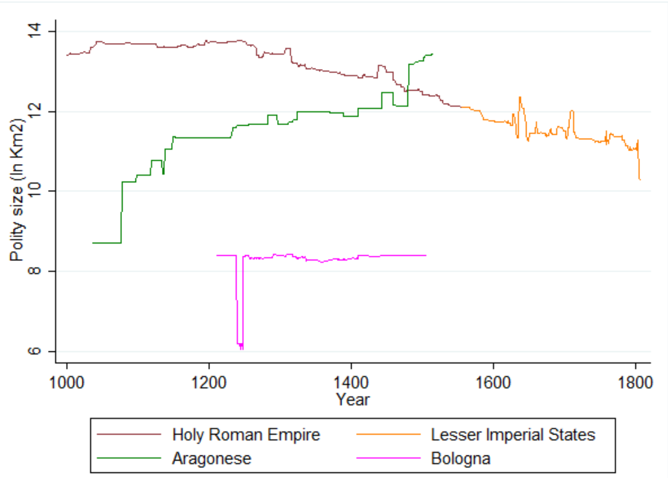
## 2.1 Sovereign Polities Dataset

### 2.1.1 Further Statistics

Figure A.2 illustrates the territorial evolution of the Holy Roman Empire, the Lesser Imperial States, the Aragonese Kingdom and Bologna, between 1000 and 1850, reporting yearly polity size in squared kilometers, with a logarithmic scale. After the first two centuries of the second millennium the Holy Roman Empire progressively dissolved until the Peace of Augsburg in 1555, when Imperial States' princes affirmed their independence on their territories. After becoming a free-city in 1116, Bologna consolidated its rule over the territory beyond its walls around 1211, when it was also formally recognized by the German emperor Otto V as a sovereign entity. The following emperor, Frederick II managed to reconquer almost all the territory of Bologna around 1246 but without succeeding: the Bolognese state prospered until it became part of the Papal State in 1506. The Aragonese Kingdom experienced a period of substantial territorial expansion between the XI and the XV century, until it merged with the Kingdom of Castille.

In the Centennia Historical Atlas the identification of sovereign polities is "based on effective power and control, that is 'power on the ground', rather than internationally-sanctioned or treaty-driven relationships".[5] The selected examples give an idea of how the specific political history of every polity, and every location, can be reconstructed and of the type of sovereign polities considered in the Atlas.

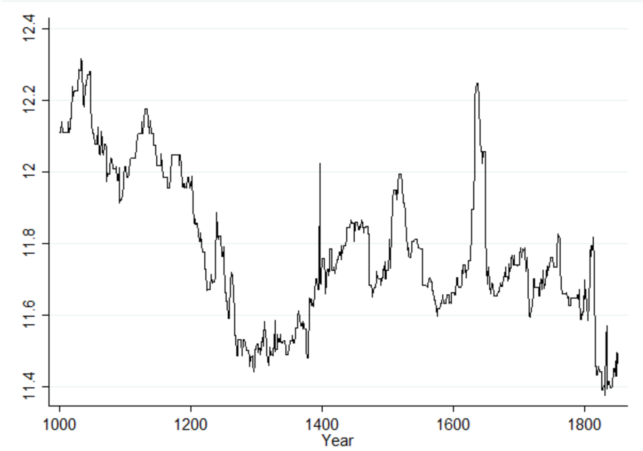
Figure A.2: Territorial evolution of selected polities




Note: The figure depicts the evolution of (log) polity size for four selected polities (Holy Roman Empire, Lesser German Imperial States, Aragonese kingdom and Bologna) in the sample of polities that ruled over Europe in the period 1000-1850.

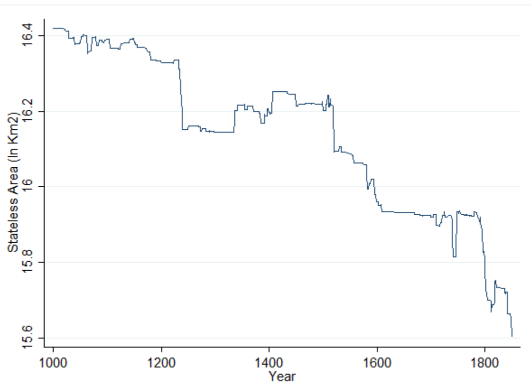
[5] http://www.clockwk.com/help.html, last accessed 28 July 2017.

Figure A.3: Ln Average Polity Size



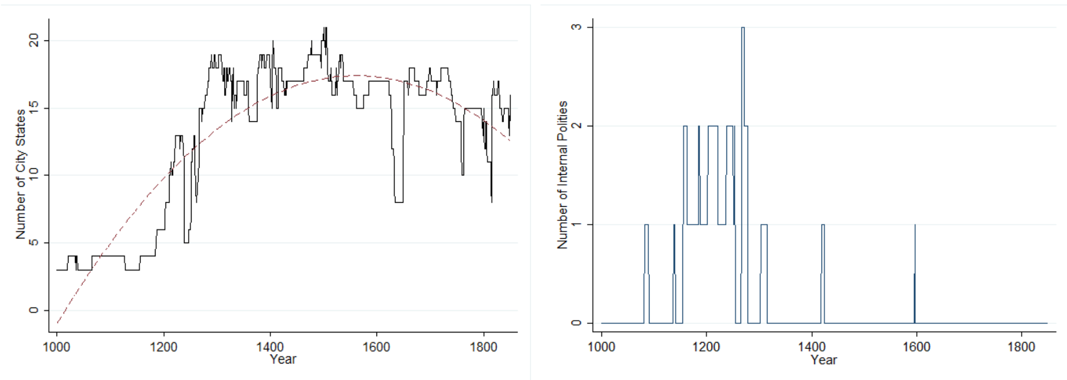

Note: The figure depicts the evolution of the logarithm of average polity size in the Sovereign Polities Dataset in each year from 1000 AD to 1850. We exclude from the sample the Mongolian, Ottoman, Seljuk and Russian Empires as their territories were largely spanning out of the European continent (out of the spatial extent of the maps of Europe) and their size can be considered as an outlier in the sample of polities.

Figure A.4: Evolution of the size of stateless territories




Note: The figure depicts the evolution of the size of the stateless territories in Europe 1000-1850.

Figure A.5: Internal Polities and City States, 1000-1850.




(a) City States

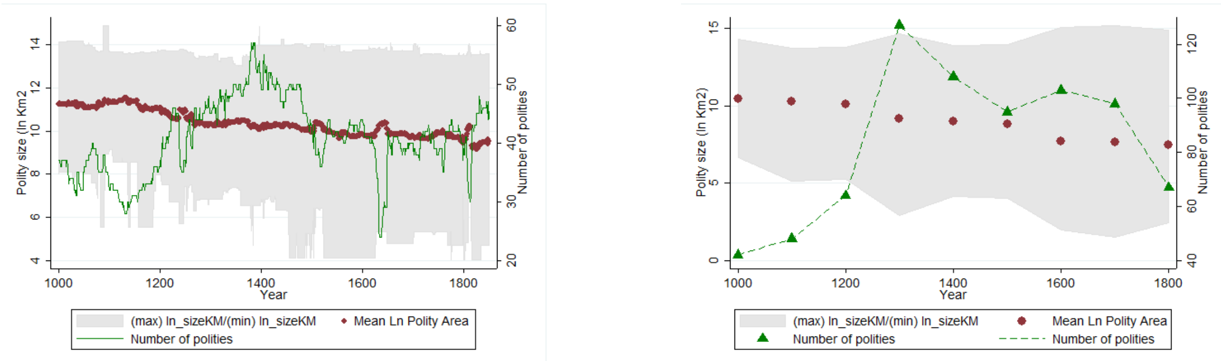
(b) Internal Polities

Note: Panel (a) shows the evolution of the number of city states in Europe in the period 1000-1850. We defined City States according to historical documentation and narratives as explained in more details in Section 4.1.1. Panel (b) shows the overtime evolution of the total number of political entities completely contained by one larger polity.

### 2.1.2 Comparison between Centennia and Euratlas

While there is a difference in the count of polities (Centennia tends to report fewer sovereign polities than Euratlas), the evolution over time of their number and size is broadly coherent, as shown in Figure A.6. Differences in the number of polities at the one-hundred year point between the two datasets are due to two main reasons. First, EurAtlas considers as sovereign entities smaller polities than Centennia (for instance, EurAtlas brakes down Ireland, South Slavs, Poland, Teutonic Order and the German Lesser Imperial States into smaller sovereign territories). Second, EurAtlas reports polities in a window of years surrounding each one-hundred year point rather than a snapshot for the exact point in time considered. For instance, the Lordship of Volterra appears in Euratlas in 1300 but can be dated around 1340; it never appears in Centennia because its territory and politics have always been dependent on the influence of either Siena or Florence (Bertini, 2004).

Figure A.6: Number and size of sovereign polities in Europe, 1000-1850




(a) Centennia Historical Atlas (b) Euratlas

Note: The figure depicts the evolution of average, minimum and maximum polity size (in log) and the number of polities ruling over Europe during the period 1000-1850. Panel (a) exploits the Centennia Historical Atlas of Europe (Reed, 2014) with data at yearly frequency, while panel (b) exploits Euratlas (Nussli, 2010) with data at century frequency. In both panels we exclude the Mongolian, Ottoman and Russian Empire as they can be considered as outliers in terms of size.

## 2.2 Political Geography Dataset

### 2.2.1 Data and Sources

The following Table offers summary information about the Political Geography Dataset. Some remarks on definition and sources are reported in order.

**Sources.** The main source of data for all political geography variables is the Centennia Historical Atlas (Reed, 2014) and our elaborations based on the Sovereign Polities Dataset described in the main text and in Appendix 2.1. An asterisk reported next to a variable label indicates that we also computed the same variable with information available from Euratlas (Nussli, 2010).

**Periods.** Variables were computed on a yearly basis and/or in every century up to 1700, and every 50 years from 1700 to 1850, following the periodization of city population data required in the following part of the analysis. In this latter case we report that the variable was computed over the "previous period". For example, if the variable relates to the seventeenth century it is computed based on its values during the years from 1600 to 1699, and in the construction of the Cities Dataset it will be matched to population data of the year 1700.

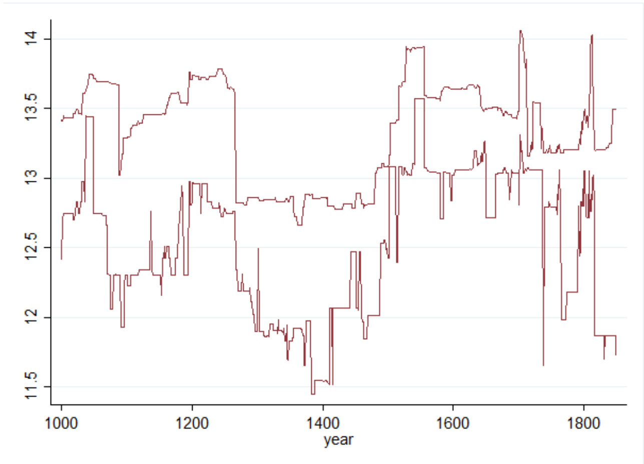
Table A.1: Description of Political Geography Variables

| |
|---|
| **Size and Type of Polity** |
| *Log Size.** Variable that computes for every location the log of the size (in squared kilometers) of the polity ruling over the location in every year from 1000 AD to 1850, based on Euratlas (Nussli, 2010), or the log of the average polity size during the previous period based on our Sovereign Polities Dataset. Extra-European territories are excluded to avoid the abrupt changes in polity size determined by colonies, especially during the Modern Age. Northern African territories, which are a relevant part of polities that dominated over cities in Southern Europe, especially in the late Middle Age, are instead included to yield a more realistic picture of polity size. |
| *Log Size in i-th Tertile (DV).* Dummy variable taking value 1 if in the previous period a location was ever ruled by a polity with Log Average Size in the i-th absolute tertile of the log size distribution 1000-1850. |
| *Median Log Size (Share of Years).* Share of years within the previous period a location was ruled by a polity with Log Size in the second absolute tertile of the of the log size distribution 1000-1850. |
| *City State (Share of Years ).* Share of years within the previous period a location was ruled by a City State. The detailed classification of polities in city states is explained in Section 4.1.1. |
| **Power and Stability** |
| *Capital Dummy.* Dummy variable taking value 1 if in the previous period a location was ever the capital of a polity. Details on the definition of capital cities are discussed in Section 4.1.1. |
| *Rulers' Turnover.* Based on yearly data on polities ruling over each location, this variable computes the number of times a location changed ruler in the previous period. |
| **Location and Centrality** |
| *Capital Distance.* This variable computes the log of the average yearly geodesic distance (in Km) from the centroid of locations to their capital in the previous period. |
| *Neighbor Polities.* Based on city locations and yearly data on polities ruling over each location, this variable computes the average yearly number of polities within 50 Km in the previous period. |
| **Sovereign Polity Dummies** |
| *Polity Dummies.* Based on city locations and yearly data on polities ruling over each location, we compute a dummy variable for each polity that ruled the location in the previous period. |

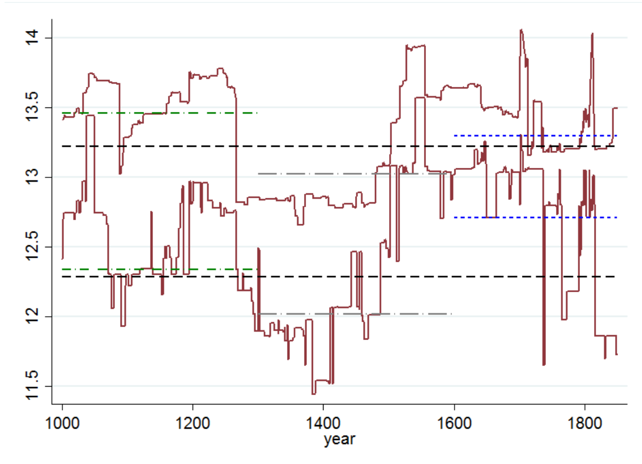
### 2.2.2 Further Statistics

Figure A.7 presents another way of looking at changes in the distribution of polity size. Panel (a) depicts with a solid line the evolution of the boundaries of the second tertile of each year's distribution, from 1000 AD to 1850, of log polity size across city locations. Panel (b) of Figure A.7 additionally reports three key subperiods: 1000-1300 (large empires and kingdoms), 1300-1600 (city- and regional-states co-exist with larger polities) and 1600-1850 (modern nation states). The boundaries of the absolute second tertile, that is, that of the overall distribution in the 1000-1850 period is also reported. The main results of the empirical analysis in Section 5 are based precisely on this variable.

Figure A.7: Relative, Selected Periods and Absolute Second Tertile of Ln Size in City Locations




(a) Relative and Selected Periods 2nd Tertile

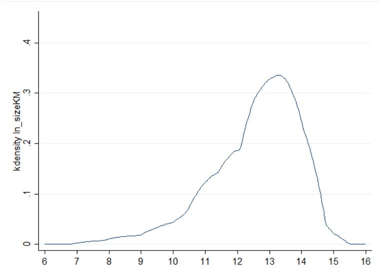



(b) Relative, Periods and Absolute 2nd Tertile

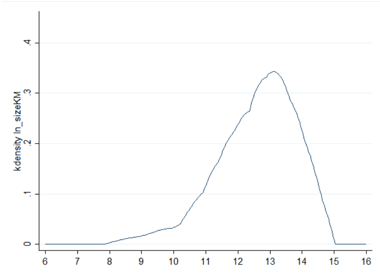
Note: Panel (a) of the picture presents the evolution of the boundaries of the second tertile of Ln Size in each year from 1000 AD to 1850. The pattern of disaggregation and reaggregation of political entities in the period of interest is summarized by the boundaries of the second tertile of the distribution in the following three subperiods: 1000-1300, 1300-1600 and 1600-1850. Panel (b) additionally reports the boundaries of the absolute second tertile 1000-1850. The figure is based on the sample of locations ever hosting a city from Bairoch, Batou and Chèvre (1988).

Figure A.8 shows the distribution of the logarithm of polity size across city locations in the years in which urban population estimates are available.

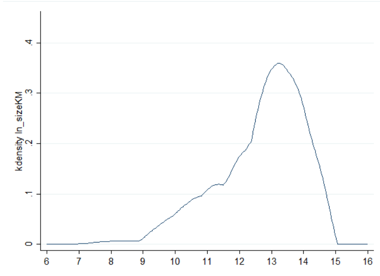
Figure A.8: Kernel Distributions, Selected Years



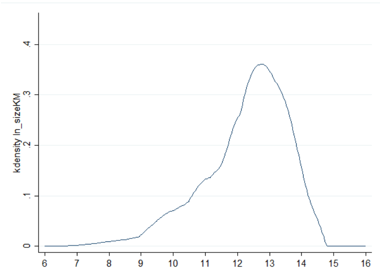

(a) Ln Size in 1000



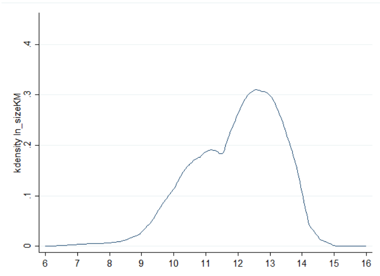

(b) Ln Size in 1100



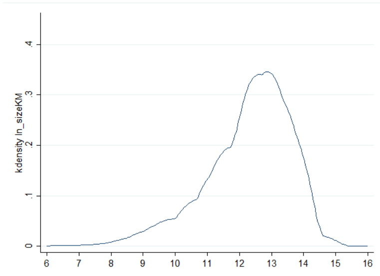

(c) Ln Size in 1200



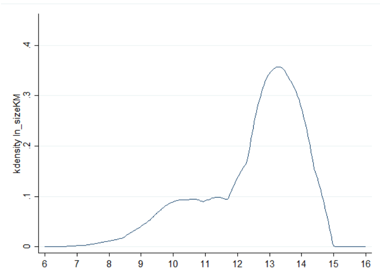

(d) Ln Size in 1300



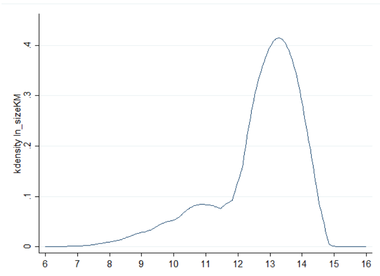

(e) Ln Size in 1400



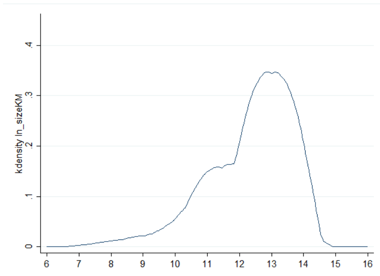

(f) Ln Size in 1500



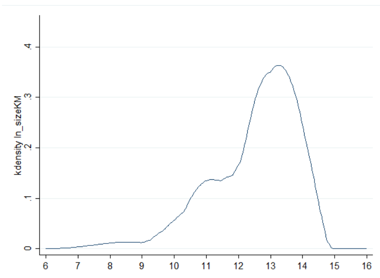

(g) Ln Size in 1600



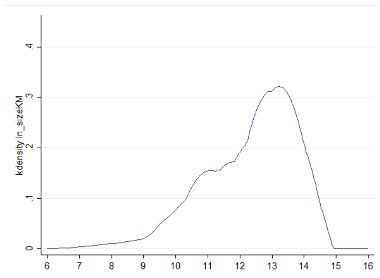

(h) Ln Size in 1700




(i) Ln Size in 1750




(j) Ln Size in 1800




(k) Ln Size in 1850

Note: The figure depicts the distribution of the logarithm of polity size at the years in which population estimates are available based on the sample of locations ever hosting a city in the Political Geography Dataset.

## 2.3 Cities Dataset

### 2.3.1 Data and Sources

The following Table offers summary information about the variables included in the Cities Dataset with relevant remarks on coding, definition and sources.

Table A.2: Description and Sources of City-level Variables

**Population**

*Ln City Population.* Logarithm of the number of inhabitants (in thousand) at the one-hundred year point from the year 1000 A.D. until 1700 and at every 50 years point thereafter until 1850 for all European cities that ever reached 5,000 inhabitants between the years 1000 and 1850. Estimates were not reported for 1100 due to lack of information, thus for that year we rely on an interpolation of 1000 and 1200. The main source of data is Bairoch, Batou and Chèvre (1988). We updated city coordinates with decimals up to 4 digits (to increase precision in the geolocalization) and revised population estimates for particular cities based on Voigtländer and Voth (2013) and Bosker, Buringh and Van Zanden (2013). We drop cities located in today's Russia because the territory of this country and the polities ruling over it in the period 1000-1850 often go beyond the spatial coverage of the maps we use. We also drop the cities of Ponte del Gada, La Valletta and St. Peter's Port because they are located on small islands not captured by the maps and use the resulting unbalanced panel dataset as *baseline sample*. As *restricted sample* we consider only cities that ever reached 10,000 inhabitants at century frequency for which we have additional time-varing covariates from Bosker, Buringh and Van Zanden (2013). Further investigations were coducted also on a revised baseline sample including updated estimates from Malanima (2010), who takes stock of information from Bairoch, Batou, and Chèvre (1988), De Vries (1984), Chandler (1974, 1987) and Pamuk (1996), and the *balanced samples* constructed either by imputing 500 inhabitants for cities with missing data points in the baseline sample (imputed balanced sample), or exploiting only the cities that were always in the baseline sample from the year 1600 (non-imputed balanced sample).

**Political Geography**

Based on geographic coordinates of European cities from Bairoch, Batou, and Chèvre (1988) we matched cities to the corresponding (intersecting) cell and constructed the political geography variables of interest as described in the Data Section of the paper and in Appendix 2.2. For some cities on the coast (Vaasa, Oulu and Berwick) we manually imputed data of political geography variables in those years for which the map was imprecisely reporting the sea rather than land at city locations.

**Market Potential**

*Domestic (External) Market.* This variable computes the distance-weighted sum of the size of all other cities within the same polity (outside the polity ruling the city) based on the Sovereign Polities Dataset at the period-year (e.g., at the year 1700). The formulation is the following:

$$DM_{it}^{j} = \sum_{k\neq i}^{n}[\frac{pop_{kt}}{D_{ik}} I_{kt}^{j}], \quad EM_{ikt}^{z} = \sum_{k\neq i}^{n}[\frac{pop_{kt}}{D_{ik}} I_{kt}^{z\neq j}], \quad SD_{it}^{j} = \frac{DM_{it}^{j}}{DM_{it}^{j}+EM_{it}^{j}},$$

where *DM*, *EM* and *SD* stand for *Domestic Market*, *External Market* and *Share Domestic Market*, and are referred to location $i$ in period-year $t$, when it belongs to polity $j$, $pop_{kt}$ is the population of city $k$ in $t$, $D_{ik}$ is the geodesic distance between location $i$ and city $k$ based on their geographic coordinates, and $I_{kt}^{j}$ and $I_{kt}^{z\neq j}$ are dummy variables indicating whether city $k$ is within the borders of the same polity $j$ to which $i$ belongs or is located outside the borders in a polity $z \neq j$.

*Domestic Share.* This variable computes the ratio between Domestic Market Access and total market access at the period-year. Data source: Bairoch, Batou and Chèvre (1988) and the Sovreign Polities Dataset (see Appendix 2.1).

**Covariates for the Baseline Sample**

*Atlantic Cities Dummy.* Dummy variable taking value 1 since 1500 AD if the city is located within 50Km from a coast with access to the Atlantic Ocean. Data source: own elaborations.

*Conflict w/100Km.* Based on city locations and conflict locations, this variable computes the number of conflicts that took place within 100 Km from the city in the previous period. Data source: Dincecco and Onorato (2016) for the period 1000-1800, Jaques (2007) for the period 1801-1850, and own elaborations.

*Epidemics w/100 Km.* Based on city locations and plague outbrakes locations, this variable computes the number of times a city was within 100 km from a plague outbrake in the previous period. Data source: Biraben (1975) and own elaborations.

**Covariates for the Restricted Sample** from Bosker, Buringh and Van Zanden (2013).

*Plundered.* Dummy variable indicating the number of times a city was plundered in the previous century.

*Capital.* Dummy variable indicating whether a city has ever been a capital in the previous period.

*Active Parliament.* Dummy variable indicating whether a city has ever had an active parliament in the previous period.

*Commune.* Dummy variable indicating whether a city has haver had a form of self-governance in the previous period.

*Muslim.* Dummy variable indicating whether a city has ever fallen under Muslim rule in the previous period.

*Bishop.* Dummy variable indicating whether a city has ever been the seat of a bishop in the previous period.

*Archibishop.* Dummy variable indicating whether a city has ever been the seat of an archbishop in the previous period.

### 2.3.2 Summary Statistics

Table A.3: Descriptive statistics baseline and restricted samples

| Variable | Obs. | Cities | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| | | | Baseline Sample | | | |
| Ln City Population | 8,549 | 1,940 | 2.02 | 0.95 | -0.69 | 7.71 |
| Log Size | 8,549 | 1,940 | 12.68 | 1.12 | 6.39 | 15.60 |
| Median Log Size (Share Years) | 8,549 | 1,940 | 0.29 | 0.36 | 0 | 1 |
| City State (Share Years) | 8,549 | 1,940 | 0.06 | 0.21 | 0 | 1 |
| Rulers' Turnover | 8,549 | 1,940 | 2.35 | 1.85 | 1 | 21 |
| Capital Dummy | 8,549 | 1,940 | 0.05 | 0.21 | 0 | 1 |
| Capital Distance | 8,549 | 1,940 | 5.57 | 1.19 | -9.26 | 8.21 |
| Neighbor Polities | 8,549 | 1,940 | 1.77 | 1.24 | 1 | 8.26 |
| Domestic Market | 8,549 | 1,940 | 10.76 | 14.29 | 0 | 291.17 |
| External Market | 8,549 | 1,940 | 18.81 | 13.97 | 1.30 | 77.74 |
| Domestic Share | 8,549 | 1,940 | 0.33 | 0.20 | 0 | .89 |
| Atlantic Cities Dummy | 8,549 | 1,940 | 0.11 | 0.31 | 0 | 1 |
| Conflict w/100 Km | 8,549 | 1,940 | 2.01 | 3.90 | 0 | 65 |
| Epidemics w/100 Km | 8,549 | 1,940 | 7.22 | 20.50 | 0 | 202 |
| | | | Restricted Sample | | | |
| Ln City Population | 2,893 | 673 | 2.39 | 0.96 | -0.69 | 6.85 |
| Log Size | 2,893 | 673 | 12.65 | 1.14 | 7.22 | 15.45 |
| Median Log Size (Share Years) | 2,893 | 673 | 0.28 | 0.36 | 0 | 1 |
| City State (Share Years) | 2,893 | 673 | 0.07 | 0.22 | 0 | 1 |
| Rulers' Turnover | 2,893 | 673 | 2.28 | 1.79 | 1 | 13 |
| Capital Dummy | 2,893 | 673 | 0.07 | 0.25 | 0 | 1 |
| Capital Distance | 2,893 | 673 | 5.55 | 1.47 | -9.26 | 8.21 |
| Neighbor Polities | 2,893 | 673 | 1.74 | 1.14 | 1 | 8.08 |
| Domestic Market | 2,893 | 673 | 6.52 | 7.86 | 0 | 117.46 |
| External Market | 2,893 | 673 | 11.44 | 8.12 | 1.30 | 44.31 |
| Domestic Share | 2,893 | 673 | 0.33 | 0.20 | 0 | 0.83 |
| Atlantic Cities Dummy | 2,893 | 673 | 0.11 | 0.31 | 0 | 1 |
| Plundered | 2,893 | 673 | 0.02 | 0.14 | 0 | 1 |
| Capital | 2,893 | 673 | 0.07 | 0.25 | 0 | 1 |
| Active Parliament | 2,893 | 673 | 0.53 | 0.50 | 0 | 1 |
| Commune | 2,893 | 673 | 0.52 | 0.50 | 0 | 1 |
| Muslim | 2,893 | 673 | 0.04 | 0.21 | 0 | 1 |
| Bishop | 2,893 | 673 | 0.38 | 0.49 | 0 | 1 |
| Archbishop | 2,893 | 673 | 0.12 | 0.32 | 0 | 1 |
| Conflict w/100 Km | 2,893 | 673 | 1.45 | 2.80 | 0 | 19 |
| Epidemics w/100 Km | 2,893 | 673 | 11.61 | 24.64 | 0 | 202 |

Table A.4: Descriptive statistics balanced samples

| Variable | Obs. | Cities | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| | | | Balanced Sample | | | |
| Ln City Population | 19,400 | 1,940 | 0.50 | 1.49 | -0.69 | 7.71 |
| Log Size | 19,400 | 1,940 | 12.70 | 1.07 | 6.16 | 16.39 |
| Median Log Size (Share Years) | 19,400 | 1,940 | 0.32 | 0.38 | 0 | 1 |
| City State (Share Years) | 19,400 | 1,940 | 0.06 | 0.20 | 0 | 1 |
| Rulers' Turnover | 19,400 | 1,940 | 2.28 | 1.71 | 1 | 21 |
| Capital Dummy | 19,400 | 1,940 | 0.03 | 0.16 | 0 | 1 |
| Capital Distance | 19,400 | 1,940 | 5.64 | 1.07 | -9.26 | 8.21 |
| Neighbor Polities | 19,400 | 1,940 | 1.65 | 1.04 | 1 | 8.26 |
| Domestic Market | 19,400 | 1,940 | 6.61 | 10.81 | 0 | 291.17 |
| External Market | 19,400 | 1,940 | 12.09 | 11.88 | 0.92 | 77.74 |
| Domestic Share | 19,400 | 1,940 | 0.31 | 0.20 | 0 | 0.96 |
| Atlantic Cities Dummy | 19,400 | 1,940 | 0.08 | 0.27 | 0 | 1 |
| Conflict w/100 Km | 19,400 | 1,940 | 1.36 | 3.03 | 0 | 65 |
| Epidemics w/100 Km | 19,400 | 1,940 | 6.83 | 18.76 | 0 | 203 |
| | | | Balanced Sample 1600-1850 | | | |
| Ln City Population | 6,784 | 1,936 | 2.05 | 0.92 | 0 | 7.71 |
| Log Size | 6,784 | 1,936 | 12.73 | 1.13 | 6.39 | 15.60 |
| Median Log Size (Share Years) | 6,784 | 1,936 | 0.28 | 0.35 | 0 | 1 |
| City State (Share Years) | 6,784 | 1,936 | 0.05 | 0.20 | 0 | 1 |
| Rulers' Turnover | 6,784 | 1,936 | 2.38 | 1.92 | 1 | 21 |
| Capital Dummy | 6,784 | 1,936 | 0.06 | 0.24 | 0 | 1 |
| Capital Distance | 6,784 | 1,936 | 5.59 | 1.15 | -9.26 | 7.61 |
| Neighbor Polities | 6,784 | 1,936 | 1.78 | 1.29 | 1 | 8.26 |
| Domestic Market | 6,784 | 1,936 | 12.94 | 15.26 | 0 | 291.17 |
| External Market | 6,784 | 1,936 | 22.14 | 13.79 | 3.05 | 77.74 |
| Domestic Share | 6,784 | 1,936 | 0.34 | 0.21 | 0 | 0.89 |
| Atlantic Cities Dummy | 6,784 | 1,936 | 0.13 | 0.33 | 0 | 1 |
| Conflict w/100 Km | 6,784 | 1,936 | 2.35 | 4.24 | 0 | 65 |
| Epidemics w/100 Km | 6,784 | 1,936 | 7.56 | 22.14 | 0 | 202 |

### 2.3.3 Further Statistics

Figure A.9 displays, for the baseline sample, the evolution over time of European cities and their average population. In the 1100-1850 period, total urban population grows monotonically in Europe (except a decline in the XIV century due to the Black Death), passing from 2.4 to 36.2 million inhabitants. This is largely due to the almost monotonic increase in the number of cities with positive population estimates, which passes from 169 in 1100 to 1,828 in 1850, with an acceleration after 1750. Average city population falls sharply in the XIII century, mainly reflecting the creation of new small towns, and remains low until 1800. The Black Death of the XIV century makes some cities disappear and reduces the population of the remaining ones. After 1400, while existing cities keep growing (especially in the XVI century, whereas they decline again in the XVII century, again due to the plague), the progressive creation of new small towns keeps average city population low. Since 1700, average urban population sharply increases, as the fast creation of new small urban centers is more than compensated by the even faster population growth of existing ones.

Figure A.9: European cities' population (thousand inhabitants) across time


Note: The figure depicts the evolution of the number of cities and the average city population in thousand inhabitants in the period 1000-1850.

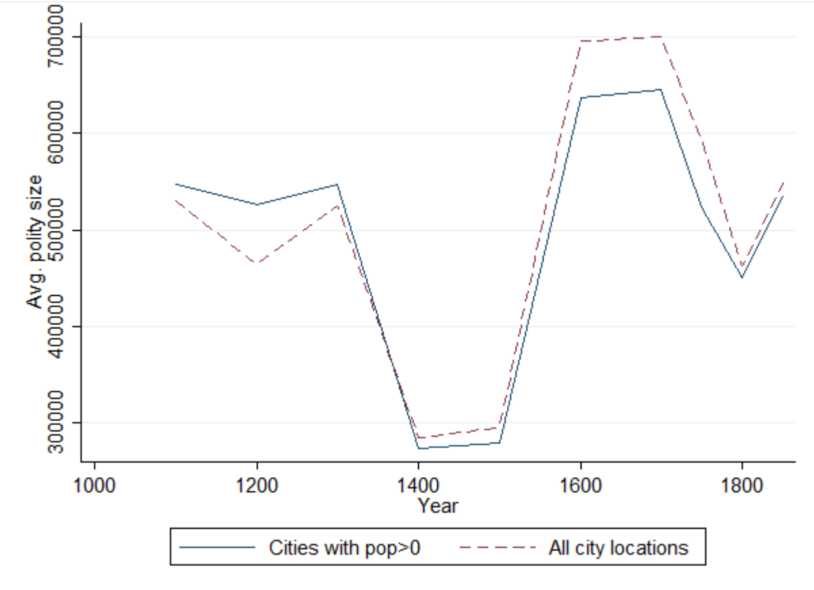
Tables A.3 and A.4 report descriptive statistics for *Log Population* for the different samples. As noted by Abramson (2017)) city population is highly skewed and approximately log-normally distributed.[6]

**Population and Polity Size.** Figure A.10 displays, for the baseline sample, the evolution over time of the average polity size of European cities. The average polity size of cities evolves non-monotonically over time: it is substantially lower in the XIV and XV century than before 1300 or after 1600. The result is independent of whether in each period the average is taken across cities with positive population estimates (those in the baseline sample) or on the fixed set of all city locations (those in the balanced sample 1000-1850).

While Figure A.10 is useful to describe the data on polity size in cities, it should be stressed that it does not present the variation exploited in the empirical analysis, which relies on within-city variations. At any rate, it may be interesting to dig a bit deeper into the non-monotonicity over time

[6] Since there are many small towns and few big cities, the average city population in the full sample is substantially higher than the median (13,600 against 7,000 inhabitants), whereas mean and median almost coincide on a log scale (2.02 against 1.95 log of thousand inhabitants).

Figure A.10: Polity size (squared Km) in European cities across time




Note: The figure shows the evolution of the average polity size (in squared Km) in both the baseline sample and the imputed balanced sample.

of the cross-sectional average of polity size across cities. One way of doing it is presented in Figure A.11, which splits polities between small and large (below and above the overall median of *Log Size* in the baseline sample). Panel (a) displays the number of cities in the two groups of polities, as well as the ratio of these numbers. Until 1300 and after 1600 there is roughly the same number of urban centers in small and large polities.

In 1400 and 1500, small polities have 3 and 8.2 times as many cities as large polities. While the overall number of European cities changes little (it falls in the XIV and grows in the XV century, but remains around 500 in that period), their distribution between small and large polities changes: with the disintegration of the Holy Roman Empire, in 1400 and 1500 many cities formerly belonging to a large polity fall under the domination of a small one. With the formation and consolidation of modern states, the reverse movement is at work, and the distribution of cities between small and large polities balances again.[7]

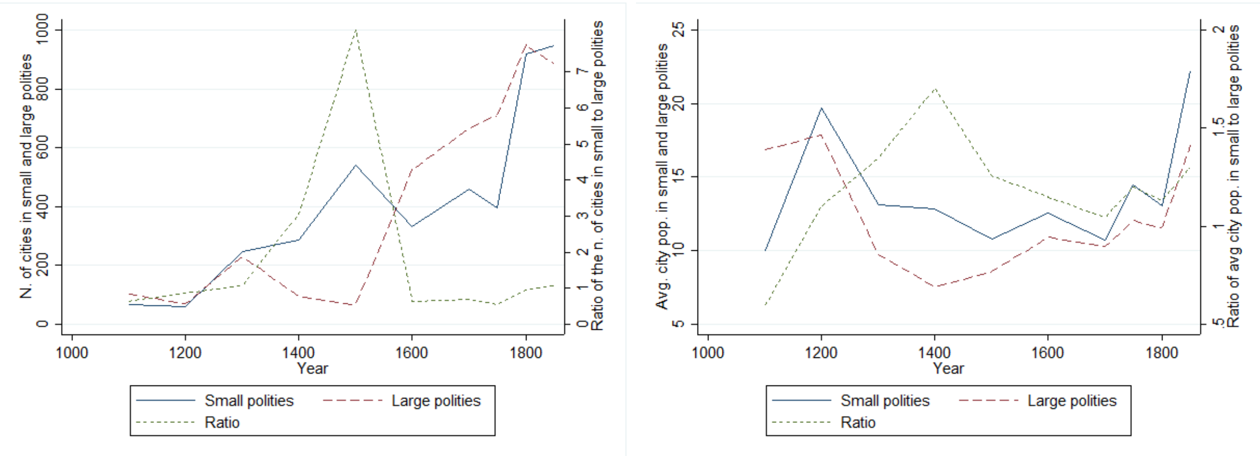
Panel (b) shows average city population in the two groups of polities, as well as their ratio. Since 1200 the average population of cities was larger in small than in large polities. While in 1400 and 1500 this may be due to existing cities passing from a large to a small polity, the process did not reverse after 1500, although there is some convergence. In sum, relative to large polities, cities in small polities grow between 1100 and 1500 both in number and in population size, whereas after 1600 large polities catch up and converge to small ones both in the number of cities and, partially, in their population.

The above discussion confirms that, if one does not focus on within-city variations, relating population to polity size yields an empirical effect that reflects the composition of the mechanical impact of city redistribution between polities of different size, the possibly different rates of city birth and death in large and small polities, and the economic effect of polity size on city prosperity we are interested in.

**Market Potential.** Figure A.12 displays the evolution over time of the average market potential for cities in the baseline sample. On average both domestic and foreign market potential increase over time. Panel (b) shows that in the period of disaggregation (XIII and XIV centuries) the average

[7] Abramson (2017) documents that average log polity size decreases monotonically in Europe between 1100 and 1800, but he averages across polities and not across cities.

Figure A.11: Number of cities and average city population in small and large polities

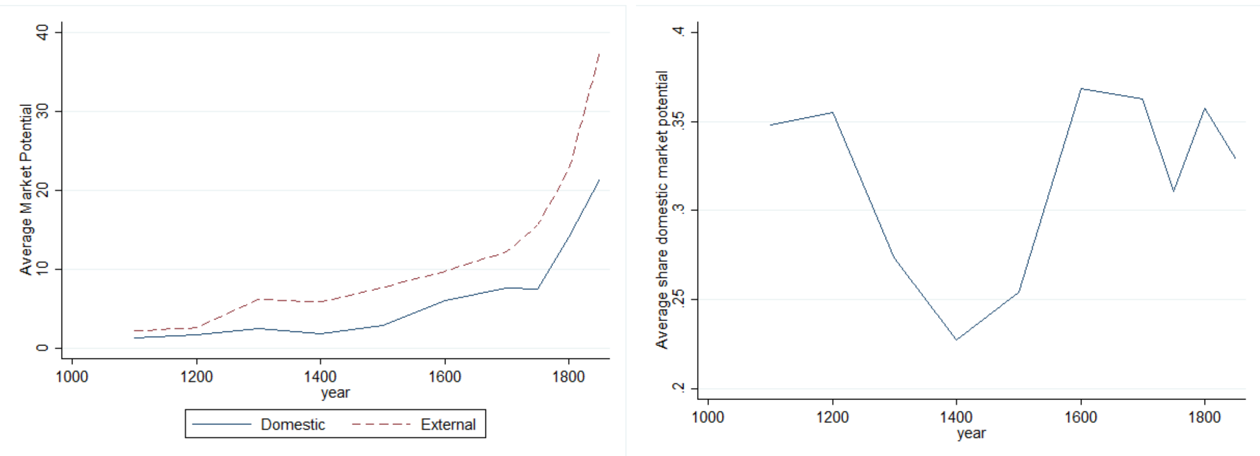



(a) Number of cities in small and large polities (b) Average city population in small and large polities

Note: The figure depicts descriptive statistics for European cities located in small and large polities in the period 1000-1850 (full sample). Panel (a) shows the evolution of the nukber of cities in small and large polities. Panel (b) shows the evolution of the average city population in small and large polities.

share of domestic market over total market potential decreased by more than 10 percentage points, but returned to previous levels during the re-aggregation phase.

Figure A.12: Descriptive Statistics for Market Potential, Baseline sample




(a) Average Domestic Market (b) Average Share Domestic Market

Note: The figure depicts descriptive statistics for the average market potential for cities in the baseline sample in the period 1000-1850. In Panel (a) the solid line represents the average domestic market potential, while the dashed line represents the foreign market potential. Panel (b) shows the evolution of the average share of domestic over total market potential.

**Additional Covariates.** While our attention is focused on the political geography variables introduced above, we also control for two sets of covariates, which may be related to both local development and our explanatory variables of interest, and might thus bias our results. The first set includes three variables that are available for all our samples (*Atlantic Cities Dummy*, *Conflict w/100 Km* and *Epidemics w/100 Km*), and the second one contains six additional variables that are only available for the restricted sample (*Plundered*, *Active Parliament*, *Commune*, *Muslim*, *Bishop* and *Archbishop*). Acemoglu, Johnson and Robinson (2005) emphasize that Western European cities engaging in colonialism and long distance trade grew faster between 1500 and 1850, therefore we control for the role of Atlantic trade through a dummy variable, *Atlantic Cities Dummy*, taking value 1 from 1500 if a location is within 50 Km from a coastline with access on the Atlantic Ocean. Additional possible confounders of our results are conflicts and epidemics. Dincecco and Onorato (2016) argue that one might expect a positive relationship between city development and conflict, driven by a safe-harbor or a target effect. According to the former, conflicts boost urban development, since cities are better defended and more stable. According to the latter, urban development attracts conflict, since richer cities are more attractive for plunder or conquest. Conflicts are also a relevant source of concomitant changes in ruling polity and polity size. We merge our data with that from Dincecco and Onorato (2016) up to 1800 and reconstruct and merge additional conflict data from 1800 to 1850 from Jaques (2007), to include in the specification the variable *Conflict w/100 Km*, which is the number of conflicts recorded in a radius of 100 Km around a location in the previous period. Finally, we also include *Epidemics w/100 Km*, which is the number of plague outbreaks in a radius of 100 Km around a location in the previous period, taken from Biraben (1975). Among the several waves of plague outbreaks, the Black Death of 1350 was responsible for major population drops. Cities were more vulnerable than the countryside, due to higher contagion probability. More densely urbanized polities may thus have been hit differentially, and if urbanization was related to past polity size, plague epidemics may be a serious confounder.

The restricted sample allows including several additional controls. The first is *Plundered*, which records the number of times a city was plundered during the previous period. Then there are covariates related to civic institutions, such as *Active Parliament* and *Commune*, which are dummies equal to 1 if, in at least one year during the previous period, the city had an active parliament or was a free commune. Finally, there are covariates related to religion, such as *Muslim*, *Bishop* and *Archbishop*, which are intuitively defined dummies.

# 3 Robustness and Additional Empirical Results

This Section presents robustness checks for the empirical results of the paper and further results.

In Appendix 3.1 we replicate results exploiting the baseline sample. In particular, in Appendix 3.1.1 we check the robustness of Table 2 by considering the inclusion of one polity dummy at a time rather than all polity dummies together, while in Table A.5 we report reverse and placebo regressions for the variable *Median Log Size (Share Years)*. In Appendix 3.1.2 we concentrate on Table 3 and report in Table A.6 the unstandardized coefficients for all political geography variables and the coefficients of all covariates, while Table A.7 reports the results of individual regressions of political geography variables. Appendix 3.1.3 shows that the pattern over time of *Median Log Size (Share Years)* is robust if we consider city presence rather than city population as dependent variable.

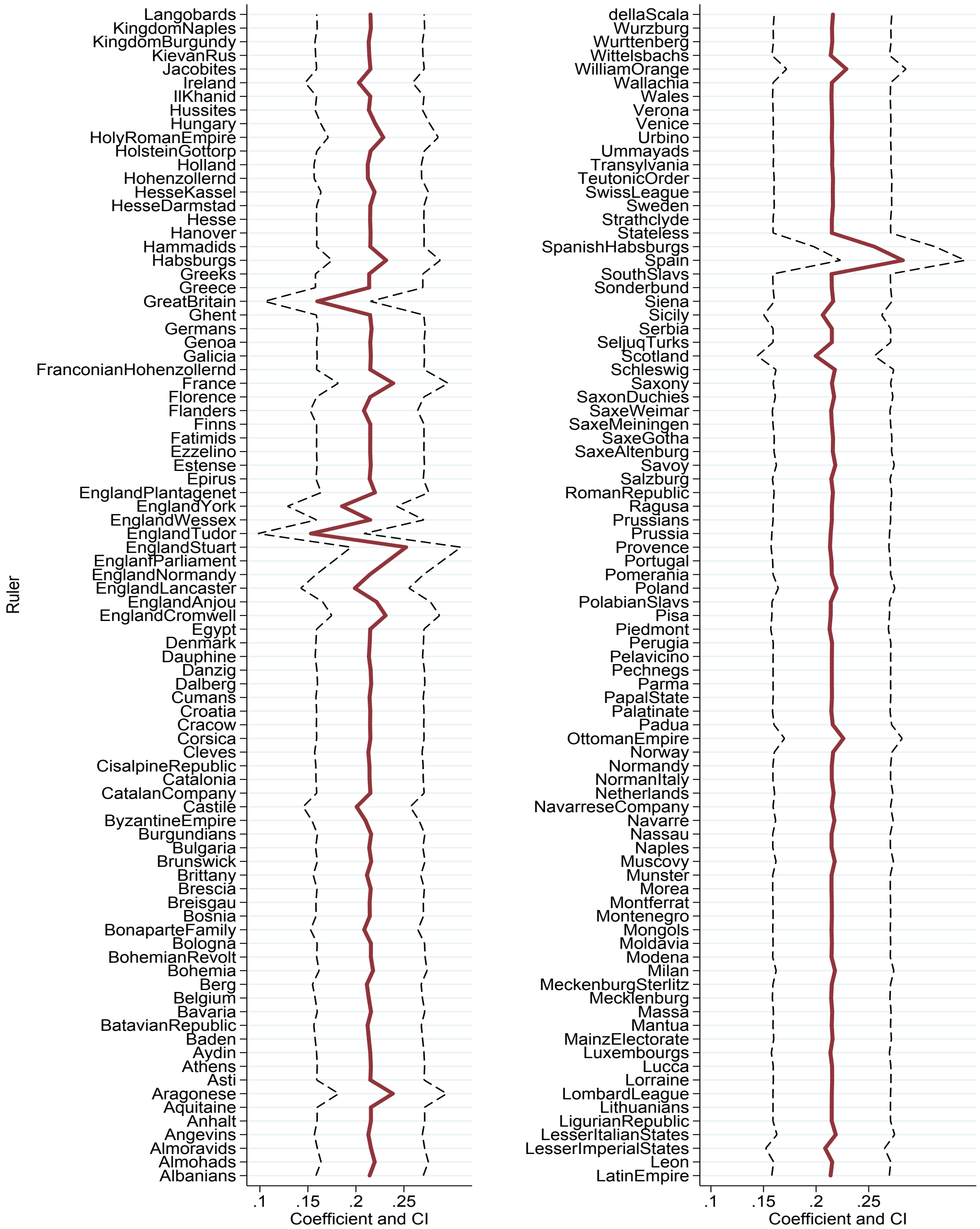
In Appendix 3.2 we replicate all empirical results updating population estimates for bigger cities with data from Malanima (2010), while Appendix 3.3 we replicate all empirical results exploiting two sets of balanced samples explained in more details below.

## 3.1 Baseline Sample

### 3.1.1 Polity Size

**Sensitivity to Specific Rulers**

Figure A.13: Sensitivity to Specific Ruler Dummy




Note: The figure depicts the sensitivity of the coefficient of *Share Years Median Log Size* when we estimate specification (6) of Table 2 adding only one polity dummy at a time instead of all polity fixed effects together.

## Reverse and Placebo Regressions

Table A.5: Reverse and Placebo Regressions

| Dependent Variable | Share Years Median Log Size | | | Ln City Population 1000-1850 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Initial Log Population | 0.005 | 0.004 | 0.008* | | | |
| | (0.006) | (0.006) | (0.004) | | | |
| Lead Share Years Median Log Size | | | | 0.045 | 0.035 | 0.042 |
| | | | | (0.035) | (0.036) | (0.044) |
| City F. Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time F. Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Polity F. Effects | No | No | Yes | No | No | Yes |
| All Samples Covariates | No | Yes | Yes | No | Yes | Yes |
| N. of cities | 1939 | 1939 | 1939 | 1930 | 1930 | 1930 |
| Observations | 7,792 | 7,792 | 7,792 | 6,721 | 6,721 | 6,721 |
| R-Squared | 0.511 | 0.519 | 0.779 | 0.672 | 0.675 | 0.722 |

Reverse and placebo regressions, based on the sample of European cities with positive population estimates between 1100 and 1850 from (from Bairoch, Batou and Chèvre (1988)). Columns (1) to (3) present reverse regressions of *Share Years Median Log Size*, the share of years a city was ruled in the previous period by a polity with log size in the second tertile of the distribution 1000-1850, on *Initial Log Population*, the log of city population at the beginning of the period. Columns (4) to (6) present placebo regressions of *Log Population* on *Share Years Median Log Size* in the following period. In each case, the first column includes city and year fixed effects, the second adds the time varying controls included in Column (3) of Table 3, and the third adds polity fixed effects. Each time period is a century between 1100 and 1700, and half a century between 1700 and 1850. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

### 3.1.2 Political Geography

### Unstandardized Coefficients, All Covariates

Table A.6: Political Geography and Market Potential

| Dependent Variable | Ln City Population | | | | | |
|---|---|---|---|---|---|---|
| Panel | 1000-1850 | | | | 1500-1850 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Polity Size and Type*: | | | | | | |
| Median Log Size (Share Years) | 0.206*** | 0.272*** | 0.251*** | 0.272*** | 0.163*** | 0.186*** |
| | (0.029) | (0.051) | (0.042) | (0.076) | (0.032) | (0.043) |
| City State (Share Years) | 0.227*** | 0.514*** | 0.109 | 0.353** | 0.073 | 0.011 |
| | (0.045) | (0.081) | (0.067) | (0.112) | (0.050) | (0.070) |
| *Power and Stability*: | | | | | | |
| Capital Dummy | 0.343*** | 0.889*** | 0.325*** | 0.857*** | 0.077 | 0.096 |
| | (0.069) | (0.111) | (0.074) | (0.117) | (0.077) | (0.089) |
| Rulers' Turnover | -0.012** | -0.012 | 0.016 | 0.010 | -0.021*** | 0.020 |
| | (0.004) | (0.009) | (0.012) | (0.020) | (0.004) | (0.012) |
| *Location and Centrality*: | | | | | | |
| Neighbor Polities | 0.021 | -0.017 | -0.027* | -0.066* | 0.016 | 0.013 |
| | (0.012) | (0.022) | (0.013) | (0.026) | (0.015) | (0.016) |
| Capital Distance | -0.006 | -0.002 | -0.021 | -0.021 | -0.006 | -0.015 |
| | (0.014) | (0.018) | (0.014) | (0.016) | (0.011) | (0.012) |
| *Benefits from Market Potential*: | | | | | | |
| Domestic Market | 0.013*** | 0.027*** | 0.010*** | 0.017** | 0.012*** | 0.009*** |
| | (0.001) | (0.005) | (0.001) | (0.006) | (0.001) | (0.001) |
| External Market | 0.008*** | 0.027*** | 0.008*** | 0.012 | 0.008*** | 0.014*** |
| | (0.001) | (0.007) | (0.002) | (0.009) | (0.001) | (0.002) |
| Domestic Share | 0.789*** | 0.348* | 0.385** | -0.086 | 1.385*** | 1.262*** |
| | (0.089) | (0.155) | (0.117) | (0.209) | (0.109) | (0.151) |
| *Covariates Baseline Sample*: | | | | | | |
| Atlantic Cities Dummy | 0.167 | 0.227* | 0.119 | 0.222 | 0.000 | 0.000 |
| | (0.089) | (0.099) | (0.116) | (0.118) | (.) | (.) |
| Conflict w/in 100Km | -0.002 | -0.010 | 0.001 | -0.004 | 0.001 | 0.003 |
| | (0.002) | (0.006) | (0.002) | (0.007) | (0.002) | (0.002) |
| Epidemics w/in 100Km | 0.000 | -0.001 | 0.003*** | 0.002 | 0.001 | 0.003*** |
| | (0.000) | (0.001) | (0.001) | (0.001) | (0.000) | (0.001) |
| *Covariates Restricted Sample*: | | | | | | |
| Plundered | | -0.108 | | -0.095 | | |
| | | (0.098) | | (0.099) | | |
| Active Parliament | | 0.181*** | | 0.102* | | |
| | | (0.043) | | (0.049) | | |
| Commune | | 0.346*** | | 0.302*** | | |
| | | (0.052) | | (0.056) | | |
| Muslim | | 0.084 | | 0.131 | | |
| | | (0.096) | | (0.183) | | |
| Bishop | | -0.033 | | 0.077 | | |
| | | (0.097) | | (0.087) | | |
| Archbishop | | 0.321** | | 0.491*** | | |
| | | (0.121) | | (0.124) | | |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes | No | Yes |
| Covariates Baseline Sample | Yes | Yes | Yes | Yes | Yes | Yes |
| Covariates Restricted Sample | No | Yes | No | Yes | No | No |
| N. of cities | 1940 | 673 | 1940 | 673 | 1936 | 1936 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 | 6,784 | 6,784 |
| R-Squared | 0.706 | 0.625 | 0.739 | 0.670 | 0.799 | 0.821 |

This table reproduces Table 3, reporting non-standardized coefficients and displaying also the coefficients of time-varying covariates. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

## Alternative Specifications

Table A.7: Political Geography and Market Potential Separately

| Dependent Variable | Ln City Population | | | | | |
|---|---|---|---|---|---|---|
| Panel | 1000-1850 | | | | 1500-1850 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Polity Size and Type*: | | | | | | |
| Median Log Size (Share of Years) | 0.078*** | 0.067*** | 0.108*** | 0.076*** | 0.055*** | 0.130*** |
| | (0.010) | (0.017) | (0.015) | (0.026) | (0.012) | (0.016) |
| R-squared | 0.752 | 0.700 | 0.796 | 0.761 | 0.829 | 0.865 |
| City State (Share of Years) | 0.033*** | 0.083*** | 0.007 | 0.061** | -0.000 | -0.018 |
| | (0.009) | ( 0.016) | (0.014) | (0.024) | (0.010) | (0.015) |
| R-squared | 0.749 | 0.701 | 0.794 | 0.760 | 0.828 | 0.863 |
| *Power and Stability*: | | | | | | |
| Capital Dummy | 0.283*** | 0.892*** | 0.327*** | 0.884*** | 0.044 | 0.100 |
| | (0.068) | (0.117) | (0.073) | (0.117) | (0.078) | (0.087) |
| R-squared | 0.750 | 0.698 | 0.795 | 0.760 | 0.828 | 0.863 |
| Rulers' Turnover | -0.031*** | -0.013 | 0.031 | 0.028 | -0.036*** | 0.017 |
| | (0.008) | (0.015) | (0.022) | (0.036) | (0.008) | (0.023) |
| R-squared | 0.750 | 0.698 | 0.794 | 0.760 | 0.829 | 0.863 |
| *Location and Centrality*: | | | | | | |
| Neighbor Polities | -0.019 | -0.024 | -0.071** | -0.078** | 0.004 | -0.002 |
| | (0.014) | (0.022) | (0.016) | (0.029) | (0.018) | (0.019) |
| R-squared | 0.749 | 0.698 | 0.794 | 0.761 | 0.828 | 0.863 |
| Capital Distance | -0.019 | -0.026 | -0.046*** | -0.046** | 0.007 | -0.019 |
| | (0.014) | (0.024) | (0.016) | (0.022) | (0.013) | (0.014) |
| R-squared | 0.749 | 0.698 | 0.794 | 0.760 | 0.828 | 0.863 |
| *Benefits from Market Potential*: | | | | | | |
| Domestic | 0.255*** | 0.205*** | 0.177*** | 0.101** | 0.257*** | 0.190*** |
| | (0.017) | (0.071) | (0.016) | (0.083) | (0.018) | (0.016) |
| R-squared | 0.765 | 0.705 | 0.799 | 0.761 | 0.847 | 0.871 |
| Foreign | -0.079*** | 0.006 | -0.030 | 0.027 | -0.100*** | -0.012 |
| | (0.020) | (0.041) | (0.025) | (0.062) | (0.020) | (0.023) |
| R-squared | 0.750 | 0.698 | 0.794 | 0.760 | 0.829 | 0.863 |
| Domestic Share | 0.183*** | 0.073*** | 0.120*** | 0.003 | 0.339*** | 0.308*** |
| | (0.015) | (0.021) | (0.019) | (0.031) | (0.019) | (0.025) |
| R-squared | 0.758 | 0.700 | 0.795 | 0.760 | 0.848 | 0.870 |
| Covariates Baseline Sample | Yes | Yes | Yes | Yes | Yes | Yes |
| Covariates Restricted Sample | No | Yes | No | Yes | No | No |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes | No | Yes |
| N. of cities | 1940 | 673 | 1940 | 673 | 1936 | 1936 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 | 6,784 | 6,784 |

The dependent variable is the log of city population, all coefficients in the table have been standardized according to respective sample means (except for dummies). Each row reports the result of a single regression. See text and the Appendix for details on the different variables, details of their construction and data sources. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

### 3.1.3 Changing Patterns Over Time

**City Presence and Polity Size** Figure A.14 below replicates Figure 6 looking at the extensive margin, namely it focuses on city presence in the sample. The over time evolution of the point estimates broadly align with the insights of Prediction [2.1] that the hump-shape effect of intermediate territorial size should emerge in the context of modern states. The magnitude of the positive effect of being ruled by polities with intermediate size sharply increases becomes more robustly significant only since the XVI century.

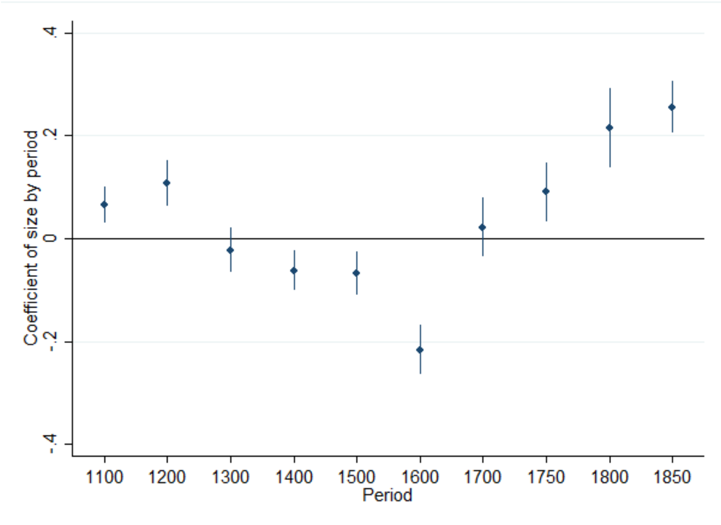



Figure A.14: City Presence in the Baseline sample

Note: The figure depicts the coefficient of the variable *Share Years Median Log Size* interacted by period dummies from a regression having as dependent variable a dummy for city presence in the baseline sample and including time, city and polity fixed effects. The baseline sample is the full sample of European cities with positive population estimates between 1100 and 1850 from Bairoch, Batou and Chèvre (1988). Confidence intervals at 90%.

### 3.2 Revised Baseline Sample

This Section replicates the results in Section 5 exploiting recent revised estimates for city population data. Exploiting Urban population estimates for 379 European cities with 10,000 or more inhabitants at half-century frequency from 1500 to 1800 are also available from De Vries (1984) and were used, for example, by Nunn and Qian (2011) and Fernihough and O'Rourke (2014) to complement missing data in Bairoch, Batou and Chèvre (1988). Taking stock of Bairoch, Batou and Chèvre (1988), De Vries (1984), Chandler (1974-1987) and Pamuk (1996), Malanima (2010) proposes an updated version of European urban population data for cities that eventually reached 10,000 inhabitants.[8] Updating our sample with this source of information does not change the results. Jedwab, Johnson and Koyama (2019) recently further updated the population estimates that we use as baseline sample with data from Campbell (2008), Chandler (1974-1987), Nicholas (1997) and add 76 cities according to Christakos, Olea, Serre, Yu and Wang (2005), but these data have not yet been released.

Table A.8: Political Geography (Extended Specification)

| Dependent Variable | Ln City Population 1000-1850 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Median Log Size (Share Years) | 0.082*** | 0.085*** | 0.116*** | 0.102*** |
| | (0.011) | (0.017) | (0.015) | (0.026) |
| *Covariates Baseline Sample* | Yes | Yes | Yes | Yes |
| *Covariates Restricted Sample* | No | Yes | No | Yes |
| City Fixed Effects | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes |
| N. of cities | 1940 | 673 | 1940 | 673 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 |
| R-Squared | 0.669 | 0.603 | 0.718 | 0.659 |

The dependent variable is the log of city population, all coefficients in the table have been standardized according to respective sample means (except for dummies). See text and Table 2 for details on the covariates (in the baseline and restricted samples) and the Appendix for details on the construction of the variables and the data sources. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

[8]For this sample the average log population is 2.04, with a minimum of -0.69, a maximum of 8.06, and a standard deviation of 0.96.

Table A.9: Political Geography and Market Potential (Extended Specification)

| Dependent Variable | Ln City Population | | | | | |
|---|---|---|---|---|---|---|
| Panel | 1000-1850 | | | | 1500-1850 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Polity Size and Type*: | | | | | | |
| Median Log Size (Share Years) | 0.087*** | 0.126*** | 0.107*** | 0.129*** | 0.074*** | 0.066*** |
| | (0.011) | (0.018) | (0.015) | (0.028) | (0.013) | (0.018) |
| City State (Share Years) | 0.058*** | 0.103*** | 0.038** | 0.072** | 0.033** | 0.031 |
| | (0.010) | (0.018) | (0.014) | (0.025) | (0.011) | (0.016) |
| *Power and Stability*: | | | | | | |
| Capital Dummy | 0.388*** | 0.860*** | 0.362*** | 0.822*** | 0.134 | 0.137 |
| | (0.069) | (0.107) | (0.073) | (0.115) | (0.071) | (0.082) |
| Rulers' Turnover | -0.027** | -0.014 | 0.023 | 0.014 | -0.044*** | 0.033 |
| | (0.008) | (0.016) | (0.022) | (0.036) | (0.009) | (0.024) |
| *Location and Centrality*: | | | | | | |
| Neighbor Polities | 0.021 | -0.030 | -0.033 | -0.076** | 0.005 | 0.023 |
| | (0.015) | (0.025) | (0.017) | (0.029) | (0.020) | (0.021) |
| Capital Distance | 0.007 | 0.008 | -0.017 | -0.024 | 0.013 | -0.006 |
| | (0.016) | (0.026) | (0.017) | (0.024) | (0.014) | (0.015) |
| *Benefits from Market Potential*: | | | | | | |
| Domestic | 0.179*** | 0.205*** | 0.141*** | 0.114* | 0.152*** | 0.115*** |
| | (0.020) | (0.039) | (0.020) | (0.046) | (0.019) | (0.020) |
| Foreign | 0.174*** | 0.260*** | 0.174*** | 0.117 | 0.165*** | 0.268*** |
| | (0.023) | (0.053) | (0.030) | (0.075) | (0.021) | (0.030) |
| Domestic Share | 0.179*** | 0.088** | 0.097*** | 0.006 | 0.318*** | 0.310*** |
| | (0.019) | (0.031) | (0.025) | (0.042) | (0.023) | (0.034) |
| Covariates Baseline Sample | Yes | Yes | Yes | Yes | Yes | Yes |
| Covariates Restricted Sample | No | Yes | No | Yes | No | No |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | No | Yes | Yes | No | Yes |
| N. of cities | 1940 | 673 | 1940 | 673 | 1936 | 1936 |
| Observations | 8,549 | 2,893 | 8,549 | 2,893 | 6,784 | 6,784 |
| R-Squared | 0.697 | 0.609 | 0.728 | 0.655 | 0.784 | 0.804 |

The dependent variable is the log of city population, all coefficients in the table have been standardized according to respective sample means (except for dummies). See text and Table 2 for details on the covariates (in the baseline and restricted samples) and the Appendix for details on the construction of the variables and the data sources. OLS Estimates. Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

## 3.3 Balanced Samples

This Section replicates the results in Section 5 exploiting two balanced samples. Table A.10 below replicates Table 1 with the balanced sample obtained by imputing 500 inhabitants for cities with missing data points in the baseline sample (henceforth "imputed balanced sample").[9] Table A.11 and Table A.12 replicate results in Table 2 and Table 3 using both the imputed balanced sample and the balanced sample obtained retaining only the cities that were always in the baseline sample in the period 1600-1850 (non-imputed balanced sample).

Table A.10: Polity Size (Baseline), Imputed Balanced Sample

| Dependent Variable | Ln City Population 1000-1850 | | | | | |
|---|---|---|---|---|---|---|
| Data Polities | EuroAtlas | | Centennia Historical Atlas | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Log Size | -0.007 | 0.228*** | -0.003 | 0.169** | | |
| | (0.004) | (0.043) | (0.004) | (0.055) | | |
| Log Size Squared | | -0.236*** | | -0.174** | | |
| | | (0.043) | | (0.055) | | |
| Log Size in 1 Tertile (DV) | | | | | -0.001*** | |
| | | | | | (0.000) | |
| Log Size in 3 Tertile (DV) | | | | | -0.001*** | |
| | | | | | (0.000) | |
| Median Log Size (Share Years) | | | | | | 0.034*** |
| | | | | | | (0.005) |
| City Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fxed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N. of cities | 1831 | 1831 | 1940 | 1940 | 1940 | 1940 |
| Observations | 14,521 | 14,521 | 19,400 | 19,400 | 19,400 | 19,400 |
| R-Squared | 0.910 | 0.910 | 0.912 | 0.912 | 0.912 | 0.912 |

The dependent variable is the log of city population. Balanced sample obtained using all European cities with positive population estimates between 1100 and 1850 and imputing 500 inhabitants for missing data points within the period. See text and Appendix 2 for details of variables construction. OLS Estimates with standardized variables (not for dummies). Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

[9] A dummy for imputed data is included to control for the potential role of imputation. All results do not change if we impute 100 or 300 inhabitants in place of 500.

Table A.11: Polity Size, Balanced Samples

| Dependent Variable | Ln City Population 1000-1850 | | | |
|---|---|---|---|---|
| Panel | 1000-1850 (imputed) | | 1500-1850 (non-imputed) | |
| | (1) | (2) | (3) | (4) |
| Sh. Years Medium Log Size | 0.036*** | 0.044*** | 0.026 | 0.085*** |
| | (0.005) | (0.007) | (0.016) | (0.022) |
| *Covariates Baseline Sample* | Yes | Yes | Yes | Yes |
| City Fixed Effects | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes |
| Sovereign Polity Fixed Effects | No | Yes | No | Yes |
| N. of cities | 1940 | 1940 | 625 | 625 |
| Observations | 19,400 | 19,400 | 3,125 | 3,125 |
| R-Squared | 0.913 | 0.918 | 0.820 | 0.854 |

The dependent variable is the log of city population. In Columns (1) and (2) the imputed balanced sample is obtained using all European cities with positive population estimates between 1100 and 1850 and imputing 500 inhabitants for missing data points within the period. In Columns (3) and (4) the non-imputed balanced sample is obtained using all European cities having always positive population estimates between 1600 and 1850. See text and Appendix 2 for details of variable construction. OLS Estimates with standardized variables (not for dummies). Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

Table A.12: Political Geography, Balanced Samples

| Dependent Variable | Ln City Population | | | | | |
|---|---|---|---|---|---|---|
| Panel | 1000-1850 (imputed) | | | | 1600-1850 (non-imputed) | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Polity Size and Type*: | | | | | | |
| Median Log Size (Share Years) | 0.031*** | 0.046*** | 0.061*** | 0.072*** | 0.071*** | 0.060** |
| | (0.005) | (0.007) | (0.009) | (0.012) | (0.015) | (0.022) |
| City State (Share Years) | 0.017*** | 0.018** | 0.026*** | 0.019 | 0.033* | 0.027 |
| | (0.005) | (0.007) | (0.007) | (0.010) | (0.015) | (0.020) |
| *Power and Stability*: | | | | | | |
| Capital Dummy | 0.198*** | 0.200*** | 0.048 | 0.060 | 0.074 | 0.125 |
| | (0.057) | (0.059) | (0.068) | (0.078) | (0.089) | (0.104) |
| Rulers' Turnover | -0.013** | 0.031** | -0.034*** | 0.028* | -0.026** | -0.053 |
| | (0.004) | (0.010) | (0.005) | (0.013) | (0.009) | (0.028) |
| *Location and Centrality*: | | | | | | |
| Neighbor Polities | 0.009 | -0.012 | 0.017 | 0.007 | 0.023 | 0.005 |
| | (0.006) | (0.007) | (0.011) | (0.012) | (0.025) | (0.026) |
| Capital Distance | -0.011 | -0.001 | -0.003 | -0.007 | 0.014 | -0.014 |
| | (0.008) | (0.010) | (0.008) | (0.010) | (0.016) | (0.015) |
| *Benefits from Market Potential*: | | | | | | |
| Domestic Market Access | 0.087*** | 0.067*** | 0.111*** | 0.087*** | 0.236*** | 0.233*** |
| | (0.008) | (0.008) | (0.010) | (0.011) | (0.032) | (0.036) |
| External Market Access | 0.015 | 0.019 | 0.018 | 0.096*** | 0.140*** | 0.229*** |
| | (0.012) | (0.017) | (0.013) | (0.019) | (0.027) | (0.040) |
| Share Domestic Market | 0.033*** | 0.021* | 0.114*** | 0.134*** | 0.259*** | 0.162*** |
| | (0.007) | (0.009) | (0.014) | (0.017) | (0.030) | (0.039) |
| City F. Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time F. Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Polity F. Effects | No | Yes | No | Yes | No | Yes |
| Covariates Baseline Sample | Yes | Yes | Yes | Yes | Yes | Yes |
| Covariates Restricted Sample | No | No | No | No | No | No |
| N. of cities | 1940 | 1940 | 1940 | 1940 | 625 | 625 |
| Observations | 19,400 | 19,400 | 9,700 | 9,700 | 3,125 | 3,125 |
| R-Squared | 0.915 | 0.919 | 0.926 | 0.931 | 0.848 | 0.863 |

The dependent variable is the log of city population. In Columns (1) to (4) the imputed balanced sample is obtained using all European cities with positive population estimates between 1100 and 1850 and imputing 500 inhabitants for missing data points within the period. In Columns (5) and (6) the non-imputed balanced sample is obtained using all European cities having always positive population estimates between 1600 and 1850. All Columns replicate Column (1) of Table 3. See text and Appendix 2 for details on variables construction. OLS Estimates with standardized variables (not for dummies). Robust standard errors are reported in parentheses. ***, **, * indicate significance at 1-, 5-, and 10-% level, respectively.

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