The Economic Origins of the Territorial State

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Abstract

What explains variation in the number and geographic size of states? Contrary to standard accounts, I find that before the French Revolution changes in patterns of economic development not the scale, frequency, or costs of war, explain variation in the number and size of units within the European system.

I advance this claim in three steps. First, I show that assertions of a military revolution in the costs and scale of warfare are either exaggerated or simply do not appear when confronted with systematic data analysis. Then, using new data describing the entire universe of European states I demonstrate that the predictions made by war-making theories of state formation regarding changes in the size and number of independent states simply do not materialize in the manner predicted.

Second I build on models of elections and industrial organization to create a theoretical framework that can explain observed patterns of state formation. This formal narrative shows that even in a world of anarchic competition between states, patterns of economic geography can explain variation in the number and size of states. Unlike the sometimes abstruse logic of macro-sociological theory, I provide a micro-founded logic that yields a set of implications which can be readily brought to data.

The preponderance of this book is devoted to the third task, testing these predictions. This analysis represents the first set of statistical tests of theories of state formation that rely on systematically collected, large-N, data. In combination I provide evidence that changes in trade, commerce, and urban revival best explain patterns of state formation before 1790. The French Revolution
and subsequent Napoleonic wars, however, forced upon states political changes that empowered commercial elites, did away with internal barriers to trade, and limited restrictive guild-based production. In doing so, these changes produced economies of geographic scale leading to “Smithian” growth, thereby creating both economic and militarily incentives to establish and maintain large states.
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Chapter 1

Introduction

The Size and Number of States

Why do some political units fail and others persist? Under what conditions do some expand and others contract? In which periods should we expect universal empires and in which systems of states? This book answers these questions by explaining variation in the number and size of a basic unit of political life, the state. To rephrase this, this book explains why in some times and some places centralized political authority emerges over large swaths of territory and, conversely, why in other eras and locations political rule is fragmented amongst many small constituent units.

An extensive historical, largely theoretical, literature has sought to explain the development of the modern state. From enlightenment political philosophers like Hobbes and Locke to twentieth century historical sociologists like Charles Tilly, in one form or another questions of state formation have fas-
cinated social scientists of all stripes. Over the last half century, scholars of comparative politics, international relations, and sociology have sought an explanation of the origins of the modern “territorial” state in Western Europe and, comparatively, the absence of this constellation of political institutions in other parts of the world. More briefly put, this scholarship seeks to understand why large, centralized, states arose as the modal form of political organization in Europe.

Although descriptively rich and historically detailed, the extant literature on state formation leaves one wanting for both convincing theoretical explanations and the concomitant empirical tests needed to assess existing theories. Take as an example the well-known Tillian dictum that “war made states” (Tilly 1985). This claim, exported to explain the development and underdevelopment of states and economies across the globe, is the closest the literature comes to an accepted conclusion. But even here there exists few, if any, explicit tests of this hypotheses against possible alternatives.

These deficiencies reflect the tradeoff between the parsimony of analytic methods founded in simplifying economic assumptions and the desire for historical nuance. Given that the formation of the modern state was, indeed, a maddeningly complex social process with multiple and interacting levels of causation, the current status quo embodies an understandable choice in favor

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1For examples of this see Hui (2005) on China, Centeno (2003) on Latin America, and Herbst (1990, 2000) on Africa. For a recent formal treatment of the relationships between war-making, state formation and economic development see Besley and Persson (2011) and for a cross-national comparison of cases in the developing world see Taylor and Botea (2008).

2On the lack of empirical tests see Bates (2008). For two papers that use agent based methods to examine theories of state formation see Cederman (1997) and Boix, Codenotti and Resta (2011).
of nuance. A consequence of pursuing detail, however, is that we are left with theories whose predictions are less than precise and which are difficult or even impossible to empirically falsify. By moving slightly back in the direction of parsimony I gain analytic leverage on the question of the territorial state’s origins and arrive at conclusions substantially different from dominant accounts. Namely, I find that before the French Revolution changes in patterns of economic development not the scale, frequency, or costs of war, explain variation in the number and size of units within the European system.

I advance this claim in three steps. First, I show that assertions of a military revolution in the costs and scale of warfare are either exaggerated or simply do not appear when confronted with systematic data analysis. Then, using new data describing the entire universe of European states I demonstrate that the predictions made by war-making theories of state formation regarding changes in the size and number of independent states simply do not materialize in the manner predicted.

Second I build on models of elections and industrial organization to create a theoretical framework that can explain observed patterns of state formation. This formal narrative shows that even in a world of anarchic competition between states, patterns of economic geography can explain variation in the number and size of states. Unlike the sometimes abstruse logic of macro-sociological theory, I provide a micro-founded logic that yields a set of implications which can be readily brought to data.

The preponderance of this book is devoted to the third task, testing these predictions. This analysis represents the first set of statistical tests of theories
of state formation that rely on systematically collected, large-N, data. In combination I provide evidence that changes in trade, commerce, and urban revival best explain patterns of state formation before 1790. The French Revolution and subsequent Napoleonic wars, however, forced upon states political changes that empowered commercial elites, did away with internal barriers to trade, and limited restrictive guild-based production. In doing so, these changes, produced economies of geographic scale leading to “Smithian” growth, thereby creating both economic and militarily incentives to establish and maintain large states.

**Why Study Premodern State Formation?**

The study of state formation has encompassed the investigation of social and political processes beyond the geographic scale of states. Broadly, it has included at least two additional topics. First, it includes scholarship explaining variation in the type of political constraints leaders face, e.g. the prevalence of parliamentarism and absolutism. Second, it includes literature that explains variation in states’ bureaucratic capacity to intrude upon the social and economic lives of their citizens. Nevertheless, in enumerating the various outcomes associated with the study of the modern state’s origins, Tilly lists very first the question:

*What accounts for the roughly concentric pattern of state-formation in Europe as a whole, with large but thinly controlled states forming early around the periphery, smaller but more tightly governed states grouped in a rough intermediate zone, and a central band of city states, principalities, federations, and other varieties of intensely*
This is the specific research question I address.

Still, as an object of inquiry the number and size of states over a roughly eight hundred year period might be outside the norm for twenty-first century political science. One cannot run a randomized control trial or conduct a survey experiment to learn about processes of state formation. However, an understanding of the macro-historical forces by which states were formed speaks not only to an important literature in the social sciences but is fundamental to our understanding of contemporary political-economy.

For example, Jones (2003) and more recently Rosenthal and Wong (2011) have argued that existence of many competing units (as opposed to an encompassing empire) contributed to long term patterns of economic development, providing an explanation for why the industrial revolution occurred in Europe and not China. In these arguments competition between political units produced checks upon any one state’s ability to expropriate and, moreover, forced institutional and technological innovation ultimately leading to intensive growth.

These processes affect modern development outcomes in other ways. Although many social scientists treat political boundaries like any other “exogeneously” fixed geographic feature, they are, in fact, anything but. Like most institutions borders are determined by the strategic choices of political actors. Moreover, like many other political institutions borders have lasting economic consequences. For example, merely by existing political boundaries form barri-
ers to trade, create transaction costs, and determine the size of markets (North 1990).

Less obviously, even seemingly fixed geographic features like access to coastline, features which are believed to have large and lasting effects on development (Sachs and Warner 1997, Acemoglu, Johnson and Robinson 2004) are determined by state formation processes. For example, the fact that Holland was an “Atlantic trader” was endogenous to the ability of the Dutch to claim independence, an ability that I will show was a function of their later capacity for economic development. In other words, latent political groups are, in part, driven to form as states by the economic incentives that natural geography provides.

In addition to direct effects on growth, the origins of both parliamentary government and systems of public debt are found in the size of political organization during the early-modern era (Stasavage 2011a, b). Moreover, the incongruence of state and nation, the violent consequences of which have been felt throughout the twentieth century, are a function of the political boundaries constructed in the period prior to the advent of modern nationalisms (Abramson and Carter 2014). In this way, understanding the development of the territorial state between 1100 and 1790 yields an explanation for why Germany and Italy were late to form and, as such, provides insight into conflicts that result from late development.

Beyond studying history for its own sake and apart from investigating the past in order to foster a better understanding of how we arrived at the world we live in today, we can learn much about the actions of contemporary political
actors by exploring the history of premodern European states. Although many non-European states have developed under the boot of imperialism and in the shadow of the Cold War, in many parts of the world the constraints and impediments that state-makers continue to face are analogous to those that Europeans came up against hundreds of years ago. Not to foreshadow this book’s conclusions but with little contortion one can read many of my results as support for materialist accounts of civil conflict (Collier and Hoeffler 2004, Ross 2004, Miguel, Satyanath and Sergenti 2004, Fearon 2005, Boix 2008). Indeed, I will show that economic incentives - “greed” - have conditioned the willingness of political entrepreneurs to seek independence across time.

**Advancing The Literature on State Formation**

Without committing too much violence to existing theory, scholarship on the origins of the territorial state points to two factors that have historically determined the equilibrium geographic size of states: *capital and coercion* (Tilly 1990). In other words, access and ability to produce economic resources, on the one hand, and the ability to produce large-scale collective violence, on the other, ultimately selected large states against their smaller competitors.

The latter factor - warmaking, has been emphasized by what has been termed the bellicist school (Centeno 2003). This group has its modern origins in the work of Charles Tilly though dates even earlier to German sociologists Otto Hintze and Max Weber and broadly views changes in war and war-making as having been determinative for the development the European system of
states (Hintze 1906, 1975; Weber 1968; Tilly 1975, 1985, 1990). For this group “war made states” through an explicitly Darwinian process. In their view large states could far easier raise the manpower and capital required to field the increasingly large standing armies and increasingly dear technologies of coercion necessary to survive an era of endemic warfare.

In making these arguments the bellicist literature relies upon histories which describe a series of technological and tactic shocks to the scale and costs of war that forced armies comprised of increasing numbers of soldiers and ever more expensive armaments upon states (Roberts 1956; Parker 1976, 1996; Black 1991; Rogers 1995). Though a number of possible military innovations are identified, the general logic of these bellicist theories is that technological and tactical changes in the production of violence, by increasing the costs and frequency of war, selected those states most fit to survive, states of substantial geographic scale (Bean 1973; McNeill 1984; Tilly 1975, 1985, 1990). Here large states maintained an advantage in the form of substantial populations, larger tax bases, and greater access to natural resources. Because of these endowments the bellicists argue large states were more capable than their smaller counterparts of meeting these demands.

The second factor – access to economic resources, has been emphasized by what I call the “economic” camp. This group reemerged with the work of Hendrik Spruyt (Spruyt 1994a, b) and builds upon both the political sociology of Stein Rokkan and the economic history of Henri Pirenne. These theories see the development of the territorial state in some places (and its absence in others) as the consequence of variation in the dominant social coalitions that
formed from changing patterns of trade and economic development (Eisenstadt and Rokkan 1973; Rokkan 1975, 1980; Rokkan and Urwin 1982; North and Thomas 1973; Anderson 1974; Tilly, Blockmans and Gilb 1995).

Broadly, these theories find that economic changes empowered new social groups relative to existing actors, allowing them to create and sustain independent political communities. Specifically, the re-emergence of the Eastern trade and the revival of urban life during the last half of the tenth century created in some places new commercial classes (Pirenne and Clegg 1937; Pirenne 1969; Lopez 1976; Cipolla 1994). Where towns formed and burghers could bargain for or force their rights upon princes and kings, smaller and more numerous political units came into existence. Common to these accounts is the idea that variation in the economic resources available to these groups explain the type and size of state capable of existing. Indeed, recent work has shown that geographically small and urban city-states could far easier and earlier construct financial instruments necessary to purchase the means of defense required to survive interstate competition (Stasavage 2011a,b).

A Single Dimension of State Formation

Clearly, the stark distinction described above, drawn here for explicative purposes, does not capture the true nuance and gradation with which both of

\[3\] A similar economic logic is used by Jeffery Herbst to explain the underdevelopment of states in sub-Saharan Africa (Herbst 1990, 2000). Here statelessness and weak control of territory are explained as a function of the economic incentives that leaders faced in establishing states. Because African geography constrained the development of large urban centers and allowed for easy exit of peripheral populations, would-be monopolists of violence had little incentive to capture and war over territory from which there was little to feasibly extract. Consequently, Weberian states existed only in the immediate urban hinterlands.
these factors interacted to produce observed outcomes. Moreover, in creating such a sharp dichotomy I beg the question, asking to what degree which each of these factors load onto a single dimension? The answer - the main argument of this book - is that for most of history capital and coercion, in the degree to which they explain variation in the number and geographic size of states, reduce to a single economic dimension.

Before the French Revolution, before the era of the mass conscript army, wealth could not only purchase the technologies of violence but also the manpower required to prosecute major wars. Rather than being an age when large states dominated militarily, this was a period where the population and natural resource advantages of territorial states provided little benefit in the production of violence. Just as they could use economic resources to purchase the most advanced technologies of coercion like siege artillery or firearms, leaders of states could, for a negotiated price, hire a Hessian colonel or an Italian condottiero and retain their men for a campaign season. It was by virtue of their economic capacity that city-states like Genoa and Florence or groups of independent towns like the Swabian league could raise armies that matched or even exceeded those of territorial states like France or England.

What is more, if economic resources largely determined the ability to project force, it is not clear that large territorial states held an advantage

4 Onorato, Scheve and Stasavage (2014) provide evidence that mass armies are the consequence of even later technological developments and did not arise until well after the French Revolution.

5 Literally “contractor”

6 For example, Genoa raised an army of 40,000 men in 1295 (Scammell 1981, p. 161) while in contrast the French army at the end of the Hundred Years War was estimated to be 14,000 (Spruyt 1994a).
over their smaller competitors. In fact, the opposite is likely true. The tax income of the Della Scala signoria\textsuperscript{7} in the fourteenth century, for example, was double that of England (Schumann 1992, p. 116). The revenue of Venice in the fifteenth century was sixty percent greater than that of France and more than double of Spain or England (Knapton 1988; Braudel 1982\textsuperscript{a}; p. 120). Moreover, geographically small and urban city-states could far easier and earlier construct financial instruments necessary to purchase the means of defence required to survive interstate competition (Stasavage 2011\textsuperscript{a, b}).

If the economic capacity of states best explains their ability to produce force, it follows that the empirical predictions of theories that emphasize an independent effect of war and war-making should not be borne out in data. Indeed, I show that, rather than being “an age of the territorial state (De Lagarde 1937),” the period between 1500 and 1800 was one in which small, economically advantaged, political communities not only persisted but remained the typical form of political organization.

**An Approach to Analytic History**

Besides presenting an accurate account of European state formation this book provides a template for conducting analytical history. It does this by bringing together the simplifying impulses of a formal historical narrative with an empirical strategy designed to systematically identify both the causal relationships and the mechanisms tying theory to outcome. By centering the empirical component of an analytic narrative within the framework of causality I pro-

\textsuperscript{7}Territory encompassing Parma, Lucca, and Modena
vide a much more complete test of the historical claims than previous work has done.

Indeed, up to this point previous attempts at evaluating theories of state formation have almost exclusively relied upon qualitative data or agent based simulation. The consequence of the former has been a reliance upon historically “important” cases to describe patterns of state formation. Most scholarship, having drawn inferences about patterns of state formation from a set of well known cases, has disregarded the vast number of small and largely forgotten states which historically have constituted the preponderance of political units we would identify as states. Scholars interested in understanding institutional selection have selected almost exclusively states understood to be “Great Powers” in order to both develop and test their theories. As such, many of the conclusions reached by this literature are biased.

In order to avoid systematic distortions of this sort I have constructed a panel dataset, measured in five year intervals, describing the size and geographic location of every European state between 1100 and 1790. In the first chapter I introduce these data. I begin by proposing a definition of the state and then a coding scheme by which to judge its presence or absence. In doing so I recognize two constraints on the positivist study of the state. First, an ideal definition would identify units that most scholars recognize as states. That is, such a definition would match the theoretical conception of statehood that most of those studying comparative politics, international relations, or sociology maintain. Second, such a definition would provide an immediate

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8For examples of the latter see Cederman (1997) and Boix, Codenotti and Resta (2011).
and replicable coding scheme with which an empirically oriented scholar could reproduce the data collection process I have undertaken.

I start from the Weberian ideal, strip from it those features that make it empirically unobservable, and arrive at the following definition: *states are the human communities that maintain a quasi-monopoly of coercion*. I then propose three observable criteria by which to judge whether such a quasi-monopoly exists. Next, I show that three proposed alternatives to the territorial state - feudalism, leagues, and universal empires - entities that some have argued represent fundamentally different types of political organization - can all be incorporated into my coding scheme.

**The Evaluation of Bellicist Claims**

With these new data the first empirical component of the book examines the claim that changes in war-making led to the consolidation and dominance of large territorial states. These arguments have two parts each of which I address separately. First I address the hypothesis that tactical or technological changes to the production of large-scale military violence led to increases in the costs and scale of warfare. Examining data from a series of cases most likely to have undergone these substantial changes, I show that the hypothesized effects either entirely disappear or are substantially attenuated when adjusted for inflation and population growth.

Next, I show that several commonly held beliefs linking changes in patterns of war to processes of state formation are likely unwarranted. I demonstrate that rather than declining over time as bellicist theories would predict - shrink-
ing as the costs of war increased, the number of states was relatively constant over the period of inquiry. Then, I show that the “age of the territorial state,” a period that historians locate between 1500 and 1800, did not exist. Once the entire distribution of states is considered I find that, in contrast to the predictions made by bellicist theories of state formation, the typical state declined in size during the period associated with the military revolution. Last, I show that the relationship between geographic scale and state survival is negative, the exact opposite of what martial theories of state formation predict. That is, small states survived at rates greater than larger states.

I conclude this portion of the analysis by noting the confluence of regional variation in the number and size of states and the reemergence of towns and cities during the first half of the last millennium. Within a highly productive and urbanized central band of geography running roughly from the Low Countries through the Rhineland and into Northern Italy the number of states increased and the typical state declined in size over time. However, outside of this central corridor the opposite occurred. In the periphery the typical state increased in size and total number of units declined.

An Economic Theory of State Formation

To make sense of this pattern I develop a game theoretic model of preindustrial state formation that simultaneously accounts for geographic and temporal patterns in the number and size of political units. Viewing states as wealth maximizing agents in competition with each other for control of valuable territory, I demonstrate that even when states exist in anarchic competition with
each-other, economic geography, e.g. the spatial distribution of economic resources available to be plundered, and variation in the technologies available to produce economic output have profound effects on the equilibrium number and size of independent units. I provide two basic results. First, new states will be more likely to form in the wealthiest regions. And second, wealthy states will be less likely to expend effort on conquest and, therefore, will be small.

In the short run I treat the number and initial location of states as given. Taking location as given, states then divide their effort between the extraction of economic output and combat over territory from which economic output is extracted. Contrastingly, over the long run I assume states’ capacities to produce military force are fixed and instead treat the number and location of states as being endogenously determined. In both models I obtain a common result: even in a world where states are involved in military competition for control of territory, states wealthier in per capita terms will be smaller.

This result occurs in the immediate term because wealthier states face a steeper trade-off in the use of resources for conquest. That is, the marginal unit of effort devoted by advantaged states to conquest brings in increasingly small amounts of economic resources. In contrast, for disadvantaged states every additional unit of effort devoted to combat brings in increasingly more resources. As a consequence, the points at which the two states are indifferent between devoting effort to extraction or conquest varies with the initially disadvantaged state being willing to devote more effort to combat than its wealthy counterpart. That is, states disadvantaged in production have a comparative
advantage in conquest. With this result I fill a theoretical blind-spot that previous accounts do not explain, providing an explanation for why wealthy, small, states, capable of purchasing coercive means, failed to expand despite a clear ability to wield sufficient military force.

In the long run, when the number of states is not fixed, the behavior of existing states is disciplined by the possible formation of new independent political units on their territory. When the costs of forming an independent state are sufficiently high then existing states will be able to thwart the formation of new states. However, conditional on these costs being low, new states will form - but only in the most productive places, e.g. those locations that will yield the greatest payoff from achieving statehood. Latent political groups will not be willing or capable of forming in places that do not provide them the material resources needed to sustain themselves in competition with other states.

**Testing the Theory’s Empirical Implications**

The next portion of the book evaluates the empirical implications this theory. I begin this task by showing that in the places where urban life reemerged during the first half of the last millennium, in the places where towns and cities formed, more and smaller states formed. Using paleo-climatic data describing historical variation in the propensity of some places to grow cereals like wheat, foods that can most easily sustain large populations, I am able to show with an instrumental variables approach that the relationship between urban growth and political fragmentation is causal. In demonstrating this, I show that one
of the main predictions of the model holds. That is, in those places with the
greatest economic surplus, in this case measured by cities, the greatest number
of states formed. The prosperous European core became increasingly urban
and, because of this, increasingly politically fragmented. In the periphery the
opposite occurred, retarded economic development prevented the fragmenta-
tion of political rule.

I then test the second implication of the model, that changes in the relative
economic productivity of states caused their boundaries to expand or contract.
To accomplish this I exploit, with a difference-in-differences approach, changes
over time in patterns of trade. I show that states with initially advantaged
geographic locations relative to existing trade routes grew increasingly large
following shifts away from these initial patterns of interstate commerce. Specif-
ically, I compare changes in the geographic size of Mediterranean and Atlantic
trading states and show that following the decline of the Eastern trade (and
the concomitant rise of the Atlantic), Mediterranean states grew relative to
those states that gained from access to the New World. In this way, we can
better understand the rise of larger territorial states in Italy like Ducal Tus-
cany and the expansive Venetian Empire; commercial elites’ advantages in
trade declined, forcing them to turn to conquest as a means of enrichment.

**A City-State Advantage (And Its Decline)**

The last section examines the effect of political boundaries on economic perfor-
mance. Here, I provide two results that indicate a city-state advantage. First,
I find that before the French Revolution political fragmentation was positively
associated with the efficient allocation of goods across space. Contrary to standard theoretical accounts - and the opposite of empirical estimates of border effects in the nineteenth and twentieth centuries - I show that cross-city prices of uniform commodities converged when cities were separated by interstate borders.

In other words, independent pairs of cities more efficiently allocated goods between each other than they would have if each city were part of the same political unit. There are two reason this statistical result appears in the data. Under the Old Regime territorial states maintained a patchwork of juridical, customary, and, importantly, local rights that inhibited internal trade. Moreover, when leaders added new territory to their existing territorial dominion, they hardly ever treated the new territorial acquisitions as political or economic equals. That is, conquest and expansion was followed by extractive behavior, again limiting efficient trade.

Next, I examine the consequences of territorially fragmented rule on city-growth. Using the ninth century breakup of the Lotharingian Kingdom as a spatial discontinuity, I compare the growth of cities just within the Lotharingian boundary that, for reason of historical accident, existed in small states to the set of cities just outside of the boundary which were more likely to exist in large states. In doing so, I demonstrate that before 1790 there was no advantage of state size on the number and size of cities.

However, the removal of both internal barriers to trade and local feudal prerogatives as well as the empowerment of the commercial bourgeois - across the continent outcomes associated with French intervention and the Napoleonic
wars - altered the incentives to construct and maintain large states. After the French Revolution, not only was geographic size positively associated with growth but, as a consequence, military dominance as well. As a result, large states came to win out over their smaller competitors.

The Plan of the Book

The first section is divided into three chapters and is devoted to the evaluation of bellicist theories of state formation. In the first chapter I present a minimalist definition of the state. In the next chapter I introduce a dataset describing the size and location of every state in Europe between 1100 and 1790. Using these data to describe patterns of state formation across time and region, it then suggests that bellicist theories alone cannot account for the observed data. That is, I show that theories of war-making by themselves are insufficient to explain observed patterns of preindustrial European state formation. In Chapter 3 I then assesses the hypothesis that technological and tactical innovations led to increases in the costs and intensity of warfare and show that these claims are greatly exaggerated.

Over the next three chapters the next portion of the book develops and tests my theory of state formation. The first chapter in this section present a simple game theoretic model of state formation from which two main empirical implications are drawn: First, states will form more frequently and be, on average, smaller in the most economically productive places. Second, the decision to allocate resources towards expansion is a function of the relative
advantages states have in producing economic output; for states advantaged in production the marginal unit of effort devoted to conquest brings in relatively less output than that for their disadvantaged counterpart. As such, they will devote less effort to conquest and be smaller.

The next two chapters empirically evaluate these theoretical predictions. Chapter 5 tests the theory’s first implication by exploiting the random ability of some places to feed large populations as an instrument to identify the causal effects of urban growth on political fragmentation. I show that in places where urban growth occurred and where social groups associated with craft manufacturing and technological development took root, more states formed. Chapter 6 evaluates the second empirical implication of the theoretical model. I show that as predicted by the model, major changes in the patterns of trade - the decline of the Eastern long-distance overland trade and the rise of Atlantic - caused observed changes in the size of states. For those Mediterranean trading states, the decline of the overland trade led to the construction of increasingly large, territorial, states.

The last section of this book explores the consequences of historical political fragmentation for two outcomes, demonstrating a city-state advantage that persisted until the nineteenth century. In Chapter 7 I explore the consequences of fragmented political authority on the development of unified markets. Using historical price data I show that, contrary to standard theories, political unification caused divergences in prices, indicating large national markets did not allocate goods efficiently across space. Then, exploiting the breakup of the Lotharingian Kingdom as a spatial discontinuity, I show that very similar
cities some randomly located in large states and others in small states grew no differently.

I conclude by arguing that political changes, largely the consequence of the French Revolution and Napoleonic wars, altered the economic incentives leaders had to produce large states. The removal of the old regime privileges, the creation of powerful bourgeois classes, and the elimination of internal barriers to trade ultimately fostered economic returns of geographic scale. The possibility of Smithian growth of this sort ultimately led to the creation of large territorial states in the nineteenth century.
Chapter 2

Observing and Measuring the State

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Ultimately, one can define the modern state sociologically only in terms of the specific means peculiar to it, as to every political association, namely, the use of physical force.
- Max Weber, 1919

What States Are (And Aren’t)

In order to chart the evolution of the Europe state, a definition and coding scheme capable of identifying which political organizations do or do not constitute states is required. Accomplishing this undertaking in a manner concurrently satisfying to comparative political scientists, scholars of international relations, sociologists, and economists is near impossible. Indeed, for every book or article written on state formation there exists nearly as many conceptualizations of statehood and, not infrequently, these distinctions lead
to incompatible and conflicting theoretical and empirical conclusions. This is a result that occurs not because of variation in data quality or empirical approach but because of this crucial difference in the understanding of the state.

With this in mind, what is a positivist scholar of state formation to do? I begin constructing a definition of statehood by recognizing two often opposing constraints. The first is that any definition should satisfy the greatest possible fraction of social scientists’ abstract theories of the state. That is, it would serve as an ideal type to which observed polities could be compared. Secondly, in making these comparisons the such a definition should provide an intuitive coding scheme leading to a straightforward operationalization of observed political units as states or non-states. In combination the right definition would capture entities recognized as states in a systematic way enabling replicable statistical analysis. I divide this task in two, first I outline a satisfying theoretical definition of the state and then I construct a set of observable criteria by which it can be operationalized, thus producing a useful coding scheme that will inform my empirical analysis.

To construct a workable definition I return to Weber’s treatment of states as political communities that “(successfully) claim a monopoly on the legitimate use of physical force within a given territory.” So to reflect empirically observable phenomena rather than a non-existent ideal type, I alter this definition in two important ways. I define states as the organizations that maintain a quasi-monopoly of violence over a fixed territory. That is,

\[1\] For an excellent historiographical review, much of which this section draws upon, see Davies (2003).
states are the organizations that have a clear preponderance of the coercive means over some geographically defined unit.

I have done away with the requirements of legitimacy and of a strict monopoly over the use of force. The notion of legitimate government is nearly impossible to measure and is itself a contested theoretical concept. Moreover, because no state in human history has ever maintained a true monopoly over the use of force, I do away with this overly stringent requirement. Even the strongest states face regular incursions and rivals to their exclusive control of violence.

Moreover, my definition of states as quasi-monopolists of violence recognizes the fact that political communities which reasonable coders would identify as states existed before juridical notions of sovereignty. As Weber does, I define states by their means, cognizant of the fact that legal claims to domination have throughout history coexisted with other forms of traditional and charismatic rule. This is to say that states were not formed at Westphalia nor Augsburg but were at best recognized within a new legal framework. I do not claim that juridical statehood is unimportant for the study of politics but, rather, that such a coding scheme would fail to capture political organizations like France, Venice and England let alone older entities like the Roman or the Han Empires that existed as coercion monopolizing entities long before 1648 or 1555. In the words of historian H. J. M. Claessen, we have no reason to consider “the realm of the Aztecs, the Mongol Empire,...or the late Roman em-

2For a discussion on the contested notion of state legitimacy see Beetham (1991), O’Kane (1993), Beetham (1993), Simmons (1999)
3See Krasner (1999) for a more complete discussion of internal control, external recognition, and Westphalian sovereignty as useful analytic tools
pire qua political structure as qualitatively different from, say, France, Spain or England in the fifteenth century. They were all states, varying from early to mature (quoted in Skalnik 1989 p. ix).” This is to say, that I am not interested in measuring the development of the international system as a network of external and mutually recognized sovereignty. But rather, the object I identify with statehood is the political entity that, comparably across human history, has maintained the preponderance of coercive capacity.

How might one distinguish the presence of this quasi-monopoly of violence from its absence? I provide three empirically observable criteria by which I distinguish states from non-states.

1. **Direct Military Occupation**

   If a political unit is militarily occupied by a foreign power, according to my coding scheme it ceases to exist as an independent state. Similarly, if a political unit successfully conquers a piece of territory, this newly occupied territory is treated as a part of the conquering state. For example, when the Ezzelino or Pallavicini families were able to effectively wield military control over several Italian city-states I code the amalgamation of these units as a single state. Analogously, when military orders like the Teutonic Knights or the Knights Hospitaller conquered well defined territories these new units are coded as independent states. Similarly, when the Castilian-Aragonese state drove the Moors from Grenada, the Emirate of Grenada ceases to be coded as an independent state and its territory gets coded as part of Castile.
2. **The Capacity To Tax**

Expropriative power, the ability to take from another that which she owns, is the coercive authority most associated with statehood. Formal expositions of states as wealth maximizing actors, as “stationary bandits” or organized criminal organizations, underscore this crucial aspect of state violence: states “steal” from those they govern. Moreover, the ability to extract is the key feature of state power driving several recent and influential theories of political transitions (Boix 2003, Acemoglu and Robinson 2006). In these theories it is precisely the ability of the state to extract that actors - economic classes in these models - enter into conflict to control. As such, I take the capacity to tax as evidence of the state’s quasi-monopoly of coercion. So, for example, when Worms (1184) or Lubeck (1226) demonstrably gained rights to collect taxes and tolls within their boundaries I code them as independent states.

3. **A Common Executive**

Recognizing that many states during the time period studied were “composite” entities, composed of political units which maintained semi-independent bureaucracies, parliaments, and other separate political institutions (Nexon 2011), I treat those sharing a common executive as a single state. Coding states this way treats the holdings of Imperial families as a common state rather than distinct units. So, for example, all of the territory held by the head of the Wittelsbach family - at various points including the Counties of Holland, Hainaut and Zeeland,
as well as the Duchies of Jülich and Berg - all get coded as a single state. However, as the family split territory amongst its various cadet branches - first between the Bavarian and Palatinate and then the numerous further divisions - each is treated as a distinct state. However, when, as in 1777 the Bavarian line died out and merged with the Palatinate branch they again get treated as a single state.

Based upon these criteria we arrive at a clear coding scheme for which political units constitute independent states and which do not. If all three criteria are met I treat political units as independent states. If they are not, I do not. This further allows flexibility in later empirical analysis by allowing for less strict coding schemes where we can assess the empirical results using permutations of the three criteria. Moreover, this scheme enables us to better characterize historical “alternatives” to the state. In doing so, we see that these alternatives are not really alternatives to the state at all but, instead, reflect variation in the geographic scale of political organization. This is to say, if what distinguishes various forms of states, e.g. leagues or city states, from modern territorial states is the degree to which they centralize political authority, my coding scheme captures this type of fragmentation of rule.

**Operationalization**

This section outlines how data measuring the life cycles of states - when they first appear and when they cease to exist - as well as each unit’s geographic scale is has been collected. I detail the construction of a longitudinal data set
Figure 2.1: The Political Boundaries of Every European State in the Year 1650.
measured in five year panels capturing all political boundaries between 1100 to
1790 in the area east of Ireland, west of the Volga, and north of Malta. That
is, these data cover the part of the Eurasian landmass roughly conceived of as
Europe.

The starting date is chosen for reasons of availability and accuracy. Before
this period I am unable to confidently measure size and existence for a large
number of known political units. The end date of the study is chosen for
substantive reasons. With the French Revolution came several concurrent
phenomena that altered and constrained the processes by which new states
formed and existing states perished, each substantively distinct but, given the
sparsity of data, difficult to econometrically distinguish from each other. The
adoption of mass warfare, the creation of strong and operative nationalisms,
and the industrial revolution concurrently and in causally interrelated ways
altered the processed driving state formation and serve as a natural bookend
to the study and warrant separate scholarly attention.

Following the coding scheme of outlined above, I treat states as the enti-
ties where all three necessary criteria are satisfied. With this coding scheme
the data are constructed by manually geo-referencing several sets of histori-
cal maps. Two of the main sources from which the base GIS boundaries are
constructed are the Centennia Historical Atlas [Reed 2008] and the Euratlas
[Nussli 2010] Digital Atlas. The Nussli data are measured in 100 year inter-
vals whereas the Reed atlas utilizes a much more high frequency approach,
recording observations in tenths of years. I use the boundaries as defined by
both datasets aligning them at every hundred year mark based upon the coding
scheme defined above. The Nussli data matches the Reed data nearly perfectly at these points. Where there are discrepancies it is usually because the Nussli dataset takes observations from a window surrounding each panel and not a snapshot exactly at the one-hundred year point. Because the Reed data is not geo-referenced I construct shape files that are compatible with GIS analysis by manually constructing the boundaries from re-projected images provided by the atlas and then referencing each observation using the European Albers Equal-Area projection system.

The Nussli data have been used in several recent publications appearing in the *American Political Science Review* and are considered highly accurate (Stasavage 2011a, b; Blaydes and Chaney 2012). Nevertheless, even after combining the data from these digital sources there are still a number of imperfections; units I code as independent states are absent from the reconstructed shape files. These tend to be small independent principalities, ecclesiastical units, and city-states that were not picked up by the historical geographers who created the digital reproductions from which my maps are constructed. In order to rectify these flaws and prevent the ensuing selection problems that would plague the subsequent statistical analysis, I turn to a number of historical and contemporary primary source maps to create high frequency boundary changes for these missing units.

This combination of secondary and primary cartographic sources allows me to project the boundaries for all political units that meet the coding criteria. Using known pieces of physical geography, known political boundaries, and the location of cities and towns to properly reference these maps, I create shape
files that, with a high degree of accuracy, reflect the geographic scale of each unit. For each unit I track the history of their boundary changes - expansions and contractions - and adjust the shape-files accordingly. In order to provide a more detailed description of the procedure I walk through the creation of the shape file for part of Nassau between 1159 and 1328.

The town of Nassau dates to at least 915 and was founded by Robert the son of Dudo-Henry of the House of Laurenburg. The Laurenburgs built Nassau Castle in 1125 and established the County of Nassau in 1159 - effectively claiming rights of taxation, toll collection, and justice. As such, Nassau enters the dataset as an independent state as of 1160. The County (later Principality) of Nassau exists in the digital base maps from this point, giving an accurate measure of its boundaries and size. However, the digital source maps fail to record the dissolutions and mergers of various component units of Nassau, of which nearly all meet my coding as independent states. I manually make these corrections as described below.

For 96 years Nassau existed as a single independent state. Upon the sale of Weilburg to the Count of Nassau in 1255 the territory was split between the two sons of Henry II with Otto I receiving the territory north of the river Lahn and his older brother Walram II receiving the rest. Using this geographic boundary as the dividing line I create the Counties of Nassau-Dillenburg and Nassau-Weilburg, respectively. Dillenburg remained a single state until Otto’s death in 1303 after which Nassau-Dillenburg was divided into three units, splitting off Siengen and Hadamar from the initial unit. The boundaries of

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4The true “Old Nassau.”
Figure 2.2: The Construction of Nassau between 1160 and 1303
these new states are constructed using the boundaries as they exist on several historical reproductions and one primary source map (Blaeu et al. 1990, Franz 1952, Hockmann 2005). Using the known latitudes and longitudes of the cities of Siengen and Hadamar I then can reference the projected images from the historical reproductions using points representing the locations of these cities. From here, using these points and the boundaries of pre-existing Nassau-Dillenburg we can create the boundaries and subsequent shape-files for each of these new units. These three states remained independent until Siengen conquered Dillenburg in 1328 and then Hadamar in 1394.

To create a perfectly coded dataset one would have to acquire country and period expertise on far too many places and eras than is practically possible for any one individual to obtain. However, I believe that the data, as is, represents the best a generalist relying upon a secondary literature can hope to accomplish. As for any mistakes that might exist, I expect them to be orthogonal to traits correlating with the outcomes of interest and as such should not systematically alter the conclusions drawn from these data.

Alternatives to the State

Spryut (1994b) identifies three “alternatives” to the state: feudalism, the Holy Roman Empire, and leagues of city-states, each of which he argues represent institutional arrangements fundamentally different from states. While these arrangements may represent ways of organizing a polity, a great deal of recent historical scholarship on political organization in the medieval world confirms
that, although there was substantial variation in the institutional makeup of political life before 1500, states were the dominant form.\footnote{For example, see Given \citeyear{1990}, Campbell \citeyear{2000}, Innes \citeyear{2000}, Wickham \citeyear{2005}, Maddicott, Palliser and Campbell \citeyear{2000}}

Following Reynolds \citeyear{1997a} I seek to disabuse the reader of the notion that “only modern states are true states.” As encouragement in this direction, I show that each of Spruyt’s proposed alternatives can be accommodated within my framework and are, analogous (though imperfectly so) to contemporary institutional forms we understand as non-states. That is, I show that these alternatives are not truly distinct forms of political organization but, instead, represent institutions actively constructed by states.

**Feudalism**

Consider the following:

\begin{quote}
A system of government based upon a hierarchy of legal status wherein some levels of the hierarchy maintain rights to govern in some policy dimensions and other levels maintain rights in some over some other subset of the policy space. These overlapping jurisdictions, though legally defined, are often ambiguous and consequently result in competing claims of authority.
\end{quote}

One could read this as a reproduction of historian Joseph Strayer’s understanding of feudalism, the basic characteristics of which is “a fragmentation of political authority, public power in private hands,” existing only when “rights of government (not mere political influence) are attached to lordship...\cite{1956, 1965}.” Similarly, one could view this hypothetical as a restatement of William Riker’s definition of federalism “as a political organization in which
the activities of government are divided between regional governments and a central government in such a way that each kind of government has some activities on which it makes final decisions."

Though these strict definitions of feudalism and federalism lack the ambiguity and conflict over authority provided by my hypothetical, in reality both institutional arrangements are (were) characterized by substantial contestation between the various claimants to power. Just as the various component units of the United States fought a civil war over, essentially, the locus of political authority, military conflict between lord and vassal - kings and dukes - was not infrequent in feudal society. Still it is clear that the fragmentation of authority does not prevent us from identifying modern federal polities like the United States as a single state.

Why then is it that some classify feudal polities as something completely distinct from modern states? A likely answer is that for modern federal polities most social scientists can clearly identify the level of a given legal hierarchy at which the preponderance of de facto coercive capacity rests. For many feudal polities this is a far more difficult task, not because of any substantive difference but because the data needed to assess the medieval world is less readily available. The result is that these same social scientists end up describing feudalism as a fundamentally different institutional arrangement than that of statehood I have outlined.

Indeed, the very concept of feudalism has been treated by many historians of the medieval world as an improper catch-all describing an inexact and inaccurate description of political, social, and economic institutions - each of which
displayed substantial variation across time and space (Brown 1974, Reynolds 1994, Bisson 1994). In the language of English legal historian F.W. Maitland, “feudalism is an unfortunate word,” given the “impossible task” of amalgamating and describing a set of widely variegated social institutions. As such, the concept should, in the least, be modified in favor of analysis and description of the particular institutions subject to inquiry. Following this logic, I take the study of political authority in the medieval world as an independent line of inquiry not dissimilar from the study of political authority in later periods. Using the same approach to identify those political communities that maintain a quasi-monopoly over the means of coercion we can identify states in the medieval era as we do in the modern era. The difficult task is to collect the appropriate data to properly identify at which level of feudal hierarchy this quasi-monopoly was maintained.

Lest one believe in taking this approach I am committing an anachronistic misdeed, note that feudalism itself is as a post-hoc concept conceived of by eighteenth century legal scholarship, appearing first as “la féodalité” in the Comte de Boulainvillier’s Histoire des anciens Parlements de France in 1737. Rather than following the convention of a commonly used but anachronistically defined term, in treating states as defined by observed coercive abilities I arrive at an object that is consistently measured across time and, moreover, which still captures the fragmented nature of authority that many contend typifies feudal society.

With this framework in mind the question becomes empirical. For example, although in a nominal sense the King of England, by virtue of his holdings in
Normandy and Aquitaine, was the seigniorial inferior to the King of France, the question of England’s statehood is defined by the his ability to coerce relative to all others over some span of territory. This can be evaluated using the existing historical record. In this instance it is obvious that the English Kings held the quasi-monopoly of violence over both Normandy and Aquitaine through least through the fourteenth century - it taking the Hundred Years war and subsequent direct military occupation by the French to drive the English from these territories. Similarly, once having identified the relevant units for all of Europe one can then classify each as an independent state (or not) based upon the same criteria.

The Holy Roman Empire

Universal empires like the Holy Roman Empire differ from states in the manner by which they make claims of authority across geography (Spruyt 1994b p. 102). These empires viewed themselves as the singular entity with the right to govern the world or some subset of it, Christendom for example. They often reinforced these claims by combining secular rule with religious authority with the Emperor as head of both empire and church. By this logic the relationship between universal empire and territory differed from that of states in that they did not recognize boundaries of authority. If you rule over all of Christendom or all of the world, territorial borders are meaningless. Though the Emperor may have had factual limits to their power, they still denied, in a conceptual sense, the right of others to rule.
As an extreme modern example consider Belgium in 1942. There existed a government (in exile) elected by the Belgian people as well as a King (also in exile) who was for over a hundred years prior considered sovereign. Despite Nazi occupation, these actors still claimed to rule. Should we code Belgium as an independent state based upon these facts? To do so would not reflect reality and would, by most reasonable measures be considered false.

This distinction between states and the Holy Roman Empire is flawed for two reasons. First, a classification scheme that rests on claims to rule rather than empirical evidence about the true distribution of power would lead to often perverse and empirically inaccurate codings. Second, it is clear that the Emperor and his contemporaries were quite aware of the geographic limits of the Empire’s territorial rule. Within the Empire Imperial rule was bounded geographically in both de jure and de facto terms. Moreover, in similar ways the Empire’s external boundaries were constructed to define the limits of Imperial rule.

In his treatment of the Holy Roman Empire Bryce makes the distinction between territory held 1.) alodial by the Emperor 2.) by other actors (princes, bishops, dukes, etc.) but still within the Empire. 3.) foreign kingdoms that paid some nominal recognition to the Emperor and 4.) the rest of the world. He, just as contemporary political actors, distinguishes between areas of direct imperial control, direct princely control, and all other places (Bryce 1920, p. 202). Indeed, for almost a millennium, one would only have to read the inscription on the walls of the town of Rendsburg, located on the
banks of the Eyder - *Eidora Romani Terminus Imperii* - to recognize the very real geographic limits of the Holy Roman Empire. These were limits actively constructed by political actors, this particular boundary having been created by King Harold “Bluesooth” of Denmark and Emperor Louis the Pious at Metz following Harold’s conversion to Christianity in 826 ([Turner] 1872, p. 195). This act established the boundary between Denmark and the German Empire, a border which lasted nine hundred and eighty years until Holstein’s cession to Denmark following Napoleon’s breakup of the Empire.

With respect to the known internal geographic limits of Imperial rule, it is clear that Emperors and other actors within the Empire would regularly inherit, disinherit, and sell territories immediately under their control, taking on or losing along with title the right to govern and collect taxes. To conduct this type of transaction it is necessary to have fairly well defined notions of the rights that are being gained or lost as well as the boundaries of over which these rights are defined. So, when the house of Luxembourg acquired the Kingdom of Bohemia in 1309 it retained rights to govern, principally to collect revenue, over a precisely defined piece of geography. Similarly, in 1411 when Emperor Sigmund gave Brandenberg to Fredrick the sixth Margrave of Nuremberg in exchange for past monetary support, an exact financial value of 400,000 Hungarian gold gulden was placed on the transaction ([Carlyle] 2008, p. 154).

Formal internal distinctions between nominally enfiefed territories and the boundaries associated with these places further demarcated the limits of polit-

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6 “The River Eyder is the Border of the (Holy) Roman Empire.”
ical rule within the Empire. By the end of the thirteenth century an increasing number of these units acquired de facto independence from Imperial rule to such a degree that even petty magnates who previously swore “fealty to only God and Emperor eschewed themselves equally of both powers” maintained “full jurisdiction... rights of legislation, privileges of coining money, levying tolls and (collecting) taxes (Bryce 1920; ch. xiv).” They were, by my definition, independent states. Indeed, “along the Rhine even the Lord of a single tower was often almost an independent prince (ibid).”

Concurrent with the achievement of de facto statehood these units were afforded a legal status within the Empire that recognized the right of allodial holders of territory to act as-if sovereign over their lands. The first of these legal acts the Confoederatio cum Principibus Ecclesiasticis, issued in 1220 by Emperor Fredrick Barbarossa, recognized the legal rights of ecclesiastical princes to govern independently of the Emperor. Subsequently, this new legal class was extended to include all territorial lords in 1232 with the Statutum in Favorem Principum. There is little doubt that the creation of a new legal status for these units allowed them to behave in new ways, often contrary to interests of the Emperor. Despite the new institutional advantages created by these legal reforms, these changes occurred, for the most part, as a response to de facto shifts in power and were not their independent cause.

In summation, the Holy Roman Empire - both internally and externally - had well recognized boundaries that reflected the true distribution of coercive power as well as contemporary actors’ perceptions of this distribution. As
such, for the Holy Roman Empire, using the historical record, we can properly classify its constituent units as states.

City States and City Leagues

There is little doubt that city states maintain the key feature of Weberian statehood, the quasi-monopoly of coercion, differing only from modern states in geographic scale. Still, even on this last measure many units typically classified as city-states were quite large. The area controlled by Venice, for example, was in the top decile of state sizes from 1400 onward. Nevertheless, during the late mediaeval and early modern periods only some of these small states could independently wield substantial military power. Where these small political communities could not project considerable force they formed leagues to jointly provide protection.

Although leagues like the Hansa were far more than a loosely bound affiliations of towns centered around the regulation of trade they did not represent a fundamentally unique and alternative to the state. In other words, although there is little doubt that these confederations of cities and towns represented adaptations to pressures of war and the expansion of trade, they do not represent a conceptual substitute to statehood. Instead, they more closely resemble modern day international organizations in that they were a rational and cooperative response of states facing anarchy (Axelrod and Keohane 1985, Keohane and Martin 1995, Oye 1986).

First, consider the activities that leagues undertook: the provision of collective security and the creation of enlarged markets. These aims are exactly
the type of quasi-public and club goods that liberal-institutionalist scholars of international relations ascribe to international organizations (Kehoane 1984, Abbott and Snidal 1998, Lake 1996, Koremenos et al. 2001). Just as twentieth century states rationally constructed international organizations like the World Trade Organization or the North Atlantic Treaty Organization to promote goals like free and trade and collective security, the cities and towns of the Hansa and other leagues, under the constraint of anarchy, created institutions to promote similar economic and political goals.

Second, consider the difficulties leagues faced at creating compliance amongst their members. Although many leagues could raise revenue and punish non-compliant members, in general these powers were limited and were closer to those of international organizations than to those of independent states. Indeed, many international organizations maintain formal measures for dispute resolution. For example, the WTO and International Criminal Court each provide its membership with a series of institutionalized procedures that take on a legal form and which are intended to punish non-compliance. The creation of constraining institutions like these is simply the rational response to the absence of third party enforcement in the international arena. However, although they existed, these mechanisms of compliance, as they are for modern international organizations, were quite limited. That is, like modern day international organizations, leagues facilitated cooperation among members through reputational mechanisms (Ewert and Selzer 2006, Greif, Milgrom and Weingast 1994).
For example, with respect to generating revenue, like modern international institutions, leagues could not directly tax. Instead they relied upon the voluntary compliance of individual member cities to obtain revenue. Typical of these organizations, lacking a third party enforcement mechanism the Hansa could at most expel member cities who failed to comply with calls for revenue and other league-wide policies (Fink 2011). The absence of third party enforcement is similarly evidenced in leagues’ conduct of military affairs. The Hansa and other leagues were certainly capable of projecting military force, fielding armies able to do combat with large territorial states like Sweden, England, Denmark, and Holland. For example, at the height of its powers the Swabian league could support armies rivaling those of any major power. In 1385 it raised an army of more than 12,000 infantrymen and 1,200 calvary (Laffan 1957). However, this capacity towards arms is not different from those of collective security organizations like NATO or the Warsaw Pact. And like these organizations the ability of leagues to wage war was similarly circumscribed by their inability to coordinate.

When, for example, the Hansa waged war against the Danish Crown in 1360 it could not compel all of its member states to participate in the conflict (Dollinger 1970 p. 70). In the Swabian league’s defeat at Doffingen in 1388 we find further evidence that leagues were analogous to institutions composed of independent states with limited third party enforcement. In this battle, because the consent of the forty-odd commissioners (representatives of the individual cities) was necessary to execute any tactical maneuver, coordination on the battlefield was made so difficult that the allied Lords the league was op-
posing were able to emerge victorious despite substantial numerical inferiority (Zimmermann 2009).

In summation, leagues were the rational response of independent states to economic and military changes taking place during the late middle ages. Independent city-states created this new institutional arrangement to provide club and quasi-public goods like collective security and to facilitate economic exchange. However, just as with any international institution, and despite the construction of measures to punish defection, the members of leagues faced an inability to commit to the provision of the very public goods that they were intended to produce.

With little doubt leagues, city-states, and universal empires represent distinct institutional configurations. However, by treating them within the same conceptual framework I am capturing the key feature that distinguishes each these from the others; the degree to which they monopolize violence. In other words, the coding scheme I have produced captures the ways in which these institutions represent centralized versus fragmental political authority.
Chapter 3

Case Selection, Bias, & The Evolution of The European State

The panorama of the past is indeed studded with greatness but it is filled in the main with lesser powers....
- Davies 2012, p. 5)

Using a new dataset describing the size and location of every European state between 1100 and 1790 I describe the evolution of the European state system before the French Revolution. In doing so I bring to bear empirical evidence that questions several commonly held beliefs about the development of the modern state. Additionally, I show that much of the previous scholarship on the origins of the territorial state has selected cases in a biased manner, choosing observations that were extremely large relative to the entire distribution of outcomes. In doing so, I show that empirical implications of theories that emphasize the role of war-making on processes of state formation
I begin by showing that over the entire period of inquiry the distribution of states is highly skewed. Like many social science data, the size of states is generated by an asymmetric process that produces outlying units far greater in size than we would expect if the data generating process was symmetric. Moreover, the heretofore lack of systematic data representing the entire universe of outcomes has led much of the literature on state formation to rely upon close historical readings of a select few cases. Historical analysis of this sort has generally relied upon research designs which have selected cases in a biased manner, emphasizing those units considered important for a number of reasons unrelated to size but which are the extreme outliers skewing the data.

The second half of the chapter shows that by using the tail end of the distribution to draw conclusions about general patterns of state formation, much of the literature has over-emphasized the role of war and war-making. I do this by demonstrating two implications of war-making theories are not borne out when confronted with data describing the entire distribution of states.

First, I question the notion that the military revolution - a series of dramatic changes to the technologies of violence caused by or exogenously contributing to changes in the frequency of war - significantly altered the number and size of states. I show that in contrast to the predictions made by bellicist theories the size of the typical state declined and the number of independent states increased during the period associated with the military revolution. In other words, rather than being “an age of the territorial state,” the period between 1500 and 1800 was one in which small political communities not only persisted but became increasingly typical.
Second, I question the notion that small units became increasingly incapable of surviving inter-state competition. I show that the relationship between geographic scale and survival probability is the opposite of what martial theories predict, finding that over this span small states were more likely to survive than their larger counterparts. Moreover, I demonstrate that the relationship between size and survival was invariant across time; the probability that a small state failed before, after, and during the period associated with the military revolution was statistically indistinguishable across time periods.

The remainder of this chapter is organized as follows. I begin by showing that the distribution of state-sizes is heavily skewed. Then, I demonstrate that when viewed relative to the entire distribution of states the cases used to link changes in patterns of war to processes of state formation have been extremely large outliers. Next, I conduct a series of statistical tests demonstrating that a.) the typical state declined in size over time, including during the period associated with the military revolution. b.) the number of states grew over time and remained roughly constant during this same period c.) geographic scale was negatively associated with a state’s survival probability and, moreover, this relationship did not vary over time.

To conclude, I explore regional variation in the number and size of states, presenting an empirical pattern to be explained in the remainder of this book: Within the Europe’s productive urban core, a corridor running from the low-countries, through the Rhine Valley, and into Northern Italy, small states formed and persisted - even during periods associated with large changes in
Figure 3.1: Density estimates of state size pooled across all years: untransformed and log-transformed state size.

the production of military violence. Outside of this central cordon, in Europe’s periphery, large territorial states emerged.

Outliers, Bias, and Inference

Very early on in graduate training social scientists internalize the injunction to never, ever, “select on the dependent variable.” Despite this, bellicist scholarship examining the rise of the modern territorial state has developed and tested theory based largely on the experiences of a few influential cases. While
historical import may be a proper method for selecting cases to descriptively trace causal mechanisms and demonstrate how particular equilibria are selected or evolve, such a method is not especially useful for making inferences with regard to general trends.

In other words, no matter how true Barrington Moore’s claim that, because “smaller countries depend economically and politically on big and powerful ones...the decisive causes of their politics lie outside their own boundaries (Moore Jr 1966 p. xix),” if we aim to explain why large territorial states came to dominate the international system we must consider the full distribution of outcomes, behemoth empires and lilliputian city-states alike. This is to say, in order to gain any analytic leverage on the origins of the territorial state we must compare large and successful units like France, Venice, or Russia alongside the “vanished” smaller kingdoms that no longer occupy our maps or consciousness’ but which have historically constituted the vast preponderance states. In this section I first demonstrate that the distribution of state size is positively skewed. Next, I show that those cases used to build arguments linking changes in the scale, cost, and frequency of war-making to the selection of large states are exactly those cases causing this skew.

To begin, note the lefthand panel of Figure 3.1 which plots the estimated density of state size in square kilometers, pooling all years together. Clearly, the data are heavily right-skewed, with more large states relative to what one would expect if than if the size of states were drawn from a symmetric distribution. These type of outliers are common in social-science data. For example, income, like state size, is positively skewed. Moreover, as with income, if we
were to simply measure the average, we might arrive poor conclusions with regard to what is typical. With data like these, an oft used and simple corrective is to assume that the data takes a log-normal distribution which, if correct, allows for better descriptive inference.\(^1\) In other words, by making this transformation we can better describe the trend in state size for the typical state. As is clear from the right-hand panel of the same figure where I transform the pooled data, the distribution appears approximately normal.

To gauge the appropriateness of this distributional assumption I plot the true sample quantiles of the log-transformed data against quantiles from a hypothetical normally distributed random variable with the same mean and variance as the observed data. If state size were normally distributed we would expect the sample quantiles to be on the line \(y = x\). Figure 3.2 gives these Quantile-Quantile (QQ) plots of both the untransformed state size in the upper panel and the log-transformed QQ plot in the lower panel at one hundred year intervals. As expected when we take the logarithmically transformed state size the QQ plots rest almost perfectly on the 45 degree line, a good indication that the data is, indeed, lognormal.

One might consider another transformation of the data designed to preserve rank, properly weight outlying cases, and create an approximately normal

\(^1\)Using a similar approach but examining only 1500 and 1998, Warren, Cederman and Schutte (N.d.) also find that in both years state sizes are distributed log-normally.
Figure 3.2: QQ Plot of Transformed and Untransformed State Size

The top row plots for the untransformed data theoretical normal quantiles on the $x$ axis against the sample quantiles on the $y$. The bottom row plots the same but for the log transformed data. Note that the transformed data sits nearly perfectly on the line $x = y$ whereas the untransformed data does not.
distribution, the Box-Cox power-transformation \cite{box1964}. This transformation is as follows:

\[
y_i^{(\lambda)} = \begin{cases} 
  \frac{y_i^{\lambda}-1}{\lambda} & \text{if } \lambda \neq 0 \\
  \log(y_i) & \text{if } \lambda = 0.
\end{cases}
\]  

Using the data pooled across all time periods I estimate \( \lambda \) to be -0.099, very close to a value of zero. This provides some additional evidence that a log normal transformation is appropriate. None of the substantive empirical conclusions drawn from this chapter are altered if I utilize a Box-Cox instead of the logarithmic transformation.

**Case Selection**

Regardless of the distribution from which the size of states was drawn and even in the absence of systematic data describing the entire universe of cases, if those studying state formation had based their work on a representative sample or had purposefully selected cases to make comparisons between small and large units, the effects of geographic scale could be estimated. This, however, has not been the case. In this section I demonstrate that the prominent cases used by historians to argue in favor of large, systemic changes in patterns of war-making were selected from the extreme end of distribution of states.

To begin, I first briefly outline the historical work on the military revolution and discuss how its conclusions have been incorporated into the literature on
the origins of the state. Then, I show that in borrowing from a historical literature the social scientists working on this topic have emphasized a particular set of extreme and outlying cases.

Changes in Violence Production, Changes in States Size

The debate among academic historians over the existence of an Early-Modern military revolution was instigated by Roberts (1956) who made the then provocative claim that between 1560 and 1650 changes in military tactics led to larger armies and the subsequent development of administrative states needed to field them. Infantry tactics promulgated by Maurice of Orange and Gustavus Adolphus established as the tactical frontier linear formations of infantry, supported by mobile artillery and cavalry, capable of projecting concentrated volley fire. These innovations demanded better trained and disciplined professional standing armies, demands that increased the financial burden governments faced in supporting these forces.

Pointing out that the infantry tactics Roberts viewed as being determinative had already been adopted by many Italian city-states during the previous century, Geoffrey Parker (1976, 1996) amongst others (McNeill 1984, Bean 1973) argues that the key technological innovation was, instead, the late-fifteenth century development of powerful artillery capable of easily demolishing town walls. This expensive and powerful new weaponry engendered an even more costly defensive response, the trace italiene. These fortifications, in turn, forced a strategic shift from battles in the open field to siege warfare. Because sieges required increasingly large armies and increasingly
complex fortifications garrisoned by ever larger numbers of soldiers, the scale and costs of standing armies concomitantly increased.

These accounts are not close to exhaustive. For example, Black (1991) questions whether a revolution in arms took place between 1500 and 1660 at all, instead placing a greater significance on the years between 1660 and 1710 and the development the flintlock musket. Rogers (1995), on the other hand dates an almost continuous series of military innovations beginning in the Hundred Years War with the movement away from feudal shock cavalry to the use of longbowmen, then Swiss pikes, and the subsequent adoption of cannons and firearms in line with Parker and Roberts’ histories. Whether or not the exact timing of the military revolution is clearly defined, a recurrent theme in much of the literature on early-modern military history is that fundamental changes in the production of force taking place sometime between the mid fifteenth and the end of the eighteenth centuries led to both increasingly dear and increasingly large armies.

These changes in the technologies, tactics, and strategies of producing large-scale military force have variously been linked to changes in patterns of state formation. The logic of these arguments is straightforward. Smaller political units - city-states, duchies, and baronies - lacked the financial resources to meeting the costs of these new technologies and, consequently, were selected against as institutional forms via interstate competition (Parker 1996, McNeill 1984, Porter 1994 p. 67-69, 65-95; p. 31, 241-78). Rodgers is not atypical in advancing the argument in the following way.
...central governments of large states could afford artillery trains and large armies. The artillery trains counteracted centrifugal forces and enabled the central governments to increase their control over outlying areas of their realms, or to expand at the expense of their weaker neighbors. This increased their tax revenues, enabling them to support bigger artillery trains and armies, enabling them to increase their centralization of control and their tax revenues still further, and so on.

Moreover, he is not alone in this regard, historical scholarship on the military revolution is replete with authors linking changes in the production of violence to changes in the geographic scale of political units (Dudley 1991, Guenée and Vale 1985, John 1950, Rice and Grafton 1994; p. 118, p. 144, p. 23?41, p. 16). Some like Bean (1973), perhaps the first to link changes in siege tactics and weaponry to the selection of large states, are explicitly economic in their logic. In his estimation the invention of the cannon, the “destroyer of castles,” favored large centralized states by making the principle defensive technology obsolete and shifting the fixed costs of defense upwards. Castles had previously made small political units viable by enabling besieged populations to sustain themselves for an almost infinite period simply waiting out the blockading forces. The cannon made this technology irrelevant, decreasing the overall costs of geographic expansion and making local political rule tenuous. Nowhere was this more apparent than in the French reconquest of Normandy during the Hundred Years War. It took Henry the Fifth thirty years to conquer Normandy but following their early adoption of the cannon the French were able to take it back in under one, demolishing a English held castle at a pace of one every week.
In a slightly less technologically deterministic manner, social scientists have similarly linked these changes in patterns of war-making to the survival and creation geographically large states (Tilly 1975, 1985, 1990, Finer 1975). (Tilly 1990; ch. 3) famously outlines how beginning in the late fifteenth century changes in the ways war were fought and armies raised cyclically escalated both the costs and frequency of war. Over time these changes selected large states against their smaller competitors.

The Use and Misuse of History in Writing Macro-History

Those composing macro-histories of the state have borrowed heavily from these accounts when developing and testing theories that relate the incidence of war and war-making to processes of state-formation. However, arguments founded upon these histories, because of the cases chosen, have problematically selected cases from the extreme tail of the distribution of state size, exactly those units outlying cases causing the skew demonstrated in the previous section. This is analogous to studying the effect of the microprocessor on incomes by writing case studies of Steve Jobs and Bill Gates; one would conclude that the introduction of computing technology universally led to a population of billionaires while disregarding the marked income inequality that followed.

In other words, one should question supposedly general theories derived from a few exceptional cases. Roberts for example, a historian of Sweden, draws upon the Swedish experience in the Thirty-Years war to make conclusions about the effects of new infantry tactics across Europe. Parker, a scholar of Early Modern Spain draws similar conclusions based upon his favored case.
Even macro-sociologists like Tilly making broad, general, comparisons are not immune. As Ertman (1997) points out, Tilly incorrectly treats the onset of intensive military competition as being temporally uniform when in fact its timing varied regionally across Europe.

To see this concretely, Table 3.1 shows the empirical cases used by several prominent historians who argue in favor of large systemic changes to the production of force between 1400 and 1800 and whose approach is typical of this line of scholarship. The top panel then plots their rank against their logged size in square kilometers at three points in time: 1400, 1650, and 1790; right before the large-scale changes in the production of violence known as the mili-
tary revolution, following the Thirty-Years war, and at the close of this study. The cases outlined in Table 3.1 are highlighted. From simple inspection is it obvious that when selecting cases historical scholarship has drawn from, almost exclusively, the extreme tail end of the distribution of state sizes. Even within the top decile, save the Dutch, all of these cases rest within the top half.

In sum, arguments in favor of a military causes of state formation have been made using cases drawn from the tail end of the distribution of geographic scale. Further confounding generalizations drawn from the experience of these outlying cases is the fact that these states were extreme not only in terms of their size but their politics. These countries were Great Powers concerned with military conquest and imperial domination, ambitions that many if not most other states could not or did not pursue.²

For purposes of inference what are the consequences of selecting outlying cases? In contrast with the historical case studies that emphasize the role of war in determining processes of state formation, the empirical approach of proponents of economic causes do not exclusively rely upon the experiences of large outlying states. For example, Spruyt (1994a,b) in highlighting the experiences of the city-states comprising the Hanseatic League, finds in favor of economic determinants of state formation. In taking a more quantitative approach Stasavage (2011a,b) stresses the advantage small states had in constructing financial instruments necessary to fund defense and therefore survival.

² On this see Kennedy (1989)
The remainder of this chapter quantifies the effects of selecting extreme cases. I show that when the entire distribution of states is considered the main implications of theories which give primacy to changes in patterns of war for determining patterns of state-formation are not matched by the empirical record.

The Size and Number of States Across Time

If changes in the prosecution of war selected large territorial states against their smaller counterparts, we should expect that during periods where the costs and scale of war increased the number of independent states should decline and the their typical size increase. However, using the data introduced in the last chapter I demonstrate two opposing trends. First, I show that during the period associated with the military revolution the typical state declined in size and second, over the same period, I find that the number of states remained roughly constant.

The Trend in State Size

The top panel of Figure 3.3 plots the trend in state size across time measured in square kilometers. If one were to only consider the mean, it appears that the bellicist hypothesis matches the general trend; between 1400 and 1790 the average size of states more than doubled from approximately 33,000 to 71,000 square kilometers. Although a proponent of the military revolution might view this as confirmation, in the presence of extreme values the mean
is a poor indicator of central tendency. This point is made apparent not only by the large spread between the median of state size and its mean but by the relationship between the mean and the third quartile of the distribution. For nearly all of the period for which we have data, the size of the state at the seventy-fifth percentile was less than the mean size.

As shown earlier in this chapter, the data describing the size of states are indeed heavily skewed and are likely is drawn from a log-normal distribution. Moreover, although a naive interpretation of the untransformed mean trend would indicate a revolution in state size coinciding with known changes in military technology, this would be akin to giving improper weight to the extreme outliers, just as the historical scholarship emphasizing warfare does.

Once I transform the data, so to account for the skew in the data, this upward trend disappears. Rather, the typical state between 1100 and 1790 declined in size. The lower panel of Figure 3.3 indicates that both the mean and median of the log transformed state size are declining over time and in near perfect tandem.\textsuperscript{3} The decline in both measures is substantial; the mean and median logged state size decreasing between 1100 and 1790 from 9.03 to 6.32 and 9.62 to 5.67, respectively. Re-transforming these results gives declines of 7,818 and 14,816 square kilometres from initial values of 8,372 and 15,106. By these measures the “typical” state, though quite small in 1100, became even smaller over time, contradicting the theoretical prediction made by war making theories of state formation.

\textsuperscript{3}A Engle-Granger two step procedure indicates that the two series are cointegrated. Estimating the following relationship Mean\textsubscript{t} - $\beta$Median\textsubscript{t} = $\mu$\textsubscript{t} where $\beta$ is estimated to be 1.04, a Dickey-Fuller test yields a test statistic of -3.69 allowing us with a high degree of confidence to reject the null hypothesis that $\mu$\textsubscript{t} is a non-stationary series.
Figure 3.3: The Trend in State Size

Both panels present trends in state size across time. The top panel gives the untransformed data and the bottom panel presents the data log-transformed. The red line represents the mean value and the solid black line represents the median. The dashed lines represent the interquartile range. Note the remarkable symmetry around the median of the log-transformed data and the absence of such symmetry in the non-transformed data. Similarly note, tandem movement of the mean and median as one would expect from a normally distributed random variable.
The Trend in the Number of States

A related claim made by proponents of bellucist theories is that number of states capable of sustaining themselves in interstate competition declined during periods associated with large-scale changes in the production of military violence. However, as with the trend in state size I find no evidence of a dramatic reduction in the number of states during the era associated with these changes. Figure 3.4 shows that instead of declining over time, the number of independent units increased, expanding rapidly between the twelfth and thirteenth centuries, peaking in the late fourteenth century, and declining slightly in the period after that.

Did this reduction from a late fourteenth century peak constitute a radical shift in the number of states within the European system? To better examine this question, I adopt the method proposed by Park (2010) to identify structural breaks in count processes like the number of states. This method classifies the set of time periods where the number of states can be described by a common data generating process. Moreover, it determines when changes in this process occur. Implementing this procedure results in the choice of a single change-point dated at 1210. Figure 3.4 plots on the right hand axis the posterior probability of a change in regime, demonstrating the break at 1210.

The mean of the first period is estimated to be 130.1 with a 95% credibility interval of [124.3, 135.7] and the mean for the second period is estimated to be 227.8 with a 95% credibility interval of [225.1, 230.7].

4A technical description of the method and estimation are included in the appendix.
From this, two substantive conclusions can be drawn. First, the break identified in the early thirteenth century precedes by several centuries the events bellicist theories argue caused a fundamental change in the number of states. Second, the change proposed by this group does not materialize; the second regime identified by the model, that containing the entire period associated with the military revolution, has on average a greater number of states. In other words, during the period in which bellicist theories predict a decline in the number of states we see no dramatic change in the number of states.

To summarize, although the bellicist literature describes a military revolution taking place at some point between 1450 and 1700, its predicted consequences fail to materialize when the data is examined systematically. During the period associated with large systemic changes in the production of violence two facts emerge: 1.) The typical state declined in size and 2.) The number of independent states saw no radical decline, though decreased slightly.

The Relationship Between Size and Survival

Thus far I have shown that in the period associated with the military revolution the number and size of states fail to change as hypothesized in war-making theories. The mechanisms proposed in these theories operate by altering the type of state capable of surviving in an anarchic international arena. That is, it is argued that the costs associated with mass armies consisting of professionally trained riflemen, the purchase of increasingly powerful cannons, and the

\[ \text{Stasavage (2012)} \] looking at a subset of 168 city-states shows a similar pattern.
development of defensive ramparts made small states unviable. This section provides two findings. First, over the entire time period of study small states were more likely to survive, the opposite of that hypothesized in bellicist theories. Second, I find that the relationship between geographic scale and the survival of states did not change across time. That is, the relationship between size and failure was the same before, after, and during the period associated with the military revolution.

Since the set of theories I am evaluating concern the capacity of states to survive I utilize duration analysis which requires a coding of state failure. I treat failure as any instance in which an existing state ceases to appear as an
independent political unit according to my coding scheme. Thus, if a state is conquered it is treated as failing. If two states merge I treat the new state as either a new unit (and the pre-existing states as being censored) or if it is clear that one subsumed the other I treat the subsumed state as having failed. In the few cases where this is ambiguous I alternate codings and re-estimate the model with each possible alternative. The treatment of these ambiguous cases does not substantively change the results.

The relationship between the hazard rate (the instantaneous rate of failure) and the geographic size of states is estimated via a mixed effects Cox proportional hazards model of the basic form

\[
\lambda_i(t) = \lambda_0(t) \times \exp(\delta_p \cdot \ln(\text{Size}_{it}) + \epsilon_i + \eta_v)
\]

Time is described in three ways. First, \( t \), indexes the time in years since a state came into existence. Second, \( v \) indexes chronological time, e.g. 1445 or 1750 and third, \( p \) captures a multi-year period in chronological time, e.g. 1450 to 1500.

The baseline hazard rate is captured by \( \lambda_0(t) \). The relationship between size and the hazard rate is captured by the set of parameters \( \delta_p = \mu + \gamma_p \) where it is assumes that \( \gamma_p \) - the period varying effect - is distributed \( N \sim (0, \sigma^2) \) and where \( \mu \), captures the time invariant, mean, relationship between state size and failure. The magnitude of each \( \gamma_p \) signifies the deviation for each period \( p \) from the time invariant mean effect \( \mu \). I present results allowing the effect of state size to vary by 100 and 50 year intervals, respectively. Since the data includes repeated observations, that is, because some states fail and
then reappear only to fail again, I follow convention and include a unit specific random “frailty” effect, $\epsilon_i$. Similarly following convention, because failure times might be clustered by chronological time, I include a time random effect, $\eta_v$.

First I estimate the model without the time varying component and find that, in contrast to the conclusions of bellicist theories, there is a robust negative relationship between the probability of survival and the size of states. That is, I find that geographically large states are more likely to fail than their smaller counterparts. I then estimate the same model, allowing the effect of size to vary across period. The magnitude of these effects are roughly uniform across models. Figure 3.5 plots these coefficient estimates. In the left panel I plot $\mu$, the parameter capturing the time invariant relationship between size and the hazard rate, which is positive and statistically significant in all specifications. To gauge the magnitude of this effect, I have plotted in Figure 3.6 survival curves from the most conservative model, manipulating state size from the first to the third quartile. A substantial difference is apparent. For example, having survived up to 100 years the probability of surviving in the next period is roughly one third less for the state at the seventy-fifth percentile of state size than the state at the twenty-fifth.

In order to examine the hypothesis that the relationship between size and failure changed during the period associated with the military revolution I compare the time varying effect of size $\gamma_p$ across periods. Since each $\gamma_p$ captures the period specific deviation from $\mu$, if $\gamma_p$ differs in a statistically significant way from zero we can say that for period $p$ the relationship between geographic scale and survival differed from the average effect. Plotted in the right-hand
Figure 3.5: Cox Proportional Hazards Model Estimates

The left panel plots the parameter estimates of the time invariant relationship between size and the hazard. Models 1. and 2. do not include time varying estimates of this effect. Model 2. is a standard Cox-proportional hazards model and does not include any random effects. Models 3. and 4. include period varying effects of size. Model 3. allows the effect of size to vary by 100 year periods and Model 4. allows the effect of size to vary by 50 year periods. These period varying effects, none of which are statistically distinguishable from zero, are plotted in the right panel.
Figure 3.6: Interquartile Survival Function

The estimated survival curves from Model 2 from a manipulation of logged size across its inter-quartile range. The top line represents the survival curve for a state at the 25th percentile of logged state size. The bottom line represents the same value for a state at the 75th percentile. The dashed lines represent 95% confidence intervals for the survival curve.

Panel of Figure 3.5 we see that this is not true for any time period; none of the time varying effects differ in a statistically significant way from zero and, moreover, I find no statistically significant difference between any pair of time periods.\footnote{Table 3.2 in the appendix presents the differences and measures of uncertainty for each pair of period varying parameters.}

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Matching the results from the previous section, I find no evidence in favor of the notion that the military revolution affected the size of states. The survival probability of small states was greater than that of large states. Moreover, the data find no evidence of a change in the relationship between geographic scale and failure during the expected period. Indeed, I find that the positive relationship between size and the failure rate of states did not change in a statistically significant way across time.

**Regional Variation in Patterns of State Formation**

This section examines trends in the number and size of states at the regional level, providing evidence that only in the most productive places in Europe, a central regional band extending, roughly, in an arc from the Low Countries, through the Rhineland and into Northern Italy, could small political communities persist. That is, in the places where the “commercial revolution” of the first half of the previous millennium took hold political fragmentation ensued. However, in less productive regions, in the absence of dense urban and commercial growth, large territorial states formed.

As initial evidence, Figure 3.7 plots the average logged size and number of states, first dividing the map into two broad regions: the urban European core, the area described above, and the remainder of the map, what I will call the periphery. In both regions the number of states is increasing before the early thirteenth century. After this period the upward trend in the number of states
The Number and Size of States

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</tr>
</thead>
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<td>-0.75</td>
</tr>
<tr>
<td>1200</td>
<td>0.25</td>
</tr>
<tr>
<td>1300</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Figure 3.7: The Number and Size of States Across Time

The average size and number of states separating out the urban European from the rest of the continent. In both plots the black line represents the core of Europe and the dashed line represents the periphery. The top panel plots against time the number of states in these two regions. The lower panel plots for each region the difference between the mean of log-transformed data in a given year and the mean for the entire (regional) series.

continues in the central core of Europe whereas in the periphery it plateaus and then begins to decline in the early fifteenth century. Similarly the average size is initially declining in both groups. However, in the periphery, beginning in the early sixteenth century, the average size starts to increase whereas it continues to decline in the center.
By aggregating the entire periphery I am combing geographic locations with disparate historical experiences and thereby run the risk of masking some alternative trend. To guard against this I further break down the peripheral states into six regions. Since “region” is itself a constructed notion reflecting the political history of state formation, it is difficult to avoid a bit of arbitrariness with regard to where one region begins and another ends. Still, I construct “natural” regions fitting their political, social, and cultural histories. They are as follows: The British Isles and France, Iberia, Italy, Scandinavia and the Baltics, Eastern Europe including Russia, and the Ottoman Territories which includes the Balkans. These are shown in Figure 3.9 in the appendix to this chapter. Each region is constructed using a line of latitude or longitude as an artificial boundary, those political units whose centroid falls within these demarcating lines gets counted as belonging to it. As a robustness check I vary the lines of latitude and longitude used to construct these regions, moving them in the cardinal directions by as much as 100 kilometers. None of the trends are substantively altered.

Again we see that outside of this central urban band the general trend was towards fewer and increasingly large states. However, within this central band the pattern is the opposite. Figure 5.4 plots the number and demeaned size of states by region across time. From this, we see that this number is declining in all regions outside of the urban central band in all years following the mid fourteenth century. Similarly the size is increasing in each peripheral location during this time period. Within Europe’s core, however, the opposite is true as more and ever smaller states form between the beginning of the series and the
Figure 3.8: Regional Variation in the Number and Size of States Across Time

The top panel plots the number of states dividing the map into the Western Periphery (Iberia, Britain/France, and Italy) on the right hand side, and the Eastern Periphery (Scandinavia, Eastern Europe, and Ottoman Territories) on the right. The lower panel plots the demeaned trend in logged state size. From the early fifteenth century a clear decline in the number and increase in the size of states in all peripheral regions is apparent.

end of the thirteenth century. Given that geographic space is fixed, the average size of states in each region is a function of both the size of the region and the number of units. It follows that the average size of states in peripheral regions increased because the number of units occupying them declined. Conversely, in the continent’s city-core the average size of states declined because the number of states increased.
Conclusion

Did war make states? In two ways I have provided evidence against theories which assert as much. In the previous chapter I have argued that much of previous scholarship linking changes in processes of war-making to the formation and dissolution of states overstates the frequency and costs of conflict. With data describing conflicts for a large number of states, not just Great Powers, I found that the frequency of conflict declined between 1400 and 1790 and, moreover, that during this same timeframe when wars were fought their duration remained constant.

Next, in this chapter I used new data describing the entire universe of European states between 1100 and 1790 to show that even if the costs associated with the military revolution rose, they did not have the predicted effects bellicist theories of state formation expect. That is, I demonstrated that the number of independent states remained constant and the typical state declined in size during the period in which these theories would predict the opposite. Moreover, I found that in contrast to the predictions made in war-making theories, small states were more than their larger counterparts to survive.

In all, I have presented a series of statistical tests that question the notion that war caused the selection of large territorial states against smaller units. Last, however, I showed a pattern of regionally fragmented political authority; in an area running from Holland through what is now Germany and into Northern Italy small states were able to form and persist. Outside of this cordon, large territorial states emerged.
The next part of this book is devoted to explaining the pattern described above, showing that variation in economic geography best explains why small independent states formed within this urban core of the Continent and why large territorial states emerged in its periphery. Highlighting the consequences of changes in patterns of trade, commerce, and urban life described by economic historians as the “commercial revolution,” the next part of this book shows that where towns and cities reemerged during the Late Middle Ages more and smaller states formed.
Appendix

Change Point Method

To assess how the processes driving the number of states changed over time, I adopt the method proposed by Park (2010) to identify structural breaks in count processes like the number of states, treating the number of states as coming from a number of possibly distinct Poisson processes and then identifying the point in time where the data generating process transitions from one state to another. Following Frühwirth-Schnatter and Wagner (2006), Park transforms a Poisson process into a linear regression model with a log Exponential (1) error distribution by exploiting the assumption that the time between successive events is independent and follows an exponential distribution. Taking the logarithm of interarrival times, they link the length of time between the \( j - 1 \)th event and the \( j \)th event within time interval \( t, \tau_{tj} \) as follows:

\[
p(y_t|\lambda_t) = e^{-\lambda_t \tau_{tj}^y_t} \\
\tau_{tj} \sim \exp(\lambda_t) = \frac{\exp(1)}{\lambda_t} \\
\log \tau_{tj} = \mu_m + \varepsilon_{tj}, \varepsilon_{tj} \sim \log(\exp(1))
\]

Where \( \exp() \) is the Exponential distribution and \( \mu_m \) the regression parameter characterizing the hidden state \( m \) at time \( t \). Using the approximation of the log Exponential(1) distribution proposed by Kim, Shephard and Chib (1998) and Chib (1998)’s method to identify changepoints, Park’s procedure can recover point estimates and credibility intervals for \( \mu_m \) in each state as well as the transition matrix.
\[
\begin{pmatrix}
p_{11} & p_{12} & 0 & \ldots & 0 \\
0 & p_{22} & p_{23} & \ldots & 0 \\
\ldots & \ldots & \ldots & \ldots & \ldots \\
0 & 0 & 0 & p_{m-1,m-1} & p_{m-1,m} \\
0 & 0 & \ldots & 0 & 1
\end{pmatrix}
\]

Where the probability of switching to regime \( j \) from state \( i \) is defined as \( p_{ij} = P(m_{t+1} = j|m_t = i) \) and regime transitions are constrained to only temporally forward switches.

I begin with an arbitrary large number of possible changepoints - seven in this instance - and use the Bayes factor selection criteria outlined by Chib (1995) and Park (2010; 2012) to choose the correct number of breaks. For each of the seven models I adopt uninformative Beta priors on the location of each changepoint reflecting an equal duration of each regime given the number of states in the model. So, since we have 139 observations for the one changepoint case I adopt \( \text{Beta} \sim (6.95, 0.1) \), for the two changepoint case \( \text{Beta} \sim (4.33, 0.1) \), and so forth. For the Poisson parameter I choose gamma priors: \( \lambda_t \sim \text{Gamma}(1, 1) \) and in the appendix provide a number of sensitivity tests to show all of the results are insensitive to the choice of priors. In each model MCMC chains are run 100,000 times after discarding the first 100,000 runs.
**The Time Invariant Effect of State Size on Failure**

The following table gives the difference in means and t-statistic for each of the time-varying parameters. No pair of parameters are statistically distinguishable from each other at conventional levels.

**Table 3.2: Differences in Time Varying Effect of State Size**

<table>
<thead>
<tr>
<th></th>
<th>(\gamma_{1100})</th>
<th>(\gamma_{1200})</th>
<th>(\gamma_{1300})</th>
<th>(\gamma_{1400})</th>
<th>(\gamma_{1500})</th>
<th>(\gamma_{1600})</th>
<th>(\gamma_{1700})</th>
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<tbody>
<tr>
<td>(\gamma_{1100})</td>
<td>0.00</td>
<td>.</td>
<td>.</td>
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<td></td>
<td>(0.00)</td>
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<td>.</td>
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<tr>
<td>(\gamma_{1200})</td>
<td>0.04</td>
<td>0.00</td>
<td>.</td>
<td>.</td>
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<tr>
<td></td>
<td>(1.05)</td>
<td>(0.00)</td>
<td>.</td>
<td>.</td>
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<td>.</td>
</tr>
<tr>
<td>(\gamma_{1300})</td>
<td>0.05</td>
<td>0.01</td>
<td>0.00</td>
<td>.</td>
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<td>.</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>(1.27)</td>
<td>(0.22)</td>
<td>(0.00)</td>
<td>.</td>
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<td>.</td>
<td>.</td>
</tr>
<tr>
<td>(\gamma_{1400})</td>
<td>0.05</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>.</td>
<td>.</td>
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</tr>
<tr>
<td></td>
<td>(1.29)</td>
<td>(0.24)</td>
<td>(0.02)</td>
<td>(0.00)</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>(\gamma_{1500})</td>
<td>0.06</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
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<tr>
<td></td>
<td>(1.46)</td>
<td>(0.41)</td>
<td>(0.19)</td>
<td>(0.17)</td>
<td>(0.00)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>(\gamma_{1600})</td>
<td>0.07</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>(1.78)</td>
<td>(0.74)</td>
<td>(0.52)</td>
<td>(0.50)</td>
<td>(0.33)</td>
<td>(0.00)</td>
<td>.</td>
</tr>
<tr>
<td>(\gamma_{1700})</td>
<td>0.05</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(1.26)</td>
<td>(0.22)</td>
<td>(0.00)</td>
<td>(-0.02)</td>
<td>(-0.19)</td>
<td>(-0.52)</td>
<td>(0.00)</td>
</tr>
</tbody>
</table>

The difference between each of the time varying parameters. Z statistic in parentheses. A Bonferrini correction for multiple comparisons confirms that none of the differences achieve standard levels of statistical significance.

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**The Regions of Europe**
Figure 3.9: The Classification of European Regions

This map represents the classification of arbitrary grid-squares into seven regional groups: Iberia, Britain and France, Central Europe, Italy, Scandinavia and the Baltics, Eastern Europe (including Russia), and Ottoman Lands, including the Balkans.
Chapter 4

A Military Revolution?

Over the long run, far more than other activities, war and preparation for war produced the major components of European states.

A vast scholarship spanning political science, sociology, and history has claimed that the pressures of war “made” states. That is, changes in the way wars were fought and financed caused a particular set of political institutions identified with the modern state to emerge. Arguments of this sort have two components. The first is that changes in military technology and tactics increased the scale and costs of warfare. The second is that these changes selected large, territorial states against their smaller counterparts. This chapter provides evidence against the first part of this argument and tests empirical claims associated with several influential theories of the early-modern military revolution. Broadly, these arguments find that radical changes in the production of military force had substantial and lasting consequences for the ways in which armies were organized and financed, changes which in turn forced po-
itical reform on states under threat of elimination. With statistical evidence from three influential cases used to by historians to develop these theories, I suggest that key predictions linking changes in the production of large-scale violence to increases the costs and size of armies are either not borne out or are exaggerated in their expected effect.

I begin by examining trends in the onset and duration of conflict across all of Europe, showing that between 1400 and 1790 the frequency of conflict declined and its duration remained constant. That is, if changes in patterns of war selected some states against others it unlikely to have been directly through its increased frequency but rather through material costs associated its conduct or deterrence. Next, I provide evidence that the description of a military revolution in tactics or technology may be exaggerated in its effect on the cost and size of armies. Incorporating a well established a result from the price history of early-modern Europe, I argue that much of the observed increase in military expenditure reflects a secular inflationary trend rather than an expansion in real terms. To show this, I evaluate two cases associated with prominent versions of the military revolution hypothesis, demonstrating that increases in Dutch military spending and Spanish debt, both associated with the technological and tactical military innovations surrounding the Dutch Revolt, do not materialize when adjusted for inflation.

Next, focusing upon the French case I examine growth in the size of armies during the period associated with the military revolution. First examining the French army’s participation in sieges, a most likely case to observe changes associated with the introduction of powerful artillery and advanced defensive
fortifications, I show that if there was an increase in the size of armies it was unlikely to have occurred because of these technological changes in siege warfare, a common interpretation of the military revolution hypothesis. Second, I show that the number of men-at-arms under French control grew non-monotonically and, moreover, what growth which did occur has in many historical accounts been over-stated.

In all, this chapter highlight several patterns in war-making before 1790. First, I show that between 1400 and 1790 conflict became less frequent and less intense in terms of its duration and number of participants. Then, examining systematic data from three cases where we are most likely to observe increases in the financial and human costs of war, I presents results that challenge the notion that the military revolution clearly led to an increase in the size and cost of armies.

Patterns of War-Making

Before evaluating claims of technological or tactical shocks to the production of military force I first briefly outline the general pattern of conflict during the period when the political, social, and economic changes described as outcomes of the military revolution are predicted to have taken place. That is, if changes in war and war-making had effects on patterns of state formation we must first determine if these effects occurred through changes in the costs directly related to the frequency or duration of conflict or through changes related to the scale and cost of armies.
To do this I rely upon the data set built by Brecke (1999) which describes all occurrences of “purposive and lethal violence among two or more social groups pursuing conflicting political goals that results in fatalities, with at least one belligerent group organized under the command of authoritative leadership” and which evidence more than thirty-two annual causalities. Unfortunately these data only cover the period after 1400. Nevertheless, they represent the best attempt to systematically measure organized violence before the Congress of Vienna. Moreover, they are considered quite accurate and have been used in a number of recent publications (Iyigun 2008, Fletcher and Iyigun 2009, Besley and Reynal-Querol 2012). With these data, I demonstrate that conflict declined in its frequency between 1400 and 1790 and was unchanged in its average duration. Then, separating out interstate conflict from that involving one or no state actors, I show that the same pattern holds.

Figure 4.1 presents the five year moving average of conflict onsets in the Brecke data. The linear time trend, plotted with the dashed line, represents an average annual decline of 0.65% of a conflict per year (\( \hat{\sigma} = .07 \)). Since for processes of state formation there may be different effects of interstate conflict and conflict in which one or more actors are not states (Jackson and Rosberg 1982, Atzili 2011) and because both types of conflict get picked up in the Brecke data, I also plot only conflicts where at least two actors are states (the dashed trend line). The result in nearly identical, the number of new conflicts between at least two states was declining between 1400 and 1790.

Still, this trend may not represent an overall diminution in the scale of conflict. For example, it could be that what were many independent conflicts
Figure 4.1: Five Year Moving Average of Conflict Onset

This figure plots the five-year moving average of conflict onset for total conflict and then only interstate conflict. The downward sloped line represents the linear time trend, a year-on-year expected decline of 0.65% of a conflict ($\hat{\sigma} = .07$).

Figure 4.2: Five Year Moving Average of Number of Combatants

This figure plots the five-year moving average of the number of combatants per conflict and then only interstate conflict. The downward sloped line represents the linear time trend, a year-on-year expected decline of 1.39% of a conflict ($\hat{\sigma} = .20$).
This figure plots the five-year moving average conflict duration for all conflicts and then only interstate conflict. The downward sloped line represents the linear time trend, a year-on-year expected decline of 2.25% of a year ($\sigma = .38$).

became wider scale events, including a greater number of combatants. Or similarly it could be that conflicts simply lasted longer and, instead of being separated by tenuous and short lasting periods of peace, became protracted affairs that were carried out continuously. To see that neither of these hypotheticals were the case, I plot the trends in the number of combatants and duration of conflict across time.

Figure 4.2 gives the five year moving average in the number of combatants per conflict across time. The linear time trend is again plotted with the dashed line and yields an annual decline of a 1.39% of a combatant per year ($\sigma = .20$).

Once more separating out interstate conflict, plotted in the dashed trend line, the pattern still holds; the number of states involved in conflict both between states and non-state actors as well as just between states declined between 1400 and 1790.
The Brecke data records duration with varying degrees of precision. For a subset of the data it records the length of a conflict down to the number of days or months. However, this set of precisely recorded duration data are not drawn a random subsample of the larger dataset. Still, for each observation the data record the number of years that a conflict lasts. So, for example, if it records a conflict lasting longer than one but not more than two years as taking on a value of one. If a conflict lasts greater than two but less than three years it takes on a value of two. Figure 4.3 plots the five year moving average of this measure of conflict duration. Again, the linear time trend, plotted with the dashed line, gives an annual decline of 2.25 % of a conflict-year \(\hat{\sigma} = .38\).

Separating out only interstate conflict, plotted in the dashed trend-line, the pattern remains; between 1400 and 1790 the length of conflict declined.

Three related patterns have emerged from the description of conflict before the French Revolution: organized violence declined in frequency, duration, and in the number of participant states per conflict. In other words, over this time period Europe became, on average, more peaceful. These descriptive results differ from the conclusions drawn by [Tilly 1990, ch. 3] who finds the opposite - more frequent and longer lasting conflicts over this same period.

In large part these divergent results are due to differences in sample selection. His descriptive analysis is based upon the dataset built by [Levy 1983] which has a higher casualty threshold for inclusion (1,000 deaths per year) and represent wars in which only the “great powers” participated. As a consequence, his data include only a small fraction of the conflicts that took place over this period and do not reflect broader trends typical of the entire state system. In
other words, for those lesser powers which have historically constituted vast majority of states the period, the patterns of conflict are substantially different from those whose histories we have typically recorded.

Still it is possible that these less frequent and less long wars were more costly in terms of manpower and treasure. The next two sections examine these possibilities, arguing that if war did increase in cost and demand for manpower, these effects were not uniform across states and are likely overstated in their magnitude.

The Cost of War

While pecuniary impact of changes in the technological, tactical, and strategic production of large-scale violence may have been substantial, there does not exist data covering a wide range of representative cases to allow for the description of broad trends in the cost of producing military force over time. Utilizing that data which are available, this section attempts to systematically evaluate the claim that the financial costs of war-making increased as a result of changes in patterns of war-making. I show using several cases likely to have undergone large changes in the costs of war that observed cost increases are considerably smaller when put in real terms.

This result is consistent with a well documented empirical regularity in the economic history of European prices. The period associated with the rapid growth in the price of arms was one also associated with rapidly expanding prices of all kinds (Hamilton 1970/1934, Hammarström 1957, Ramsey and
Located variously between the late fifteenth and seventeenth centuries and termed the “price revolution,” this period was characterized by a secular inflationary trend that almost universally drove up prices across the continent. According to several of the best comparable estimates, between 1511 and 1650, Spain’s consumer price index increased by over three and a half times its original value, in England over six and three-quarters, and in Brabant over seven and quarter times the original price level in 1511 (Hamilton 1970/1934, Phelps Brown and Hopkins 1955, Brown and Hopkins 1981, Van der Wee 1978).

Accepted as near fact by economic historians, substantial effort has been devoted to establishing the causes of the price revolution. What is more, contemporary actors were cognizant of the fact that they were living in a uniquely inflationary period and similar to modern economic historians they were actively searching for its causes. For example, as early as 1556 the cleric Azpilcueta Navarra of the Salamanca School linked the rise in prices to the flood of specie from the New World (Grice-Hutchinson 1952, p. 52 Appendix III). A decade later French royal councilor Jean Cherruyt de Malestroit and the philosopher Jean Bodin engaged in a relatively public debate on the causes of the tremendous inflation they witnessed, with the former contending that currency debasements were the main cause and the latter again emphasizing Silver from the Spain’s American colonies (Le Branchu and Simiand 1934, Bodin 1946, Spufford 1989). However, for the purpose of this chapter it is the empirical regularity of a secular increase in prices, not its fundamental cause that is important. In sum this section demonstrates that when viewed light of
this trend the costs of war-making, typically presented in nominal terms, are substantially diminished.

The Dutch Army Under Maurice of Orange

To see the effects of this inflationary pressure on the real costs of war I first examine data from Holland on expenditure devoted to the army, showing that nominal increases in this outcome typically associated with changes in warfare are attenuated when put in real terms. I focus on expenditure devoted to the army because it is there where we would expect the changes in tactics and technology to have their greatest impact. My focus on Holland is similarly chosen for two reasons. First, it is one of the few countries for which there exist high frequency data on state expenditure and prices. More importantly, however, is that it is in Holland that financial instruments and military tactics associated with funding and waging modern warfare both originated. That is, it was Maurice of Orange, who after taking over as *Stadtholder* in 1585 introduced volley-fire and reorganized the Dutch military, transforming its training and tactics by focusing on disciplined, mobile tactical maneuvers. These changes are specifically attributed to the development of costlier and increasingly large, quasi-professional, standing armies that were continuously trained in this new manner of war (Roberts 1956, McNeill 1984). It follows that this is a good case to see whether increases in the cost of this new type of infantry-based army arose as predicted.

To begin, note the increase in Dutch prices taken from the price index constructed by Van Zanden (2004) and plotted in Figure 4.4. These data
indicate an 1,782 % increase in prices between 1450 and 1800, with most of this change, as was true throughout most of Europe, occurring between 1500 and 1650, the period including the Dutch Revolt and the changes in military organization described above. Moreover, the trend before and after this period are statistically indistinguishable from each-other, whereas the inflationary trend between 1500 and 1650 was four and a half times greater than in the preceding and subsequent periods.¹

This inflationary trend has affected the perception of costs of war-making which, typically, have been placed in nominal instead of real terms. Figure 4.5 plots in thousands of Guilder Holland’s nominal and inflation adjusted expenditure on the army between 1586, the first year for which we have data,

¹This is calculated by estimating the following regression $CPI_t = \beta_0 + \beta_1 \cdot Year + \sum_{p=2}^{3} \beta_p \cdot P_p \cdot Year + \epsilon_t$ where $P_p$ are dummies for the period between 1500 and 1650 and 1651 and 1800 and $\beta_2$ and $\beta_3$ capture the deviation from the baseline period’s trend for these two subsequent periods.
Figure 4.5: Inflation adjusted trends for Holland’s expenditure on the army

This figure plots nominal and inflation adjusted trends in Holland’s expenditure on the army. The dotted trend lines are estimated from a linear regression of expenditure on time. The trend for the nominal figure is estimated to be 21,591 Guilder per annum with a standard error of 4,939. When adjusted for inflation no statistically significant trend is found. Data from Fritschy et al. (1995). Inflation adjustment made using the CPI provided by Van Zanden (2004) as a price deflator.

and 1790. The ratio of greatest to smallest annual expenditure in nominal terms is 13.14. Using the consumer price index provided by Van Zanden (2004) as a price deflator, adjusting for inflation this ratio drops by more than half to 6.85. Moreover, estimating the average annual growth in expenditure on the army I find a positive and statistically significant trend when in nominal terms of 21,591 Guilder (s.e. = 4,939). However, when estimating the same relationship, instead using expenditure in real terms, no statistically significant trend is found. In all, for the case of Holland, a case where we should expect a large increase in expenditure devoted to the army, once put in real terms,
the upward trend in the costs of arms disappears and the gap between the greatest and smallest yearly expenditure is cut in half.

The Public Debt in Spain

The literature on the development of the modern state repeatedly draws the link between the costs of waging war and the development of public debt (Brewer 1990, Tilly 1990, Bordo and White 1991, Jonker and Van Zanden 1997, Bonney 1995, 1999, Stasavage 2011a, Slantchev 2012). However, when describing the effects of the former on the latter, empirical scholarship has nearly always enumerated the size of these debts in nominal rather than real terms. The consequence of this has been an exaggerated description of the size of debt accruing to national governments. This section takes the Spanish case in the sixteenth century and shows that when put in real terms the nominal growth in debt is substantially smaller.

The focus upon Spanish debt during this period is, again, purposeful. Besides the fact that over the sixteenth century its growth in nominal terms was particularly large, this expansion of debt has been linked to patterns of Spanish political development and European state formation more generally (Tilly 1990, Hillgarth 2000, Glete 2002). Spain in this regard is an exemplar of the idea that pressures related to waging war led to increased costs of statehood; as the continent’s premier power during this period, Spain borrowed heavily to fund its wars and empire. In other words, Spain is an extreme case, one where we should according to standard histories expect large increases in debt - between 1492 and 1552 the size of the Spanish army increased from approx-
Figure 4.6: Spanish composite index of prices from Gelabert (1999) 1505-1650

This figure plots the Spanish composite index of prices from Gelabert (1999) for the years between 1505 and 1650. The linear trend of .79 units is plotted with the dashed line. The maximal value, the year 1600, is 140.65 and the minimal value, the year 1505, is 37.15.

imimately 20,000 men at arms to around 148,000 (Parker 1996). Despite this large surge in army-size, and even though real increases in debt are manifest in the data, they are substantially smaller when put in real terms. Moreover, they are even smaller when viewed in light of the general expansion of the Spanish economy during this period.

Figure 4.6 plots the Spanish consumer price index constructed by Hamilton for the years between 1505 and 1650. Consistent with the continent wide-trend, there was substantial inflationary pressure before 1600, a period in which this price index increased from a low of 37.15 to a high of 140.65. Over the entire period this index increased annually by an average of .79 units. The consequences for this expansion of prices on the real size of debt are substantial.
Figure 4.7: Inflation Adjusted Spanish Debt 1505-1586

This figure plots the natural logarithm of consolidated Spanish debt \((juros)\), - measured in millions ducats between 1505 and 1586. The non-shaded points give the nominal value and the shaded points give the inflation adjusted value. The data come from Gelabert (1999).

Figure 4.7 plots the consolidated Spanish debt \((juros)\), - measured in millions ducats - issued by the Spanish crown for the subset of years for which it is available in the sixteenth century. The shaded-in plot gives the inflation adjusted debt level while the non-shaded gives it in nominal terms. In both adjusted and unadjusted terms this value is increasing across time. However, in real terms the rate of growth is attenuated. In nominal terms the ratio of debt in 1586 to that in 1504, its greatest and smallest values as well as the first and last observations, is 35.95. Adjusted for inflation this ratio falls to 10.85. Similarly, the nominal annual percent change, plotted in the black line in Figure 4.7 is estimated at 4.03\% but adjusted for inflation, plotted with the dashed line, this falls to 2.67\%.
This figure plots the natural logarithm of interest payments on Spanish debt measured in millions ducats between 1505 and 1586. The non-shaded points give the nominal value and the shaded points give the inflation adjusted value. The data come from Gelabert (1999).

To capture changes in the actual costs to the Spanish crown of this debt, I conduct the same analysis now focusing upon actual interest paid in service of this debt. Plotted in Figure 4.8, roughly the same pattern emerges. The ratio of the nominal interest payment in 1586 to that in 1504, again the ratio of its maximal and minimal values, is 15.94. As before, when adjusted for inflation this ratio falls to 4.80. Similarly, I estimate the annual growth of nominal interest payments to be 3.2% but when adjusted to account for inflation the real annual growth of interest payments falls to 1.84%.

For the extreme case of Spain, one where we expect a very large expansion of the public debt associated with the costs of war-making, growth in both the total sum and annual interest paid on these debts was substantially attenuated by the secular increase in prices. Moreover, even the observed real increases
are made smaller in relation to the overall size of the Spanish economy which between 1500 and 1600 grew by 56% from $4,495,000,000 (1990 International Geary-Khamis dollars) to $7,029,000,000 Maddison (2006). In sum, for the cases of Holland and Spain, cases where expenditure and debt are predicted have grown by large amounts between 1550 and 1650 I find that, once put in real terms, the observed upward trends in these outcomes disappear or are substantially attenuated.

The Size of Armies

The financial cost of waging and preparing for war are both a function of the technologies available and the scale of armies required to sustain or deter conflict. Of course, technological and man-power constraints are interactive. For example, some technologies allow for easier substitution of labor for capital in the production of force. Such an interactive argument is made in the version of the military revolution hypothesis put forth by Parker (1976; 1996). This section first examines Parker’s theory with data on French sieges, showing that in this sample, contrary to prediction the number of soldiers required to undertake a siege did not increase between 1455 and 1715. Then taking a more macro perspective and using what systematic data on the size of armies exists, I show that trends in the size of national armies are ambiguous and non-monotonic.
The Size of Sieges

This section examines patterns of sieges warfare, considering the implications of Parker (1976; 1996)’s version of the military revolution hypothesis. This form of the argument contends that technological changes in artillery and defensive fortification were especially crucial in causing increases in the size of armies. New siege weapons and tactics, specifically fortifications in the Italian style, altered the landscape of battles taking them from the open field engagements to extended sieges of fixed, heavily fortified, locations. The consequence was an increase in the duration of sieges and the size armies needed to undertake them. To test these implications I use the data describing French sieges between 1455 and 1715 collected by Lynn (1991) and show, contrary to prediction, that sieges in this sample became no longer over time and the size of armies needed to maintain them did not increase.

The French case is chosen for three reasons. First, it is one where there exists substantial data straddling the period before the introduction of advanced artillery and advanced fortification techniques. Second, these data, which include cases where the French were both the besiegers and besieged, cover campaigns across a wide scope of geography; over this period France fought wars in what is now Germany, Italy, and Spain. Of greatest importance, however, is that the French army, the premier fighting force on the Continent throughout much of this era, was at the technological frontier, adopting both the methods of offensive and defensive warfare associated with the artillery revolution (Duffy 1996; Lynn 1991) 2006).
Figure 4.9: The Size of Assaulting Forces in French Sieges 1455-1715

This figure plots the logged size (in thousands of troops) of assaulting forces participating in French sieges between 1455 and 1715. A statistically insignificant linear time trend in this value of .10% change per year (s.e. = .08) is plotted in the dashed line.

Indeed, the French not only followed the technological frontier of siegecraft, they pushed it forward. They “not only led in their reliance upon sieges; they also led Europe in improving fortress design and in developing siege warfare (Lynn 2006, p. 579)”. It follows that if changes in technology led to larger and longer sieges we should observe these changes in the French case.

First, I examine changes in the size of assaulting forces. Figure 4.9 plots the logged size of attacking forces for each French siege between 1455 and 1715 over time. The annual change in this value, estimated by regressing the log of assaulting forces on time and plotted in the dashed line, indicates a slight but statistically insignificant annual increase of .10% (s.e. = .08). In other words, between 1455 and 1715 for each siege in which the French army was
Figure 4.10: The Duration of French Sieges 1512-1715

This figure plots the logged duration of French sieges (in days) between 1512 and 1715. A statistically significant linear time trend indicating a decline of 3.4 % (s.e. = 1.5) per year is plotted in the dashed line.

a participant, the size of the attacking force did not change in a statistically significant way.

Repeating this exercise, I next look at changes in the duration of sieges across time. Plotted in Figure 4.10, the trend in siege length is declining. Estimating the average annual change by regressing siege duration on time, I find a statistically significant decline of 3.4 % (s.e. = 1.5). That is, instead of increasing the length, the average duration of French sieges between 1455 and 1715 declined.

Still, even though there is no clear trend in the size of besieging forces and, moreover, that there is a decline in the duration of sieges across time, it is apparent is that the number of sieges is increasing. To some degree this

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2The Lynn (1991) data only include data on duration for years following 1512.
is simply because France was involved in two continent-wide conflagrations, the Thirty-Years war and the War of Spanish Succession both of which, but particularly the latter, contribute to the observed increase in the frequency of events.

To see if these results are affected by an increased frequency of sieges, for the years in which any sieges took place (e.g. years in which there were wars), I measure the number of troop-days devoted to sieges. This measure of siege intensity is plotted against time in Figure 4.11. Again there not exist statistically a significant trend across time. A regression of this measure of intensity on time yields an estimated annual change of 4.2% (s.e = 2.7), indicating that, using this measure, it does not seem that in years when wars were fought there was a substantive change in the number of troop-days devoted to sieges.

In sum, when examining data on French sieges between 1455 and 1715, a case where if the military revolution hypothesis held we would expect the size and duration of assaults to increase, I find little evidence supporting these hypothesized trends. In other words, it does not appear that changes in siege warfare led to increases in the number of men-at-arms needed to take a well defended stronghold.

**The Size of The French Army**

While there was no apparent change in the size of French forces participating sieges across time, considerable variation in the overall size of the French army is manifest. However, even though the number of men-at-arms grew over time,

\[^3^text{ TroopDays} = \text{Duration} \times \text{AttackingForce} \times \#\text{Battles} \]
Figure 4.11: The Intensity of French Sieges 1512-1715
This figure plots the intensity (the number of troop-days per year) of French sieges between 1512 and 1715. A statistically insignificant linear time trend in this value, estimated to be 4.2% (s.e = 2.7) is plotted with the dashed line.

It did not do so monotonically. Moreover, these increases are less substantial than a simple count of the on-paper strength would indicate; historical estimates of true army size have been, for a number of reasons to be outlined, inflated. Similarly, when considering the size of France’s army relative to the country’s overall population, observed growth in army size is considerably diminished.

Data collected by [Lynn (1994)] describes, at various points in time, the theoretical, “on-paper,” size of the French army. In addition, he provides discounted estimates of army size, reflecting the true capacity of the state to bring men to the field. These discounted figures take into account exaggerations resulting from an over-reliance on military ordinances and other government documents when tallying the historical size of armies. These sources were intended as
<table>
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<td>1715-25 (War of the Austrian Succession)</td>
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<tr>
<td>1740-48</td>
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**Table 4.1: The Size of The French Army**

This table provides estimates of the French army at various points in time. Data taken from [Lynn (1994)](https://www.jstor.org/stable/2643395) (T) indicates the theoretical - “on paper” size and (D) indicates the discounted size, capturing the true number of French men-at-arms.

Rough estimates of total force size for the purpose of anticipating expenditure and provisioning armies, not as actual head-counts. Moreover, they often provide overestimates because they fail to account for variation in the size units within the army, treating all regiments and divisions as being composed of a regulation size. Using actual head counts from *étapes routes*, documenting the
stipulated travel routes, rations, and lodging, of specific units during wartime, he constructs these discounted estimates of overall army size.

From these data, described in Table 4.1 before the Thirty Years War the peace and war-time size of the French army remained roughly constant. The wartime on-paper size declined between 1340 and 1475 from an estimated 60,000 troops to between 40,000 and 45,000 soldiers, - a likely a consequence of Black-Death related population decline. It then increased to a theoretical high of 80,000 in 1576 and subsequently declined to 55,000 by 1610. However, this maximum value, when discounted in the manner described above is likely smaller by 10,000. While the size of the French wartime army remained relatively constant, France’s peacetime force actually declined from a theoretical high of 14,000 to 10,000. In sum, before the mid seventeenth century it does not seem as if the French army increased in size.

Still, it is clear that following the Thirty-Years War, a continent wide conflagration unmatched in scope and scale until the First World War, the size of French peace and wartime armies substantially increased in size. However, these gains in size, when properly discounted, are not as substantial as many claim, and moreover, declined from their peak relatively quickly. So, for example, when ([Tilly] 1990 p. 79) cites a high of over 400,000 French men-at-arms around 1700, using the on-paper value, he is overestimating this number by at least 60,000. Moreover, this peak wartime value declined by 85,000 between 1697 and 1701. Similarly, its theoretical peacetime size between 1678 and 1756 fluctuated between a high of 160,000 and 130,000. While no doubt large, these changes in army size are further diminished when examined in per capita
terms. France’s population increased by more than a third between 1500 and 1700, increasing from approximately 15 million to 21.471 million over this two hundred year period (Maddison 2006).

In all, although the size of the French army certainly increased in the late seventeenth century, these changes have been exaggerated by historical scholarship trying to tabulate its size. Moreover, it did not increase monotonically, reverting to a relatively constant peacetime level and declining substantially from its peak over the course of the eighteenth century. These patterns may simply reflect France’s ascendency as the premier great-power politics, rather than a general trend affecting all states. To see this note the analogous trend of Spain several centuries earlier. Spain, Europe’s dominant power for much of the sixteenth and early seventeenth centuries similarly increased the size of its (on paper) army from 150,000 in the 1550s to over 300,000 in the 1630s. However, having declined as a first-rate power, by 1710 the size of the Spanish army had dropped precipitously to 20,000 (Kennedy 1989 p. 56, 99). This is to say, even though France’s army increased in size, it may have been a function of its participation in great-power politics, rather than systemic changes in the number and size of armies required of all states.

Conclusion: Implications for The Universe of States

Evaluating data on the frequency, duration, and costs of conflict, I have highlighted several reasons to question the notion that systemic changes in the
production of violence had the stark consequences that previous scholarship on the military revolution and state-formation have described. First, using data describing outcomes including both great powers and lesser states, I show that contrary to findings relying upon data describing just the former conflict became less frequent and less intense between 1400 and 1790. Second, because systematically collected data describing the financial and man-power costs of war do not exist for a large and representative set of states, I examine data from several “most likely” cases and show that evidence in favor of increasing costs and size of armies either does not appear or is greatly diminished relative to what previous scholarship has argued. That is, even in this set of cases most likely to have experienced radical changes, it is not readily apparent that wars became as increasingly costly as many have argued.

Two questions arise from these observations. First, can we extrapolate from the experiences of these cases to the experiences of a most states? In some ways we cannot. These countries, like those selected to argue in favor of radical changes in the costs of war-making reflect patterns of great power politics rather than a representative sample of states. In other words, the cases used to make arguments linking war to patterns of state formation are also those most likely to adopt the forefront of military technologies, take part in interstate conflict, and are also the countries that were greatest in terms of geographic scale. Second, if the effects of the military revolution are attenuated in the set of cases where we are most likely to observe them and since these countries are very different from those which constituted most of the state-
system, should we expect changes in patterns of war to have the centralizing
effects predicted in bellicist theories of state formation?

Moreover, the historical record provides ample evidence that for substantial
periods urban groups held clear advantages in producing force. The period
of rapid urban growth associated with the commercial revolution was also a
period of marked decline in the relative costs of waging war specific for these
groups. The gradual replacement of armies comprised of heavily armored
feudal shock-calvary with those made up of infantry supported by relatively
few horsemen effectively drew down the costs of producing military force for
the urban groups who at this very point in time were gaining the economic
capacity to support these new forms of military organization.

The combined introduction of the high saddle, stirrup, and horseshoe in
the Carolingian period allowed knightly armies to dominate the production of
violence through much of the Middle Ages. These heavily armored calvary
could at a fast gallow decimate infantry formations and served as the vast pre-
ponderance of mediaeval militaries (Oman 1885, Verbruggen 1997). However,
armies of this sort were extremely costly to maintain. Parker (1988, p. 69-70),
for example, estimates the cost of a war-horse capable of carrying a knight in
full armor to be between six and twenty-six months of his wages and, more-
over, notes that a knight would need between three and five mounts per year.
Rogers (1993), in turn, estimates the cost of a fully equipped knight to be
ten year’s wages for a common foot archer. The costs of knighthood and the
lack of a commercialized economy led to the development of large feudal states
wherein a hierarchy of vassalage, the exchanged manorial revenue derived from
others’ agricultural labor directly for military service, weakly bound polities together (Bloch 2002).

Beginning in the late twelfth and early thirteenth centuries the near invincibility of armored calvary on the battlefield was curtailed by a series of tactical and technological innovations. The development of massed pike infantry that could withstand the charge of mounted calvary and technological innovations like the cross-bow favored infantry over expensive mounted soldiers (Contamine and Jones 1984; Rogers 1993). Indeed, a clear trend between 1100 an 1300 toward infantry based armies is apparent. Though, in the eleventh century the vast majority of men at arms were knights supported by relatively few infantry, by the mid thirteenth century this ratio had flipped. For example, the Lombard army raised in 1231 to counter Fredrick II’s imperializing efforts was comprised of 3,000 horsemen, 10,000 infantry with pike, and 1,500 crossbowmen (Contamine and Jones 1984; p. 72). As early as 1302, when at Courtai the communal pikemen of Flanders decisively defeated a French army consisting of mostly heavy calvary, a clear ability of infantry based armies to defeat feudal calvary was apparent (Verbruggen 1997; p. 166-173).

These changes lowered the relative costs of producing force directly; a crossbowman, for example, was approximately one-fortieth as expensive as a knight (Rogers 1993). The trend towards infantry lowered the costs of producing force in additional indirect ways; whereas knights required training beginning at a very young age removing an entire class of individuals from productive activity all together, a commune could with only semi-regular drilling could maintain an effective force of pikemen. Both of these effects advantaged urban groups.
First, densely urban places were those where sufficiently large groups of men could organize and train - even if only sporadically - as infantry (Contamine and Jones 1984, Verbruggen 1997, p. 84, 62). Second, because urban groups were wealthier they held direct material advantages over their rural counterparts, allowing them a superior capacity to purchase the means of coercion. Indeed, rural states like Poland and Russia were extremely resistant to modernizing their militaries and remained oriented towards heavy calvary until the seventeenth century, in part because they lacked the commercial resources to adapt to the changing technologies of war (Parker 1996, p. 37).
Chapter 5

A Simple Model of State-Formation

*The efforts of men are utilized in two different ways: they are directed to the production or transformation of economic goods, or else to the appropriation of goods produced by others.*

- Vilfredo Pareto, 1906

Introduction

By historical standards the current European system of states consists of a small number of geographically large political units. However, this has not always been the case. For most of the last millennium many extremely small political units have coexisted alongside comparatively few geographically large territorial states. In two parts this chapter develops a formal model that
explains the major patterns of European state formation before the French revolution. In doing so, I develop an explanation for why political fragmentation occurred in Europe’s productive central band and, moreover, why these small political units failed to expand to form large territorial states.

The model presented herein emphasizes the primacy of economic forces in determining the number and size of states in the international system. Because it emphasizes the effects of economic change it differs from war-making theories of state formation which argue that large territorial states emerged as a consequence of dominating alternative institutional types in their ability to produce large scale intentional violence.\footnote{Tilly defines coercion as “all concerted application, threatened or actual, of action that commonly causes loss or damage to the persons or possessions of individuals or groups who are aware of both the action and the potential damage (Tilly 1990, p. 19).”}

Empirically, however, it is not clear, however, that large states were advantaged in the production of coercion. Before the levée en masse the benefits of size - large population, access to natural resources, and substantial geography - offered little advantage in the production of military violence. Instead, this was a period where the leaders of states could, for some price, purchase the men and arms needed to prosecute war and police their realm. Mercenary troops of the Italian condotterii or Hessian princes, for example, served in campaigns across the continent and in armies on both sides of conflicts. By virtue of their wealth\footnote{Certainly wealthier than most territorial states in per capita terms, small city states, particularly those in Northern Italy, were capable of generating revenue often greater than that of the wealthiest territorial states. By then end of the fifteenth century Venice, for example, generated sixty percent more tax revenue than France (Braudel 1982a, p. 120) also Knapton (1988). The cities controlled by the Della Scala in the same period generated yearly revenue double that of England Schumann (1992).} small city-states like Florence or Genoa could purchase the
services of these men and raise armies capable of waging war with those of even the largest of territorial states.\(^3\)

Still, we are left with a puzzle. If wealthy states were capable of producing military violence why were small states that were wealthy unwilling or unable to use this capacity to expand their boundaries and emerge as territorial states? Taking a step even farther back, why is it that small states were more likely to emerge in the wealthiest regions? This chapter answers both questions.

To accomplish this I present two versions of a stylized model. In the short run, I treat the number and initial location of states as fixed. Taking location as given, states then divide their effort between the extraction of economic output and combat over territory from which economic output is extracted. Next, over the long run I assume states’ capacities to produce military force are fixed and instead treat the number and location of states as being endogenously determined. In both models I obtain a common result: even in a world where states are involved in military competition for control of territory states wealthier in per capita terms will be smaller.

In the short run this is because wealthier states face a steeper trade-off in the use of resources for conquest. That is, the marginal unit of effort devoted by advantaged states to conquest brings in increasingly small amounts of economic resources. In contrast, for disadvantaged states every additional unit of effort devoted to combat brings in relatively more resources. As a consequence, the points at which the two states are indifferent between devoting effort to

\(^3\)In the late thirteenth century the Florentines raised an army of 12,000 (Waley and Dean 1988, p. 84). In 1295 the Genoese raised an army of 40,000 (Scammell 1981, p. 161). By 1450 the Venetians could muster more than 60,000 men at arms between the navy and army (Hay and Law 1989, p. 89) (McNeill 2009, p. 70).
extraction or conquest varies; the initially disadvantaged state being willing
to devote more effort to combat than its wealthy counterpart: disadvantaged
states have a comparative advantage in conquest. And thus I arrive at an
answer to the first question this chapter addresses; wealthy states remain small
because, at the margin, they gain less from conquest than do poorer states.

In the long run, however, the number of states is not fixed. Indeed, over
any substantial historical span the number of possible political groups who
might plausibly seek statehood has always been fewer than the number of
independent states (Gellner 1983). In this version of the model the behavior
of existing states is disciplined by the possible formation of new independent
political units on their territory. Under this threat of entry a conditional
relationship between war, economic development, and state formation emerges.
When the costs of statehood are sufficiently high then existing states will be
able to thwart the formation of new states. However, conditional on these
costs being low, new states will form but only in the most productive places,
e.g. those that will yield the greatest payoff from achieving statehood. This
yields an answer to my second question; latent political groups will not be
willing or capable of forming in places that do not provide them the material
resources needed to sustain themselves in competition with other states.

In all, this chapter highlights the effects of economic forces on patterns of
state formation. That is, even when modelling states in anarchic competition,
it is the distribution of economic surplus, the distribution of what there is for
leviathans and potential leviathans to steal, that conditions political geogra-
phy. Where there is a large economic surplus to expropriate new states will
form. In the least productive places, where there is little to steal, fewer states will form and, as a consequence, be of a larger size.

This model differs from existing game theoretic treatments in two ways. First, it differs from the class of models that seek to explain the size and number of states (Friedman 1977, Bolton, Roland and Spolaore 1996, Bolton and Roland 1997, Alesina and Spolaore 1997, 2005a). Instead of viewing these outcomes as the product of an optimization problem facing a social planner, decisive voter, or autocrat I more realistically treat these outcomes as the consequence of competition where combat between states determines territorial boundaries. By treating the optimal size of states as a choice made by some decisive actor, even sometimes in the shadow of interstate competition (Alesina and Spolaore 2005b, 2006), previous models fail to treat the number and size of states as outcomes directly determined by conflict. Borders themselves are the product of costly competition between states rather than a choice made by a planner, voter, or autocrat weighing welfare gains and losses of changes in size.

Second, unlike formal models of state formation that allow for the development of states in anarchic competition (Skaperdas 1992, Konrad and Skaperdas 2005, Hirshleifer 2001), this model explicitly considers the spatial component of statehood. Although these models treat the number of states as the outcome of a violent processes, the competition they describe is not geographically bound. These models view the economic prize latent states attempt to claim as being amorphously defined in space. States simply fight over some pie that is divided amongst a number of agents through some sort of grand melee. This disre-
gard of the territorial nature of state formation is similarly unrealistic. States fight other states for control of specific territorially fixed resources. The model I present combines the anarchic-competitive nature of interstate competition found in the models presented by this second group with the spatial component of the first group and, in doing so, moves towards a more complete model of state formation.

Since I attempt to capture the behavior of a single wealth maximizing agent I draw on models of similar actors, namely, wealth maximizing firms and vote maximizing candidates. First, similar to economic models that seek to explain the number, size, and location of firms within a given industry or sector, I make the simplifying assumption of a single dimension along which actors may locate. For geography, the elimination of one dimension is an obviously stark reduction from two to one. Recognizing this, one must compare what is gained in tractability to the loss of realism. In this instance the gains certainly outweigh the losses.

Since at least Hotelling (1929) and Downs (1957) economists and political scientists have reduced geographic (and ideological) space to one dimension. This is not to justify my simplification of the world via citation of canonical assumptions. Rather, my aim is to demonstrate that, as in much of this literature, treating a two-dimensional plane as a single dimensional line is not an extreme distortion of reality. As I will show in detail in Chapter 5 variation in economic activity - they key geographically distributed parameter in my model - is captured fairly well by longitudinal distance from the center of the continent. In a historical sense, the re-emergence of trade during the early
centuries of the second millennium was contained within the central corridor of the continent’s east-west axis. In other words, variation in the principle geographic feature we are modeling is, largely, captured in a single dimension.

Still, this model differs from those of firms or elections. In these models actors in competition with each-other divide geographic or ideological space by the price mechanism or through their ideological proximity to voters. However, setting a price or choosing an ideological location are not costly in the way that combat over territory is. This is to say firms or parties do not destroy otherwise productive resources in the choice or price or location. In a realistic model of state formation, however, actors should divide space via conflict, through a costly investment in their military capacities. As such, I model the boundaries between states as determined by a simple contest technology which captures the costliness of military conflict between states and divides territory based upon their relative investments in conquest. Importantly, unlike in models of firms or of candidates for election, the most economically productive units in my model to not grow large but instead, because of their relative productivity, remain small.

A Comparative Advantage In Conquest

In this section I model the choice of a wealth-maximizing unitary actor who divides effort/resources between productive activity and conquest. Limiting the actions of states is justified once one considers the constraints a Malthusian economy placed on alternative strategies for enrichment. Between the
beginning of the eleventh and end of the nineteenth centuries the European economy was characterized by a hard cap on growth (Jones 2003, Landes 2005, Clark 2008, Morris 2010). It was a world of sporadic technological progress and limited growth in the capital stock and, as such, land and population were the key determinants of changes in economic output (Clark 2008). In per capita terms any increase in output simply altered the birth and death rates, increasing the total population, and forced a return to the Malthusian equilibrium. In absolute terms land and population size were still the crucial determinant of total output. Given a fixed amount of capital and land, the declining marginal product of labour meant that additional population simply failed to increase total output. Conquest of new territory thus proved to be an alternative strategy, perhaps the only available alternative, to produce gains in total output. In this light, the Norman invasions of England, the Angevin capture of Naples, and the Castilian seizure of Andalucia should all be viewed as successful examples of type of rational economic conquest. The short-run theory developed here captures these material incentives for territorial expansion.

**Setup**

In the short run the location and number of states are fixed. As such, I model the decisions of two states who maximize revenue with respect to effort devoted to production and effort devoted to the acquisition of territory necessary to produce economic output. The total amount of revenue generated by a state is modelled a function of effort devoted to economic activity and the size
territory held, $R_i = R((1 - E_i), Y_i(E_i))$. For simplicity we can use the following production function:

$$R_i = (1 - E_i)^{\gamma_i} Y(E_i)$$

By assumption we have:

$$1 = E_i + (1 - E_i)$$

Where $E_i$ is the effort state $i$ devotes to conquest and $(1 - E_i)$ the effort it devotes to productive activity. The parameter $\gamma_i$ captures technology by which effort devoted to production is translated into revenue, measuring the elasticity of productive effort. That is, it tells us for a 1% change in effort devoted to extraction what percentage change in total revenue is yielded. For high values of $\gamma_i$ states are efficient at production and for low values they are inefficient.

Land, L, has different value, $Y$, which is distributed, on $[0, 1]$ according to a cumulative distribution function $F(\cdot)$ and corresponding density, $f(\cdot)$, where $F(\cdot)$ is strictly increasing on $[0, 1]$ and satisfies $F(0) = 0$ and $F(1) = 1$. I assume that $f(\cdot)$ is strictly quasi-concave. Letting $\overline{M}$ denote the mode, this implies that $F(\cdot)$ is strictly convex on $[0, \overline{M}]$ and strictly concave on $[\overline{M}, 1]$. States 1 and 2 are located at 0 and 1 respectively. The border between them is established by the ratio of effort devoted to combat by bordering states and is defined by the following contest success function:

\footnote{To see this simply take logs of the production function $\log(R_i) = \gamma_i \log((1 - E_i)) + \log(Y(E_i))$}
\[ p = \frac{E_1^m}{E_1^m + E_2^m} \]

Where \( m \) is the decisiveness parameter, capturing the returns to scale of effort devoted to combat. Since \( m \) cannot be meaningfully zero or negative we assume \( m > 0 \). If \( m \leq 1 \) diminishing returns from competitive effort result. For \( m > 1 \) then increasing returns to combat hold throughout. The decisiveness parameter has an immediate interpretation with respect to military conflict. A low \( m \) corresponds to situations in which the defense has the upper hand whereas a high level of \( m \) implies that the offense is advantaged.\(^5\)

This setup allows us to write the ratio of land held states 1 and 2 as:

\[ \frac{L_1}{L_2} = \frac{p}{1-p} = (\frac{E_1}{E_2})^m \]

The value of the territory held by each state is therefore defined as.

\[ Y_1 = F(p) \quad \& \quad Y_2 = 1 - F(p) \]

Each state maximizes output with respect to \( E_i \).

\[ \max_{E_i} R_i = (1 - E_i)Y(E_i) \]

\(^5\)Alternately, we can view the border between states as an outcome determined by a bargaining process taking place in the shadow of costly war, the success of which is determined by the contest success function, \( p \). We can view the main model presented here as the reduced form version of this bargaining game. Proof of the main result within the context bargaining is given in Appendix A.
The simultaneous investment choice leads to a Nash equilibrium concept. That is, both states will choose $E_i$ to maximize their revenue, best responding to the other state’s investment choice. All Nash equilibria to this game will satisfy the following condition[5]

$$e_1 \cdot \gamma_1 \cdot Y_1 = e_2 \cdot \gamma_2 \cdot Y_2$$  \hspace{1cm} (5.3)

Where

$$e_i = \frac{E_i}{1 - E_i}$$

and $Y_i$ is determined by the contest success function $p = \frac{E_i}{E_1 + E_2}$ and the distribution function $F(\cdot)$. From this several implications arise.

**A Comparative Advantage in Conquest**

Having described the condition necessary to satisfy equilibrium behavior I now show how the strategic actions taken by both states change with respect to the parameters of the model. First, I begin by showing how states behave in

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To solve for this begin by taking logs

$$\log(R_1) = \gamma_1 \log(1 - E_1) + \log(F(p))$$

$$\log(R_2) = \gamma_2 \log(1 - E_2) + \log(1 - F(p))$$

Taking first order conditions and rearranging we get

$$e_1 \cdot \gamma_1 \cdot \frac{1}{m} = f(p) \cdot \frac{p(1 - p)}{Y_1}$$  \hspace{1cm} (5.1)

$$e_2 \cdot \gamma_2 \cdot \frac{1}{m} = f(p) \cdot \frac{p(1 - p)}{Y_2}$$  \hspace{1cm} (5.2)

Where $e_i$ is defined in the text.

Dividing Equation 5.2 by Equation 5.1 We get the resulting reaction function.
a world where economic output is distributed in an unequal, non-symmetric, manner.

Consider a world in which all states have access to the same technology. That is \( \gamma_1 = \gamma_2 \) and \( m_1 = m_2 \). However, let us also assume that one state has an advantage in production; it is closer to the peak of the distribution of economic output. For example, states advantaged in this way might sit closer to trade routes and therefore will be more capable of conducting economic exchange. Formally this means that \( f(\cdot) \) is asymmetric. That is, \( F(\frac{1}{2}) \neq \frac{1}{2} \).

If \( F(\frac{1}{2}) < \frac{1}{2} \) then State 2 is advantaged in terms of production - it is closer to the peak of the distribution of economic output. If \( F(\frac{1}{2}) > \frac{1}{2} \) the opposite is true. This productive inequality results in states are of different sizes.

**Proposition 5.0.1.** If there is an asymmetric distribution in the value of land, the state that is advantaged by this asymmetry will be of a smaller size than the state that is disadvantaged by the skewed distribution of output.

*Proof.* Assuming an asymmetric distribution of economic output there are three possible cases to consider. \( E_1 > E_2 \), \( E_2 < E_1 \) and \( E_1 = E_2 \).

First I will show that with any asymmetric distribution states will not exert equal effort to conquest.

After some algebra, we can rearrange Equation 5.3 such that.

\[
\frac{e_2}{e_1 + e_2} = F(p(E_1, E_2)) \quad (5.4)
\]
Suppose $E_1 = E_2$. This implies $p = \frac{1}{2}$ and that $\frac{e_1}{e_1 + e_2} = \frac{1}{2}$. From Equation 8.2, we get $F(\frac{1}{2}) = \frac{1}{2}$, a contradiction. So, we know in this scenario states will not devote equal effort to conquest. Now I will show that the state disadvantaged in production will not spend more on conquest than its counterpart. Without loss of generality we can consider the case, $F(\frac{1}{2}) < \frac{1}{2}$. In this case when State 1 is disadvantaged by being located in a less productive initial location.

First, rewriting Equation 8.2 as $\frac{1}{F(p)} = 1 + \frac{e_1}{e_2}$.

Now if $E_1 \leq E_2$ then the righthand side is less than two and the lefthand side is greater than two, a contradiction. Since $E_1 \neq E_2$ and $E_1 \not< E_2$, It follows that it must be the case that $E_1 > E_2$. The proof for when $F(\frac{1}{2}) > \frac{1}{2}$ is symmetric.

Because each state devotes different fractions of effort to fighting each other they will be of different sizes. To see this we can look at the ratio of ratio of land held by States 1 and 2,

$$\frac{L_1}{L_2} = \left(\frac{E_1}{E_2}\right)^m \quad (5.5)$$

Which is greater than 1. When there is an asymmetric distribution of resources, because states are devoting different effort to conquest, they will be of different sizes with the state being located closer to $F(m) = \frac{1}{2}$ the smaller of the two. 

\[\square\]
We see that when there is a skewed distribution of economic output that states will devote differing amounts of effort to the capture and defense of territory. As a consequence, we see that states will be of unequal size. Specifically, when there is an asymmetric distribution of resources across geography the state disadvantaged by this will maintain a comparative advantage in violence. That is, the state located farther away from the mode of the distribution we be willing to devote more effort to acquiring territory than it's counterpart.

The reason is straightforward, the additional unit of effort for the disadvantaged state brings in increasingly valuable territory. For the advantaged state the opposite is true. Each unit of effort devoted to conquest brings in less and less valuable land. The disadvantaged state will therefore be willing to continue to exert effort to conquest when her advantaged counterpart will be unwilling. In other words, both states will be expending effort on acquiring territory until the point where they are indifferent between expending the marginal unit on the acquisition of more territory and the marginal unit of effort on extracting from the territory they would end up controlling. These points of indifference are simply not the same for both states when one has an advantage and the other a disadvantage in production; the state that maintains this advantage, at the margin, is less willing to devote effort to acquiring territory than her disadvantaged counterpart because doing so brings in less income than it would from extraction.

This is not to say that states do not expend effort defensively. As is obvious from Equation 5.3, if either player increases (decreases) their effort their opponent will similarly respond. For example, if the disadvantaged state were
to expend a greater amount of effort on conquest the advantaged state would follow suit. It is simply that the advantaged state will not be willing to expend the same effort as her disadvantaged counterpart. She will, however, increase effort devoted to conquest in response to a more belligerent opponent in order to protect her valuable territory.

Empirically this results comports with stylized historical fact. Geographically and economically peripheral groups have tended to be the formatuers of history’s great empires. The Mongols or the Macedonians, just two examples, were economically backwards and resorted to conquest as a means of enrichment, creating massive continental Empires in the process. We can consider the Danish and later the Norman conquest of England in a similar light. For the former, the conquest of England began as an explicitly economic strategy - maurading bandits seeking plunder. However, it ultimately resulted in the Danish-English state, a large centralized political community capable of regular taxation.

Moreover, this result explains an observed phenomenon that has heretofore gone unexplained by both sociological and game-theoretic models of state formation. That is, this result yields an explanation for why small wealthy states failed to expand despite a clear ability to wield massive coercive force. Though these places had the means to extend their boundaries they chose not to because the use of resources for conquest was, at the margin, less productive in terms of revenue generation than it was for their less wealthy competitors.
Biased Technologies of Production

What if $\gamma_1 \neq \gamma_2$? That is, what if the two states have different technologies of production, one state being more capable of converting effort devoted to production into economic output. The result is almost identical to that when the distribution of economic output is unevenly distributed. The state which has an advantage in production will similarly be less willing to expend effort to acquire territory when it can get a greater relative return from production. Because it maintains this advantage in extraction the point at which the advantaged state becomes indifferent between extraction and expansion is earlier than for its disadvantaged counterpart.

**Proposition 5.0.2.** If there is a technological bias in production then states will exert unequal effort to conquest and it is the state that is advantaged in production that will exert less effort to conquest: That is if $\frac{\gamma_2}{\gamma_1} > 1$, then $E_2 < E_1$.

**Proof.** Without loss of generality we can consider the case where State 2. is advantaged in extraction, $\frac{\gamma_2}{\gamma_1} > 1$. For simplicity assume a symmetric distribution function for economic output $F(\frac{1}{2}) = \frac{1}{2}$. Again we have three possible cases $E_1 = E_2$, $E_1 < E_2$, & $E_1 > E_2$. To prove the result start by rearranging Equation [5.3] to yield

\[
1 + \frac{e_1}{e_2} = \frac{\gamma_2}{\gamma_1} \cdot \frac{1}{F(p(E_1, E_2))} \tag{5.6}
\]
Suppose $E_1 = E_2$ then the left-hand side of Equation [5.6] is equal to 2. but the right hand side is greater than 2. A contradiction. Now, suppose $E_1 < E_2$ The left hand side of Equation [5.6] is then less than 2. and the right-hand side is greater than 2, a contradiction. So, it must be that $E_1 > E_2$.

From this result we get:

\[
\text{If } \frac{\gamma_i}{\gamma_j} > 1 \text{ then } L_j > L_i \quad (5.7)
\]

Which follows directly from Equation [5.5].

This result again captures the basic insight of the short term model. That is, because the advantaged state faces a steeper trade-off between the use of effort extraction and conquest, it expends less on capturing territory. States who have some advantage in the extraction of economic output - either because of a superior geographic location, for example controlling ports or waterways that were choke-points for commercial activity, or because of a technological advantage in extraction, a more efficient bureaucratic organization for example, - are less willing than their disadvantaged counterpart to invest the marginal unit of effort towards conquest. Because of this, the state disadvantaged in extraction maintains a comparative advantage in conquest and will be of a larger geographic scale.
Military Technology

Having shown that the boundaries between states are a consequence of both economic geography and the technologies of production, I now turn to an examination of the effects that the technology by which states produce interstate violence. Consider a situation in which either because the distribution of economic surplus is asymmetric or the technologies of extraction are biased states are devoting an unequal amount of effort to conquest. In both of these situations states are of unequal size. However, the magnitude of this difference in equilibrium size is going to be not only a function of the technologies of extraction or of the distribution of economic rents but also the military technology with which states do combat against each-other.

Recall that I am modeling the boundary between states as a function of the ratio of the effort they devote to conquest and the parameter $m$. Where $m$, the decisiveness parameter, captures the returns to effort devoted towards combat. Holding the other player’s effort fixed, when this is low additional effort devoted to conquest brings in relatively less land than when it is high. More specifically, when $m < 1$ there are diminishing returns to conquest and we can say defensive technologies of interstate conflict predominate. The relative size of states is going to also be determined by whether the offense or the defense predominates when states do combat. In situations where the defense is favored states will be of more equal size than in those situations when the offense is favored.
Proposition 5.0.3. When the technology of interstate conflict favors the defense states will be of more equal size: As $m$ approaches zero, $L_1 = L_2 = \frac{1}{2}$

Proof. To show this, examine the ratio of territory held by the two states, $\frac{L_i}{L_j} = (\frac{E_i}{E_j})^m$

The limit of this ratio as $m$ goes to 0 is 1. That is, the denominator and numerator must be equal. This follows from the contest success function, $p = \frac{E_i^m}{E_i^m + E_j^m}$ whose limit as $m$ goes to zero is $\frac{1}{2}$, an equal division of space.

From this we get:

$$\lim_{m \to 0} L_i = \frac{1}{2}, \quad \lim_{m \to 0} L_j = \frac{1}{2} \quad (5.8)$$

The implication of Proposition 5.0.3 is that when military technology favors the defense, for example, in periods when lightly garrisoned fortifications could halt the campaigns of large armies, the comparative advantage in conquest maintained by the economically disadvantaged state is predicted to diminish. We can derive a similar conclusion about a world when the technologies of interstate competition favor the offense.

Proposition 5.0.4. When the technology of interstate conflict increasingly favors the offense then the state that maintains an advantage in conquest will
be increasingly large: When $E_1 > E_2$, as $m$ approaches one $L_1 = 1$ and $L_2 = 0$

Proof. Without loss of generality consider the case when $E_1 > E_2$. We can write the ratio of territory held by both states as $\frac{L_1}{L_2} = \left(\frac{E_1}{E_2}\right)^m$ which is greater than one. Taking the limit of this as $m$ goes to infinity we get that this ratio also goes to infinity. To see again see what happens to the contest success function, $p = \frac{E_1^m}{E_1^m + E_2^m}$ as $m$ goes to infinity and $E_1 > E_2$. as $m$ gets large the numerator is increasing at a relatively faster rate than the denominator and the amount of territory held by State 1 similarly follows.

From this we get:

$$\text{If } E_1 > E_2, \lim_{m \to \infty} L_1 = 1, \lim_{m \to \infty} L_2 = 0 \quad (5.9)$$

This result can be interpreted to mean that as the balance between offense and defense favors the offense, the comparative advantage held by the disadvantaged state becomes more pronounced. As such, the fraction of territory held by the disadvantaged state increases and the two entities become less equal in size. For example, during the Hundred Years War the introduction of powerful siege artillery, an invention that favored the offensive capabilities of armies, enabled Charles VII of France to reconquer Normandy at the pace of a castle per week in under a year. Thirty years prior to this it took Henry V ten years to conquer the same territory.
To summarize, when the number of states is fixed and the costs of statehood have already been paid, the question of size becomes not why states form or fail nor where they locate but rather why they expand and contract. The answer I provide is straightforward: states that have an economic advantage are less willing than their disadvantaged counterpart to expend the marginal unit of effort on expansion. This is because conquest for the disadvantaged state brings relatively larger returns in terms of total output than it does for the advantaged state. It maintains a comparative advantage in conquest and will therefore be of a larger size. This advantage arises in two ways. First, states may be advantaged because they have more to extract by virtue they are located in places that are more productive. Second, they might be better at extraction because they have superior technology with which to steal from the territory they control. In either case, when states are more efficient bandits they are less willing to expend effort on fighting with other states.

This advantage is exacerbated or diminished by the tools with which states fight each other. When the production military force favors the offense then the initially disadvantaged state, the state expending greater effort on conquest, will be able to hold more territory. The opposite is true when the state of military technology favors the defense. When effort devoted to conquest is less successfully translated into territorial conquest states will more equal in size. In the extreme, when there is zero return to effort devoted to conquest - when states can perfectly defend themselves - then the territory held by each will be of equal size.
State Formation With Deterrent Existing States

Having addressed the question of why productive states ultimately devote less effort to the acquisition of territory than their less productive counterparts, this section explains why new states will be most likely to form in the most productive regions. Again, modeling states as wealth maximizing unitary actors I show that so long as the costs associated with forming a new state are sufficiently low, new states will be more likely to form in the most productive regions. This outcome results not from a decision theoretic weighing of the costs of forming as a state against the expected benefits of independence but, instead, is the consequence of the strategic interaction of existing, incumbent, states and latent, possible, states.

Differing from the previous section, I treat the number and location of states as fixed and the choice of conquest effort as endogenously determined. In other words, I now develop a model where the conquest effort is fixed and the number and location of states are determined in equilibrium. Stylistically, we can consider a world in which there exists two incumbent states, 1 & 2, and a single latent political group, e that does not exist as a state. That is, this is a game of state formation that has both stationary and roving bandits. The incumbent states face the problem of revenue maximization in the face of a possible new state forming on the territory they control. As such, they will strategically choose the area they attempt to control in order to prevent the latent political group from forming as a state. However, given a sufficiently
low cost of statehood they will be unable to deter this action. Conditional upon the costs of statehood being sufficiently low the entrant state will form closest to the peak of the distribution of economic output.

This result occurs because of the tradeoff incumbent states incur when faced with the possibility of a new state forming on their territory. If incumbent states attempt to assert control in the most productive regions, they face the possibility of losing out to an entrant on their periphery, allowing the latent state to form in their less productive region whilst still fighting for control of the productive lands. Consequently, existing states will prefer to allow the entrant to form in the productive region and retain strong control of their periphery - only fighting a single enemy instead of two.

**Setup**

Again we assume that geography is defined on the interval $[0,1]$. As before we will assume that the economic value of land, $Y$, is distributed according to a cumulative distribution function $F(\cdot)$ which we assume to be continuously differentiable, strictly increasing with $F(0) = 0$ and $F(1) = 1$. We also assume that the continuous density function $f(\cdot)$, generated by $F(\cdot)$, is strictly quasi-concave and single-peaked, i.e. $f(\cdot)$ is strictly increasing on the interval $[0, \frac{1}{2}]$ and is strictly decreasing on the interval $[\frac{1}{2}, 1]$.

States will choose a location $l_i$ somewhere the space $[0,1]$. However, unlike political parties or candidates for election two entrant states, restricted by the laws of physics, cannot realistically occupy the same space. As such,

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7The basic setup of this game follows Palfrey (1984)
throughout we will restrict location strategies to exclude multiple entrants at the same location. The boundary between each state is determined by the ratio of their long-term military capacities, \( p_i = \frac{E^m_i}{E^m_i + E^m_{i+1}} \). So, the territory held by state \( i \) between state \( i \) and state \( i + 1 \), where \( l_{i+1} > l_i \), is simply \( l_i(1 - p_i) + l_{i+1}p_i \).

I solve the baseline model assuming that in the long run states have the same long-term military capacities and expend roughly equivalent effort to conquest. That is, to start I will assume \( E_i = E_j \forall i, j \) and therefore the boundary between any two states will simply be the midpoint between them. In other words, because they are expending equal effort on military conquest, the boundary between state \( i \) and state \( i + 1 \) will simply be equal to \( \frac{l_{i+1} - l_i}{2} \) with economic resources within the interval \([l_1, \frac{l_{i+1} - l_i}{2}]\) controlled by state \( i \) and those on the interval \([\frac{l_{i+1} - l_i}{2}, l_{i+1}]\) controlled by state \( i + 1 \). Substantively, one might interpret the location action as the choice of a capital beyond which control is exerted only up until the point where a competitor can exert the same level of control.

Location decisions are first made by the established states and then by the entrant. In other words, the established states play non-cooperatively, choosing their locations and taking the rent maximizing location and entry decision by the entrant state as given. That is, the established states act as Nash players with respect to each other and as Stackelberg leaders with respect to the latent state, predicting it’s response as a Stackelberg follower.

We can define payoffs for states as follows. First, consider just exterior states, i.e. those who have only one border. For the left exterior player the
payoff is $R_L = F\left(\frac{l_L + l_L}{2}\right)$ and for the right exterior player $R_R = 1 - F\left(\frac{l_R + l_R}{2}\right)$. When there is no entrant state, i.e. where there are only two states, $R_L = F\left(\frac{l_R + l_R}{2}\right)$ and $R_R = 1 - F\left(\frac{l_R + l_R}{2}\right)$. When there is a third entrant the interior state, that with two boundaries, receives $R_M = F\left(\frac{l_M + l_M}{2}\right) - F\left(\frac{l_M + l_M}{2}\right)$ and the exterior states receive $F\left(\frac{l_L + l_M}{2}\right)$ and $R_M = 1 - F\left(\frac{l_R + l_M}{2}\right)$. For the entrant state, $e$ we assume a cost $c \geq 0$ of state formation. So, the entrant’s payoff given that it enters is $R_e - c$.

Since for a number of incumbent strategy profiles a unique rent maximizing best response may not exist I follow Weber (1992; 1997) in focusing on the set of hierarchical equilibria to this game. This equilibrium concept considers two cases:

1. There does not exists a unique best response by the entrant to incumbents’ choices

2. There exists a unique best response by the entrant to the incumbent’s choices

In the first case we define the payoffs for each actor following Palfrey (1984) by taking the average share of rents over the set of “almost” best responses of the entrant given the incumbents’ location choices. In the second case, given that states are wealth maximizing actors, we assume entrant states will locate at the unique wealth maximizing location.

\footnote{See Weber (1992) for a more detailed exposition of hierarchical equilibria}
Long Term Results

I characterize equilibria under three intervals of state formation costs, $c$. For high costs ($c \geq \frac{1}{2}$) we are not guaranteed an equilibrium. For intermediate costs ($\frac{1}{2} < c \leq \frac{1}{2}$) I show that incumbent states can deter the formation of new states and low costs of state formation ($0 < c \leq \frac{1}{2}$) the latent state will form. Moreover, I will show that when state formation costs are low enough to allow for the creation of a new state, the new state will form at $\frac{1}{2}$ and that as the variance of $f(\cdot)$ declines - as the economic surplus available for states to expropriate becomes increasingly concentrated - the entrant state will become increasingly small.

Note that the latent state will be indifferent between entering and remaining latent when $c = R_e$. Knowing this, for sufficiently high costs, $c > c$, the incumbent states will be capable of strategically construct boundaries to prevent any interval on $[0,1]$ from giving a positive return. That is for a sufficiently high cost of state formation there will only be an equilibrium in which new states are deterred from forming.

To begin, let us consider the situation when the costs of statehood are high. For a sufficiently large cost of state-formation we see that existing states will be able to deter the creation of new states.

**Proposition 5.0.5.** If $\frac{1}{2} \leq c < \frac{1}{2}$ then $x_1 = F^{-1}(c)$, $x_2 = 1 - F^{-1}(c)$ and the latent state is deterred from forming

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9Because we have assumed that states cannot occupy the same space Hoetelling-Downs convergence to the median is ruled out, yielding the result. If we allowed states to occupy the same location in space, the unique equilibrium when $c \geq \frac{1}{2}$ would be both existing states locate at $\frac{1}{2}$.  

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To see this, note that if the existing states are going to deter entry then they must locate on opposite sides of the median, that is, \( l_1 < \frac{1}{2} < l_2 \) and that \( \max[F(l_1), 1 - F(l_2)] < q \). If either \( F(l_1) \) or \( 1 - F(l_2) \) is less than \( c \), then one of the parties can improve their payoff by moving towards the median. To see this, note that if \( l_1 = F^{-1}(c) \), \( l_2 = 1 - F^{-1}(c) \) then if either state moves away from the median she decreases her payoff. Conversely, if she moves any closer to the median it will allow the entry of \( e \). Thus, \( l_1 = F^{-1}(c) \), \( l_2 = 1 - F^{-1}(c) \) represent best responses by all actors.

For low enough values of \( c \), however, the incumbent states will not be able to deter the formation of new states. That is, for a small enough cost the incumbent states will be unable to construct intervals along both their interior and exterior that would, given entry, provide a negative payoff to the latent state. To see how equilibrium behavior changes when the costs of state formation are low, consider the situation where \( c = 0 \). This setup matches the model of elections with entry already solved by Palfrey (1984). And yields the following unique equilibrium:

**Proposition 5.0.6.** If the costs of state formation are sufficiently low, making the incumbent states incapable of deterring the latent state to form, the two incumbent states select positions to maximize rents given certain entry, selecting the unique equilibrium strategies \( F(l_1^*) = 1 - 2F(\frac{1}{4} + \frac{l_e^*}{2}) \), \( F(l_2^*) = 1 - F(l_1^*) \) and \( l_e^* = \frac{1}{2} \).

The intuition behind this result is simple: given that states face a certain entrant, they will minimize the payoff available to the new state, constructing intervals in geography that prevent the latent state from entering on their
outside. At \( F(l_1) = 1 - 2F(\frac{1}{4} + \frac{l_1}{2}), 1 - F(l_2) = F(l_1) \) the entrant state locating at any point to the left of \( l_1 \) or at any point to the right of \( l_2 \) achieves less than \( F(l_1) = 1 - F(l_2) \). If the entrant enters at \( \frac{1}{2} \) they get a payoff of \( F(l_1) = 1 - F(l_2) \). Because of the quasi-concavity of \( f(\cdot) \) movement away from \( \frac{1}{2} \) yields a payoff strictly lower than \( F(l_1) \). Similarly, any movement towards the median by players 1 or 2 allows for the entrant to locate on their extreme and receive a payoff greater than or equal to \( F(l_1) \), lowering the payoff for the incumbent. Likewise, any movement farther away from the median yields strictly lower payoff for the incumbent state.

In other words, to maximize its own payoff, the incumbent state seeks to limit the payoff available to the entrant state. To do this he must be assured that the entrant doesn’t usurp him on his own territory. That is, the incumbents seek to prevent losing control of nearly all of its peripheral territory whilst also having to fight for control of the productive region. The incumbents therefore choose a capital guaranteeing a weakly greater payoff to the entrant from locating in the productive region, and guaranteeing that they only have to fight along this one front. A formal proof is left to Appendix B.

**The Size of States in the Long Run**

Now, what predictions about the size of states do these results imply? First, when the costs of statehood are low and the the formation of new states is deterred states will be of equal size. Obviously, when the costs of statehood are low and the latent state forms, the average size declines. We can, however,
provide more precise predictions about the size of states when the costs of state formation are sufficiently low.

**Proposition 5.0.7.** When the latent state enters it will always be smaller in size than the incumbent states.

*Proof.* First, suppose that the latent state were the same size as the incumbent states. For this to be true the locations must be as follows: \( l_1 = \frac{1}{6}, l_e = \frac{1}{2}, l_2 = \frac{5}{6} \). However, this would require \( F\left(\frac{1}{6}\right) = 1 - 2F\left(\frac{1}{3}\right) \), a contradiction. Next, consider the case when the latent state is larger than either of the incumbents. Because equilibrium behavior requires that both incumbents locate symmetrically around \( \frac{1}{2} \) we only need to consider the case when the entrant state is larger than both incumbents. Take the smallest possible way in which this can be true, \( l_1 = \frac{1}{6} - \epsilon, l_e = \frac{1}{2}, l_2 = \frac{5}{6} + \epsilon \), again yielding a contradiction, \( F\left(\frac{1}{6} - \epsilon\right) = 1 - 2F\left(\frac{1}{3} - \frac{\epsilon}{2}\right) \) which cannot hold for any value of \( \epsilon \). Since the entrant state cannot be larger and cannot be the same size as the incumbent states it must be smaller. \( \square \)

**Corollary 5.0.8.** As the variance of \( f(\cdot) \) decreases, the size of the entrant state declines relative to the size of the incumbent states.

To see this note that the size of the entrant state is \( \frac{l_2 - l_1}{2} = \frac{1}{2} - l_1 \). Assuming a sufficiently low cost so that the formation of the entrant state is assured, first consider a distribution \( F(\cdot) \) and associated equilibrium location for incumbent 1, \( l_1^* \). Now, consider a distribution function with a smaller variance, \( F'(\cdot) \) and an equilibrium location for player 1, \( l_1^{**} \). It is clear that \( F(l_1^*) < F'(l_1^{**}) \), and
that $F(l_1^*) > F'(l_1^*)$. It follows that $l_1^{**}$ must be greater than $l_1^*$ and therefore that the entrant state is going to be smaller under distribution $F'(\cdot)$.

Substantively, this result can be interpreted in the following way: given that the cost of state formation is sufficiently low to allow entry, as the spatial distribution of economic output becomes more unequal, specifically, as the concentration of wealth becomes increasingly located around the mode, the entrant state will be concomitantly smaller. The logic is straightforward, as output becomes concentrated around the mode, the incumbent states can locate increasingly close to $\frac{1}{2}$ whilst still guaranteeing that the entrant does not locate on its outer flank.

**Unequal Military Strength**

How does this equilibrium change if states do not equally split territory between them? That is, instead of balancing against each other, what if in the long run some states are more capable of projecting military force? Formally, what if $E_i \neq E_j$? I will solve the case when the incumbent states have symmetric military capacities and there is an entrant state that is weaker than them, $E_e < E_1 = E_2$. When this is the case, I will show that the advantage that the incumbent states have in terms of size and payoff is exacerbated. In other words, when the long term military capacity of the incumbents is greater than the entrants

First, consider the situation when $c$ is sufficiently low that we are guaranteed the latent state will enter. If this is the case, then the following equilibrium must hold.
Proposition 5.0.9. If $E_e < E_1 = E_2$. And $c$ is sufficiently low such that the latent state enters with probability one, the unique equilibrium will satisfy 
\[ F(l_1) = 1 - 2F(l_1 \cdot (1 - e) + e \cdot \frac{1}{2}), \quad 1 - F(l_2) = F(l_1) \text{ and } l_e = \frac{1}{2}. \]

The intuition behind this result is nearly identical to the case when $E_1 = E_2 = E_2$. The incumbent states can locate providing the a strictly better payoff from playing $l_e = \frac{1}{2}$ than $l_1 - \epsilon$ or $l_2 + \epsilon$. A formal proof is left to the appendix.

When $E_e < E_1 = E_2$ it follows that the incumbent states must locate more distant from $\frac{1}{2}$. That is, if $l_1$ is an equilibrium when $E_1 = E_2 = E_2$, then if $l_1^*$ is an equilibrium under $E_e < E_1 = E_2$, then $l_1^* < l_1$. To see this, suppose that $l_1^* \geq l_1$, then the entrant state would be able to locate at $l_1^*$ and obtain a strictly greater payoff than if they were to locate at $\frac{1}{2}$. It follows then, that $l_1^*$ must be less than $l_1$. Similarly, it follows that the payoff to the entrant is strictly less when her military capacity is less than the incumbent states.

To see this note that the payoff when $E_1 = E_e$ for the entrant is $F(l_1)$, and when $E_1 > E_e$ it is $F(l_1^*)$ which is less than $F(l_1)$. As before, we can obtain a prediction about the size of the the entrant state when $E_e < E_1$ when it is willing to form.

Corollary 5.0.10. If $E_e < E_1 = E_2$. And $c$ is sufficiently low such that the latent state enters with probability one then the size of the entrant state is smaller than when $E_1 = E_2 = E_2$.

Note that in both equilibria the entrant locates at $\frac{1}{2}$. Since under both $E_e < E_1 = E_2$ and $E_1 = E_2 = E_2$ the entrant state chooses the same location it follows that if the payoff under one equilibrium is greater than the payoff from
another then the size of the state when they payoff is greater will necessarily
be larger than that when the payoff is smaller.

In all, the long-run theory characterizes a conditional relationship between
war, economic development, and state-formation. When the costs of forming a
new state, those related to a bureaucratic-military apparatus, are sufficiently
high latent political communities will not be able to form as states. However,
when these costs are low enough, new states will form, doing so in the wealth-
iest places matching in many ways the conclusions of the economic school of
state formation.

The creation of new states is not only a function of their ability to obtain a
positive payoff from forming but also from their strategic interaction with al-
ready existing states. That is, state formation is a function of not only the costs
and benefits of statehood associated with variation in the economic potential
of geography. Because existing states behave strategically in establishing the
bounds of their control latent states will either be incapable or unwilling of
forming in the periphery. Instead, they will seek to maximize income by es-
establishing states in the wealthiest regions (in per capita terms). Moreover, as
incomes become increasingly concentrated, the geographic space over which
latent political groups can successfully claim independence becomes smaller,
resulting in the formation of even smaller states.

By providing groups in some places the resources needed to effectively
monopolize coercion, the unequal re-emergence of trade and urban life led
to a concomitant increase in the number of independent states in Europe’s
prosperous core. However, the effect of the concentrated reemergence of trade
and urban life was greatest in the period associated with low costs of statehood. That is, in the period before the French Revolution the effect of increased urbanization and growth caused political fragmentation in Europe’s central urban band.

**Conclusion**

This chapter presents a micro-founded theory of pre-industrial state formation that explain variation in the size and number of states over the short and long term. In treating the number and size of states as the outcome of interstate competition between wealth maximizing Olsonian bandits I arrive at a set of novel conclusions, conclusions which result from a set of mechanisms that accurately reflect the violent nature of state formation. Moreover, these results reflect the observed historical patterns of European political development.

Specifically, the model presented in this chapter highlights the notion that economic and martial constraints on the number and size of states are not only compatible but are interactive in ways thus far not highlighted by either formal or sociological models of state formation. That is, state makers seeking to maximize rents to office will choose to expend resources on conquest constrained not only by the costs, technologies, and intensity of interstate conflict but by both the size, ease of extraction, and spatial distribution of the economic surplus available.

Groups who might otherwise seek independence will only be willing to do so when they receive a non-negative return from statehood. In the long run two
opposing constraints limit both the willingness of these latent states to claim independence and condition the locations where they are capable of forming. First, the fixed costs of statehood and the equilibrium level of resources being devoted to combat limit the ability of groups to receive a net positive return to statehood. When these are high fewer groups can “turn a profit” on statehood.

Which latent groups are capable of obtaining a positive payoff is a function of economic geography. Because groups will be willing to form as states up and to the point where they are indifferent between remaining latent and claiming independence, in those places where there is a greater economic surplus to be captured states will be capable of obtaining a positive return. Consequently, in these most productive places more states will form and as a result be of a smaller size.

In the short-run, when the number of states is taken as given and the fixed costs of statehood have already been paid, the boundaries between units are still determined by the distribution of economic surplus and the technologies of extraction. State advantaged either by geography or by extractive technology will be less willing to exert costly effort to acquire territory. Their disadvantaged opponent will maintain a comparative advantage in conquest. I show that this advantage will be exacerbated or curtained by the offensive or defensive nature of interstate violence production.
Appendix A

For simplicity, assume that the value of territory, \(Y\), is uniformly distributed on the interval \([0, 1]\). Now, instead of immediately fighting to determine their border, States 1 and 2 can bargain over the choice of a boundary. They follow a Rubinstein bargaining protocol where State 2 and State 1 make iterative offers and where the outside option is determined by war, e.g. the contest success function, \(p\), determines how territory is split if no bargain is struck. The timing is as follows. In the first stage each state chooses \(E_i\) and in the second stage they bargain in the shadow of conflict.

Solving the game backwards, each state will offer a border location \(x_i\), with an associated utility \(R_1 = (1 - E_1)^{\gamma_1}x_i\), \(R_2 = (1 - E_2)^{\gamma_2}(1 - x_i)\). Assuming uniform discount values \(\delta\), the border associated with a given continuation values \(V_1\) can be expressed as \(x_i = (1 - E_1)^{-\gamma_1} \cdot V_1\) and for \(V_2, x_i = (1 - (1 - E_2)^{-\gamma_2} \cdot V_2)\). State 1 will offer the point to State 2 that gives them a utility equal to their discounted continuation value and the same for State 2. So, for State 1.

\[
V_1 = (1 - E_1)^{\gamma_1} - \frac{V_2}{\delta} \frac{(1 - E_1)^{\gamma_1}}{(1 - E_2)^{\gamma_2}}
\]

and for State 2.

\[
V_2 = (1 - E_2)^{\gamma_2} - \frac{V_1}{\delta} \frac{(1 - E_2)^{\gamma_2}}{(1 - E_1)^{\gamma_1}}
\]

Which can be solved for \(V_{1/2} = \frac{\delta(1-\delta)}{1-\delta^2} \cdot (1 - E_i)^{\gamma_1}\). Without loss of generality consider the game where State 2 makes the initial offer. The unique equilibrium to this subgame is \((\delta \cdot \frac{\delta(1-\delta)}{1-\delta^2} \cdot (1 - E_1)^{\gamma_1}, \frac{\delta(1-\delta)}{1-\delta^2} \cdot (1 - E_2)^{\gamma_2})\).

Because there is perfect information, bargaining will always be successful so long as the utility from the bargained outcome is greater than or equal to that from fighting. In other words each state maximizes \(V_i\) with respect to \(E_i\) subject to the constraints \(V_1 \geq U_1\) and \(V_2 \geq U_2\) where \(U_1 = (1 - E_1)^{\gamma_1}p - c_1\)
and where \( U_2 = (1 - E_2)\gamma_2 (1 - p) - c_2 \) which are the utilities from fighting and \( c_{1/2} \) are the costs from war. Formally,

\[
\max_{E_1; \lambda_1, \lambda_2} \delta D (1 - E_1)^{\gamma_1} + \lambda_1 (\delta D - p - c_1 (1 - E_1)^{-\gamma_1}) + \lambda_2 (D - (1 - p) - c_2 (1 - E_2)^{-\gamma_2})
\]

and

\[
\max_{E_2; \lambda_1, \lambda_2} D (1 - E_2)^{\gamma_2} + \lambda_1 (\delta D - p - c_1 (1 - E_1)^{-\gamma_1}) + \lambda_2 (D - (1 - p) - c_2 (1 - E_2)^{-\gamma_2})
\]

Where the complimentary slackness constraints are defined as
\[
\lambda_1 (\delta D - p - c_1 (1 - E_1)^{-\gamma_1}) = 0 \quad \text{and} \quad \lambda_2 (D - (1 - p) - c_2 (1 - E_2)^{-\gamma_2}) = 0
\]

Solving this problem yields the following reaction function which proves the main result for \( c_1 = c_2 \) and sufficiently high \( \delta \):

\[
\delta (1 - E_1)^{2\gamma_1} \cdot c_2 = \delta (1 - E_2)^{2\gamma_2} \cdot c_1
\]

That is, when \( \gamma_i > \gamma_j \), \( E_i < E_j \).

**Appendix B**

**Existence:** Since the problem is symmetric for the two incumbents we consider the behavior of incumbent 1. I show that for every \( l_1 \neq l_1^* \) then \( R_1(l_1, l_2, l_e) < R_1(l_1^*, l_2, l_e) \).
Consider three cases:

**Case 1.** \( l_1 < l_1^* \)

1. for \( l_e < l_1 \)
   - Note that the payoff to the entrant when \( l_e = 0 \) is equal to \( F\left(\frac{l_1}{2}\right) \).
   - Also, the (limit) payoff to the entrant when \( l_e = l_1 - \epsilon \) is \( F(l_1) \). (as \( \epsilon \to 0 \))
   - Moreover, from the single peakedness of \( f(\cdot) \) we get that they entrant state's payoff is weakly increasing between 0 and \( l_1 \).

2. for \( l_e > l_1^* \)
   - Note that \( R_e \) when \( l_e = 1 \) is equal to \( F\left(\frac{l_1}{2}\right) \).
Also, the (limit) payoff to the entrant when \( l_e = l_2 + \epsilon \) is \( F(l_1) \). (as \( \epsilon \to 0 \))

Again, from the single peakedness of \( f(\cdot) \) we get that they entrant state’s payoff is weakly decreasing between \( l_1 \) and 1.

3. for \( l_1 < l_e < l_2^* \) there exists a \( \hat{l}_e \in \left( \frac{1}{2}, \frac{1}{2} + (l_1^* - l_1) \right) \) such that

- The payoff for the entrant (\( R_e \)) is increasing from \( l_1 \) to \( \hat{l}_e \)
- \( R_e \) is decreasing from \( \hat{l}_e \) to \( l_2^* \)
- \( R_e \) is therefore maximized by locating at \( \hat{l}_e \)

The intuition here is simple, if incumbent state 1 moves leftward from \( l_1^* \), the entrant can locate the same distance farther to the right from the mode and receive a greater payoff by now establishing the same border she would if \( l_1 = l_1^* \) but now claiming more territory valuable territory (territory closer to the mode from player 2.)

So, if \( l_1 < l_1^* \) it is clear that \( l_e = \hat{l}_e \). Consequently, the payoff for player 1 is equal to \( F(l_1^* + l_2^*) \) which, because \( l_e < \frac{1}{2} + (l_1^* - l_1) \) is less than \( F(\frac{1}{4} + l_2^*) \), the payoff player 1 obtains from \( l_1^* \)

**Case 2.** \( l_1^* < l_1 < l_2^* \)

In this case, the payoff to the entrant looks like either Figure ?? or Figure ???. It is clear that the entrant will maximize \( R_e \) by locating at \( l_1 - \epsilon \), receiving a limit payoff of \( F(l_1) \). It follows that the payoff for player 1 is \( F(l_1^* + l_2^*) - F(l_1) \) which is less than \( R_1^* = F(\frac{1}{4} + l_1^*) \). To see this, note that \( F(l_1^* + l_2^*) - F(l_1) < 1 - 2F(\frac{1}{4} + l_1^*) < F(\frac{1}{4} + l_2^*) \).

**Case 3.** \( l_1 > l_2^* \)

We can plot the payoffs for the entrant for two cases. The first, shown in Figure ?? considers when \( l_1 \) is close to 1 and the second, when \( l_1 \) is close to \( l_2^* \) is shown in Figure ???. In either case the best response for the entrant is locate at \( l_e = l_2 - \epsilon \), receiving a (limit) payoff of \( F(l_2) \). In this case player 1 receives \( R_1 = F(1 - \frac{l_1 + l_2^*}{2}) \) which is less than \( 1 - F(l_2) = F(l_1^*) F(l_1^*) \), in turn
Figure 5.2: The Payoff to the entrant when $l_1^* < l_1 < l_2^*$

is less than $R_1^* = F(\frac{1}{4} + \frac{l_1}{2})$.

*Uniqueness:* If $(l_1, l_2) \neq (l_1^*, l_2^*)$ or $(l_1, l_2) \neq (l_2^*, l_1^*)$ then $(l_1, l_2)$ is not an equilibrium.

To show this we can divide all possible incumbent state locations $[0,1] \times [0,1]$ into ten regions plotted in Figure 5.4.

- R1: $[0, \frac{1}{2}] \times [0, \frac{1}{2}]$
- R2: $[0, l_1^*) \times (\frac{1}{2}, l_2^*)$
- R3: $[0, l_1^*) \times (l_2^*, 1)$
- R4: $(l_1^*, \frac{1}{2}) \times (\frac{1}{2}, l_2^*)$
- R5: $(l_1^*, \frac{1}{2}) \times (l_2^*, 1)$
- R6: $[\frac{1}{2}, 1] \times [\frac{1}{2}, 1]$
Figure 5.3: The Payoff to the entrant when $l_2^* < l_1$

R7: $(l_2^*, 1) \times (l_1^*, \frac{1}{2})$
R8: $(l_2^*, 1) \times [0, l_1^*)$
R9: $(\frac{1}{2}, l_2^*) \times l_1^*, \frac{1}{2})$
R10: $(\frac{1}{2}, l_2^*) \times [0, l_1^*)$

With the exception of points of the form $(l_1, l_2^*), (l_1, l_1^*), (l_1^*, l_2), (l_1^*, l_2^*)$ the union of R1,R2,...R10 equals $[0,1] \times [0,1]$. These exceptions are either excluded by the proof of existence or are the equilibrium values. So, to complete the proof I will show that no set of points in the union of R1 through R10 are equilibrium.

First, because $f(\cdot)$ is symmetric the following must be true:
Figure 5.4: Regions of possible locations for $l_1$ and $l_2$ (R1 through R10) $[0,1] \times [0,1]$

- An equilibrium exists in R1 iff one exists in R6
- An equilibrium exists in R2 iff one exists in R5, R7, or R10.
- An equilibrium exists in R3 iff one exists in R8
- An equilibrium exists in R4 iff one exists in R9

R1:
Note that in R1 the entrant locates at \( l_e = \max\{l_1, l_2\} + \epsilon \) and receives a limit equilibrium of \( F(1 - \max\{l_1, l_2\}) \). Suppose now that \( l_1 = l_2 + \epsilon \). Then both receive a payoff of \( \frac{1}{2} F(l_1) \). If \( l_1 \neq 0 \), by the continuity of \( F(\cdot) \), there exists \( l'_1 < l_1 \) s.t. \( F(l'_1) > \frac{1}{2} F(l_1) \). If \( l_1 = 0 \) and \( l'_1 = \frac{1}{2} \) the limit payoff for \( l_1 = \frac{1}{2} - F(\frac{1}{4}) \) which is strictly greater than the payoff from the point \((0,0)\). Now, suppose that \( l_1 < l_2 \) then the limit payoff for player 1 is \( F(l_1) \). Now define \( l'_1 = \frac{l_1 + l_2}{2} < l_2 \). It follows that \( R'_1 = F(l'_1) > R_1 = F(l_1) \). The argument for player 2 is symmetric.

R2:

The best payoff for player 1 is at most \( F(\frac{l_1 + l_2}{2}) \) (The best player 1 can do is when the entrant enters to the right of player 2). For all \( l_e \) let, \( l'_1 = \frac{l_1^* + (1-l_2)}{2} > l_1^* > l_1 \). Then it also must be true that \( F(\frac{l'_1 + (1-l_2)}{2}) > F(\frac{l_1 + (1-l_2)}{2}) \) That is, since \( l_2 < l_2^* \) player one can always move rightward, obtaining a strictly higher payoff, and still force the entrant to enter to the right of player 2.

R3:

In region 3 we are guaranteed that the entrant locates between \( l_1 \) and \( l_2 \). Because of this, there is a profitable deviation made by moving closer to \( l_1^* \) (\( l_2^* \) for player 2). That is, the entrant will still locate between \((l_1, and l_2)\) even if either incumbent moves closer to \((l_i^* )\), claiming a positive payoff in doing so.
R4:
In region 4 both incumbents locate closer to the mode than $l^*_i$. First, suppose $l_1 < (1 - l_2)$. In this situation we can construct a profitable deviation towards the median $l'_1 = \frac{l_1 + (1 - l_2)}{2}$ which provides incumbent 1 a payoff of $F(l'_1 + l_2) > F(\frac{l_1 + l_2}{2})$ (still guaranteeing that the entrant locates to the right of player 2). When $l_1 > (1 - l_2)$ we can similarly construct a profitable deviation for incumbent 2. When $l_1 = (1 - l_2)$ we can similarly find a profitable deviation. Note that the payoff for player 1 here is $\frac{1}{2} - \frac{1}{2}F(l_1)$. By moving $\epsilon$ to her left she receives a limit payoff of $\frac{1}{2}$, a profitable deviation.
Chapter 6

Urban Revival and the Territorial State

Politically, the centralized state was a new creation called forth by the commercial revolution

- Karl Polanyi

The collapse of Roman rule left Europe an economic and political backwater, by any measure less wealthy than the Muslim or Chinese worlds and, save for the brief Carolingian success, lacking geographically robust states (Maddison 2006, Pomeranz 2001, Kuran 2010, Rosenthal and Wong 2011). Her cities, excluding those in Muslim controlled Iberia and Sicily, declined in population and grandeur (Bairoch and Braider 1991). Without encompassing Imperial rule long distance trade slowed and then nearly vanished, classical knowledge was lost, and economic life reverted to manorial autarky (Mokyr 1992, Jones 2003, Findlay and O’Rourke 2007). Absent the protection of strong states Viking raiders, Saracen pirates, and other marauders groups pillaged coasts and countrysides.
Momentum against this Hobbesian tide began to grow in the latter half of the tenth century. New towns formed, the Eastern trade was re-established, the pace of technological innovation hastened, and standards of living increased (Pirenne and Clegg 1937, Pirenne 1969, Braudel 1982b, Lopez 1976, Cipolla 1994, Van Zanden 2009). This chapter demonstrates that before the French Revolution uneven patterns in this re-emergence of commerce and urbanization associated with what economic historians call the “commercial revolution” caused variation in the number and size of states.

As predicted by the model presented in Chapter 4 the existence of an economic surplus in some places and not others created differential material incentives across space for new states to form. As a consequence of these changes, latent political groups were both more willing and capable of forming and sustaining themselves as independent units in economically advantaged locations. In less prosperous places, where an absence of an economic surplus gave neither the material incentive to form nor the capacity to remain independent, the opposite was true.

The chapter proceeds as follows. I first locate the findings within the broader literature on state formation, emphasizing existing arguments that tie urban and commercial development to the origins of the modern state. Next, I show that premodern economic development, proxied by urban population, was concentrated in two ways. First, I demonstrate that the places with a slight initial advantage, those that were more urban early on, maintained and expanded upon this advantage over time. That is, as history unfolded those places that were slightly more developed early in the last millennium became
increasingly urban relative to other locations. Second, I show that urban growth was concentrated within a narrow geographic corridor running through Central Europe. Matching the previous finding, this concentration became more pronounced over time.

Next, I show that urban development was correlated with the formation of new states: where there were more and larger cities, more states formed. Then, taking an instrumental variables approach, I show this relationship was causal. Using the optimal growing temperature for cereals like wheat, I instrument for urban population. Places closest to this value could most easily, with the least effort devoted to agriculture, produce storable, highly caloric foods that constituted the bulk of premodern European diets. Because these places could most easily feed large populations they developed as urban centers.

**Urban Revival and the Modern State**

The causal link between the revival of commerce and patterns of European state formation has been drawn by a number of scholars. Despite this the fact that numerous mechanisms have been proposed, few systematic empirical tests of this relationship have been undertaken. This section briefly outlines the relevant literature tying the re-emergence of commerce and urban life to political fragmentation.

In an early incarnation, Stein Rokkan (Eisenstadt and Rokkan 1973, Rokkan 1975, 1980, Rokkan and Urwin 1982) argued that the existence of
a “city belt” running through central Europe was the crucial determinant explaining why the modern territorial state developed in places peripheral to this productive core. The existence of a large number of prosperous urban centers prevented the rulers of any one from consolidating rule over the others. In peripheral England and France, for example, the absence of many urban centers allowed monarchs, by force or diplomacy, to establish rule over expansive territories.

Most familiar to social scientists is the work of Spruyt (1994) who views the creation of new social groups located in cities as both an outcome of the revival of commerce and a catalyst for premodern innovation in the organization of the state. In those places where trade resumed new towns and cities formed as centers of exchange, allowing a class of burghers to establish effective independence. By virtue of these groups’ economic power, monarchs, particularly the Holy Roman Emperor, were impeded in their attempts to create geographically large states and were forced into political bargains accepting the de facto independence of these states. Moreover, because of their wealth - and their ability to establish institutions like the Hansa that were capable of providing collective security - these states could wield sufficient military force to not merely claim independence but to sustain it over time.

This mechanism is echoed throughout the historical literature on state formation. Blockmans and co-authors, for example, argue that the larger and more populous urban centers were more effective and more likely to resist the

\[1\] Rokkan at various times refers to the region I identify as the European core as the “trade belt,” “middle belt,” “city-studded centre,” “city-state Europe,” “heartland,” and “dorsal spine”
centralizing efforts of would-be monarchs (Blockmans 1989, Tilly and Blockmans 1994, Tilly, Blockmans and Gilib 1995, Blockmans 1996). Sometimes bargained, but frequently earned through a superior capacity to produce violence, many of these smaller polities were able to claim de-facto independence and obtain legal privileges guaranteeing as much, by virtue of their economic power (Blockmans 1989, 1996, Le Gales and Harding 1998, Le Galès 2002, Genet 1990).

A similar logic similarly underlies Olsonian models of state formation wherein states form when “roving” bandits become “stationary.” In these models economic shocks create a surplus to be captured by individuals or groups capable of asserting control over some fixed territory (Olson 1993, 2000, Boix 2010, 2015). This is a dynamic similar to that found in Jeffery Herbst’s work on the origins of states and statelessness in sub-Saharan Africa. Here, he views the absence of centralized political organization as a function of geographic constraints limiting high population densities. Because African cities were few and because populations in the hinterland of those cities which did exist could easily evade state control, the incentive to form and fight over the control of strong centralized states never materialized (Herbst 1990, 2000).

What is common amongst these theories is that changes in patterns of economic activity, principally those associated with changes in commerce and urban life, alter the balance of political power by created inequality of material resources. Specific to Europe, the reemergence of cities and towns in the continent’s the dense urban core caused political fragmentation. That is, in the places where the commercial revolution of the first half of the previous
millennium took hold political fragmentation ensued because it created incentive and capacity for local groups to assert themselves as states. However, in less productive regions, in the absence of dense urban and commercial growth, large territorial states formed; the failure of urban social groups capable of establishing independent states.

Both the mechanisms and predictions proposed by these theories match those made by the model presented in the previous chapter. That is, given that the costs of forming as a state were low, evidence of which was provided in the first chapter of this book, latent political groups are expected to have formed in the locations that allows them to best meet these costs. In other words, new states are predicted form where there economic surplus is most concentrated and not in peripheral economic areas.

Cities as an Indicator of Economic Development

Preindustrial cities were hubs of economic life, serving as centers of exchange, trade, and finance. Information and goods from distances far and near flowed to and from urban centers in proportion to their size and importance. What proto-industry that existed emanated into their hinterlands and centers of knowledge and learning prospered within their bounds. In all, they existed because of economic specialization; their populations prospering by virtue of the gains made from each individual pursuing their comparative advantage (Epstein 2004, Berg, Hudson and Sonenscher 2002, Weber 1968, Pirenne and Clegg 1937, Pirenne 1969, Braudel 1982b).
In the pre-industrial world, economic development and the growth of cities were intimately related phenomena. Moreover, they have been treated as such in the empirical literature. Although there exist estimates of per capita income for the pre-modern era, for example those from [Maddison (2006)], they are taken across anachronistic political units - measured using twentieth century boundaries and across large territories that mask substantial within unit variation. As an example, for all of Germany before 1871 we obtain a single estimate of per capita income despite the fact that Germany did not exist as a political unit until after this date.

A convention in much of the literature on preindustrial growth is to use urban population as a measure of development ([Bairoch and Braider 1991], [De Long and Shleifer 1993], [Hohenberg and Lees 1995], [Acemoglu, Johnson and Robinson 2002, 2004], [van Zanden, Buringh and Bosker 2010], [Abramson and Boix 2012]). From a purely statistical sense urbanization and per capita income are highly correlated. [Chanda and Putterman (2007)], for example, construct accurate estimates of GDP per capita as a function of urbanization for a cross-country sample in 1500. Perhaps more convincingly, however, is the known fact that cities were the cause and consequence of a number of activities related to preindustrial growth.

Still, the claim that cities represent a good measure of social development may be limited to the European experience. Although towns may embody a process of economic specialization, technological innovation and higher income, they may also be administrative centers from which state bureaucracies controlled the extractive apparatus of the state ([Hoselitz 1955], [Weber 1968, 1958]).
Breese (1969). While parasitic cities like this certainly have existed throughout history an extensive literature in urban development and growth makes a clear-cut distinction between European cities featuring a core of craftsmen, merchants, and financiers and the imperial cities of Asia and the Middle East built around a royalty, its court and its tax and military bureaucracy (Weber 1968; 1958; Costello 1977; Harriss and Harriss 1984; McGee 1971; 1991). Unlike their Asian counterparts the European nobility, except for on the Italian peninsula where the aristocracy actively pursued commerce (Epstein 2000b; Coleman 1999), were rural in orientation, living outside of the great commercial cities. In this section, I show that the location and size of cities correlates with the development of proto-industrial activity, indicating that cities as centers of innovation reflect not only economic development but the growth of social groups that arose as a consequence of this process.

To begin, Figure 6.1 maps the locations of cities in the years 1200 and 1500 as well as two forms of proto-industry, textile and iron production. The data on urban population are those built by Bairoch, Batou and Pierre (1988) which measures urban population for all cities in Europe between 800 and 1800 that which at any point had a population greater than 5,000. Since Bairoch, Batou and Pierre (1988) do not produce estimates for the year 1100, in this and the subsequent analysis I am only able to use those observations for which we have both estimates of urban population and my cartographic measures between 1200 and 1800. For the textile industry the data describe the location of wool, linen and silk manufacturing centers as reported in Gutmann (1988), who in turn follows Carus-Wilson (1966). For the metal industry we employ
the exhaustive data set built by Rolf Sprandel on the location of iron forges between 1200 and 1500 (Sprandel 1968, p. 93-220).

The data on proto-industry capture the presence of early manufacturing before the sixteenth century and are intended to serve as a proxy for the existence of a class of skilled artisans, groups of individuals who have specialized in the production of a particular manufactured craft, and who, moreover, represent the decisive social and economic group driving processes of state formation. As a correlate of the process of urbanization, it is clear not merely from visual inspection that these measures covary but in a statistical sense as well. Dividing the map of Europe into 10,000 square kilometer units, the correlation coefficient of urban population in 1500 and the number a textile manufacturing centers on a given unit is .54, combining the iron forge data with that on textiles this correlation falls to .43.\footnote{A full correlation matrix describing the relationships between urban population in 1200, 1500, and proto-industry is given in Figure ?? in the appendix.}

Since the data describing proto-industry capture their existence at any point between 1200 and 1500, such a measure of association includes “the post-treatment” relationship between urban population and the evolution of proto-industry. To account for this Table \ref{tab:6.1} presents a set of negative binomial regression estimates of the relationship between urban population in 1200 and the presence of proto-industry before 1500.\footnote{Since these data are a count, I present results from negative binomial regression. OLS estimates are roughly the same.} These estimates indicate a substantial positive and statistically significant relationship between urban agglomeration and the development of craft manufacturing. Treating as the dependent variable as textile and iron production, respectively, and next using
Urban Population

1200

1500
Proto-Industry

Metallurgic Centers

Centers of Textile Production
The Relationship Between Urban Population in 1200 and Proto-Industry Before 1500

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th>Iron</th>
<th></th>
<th>Total Proto</th>
<th></th>
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<td>0.28***</td>
<td>0.21***</td>
<td>0.24***</td>
<td>0.17***</td>
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<tr>
<td></td>
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<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.02)</td>
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Geographic Controls

<p>| | | | | | |</p>
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<td>1351.29</td>
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<td>0.821</td>
<td>0.234</td>
</tr>
<tr>
<td>N</td>
<td>1127</td>
<td>1127</td>
<td>1127</td>
<td>1127</td>
<td>1127</td>
</tr>
</tbody>
</table>

Table 6.1: Urban Population and Proto-Industry Before 1500

Negative Binomial estimates of the relationship between urban population in 1200 and the existence of proto-industrial centers before 1500. Heteroskedasticity-robust standard errors in parentheses. Geographic controls are latitude/longitude and the density of rivers on a given unit.

their sum, Figure 6.2 plots predicted values across observed values of urban population in 1200. A clear positive relationship between urban population and these measures of proto-industrial activity is apparent and is robust to the inclusion of a number of geographic control variables. Moreover, note the sharp increase in predicted proto-industrial centers as units move from having zero to around ten thousand individuals, an increase of just over one and a half new centers. In all, the process of pre-modern urbanization in Europe led to not only a process of agglomeration and development but the presence of a group of specialized artisans.\footnote{For a more detailed, causal, argument see Abramson and Boix (2012)}
Urban Growth and State Formation

This section directly estimates the relationship between development and state formation. As the unit of analysis I employ arbitrarily defined pieces of geography, 10,000 km$^2$ grid squares, and estimate the effect of changes in urban population on the number of states forming within the bounds of a given unit.\footnote{I have estimated all of the subsequent analysis using an alternative dependent variable, a Herfindahl like index of fragmentation, defined for each grid-square $j$ as $H_j = \sum_i^N \left( \frac{\text{Area}_i}{\text{Area}_j} \right)^2$. Where Area$_i$ is the total area held by state $i$ in grid-square $j$ and Area$_j$ is the total area.} The data on urban population comes from the widely used data set.
of Bairoch, Batou and Pierre (1988) which describes the population sizes of the about 2,200 towns which ever had 5,000 or more inhabitants at some time between 800 and 1800.\footnote{For a discussion on the use of urban growth as a good proxy for preindustrial economic activity see Acemoglu, Johnson and Robinson (2002), Chanda and Putterman (2007)}

I estimate the following model:

\[
\text{Number of States}_{it} = \alpha + \beta \cdot \log(\text{Urban Population}_{it}) + \epsilon_{it} \quad (6.1)
\]

Where the parameter of interest $\beta$ captures the effect of urban population on the number of states on a given grid-square. I estimate this relationship via pooled OLS and, since the number of entrants is by definition a non-negative integer, negative binomial regression. The results are summarized in Table 6.2. I estimate three models, the marginal effects of which are extremely close in size. For each model I successively add in year effects and, latitude and longitude as controls. The estimated effects of a one-hundred percent change in urban population range from 16\% to 20\%, a substantial effect when the differences between the maximum urban population in any given year range from forty-seven to sixty-six times the mean.

These results provide some initial evidence that the most urban quadrants were those that had the most states form on them. As a consequence, the average size of these states in these places was by definition smaller. Nevertheless, these results need not signify a causal relationship. That is, the assumptions necessary for the above regression analysis to consistently estimate $\beta$ from...
Table 6.2: The Relationship Between City-Size and Political Fragmentation

This figure gives the marginal effect of a one-hundred percent change in urban population on the number of entrant states on a given grid-square. Ninety-five percent confidence intervals in brackets estimated from robust standard errors clustered by grid-square. The confidence interval for the negative binomial regressions are estimated via quasi-Bayesian simulation.

Equation 6.1 are unlikely to be satisfied. The size of the urban population and the number of states that exist on a given piece of territory are likely driven by a number of common but unobservable confounders. Moreover, simultaneity bias, the fact that state-formation processes are likely a cause of urban development as well as its consequence, may plague estimates of this sort.

So, in order to show that the relationship between changes in patterns of urban development and state formation is causal, I take an instrumental variables approach, exploiting random climatic variation in the ability of arbitrary

---

7On this see Dincecco and Onorato (2013)
pieces of geography to support large urban populations. Using a set of paleo-climatological sources I construct an estimate of the propensity of land to feed large populations by growing cereals like wheat. I show that the ease with which some places could produce calorically dense and easily storable foods like wheat is a strong cause of urban population and, I argue has no direct effect on state formation processes. It follows that this measure is an ideal instrument, satisfying the necessary exclusion restriction needed to estimate causal effects.

**Urban Growth and Agricultural Productivity**

Cities as centers of economic specialization can only exist once populations are able to devote effort to activities other than subsistence. Places that could produce certain foods most easily were also those more likely to develop as urban centers. In pre-modern Europe these locations were those that could grow a specific set of crops that were superior to other alternatives in terms of their ability to support sizable populations over an extended period.\(^8\)

To identify the causal effect of urban development on state formation in an instrumental variables framework I exploit random climactic variation in the ability of a given location to produce key agricultural outputs necessary to support large populations. The natural predisposition for some places to feed large groups has been directly related to the development of urban life and the revival of commerce by a number of economic historians. Pirenne\(^9\)

---

\(^8\)See De Vries (1984), Bairoch and Braider (1991), and Nicholas (1997) for three prominent examples of the view that increases in agricultural productivity were a necessary precondition for the growth of cities.
for example, argues that the location of towns in premodern Europe was a function of natural geography, that "In a more advanced era, when better methods would permit man to conquer nature and to force his presence upon her despite handicaps of climate or soil, it would doubtless have been possible to build towns anywhere the spirit of enterprise and the quest of gain might suggest a site." This was, however, not the case. Rather, "...the first commercial groups were formed in neighborhoods which nature had disposed to become...the focal points of economic circulation."

I focus on the ability of some places to produce cereals like wheat two reasons. First, the European diet of the premodern era was centered around the consumption of complex carbohydrates derived from cereals. Economic historian Robert Lopez notes that "in the form of bread, porridge, or mush, cereals were almost everywhere the basis of human alimentation... (Lopez 1976)." Not only were cereals central to diets across European geography but across classes as well and were integral to the consumption of the aristocracy and peasantry alike although certainly in unequal proportions (Duby, Clarke and Becker 1974).

Second, the ability to grow cereals has been directly linked to the support of large populations. Cereals like wheat, unlike other plants, are most capable of feeding large populations with minimal effort; cereal crops, unlike fruits, pulses, or nuts, are extremely fast growing, high in calories from carbohydrates, and have extremely high yields per hectare (Diamond 1997). Moreover, unlike other crops cereals can be stored for long periods of time enabling communities to smooth consumption over extended periods. To summarize, the ability to
feed large populations was key to the development of cities. Since in pre-modern Europe the principle component of diets were cereals like wheat, foods that are particularly good at supporting large populations, climatic variation across time and space in the ability to grow these crops serves as a good encouragement for urban growth.

The instrument is constructed in two steps:

1. I take spatially referenced temperature data from two paleo-climatological sources, measured at half-degree by half-degree latitude/longitude intervals. The first measure from Mann et al. (2009) records temperature anomalies for the past 1500 years. A temperature anomaly captures the deviation at each point from the 1961-2000 mean temperature. I then construct a measure of absolute temperature by adding back the 1961-2000 baseline mean temperature as calculated from Jones et al.’s twentieth century data. This yields a half degree by half degree grid of temperatures for every year over the past 1500 years. Hundred year averages of these yearly measures are then taken.

2. Next, I take these estimates, measured at fixed intervals, and construct a smoothed measure of temperature for the entire continent. From this continuous measure the average for each grid-square is taken yielding an estimate of temperature across our fixed but arbitrary pieces of geography. All of these operations are taken using the interpolation and zonal averaging tools found in ArcGIS 10.
### Optimal Growing Temperature and Wheat Propensity/Yields (1960-2000)

<table>
<thead>
<tr>
<th>FAO Wheat Suitability</th>
<th>Avg Wheat Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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</tr>
<tr>
<td></td>
<td>(.49)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>$</td>
<td>\text{Growth Temperature}</td>
</tr>
<tr>
<td></td>
<td>(.05)</td>
</tr>
<tr>
<td></td>
<td>-1612.7</td>
</tr>
<tr>
<td></td>
<td>(254)</td>
</tr>
</tbody>
</table>

$R^2 = .55$, $N = 119$, $p < 0.001$,

$R^2 = .30$, $N = 94$, $p < 0.01$,

$R^2 = .05$, $N = 254$, $p < 0.05$

---

**Table 6.3: Wheat Suitability Measures**

The relationship between temperature and the suitability to produce wheat. The first column regresses the FAO wheat suitability index against the absolute average distance from 10.5 °C between 1960 and 2000. The second column regresses the average wheat yield on this measure.

To show that the logic of the instrument holds, I use twentieth century data on temperature and two measures of the ability to grow wheat to demonstrate the robust relationship between the two. I employ two data sets from the FAO. The first, the “Agro-climatically attainable yield for rain fed wheat,” is from the Global Agro-ecological Assessment for Agriculture in the 21st century. It captures the ability of land to produce wheat absent of modern irrigation techniques. I estimate the optimal climate to grow wheat (at around 10.5 °C ). A clear a parabolic relationship between temperature and this FAO measure is observed simply by plotting it against average annual temperature between 1960 and 2000.
The FAO wheat suitability index is plotted on the y-axis against average annual temperature on the x-axis. The FAO measure is the “Agro-climatically attainable yield for rain fed wheat” is from the Global Agro-ecological Assessment for Agriculture in the 21st century. It captures the ability of land to produce wheat absent of modern irrigation techniques. A clear parabolic relationship with a peak at approximately 10.5 degrees Celsius is observed. The radius of each circle is proportional to the average wheat yield between 1960 and 2000.

Regressing the FAO measure of wheat suitability on the absolute deviation from 10.5 degrees we see that, indeed there is a negative relationship between the two. The results from this regression are summarized in first column of Table 6.3. The effect of a one degree deviation from the optimal temperature is substantial, decreasing the FAO measure by .61 units. This is a particularly large effect since the FAO measure is on a fourteen point scale. Moreover, an large amount of the variation in the FAO wheat suitability measure is ex-
plained by deviation from this optimal growing temperature, the $R^2$ statistic is calculated to be .55. In addition, regressing average annual wheat yields between 1960 and 1990 on deviation from the optimal growing temperature again shows a similarly robust relationship. A one degree deviation from the optimal temperature has a large effect on average annual wheat yields – approximately 1600 hectograms per hectare.

**The Validity of the Instrument**

In an instrumental variables framework several assumptions must be satisfied in to consistently estimate $\beta$, the parameter describing the relationship between urban population and the number of states forming on a given piece of territory. The first assumption, random assignment, is likely satisfied since until the 19th century there has been little to no human effect on climate, the changes to which have been determined by naturally occurring phenomena in ways unrelated to our independent variable of interest, urban population. The second assumption that the instrument is strong is also satisfied. In each of the first-stage regressions all tests against weak instrumentation meet conventional levels of statistical significance.

The last assumption, the exclusion restriction, is also likely satisfied. For this to be violated the instrument, deviation from the optimal growing temperature for cereals like wheat, would have to affect the number of states entering on given quadrant in some way other than through my measure of economic development, urban population. It seems unlikely that changes in this measure of climate will effect the choice to form a new state or for states to fail
other than through their effect on economic incentives as proxied by urban development.

To see this we can broadly divide the constraints facing statemakers into two components. The first are the costs of statehood. Substantively these can be taken to mean the size of militaries and bureaucracies necessary to maintain statehood. Shocks to the propensity for a given piece of geography to support urban populations should have no direct effect on this particular incentive to form or dissolve as an independent state. The instrument perturbs the major component of the second constraint, the economic surplus available for latent or existing states to claim, here measured by urban population. The question then becomes do changes in this measure of temperature affect economic incentives not captured by changes in urban population?

Here, we must recognize two facts about the preindustrial economy. First is transportation costs were extremely high such that long distance trade was concentrated in luxury goods (Findlay and O'Rourke 2007). As such, markets for agricultural products were for much of this period local. Second, the

9 Whyte (1979), for example, argues that in early-modern Scotland there existed a limit of 22 kilometers inland from the coast or major rivers beyond which the cost of overland transport prohibited large-scale trade in grains. Others similarly view the creation of national and international markets for agricultural products like grain as being relatively late phenomena. Gras (1915), for example, famously argued that before the seventeenth century England consisted of at least fifteen distinct agricultural markets. Econometric evidence finds support for this claim. For England Bowden (1990) shows a process of declining wheat price differentials between the late fifteenth century and mid eighteenth century. Using a similar methodology, Weir (1989) finds that by the mid eighteenth century France consisted of several distinct markets for grain. With perhaps the best sub-national data, Gibson and Smout (2008) similarly show that a national market for oatmeal emerged in Scotland slowly between 1660 and 1780, with much of the convergence in prices across space occurring after 1750. The evidence concerning international trade in agricultural products is even more stark. In a number of recent econometric studies little or no apparent market integration in the form of diminished price differentials can be found throughout the early modern age. See, evidence from all of Europe see Unger (1999), Allen (2001), Ozmcuur, Pamuk and Cen-
market for surplus agricultural product was concentrated in towns and cities. That is, those who specialized in non-agricultural sectors - located in towns - exchanged their goods for the surplus agricultural product produced in the hinterland. Because of the limited ability to trade these goods across extreme distances, changes in the productivity of agriculture affect these local markets either by shifting labor from the countryside to towns or by allowing a greater number individuals to specialize in non-agricultural activity, both of which result in a greater number of people living in towns and cities. Since my measure of urban population includes towns as small as 1,000 individuals, we should pick up these dynamics.

Moreover, since the changes in optimal growing temperature over a hundred year panel are extremely slow, the long term tend which would be very difficult to perceive at any given point in time in an era before meteorological data was systematically collected. Because of this these changes would only effect the economic incentive to form states through their long term effects - the ability to sustain large populations.

Nevertheless, in case the growing climate for wheat has some direct effect on urban population I attempt to control for alternative channels through which the optimal growing temperature might effect state formation. I control for the ways in which climate, other than though the deviation from this optimal temperature for cereals, might effect the number of states on a given square. I do this in two ways. The first is by controlling for both latitude and longitude.
Since climate is strongly correlated with geographic location, controlling for the position in space should similarly control for the effects of climate other than through the optimal growing temperature.

By including grid square fixed effects we get similar results. Here identification is most plausible and comes from within unit variation, shocks from the mean of each unit’s distance from the optimal growth temperature for cereals. In this sense we are again controlling for long term climatic conditions and identification is only coming from the random changes from this long-term value. A generalized Hausman test fails to reject the null hypothesis that the 2SLS fixed effects parameter estimates are different from the pooled 2SLS estimates, indicating that controlling for latitude and longitude accounts for all time invariant aspects of climate. Similarly, I estimate the same instrumental variables model in first differences, where identification is coming exclusively from century-on-century changes in the propensity to support urban populations. The results are similar though less precisely estimated. Moreover, although the results are nearly identical, in the first-differenced 2SLS estimates the instrument fails to meet “rule of thumb” levels of strength (Stock and Yogo 2005).

Similarly, in the appendix I present results where I construct and control for grid-square level estimates of per capita income. Controlling for income at this level, I identify the effect of urban population after accounting for the possible violation of the exclusion restriction as it might operate through other economic channels captured by per-capita wealth. Across these specifications
the results remain positive and statistically significant. Moreover, they are very close in magnitude to those presented here in the main-text.

One might also worry about violations of exclusion that operate through the spatial correlation of the dependent variable. That is, the instrument may be correlated across space and consequently its effects on the number of states in one quadrant might directly effect those in another other. To investigate this possibility I conduct a Lagrange multiplier test for error dependence in the possible presence of a missing spatially lag. In the specifications that rely upon within-unit variation I find no evidence of a missing spatial lag. However, in the pooled estimates I cannot reject the possibility.

In the appendix include specifications where I consider additional possible confounders and violations of the identifying assumptions. First, in case my results are being driven by my coding of small states within the Holy-Roman Empire I divide the data and estimate the same specifications separately for the core region of Europe and the remaining periphery. While the resulting effects are slightly smaller in the periphery than the core the main result holds. Similarly, in case there are confounders that vary by region I include a series of regional dummies. Again, the results remain roughly constant to those presented here.\(^{10}\) Similarly, in the cross-sectional estimates I account for access to over-land travel routes by including a measure of river density and, again, the results remain unchanged.

\(^{10}\)I divide the map into the following regions coterminous with contemporary boundaries: The British Isles and France, Iberia, Italy, Scandinavia and the Baltics, Eastern Europe including Russia, and the Ottoman Territories which includes the Balkans.
On top of these robustness checks, following Conley, Hansen and Rossi (2012) I conduct a sensitivity analysis of the assumption that the instrument perfectly satisfies the exclusion restriction. Detailed in the appendix, I show that my results are robust at the 5% significance level up to a direct negative effect of the instrument on the outcome equivalent to 36% of the estimated effect of urban population. This would require a substantively large violation of the identifying assumption in order to obtain a null effect of urban population on the number of states formed on a given geographic unit.

### Instrumental Variables Results

The instrumental variables estimates of $\beta$, interpreted as the effect of a 100% change in urban population on the number of states forming on an arbitrary piece of land, are shown in Table 6.4. The effect sizes are rather large, a one hundred percent increase in total urban population on a given grid-square is expected to increase the number of states locating within that same unit by between just under four and just over eight tenths of a new state depending upon specification. Again, this is a rather large effect size as the inequality between geographic units is quite large. Taking the smallest 2SLS estimated effect size, .37, it would only take slightly more than a two and a half fold increase in the total urban population to increase the number of states on a given unit by one.

The estimates in which identification is coming off of changes in optimal growing temperature after accounting for other possible climatic channels, those controlling for latitude and longitude as well as for unit specific het-
**Instrumental Variables Estimates of the Effect of City-Size and the Number of States**

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**First Stage Estimates**

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Table 6.4: 2SLS and IV Negative Binomial Estimates of the Effect of City-Size on the Number of States

This table gives parameter estimates of the effect of urban population on the number of states existing on a given 10,000² km piece of geography. Controls for latitude and longitude, year effects, and fixed effects, are continued in both the first and second stage regressions. 95% confidence intervals estimated from robust standard errors clustered by grid-square are in brackets. Tests for spatial autocorrelation in the error structure fail to reject the null hypothesis of no spatial correlation in the models 4 & 5.
ergeneity (Models 3 through 6) are slightly larger, ranging from .67 to .88. Of these, the fixed effects (Models 4 & 5) and first-differencing (Model 6) estimates have a ready interpretation. Because they are identified off of within unit changes, they tell us how the number of states on a given geographic unit changes over time with changes in urban population. As an additional specification Model 5 includes the lag of the number of states. Again instrumenting for the urban population, the effect is roughly similar. Controlling for the number of states in a territory during the last century, a one-hundred percent change in the urban population still causes .58 of a new state to form on the same piece of geography in the next century.\(^\text{11}\)

Interpreted this way these results provide an explanation for why the European core became simultaneously more urbanized and politically fragmented. Distance from this central corridor is highly predictive of the size of the urban population living within the bounds of a given geographic unit. For example, in 1800 at a distance of 2000 kilometers away from the central core a given unit is expected to have an urban population of approximately seven thousand. In the same year, a unit directly on the line connecting Northern Italy and Holland, the urban population is expected to be more than ten times this amount.\(^\text{12}\)

Making use of the lowest estimated effect of urban population on the number of states existing within a given unit, the grid square directly on this central band is expected to have two and a half more states on it than

\(^{11}\) Additional specifications, including controls for possible region effects, geographic features like river density, and estimating separate effects for the core and periphery are presented in Table 6.7 in the appendix.

\(^{12}\) These estimates are derived from a regression of urban population on the fourth order polynomial of distance from the line connecting Amsterdam and Milan.
The expected number of states in the year 1500 as derived from the 2SLS estimate of Model 4 in Table 6.4, plotted across space. Darker colors denote a greater number of predicted states for a given piece of geography, lighter colors represent fewer predicted states.
the quadrant 2,000 kilometres away. Using the largest estimated effect this difference doubles, with five more states expected to be found in the centrally located quadrant. To visually demonstrate the geographic distribution of political fragmentation as a function of urban population, Figure 6.4 plots the predicted values derived from the same model across space.

I summation, where new towns and cities formed the urban groups that inhabited them were able to construct and maintain independent states. In the absence of city-life, the makers of territorial states won out, consolidating large swaths of geography into comparative few large states. That is, variation in the economic capacity of groups, not war “made” states.

**Mechanisms**

This section provides some suggestive empirical evidence that the process of urbanization caused the fragmentation of political rule by creating new social groups associated with the revival of commerce and urbanization. Again, I use the data on proto-industrial activity presented in the first section as a proxy for these actors’ presence. First, I simply describe the statistical relationship between proto-industry and political fragmentation in the 1500. Next, I treat the presence of the actors proxied by the existence of proto-industry as a mediating variable affecting the number of states forming on a given piece of geography. That is, I estimate the relationship between urbanization in 1200 and political fragmentation as it operates through the existence of proto-industry.
To begin, I estimate the relationship between the presence of proto-industry before 1500 and the number of states on the geographic units defined above. The results, estimated via negative binomial regression, are presented in Table 6.5 and indicate a strong, positive, and statistically significant relationship between the existence of proto-industry and the number of states forming on a given piece of territory. To gauge the magnitude of this relationship, in Figure 6.5 I plot the predicted number of states on each unit as derived from the odd columns of Table 6.5, for the observed values of iron and textile centers and then their sum. The predicted increase in the number of states is stark, with one state expected on a unit with zero proto-industrial centers and twenty at eight, the maximum observed total proto-industrial centers. The magnitude of this relationship is substantial, indicating that in those places where the presence of groups involved in craft manufacturing were also those places where by 1500 the most new states had formed.

As a next step, I estimate proportion of the effect of urbanization on political fragmentation that operates through the creation of social groups proxied by the existence of early manufacturing. To accomplish this, I adopt the methodology proposed by Imai, Keele and Tingley (2010), Imai et al. (2011), Imai, Tingley and Yamamoto (2013) to conduct causal mediation analysis. Because the “treatment” - urban population in 1200 - is not randomly assigned the mediating effects I estimate here should not be interpreted causally. Still, conducting this exercise and estimating this mediating relationship gives us

\[ \zeta = \mathbb{E}[Y(t,M(m+1)) - Y(t,M(m))] \]

the direct effect, \[ \delta = \mathbb{E}[Y(t+1,M(m)) - Y(t,M(m))] \]

and the total effect \[ \tau = \mathbb{E}[Y(t+1,M(m+1)) - Y(t,M(m))] = \zeta + \delta \]

13We implement the procedure as detailed in Imai, Keele and Tingley (2010).
The Relationship Between Proto-Industry and The Number of States

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>0.42***</td>
<td>0.22***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Textiles</td>
<td>0.45***</td>
<td>0.12**</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Iron+Textiles</td>
<td>0.35***</td>
<td>0.17***</td>
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<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
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<table>
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<td>4247.54</td>
<td>3902.88</td>
<td>4330.72</td>
<td>3964.48</td>
<td>4217.64</td>
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<td>θ</td>
<td>1.56</td>
<td>2.29</td>
<td>1.46</td>
<td>2.15</td>
<td>1.61</td>
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<td>1127</td>
<td>1127</td>
<td>1127</td>
<td>1127</td>
<td>1127</td>
</tr>
</tbody>
</table>

Table 6.5: The Relationship Between Proto-Industry and Political Fragmentation

Negative Binomial estimates of the relationship between the existence of proto-industrial centers before 1500 and the number of states existing on a given. Heteroskedasticity-robust standard errors in parentheses. Geographic controls are latitude/longitude and the density of rivers on a given unit.

some picture of the proportion of the effect of urbanization as it operates through the existence of groups involved in manufacturing.

Again, to avoid post-treatment bias I am forced to examine the relationship between the “treatment,” urban population in 1200, the mediator, proto-industry before 1500, and the number of states on a given unit at 1500. Figure 6.6 describes these relationship graphically. Implementing the procedure detailed in [Imai, Keele and Tingley (2010)], Table 6.6 gives two types of estimates of this mediating relationship. First, I estimate both the mediating and direct
This figure gives the predicted number of states forming on a given geographic unit as a function of the number of proto-industrial centers existing before the year 1500.

There exists a consistently positive and statistically significant relationship between urbanization and political fragmentation as it operates through each measure of proto-industrial activity. Moreover, these results indicate that

\footnote{Count-models that account for over-dispersion are not currently available in the \texttt{R} package \texttt{mediate}.}
This graph describes the mediating effect of proto-industrial development on the number of states forming in the year 1500. The treatment is taken to be early urbanization, measured in the year 1200, which has some direct effect on the process of state formation (in 1500) as well as some indirect, mediating, effect as it operates through the creation of groups involved in craft manufacturing.

about forty percent of the total relationship between urban population in 1200 and the number of states forming on a given geographic unit is estimated to operate through the presence of proto-industry. To the degree that the existence of iron metallurgy and textile production proxy for the presence of artisan and other commercial groups, this result demonstrate that the process of uneven urbanization caused, in part at least, political fragmentation by
Table 6.6: The Mediating Effect of Proto-Industry on Political Fragmentation

This table gives estimates of the effect of urban population in the year 1200 on the number of states forming on a given 10,000 km² geographic unit in the year 1500 as mediated by the presence of proto-industry before 1500. 95% confidence intervals derived from quasi-bayesian simulation.

Creating new social groups with the material resources capable of asserting independence.

Conclusion

This chapter has provided empirical evidence in favor of the first implication of the theoretical model presented in the previous chapter. Those places where new cities formed and where urban social groups came into existence, a greater number of states formed. Urban revival caused the formation of new social groups, townsmen and traders, who by virtue of their material resources, were able to assert independence. That is, fragmented political authority resulted in the places where these newly wealthy urban groups came into existence.

In all, geographic and temporal variation in the reemergence of towns and cities, the consequence of the commercial revolution of the first half of the last
millennium, caused new and more states to form in the dense urban core of Europe. In the continent’s periphery, in the places where these new urban groups failed to emerge, large territorial states came into existence.
Appendix

Regional Effects

Table 6.7 gives empirical results including regional dummies for the following regions: The British Isles and France, Iberia, Italy, Scandinavia and the Baltics, Eastern Europe including Russia, and the Ottoman Territories which includes the Balkans. I then divide out Central Europe, comprising contemporary Germany and Austria, from the rest of peripheral Europe. Across specification, the main results hold and are of roughly the same magnitude.

Controlling for Income

To construct a grid-square level estimate of per capita income, I take the data defining historical incomes for contemporary states from Maddison (2006) and assign these values to the centroid of each contemporary state. Then, using these points I estimate smooth-spline estimate of income and measure the average value to each grid-square. All operations are done in ArcMap10. Since Maddison (2006) only provides estimates for the years 1000, 1500, 1600, 1700, and 1800. I linearly interpolate income for the years 1200-1400 based on their 1000 and 1500 income levels.

If the instrument affects state formation processes through other economic channels, inclusion of this measure of income should control for these channels. These results, given in Table 6.8, show that the effect urban growth remains qualitatively unchanged when I include this measure of per capita income. The
results hold, but are slightly smaller, when I exclude the linearly interpolated years 1200-1400 from the analysis.

**Sensitivity Analysis**

Following Conley, Hansen and Rossi (2012) I conduct a sensitivity analysis using their union of confidence intervals method and allow for a direct effect of the instrument on the outcome over a range of symmetric bounds. Formally, we estimate via a 2SLS-like procedure $Y = X\beta + Z\gamma + \epsilon$, where $Z$ is my instrument and $X$ is my variable of interest and allow the parameter $\gamma$ - capturing the direct effect of the instrument on the outcome - to take on a range of values $\gamma_0 \in [-\gamma, \gamma]$. The following graphs give the resulting confidence rustling from this procedure and treating $\gamma$ as a function of my initial 2SLS estimate of $\beta$. I conduct this exercise for both the within estimator and the pooled estimator. For the within estimates we see that our initial estimate would become statistically indistinguishable from zero when $\gamma = .36\beta$. For the pooled estimates this is true when $\gamma = .26\beta$. 

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Table 6.7: Additional 2SLS Estimates of the Effect of City-Size on Political Fragmentation

<table>
<thead>
<tr>
<th>Instrumental Variables Estimates By Region</th>
<th>log(Urban Population)</th>
<th>0.43</th>
<th>0.42</th>
<th>0.46</th>
<th>-0.81</th>
<th>0.47</th>
<th>4.41</th>
<th>1.17</th>
<th>0.28</th>
<th>0.28</th>
<th>0.58</th>
<th>0.68</th>
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<td></td>
<td></td>
<td>[0.32,0.54]</td>
<td>[0.32,0.53]</td>
<td>[0.33,0.60]</td>
<td>[-11.56,9.95]</td>
<td>[-2.48,3.43]</td>
<td>[-2.41,11.24]</td>
<td>[0.52,1.82]</td>
<td>[0.25,0.32]</td>
<td>[0.25,0.32]</td>
<td>[0.31,0.84]</td>
<td>[0.25,1.11]</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Just Periphery</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Region Effects</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Time Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Lat/Long</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<tr>
<td>River Density</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F Stat on Excluded Instrument</td>
<td>51.61</td>
<td>38.70</td>
<td>33.67</td>
<td>0.02</td>
<td>8.01</td>
<td>2.19</td>
<td>12.02</td>
<td>236.37</td>
<td>57.40</td>
<td>21.28</td>
<td>9.54</td>
<td></td>
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This table presents additional specifications of the baseline empirical model. The first three columns present results controlling for region effects. Columns 4-7 estimate the effect of urban population on the number of states forming on a given unit, excluding territory outside of the core. Columns 8-11 do the same, excluding the core. Ninety-five percent confidence intervals in brackets. Standard errors are clustered by unit.
Table 6.8: 2SLS Estimates of the Effect of City-Size on Political Fragmentation Controlling for Income

<table>
<thead>
<tr>
<th>Instrumental Variables Estimates Controlling For Income</th>
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<th>&gt; 1400</th>
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<td>log(Urban Population)</td>
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<td>1.83</td>
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<td></td>
<td>[0.35, 0.48]</td>
<td>[1.73, 1.92]</td>
</tr>
<tr>
<td>log(Income)</td>
<td>-1.02</td>
<td>-0.44</td>
</tr>
<tr>
<td></td>
<td>[-1.46, -0.58]</td>
<td>[-0.54, -0.34]</td>
</tr>
<tr>
<td>Lat/Long</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Year Effects</td>
<td>Y</td>
<td>Y</td>
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<td>N</td>
<td>10864.00</td>
<td>10864.00</td>
</tr>
<tr>
<td>R²</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>F-Stat on Excluded Instrument</td>
<td>502.35</td>
<td>395.91</td>
</tr>
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</table>

Instrumental variables results controlling for estimated income per capita at the grid-square level. The first six columns use all data including those linearly interpolated, covering 1200-1400. The last six only use data as estimated from Maddison (2006). 95% confidence intervals derived from standard errors clustered by unit are in brackets.
Figure 6.7: Union of Confidence Interval Method for Sensitivity Analysis
This plots provides results from the union of confidence interval method for conducting sensitivity analysis of the exclusion restriction. The x axis gives the symmetric interval of $\gamma$ as a fraction of the estimated effect size $\beta$. The y- axis gives the resulting confidence band.
Chapter 7

The Decline of the Mediterranean Trade and the Rise of the Territorial State

*The discovery of America, and that of a passage to the East Indies by the Cape of Good Hope, are the two greatest and most important events recorded in the history of mankind.*

- Adam Smith, 1776

By 1500 the Mediterranean had been the geographic center of economic life in Europe for (at least) two millennia (Barbour 1963, Scheidel 2004, Maddison 2007, Morris 2011). Luxury goods made their way from Asia overland to the Levant and through Mediterranean ports to the rest of Europe (Ash- tor 1975, Findlay and O’Rourke 2007, ?). The city-states whose merchants dominated the Eastern trade developed new manufactures and modern financial instruments, expanding upon the economic advantages fortunate geography had endowed upon them (Mokyr 1992, 1995, Munro 1993, Postan 2002).
By this point, however, Dias had rounded the Cape of Good Hope and the Portuguese were making regular journeys into Indian ocean, eventually undercutting the overland trade with the East (Diffie and Winius 1977, Chaudhuri 1985, Subrahmanyam 2012). Almost simultaneously, Columbus, a Genoese sailing under the Spanish flag, landed on the island of Hispaniola, opening up a period of exploration and trade with the Americas which would surpass in importance and magnitude Europe’s trade with Asia (Acemoglu, Johnson and Robinson 2004, O’Rourke and Williamson 2002, Davis 1973).

As access to the Atlantic increasingly provided an economic advantage, the Mediterranean was becoming a progressively more difficult location to conduct long-distance trade (Rapp 1975, Ashtor and Kedar 1986, Braudel 1995). The Ottoman capture of Constantinople in 1453 not only immediately threatened European access to the Eastern Trade but their continued expansion threatened trade throughout the Mediterranean. In all, while the period before the sixteenth century was one of Mediterranean economic dominance, the period after was marked by its gradual economic decline relative to the Atlantic world.

This chapter shows how these changing patterns of trade affected the size of states. In doing so, I provide empirical evidence in favor of the main implication of the model presented in Chapter 4 wherein I describe a comparative advantage in conquest. According to this theory, states that are good at the production of economic output are, at the margin, less willing to devote effort to the conquest of territory. As a consequence, these states are predicted to be small relative to those who are less economically advantaged.
I show that this empirical implication is matched by observed trends in state size. After the year 1500 states with access to the Mediterranean grew relative to other states, in particular those with access to the Atlantic. After this period, the economically ascendant Atlantic states shrunk relative to the Mediterranean. Before this point the opposite was true: Mediterranean states were shrinking and Atlantic states growing. That is, I show a reversal of regional trends in state size that matches their reversal of their economic fortune. Last, using a cartographic reconstruction of the main trade routes before 1500, I demonstrate that these findings are driven by access to trade not just proximity to the coasts.

The remainder of this chapter proceeds as follows. First, I provide a brief sketch of the major changes in patterns of trade and economic development and relate them to the empirical predictions and mechanisms highlighted by the model presented in Chapter 4. Second, I exploit these changes to show empirically that the decline of the Mediterranean trade led to the emergence of large territorial states there.

**The Rise and Fall of the Mediterranean Trade (and the Rise of the Atlantic)**

In this section I very briefly outline major changes in patterns of trade between Europe and the rest of the world between 1100 and 1790. Then, I relate these changes to the theoretical model presented in Chapter 4. In doing so, I construct a set of testable hypotheses to be brought to data.
European Trade With the World

In 1095 much of Christendom embarked on the first crusade to retake the Holy Land. While the stated military objective, capturing Jerusalem and other holy sites in the Levant, was met with only ephemeral success, the economic consequences of the Crusades were far longer lasting. Immediately, the venture exposed the maritime powers who had transported the crusading armies to new trade routes and opportunities in the East \cite{Day1981, Pirenne and Clegg1937}. Moreover, returning crusaders brought with them a host of goods - spices and silks - novel to European markets that generated new demand for products from the East \cite{Mazzaouni1981}.

The surge in demand for luxury goods from the East was matched by an increase in the willingness and ability of new maritime powers like Venice, Genoa, and Pisa to meet it. Although systematic cliometric data is sparse, particularly for the eleventh and twelfth centuries, that which does exist indicates a rapid rise in commercial activity over the twelfth and into the late thirteenth centuries and fourteenth centuries \cite{Luzzatto and Jones1961, De Roover1963, Goldthwaite1987, Lane1973, Lopez1976, Cipolla1994}. For example, between the late twelfth and thirteenth centuries the number of commercial contracts recorded in Genoese tax data more than doubled from thirty to ninety thousand \cite{Lopez1964}. Similarly, data on the volume of Genoese maritime trade with Byzantium indicates a rapid increase through thirteenth century. Domestically, the value of goods moving through the port of Genoa doubled between 1214 and 1274 and then doubled again over the next twenty years \cite{Ibid}.
A general pattern of trade wherein merchants from the Occident, through Muslim intermediaries, traded for luxury goods from India, Africa, and China, persisted and perhaps expanded through the fifteenth century. While the long distance trade certainly benefited some states more than others, it was not only those from prominent trading states like Venice and Genoa who were active in this exchange, Merchants from states across the Mediterranean, Catalonia, Provence, Ancona, Sicily, Naples, Ragusa, Amalfi, to name but a few, could be found in the markets of Cairo, Alexandria, and Syria, actively participating in and benefiting from trade with the East (Ashtor 1975).

A host of second-order economic benefits resulted from exposure to the Eastern trade. The need of merchants for credit to sustain risky long-distance exchange drove the creation of modern financial instruments still in use today. And as a consequence, it was in these trading city-states of Italy where modern systems of banking and public debt were first created (Munro 1993, Postan 2002, Stasavage 2007, 2011). Beyond financial innovation, over time these trading cities developed craft manufacturing and industry at the technological forefront, Venice’s Arsenal famously represented the very first European attempt at the mass, assembly line, production of manufactured goods (Davis 2007, Epstein 1998). Furthermore, these advances all benefited from a cultural exchange, fostered by economic exchange with the Muslim and Chinese worlds, that reintroduced classical knowledge, disseminated mathematical and scientific methods, and directly spread a host of technologies theretofore unknown to Europeans (Curtin 1984).
Though income data do not exist for each political unit, in the year 1500 Maddison’s per capita GDP estimates for the geographic territory that is now Italy dwarf all other European states. Here he estimates the average Italian income to be 1100 dollars, 1.4 times the Western European average and over a quarter larger than the next wealthiest region, Belgium (Maddison 2003). By other measures as well, it is clear that the Mediterranean was more advanced that the Atlantic world. For example Italy at this point was clearly the most urbanized region in all of Europe (De Vries 1984, Bairoch and Braider 1991), again with the low-countries placing second. Of the twenty most populous cities in 1500, eight of them are in present-day Italy. Of the rest, only Lisbon and London are Atlantic ports.

By the mid fourteenth century, however, the underlying political factors that drove this advantage began to slowly decay. First, is the end of what Findlay and O’Rourke term the \textit{Pax Mongolica}. The overland trade between China, India, the Middle East and Europe relied on the peace and security provided by the Mongol Khanate who controlled the entirety of the vast overland route connecting the continents. By establishing the rule of law and a uniform system of governance favorable to the conduct of trade, the Mongol rulers sought to encourage the flow of goods from East to West, a trade they taxed and benefited from (Weatherford 2004). However, divisions within the Empire, catalyzed by the onset of plague, led to the division and breakup of the Khanate in the year 1350. The consequences, though not immediate, were a gradual worsening of the conditions for long-distance trade (Findlay and O’Rourke 2007).
In part driven by the vacuum left by the breakup of the Khanate, the creation and expansion of the Ottoman Empire began to impede the conduct of trade for Occidental merchants in the Mediterranean (Munro 2006, Tracy 1993, McGowan 1981, Lybyer 1915). It did this in two ways, first the episodic violence that periodically erupted between the Ottomans and Western states disrupted trade. But in a more long-lasting way the territorial expansion of the Ottoman state came at a severe cost to the trading states of the West. First, the growth of the Ottoman Empire entailed the restriction of trade routes and the conquest of outposts controlled by trading states. Famously, the fall of Constantinople in 1453 limited access to the Black Sea. But in addition, over the course of the fifteenth and sixteenth centuries, the Turks seized Caffa, Cyprus, Rhodes, Chios - all major colonial trading outposts. By directly occupying these entrepôts the Ottomans removed direct control of major choke-points for trade from the trading states and imposed comparatively harsh taxes, replacing the limited regime enacted by the Venetians and Genoese with far more onerous system of customs and duties.

While the collapse of the Mongol and the expansion of the Ottoman Empires ate away at the advantage held by Mediterranean trading states, by the early fifteenth century the Portuguese had begun a gradual process of exploration which would eventually alter the principle locus of exchange in Europe from the Mediterranean to the Atlantic. Initially led by the private investment of Infante Dom Henrique, known in the contemporary English speaking world as Prince Henry the Navigator, the Portuguese began a series of expeditions into the Atlantic, reaching the Azores in 1427 and moved progressively south
along the African coast; In quick succession they advanced as far as Cape Bo-
jador in 1434, Cape Blanco in 1441, the Bay of Arguin in 1443, and Cape Vert in 1444, effectively circumventing land routes across the Western Sahara. By 1456 they had discovered the Cape Verde Islands and six years after they had ventured as far south as modern-day Sierra Leone. Twenty years later Barthala-
lamau Dias became the first European to round the Cape of Good Hope and shortly after, in 1488, Vasco De Gamma had crossed into the Indian Ocean.

By discovering a sea-route to India, the Portuguese opened an alternative - and ultimately less costly - method for the acquisition of the cloths, spices, and other luxury goods from Asia, previously only available in Europe by way of overland transport. Moreover, while the oceanic transport around Africa to the East eventually supplanted the overland route, the Genoese sailor Christopher Columbus, under the Spanish flag, attempting to discover an alternative western route to the East, opened up an entirely new hemisphere for trade and conquest.

The exploration of the Americas and the establishment of regularized oceanic trade with Asia favored those Atlantic states who could most easily exploit these new (re)discoveries. Acemoglu, Johnson and Robinson (2004), for example, document a growing divergence after 1500 in urbanization and per capita income between those states which partook in the Atlantic trade and those who lacked access to it. This sentiment is echoed in a lengthy historical on the “rise of the Atlantic world” which argues that profits and resources derived from exchange with the New World (and to a lesser degree trade with the East Indies) resulted in the economic and military hegemony
of the West (Davis 1973, De Vries 1984, Bairoch, Batou and Pierre 1988, De Vries and Van der Woude 1997, Braudel 1992). While access to the Atlantic may have caused the emergence of observed disparities in income, using Maddison’s estimates of per-captia GDP it is clear that Italy’s economic lead, by 1700, had receded; it is estimated to be 1.07 times the average for Western Europe and only fifty-two percent of the maximum income of Holland (Maddison 2003).

Implication for the Size of States

While Italy and the Mediterranean may not have declined in absolute terms, it is clear that the factors described above led to a decline in relative well-being. The theoretical model presented in Chapter 4 makes two clear predictions 1.) States that undergo a relative decline in their ability to produce economic output will be more willing to devote resources towards extractive, conquest efforts. And 2.) Because of this, as states grow comparatively wealthy they are predicted to become larger in geographic scale. These results occur because of a comparative advantage in conquest. Poor states are, at the margin, more willing to devote resources to conquest and extraction than their more productive counterparts.

With regard to observed patterns of state formation, these implications match stylized historical facts. Comparatively small city states like Florence, Venice, and Milan after grew into large territorial states, an expansion that occurred during this period of economic decline. Florence, for example conquered all of modern day Tuscany by 1555, Venice similarly extended control
This figure gives the composition of Venetian revenue between 1587 and 1670. There are four categories of revenue. 1.) Duties and taxes on trade, 2.) duties and taxes on consumption, 3.) revenue extracted from Venice’s mainland empire, 4.) and all other sources. Data are taken from Rapp (1975) of her empire on *terra firma* to make it one of the largest states in Europe. But perhaps most importantly, these states did this whilst enacting extractive policies of the type described in the model.
The Venetian case is illuminates the mechanism described in the model. Here, a tradeoff between collecting revenue from trade and revenue from the extraction from conquered territory appears. Figure 7.1 gives data from Rapp (1975) on the breakdown of revenue accruing to the Venetian state during the period of its decline. He divides revenue into four categories: that collected from duties and taxes on trade, duties and taxes on consumption, revenue extracted from Venice’s mainland empire, and all other sources. Between 1587 and 1670, the period for which data exists, revenue from trade declined from 36% of the total to 22%. In contrast, revenue from the colonial empire increased from 35% to 43% and reached a high of 51% in 1637.

The tradeoff that the Venetian merchant elite faced went beyond the choice of extracting a relatively larger portion of the budget from conquest. It has been said of this group that “the nobles were merchants, the merchants noble, and the interests of both were identical (Norwich, 85).” However, by the sixteenth century this group grew increasingly less devoted to trade and manufactures and increasingly more to the creation of large agricultural estates on the mainland Venetian empire. That is, they moved their activity towards extraction and away from production.

Unfortunately, systematic data on the relative extractive efforts of the leaders or dominant coalitions does not exist. However, using data on the size of states across time I can test the implied effect of these investment decisions on the size of states. Given the described changes in patterns of trade, several empirical conjectures can be made:

---

1Both of these changes occurred in absolute terms as well, however, it is difficult to gauge their magnitude as information about the rate of inflation over this period is scarce.
1.) The size of Mediterranean states in the period of their declining advantage in the Eastern trade should increase.

2.) The size of Mediterranean states should grow in size relative to Atlantic states which over the same period increasingly benefitted from access to oceanic trade with the Americas and East Indies.

3.) These changes should be observed only in the states in these regions that participated in trade and which therefore could be affected by it.

The remainder of this chapter uses the data presented in Chapter 2 to examine the validity of these conjectures, focusing upon relative changes in the Mediterranean and Atlantic worlds.

**Empirical Approach**

This section outlines the general approach that the remainder of this chapter will take in order to identify the effects of changes in patterns of trade on changes in the size of states. Since data describing trade volumes for the entire period of inquiry or for a large set of relevant cases does not exist I begin, following Acemoglu et al (2005), by treating access to the Mediterranean (Atlantic) as a proxy for the ability to conduct seaborne trade. On the one hand this has disadvantages in that it is not a direct measure of participation in foreign trade. On the other, participation in trade is a strategic choice influenced by a host of unobservable and possibly confounding factors whereas the geographic proxies I use to capture access to trade and are, at least in the short run, fixed.

Throughout, I will use two measures of access to trade. The first are binary indicators that take on a value of one when a state borders the Mediterranean
or Atlantic, respectively, and zero when it does not. Second, because states that are closer to the coasts plausibly had easier access to the trade that passed through each body of water, I construct two variables which measure the distance of each state from each of the two respective coasts. To be assured that I am capturing access In the last empirical section of the paper, I use a cartographic reconstruction of the main fifteenth century trade routes and show that each of these measures only affect the size of states when they exist on trade routes.

The empirical strategy I take to identifying the effect of changes in patterns of trade closely follows that of Acemoglu et al (2005). The basic idea is to compare trends in state size for units with access to the Mediterranean first with trends in the counter-factual group of of states without access and then with a comparison to the group of states with access to the Atlantic. That is, I compare the changes in state size across these groups before and after the period when access to the Mediterranean had an economic benefit by providing access to trade with the east. Again, I start by following Acemoglu and place this break at the year 1500. Then, I allow for a more flexible approach to placing the relative decline of the Mediterranean in time.

The Changing Effect of Access to Trade

Here I present statistical results which indicate that, as predicted by the theoretical model, the states in the Mediterranean experienced an increase in
geographic size contemporaneous with their economic decline. To do this I estimate the following model.

$$\log(\text{Size}_{it}) = \beta_0 + \beta_1 \text{Mediterranean}_{it} + \beta_2 \text{After1500}_{it} + \beta_3 \text{Mediterranean}_{it} \times \text{After1500}_{it} + \eta_i + \epsilon_{it}$$

Where the outcome is the logged size of state $i$, measured in square kilometers, in year $t$ which is recorded at five year intervals. In order to estimate the effect of this change and not longer trends I first use data between 1300 and 1700 and then later from 1400 to 1600. Regardless of the period used the results do not change. The parameter $\beta_1$ captures the association between access to the Mediterranean - either a dummy variable indicating state $i$ has Mediterranean coast or the logged distance in kilometers of state $i$ from the Mediterranean.\(^2\) The parameter $\beta_2$ captures the average trend in state size after 1500. I account for all time invariant unit specific effects by including a complete set of country fixed effects, $\eta_i$. In some specifications I also include a full set of time effects and the results are nearly identical. Similarly, the results are robust to the inclusion of a high-order polynomial time trend.

The parameter of interest, $\beta_3$, captures the difference in trend associated with access to the Mediterranean. That is, it gives the changing effect associated with the period of economic decline. The null hypothesis is therefore that there is no change in trend associated with the Mediterranean during this period of decline and the alternative proposed by my theory is that in this period the relationship between access to the Mediterranean and state size

\(^2\)I add one to the distance so that when the state is located on the coast to this value is non-zero.
should increase. The prediction with regard to the sign of $\beta_3$ differs depending upon how I operationalize access to the Mediterranean. When I treat it as a binary indicator of access to the coast, the prediction is that $\beta_3$ is positive - those with access to the Mediterranean are predicted to grow large. However, when I operationalize access as the distance from the coast the predicted sign is expected to flip and be negative - states closer to the coast should be larger than those distant.

The estimates are summarize in Table 7.1. The top panel uses the binary measure of access to the Mediterranean and the lower panel uses the distance from the coast as the independent variable. All of the results match the predictions of the theory and are statistically significant at conventional levels. The main results using the binary measure indicate that after 1500 access to the Mediterranean coast was associated an approximately 23% increase in the size of states. Because there is little over-time variation in this measure of access to the Mediterranean, we might worry about multicollinearity with the unit fixed effects. To avoid this possibility, in column 3 I do not include the direct effect of Mediterranean access. The results remain qualitatively similar, increasing slightly to an 38% increase in state size associated with Mediterranean access after 1500. In the fourth column I restrict the data just to the hundred years prior and after the break at 1500. The results here are slightly smaller but still indicate a 9% increase in state size associated with the Mediterranean after 1500. This provides some evidence that the effect is being driven, at least in part, by changes after 1600 - the period associated with the most stark economic decline for the Mediterranean traders.
### Binary Access to Mediterranean

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
<th>1300-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After × Med</strong></td>
<td>0.23***</td>
<td>0.24***</td>
<td>0.38***</td>
<td>0.08*</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.02)</td>
<td>(0.04)</td>
<td>(0.04)</td>
</tr>
<tr>
<td><strong>After</strong></td>
<td>0.02***</td>
<td>−0.26</td>
<td>0.01*</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.26)</td>
<td>(0.00)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>Med</strong></td>
<td>0.68***</td>
<td>0.66***</td>
<td>0.29***</td>
<td>0.69***</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.08)</td>
<td>(0.06)</td>
</tr>
</tbody>
</table>

|                  | Y           | Y         | Y                     | Y         | Y         | Y         |
| Country Effects  | Y           | Y         | Y                     | Y         | Y         | Y         |
| Year Effects     |            |           |                       |           |           |           |
| R²               | 0.05        | 0.04      | 0.02                  | 0.01      | 0.04      | 0.10      |
| N                | 538         | 538       | 538                   | 383,      | 538       | 419       |
| T                | 1-80        | 1-80      | 1-80                  | 1-40      | 1-80      | 1-40      |
| N×T              | 19992       | 19992     | 19992                 | 9928      | 19992     | 10123     |

### Distance to Mediterranean

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
<th>1300-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After × Med</strong></td>
<td>−0.04***</td>
<td>−0.04***</td>
<td>−0.06***</td>
<td>−0.01*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>After</strong></td>
<td>0.26***</td>
<td>−0.23</td>
<td>0.35***</td>
<td>0.07*</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.26)</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td><strong>Med</strong></td>
<td>−0.33***</td>
<td>−0.33***</td>
<td>−0.27***</td>
<td>−0.33***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.01)</td>
</tr>
</tbody>
</table>

|                  | Y           | Y         | Y                     | Y         | Y         | Y         |
| Country Effects  | Y           | Y         | Y                     | Y         | Y         | Y         |
| Year Effects     |            |           |                       |           |           |           |
| R²               | 0.12        | 0.11      | 0.02                  | 0.05      | 0.11      | 0.11      |
| N                | 538         | 538       | 538                   | 383,      | 538       | 419       |
| T                | 1-80        | 1-80      | 1-80                  | 1-40      | 1-80      | 1-40      |
| N×T              | 19992       | 19992     | 19992                 | 9928      | 19992     | 10123     |

**Notes:** ***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.10

**Table 7.1: The Effect of Mediterranean Access**

This table gives estimates of the changing effect of access to the Mediterranean. Huber-White standard errors clustered by country in parentheses. The first four columns use the year 1500 as the break in trend. The last two estimate the same models but using the year 1400.
When I operationalize access to the Mediterranean using distance from the coast the results are substantively the same. Here the change after 1500 results in an estimated 4% reduction in the elasticity between distance to the coast and state size. As before, when I do not include the direct effect of access to the coast the magnitude of this effect increases to 6%. Similarly, when only the years spanning 1400 and 1600 are included, the magnitude of the effect decreases to 1%.

The key identifying assumption for the consistent estimation of these effects is that the trend for those states without access to the Mediterranean is a good counterfactual for the trend for those which did have access. If this assumption is true the difference for these groups in trend before the decline of the Mediterranean trade should be statistically indistinguishable from zero. To assess this, I estimate the same baseline model but instead of placing the break at 1500 I date it a century earlier. These results are presented in the last two columns of Table 7. When I use distance to the coast as the measure of Mediterranean access in neither specification is the placebo break at 1400 statistically significant. However, when the binary measure of access is used only in the full sample is the placebo break insignificant. When I restrict the data only the years between 1300 and 1500 and estimate a change in trend at 1400, the result is significant at the 10 percent level but in the opposite direction as before. That is, the trend before the associated with access to the Mediterranean coast before the region’s decline in trade was negative. If state size in the Mediterranean was declining relative to other states before 1500, as this result indicates, it suggests that the I may be underestimating
the magnitude of the effect in the baseline model which compares trends after 1500.

Comparing The Mediterranean With the Atlantic

The economic decline of the Mediterranean and the subsequent change in state size associated with it can be compared more explicitly with the fortunes of Atlantic world. Here I extend the results of the previous section by making this comparison statistically. One reason to conduct this type of analysis is that it may be that Atlantic states might provide a better counter-factual group. However, I provide evidence that shows the trends for the Atlantic and Mediterranean states moved in a countervailing manner. That is, the economic rise of the Atlantic world was matched with the decline of the Mediterranean, with opposite effects with regard to state size, results which are consistent with the theoretical model.

I estimate the following model which compares the respective changes in trend associated with access to the Mediterranean and Atlantic coasts after 1500.

\[
\log(\text{Size}_{it}) = \beta_0 + \beta_1 \text{Mediterranean}_{it} + \beta_2 \text{Atlantic}_{it} + \beta_3 \text{After1500}_{it} \\
+ \beta_4 \text{Mediterranean}_{it} \times \text{After1500}_{it} + \beta_5 \text{Atlantic}_{it} \times \text{After1500}_{it} + \eta_i + \epsilon_{it}
\]

All parameters are defined as before. However, I estimate the change in trend associated with access to the Atlantic as well (\(\beta_5\)) in addition to that associated with access to the Mediterranean (\(\beta_4\)). Estimates using the binary measure of access for both the Atlantic and Mediterranean are presented in Table 7.5.
### Table 7.2: The Effect of Mediterranean and Atlantic Coast Access

This table gives estimates of the changing effect of access to the Mediterranean and Atlantic. Huber-White standard errors clustered by country in parentheses. The first four columns use the year 1500 as the break in trend. The last two estimate the same models but using the year 1400 as the break in trend. The F-statistic presented in the third row tests the restriction that the estimates of \( \text{After} \times \text{Med} = \text{After} \times \text{Atlantic} \)

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Full Sample</td>
</tr>
<tr>
<td><strong>After \times Med</strong></td>
<td>0.23***</td>
<td>0.23***</td>
<td>0.38***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.02)</td>
<td>(0.04)</td>
</tr>
<tr>
<td><strong>After \times Atlantic</strong></td>
<td>0.01</td>
<td>0.01</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
</tr>
<tr>
<td><strong>F stat</strong></td>
<td>17.13***</td>
<td>47.48***</td>
<td>59.82***</td>
</tr>
</tbody>
</table>

|                |             |           |           |                   |                   |
| **After**      | 0.02***     | -0.25     | 0.01**    | 0.00               | 0.04***            | 0.04***             |
|                | (0.00)      | (0.26)    | (0.00)    | (0.00)             | (0.01)             | (0.01)              |
| **Med**        | 0.68***     | 0.67***   | 0.30***   | 0.71***            | 1.06***            |
|                | (0.06)      | (0.03)    | (0.08)    | (0.06)             | (0.06)             |
| **Atlantic**   | 0.88***     | 0.88***   | 0.88***   | 1.55***            | 0.82***            | 0.25**              |
|                | (0.08)      | (0.04)    | (0.09)    | (0.11)             | (0.08)             | (0.08)              |

<table>
<thead>
<tr>
<th><strong>Country Effects</strong></th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year Effects</strong></td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>0.08</td>
<td>0.07</td>
<td>0.05</td>
<td>0.13</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>538</td>
<td>538</td>
<td>538</td>
<td>383</td>
<td>538</td>
<td>419</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>1-80</td>
<td>1-80</td>
<td>1-80</td>
<td>1-40</td>
<td>1-80</td>
<td>1-40</td>
</tr>
<tr>
<td><strong>N×T</strong></td>
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<td>19992</td>
<td>19992</td>
<td>9928</td>
<td>19992</td>
<td>10123</td>
</tr>
</tbody>
</table>

***p < 0.001, **p < 0.01, *p < 0.05, †p <0.10

The results are qualitatively the same.
The estimated effect of the change in access to the Mediterranean after 1500 are nearly identical to those where I do not estimate the change in trend for the Atlantic. Only in the specification where I limit the data to the hundred years in either direction of 1500 is the estimate statistically insignificant. Still, the coefficient is in the expected direction. In contrast, in each specification the estimates of the effect of the Atlantic after 1500 are statistically indistinguishable from zero. In the main specifications an F-test rejects the equality of the post-1500 trend for the Atlantic and Mediterranean. However, in the model which only uses data from 1400 to 1600, this test fails to reject this equality. The trends for Mediterranean and Atlantic states as derived from the First column of Table 7.5 are plotted in Figure 7.2. Before 1500 the predicted value for states with access to the Mediterranean is small relative to Atlantic states. However, after 1500 the prediction for the Mediterranean state increases whilst that for the Atlantic remains constant. After 1500 the predicted value for both are statistically indistinguishable from each other.

Next, I conduct the placebo exercise as before, placing the break at 1400 instead of 1500, the results for the Mediterranean remain the same; when the entire data are included a null effect is estimated but when just the years between 1400 and 1600 are used the effect is estimated to be negative and significant at the 10% level. In contrast, when we use this placebo break the change associated with Atlantic access is positive and statistically significant, indicating the trend for Atlantic states before the “discovery” of the Americas was towards larger size. An F-test rejects with a high degree of confidence that after 1500 trends in the Atlantic and Mediterranean were the same.
This figure plots the trend in state size for Atlantic and Mediterranean States. Estimates and 95% confidence bands taken from the first column of Table 7.5.

In combination, these placebo results highlight a theoretical consistency. The period before 1500 was one of relative economic stagnation and even decline for much of the Atlantic world. This result indicates a trend towards larger state size, in line with the theoretical prediction that relatively poorer states will be larger. The opposite was true for Mediterranean states. Between 1300 and 1500 the Eastern trade was growing and, as the theory predicts, the...
estimated trend in state size associated with access to the Mediterranean is negative.

**A More Flexible Approach**

The economic gains from the Atlantic trade did not become substantial at least until the seventeenth century, when colonization and the trans-Atlantic trade fully developed. Because of this, the null effect of access to the Atlantic after 1500 presented in the last section is, perhaps, to be expected. I can, however, exploit the longitudinal structure of the data to more flexibly estimate the consequences of the economic rise of the Atlantic world. I do this in two ways. First, I take a regression based approach, estimating a time-varying effect of access to each coast. Then, I use non-parametric methods to identifying changes in trend for each of the three groups - the Atlantic, Mediterranean, and all other states - over the entire period of inquiry.

To begin, I estimate how access to each coast changed at a higher frequency interval, comparing the change associated with access to the Mediterranean and Atlantic at twenty-five year intervals. To accomplish this I estimate the following model.

\[
\log(\text{Size}_{it}) = \beta_0 + \beta_1 \text{Mediterranean}_{it} + \beta_2 \text{Atlantic}_{it} + \sum_{j \geq 1500} \beta_{3j} \text{Period}_j \\
+ \sum_{j \geq 1500} \beta_{4j} \text{Mediterranean}_{it} \times \text{Period}_j + \sum_{j \geq 1500} \beta_{5j} \text{Atlantic}_{it} \times \text{Period}_j + \eta_i + \epsilon_{it}
\]
Where now instead of a single break at 1500, I divide the post 1500 period into 25-year blocs and estimate the change in trend associated with access to the Mediterranean and Atlantic in each period. To do this I include a set of dummies, $Period_j$, which take on a value of one if an observation is within a given twenty-five year bloc, e.g. 1500-1525 or 1526-1550. So, the parameters $\beta_{3j}$ capture the baseline trend after 1500, $\beta_{4j}$ capture the trend for states associated with Mediterranean access, and similarly $\beta_{5j}$ captures the trend for those states with access to the Atlantic. All other parameters are defined as before.

By comparing these parameters we obtain an estimate of the relative growth-path of state size in the period when the Atlantic was economically ascendant and the Mediterranean was in decline. These results are presented in Table 7.6 and use the binary measure of coast access. Results using the distance measure are included in the appendix but are qualitatively the same. I estimate the same three basic models as before, one with unit fixed effects, another with both unit and time effects, and, to account for possible multicollinearity with the unit effects, one without the direct effect of either coasts but with unit effects.

Across specification the results are consistent and demonstrate a clear reversal of trend in state size between the Mediterranean and Atlantic. Estimates of the total effect derived from Model 1 of Table 7.6 are plotted in Figure 7.3 and show that the relationship between access to the Mediterranean and state size is increasing over the post-1500 period whilst concurrently, the relationship between access to the Atlantic and state size is decreasing over the same
This figure plots the trend in state size for states with Atlantic and Mediterranean access in twenty-five year blocs. Estimates are taken from Model 1 in Table 7.6. Ninety-five percent confidence intervals derived from standard errors clustered by state.
Table 7.3: The Effect of Coast Access at Twenty-Five Year Intervals
This table gives estimates of the changing effect of access to the Mediterranean and Atlantic in twenty five intervals. Huber-White standard errors clustered by country in parentheses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mediterranean</th>
<th>Atlantic</th>
<th>Mediterranean</th>
<th>Atlantic</th>
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<th>Atlantic</th>
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<td>0.53</td>
<td>0.01</td>
<td>0.18***</td>
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<td></td>
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<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.04)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>1525</td>
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<td>0.13†</td>
<td>0.11*</td>
<td>-0.36</td>
<td>0.13**</td>
<td>0.11**</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.07)</td>
<td>(0.05)</td>
<td>(0.55)</td>
<td>(0.04)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>1550</td>
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<td>0.1</td>
<td>0.07</td>
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</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.60)</td>
<td>(0.05)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>1575</td>
<td>0.05***</td>
<td>0.31***</td>
<td>0.31***</td>
<td>0.43***</td>
<td>0.31***</td>
<td>0.43***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.58)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>1600</td>
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<td>0.43***</td>
<td>0.43***</td>
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<td>0.43***</td>
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<tr>
<td></td>
<td>(0.01)</td>
<td>(0.1)</td>
<td>(0.07)</td>
<td>(0.72)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>1625</td>
<td>0.01</td>
<td>0.43***</td>
<td>-0.01</td>
<td>-0.44</td>
<td>0.43***</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.1)</td>
<td>(0.06)</td>
<td>(0.74)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>1650</td>
<td>0.02†</td>
<td>0.34***</td>
<td>-0.15**</td>
<td>-0.30</td>
<td>0.34***</td>
<td>-0.15***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.09)</td>
<td>(0.05)</td>
<td>(0.74)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>1675</td>
<td>0.02†</td>
<td>0.41***</td>
<td>-0.18**</td>
<td>-0.32</td>
<td>0.41***</td>
<td>-0.18***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.09)</td>
<td>(0.06)</td>
<td>(0.71)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
</tbody>
</table>

Country Effects, R²=.08
n=538, T=1-80, N=19992

Country Effects, Year Effects, R²=.08
n=538, T=1-80, N=19992

Country Effects, R²=.08
n=538, T=1-80, N=19992
This figure plots the estimated trend in state size for units with access to the Atlantic, Mediterranean and those with access to neither. The red lines are derived from a loess fit and the black lines are from OLS estimates with a fourth order polynomial time trend. Both include unit-fixed effects period. An F-test shows that by 1550 the estimated relationship between access to the two coasts are statistically indistinguishable. After 1600 the relationship access to the Mediterranean and state size is greater than that of the Atlantic.

A second approach to estimating the change in relationship between coast access and state size across time yields nearly identical conclusions. The goal
here is to estimate a smooth trend in state size for each the three groups I want to compare. I use to methods to do this, one regression based and the other non-parametric. Both yield very similar estimates. In the regression based approach I estimate the following model.

\[
\log(\text{Size}_{it}) = \beta_0 + \beta_1 \text{Mediterranean}_{it} + \beta_2 \text{Atlantic}_{it} + \sum_{p=1}^{4} \beta_3 p \text{Year}_t^p \\
+ \sum_{p=1}^{4} \beta_4 p \text{Mediterranean}_{it} \times \text{Year}_t^p + \sum_{p=1}^{4} \beta_5 p \text{Atlantic}_{it} \times \text{Year}_t^p + \eta_i + \epsilon_{it}
\]

Where I am estimating the baseline trend in time with a fourth order polynomial. Then, by interacting these polynomials in time with both measures of coast access I estimate a separate trend for both the Atlantic and Mediterranean. The second way of estimating this is to estimate a smooth loess estimate for each group - those without access to either coast and both coasts separately. The predictions from both methods are given in Figure 7.4. I obtain the same result as before. For those with access to the Atlantic, the size of states was increasing until 1500 and declined thereafter. The Mediterranean declined (based on the polynomial form) or expressed no change (based on the loess estimates) before 1500 but grew clearly after 1500.

Thus far all of the results I have presented match the empirical implication of the model presented in Chapter 4. As the Atlantic powers’ trade with the New World grew, the model predicts that these states’ comparative advantage in conquest will decline they will grow relatively smaller. In contrast, as the Eastern trade declined, the payoff from conquest increased for the Mediter-
ranean states and the model predicts they expand in size. These are the exact trends that the data demonstrate. The next section provides empirical support that these results were driven specifically by changes in access to trade.

**Mechanisms**

In the previous sections I have shown that the in the period in which the Eastern trade was in decline, access to the Mediterranean led to increasingly large states. Similarly, the period following "discovery" of the new world and the rise of the Atlantic trade led to a decline in the average state size for those political units that had access to it. This section uses a cartographic reconstruction of the main European trade routes in the late fifteenth century to compare units in the Mediterranean who sat along these routes to other Mediterranean and Atlantic states. In doing so, I show that these results are driven by those Mediterranean states that sat along trade routes in the late fifteenth century.

Since systematic data on trade does not exist, I use the location of states relative to the main European trade routes in the late fifteenth century as a proxy. These data are derived from the Penguin Historical Atlas of Europe map “Trade in A.D. 1478” which has been reprojected and geo-referenced for GIS analysis. Other reconstructions of major trade routes can be used. The Pearson reconstruction produces nearly identical estimates.
I estimate a model similar to that in the previous section, now interacting both measures of Mediterranean and Atlantic access with these indicators of trade. This allows me to distinguish between the effect of access to the coast and access to trade.

Estimates using both binary measures of coast access and the location of trade are presented in Table 7.6. The results using distance measures are qualitatively similar and are included in the appendix. These results indicate that the changing effect of access to the Mediterranean demonstrated in the previous sections is driven by those states located on trade routes. Estimates from the first column of Table 7.6 are plotted in Figure 7.5 which gives relationship between Mediterranean access for four types of states before and after 1500;
The change in effect of access to the coast for states defined by access to the coast and which sit on trade on trade routes

states with access to the Mediterranean and which sit on a main trade route

those with access to the Mediterranean and not on a trade route, those with access to the Atlantic and which sit on a trade route and those with access, and lastly those with access to the Atlantic and not on a trade route.
was null or negative, depending on model specification. As before, I conduct
Mediterranean states that did not sit along trade routes the change after 1500
and indicates between a 32% and 58 % increase in size. However, for those
size for Mediterranean states that sat on trade routes is consistently positive
Huber-White standard errors clustered by country in parentheses.
This table gives estimates of the changing effect of access to the Mediterranean
Atlantic as they vary by access to trade in the late fifteenth century.

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
</tr>
</thead>
<tbody>
<tr>
<td>After × Med × Trade</td>
<td>0.39***</td>
<td>0.32***</td>
<td>0.38***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>After × Med</td>
<td>−0.07*</td>
<td>0.10*</td>
<td>−0.13*</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>After × Atlantic × Trade</td>
<td>−0.07</td>
<td>−0.07</td>
<td>−0.53***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.17)</td>
</tr>
<tr>
<td>After × Atlantic</td>
<td>0.02</td>
<td>0.02</td>
<td>0.20***</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>After × Trade</td>
<td>0.07***</td>
<td>0.07***</td>
<td>0.31***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Trade</td>
<td>1.35***</td>
<td>1.34***</td>
<td>0.96***</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Atlantic × Trade</td>
<td>−1.42***</td>
<td>−1.43***</td>
<td>−2.05***</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(.06)</td>
</tr>
<tr>
<td>Med × Trade</td>
<td>−0.70***</td>
<td>−0.70***</td>
<td>−0.70***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>After</td>
<td>−0.02***</td>
<td>−0.32</td>
<td>−0.06***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.24)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Med</td>
<td>0.94***</td>
<td>0.93***</td>
<td>0.72**</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Atlantic</td>
<td>1.23***</td>
<td>1.23***</td>
<td>2.18***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.10)</td>
</tr>
</tbody>
</table>

| p < 0.001, ** p < 0.01, * p < 0.05 |

Table 7.4: The Effect of Coast Access by Trade Access

This table gives estimates of the changing effect of access to the Mediterranean
and Atlantic as they vary by access to trade in the late fifteenth century.
Huber-White standard errors clustered by country in parentheses.

These results are consistent across specification. The estimated change in
size for Mediterranean states that sat on trade routes is consistently positive
and indicates between a 32% and 58 % increase in size. However, for those
Mediterranean states that did not sit along trade routes the change after 1500
was null or negative, depending on model specification. As before, I conduct
the same placebo exercise, dating the break at 1400 instead of 1500. For those Mediterranean states with access to trade there is an estimated null effect at this placebo break. However, as before, the break at 1400 for Mediterranean states without access to trade is towards increasingly small size.

In all, these results demonstrate that access to the Mediterranean led to larger states only for those who were located proximate to trade routes around the year 1500. This, provides further evidences in favor of the theoretical model indicating a tradeoff between the use of resources for territorial expansion and productive economic activity. Moreover, these results show that the rise of large, territorial, states in the Mediterranean was caused by a decline in the Eastern trade. After 1500, those states in the Mediterranean that were located close to the locus of trade before 1500 grew large.

**Conclusion**

Consistent with the theoretical model presented in chapter 5, I have provided evidence that changing patterns of trade caused the relative expansion of states in economic decline and the relative contraction of those that were economically ascendant. To demonstrate this, the empirical strategy I have take compares changes in state size for states with access to the Mediterranean coast to all other states. Then, I explicitly compare Mediterranean states to those with access to the Atlantic. In doing so I demonstrate a reversal in trend for these two groups. Again, this is consistent with the model. In the period after the discovery of the Americas, states with access to the Atlantic, those

\[ \text{The total effect of the change for these states is statistically insignificant.} \]
who benefitted economically from these discoveries, grew increasingly small. For the Mediterranean, the trend was the converse. After 1500, in the period of a declining Eastern overland trade, the typical state in the Mediterranean increased in size.

In this way, I explain why small Italian city-states eventually expanded, agglomerating the areas surrounding them. Beginning in the sixteenth century these states entered a period of economic decline, gradually losing ground to their Atlantic counterparts. Again, as indicated by the model these changes affected the tradeoff states faced between the use of effort and resources for productive outcomes like trade and destructive outcomes like conquest. The observable implication is that during periods of relative economic decline should also be one of territorial expansion. This is precisely the empirical pattern I have demonstrated.

Appendix

Results With Distance Proxy of Access to Coast

The following two tables in this section reproduce the results from Tables 7.5 and 7.6 but using distance to the Mediterranean and Atlantic coasts as a proxy for access instead of the binary measure. The results from both indicate the same pattern as in the main text. The trend associated with access to the Mediterranean is increasing in size after 1500.
Results Without the Ottoman Empire

The next three tables present the main results of the paper, duplicating Tables 7.1, 7.5, & 7.4 but now excluding the Ottoman Empire from the analysis. All of the results remain qualitatively the same.
### The Changing Relationship Between Mediterranean Access (Distance to Coast) and State Size

This table gives estimates of the changing effect of access to the Mediterranean and Atlantic. Huber-White standard errors clustered by country in parentheses. The first four columns use the year 1500 as the break in trend. The last two estimate the same models but using the year 1400 as the break in trend. The F-statistic presented in the third row tests the restriction that the estimates of After × Med = After × Atlantic.

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
<th>Full Sample</th>
<th>1300-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>After × Med</td>
<td>-0.04***</td>
<td>-0.04***</td>
<td>-0.05***</td>
<td>-0.01</td>
<td>-0.01*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>After × Atlantic</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.00</td>
<td>-0.01***</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>F stat</td>
<td>34.25***</td>
<td>72.93***</td>
<td>95.45***</td>
<td>0.37</td>
<td>0.68</td>
</tr>
</tbody>
</table>

| After              | 0.28***     | -0.18     | 0.30***               | 0.09        | 0.17***   |
|                    | (0.04)      | (0.24)    | (0.04)                | (0.05)      | (0.04)    |
| Med                | -0.33***    | -0.32***  | -0.26***              | -0.33***    | -0.33***  |
|                    | (0.01)      | (0.01)    | (0.01)                | (0.01)      | (0.01)    |
| Atlantic           | -0.31***    | -0.31***  | -0.32***              | -0.34***    | -0.31***  |
|                    | (0.02)      | (0.01)    | (0.02)                | (0.03)      | (0.02)    |

Country Effects: Y Y Y Y Y Y
Year Effects: Y
R²: 0.08 0.07 0.05 0.13 0.07 0.11
N: 538 538 538 538 383, 538 538
T: 1-80 1-80 1-80 1-40 1-80 1-40
N×T: 19992 19992 19992 9928 19992 10123

**p < 0.001, **p < 0.01, *p < 0.05, † p < 0.10

Table 7.5: The Effect of Mediterranean and Atlantic Access (Distance Proxy)
### The Effect of Mediterranean and Atlantic Distance to Coast as Access Proxy at Twenty-Five Year Intervals

<table>
<thead>
<tr>
<th>Year</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.33***</td>
<td>-0.32***</td>
<td></td>
<td>-0.33***</td>
<td>-0.32***</td>
<td></td>
<td>-0.33***</td>
<td>-0.32***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>0.13†</td>
<td>0.00</td>
<td>-0.01*</td>
<td>.681</td>
<td>0.00</td>
<td>-0.01**</td>
<td>0.23†</td>
<td>-0.35***</td>
<td>-0.33***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.07)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>1525</td>
<td>0.23***</td>
<td>-0.02</td>
<td>-0.01†</td>
<td>-0.35</td>
<td>-0.02***</td>
<td>-0.01*</td>
<td>0.21**</td>
<td>-0.35 ***</td>
<td>-0.33***</td>
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<tr>
<td></td>
<td>(0.07)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.51)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.07)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>1550</td>
<td>0.21**</td>
<td>-0.03**</td>
<td>-0.01</td>
<td>-0.30</td>
<td>-0.03***</td>
<td>-0.01</td>
<td>0.32***</td>
<td>-0.37***</td>
<td>-0.32***</td>
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<tr>
<td></td>
<td>(0.07)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.48)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>1575</td>
<td>0.32***</td>
<td>-0.05**</td>
<td>0.00</td>
<td>-0.28</td>
<td>-0.05***</td>
<td>0.00</td>
<td>0.46***</td>
<td>-0.39***</td>
<td>-0.32***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.56)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.02)</td>
<td>(0.02)</td>
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<tr>
<td>1600</td>
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<td>-0.01</td>
<td>-0.37</td>
<td>-0.06***</td>
<td>-0.01</td>
<td>0.46***</td>
<td>-0.4***</td>
<td>-0.33***</td>
</tr>
<tr>
<td></td>
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<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.55)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>1625</td>
<td>0.46***</td>
<td>-0.07***</td>
<td>-0.01</td>
<td>-0.41</td>
<td>-0.07***</td>
<td>-0.01</td>
<td>0.35***</td>
<td>-0.38***</td>
<td>-0.32***</td>
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<td>(0.01)</td>
<td>(0.67)</td>
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<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.02)</td>
<td>(0.02)</td>
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<tr>
<td>1650</td>
<td>0.35***</td>
<td>-0.06***</td>
<td>0.00</td>
<td>-0.32</td>
<td>-0.06***</td>
<td>0.00</td>
<td>0.31***</td>
<td>-0.39***</td>
<td>-0.32***</td>
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<tr>
<td></td>
<td>(0.08)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.69)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.08)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>1675</td>
<td>0.31***</td>
<td>-0.06***</td>
<td>0.01</td>
<td>-0.32</td>
<td>-0.06***</td>
<td>0.01*</td>
<td>-0.33***</td>
<td>-0.32***</td>
<td>-0.30***</td>
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<tr>
<td></td>
<td>(0.08)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(.66)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
</tbody>
</table>

Country Effects, $R^2=.21$  
n=538, T=1-80, N=19992  
Country Effects, Year Effects, $R^2=.20$  
n=538, T=1-80, N=19992  
Country Effects, $R^2=.21$  
n=538, T=1-80, N=19992  

Table 7.6: The Effect of Mediterranean and Atlantic Access at 25 Year Intervals (Distance Proxy)

The changing effect of access to the Mediterranean and Atlantic in twenty five intervals. Huber-White standard errors clustered by country in parentheses.
### Table 7.7: The Effect of Mediterranean Access (No Ottoman Empire)

This table gives estimates of the changing effect of access to the Mediterranean. Huber-White standard errors clustered by country in parentheses. The first four columns use the year 1500 as the break in trend. The last two estimate the same models but using the year 1400.
### The Changing Relationship Between Mediterranean Access and State Size

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
<th>1300-1500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After × Med</strong></td>
<td>0.10**</td>
<td>0.10***</td>
<td>0.23***</td>
<td>−0.01</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.04)</td>
</tr>
<tr>
<td><strong>After × Atlantic</strong></td>
<td>0.03</td>
<td>0.02</td>
<td>−0.01</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>F stat</td>
<td>2.45</td>
<td>6.10*</td>
<td>25.08***</td>
<td>1.48</td>
</tr>
</tbody>
</table>

|                      |             |           |                       |           |
| **After**            | 0.02***     | −0.44     | 0.01**                | 0.00      | 0.04***   | 0.03***   |
|                      | (0.00)      | (0.25)    | (0.00)                | (0.00)    | (0.01)    | (0.01)    |
| **Med**              | 0.60***     | 0.58***   | 0.33***               | 0.63***   | 0.97***   |
|                      | (0.05)      | (0.03)    | (0.08)                | (0.06)    | (0.06)    |
| **Atlantic**         | 0.87***     | 0.87***   | 0.88***               | 1.55***   | 0.82***   | 0.23***   |
|                      | (0.08)      | (0.04)    | (0.09)                | (0.11)    | (0.08)    | (0.08)    |

| Country Effects      | Y           | Y         | Y                     | Y         | Y         | Y         |
| Year Effects         | Y           |           |                       |           |           |           |
| R²                   | 0.08        | 0.07      | 0.05                  | 0.13      | 0.07      | 0.11      |
| N                    | 538         | 538       | 538                   | 383,      | 538       | 419       |
| T                    | 1-80        | 1-80      | 1-80                  | 1-40      | 1-80      | 1-40      |
| N×T                  | 19992       | 19992     | 19992                 | 9928      | 19992     | 10123     |

***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.10

Table 7.8: The Effect of Mediterranean and Atlantic Access (No Ottoman Empire)

This table gives estimates of the changing effect of access to the Mediterranean and Atlantic. Huber-White standard errors clustered by country in parentheses. The first four columns use the year 1500 as the break in trend. The last two estimate the same models but using the year 1400 as the break in trend. The F-statistic presented in the third row tests the restriction that the estimates of After × Med = After × Atlantic
The Changing Relationship Between Mediterranean Access, Trade Routes, and State Size

<table>
<thead>
<tr>
<th></th>
<th>Full Sample</th>
<th>1400-1600</th>
<th>Placebo Break in 1400</th>
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<td></td>
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<td></td>
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<tr>
<td>After × Med × Trade</td>
<td>0.19***</td>
<td>0.19***</td>
<td>0.26***</td>
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<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>After × Med</td>
<td>-0.07*</td>
<td>-0.07*</td>
<td>-0.13</td>
</tr>
<tr>
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<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.05)</td>
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<tr>
<td>After × Atlantic × Trade</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.23***</td>
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<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.06)</td>
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<td>After × Atlantic</td>
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<td>0.02</td>
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<td>(0.02)</td>
<td>(0.04)</td>
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<td>After × Trade</td>
<td>0.07***</td>
<td>0.07***</td>
<td>0.03**</td>
</tr>
<tr>
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<td>(0.01)</td>
<td>(0.01)</td>
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<tr>
<td>Trade</td>
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<td>1.32***</td>
<td>0.98***</td>
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<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.07)</td>
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<td>(0.06)</td>
<td>(0.17)</td>
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<td>(0.04)</td>
<td>(0.11)</td>
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<tr>
<td>After</td>
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<td>-0.51*</td>
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<td>(0.22)</td>
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<td>0.87***</td>
<td>0.86***</td>
<td>0.73***</td>
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<td></td>
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<td>(0.03)</td>
<td>(0.13)</td>
</tr>
<tr>
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<td>1.23***</td>
<td>2.18***</td>
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<td>(0.04)</td>
<td>(0.10)</td>
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<th>Y</th>
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<tr>
<td>R²</td>
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<td>0.23</td>
<td>0.01</td>
<td>0.25</td>
<td>0.23</td>
<td>0.21</td>
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<td>537</td>
<td>387</td>
<td>537</td>
<td>418</td>
</tr>
<tr>
<td>T</td>
<td>1-80</td>
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<td>1-80</td>
<td>1-40</td>
<td>1-80</td>
<td>1-40</td>
</tr>
<tr>
<td>N×T</td>
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<td>19916</td>
<td>19916</td>
<td>9889</td>
<td>19916</td>
<td>10087</td>
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</tbody>
</table>

**p < 0.001, ***p < 0.01, *p < 0.05

Table 7.9: The Effect of Mediterranean and Atlantic Access by Trade Access (No Ottoman Empire)

This table gives estimates of the changing effect of access to the Mediterranean and Atlantic as they vary by access to trade in the late fifteenth century. Huber-White standard errors clustered by country in parentheses.
Chapter 8

Political Union, the Persistence of Barriers to Trade, and City-Growth

The industrial capitalists, these new potentates, had on their part not only to displace the guild masters of handicrafts, but also the feudal lords, the possessors of the sources of wealth. In this respect, their conquest of social power appears as the fruit of a victorious struggle both against feudal lordship and its revolting prerogatives, and against the guilds and the fetters they laid on the free development of production and the free exploitation of man by man.

- Karl Marx (1867 Capital I. p. 501)

It is a common assertion that geographical scale and economic efficiency go hand-in-hand. Arguments of this sort contend that the amalgamation of independent units into larger polities and the consequent removal of barriers to trade leads to a reduction in transaction costs and increases the potential for mutually beneficial exchange. This, in turn, allows for the specialization of production, ultimately causing so-called “Smithian” growth (Smith 1937 (1776)).
Barkai 1969, Kelly 1997, Federico 2012, Findlay and O’Rourke 2007, Studer 2009). This chapter argues that political unification resulting in the removal of barriers to trade is a historically rare phenomena. Instead, before the French Revolution, the conditions that caused the construction of large states led to inefficiencies in trade across regions. Because of this, small independent states incurred no losses of economic efficiency. Only during the nineteenth century did geographic scale result in economic gains and lead to the active construction of large, territorial states.

I develop this argument in three parts. To begin, I show that only under historically uncommon conditions should we expect leaders to remove barriers to trade between regions of even unified states. The existence of feudal levies and other medieval prerogatives that limited the free flow of goods were a crucial method of constructing rents for dominant but unproductive aristocratic classes (Spruyt 1994a, b; Bloch 2002; Saltman 1987; Epstein 2000a, b, 2002). Only when the interests of the elite coincided with the interests of consumers and producers should we expect leaders to have done away with these privileges. Similarly, when economic relations involve coercion, efficiency should not be the predicted outcome (Findlay and O’Rourke 2007, North et al. 2009). When new territories were incorporated via conquest, allowing for extraction of tributary rents, exchange across regions was unlikely to be free. In other words, when strategies of coercion typified the political relationship between regions of the same state, efficient economic allocation was not achieved.

Second, I couple data on commodity prices across ninety-six European cities between 1260 and 1789 (Allen and Unger 2014) with the data on border
changes presented in Chapter 2 to estimate the effect of political unification on divergences from the law of one price. Exploiting the timing of changes in political boundaries, I estimate the effect of introducing of state borders on the divergence of commodity prices in pairs of cities. If borders hinder economic efficiency as standard arguments would predict, cross-city prices would converge when the borders separating them are removed. However, I show that political unification did not lead to a convergence in prices across locations. Rather, political union, on average, led to a divergence in prices.

Third, I estimate the effect of political fragmentation on city-growth. Since political boundaries are endogenous to patterns of development, I exploit the break-up of the Lotharingian Kingdom to compare similar locations proximate to the territorial division established by the Treaty of Meersen (870 AD). I show, using a regression discontinuity approach, that units just inside of this boundary that split into many polities were no less urbanized than politically unified observations just outside of it.

These results indicate that the selection mechanism proposed by many economic theories of state formation did not operate as hypothesized (North [1990], Spruyt [1994]\(^a\)\(^b\), Epstein [2002], Alesina and Spolaore [2005]\(^a\)\(^d\)). In this view the ability of large states to achieve Smithian growth caused the ultimate dominance of territorial states over their smaller counterparts. Because city states were by definition self-rulled, they could not obtain the efficiencies of scale maintained by large territorial states. This resulted in economic and therefore military decline, ultimately causing the failure of small independent states. The finding that political unification did not lead to price convergence
suggests that efficiencies associated with the construction of larger states did not exist before the French Revolution.

The result also speaks to the substantial literature on the effects of political borders and market integration in the contemporary period. Beginning with Engel and Rogers (1996)'s influential investigation into the effect of the U.S.-Canadian border, estimates of border effects in the twentieth century have consistently found that political borders correlate with divergence from the law of one price (Helliwell 1996, Jenkins 1997, Helliwell 1998, Parsley and Wei 2001, Engefi and Rogers 2000, Engel, Rogers and Wang 2003, Allington, Kattuman and Waldmann 2005, Goldberg and Verboven 2005, Rogers 2007). Looking slightly to the past, a series of more recent papers have investigated the effect of political unification on prices in nineteenth century Europe, again finding that the removal of political borders is related to the convergence of prices across cities (Jacks 2006, Federico 2007, Shiue 2005, Trenkler and Wolf 2005, Wolf 2009, Schulze and Wolf 2009). This paper shows that these results are historically and politically contingent. Independence before the French Revolution brought with it no economic costs.

**Does Political Unification Lead To Economic Unification?**

It is stylized fact that the barriers to trade reduce social welfare. Despite this, for much of the late medieval and early modern period regions and cities, clergy and feudal lords, political and social actors of all types, maintained legal privileges hindering free exchange (North and Thomas 1973, Bloch 2002).
Besides introducing tariffs and tolls on goods and travel, jurisdictional fragmentation imposed transaction costs in the form of distinct weights & measures, coinage, and legal codes (Duby 1968, Reynolds 1997b, Berman N.d., Zupko 1977, 1978, 1981, Lopez and Raymond 1968, Clough and Rapp 1968). The ultimate result of this patchwork of juridical rights and local prerogatives was the imposition of pervasive barriers to trade even within politically unified states.

This section explains why leaders would construct and maintain such impediments to efficient exchange. Two answers emerge. First, in the early middle ages institutional arrangements established to sustain dominant political coalitions, institutions rewarding a non-productive aristocratic elite, fostered the continued legal parcelization and the persistence of local prerogative well into late medieval period. Second, the union of polities rarely resulted in a marriage of equals. Rather, the creation of territorial states involved some manner of economic coercion; peripheral regions of expanding territorial states were subject to all manner of extractive economic policies that favored core regions at the expense of the periphery thus limiting free exchange. In both cases, political constraints led to the maintenance of barriers to trade.

The panoply of internal barriers to trade that divided most of Europe through the eighteenth century originated nearly a millennia earlier in the Carolingian need to sustain its dominant coalition. Reliant upon armored shock calvary to produce violence, the size of this group and limits of its control were constrained by the economic carrying-capacity of land and the

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1A formalized treatment of these arguments can be found in the appendix of this chapter.
absence of a bureaucracy capable of extending great distances. The result was a set of institutions wherein political authority was devolved to countless Dukes, Counts, and Barons, who in exchange for military service obtained their title. These nobles generated the revenue needed to support the major expense of arming and training devoted violence specialists by maintaining legally sanctioned economic rights and outright ownership of land and the labor on it.

Evolving as a system of hereditary inheritance, this class-based form of political-economic domination codified by both law and tradition persisted as a basic organizing principle of European society. Initially it represented a truly fragmented form of sovereignty and then, as the constructors of territorial states asserted themselves, it came to exist as a system of legalized economic rights and privileges aimed at producing rents for of a non-productive aristocracy. While the most extractive of these institutions, serfdom, had largely fallen by the wayside in most of Western Europe, it was replaced by various forms of tribute and economic prerogative derived from locally defined legal, class based, privilege. In sum, early-modern states inherited from their medieval forbearers a jurisdictional patchwork supporting legally sanctioned monopolies, guilds, and impediments to free-exchange of all sort. The consequence was that even in burgeoning territorial states, transaction costs and limits to the free-movement of goods and labor proliferated.

Moreover, the confluence of political and economic power in the hands of an aristocracy created a set of powerful but otherwise economically idle veto players. This group’s reliance on the rents of their position coupled with its
ability to thwart serious reform of these privileges meant that until the French Revolution swept through Europe forcing this class from political power, these internal barriers to efficient exchange remained in place. These impediments hindered the specialization of production, stymying Smithian growth associated with geographic scale.

Besides the existence of internal barriers, the construction of large territorial states was frequently followed by the restriction, rather than promotion, of trade across regions. While leaders of states may have sought to do away with local privilege (though until the nineteenth century they never truly succeeded at this), they nevertheless intervened in the economies of their territorial acquisitions, encouraging the subsidized export of finished products, limits on import competition, and the forced extraction of raw materials from colonized region. Coupled with an expansionist foreign policy, these objectives led to the construction of states that promoted the divergence of prices between core and peripheral regions - even within European regions of the same polity.

Famously, the French under Colbert pursued such acquisition of territory explicitly for the purposes of extraction. However, these were not practices exclusive to the French or other extremely large states. The construction of territorial states in Italy, for example, was driven by dynamics of the sort described above. Here, the economic objectives of state makers: commercial expansion, a secure food supply, the direct control of production, were achieved by the conquest and subjugation of surrounding territory (Chittolini 1989). Rarely was the candado surrounding a central-city on equal footing in either legal or commercial relations. The case of Florence is particularly telling.
With its conquest of Arezzo in 1384 Florence began a rapid march towards becoming a territorial state, acquiring over the next twenty years Cortona, Pisa, Pistoia, and eventually all of Tuscany. The Florentine elite viewed their new territorial acquisition as a means of maximizing revenue, treating “the inhabitants of their subject cities as a glorified *condado* to be fiscally and economically exploited.... ([Epstein 2002](Epstein2002)),” raising revenue from tolls from 5-10 percent of total receipts to 13-15 percent of revenue, shifting the tax burden to its subject towns (ibid). Through the first half of the fifteenth century Florentine policies included rural bans on exports, fixed prices of agricultural imports into the city, and even sometimes forced supply. In all, the political apparatus of the Tuscan territorial state favored Florence and enacted policies limiting the free trade of goods between the center and the periphery.

To summarize, political unification that results in unimpeded cross-regional exchange was rare because 1.) dominant political coalitions relied upon rents derived from the restriction of trade and 2.) economic relations between regions were typified by coercion. The implication being that the addition of territory and the creation of politically unified states need not result in increased levels of efficiency and well-being and, in particular, was

**Empirical Approach**

In this section I outline the empirical approach the second section of this paper will take, first demonstrating how it differs from existing empirical work on border effects and, second, showing how it improves upon these approaches.
The left hand portion of this figure gives the average price difference and 95% confidence interval for city-pairs separated by a border in blue and those within the same state in red. The right hand portion gives the difference for these groups and its 95% confidence interval. The top panel uses the raw data and the lower panel de-means these data by city-pair.

Then, after introducing the data, I present the first result of the paper, namely, that the removal of political borders separating cities resulted in a divergence of commodity prices. Last, I present a series of robustness checks.

The standard approach to estimating the effect of political boundaries has been, after controlling for a host of possible confounders, to compare the difference in commodity prices in pairs of cities separated by borders to the difference
in pairs not separated by a borders. Graphically, this approach is captured in top half of Figure 8.1. The left-hand panel plots the average difference in logged price (and ninety five percent confidence band) for cities separated by a state-border in the blue and for those with no border separating them in the red. The right-hand panel plots their difference. Across each period the average price difference in cities separated by borders is larger than that for cities within the same political unit, an indication of a strong border effect.

The identification of effects off of cross-sectional variation of this sort, even after accounting for confounders like transportation costs - typically proxied by the distance separating each city-pair - leads to both statistical and substantive problems in estimation and interpretation. Clearly political and economic affinity between cities confounds whatever statistical relationship that might exist between political union and prices across cities. For example, If cities sharing common culture, language, and legal systems, are more likely to both trade efficiently and dissolve political barriers separating them, then these estimates will be biased. What is more, substantively, we are interested in the act of changing political boundaries rather than the effect of borders in any given cross-section. In other words, we are interested in the effect of breaking down political borders and creating larger

To see how a failure to account for city-pair specific heterogeneity influences our estimates I conduct the same exercise as in the top of Figure 8.1, now demeaning the data - subtracting from each observation the overall mean price difference for it’s city-pair. Plotted in lower half of the figure, the demeaned

\[ \text{average difference between these groups is 0.31, with a p-value of less than .001.} \]
price differences indicate that cross sectional estimates may exaggerate the
effect of borders. Now, instead of city-pairs separating by borders having
a clearly greater divergence in price than cities within the same polity, the
difference is closer to zero.

Rather than simply compare a difference in means I estimate regressions
of the following form

$$P_{itc} = \beta_0 + \beta_1 \text{Border}_{it} + \gamma_i + \eta_c + \delta_t + \epsilon_{ict}$$

(8.1)

Defining $p_{jct}$ as the price of commodity $c$ in city $j$ in year $t$, I am interested in
the effect of interstate borders, $\beta_1$, on the absolute difference in prices across
city $j$ and $j'$ so that $P_{ict} = |\log(p_{jct}) - \log(p_{j't})|$. I further include, city-pair ($\gamma_i$), commodity ($\eta_c$), and year ($\delta_t$) fixed effects. $\epsilon_{ict}$ is a mean zero random
disturbance. The effect of political borders in this framework is identified off
of the within unit, within commodity, difference in differences. More simply
put, this estimator compares the differences in prices for city-pairs that change
their border status to the counter-factual group comprised of city-pairs whose
border-status remains constant.

Data

In order to estimate the effect of political borders on price convergence I rely
upon the Allen-Unger data set of commodity prices. This is the most com-

---

3The average difference pairs of cities separating by a border and those not is -0.0084.
The p-value of this difference is .003

4To see this note that $E[Y_{1tc}(1) - Y_{0tc}(0)] - E[Y_{1tc}(t) - Y_{0tc}(t)]$, where $Y_{1tc}(t)$ represents
the potential outcome of city-pair $i$ under border status $t \in \{0, 1\}$, equals $\beta_1$.
prehensive collection of city-level prices for the period in question, covering ninety-six cities, in four hundred and fifty-seven years, and forty-eight commodities. These data are summarized in Table 8.1 which gives the mean logged price divergence across city-pair for each commodity, its standard deviation, as well as the number of city-pair years for which we have observations. We see that price data is far more frequently available for grains like wheat, oats, and barley, than for commodities like beef or pepper. Again, this reflects the ubiquity of grain consumption relative to other goods.

The data are summarized by geography in Figure 8.2 which gives the average price and number of observations by city. We have good coverage across Western and Central Europe but comparatively fewer observations in the East and Balkans. Similarly, the data are an unbalanced panel covering the years 1329 to 1790, with more observations late in this period than early.

Besides its temporal and geographic coverage, the data have a number of virtues making it ideal for this analysis. First, price convergence should only occur when products are undifferentiated across space. That is, only when goods produced in both cities within a dyad are perfect substitutes should, given completely free trade between locations, after accounting for transportation costs, prices converge across sites. By focusing upon the prices of undifferentiated commodities, this necessary condition is most likely to be met. Second, since Allen-Unger have converted local prices into prices in terms of grams of silver per litre thus allowing for comparison of goods which would

---

5There are two observations in 1329 and a maximum of 1893 observations in 1769

242
### Price Divergence by Commodity

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<th>Bark</th>
<th>Barley</th>
<th>Beef</th>
<th>Beer</th>
<th>Bread</th>
<th>Bricks</th>
<th>Butter</th>
<th>Candles</th>
<th>Carp</th>
<th>Charcoal</th>
<th>Cheese</th>
<th>Cinnamon</th>
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<td>( \log(P) )</td>
<td>0</td>
<td>0.81</td>
<td>1.57</td>
<td>3.64</td>
<td>0.5</td>
<td>6.03</td>
<td>2.19</td>
<td>1.32</td>
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<td>2.51</td>
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<td>( \sigma_{\log(P)} )</td>
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<td>2.26</td>
<td>1.43</td>
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<td>0.51</td>
<td>2.55</td>
<td>0.97</td>
<td>1.51</td>
<td>2.17</td>
<td>1.61</td>
<td>0.46</td>
<td>-</td>
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<td>( N )</td>
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<td>55</td>
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<td>84</td>
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<th>Firewood</th>
<th>Flax</th>
<th>Flour</th>
<th>Ginger</th>
<th>Grains</th>
<th>Herring</th>
<th>Lime</th>
<th>Millet</th>
<th>Mutton</th>
<th>Oats</th>
<th>Olive Oil</th>
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<td>2.87</td>
<td>9.27</td>
<td>0.9</td>
<td>0.37</td>
<td>0.59</td>
<td>0.25</td>
<td>0.3</td>
<td>1.69</td>
<td>0.38</td>
<td>1.84</td>
<td>0.36</td>
<td>2.44</td>
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<tr>
<td>( \sigma_{\log(P)} )</td>
<td>0.31</td>
<td>1.65</td>
<td>0.33</td>
<td>0.24</td>
<td>0.37</td>
<td>0.5</td>
<td>0.14</td>
<td>0.67</td>
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<td>0.25</td>
<td>1.57</td>
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<td>( N )</td>
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<td>41</td>
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<th>Pepper</th>
<th>Rice</th>
<th>Rye</th>
<th>Saffron</th>
<th>Salt</th>
<th>Soap</th>
<th>Sugar</th>
<th>Veal</th>
<th>Vinegar</th>
<th>Wheat</th>
<th>Wine</th>
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<td>1.19</td>
<td>0.83</td>
<td>1.52</td>
<td>0.71</td>
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<td>0.93</td>
<td>1.61</td>
<td>4.14</td>
<td>1</td>
<td>0.77</td>
<td>2.06</td>
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<tr>
<td>( \sigma_{\log(P)} )</td>
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<td>1.4</td>
<td>0.78</td>
<td>0.93</td>
<td>0.29</td>
<td>1.29</td>
<td>0.81</td>
<td>1.6</td>
<td>3.14</td>
<td>0.67</td>
<td>1.06</td>
<td>1.79</td>
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<td>94</td>
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<td>1061</td>
<td>380</td>
<td>7</td>
<td>210811</td>
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</tbody>
</table>

**Table 8.1: Commodity Price Descriptive Statistics**

This table presents the average, standard deviation, and number of observations for each commodity.
This figure plots the location of each city where we have observed commodity prices. The circumference is proportional to the number of observations. Lighter shadings denote lower average prices. Each commodity is demeaned to yield a city level price relative to the entire sample.
otherwise be denominated in nominal prices of the local currency over time and across political units.

The data on border changes are taken from those presented in Chapter 2. Although the border data are measured every five years, in constructing it I have recorded the year in which each change took place. Since I have annual data on prices and the border data are measured every five years, I code a given city as being within a given state if it is coded as within that unit for more than half of the year in question.

Results

This section presents the main empirical results of this section. I first demonstrate that that rather than the causing a divergence in prices, the removal of political borders is associated with an increased spread in prices across cities. Next I suggest that these results are driven by extractive empires. For “types” of states other than empires, the relationship between borders and price convergence is substantially attenuated. Last, I explore how the relationship between borders and price convergence have changed across time.

The main results are presented in Table 8.2. Note that for each specification where identification is coming from the cross sectional variation the results are positive and statistically significant. That is, when we compare units separated by borders to those within the same country, on the expected price spread is greater for those separated by a border. Moreover, these estimates are both stable and substantial in magnitude, ranging from an estimated sixteen to twenty percent increase in prices across cities separated by a border.
However, as discussed earlier, cross-sectional comparisons of this sort are likely to result in biased estimates of the true relationship between state borders and cross-city prices. So, in order to account for the host of possible time-invariant confounders I include city-pair fixed effects. The inclusion of city-pair effects our estimates account for all time invariant explanitors of both prices and political unification. In these specifications the parameter describing the relationship between state borders and price convergence is now identified off of over-time variation in borders, comparing units that change border status - going from unified to independent states or vice versa - to units whose border status remains the same.

The results of these difference-in-differences estimates are presented in the even numbered columns of Table 8.2. The left hand panel of this table treats as the outcome the average divergence across cities in the price of a given commodity in a single year, giving us an estimate of the short-term effect of a border change. The right hand panel treats as the outcome the average price divergence across cities over a five year period. As a consequence of imbalance in the panel structure there are comparatively fewer observations with a full five year’s worth of observations needed to construct a five year average. Still, we have between over 18,000 city-pairs in the smallest specification looking at the longer term effects.

Since I rely upon the assumption of undifferentiated commodities, in models five and six and eleven and twelve, I examine only the effect of borders on the prices of wheat, oats, barley, and rye. Whereas goods like wine, or beer, likely vary on a host of unmeasured attributes, grains like these are less
likely to be differentiated along unobservables. These grains constitute the vast majority of observations and are most likely to satisfy this assumption. Lastly, because cities distant from each other may be poor counterfactuals of each other’s price trend - transportation costs being sufficiently large even similar goods were unlikely to be exchanged across large distances - I restrict the analysis to city-pairs less than 500 km and 250 km away from each-other, respectively.

The magnitude of the effect is substantial and the opposite of that predicted by standard theory: the removal of a border general increases the cross-city spread in prices. The smallest estimate, derived from the model treating the annual price as the outcome and considering all commodities traded across cities within 250 km radius of each other is estimated to be zero. However, besides this one null estimate, the results are statistically significant at conventional levels and range from -.09 to -.02, indicating an increase in the price spread across cities of between two and nine percent upon the removal of a state border.

Moreover, across equivalent specifications the effect is consistently larger when treating the five year average price divergence as the outcome instead of the annual spread. This indicates that the effect of political union does not happen instantaneously. Since units are recorded annually but actual border changes take place within a given calendar year, examining the annual change is likely to underestimate the true effect. Still, on average whether the annual price or the five year average is treated as the dependent variable the effect
### Table 8.2: Political Borders and Cross-City Price Convergence

This table presents results that relate the existence of interstate borders to the cross-city difference in prices for a set of commodities. The first six columns treat as the dependent variable the annual price difference and the last six take the five-year average price divergence. All models include a set of commodity and year effects. Even numbered columns include city-dyad effects. Heteroskedasticity robust standard errors clustered by dyad in parentheses.
the construction of political union, on average, leads to a divergence in prices across cities.

**Distance and Transportation Costs**

Typically, when estimating the effect of political borders on prices, effects are expressed in terms of additional distance - a proxy for the transportation costs that borders induce. In the above analysis where my estimates are derived from within city-pair changes in the existence borders, I cannot directly include time-invariant covariates like distance because they would be perfectly collinear with the city-pair fixed effects. In this section, I adopt a slightly more flexible approach allowing me to estimate the effect of borders relative to distance. Then, I examine how the effect of political borders interacts with the geographic distance separating city-pairs.

In order to simultaneously estimate the effects of borders and distance while still accounting for unobserved city-pair heterogeneity, I estimate the same model as in Equation 8.1 now treating the year, city-pair, and commodity effects as random disturbances drawn from mean zero normal distributions instead of fixed effects. By including these terms as random effects I am able to estimate the relationship between time-invariant covariates like the distance and cross-city price divergence.

The first two columns of Table 8.3 provide results when the logarithm of distance, measured in kilometers, between each city-pair is included in the model specification. The effect of borders remains qualitatively unchanged. When the five-year average commodity price is taken as the dependent variable
the removal of a border is estimated to increase the spread in prices by about 7%. When the annual price is taken as the dependent variable the removal of a border is estimated to increase the spread in prices by roughly 5%. Relative to the distance between cities, these effects are large. In both models a one hundred percent increase in distance between two cities is expected to produce an approximately eleven percent increase in cross-city prices. These results indicate that the removal of a border is equivalent to between a 43% and 67% increase the distance between two cities, the introduction of a boundary is predicted to lead to the equivalent reduction in price divergence.

All else equal, in order to conduct trade between cities distant from each other one must pay a greater cost than when cities are located proximate to each other. Controlling for city-pair fixed effects accounts for the possible confounding effect of distance. However, the existence of a political border may have heterogeneous effects based upon distance. In other words, we might expect borders to indicate different political relationships between cities that are close than they do for cities that are far from each other. To test this, I simply interact the introduction of a border with the logarithm of distance in kilometers.

Columns 2-3 and 5-6 in Table 8.3 present results interacting the distance between cities and the existence of a border. The fixed effect (columns 3 and 6) and random effect (columns 2 and 5 ) specifications produce nearly identical estimates of the distance varying effect of a border. Figure 8.3 plots the predicted border effect across distance. For both the five year average price

\footnote{In the fixed effects models the direct effect of city-pair distance is subsumed in the pair fixed-effect. In the random effects specifications I include the direct effect of distance.}
### Table 8.3: The Effect of Political Borders on Cross-City Price Convergence by Distance

This table provides results allowing the effect of interstate borders to vary by the distance across cities. The first three columns treat as the dependent variable the annual price difference and the last three take the five-year average price divergence. Columns 1-2 and 4-5 include commodity, year, and dyad random effects. Columns 3 and 6 treat these as fixed effects. Heteroskedasticity robust standard errors clustered by dyad in parentheses in Columns 3 and 6. In Columns 3 & 6 the direct effect of distance is time-invariant and is therefore subsumed by the unit fixed effects.

<table>
<thead>
<tr>
<th></th>
<th>Dependent Variable: Annual Price</th>
<th>Dependent Variable: Five Year Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border</td>
<td>−0.05*** (0.01)</td>
<td>−0.07*** (0.01)</td>
</tr>
<tr>
<td>log(Distance)</td>
<td>0.11** (0.05)</td>
<td>0.11** (0.05)</td>
</tr>
<tr>
<td>Border × log(Distance)</td>
<td>−0.07*** (0.01)</td>
<td>−0.05*** (0.02)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.10 (0.30)</td>
<td>0.68 (0.33)</td>
</tr>
</tbody>
</table>

Random Effects: Y Y N Y Y N | Fixed Effects: N N Y N N Y

R²: .77 .90 .90 .90 .77 .77

Num. obs: 86035 86035 86035 58550 58550 58550

***p < 0.001, **p < 0.01, *p < 0.05
This figure plots the effect of borders as it varies by cross-city distance. The left hand panel gives this for the five-year average price divergence as derived from the model in Column 5. The right-hand panel does the same for the annual price divergence as derived from the model in Column 2. The vertical dashed line gives the distance at which the effect of a border becomes statistically indistinguishable from zero.
and the annual price the effect of a border becomes null at 25 and 15 kilometers separating cities, respectively. Of all city-pairs less than 500 kilometers apart only 1.65% are separated by less than 25 kilometers. The interquartile rage of the distance separating cities in these data is 209 to 413 kilometers. So, for most cities the effect of a boundary is, as before, negative.

To briefly summarize, removing a political border causes an increased divergence in prices roughly equivalent between to a 43% to 67% increase in the distance between cities. Additionally, this effect is increasing across the distance separating city-pairs. However, for nearly all observations the consequence of political unification is an increase in price divergence across sites.

**Typologies of State and Barriers to Trade**

As argued in the first section, convergence to a common price is dependent upon the willingness of political actors to eliminate barriers to trade. The existence of rent extracting aristocratic elites or the adoption of an imperial strategies, as examples, are predicted to be associated with divergence from the law of one price. This section explores how the borders of different “types” of states, each theoretically linked to different strategies described in the first section, affect cross-city prices.

To accomplish this, I classify each state in the data as either a city-state, empire, or territorial state based upon the following, admittedly rough coding rule: Empires are geographically discontiguous large polities, territorial states are contiguous geographically large polities, and city-states are small
geographically contiguous states. A table proving the classification of each unit is provided in the appendix of this chapter.

Stylistically, city states have tended towards republican forms of government whereas empires and territorial states have been governed by aristocratic elites. As such, we would predict that, in comparison to the other types, city-states would be more likely to maximize total welfare and thereby reduce barriers to trade. The prediction with regard to territorial states and empires is less clear. If empires pursue extraction as described in the first section we would expect divergence from the law of one price, but similarly, the institutional foundations of feudalism provide incentives to retain barriers to trade within territorial states. The question then becomes empirical.

To examine the effects of these different types of states on price convergence I adopt two empirical strategies. First, I iteratively eliminate from the analysis each type of state so that we are comparing prices in cities within unified empires and city states, then empires and territorial states, and last city-states and territorial states to cities separated by borders. The results from these analyses are presented in columns 1-3 and 6-8 of Table 8.4. When territorial states are included in the analysis the results remain qualitatively unchanged, with estimated effects ranging from a 2% to 9% increase in price divergence associated with political union. However, when cities within territorial states are excluded from the analysis the estimated effect becomes null.
Second, I adopt a slightly more principled approach by estimating regressions of the following form

\[
\log(P_{itc}) = \beta_0 + \beta_1 \text{Empire} + \beta_2 \text{Territorial} + \beta_3 \text{City} + \gamma_i + \eta_c + \delta_t + \epsilon_{ict} \tag{8.2}
\]

Where \(\text{Empire}, \text{Territorial},\) and \(\text{City}\) are indicator variables taking on a value of one if both cities in pair \(i\) are within the same state of a given type. So, for example, if the two cities in pair \(i\) were both in France the \(\text{Territorial}\) indicator would take on a value of one but if one city was in England and the other in France the \(\text{Territorial}\) indicator would take on a value of zero. The coefficients \(\beta_1, \beta_2,\) and \(\beta_3\) tell us the effect of political union for each type of state.

Across specification the effect of union within a territorial state is positive, significant, and consistent with the previous results. These estimates range from an 8% to a 14% divergence in prices for cities within the same territorial state. The estimates for city-states and empires are slightly more ambiguous. When the annual price divergence is treated as the outcome, for both city-states and empires a null effect is estimated. However, when the five year average price divergence is the outcome, there is a small but positive effect of between a 2 and 3% divergence in prices associated with political union in an empire. For city-states, when the five year average price divergence is the outcome and all commodities are considered, a large price divergence of approximately 9% is estimated. However, when only grains are considered, and the assumption of undifferentiated commodities most likely satisfied, there is a null effect of political union within a city-state.
The Effect of Political Boundaries on Price Convergence by State Type

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<th>Dependent Variable: Annual Price Divergence</th>
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<td>Border</td>
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<td>-0.09***</td>
<td>-0.08***</td>
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<tr>
<td>(0.01)</td>
<td>(0.02)</td>
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<tr>
<td>City-State</td>
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</tr>
<tr>
<td>0.09**</td>
<td>0.02</td>
</tr>
<tr>
<td>(0.03)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Empire</td>
<td></td>
</tr>
<tr>
<td>0.02*</td>
<td>0.03*</td>
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<tr>
<td>(0.01)</td>
<td>(0.01)</td>
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<td>Territorial State</td>
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</tr>
<tr>
<td>0.13***</td>
<td>0.14***</td>
</tr>
<tr>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Intercept</td>
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</tr>
<tr>
<td>0.24</td>
<td>-0.29</td>
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<tr>
<td>(0.28)</td>
<td>(0.25)</td>
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<table>
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<tr>
<th>Excluded Commodity Effects</th>
<th>City States</th>
<th>Empires</th>
<th>Territorial States</th>
<th>-</th>
<th>Only Grains</th>
<th>City States</th>
<th>Empires</th>
<th>Territorial States</th>
<th>-</th>
<th>Only Grains</th>
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<tr>
<td>Dyad Effects</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
</tr>
<tr>
<td>R²</td>
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<td>0.90</td>
<td>0.87</td>
<td>0.90</td>
<td>0.92</td>
<td>0.86</td>
<td>0.78</td>
<td>0.66</td>
<td>0.77</td>
<td>0.80</td>
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<tr>
<td>Num. obs.</td>
<td>33968</td>
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<td>13208</td>
<td>58550</td>
<td>56759</td>
<td>47541</td>
<td>62460</td>
<td>21206</td>
<td>86035</td>
<td>82608</td>
</tr>
</tbody>
</table>

Table 8.4: The Effect of Political Borders by State-Type

The first three columns estimate the effect of borders on price-divergence across cities iteratively eliminating observations that are city-states, empires, and territorial states. Then we estimate the effect of political union by each of these three types. The first five columns are treat as the dependent variable the five year average cross-city price divergence. The next five conduct the same exercise using the annual price divergence as the dependent variable. Heteroskedasticity robust standard errors clustered by dyad in parentheses. All estimates include commodity, year, and dyad fixed effects.
In sum, the effects found in the initial analysis, that the removal of borders caused a divergence in prices, is driven by the behavior of territorial states. The creation of feudal institutions that created rents for political leaders of the ancien regime impeded the free flow of goods and led to the divergences from the law of one price. In city-states, where political institutions frequently meant that the decisive political actor maximized aggregated welfare, the political union of two cities had no effect on cross-city prices.

The Advantage of Independence Across Time

Thus far I have shown that political unification, rather than leading to the destruction of barriers to trade, results in a further divergence of prices across locations. In other words, independence not geographic scale is associated with economic efficiency. These estimates, however, represent the average effect taken over an over six-hundred year period. Theories arguing that economic efficiencies of scale selected large states could be consistent with this result if the effect of political union changed across time such that geographic scale became increasingly associated with economic efficiency. That is, it could be that across the entire panel the average effect of political union caused a divergence in prices but the effect in more recent periods was to promote a convergence to the law of one price.
To examine the time varying effect of political borders I estimate the following mixed effects model.

\[ P_{itc} = \beta_0 + \beta_{1p} \text{Border} + \beta_{2p} \log(\text{Distance}) + \gamma_i + \eta_c + \delta_t + \epsilon_{ict} \quad (8.3) \]

where we are again treating the city-pair \((\gamma_i)\), commodity \((\eta_c)\), and year \((\delta_t)\) effects are treated as mean zero random normal disturbances. To see how the effect of borders changes across time I need to estimate two parameters. First, the time-varying effect of a border captured by the parameter \(\beta_{1p} = \mu_1 + \beta_{1p}\) where I assume that \(\beta_{1p}\) - the time varying effect - is distributed \(\mathcal{N} \sim (0, \sigma_{\beta_1}^2)\) and where \(\mu_1\), captures the time invariant, mean, relationship between borders and cross-city price divergence.

Similarly, transportation costs might decline across time while association between borders and prices remains constant, yielding a relative effect that is in fact increasing. To test this I again estimate the time varying relationship between the distance between each city-pair and price divergence. This is captured by the parameter \(\beta_{2p} = \mu_2 + \gamma_{2p}\) where, again, I assume that \(\gamma_{2p}\) - the time varying effect - is distributed \(\mathcal{N} \sim (0, \sigma_{\gamma_2}^2)\) and where \(\mu_2\), captures the time invariant, mean, relationship between cross-city distance and the divergence of prices.

Figure \[8.4\] plots both the time varying relationship between borders and cross-city price divergence as well as the relationship between the city-pair distance and the same outcome. I allow both the relationship between distance
This figure presents the time-varying effect of distance between cities (triangles) and political borders (circles) with ninety-five percent confidence intervals.

and borders to vary by fifty year periods so that it yields an estimate of the relationship for the years between 1300 and 1350, 1350 and 1400 and so forth. Estimates using 25 year periods or 100 year periods provide qualitatively similar results. The left hand panel gives these estimates treating the outcome as the five year average price divergence and the right hand panel gives the same estimates but treating the outcome as the annual price divergence.

These results indicate that the effect both directly and relative to transportation costs remained unchanged across time. Matching my earlier analysis, the estimated average effects of political union ($\mu_1$) and the logarithm of city-
pair distance ($\mu_2$) indicate between a .6-9% and 11-14% increase in cross-city price divergence, respectively, and are statistically significant at conventional levels ($p < .05$). Moreover, the time varying effects of borders ($\mu_1 + \gamma_{1p}$) and distance ($\mu_2 + \gamma_{2p}$), plotted in Figure 8.4 are statistically indistinguishable across period. That is, we cannot reject the null hypothesis that the effect of political union in each period is different from the effect in all other periods. Similarly, the relationship between distance and cross-city price divergence is indistinguishable across time.

In sum, by examining the time-varying effect of political borders as well as city-pair distance on cross-city price divergence I find no change in the consequences of political union in later periods. Rather, I show that the negative consequences of unification on price behavior were constant between 1350 and 1789. Succinctly, before the French Revolution political independence was a boon for economic efficiency.

**Political Fragmentation and Development**

Having show that, contrary to prediction, the existence of borders led to price convergence across cities, this section explores the relationship between political boundaries and levels of economic well-being. In other words, I ask did large territorial states produce higher levels of development? Here I provide evidence in line with the previous section. First, in a small sample of anachronistic twenty-first century states territorial states, I show that past per capita income was positively correlated with the density of historical borders. Sec-
ond, treating city-size as a proxy for levels of development, I show that before the French Revolution cities in small states were no less developed than cities in large states.

Per Capita Income and Political Fragmentation

As an initial step I look at broad trends in per capita income. Taking as units the sixteen existing twenty-first century territorial states for which there exists both historical estimates of income, I relate the degree to which these states were previously fragmented to their historical levels of development. Using the contemporary boundaries of these states, at hundred year intervals (the frequency with which we have incomes data) I intersect each unit with the historical border data introduced in the previous chapters and construct a measure of historical border density that equals the ratio of historical border length (km) intersecting the contemporary unit to the size of each state (square km). This measure captures the degree to which these contemporary states were previously divided by historical interstate boundaries. Data on income per capita are taken from Maddison (2003)’s reconstructions.

Using these data, it is clear that there is a positive relationship between the density of borders and GDP per capita is positive. In other words, for contemporaneous but historically anachronistic states - all of a large geographic scale - the degree to which they were historically divided into multiple political units correlates positively with past levels of economic development. Pooling these data and regressing the log of GDP per capita on the log of political border density yields an estimated elasticity of 0.13 with a ninety-five percent
confidence interval of \([0.02, 0.24]\). In line with the results of the previous section, greater political fragmentation was associated with greater levels of well-being. This result is plotted in Figure 8.5.

However, the processes of state formation - those that determined the degree to which each of these territorial states was politically fragmented - were as much driven by levels of development as they were a consequence of them. That is, political boundaries are endogenous to growth. To estimate the converse relationship, that between political fragmentation and development, I exploit a historical accident - the division of the Lotharingian Kingdom - to compare urban growth just within this boundary - where many states formed - to units just on the other side that remained politically unified.

Using the boundary created by this accident of history, I take a regression discontinuity approach to identify the effect of state size on the growth cities - a good proxy for the level of development before the industrial revolution. In doing so I find that there is no evidence that cities within large polities were any more developed than cities in small states. In other words, before 1790 I find no evidence that geographic scale provided an economic advantage. However, unlike the results from the previous section or from the cross-national regression presented earlier, I do not find any evidence that political fragmentation was positively associated with economic performance.

The Carolingian Partition as a Natural Experiment

The death of Louis the Pious, the last Carolingian Emperor, in 840 without an established line of succession resulted in the partition of his empire between
This figure plots the log of border density - the ratio of borders intersecting each anachronistic state to the total area of the state - against the log of Maddison (2003)'s GDP per capita estimates for each state. The estimated slope is 0.13 with a standard error of 0.06.
his sons Lothar, Louis, and Charles. Formalized in 843, the treaty of Verdun brought an end to the brief fratricidal civil-war for control of the empire and created three roughly equal kingdoms; West Francia (all Frankish lands west of the Rhone) was awarded to Charles, East Francia (land east of the Rhine and north of Italy) were given to Louis, and Lothar was awarded the Kingdom of Italy and a strip rising north from it including the Low Countries, Lorraine, Alsace, Burgundy, and Provence. Current historiography emphasizes the equal nature of this division, stressing the basic political condition leading to the partition: the need to produce an immediately equitable division of the spoils in order to reward each of the warring factions and their supporting coalitions.

While the partition of the Carolingian Empire resulted in an equitable division of territory, historians have highlighted the fact this division was undertaken without respect to the distribution of existing ethno-linguistic groups. What is more, it also was accomplished with near complete disregard for the internal Imperial boundaries established in 817 and, moreover, split ecclesiastical provinces across kingdoms. In sum, this division brought about an initial condition of three Kingdoms of comparatively equal size, value, and resources, each constructed without regard to the cultural and religious history on the ground.

However, while the division of the Carolingian state may have been purposefully uniform, the later break-up of the Middle Kingdom and the unification of West and East Francia into territorial states, respectively, were driven by happenstance. The Western Kingdom of Charles provided what was by the 10th and 11th centuries the foundation for the French state. Over the same
time period the Eastern Kingdom similarly emerged as the stronghold for Ot-
tonian control in Bavaria. In part this was because both Louis and Charles lived into the 870s, allowing them to consolidate their rule and establish clear lines of succession. In contrast, Lothar passed away twelve years years af-

after Verdun and the Lotharingian state quickly fragmented. Following Lothar I’s death in 855, the Middle Kingdom was again divided between his three sons - the eldest, Louis II, receiving the Kingdom of Italy, Lothair II, received Lotharingia, and the youngest, Charles, received Provence.

The political fragmentation of the Middle Kingdom was further com-
pounded by the contentious divorce of Lothar II whose first wife was unable to produce an heir, forcing him to seek an annulment. At first this was awarded by local clergy, thereby allowing him to legitimize his bastard son, the an-

mulment was later revoked by the Papacy. But in 869, the year of Lothar’s death, the new Pope, Adrian II, assented to the annulment, again leading to a disputed succession and a further territorial division of Lotharingia, codified in the treaty of Meersen in 870. Again, accident - the inability of Lothar II’s first wife to bear him a legitimate heir and the church’s indecision on an annulment - led to further political fragmentation of the Middle Kingdom.

The notion that the partition of the Carolingian realms at Verdun and then again Meersen had consequences for future patterns of West-European state formation is echoed repeatedly. To provide a prominent example Henri Pirenne (?, p. 86), views the division of territory constructed at Verdun as “the first of the great treaties of European history and the one with the most enduring consequences.” Historian Rosamund Mckitterick views the consequences of
this division as having been crucial. For her “the decisions taken at Verdun largely determined the future (geographic) shape of Europe.”

The long lasting impact and accidental nature of the Carolingian partition yields a research design that allows me to estimate the effect of state size on city-growth. In simple terms, cities just within the Lotharingian Kingdom are, because of the historical accidents described above, more likely to have existed within states smaller than those just outside of the border. However, on all other dimensions they are similar. That is, the historical boundary provides a spatial discontinuity in the size of the state each city is governed by. For two reasons, however, the assignment to state size is not perfect around the discontinuity associated with the Lotharingian border.

First, the exact text of the treaty of Verdun has been lost. Nevertheless, the treaty of Meersen does exist in its full form, enabling James Westfall Thompson (1935) to reconstruct the borders. However, the treaty itself delineates the division of holdings, not precise geographic coordinates. As such, there may be some noise in the reconstruction. Second, border changes in years subsequent to the initial partition mean that some cities initially in the Middle Kingdom are in large territorial states. Still, so long as there is a sharp probabilistic jump in the size of states around this discontinuity, I can consistently estimate the effect state size on city-growth.\footnote{Recently, David Stasavage has used a similar identification strategy, wherein he exploits distance from Meersen as an instrument for state size in a broad sample. I differ from this in focusing upon cities close to the partition where the identifying assumptions are most likely to hold, exploiting the jump just at the boundary.}

In order to account for the spatial threshold in two dimension space, I adopt a methodology similar to Dell (2010). However, because the discontinuity is
This map from Muir’s Historical Atlas (1911) (Fordham University Internet Medieval) gives the partition of the Carolingian Empire. The dark blue lines give the boundaries associated with a discontinuous jump in state-size.

not sharp, that is, the size of states varies only probabilistically around the border, I estimate the effect of political fragmentation on city-size via two-stage least squares. This is accomplished by estimating the system of equations given below.

\[
\begin{align*}
\text{StateSize}_i &= \alpha_1 + \gamma_1 \text{Lothar} + \beta_1 f(\text{lat, long}) \times \text{Lothar} + \delta_1 f(\text{lat, long}) + \mathbf{X}\psi_1 + \eta_1 + \epsilon_{1i} \\
\text{StateSize}_i \times f(\text{lat, long}) &= \alpha_2 + \gamma_2 \text{Lothar} + \beta_2 f(\text{lat, long}) \times \text{Lothar} + \delta_2 f(\text{lat, long}) + \mathbf{X}\psi_2 + \eta_2 + \epsilon_{2i} \\
\text{CitySize}_i &= \alpha_3 + \gamma_3 \text{StateSize} + \beta_3 f(\text{lat, long}) \times \text{StateSize} + \delta_3 f(\text{lat, long}) + \mathbf{X}\psi_3 + \eta_3 + \epsilon_{3i}
\end{align*}
\]
where the function $f(lat, long)$ represents a high order polynomial in latitude
and longitude. Throughout I will use a cubic expansion of latitude and longi-
tude however, in the appendix I show that the results are robust to various
functional forms, including simple Euclidean distance to the border. In ad-
dition, I control for possible confounding factors by including $X$, a vector of
geographic variables, and $\eta$ is a dummy indicating whether a given city is
closest to the West or East Francian boundary.

The parameters $\delta_1$ captures the relationship between a city’s location in
space and the size of the state it belongs to. Similarly, the parameter $\beta_1$
captures the way this relationship varies across the boundary by interacting
$f(lat, long)$ with a dummy variable, Lotharingia, that indicates whether or not
a unit was within the Middle Kingdom. The “jump” associated with crossing
the boundary into Lotharingia is captured by the parameter $\gamma$ and, last, $\epsilon$ is a
mean zero random disturbance. The entire first stage is comprised of series of
equations, one for each element of the endogenous regressors in $f(lat, long) \times
StateSize$ as given by the second equation below.

The causal effect of state size at the border is given as the limit of the ratio:

$$\lim_{lat, long \to \text{Border}} \frac{E(City Growth|\text{Lothar} = 1, Lat, Long) - E(City Growth|\text{Lothar} = 0, Lat, Long)}{E(State Size|\text{Lothar} = 1, Lat, Long) - E(State Size|\text{Lothar} = 0, Lat, Long)}$$

whereby taking the limit approaching the border, we are estimating the ratio of
jumps in city-growth and state size just within the Lotharingian Kingdom and
just outside of it. In the framework presented above, this limit is represented
by $\gamma_3 + \beta_3 f(lat = \text{border}, long = \text{border})$. This estimator compares a set of

---

8This is given by including as regressors $x, y, x^2, y^2, xy, x^3, y^3, x^2y, & xy^2$
cities just within the boundary which were more likely to exist in small states or the counterfactual group of cities just outside of the partition that were more likely to be within large states.

However, since there exist infinite possible coordinates associated with the boundary, this value is not uniquely identified. However, centering both latitude and longitude at a particular point on the boundary yields $\gamma_3$ as the effect of state size at that point.\footnote{To see this, consider a point on the border give by the coordinates $x_c, y_c$. For all points $\tilde{x} = x - x_c, \tilde{y} = y - y_c$, when $x = x_c$ and $y = y_c$, $f(\tilde{x}, \tilde{y}) = 0$ and the effect at this point equals $\gamma_3$. It is crucial that the data are projected using a distance preserving coordinate system.} Without centering in this manner, $\gamma_3$ represents the average direct effect of state size on city-growth induced by the “jump” associated with entering the Lotharingian kingdom. I will present both as quantities of interest.

Data

To estimate the effect of state size on city-growth, I rely upon the data on state-size presented in Chapter 1 and the data on city-size constructed by Bairoch, Batou and Pierre (1988). The former measures the size of states in square kilometers and the later in thousands of individuals living in cities that before 1800 ever had at least 5,000 inhabitants. Throughout I will use borders as measured in 1790 and city-population estimates taken in 1800 as the independent and dependent variables. By taking the last measures available before the Congress of Vienna, this best captures the persistent effects of political fragmentation on city-size. In the appendix I provide results using earlier measures of political fragmentation. The results do not change, though
Table 8.5: State Size and City Growth Inside and Outside of Lotharingia

<table>
<thead>
<tr>
<th></th>
<th>State Size (1790)</th>
<th>State Size (1500)</th>
<th>State Size (1200)</th>
<th>City Pop (1800)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
<td>Outside</td>
</tr>
<tr>
<td></td>
<td>23,393.48</td>
<td>27,761.16</td>
<td>120,664.3</td>
<td>243,786</td>
</tr>
<tr>
<td></td>
<td>(-1.90)†</td>
<td>(-6.42)***</td>
<td>(-2.80)**</td>
<td>(.13)</td>
</tr>
<tr>
<td>Number of Cities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance to Boundary:</td>
<td>≤ 200 km</td>
<td>≤ 100 km</td>
<td>≤ 50 km</td>
<td></td>
</tr>
<tr>
<td></td>
<td>193</td>
<td>180</td>
<td>117</td>
<td>124</td>
</tr>
</tbody>
</table>

For each city within 200 km of the Lotharingian partition, the top panel of this table gives the average state size for three periods as well as the difference the average population (in thousands). T-statistics for the difference in means is given in parentheses. The lower panel gives the number of cities within 200, 100, and 50 kilometers of the boundary.

the association between the Lotharingian kingdom and fragmentation does decline over time.

In the widest selection of observations I restrict the sample to cities within 200 kilometers of the border and exclude the few cities in England that fall within this range as they would not serve as good counter-factuals for cities in the Middle Kingdom. In the most narrow sample I include only those cities within 50 kilometers of the border. In the largest sample there are 575 cities, 382 outside of the Lotharingia and 192 within. In the smallest sample there are a nearly identical number of cities proximate to the border; 117 within Lotharingia and 124 outside of it.

Data on the Lotharingian boundary are taken from the historical recreation provided by TKTK and weer re-projected using the Albers European coordinate system. In addition I include a series of geographic controls. However, later in the chapter I show that there are no substantial jumps associated with
the lotharingian border for any of these additional covariates. First, I account for agricultural economic potential via measurement of the rain-fed suitability to produce agricultural output. This measure captures the capacity for a given piece of territory to produce agricultural output without extensive man-made irrigation and is taken from the FAO’s GAEZ combined land suitability dataset (?). The data are extracted from the FAO raster dataset at the coordinate given for each city.

Similarly, using new spatial data on terrain ruggedness collected by ? I account for how mountainous the area upon which a city is located. The ruggedness data are created at the one kilometer by one kilometer (1 km x 1 km) grid-squares, I take the ruggedness measure for a 10 km buffer surrounding each city. Additionally, for each city I measure the distance to a major river as recorded by the European Environmental Agency. Last, taken from Jedin, Latourette and Martin (1987), I record whether or not a city was the seat of a bishopric or archbishopric circa 600. This serves as a pre-treatment proxy for the importance and development of each city; comparatively more developed and influential cities were more likely to be named as bishoprics.

In the subsequent section I show that the inclusion of any of these covariates as additional regressors does not alter any of the results. Later, I conduct a series of “placebo” tests, showing that in line with the identifying continuity assumption, there are no statistically significant jumps in any of these pretreatment covariates at the Lotharingian border.
Results

In this section I demonstrate that 1.) there is a large and statistically significant jump in the predicted direction associated with crossing over into the Lotharingian kingdom and 2.) there is no change in the population of cities associated with this jump. I then provide a series of checks to the main assumption of continuity around the border. Each of these find no evidence of a discontinuity in any pre-treatment covariates.

Table 8.6 gives the main results. I estimate the system described in the previous section via two-stage least squares and use a cubic polynomial to approximate the smooth surface in latitude and longitude, $f(lat, long)$. In the appendix I provide results using different functional forms to approximate $f(lat, long)$. I begin by using a sample of all cities within a 200 kilometer buffer of the Lotharingian boundary. Then, I reduce this buffer by half to 100 kilometers and then again by half again to 50 kilometers. I then estimate each model and introduce as controls the possible pre-treatment geographic confounders described in the previous section.

The lower half the panel gives the estimated jump associate with the Lotharingian border. Across all specifications the jump is substantively large and statistically significant. At its smallest, derived from the model using all cities within a 200 kilometer radius, the jump is estimated to be a 93,300 square kilometer decline in state size. At its largest, using cities within 100 kilometers of the boundary as well as geographic controls, the jump is estimated to be a 116,000 kilometer decline. Besides being substantively large, these effects are statistically significant. Since there are more than one endoge-
**Main Result:** Fuzzy RD Effect Estimates of State Size on City-Growth

<table>
<thead>
<tr>
<th>Distance to Boundary:</th>
<th>≤ 200 km</th>
<th>≤ 100 km</th>
<th>≤ 50 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SLS Estimates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Size</td>
<td>0.001</td>
<td>-0.002</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.004)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Lotharingian “Jump”</td>
<td>-9.33***</td>
<td>-9.10***</td>
<td>-11.40***</td>
</tr>
<tr>
<td></td>
<td>(1.48)</td>
<td>(1.49)</td>
<td>(1.83)</td>
</tr>
</tbody>
</table>

**Dependent Variable: ln City-Size (Thousands)**

<table>
<thead>
<tr>
<th>Border FE</th>
<th>Geographic Controls</th>
<th>Lat/Long Cubic Polynomial</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

**Dependent Variable: State Size (KM)**

<table>
<thead>
<tr>
<th>Border FE</th>
<th>Geographic Controls</th>
<th>Lat/Long Cubic Polynomial</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

**A-P Multivariate F-Stat**

<table>
<thead>
<tr>
<th>A-P Multivariate F-Stat</th>
<th>87.06</th>
<th>7.53</th>
<th>50.27</th>
<th>48.29</th>
<th>31.11</th>
<th>16.63</th>
</tr>
</thead>
<tbody>
<tr>
<td>R²</td>
<td>0.75</td>
<td>0.79</td>
<td>-2.04</td>
<td>0.79</td>
<td>0.40</td>
<td>0.91</td>
</tr>
<tr>
<td>N</td>
<td>575</td>
<td>575</td>
<td>394</td>
<td>394</td>
<td>241</td>
<td>241</td>
</tr>
</tbody>
</table>

Table 8.6: The Effect of State Size on City-Growth 1.

This table gives the effect of state size on city-growth before the French Revolution from the spatial discontinuity created by the breakup of the Lotharingian Kingdom. All standard errors are robust to arbitrary heteroskedasticity.
## Border-Midpoint: Effect Estimates of State Size on City-Growth

<table>
<thead>
<tr>
<th>Distance to Boundary:</th>
<th>≤ 200 km</th>
<th>≤ 100 km</th>
<th>≤ 50 km</th>
<th>≤ 200 km</th>
<th>≤ 100 km</th>
<th>≤ 50 km</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W. Francia Midpoint</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2SLS Estimates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Size</td>
<td>-0.003</td>
<td>-0.038</td>
<td>0.013</td>
<td>0.004*</td>
<td>0.002</td>
<td>0.007</td>
</tr>
<tr>
<td>(0.010)</td>
<td>(0.022)</td>
<td>(0.019)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.014)</td>
<td></td>
</tr>
<tr>
<td><strong>E. Francia Midpoint</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent Variable: In City-Size (Thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Border FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Geographic Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Lat/Long Cubic Polynomial</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>A-P Multivariate F-Stat</td>
<td>57.37</td>
<td>51.75</td>
<td>15.76</td>
<td>40.88</td>
<td>49.85</td>
<td>13.78</td>
</tr>
<tr>
<td>R²</td>
<td>0.69</td>
<td>0.70</td>
<td>0.38</td>
<td>0.73</td>
<td>0.51</td>
<td>0.86</td>
</tr>
<tr>
<td>N</td>
<td>575</td>
<td>394</td>
<td>241</td>
<td>575</td>
<td>394</td>
<td>241</td>
</tr>
</tbody>
</table>

***p < 0.001, **p < 0.01, *p < 0.05

Table 8.7: The Effect of State Size on City-Growth 2.

This table gives the effect of state size on city-growth before the French Revolution from the spatial discontinuity created by the breakup of the Lotharingian Kingdom. It does this for the midpoints of the Eastern and Western boundaries. All standard errors are robust to arbitrary heteroskedasticity.
nous regressors, e.g. each element associated with $StateSize \times f(lat, long)$, I rely upon the Angrist-Pitscke multivariate F-statistic to assess the strength and significance of the jump. Across all specifications the border instrument meets standard levels of strength. In the appendix I give the Angrist-Pitscke test statistic for each of the endogenous instruments. While the jump associated with the Lotharingian boundary is strong and statistically significant, I find no evidence of an effect of state size and city-growth. Across specification, the average effect of state size induced by Lotharingian border is both small and statistically indistinguishable from zero.

Next, I conduct the same exercise, detailed in Table ??, and estimate the effect of state size at two distinct points on the Lotharingian boundary. First, I estimate the effect at the mid-point of the border with West Francia. Again, the results remain the same. In each specification, regardless of the sample size used, the jump associated with Lotharingian border is substantively large - roughly equivalent to the previous models - and statistically significant and at conventional levels. Again, the effect of state size is estimated to be null. Second, I do the same, this time estimate the effect of state size at the midpoint of the East Francian boundary. The results are nearly identical; there is no evidence that cities in small states were any smaller than cities located in large states.

To recapitulate thus far, using the accidental breakup of the Lotharingian Kingdom as a lasting historical shock to the size of states, I compare the size of cities just within this boundary, those more likely to be in small states, to those just outside of it, those more likely to be in large states. In doing so, I
find that there is no difference in the size of these cities, indicating that there is no effect of state size on the level of city-development, a good proxy of the level of economic well-being.

**Placebo Tests**

The assumption necessary for these results to be properly identified is that potential outcomes for each unit are continuous at the border. An implication of this is that other pre-treatment covariates should express no jump at the border like we find with the size of states. I assess this by looking at three outcomes: Whether or not a city was the seat of a bishopric or archbishopric circa 600 AD, the agricultural suitability and terrain ruggedness surrounding each city. In line with the assumption of continuity, I find no evidence that any of these outcomes experience such a discontinuity at the border. To accomplish this, I estimate models of the following form.

\[
Outcome_i = \alpha + \gamma Lothar + \beta f(lat, long) \times Lothar + \delta f(lat, long) + \epsilon_i \tag{8.4}
\]

Where, as in the previous analysis, I am treating each outcome as a smooth function of its location in space, allowing this effect to vary within and outside of the Lotharingian kingdom. Again, I will use the cubic polynomial to approximate the function \( f(lat, long) \) and as before \( \epsilon \) is a mean zero random

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\[10^* \text{I do not use the distance to major rivers here as distance is, by construction, will have no difference at the limit as one approaches the border.} \]
disturbance. The “jump” associated with the Lotharingian border is once more captured by the parameter $\gamma$.

The results from these tests are presented in Table 8.8. The top panel treats as the outcome the probability that a given city was a bishopric or archbishopric - a pre-treatment measure of the relate importance of a city. I conduct two analyses, the results of which are identical. Using both a simple linear probability model and then probit regression, I find no evidence that there is a jump in the probability of a city being a bishopric associated with the Lotharingian border. Across specification, using samples within 200, 100, and 50 kilometers of the border, as well as conditioning on geographic covariates, the effect of the boundary on the probability of a city being a bishopric is statistically indistinguishable from zero.

In the lower panel I present results treating the geographic covariates as the outcome of interest. First, I look for a jump in FAO’s agricultural suitability measure. Again, across all specifications and samples I find no evidence of a jump associated with the Lotharingian border. Second, I treat as the outcome the measure of terrain ruggedness for each city. Once more, there is no evidence that the border with the Middle Kingdom induced a jump in the type of terrain surrounding each city. In sum, if the continuity assumption were violated we might expect each of these pre-treatment outcomes to change significantly around the border. However, this section has showed that there were no such jumps associated either with the probability of being the seat of a bishopric nor of changes in geographic conditions.
Table 8.8: Placebo Results

This table gives placebo tests for three pre-treatment covariates. The top panel gives OLS and probit estimates treating the presence of a Bishopric as the dependent variable. The bottom panel treats agricultural suitability and terrain ruggedness as the outcome. All standard errors are robust to arbitrary heteroskedasticity.
Conclusion

The evidence presented in this chapter demonstrates that before the French Revolution geographic scale provided no economic advantages. Not only did interstate borders prove not to be barriers to trade but, rather, had the converse effect; political independence was positively associated with price convergence and efficient economic exchange across space. Moreover, examining a set of comparable cities, some randomly located within geographically large states and others in small states, I have provided evidence of no effect of state-size on urban population.

Building on results from the previous chapters, these findings point to a city-state advantage of two types. Not only were small states more likely to survive than their larger competitors but they were no worse - and perhaps even better - at the producing positive of economic outcomes. This indicates that neither of the selection mechanisms produced by war-making theories or economic theories are borne out. Small states were successful both militarily and economically. Nevertheless, by the mid-nineteenth century the large territorial state, as an institutional form, had achieved a clear dominance. By 1816 the number of European states had decreased from over 200 to just over 40. Just over a half-century later this number had decline farther to a historic low of 17.

The cause of this rapid decline, detailed in the subsequent chapter, was a fundamental change in the relationship between the geographic size of states and economic development. This itself was a result of political changes caused by the French Revolution and Napoleonic wars. The elimination of Old Regime
privileges did away with internal barriers to trade, restrictive guild-based production, and empowered commercial elites. In combination these promoted specialization and trade across larger geographic regions. That is, these political changes created a world in which Smithian growth was achievable.

While the political transformation that followed the French Revolution altered the economic incentive to construct large states, in doing so it also indirectly changed the military incentives favoring size. Rapid economic growth provided newly industrializing states a marked advantage in the field. This forced a defensive modernization upon laggard competitors who in order to compete militarily did away with market retarding barriers to free exchange and thus in a second-order way affected the relationship between geographic size and survival.
Appendix

The Persistence of Barriers to Trade in Unified States

This section explores why leaders of such states would construct impediments to efficient exchange. For simplicity I consider a politically unified country consisting of two regions each producing a uniform good and where a political choice to remove barriers to trade between regions must be made. Stylistically let region \( I \) be an importing region, given in the left hand panel of Figure 8.7 and region \( E \) be an exporting region, given in the right hand panel of the same figure.

When there is free trade between regions, excess demand in the importing region equals excess supply in the exporting region, resulting in a shift in supply the length of the horizontal blue line and an equilibrium price of \( p_I \). The existence of numerous feudal tolls and local prerogatives, however, prevent this equilibrium from resulting. These barriers to trade limit the quantity of goods from the exporting region that ultimately reach the importing region. In Figure 8.7 the degree to which these feudal rights allow supply to shift from the exporting to the importing region is captured by the horizontal red line. The resulting prices in each region when these barriers exist are given by \( p_{sq}^I \) and \( p_{sq}^E \), respectively. Clearly, \( p_{sq}^I > p_{sq}^E \).

The political leader will choose whether or not to impose feudal rights. The welfare effects of removing or maintaining these privileges are clear: total welfare is increased when the feudal levy is removed.\(^{11}\) However, if the

\(^{11}\)The loss associated with these barriers is denoted by sum the area denoted by \((B+D+f+h)\) in Figure 8.7.
This figure gives the equilibrium price resulting in an importing region (the left hand panel) and the an exporting region (the right hand panel) of a unified country under two conditions. The first condition, free trade, is denoted by supply shift given by the blue horizontal line and the price $p_{ft}$. The second condition, with barriers to trade, is denoted by the supply shift given by the red horizontal line and the prices $p_{sq}$.

rule aggregating these outcomes does not weigh the welfare gains in both regions equally, it is not apparent that the decisive political actor will choose to eliminate barriers to trade
This figure plots the weight assigned to each region at which the political actor would be indifferent between free and restricted trade. The x-axis gives the losses (relative to gains) of the importing region associated with restricted trade. The y-axis gives the institutional weight at which the political leader would be indifferent. This is plotted iteratively for losses (relative to gains) for the exporting region. For $\pi$ above the plotted line free trade will be chosen.

Let us assume that if the importing region’s interests were alone taken into account it would prefer to enact barriers to trade. Now, suppose that the decisive actor weights the exporting region’s welfare with weight $\pi \in [0, 1]$ and the importing region’s welfare with weight $1-\pi$. The total welfare of the status

$^{12}$More precisely assume, $G > (B+D)$
quo for the political actor is now given by $G-(B+D) - \pi(f+h+2g-D-B)$. For sufficiently low $\pi$ the feudal levy will remain in place.

Figure 8 gives the weight placed on the exporting, $\pi$, at which the decisive political actor would be indifferent between keeping and removing the feudal barrier to trade for different sizes of the deadweight loss accruing to the exporter ($f+h$) and importer ($B+D$) where both are treated as a function of the size of benefits accruing to the importer ($G$). For given costs and benefits when $\pi$ is above the plotted curve free trade be chosen. When it below feudal barriers to trade will be the outcome. When $G$ is small relative to ($B+D$) the weight that the leader has to put on the exporter’s welfare in order to obtain free trade is also small. However, when the benefits accruing to the importer are large relative to the losses the weight the political actor must place on the exporter must be large. Moreover, we see that this is declining in the deadweight loss specific to the exporter ($f+h$). That is, if the losses to the exporter are high relative to $G$ then the weight given to the exporting country in order to make the political actor indifferent between the status quo and free trade needn’t be as large as when they are small.

**The Ancien Regime**

Clearly, if the leadership of the unified country favors the interests of the importing over the exporting region then we should not expect prices to converge to the free market value. If the opposite is true then we should expect free trade and a convergence in prices. However, the decisive political actor’s concerns need not be biased geographically to obtain the similar predictions.
For example, aristocratic elites who live off rents provided to them by the state will have no incentive to remove their feudal privileges. Under the *ancien régime*, the case where the state is controlled by aristocrats, the decisive political actor will not maximize total welfare or even some combination of welfare across regions but, instead will maximize the rents accruing to the state. Continuing with the example in Figure 8.7, the rents associated with the feudal levy are given by the area defined by C+G and they can only be achieved if the levy remains in place. If free trade is chosen then these quota rents are eliminated. So long as the decisive political actor relies upon aristocratic privilege for their well-being, again, we should not expect the removal of the status quo feudal levy.

**Empire**

In the above examples, the choice facing a newly unified polity is between the removal of trade barriers and free trade. However, strategies beyond the maintenance or removal of feudal privilege have frequently been available to the constructors of new states. The formatters of empires, for example, have pursued what we might call an extractive strategy. Here, when one state amalgamates another via conquest it not only can remove barriers to trade but can force the conquered state to pay what I will call tribute. That is, the conquering state can force the conquered state to export (import) some fraction of the stylized good at a subsidized cost.

The construction of an Empire is captured in Figure 8.9. Again, the horizontal blue line represents the supply shift under free trade and $p_f$ is the
Figure 8.9: Prices Under Free and Mercantalist Trade

This figure gives the equilibrium price resulting in an importing region (the left hand panel) and the an exporting region (the right hand panel) of a unified country under two conditions. The first condition, free trade, is denoted by supply shift given by the blue horizontal line and the price $p_{ft}$. The second condition, with forced tribe, is denoted by the supply shift given by the green horizontal line and the prices $p_c$.

free-trade price common across regions. Now, consider the case when the importing region conquers the exporting region and where the political actor only considers the welfare of the conquering importer. Under empire the conquering state can coerce the conquered state to export more than it would under the free trade regime. That is, it can exact tribute. This excess supply is given by the green horizontal line.

In the above example, this shift in supply due to tribute causes prices to diverge across regions with price $p_{ci}$ in the importing region and $p_{ce}$ in the
exporting region where \( p_{ce} > p_{ci} \). This increases welfare in the importing region relative to free trade by the area \( t \) in the left hand panel of Figure 8.9. Conversely, it decreases the welfare of the conquered region by the area defined by the sum of \( Z + Y + U + T + V \) in the right hand panel of the same figure. In sum, if the importing region is the conqueror, the construction of empire unambiguously enhances its welfare whilst harming the conquered region.\(^{13}\)

When the leadership of the newly formed state favors the importing over the exporting region we should expect a maintenance of the status quo prices across regions. However, if the extractive strategy is pursued and an empire formed, then again we should expect a divergence from the free trade price. However, the prediction with regard to change in cross-regional prices is ambiguous. Depending on the shape of the supply and demand functions in question as well as the degree to which feudal barriers to trade limit adjustment and the size of the tribute commanded by the conquering state.

To see this, consider the case when the importing region conquers the exporting region and must choose between forming an empire or maintaining the feudal status quo. That is, the decisive political actor, here assuming they care only about the welfare of the importing region, will compare the welfare gains from the status quo to those of empire and will be indifferent when

\[
  r \left[ (p_f - p_{se}) + (p_{si} - p_{se}) \right] = g(p_f - p_{ci}) + b(p_{si} - p_{ci})
\]

\(^{13}\)If the exporting region were to conquer the importing region we can obtain the same result so long as the conqueror can impose a tax of \( (Z + Y + U + T + V) \) on the importer. That is, the exporter can force the importer to subsidize exports. It then achieves an increase in national welfare given by the size of X in the right-hand panel of Figure 8.9.
Where $r$ is the length of the horizontal red line in Figure 8.7, $b$ is the length of the horizontal blue line common to Figures 8.7 & 8.9, and $g$ is the length of the horizontal green line in Figure 8.9. If the left hand side of Equation 8 is greater than the right hand side then the feudal status quo is preferred to empire, if the opposite is true then empire is the preferred choice. Since the prices here are a function of the supply and demand functions about which we have made no assumptions other than supply is upward sloping and demand is downward sloping, we do not gain a clear prediction about which will be chosen. This means, however, that $p_{ce} - p_{ci} > p_{si} - p_{se}$ is possible. In other words, the creation of a unified polity via conquest can yield not only a null effect but, rather, a divergence from the status quo feudal price levels.

To summarize, when the decisive political actor places more weight on the welfare of the importing region we should expect no change in prices across regions. Contrastingly, when the actor places weight on the welfare of the exporting region we should expect a convergence in prices. However, if empire is a possible strategy, then our predictions become less precise. When extraction is possible it leads to a divergence from the free trade price. Whether or not this is greater or less than status quo price difference that results from feudal barriers to trade is undetermined.
### Table 8.9: Classification of State - Types

<table>
<thead>
<tr>
<th>City-States</th>
<th>Territorial States</th>
<th>Empires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brabant</td>
<td>France</td>
<td>Habsburgs</td>
</tr>
<tr>
<td>Ghent</td>
<td>Holland</td>
<td>Wittelsbachs</td>
</tr>
<tr>
<td>Arnhem</td>
<td>Papal States</td>
<td>Muscovy/Russia</td>
</tr>
<tr>
<td>Augsburg</td>
<td>Kingdom of Burgundy</td>
<td>Luxembourgs</td>
</tr>
<tr>
<td>Florence</td>
<td>Ducal Tuscany</td>
<td>Spain</td>
</tr>
<tr>
<td>Venice</td>
<td>Aragon</td>
<td></td>
</tr>
<tr>
<td>Cologne</td>
<td>Kingdom of Naples</td>
<td></td>
</tr>
<tr>
<td>Frankfurt</td>
<td>Switzerland</td>
<td></td>
</tr>
<tr>
<td>Modena</td>
<td>Portugal</td>
<td></td>
</tr>
<tr>
<td>Lorraine</td>
<td>England</td>
<td></td>
</tr>
<tr>
<td>Baden</td>
<td>Saxony</td>
<td></td>
</tr>
<tr>
<td>Wurtemberg</td>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td>Siena</td>
<td>Prussia</td>
<td></td>
</tr>
<tr>
<td>Strasbourg IC</td>
<td>Scotland</td>
<td></td>
</tr>
<tr>
<td>Milan</td>
<td>Sweden</td>
<td></td>
</tr>
<tr>
<td>Brescia</td>
<td>Lithuania</td>
<td></td>
</tr>
<tr>
<td>Utrecht</td>
<td>Savoy</td>
<td></td>
</tr>
<tr>
<td>Wurzburg</td>
<td>Bavaria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Denmark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hungary</td>
<td></td>
</tr>
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</table>
Table 8.10: Angrist-Pitchke Multivariate F-Test

<table>
<thead>
<tr>
<th>Distance to Boundary:</th>
<th>≤ 200 km</th>
<th>≤ 100 km</th>
<th>≤ 50 km</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endogenous Regressor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Size</td>
<td>87.06</td>
<td>7.53</td>
<td>50.27</td>
</tr>
<tr>
<td>State Size × Long</td>
<td>71.43</td>
<td>0.62</td>
<td>91.01</td>
</tr>
<tr>
<td>State Size × Lat</td>
<td>48.74</td>
<td>46.26</td>
<td>44.51</td>
</tr>
<tr>
<td>State Size × Long²</td>
<td>145.6</td>
<td>0.29</td>
<td>114.42</td>
</tr>
<tr>
<td>State Size × Lat²</td>
<td>55.36</td>
<td>40.19</td>
<td>41.63</td>
</tr>
<tr>
<td>State Size × Long³</td>
<td>257.86</td>
<td>0.15</td>
<td>170.91</td>
</tr>
<tr>
<td>State Size × Lat³</td>
<td>49.61</td>
<td>31.54</td>
<td>35.78</td>
</tr>
<tr>
<td>State Size × Long × Lat</td>
<td>102.55</td>
<td>59.91</td>
<td>77.08</td>
</tr>
<tr>
<td>State Size × Long² × Lat</td>
<td>645.78</td>
<td>90.38</td>
<td>123.54</td>
</tr>
<tr>
<td>State Size × Long × Lat²</td>
<td>55.64</td>
<td>47.68</td>
<td>68.69</td>
</tr>
<tr>
<td>Border FE</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Geographic Controls</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Lat/Long Cubic Polynomial</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Table 8.11: Alternative Functional Form: Fuzzy RD Effect Estimates of State Size on City-Growth

<table>
<thead>
<tr>
<th>Distance to Boundary:</th>
<th>Euclidean Distance (Cubic)</th>
<th>Quadratic in Lat/Long</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 200 km</td>
<td>≤ 100 km</td>
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<tr>
<td></td>
<td>≤ 50 km</td>
<td>≤ 200 km</td>
</tr>
<tr>
<td></td>
<td>≤ 100 km</td>
<td>≤ 50 km</td>
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</tbody>
</table>

**2SLS Estimates**

<table>
<thead>
<tr>
<th>State Size</th>
<th>0.000</th>
<th>-0.000</th>
<th>0.000</th>
<th>0.002</th>
<th>0.001</th>
<th>0.006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.00001)</td>
<td>(0.00003)</td>
<td>(0.00002)</td>
<td>(0.01712)</td>
<td>(0.00262)</td>
<td>(0.00993)</td>
</tr>
</tbody>
</table>

**First Stage**

<table>
<thead>
<tr>
<th>Lotharingian “Jump”</th>
<th>41.42</th>
<th>150.47†</th>
<th>202.98†</th>
<th>-8852.76***</th>
<th>-7032.42**</th>
<th>-4761.37†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(66.51)</td>
<td>(81.88)</td>
<td>(120.26)</td>
<td>(1925.45)</td>
<td>(2184.12)</td>
<td>(2550.22)</td>
</tr>
</tbody>
</table>

**Dependent Variable: Ln City-Size (Thousands)**

<table>
<thead>
<tr>
<th>Border Dummy</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

**A-P Multivariate F-Stat**

<table>
<thead>
<tr>
<th></th>
<th>0.39</th>
<th>2.35</th>
<th>2.13</th>
<th>21.14</th>
<th>10.37</th>
<th>3.49</th>
</tr>
</thead>
</table>

**R^2**

<table>
<thead>
<tr>
<th></th>
<th>-0.037</th>
<th>-10.394</th>
<th>-1.918</th>
<th>-46.139</th>
<th>-0.796</th>
<th>-6.365</th>
</tr>
</thead>
</table>

**N**

|                      | 575.00 | 394.00 | 241.00 | 575.00 | 394.00 | 241.00 |

***p < 0.001, **p < 0.01, *p < 0.05, †p < 0.1
Chapter 9

Conclusion: The Selection of Large States in the Nineteenth Century

What Have We Learned?

Four results have emerged. Changes in patterns of war and war making alone cannot explain the creation or persistence of states. Large states and small states alike survived and were formed based upon their economic capacities - strengths and weaknesses which, in turn, determined their ability to produce violence. Empowered social groups that developed from changes in patterns of trade and commerce early in the last century, primarily located in a corridor of increasingly prosperous cities running through the former Kingdom of Lothar, used their material advantages to assert themselves as independent states. They did not, however, seek to use their economic advantage to construct large territorial states; facing a tradeoff between the use of valuable resources

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for the destructive pursuit of conquest and economically productive endeavors, these groups chose the latter.

Moreover, I have presented evidence from commodity prices that before the French Revolution small states were no worse and were likely superior at efficiently allocating economic resources. The set of political economic-institutions which prevailed in this period created substantial internal barriers to trade and limited the capacity of large states to produce Smithian growth. However, the French Revolution and subsequent revolutionary wars altered in four ways the economic incentive to produce states of substantial geographic scale.

**Economic Causes in the 19th Century**

In the first place, the conquest of much Europe by Napoleon directly resulted in a reorganization of the political map. After the Napoleonic conquests the French consolidated the hundreds of small states they came to occupy into just over 40 units. In addition to redrawing boundaries, however, occupation resulted in a series of institutional and political reforms that created economic incentive for the further consolidation of these remaining units into states that would ultimately become Germany and Italy.

take an econometric approach and show that for a set of comparable German principalities variation in the timing and duration of French occupation between 1790 and 1815 explains a substantial variation in the intensity of political reform. These reforms had two interrelated effects which led, ultimately, to the construction of large states.

By removing the institutions of the Old Regime the French created incentive for further political integration in the territories they conquered. These internal barriers to trade, once pervasive, ceased to exist. In their absence, large states could more efficiently allocate goods and services across space, creating a world with positive economic returns to geographic scale. Moreover, these reforms, both by removing the old elite and by creating an institutional environment conducive to growth, empowered a commercial class who were the greatest proponents of political-economic integration (Ziblatt 2006).

In Germany the leadership of the most commercialized states - those most greatly affected by externally imposed institutional reform - supported the national project (Ziblatt 2006, Diefendorf and Diefendorf 1980, Hamerow 1969). In contrast, the least commercialized states in southern Germany, Bavaria, Württemberg, and Baden, for example, were the greatest opponents of an enlarged German territorial state. Moreover, these were the states who last abandoned the institutions of the Old Regime (Kocka 1986, John 2000, Ziblatt 2006).

A similar pattern of institutional reform, commercialization, and support for a unified national state is found in Italy. The north-central regions of Tuscany, Piedmont, Emilia, and Lombardy came directly under French rule.
The rest of Italy, while conquered by the French, was administered indirectly. In the North, as in the Rhineland, French rule radically transformed society by both eliminating feudal privilege and rights and making land and other property alienable, the consequence of which was a reorientation of the north-Italian ruling class away from a reliance on landed prerogative and toward the market (Lyttelton 1979, Cardoza 1993, 2002, Ziblatt 2006). In the rest of Italy, in those locations where French rule was indirect, traditional social structures persisted (Davis 1979, Riall 1994).

Again, as in Germany, the elite of the most commercialized Italian states - those states whose institutions were radically reformed by the French - were the greatest and earliest proponents of a unified Italy (Ziblatt 2006, Greenfield 1978, Cardoza 2002). In the least commercialized states, those like the Kingdom of two Siciles, where externally imposed political reforms failed, elites resisted the construction of a unified national market (Ziblatt 2006, Chubb 1982).

Besides the effect of French intervention as it operated through elite preferences, the ensuing commercialization of the economy in some places and not others similarly influenced broader attitudes towards national unification. For example, Ziblatt (2006)[p. 34] notes a strong correlation ($\rho = .52$) between regional GDP per-capita and membership in the Nationalverein - a vocal pro-unification civic organization. Similar data is not available in Italy, but he notes that a disproportionate share of the Societá Nazionale Italiana’s membership coming from Tuscany, Piedmont, and Lombardy - the three most commercialized regions (Ibid, 65). In this way a mechanism linking French
intervention to mass preferences for national-states may operate through commer-
cialism and modern economic growth à la Gellner (1983). Regardless, a
substantial historical literature links the revolutionary expansion of France to
the development of national identities throughout Europe (Dann and Dinwiddy

Lastly, the impulse to construct large states can further be thought of as a
defensive response on the part of the rulers of small states to the modernizing
efforts of existing territorial states. In other words, as states like France and
England modernized their economies, removing feudal institutions, reorganiz-
ing agriculture, and doing away with internal barriers to trade, small states
faced increasingly economically efficient competitors. In order to match these
ascendent powers, small states now economically backward and, therefore, mil-
itarily weak needed to similarly construct large national markets in order to
compete in the international system.

**What Is Next?**

The above section has outlined four ways in which the French Revolution
affected the ultimate selection of large territorial states. Some of which provide
avenues for further research.

1. The Napoleonic wars and the Congress of Vienna led to the immediate
dissolution and reconstruction of hundreds of units into comparatively
few states. This is a historically anomalous event in terms of the mag-
nitude with which states failed and were born. Without proper counterfactual, it provides little in the way of systematic empirical study.

2. Occupation by the French led to political reforms which created incentives to create large national states. This occurred in two ways; first by reducing internal barriers to trade, creating economic returns to scale and, second, by empowering a set of commercial elites who sought to take advantage of this. This set of hypotheses produces a number of empirically testable hypotheses. The existence of data on the behavior of political elites, particularly roll call data in the parliaments of the various German states, may provide fruitful avenues of investigation.

3. The creation national identities and mass political attitudes in favor of large unified states based upon ethnic and linguistic ties. The absence of systematic public opinion data before the twentieth century clearly restricts the investigation of this mechanism. However, the dual advent of the mass digitization of primary source historical documents and statistically methods of analyzing texts may allow the effects of nationalism and national identity on preferences for large states to be studied.

4. Modernization by existing large states provoked a defensive modernization including the removal of internal barriers to trade and the construction of large national markets. Here it may be possible to couple variation the timing of reforms by the great-powers with variation in their strategic interactions with smaller European states to identify the effects of defensive modernization.
Each of these elements together represent future avenues of research on the ultimate success of large territorial states in the nineteenth century.
Bibliography


Allen, R.C. and R Unger. 2014. “Global Commodity Prices Database.” URL: http://www.history.ubc.ca/faculty/unger/ECPdb/


301


305


Diamond, J. 1997. “Guns, Germs and Steel.”.


Duby, Georges. 1968. “Rural economy and country life in the medieval West.”.


Fletcher, Erin and Murat Iyigun. 2009. “Cultures, clashes and peace.”.


308


Le Branchu, Jean-Yves and François Simiand. 1934. “Écrits notables sur la monnaie, XVIe siècle de Copernic à Davanzati.”.


314


Munro, John H. 2006. “South German silver, European textiles, and Venetian trade with the Levant and Ottoman Empire, c. 1370 to c. 1720: a non-Mercantilist approach to the balance of payments problem, in *Relazione economiche tra Europa e mondo islamico, secoli XIII-XVIII*, ed. Simonetta Cavaciocchi.”.


Oman, Charles William Chadwick. 1885. The Art of War in the Middle Ages, A. BH Blackwell.


Parker, G. 1996. The military revolution: Military innovation and the rise of the West, 1500-1800. Cambridge Univ Pr.


317


318


Struder, Roman. 2009. “Does Adam Smith help to explain the Industrial Revolution? Geography, market size and the rise of the two Europes.”


Van Zanden, Jan Luiten. 2004. “The prices of the most important consumer goods, and indices of wages and the cost of living in the western part of the Netherlands, 1450–1800.”.


Verbruggen, Jan Frans. 1997. The art of warfare in Western Europe during the Middle Ages: from the eighth century to 1340. Vol. 3 Boydell Pr.


Wickham, C. 2005. Framing the early Middle ages: Europe and the Mediterranean 400-800. Oxford University Press, USA.


Ziblatt, Daniel. 2006. Structuring the state: the formation of Italy and Germany and the puzzle of federalism. Princeton University Press.


