

**Endogenous Parliaments:**  
*Urban Agglomeration, Technological Accumulation, and the  
Deep Roots of Executive Constraints in Europe*

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**Abstract**

Institutional constraints on executive behavior are commonly understood to be crucial constitutional features that limit state expropriation, protect property rights, and promote economic development. Combining new data describing the presence of parliamentary constraints for the entire European continent with data on city-sizes we build upon theories of endogenous economic growth to demonstrate that paths of economic and political development over the long-span of European history from 1200-1900 are the consequence of a common process of agglomeration. In doing so, we provide evidence that both outcomes - the existence of constraining institutions and growth - are caused by initial conditions that fostered technical know-how embodied in urban-dwelling artisans whom, in turn, were able to force institutional limits on rulers' actions. Our results suggest that instead of reflecting a true underlying cause of development, parliamentary constraints are themselves outcomes determined by an endogenous process of growth.

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Among the wide variety of theories developed to explain how parts of Europe managed to escape from a pre-industrial, Malthusian world through a long period of sustained growth, two families of models stand out. On the one hand, institutionalism, which has become the predominant explanation of economic development, traces growth back to a particular configuration of institutions, placing strong emphasis on the presence of formal structures such as constitutional checks and balances and constraints on the executive (North and Weingast 1989). On the other hand, endogenous growth models explain economic development as a function of technological innovation, which (especially in medieval and modern Europe) happened in the shopfloor through a process of learning-by-doing. In this paper we provide evidence in favor of a model of endogenous political development that integrates both perspectives. Combining new data on both the presence of proto-industrial centers and parliamentary constraints with data on the size of cities, we show that, through a process of agglomeration, very early productive advantages fostered technical know-how embodied in urban-dwelling artisans. That, in turn, caused both further growth and the introduction of institutional constraints upon governments' actions.

The ability to place constitutional checks on political leaders is commonly seen as crucial for development. Formal limits on the executive's ability to behave capriciously, expropriate wealth, and unilaterally abrogate contractual agreements fosters economic growth by promoting a stable environment for investment and the protection of property rights. Nevertheless, those who argue in favor of the independent effect of parliamentary constraints do little to explain their origins and they do not convincingly show that these institutions themselves are not endogenous to development. From a statistical point of view, assertions of a relationship between parliaments and development often result from an over-reliance upon cross-sectional comparisons or panel data that do not extend sufficiently far into the past. For example, estimating the effect of parliamentary constraints in a given cross-section, even after conditioning upon contemporaneous levels of development, will yield confounded estimates if the deep past has a persistent direct effect on both present-day political and economic outcomes.<sup>1</sup> Similarly, relying upon "short" panels which do not reach far into the past in

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<sup>1</sup>See, De Long and Shleifer (1993), Acemoglu, Johnson and Robinson (2002; 2004), Hibbs and Olsson (2004), Chanda and Putterman (2007), Van Zanden, Buringh and Bosker (2012), Stasavage (2014). For a related critique, see Wang (2017).

order to estimate patterns of political-economic divergence may mask true underlying causes. Take as an example the claim that executive constraints in the fifteenth century (in conjunction with access to the Atlantic Trade) caused divergent patterns of growth in Europe (Acemoglu, Johnson and Robinson 2004). Focusing upon institutions and subsequent growth at this one point in time potentially misses a process of political-economic divergence that, in fact, started at a much earlier point in time.

Our results suggest just that instead of reflecting a true underlying cause of development, parliamentary constraints were themselves outcomes determined by an endogenous process of growth. We flesh this out in two steps. First, we show that the economic take-off and development of parts of Europe should be understood as a process of endogenous growth (within which the development of political and social institutions was embedded). We provide evidence that very early advantages, emerging after 1000 AD, i.e., at the end of the “long period of migration, invasion, and conquest” (Strayer 1973; 16), resulted in some regions of Europe, mostly clustered in the north-south corridor that broadly runs from southern England to northern Italy, in faster population growth, higher population density, and growing urban clusters. The latter then spurred the development of a network of artisan manufactures, which, in turn, fostered, through a process of learning-by-doing, incremental technological innovations. Moreover, because urbanized proto-industrial regions benefited from increasing returns to scale due to sector- and location-specific positive agglomeration externalities (Krugman 1991), the European areas that urbanized earlier in time grew into much larger towns than the regions that were mainly rural in the Middle Ages.<sup>2</sup>

In our second step we show that the processes of urbanization and proto-industrialization generated social actors capable of forcing parliamentary checks (in the form of city councils or territorial assemblies with stronger urban representation) on would-be absolutists. After finding that the existing correlation between levels of development and parliamentary constraints is just a statistical artifact of a historically rooted common cause, we show that correlation to be driven by very early economic advantages, that is, we demonstrate that both paths of urban agglomeration and executive constraints share a common cause: the initial conditions of urban development.

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<sup>2</sup>For a review of the political-economic literature of urban development, see Post (Forthcoming).

To describe the joint evolution of political institutions and economic development in Europe from around 1200 (or the onset of the commercial and technological innovations that transformed that continent) to 1900 (a time at which the industrial revolution had been in place for about a century) we compile a new and wide-ranging dataset. We construct a comprehensive dataset for the European continent that includes geographic and climatic features (1200-1800), urban population data (1200-1800), per capita income data in the second half of the 19th century, location of proto-industrial (textile and metal) centers, political borders, and political institutions. All the data are calculated at  $225 \text{ km} \times 225 \text{ km}$  grid-square units as well as for sovereign and semi-sovereign political units (such as Genoa, Venice, France or Sicily). We then estimate the geographic, economic, and political covariates of urban density (commonly used as a proxy for per capita income) and 19th-century per capita income. Moreover, we assess causal relationships between urban development and our political-economic outcomes of interest using both a sensitivity analysis procedure and an instrumental variables approach that exploits random climatic variation across time and space in the propensity of territory to support urban populations.

The paper is organized as follows. Section 1 weaves the dominant theories of development into a relatively integrated explanation of the sources of Europe's development. Section 2 describes the data employed in the paper. The following four sections examine our main empirical implications by proceeding in a piecemeal fashion. Section 3 characterizes economic growth in Europe as following an endogenous process – with early urban density leading to subsequent urban growth, reinforced by agglomeration effects. Section 4 uncovers the technological dynamics that fed (and were fed by) that process of urban growth: it shows how high urban populations stimulated a process of proto-industrialization (in the textile and metal sectors) and then identifies how the latter in turn acted as a key engine of urban growth. Section 5 shows that, although parliaments multiplied with urban growth, they did not operate as precondition of economic growth: institutions did not trigger the process of economic development but rather were embedded within it. Section 6 reassesses and finds little empirical support for a leading non-institutional explanation of growth: Atlantic trade, alone and in interaction with institutions. Section 7 concludes by summarizing and taking stock of our results.

# 1 Theory

The gradual rise of the European core arguably fits an endogenous (or self-sustained) development process characterized by the following components.<sup>3</sup> First, growth was ultimately a function of the creation and accumulation of knowledge: the latter determined the uses to which capital and labor would be put as well as the efficiency with which those production inputs would be employed. Second, the generation and transmission of knowledge was embodied in a class of innovators and problem-solving producers who, mostly reacting to what they had been “learning on the shopfloor”,<sup>4</sup> developed new ideas, that is, new instructions or recipes on how to reorganize and improve production. Third, the existence of that class of inventors, problem-solvers, and artisans depended on the size and growth rate of population. As population grew, and provided there was some (agricultural) surplus that freed a fraction of the population to set up crafts and shopfloors (where they would engage in the generation of knowledge), there was a positive growth of ideas and some increase in average productivity throughout the economy.<sup>5</sup> Finally, the temporal and spatial variation in initial population growth, which then on average defined each region’s particular growth path, was probably shaped by biogeographical factors, mainly, the quality of soils and their effect on food availability.<sup>6</sup>

In the European context, endogenous economic (and, as we discuss shortly, institutional) change adopted the following structure. With the end of the waves of wars and massive migrations that had started with the penetration of Barbarian populations in the late Roman empire and lasted until the Hungarian invasion and the Viking raids of the 9th and 10th centuries and that had resulted in the collapse of urban life and the absence of any significant interregional trade, the continent stabilized politically and growth resumed (Pirenne 1936, Randsborg 1991). Across Europe, at that point

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<sup>3</sup>For a comprehensive review of the endogenous growth literature, see Jones (2005). See also Arrow (1962), Kremer (1993), Romer (1996), and, more recently, Galor (2005).

<sup>4</sup>The expression comes from de Munck and Soly (2007) and is cited by De la Croix et al. (2016), page 6.

<sup>5</sup>As emphasized by endogenous growth theories, knowledge and ideas are, in contrast to most economic goods, nonrivalrous, making growth a function of the total stock of ideas (and not of the stock of ideas per capita). Hence, as population grows, there should be more innovators and, correlatedly, an expanding stock of ideas and per capita output growth. However, for evidence on long-run technological persistence, mostly unlinked to population channels, see Comin, Easterly and Gong (2010).

<sup>6</sup>For the role of biogeographical factors on population change and economic growth, see Sachs and Warner (1997). For growth models that endogenize population choices, see Galor, Moav and Vollrath (2009). Its variation was also probably shaped by political and military shocks.

completely rural and autarkic, the introduction of new agricultural techniques such as the heavy mould plough and the three-field rotation system boosted yields and population growth (Lynn 1964, Andersen, Jensen, and Skovsgaard 2013). The latter varied, however, with biogeographical conditions. European regions endowed with rich soils and optimal temperatures generated a large crop yield per hectare, which allowed them to support high population densities and the formation of urban agglomerations.

Those urban clusters were, in turn, conducive to the formation of a class of traders, artisans and craftsmen who engaged in a process of learning-by-doing in the shopfloor and in the context of a master-apprentice relationship (in which young workers were taught by older craftsmen). Once exposed to the existing technological and ideational stock, the next generation of artisans arguably picked the best-practice techniques and, stimulated by their professional interaction, developed new ideas to solve the production problems they encountered. Over time, as emphasized in the historical work of Mokyr (2004, 2017), that process of technical learning, sorting and innovation resulted in faster rate of technological change relative to less urbanized populations and territories. The initial advantage of early urbanizers gave them a persistent lead over time. In the presence of increasing returns to scale to knowledge and positive agglomeration externalities, the initial (and probably modest) variation in soil fertility and transportation costs across European regions resulted in much faster growth in the better-endowed territories and in a growing process of economic divergence between the European corridor running from England to Northern Italy and the rest of the continent.

That process of economic development triggered (or at least co-evolved with) key institutional transformations and sustained them. The new economic actors created mechanisms to secure the enforcement of commercial contracts (from guarantorships and bills of exchange to notarial systems of registration and municipal certification offices) and had the capacity to establish institutions to protect property rights and resist abusive taxes from feudal lords and monarchs. As emphasized by a long institutional literature, the development of those pro-growth institutions was ultimately underpinned by a structure of constitutional checks and balances, generally in the form of parliamentary bodies, that constrained the state and curb its incentives to exploit individual agents

(North and Weingast 1989, North 1990, De Long and Shleifer 1993). <sup>7</sup>

Current institutional theories of growth grant institutions a primary causal role in economic development: a stable political order guaranteed by the state jointly with parliamentary institutions constraining the executive resulted in well-defined property rights and low transaction costs, fostering private investment, economic specialization, trade, and innovation (Smith 1937, North 1990, Olson 1993; 2000). Here we do not deny that one or more of these institutions performed the functions attributed by the institutionalist literature. Our claim is, instead, that those political institutions were embedded in a broader process of economic and technological change. <sup>8</sup>

In the case of Europe, once towns had grown in size and wealth, their dwellers had the numbers and money to defeat the heavy cavalry of the old feudal class and to introduce pluralistic institutions in autonomous or semi-autonomous city-states in the 13th and 14th centuries (Tilly 1990, Abramson 2017). The use of gunpowder and the intensification of war competition around 1500 led to the emergence of several large continental monarchies and to a generalized decline of most proto-parliamentary institutions. The latter only remained in place, if at all, in the most commercially dynamic enclaves of northwestern Europe. In other words, the strength of parliamentary institutions reflected the particular economic and social structure of each territory. Economic development happened in heavily urbanized territories, rich in proto-manufacturing clusters.

## 2 Data

We explore the covariates associated with economic growth by employing two types of units as our observations: 225 km-by-225 km grid-scale units or quadrants that have some mass of land; and political units that were either sovereign or semi-sovereign polities. Sovereign units were fully independent territories with their own executive (monarchical or not). Semi-sovereign units were those territories that, although under the control of a different state, retained some measure of

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<sup>7</sup>For a recent comprehensive review of institutions (both those enabling private contracts between ordinary people and those protecting against vertical expropriation) and growth from a historical perspective, see Ogilvie and Carus (2014).

<sup>8</sup>In that sense, we align with recent historical work stressing that many key institutions were present in England in the eleventh to thirteenth centuries (Clark 2008). Likewise, social capital had already emerged in the republican and commercial areas of northern Italy during the same period (Putnam 1993).

political autonomy (defined by the existence of their own governing institutions or special “colonial” institutions such as having a permanent viceroy) generally in the context of composite monarchies. Examples of sovereign units are Portugal before 1580 and after 1640 or Venice until 1798. Examples of semi-sovereign units are Naples (after passing to the Catalan Crown in 1444) or Valencia (member of the Catalan confederation and later of Spain) until 1707. Using semi-sovereign units allows us to employ smaller territories and more fine-grained data. More generally, coding our data at either the quadrant level or according to old borders minimizes a fundamental problem in studies that employ current sovereign countries as their main unit of analysis: the fact that political boundaries are endogenous to territorial economic conditions and factor endowments (Tilly 1990, Abramson 2017).<sup>9</sup>

Our data coverage for political institutions is broader than existing studies. First, we include Scandinavia and most of Eastern Europe. Second, we code our observations going back to 1200 whereas most current studies employ instead historical panels that start at a moment in time when economic divergence had already taken place.

## 2.1 Economic Development

Following the current literature (Acemoglu, Johnson and Robinson 2002, Chanda and Putterman 2007), we rely on urban population data to proxy for economic development. Employing Bairoch, Batou and Pierre (1988), who provide a comprehensive dataset with information on about 2,200 towns that had 5,000 or more inhabitants at some time between 800 and 1800, we construct a measure of urban density equal to the ratio of urban population over geographical size of the unit.<sup>10</sup>

Figure 1 represents the location of all the cities in the Bairoch dataset for 1200, 1500 and 1800. The diameter of each dot is proportional to population size. The maps also include the grid we

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<sup>9</sup>Historical state boundaries are taken from Abramson (2017), which allows the size of units to change over time. Therefore, when measuring urban density we account for both changes in the size of states as well as the addition of urban population via expansion.

<sup>10</sup>This measure proxies the standard urbanization rate (urban population over total population), which cannot be estimated at a subnational level for lack of data on total population. In Appendix A (Tables A10-A12) we replicate our result using data from the Klein Goldewijk et al. (2011) who construct low-level estimates of urban population density (urban population over total population) employing models of climatological and geological constraints to population growth. Our results using this measure are nearly identical to those presented in the main text.

use to define our observations. The three maps capture a continuous process of urban expansion over time. By 1200 an urbanized axis had emerged in the old Lotharingian kingdom, with cities mostly clustered in today's Benelux and in Northern Italy. The map also records the existence of a set of (by that time declining) towns in the southern half of the Iberian Peninsula. Three hundred years later the urban population had grown quite rapidly. According to Bairoch, Batou and Pierre (1988) the number of Europeans living in towns grew from 8.4 million in 1300 to 23 million in 1800. Urban growth did not simply track total population growth. It resulted in a higher proportion of the population living in cities. In Western Europe, the urbanization rate went up from 2.1% in 1000 to 8.1% in 1500 and 21.2% in 1800 (Boix 2015). Urbanization rates also varied across countries – for example, in 1500 they ranged from 29.5% in the Netherlands to 2.2% in Scandinavia.

Besides Bairoch's urban population data, we employ regional per capita income in 1870 and 1900 across Europe. To construct this measure at the regional level, we rely on a growing number of new estimates of GDP per capita done at the subnational level by several economic historians, harmonized across countries using Maddison's per capita income data at the national level as a benchmark.<sup>11</sup>

## 2.2 Urban Development and Proto-Industrialization

Towns may embody a process of economic specialization and technological innovation leading to higher incomes. However, they may just be urban agglomerations where a rent-seeking clique (served by a class of servants) lives out of the surplus it extracts from its particularly productive agricultural hinterland. Aware of this possibility, Weber (1968; 1212 ff.) distinguished between towns featuring a core of craftsmen, tradesmen and financiers and cities built around a royalty, its court and its tax and military bureaucracy. Both cities may be located in rich agricultural lands. But only the former could have fostered the kind of technological innovation that ended up breeding the industrial breakthrough of the 18th and 19th centuries.

To measure the commercial and industrial dimension of cities and to proxy for the learning-by-doing process embodied in the artisanal network, we have collected data on the geographical

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<sup>11</sup>For the sources and procedure employed to build regional per capita incomes, see appendix B.

location of textile and metal production centers before 1500 in Europe. For the textile industry, we plot the location of wool, linen and silk manufacturing centers 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; 93-220).

### 2.3 Political Institutions

We examine the evolution and role of political institutions (acting as a main guarantor of property rights and as the foundation of the rule of law) by looking at the presence of parliamentary institutions (North and Weingast 1989, North 1990). Our index of parliamentary strength, coded at the level of politically sovereign (and semi-sovereign) units, is the fraction of years with parliamentary meetings in each given century. The frequency of parliamentary meetings is an indirect but plausible measure of institutional strength. The history of the conflict between parliamentary forces and absolutist monarchs in modern Europe revolved around the capacity of the latter to first domesticate and then suppress parliaments (Anderson 1979, Williams 1970, Van Zanden et al. 2012). Recent literature on authoritarian regimes shows that the presence of working institutions (such as legislatures) is fundamental to the preservation of power-sharing agreements among governing elites (Gandhi and Przeworski 2007, Svobik 2009, Boix and Svobik 2013).

Parliamentary bodies include traditional territorial assemblies (like the British parliament or the French General Estates) and permanent local councils (like Genoa's Maggiore Consiglio or Florence's executive committee). More precisely, to be defined as having a parliament, the political unit under analysis has to have a non-executive body (i.e. a body that fulfills legislative and sometimes judicial functions as opposed to or in addition to strict executive tasks) formed by a plurality of members. This non-executive body must be chosen through procedures (elections or lottery) not directly controlled by the executive.<sup>12</sup> The coding, done annually, is then converted to century averages that range from 0 (Spain in the second half of the 18th century) to 1 (with a meeting every year, like Venice through 1798).

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<sup>12</sup>A council directly appointed by the executive (generally a monarch, prince or lord) is not counted as a parliament. Directly appointed councils range from early medieval curiae to advisory bodies set in place by absolutist kings. Multimember committees renewed through pure co-optation are not counted as "parliamentary bodies" unless they also control executive powers directly.

The coding partly follows the data bases collected by Van Zanden, Buringh and Bosker (2012) and Stasavage (2011), corrected and complemented using secondary sources and historical collections of parliamentary sessions. However, our data base differs from previous studies in two ways. In the first place, we also code as parliamentary bodies those parliaments that did not include third estate representatives. Requiring urban representatives to code legislative bodies as parliaments conflates a purely institutional effect (i.e. a body capable of constraining the executive) with the presence of a particular social sector that was in fact endogenous to (proto-industrial) growth.<sup>13</sup> In the second place, our data is more exhaustive than the existing data sets: it includes parliaments from territories that were members of political confederations (such as Catalan or Valencian Corts, which were fully autonomous until the early 18th century) and imperial structures (such as the parliament of Sicily, which continued to meet under Catalan, Spanish and Austrian control); and it incorporates data on the governance structures of city-republics (as well as small duchies and principalities) such as Genoa, Lucca, Modena, Verona, etc. As a result, institutions are coded at a much lower level of aggregation than previous studies, which by using contemporary borders throw away key regional variation. The number of political units coded reaches over three hundred about ten times the universe of observations employed in Van Zanden, Buringh and Bosker (2012) and twice as many as in Stasavage (2014).

## 2.4 Controls: Climate, Agricultural Suitability, and Urban Population

As pointed out in Section 1, the growth of cities and proto-industrial centers and the development of quasi-representative political institutions was likely to have been endogenous to a self-sustained process of population growth and technological innovation through learning-by-doing. The literature on premodern city growth (De Vries 1984, Bairoch and Braider 1991) highlights the fact that urban centers required an agricultural surplus to sustain themselves. As Nicholas (1997) points out, “cities could not develop until the rural economy could feed a large number of people who, instead of growing their own food, compensated the farmer by reconsigning his products and later by manufacturing items that the more prosperous peasants desired. The ‘takeoff’ of the European

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<sup>13</sup>Nevertheless, we can restrict our analysis to just those bodies with third-estate representation and obtain nearly identical estimates to those we present in Section 5.

economy in the central Middle Ages is closely linked to changes in the rural economy that created an agricultural surplus that could feed large cities” (p. 104). As such, we take particular care in accounting for the effects of natural biogeography on early population growth.

To disentangle the relationship between economic development, proto-industrialization, and parliamentary constraints we take two approaches. First, because the bio-geographical conditions that promote early urban development may also affect the later economic and political outcomes we are interested in, we control for a large number of possible confounders and, then, using the sensitivity analysis procedure discussed in Oster (2013), we show that our estimates of the impact of early urban development on subsequent patterns of economic growth are robust to substantively large violations of the assumption of exogeneity conditional on observable covariates.<sup>14</sup> Second, we employ an instrumental variables approach where we exploit random climatic shocks to the ability of some areas to grow cereals as a cause of urban growth that arguably had no direct effect on our variable of interest in later periods.

As controls, we include, first, the rain-fed suitability to produce agricultural output. This variable, which measures the capacity for a given piece of territory to produce agricultural output without extensive irrigation, is derived from the FAO’s GAEZ combined land suitability dataset (FAO 2000). Second, we control for how mountainous an area is using the spatial data on terrain ruggedness collected by Shaver, Carter and Shawa (2016). Third, since the ability to trade may have affected both the development of cities and our outcomes of interest, we account for access to trade routes by controlling for river density, distance to coasts, and the total length of coastline. Fourth, we include measures of latitude and longitude for the centroid of each unit. Finally, we add unit fixed effects whenever we have repeated observations over time allowing us to control for qualities specific to each territory and identifying any effects through within-unit variation.

Our results rely upon the standard assumption that, conditional upon observable variables that we control for, our independent variable of interest, urban density, is exogenous. We assess the validity of this assumption with the test developed by Oster (2013). In order to place bounds

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<sup>14</sup>For examples of recent empirical work in economics and political science using this method see Satyanath, Voigtländer and Voth (2013), Alesina, Harnoss and Rapoport (2016), Laitin and Ramachandran (2016), and Cagé and Rueda (2016)

on the bias of a treatment effect estimate caused by the presence of unobservables, i.e., omitted variables, this method uses information from changes in both point estimates and  $R^2$  values derived from comparing the unconditional estimated impact of our main independent variable of interest, early urban density, to this variable's estimated effect after conditioning on all other observable covariates. The procedure allows us to evaluate the degree to which unobservable factors are likely to bias our results. Oster (2013) considers to be robust those results that survive the presence of hypothetical unobservables explaining variation in the outcome of interest equal to 1.3 times the  $R^2$  associated with the regression containing the full set of observed controls.<sup>15</sup> As we detail later, all of our results relating the presence of early urban clusters to proto-industrial skills, future urban density, and future incomes survive at or beyond this level.

Second, recognizing the presence of cities were contingent upon the capacity to feed large populations, we also employ an instrumental variable approach where we use climatic perturbations in the capacity of some places to produce cereals like wheat. We do this for two reasons. First, the European diet of the premodern era was centered around the consumption of complex carbohydrates derived from cereals across all social classes (Lopez 1976, 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 because they are extremely fast growing, high in calories from carbohydrates, and have extremely high yields per hectare (Diamond 1998). Moreover, unlike other crops, cereals can be stored for long periods of time enabling communities to smooth consumption over extended periods.

In order to use agricultural suitability (measured as deviation from optimal temperature) as an instrumental variable for urban population, several assumptions must be met. First, deviations from this temperature must be a strong encouragement of urban growth. Throughout, these shocks prove to satisfy all tests against weak instrumentation. Second, the instrument should meet the requirement of being randomly assigned: we understand it does since, at least until the 19th century, there was no direct human effect on climate. Finally, our instrument must satisfy the exclusion

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<sup>15</sup>Oster (2013) finds that 90% of a random sample of randomized control trials (N=65) published in the *American Economic Review*, *Journal of Political Economy*, *Quarterly Journal of Economics*, *Econometrica* and *American Economic Journal: Applied Economics* would survive this threshold.

restriction: climate shocks to the ability to sustain large populations in period  $t$  should have no effect on political or economic outcomes like the development of proto-industry or parliaments in period  $t + 1$  other than through its effect on urban populations at time. Using the sensitivity analysis proposed by Conley, Hansen and Rossi (2012), we show that it would take a substantively large violation of the exclusion restriction to nullify the causal interpretation of our findings. We report Oster’s sensitivity analysis estimates in the main text and then present results from the instrumental variables strategy in Appendix A.

### 3 Endogenous Growth and the Persistence of Initial Advantages

#### 3.1 Economic Development

Figure 2 plots the bivariate relationship between total urban population in each geographical quadrant in 1200 and 1500 and total urban population at a later time. It also reports bivariate regressions looking at the relationship between urban population in 1200, 1500 and 1800. The units of analysis are 225km-by-225km quadrants. Urban population is defined as population living in cities of 1,000 inhabitants or more. Figure 2 shows that there is a strong, persistent, and statistically significant relationship between early urban densities in 1200 and later urban densities in 1500 and 1800, respectively. For every thousand individuals living on a 225 km  $\times$  225 km grid in 1200, approximately four times this number are expected to be living there six centuries later, implying a century on century effect of approximately 1.26. This effect is smaller in the first half of the series than in the second. Total urban population on a given unit increased 1.7 times between 1200 and 1500 and then approximately 2.3 times in the following three centuries. This differential rate of growth suggests a widening gap between early and laggard urbanizers.

Since we have data covering more than three points in time we can exploit the full series to estimate the dynamic effect of past urban population (both from the immediately preceding century as well as from more distant times). We begin by estimating autoregressive models of the following form:

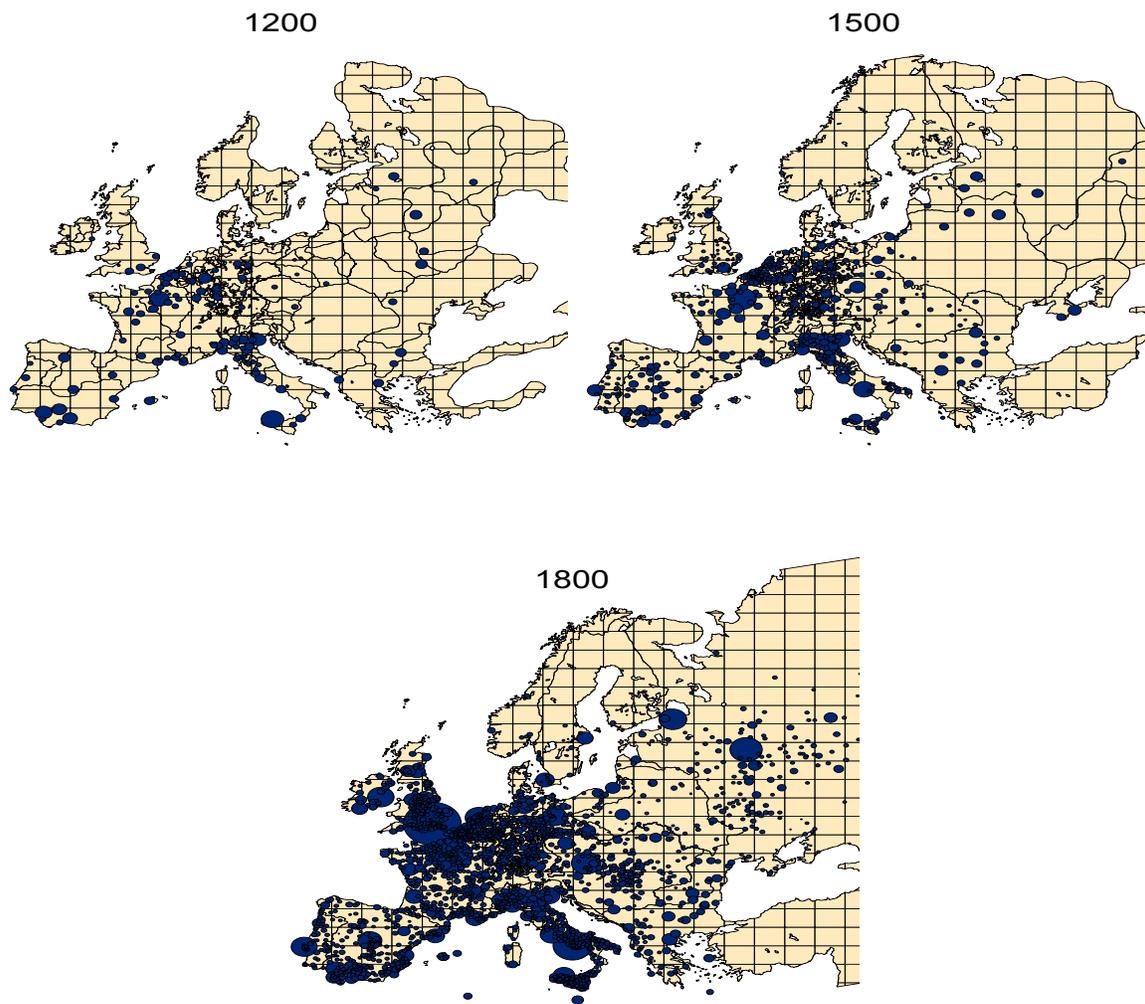


Figure 1: Urban populations in Europe in 1200, 1500 & 1800 (in thousands).

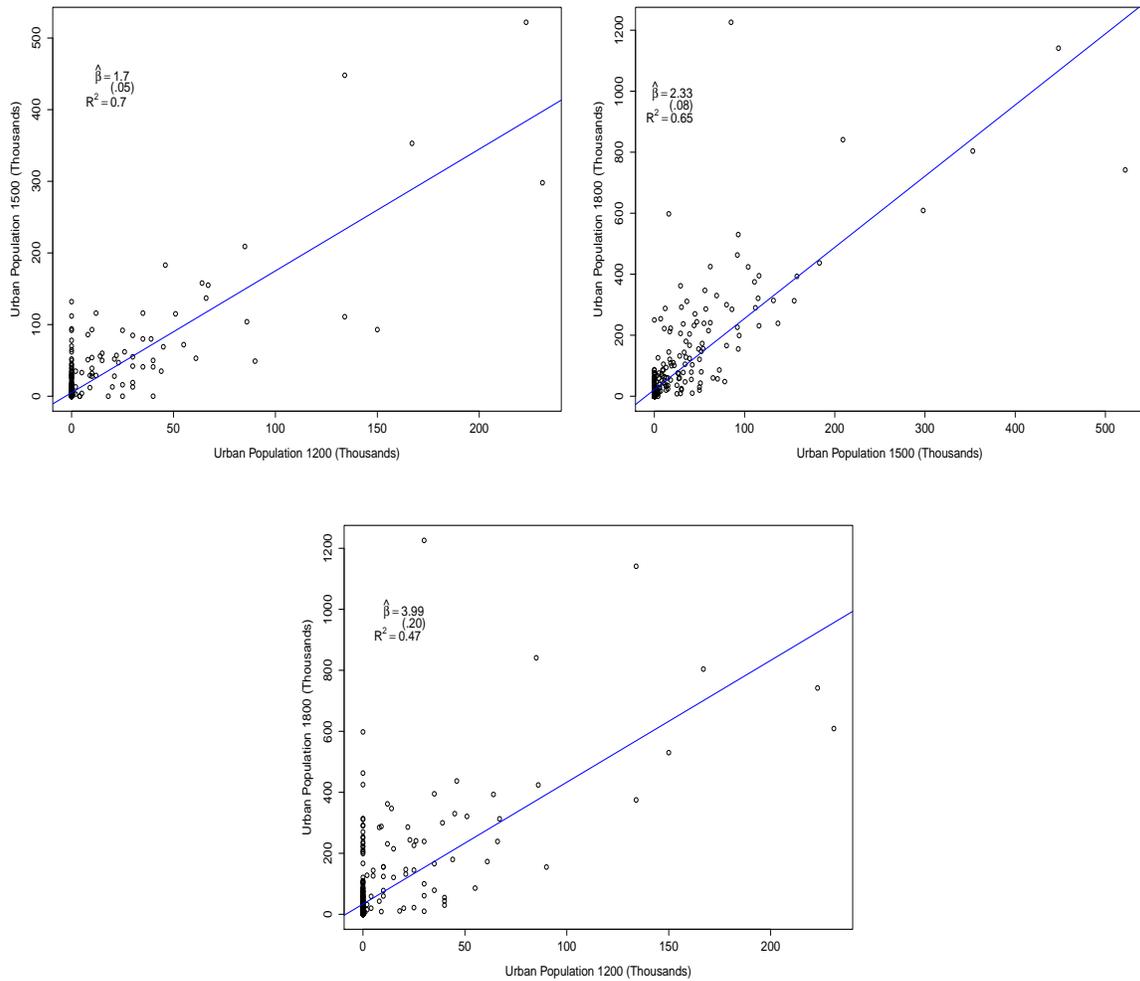


Figure 2: Bivariate relationship between urban population and future urban population across time.

$$\mu_{i,t} = \alpha + \phi_{t-1}\mu_{i,t-1} + \phi_{t-2}\mu_{i,t-2} + \dots + \phi_{t-k}\mu_{i,t-k} + \delta_t + \eta_i + \epsilon_{it} \quad (1)$$

Where  $\mu_{it}$  is total urban population (or its logged value) on a given geographical unit  $i$  in period  $t$ ,  $\eta_i$  is a country-specific effect,  $\delta_t$  is a period-specific constant, and  $\epsilon_{it}$  is an error term. The unit-specific effect  $\eta_i$  captures the existence of other determinants of a geographical unit's steady state. The period-specific effects,  $\delta_t$ , capture common shocks affecting urban populations across the continent such as the plague of the 14th century.

Table 1 reports estimates of  $\phi$ .<sup>16</sup> We present models that include one, two and three lags sequentially. Columns 1-3 present pooled OLS estimates not accounting for unit specific heterogeneity. Since, as shown by Nickell (1981), estimating equation 1 in a standard fixed effects framework will yield biased parameter estimates, we follow a now conventional approach and report in Columns 4 to 6 a system GMM estimator to consistently and efficiently identify equation 1 (Arellano and Bond 1991, Arellano and Bover 1995, Blundell and Bond 1998).<sup>17</sup> The estimates of  $\phi_{t-1}$  in the first six columns of of Table 1 are close to one, indicating that the panel has a unit-root and that the data generating process contains an exploding trend across time. Recognizing this, in Columns 7-12 we conduct the same exercise, estimating the same set of models but with the data log-transformed. Once this transformation is taken into account, all estimates of  $\phi_{t-1}$  fall between -1 and 1. However, when second order lags are included, the sum of their coefficients,  $\phi_{t-1} + \phi_{t-2}$ , either exceed the bounds of stationarity or come very close to doing so.<sup>18</sup>

In order to further evaluate if the time-series component of urban population, either in logs or levels, is non-stationary, we conduct two unit-root tests, the results of which are presented in the lower panel of Table 1. The first, proposed by Breitung (2000), takes as the null hypothesis that all panels contain unit-roots: using it, we are unable to reject the null that geographical units in all panels have a unit root. The second test, developed by Hadri (2000), takes as the null hypothesis that all panels are stationary. In this case we can reject the null hypothesis that all panels are

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<sup>16</sup>Note that our estimating equation is equivalent to the following model of growth  $\Delta\mu_{it} = \alpha + \lambda\mu_{i,t-1} + \delta_t + \eta_i + \epsilon_{it}$ , where  $1 + \lambda = \phi_{t-1}$ .

<sup>17</sup>For an example of this approach applied to growth outcomes see Caselli, Esquivel and Lefort (1996).

<sup>18</sup>Table A10 in Appendix A shows these results to the use of urban population density derived from the HYDE project.

stationary with a high degree of confidence. In short, both tests suggest that the development of urban population was a non-stationary process.

From a substantive point of view, those results indicate that very early differences in urban population had a persistent effect on present outcomes greater than those in later periods. In other words, the “great divergence“ between the European core and its peripheries cannot be pinned down to a structural break (at a given point in time) but was rather the result of a slow and continuous effect of early advantages: those places that urbanized early in time continued to be so, growing faster than places that were not urbanized early on due, again, to the persistent and cumulative effects of past advantages.<sup>19</sup>

To give a sense of the magnitude of that divergence, Figure 3 plots the estimated difference in logged urban population between three areas from 1200 until 1800 that had an initial urban population of 1,000, 12,000 and 24,000 respectively. The 23,000 difference between the two extreme values represents approximately one standard deviation for the year 1200.<sup>20</sup> Figure 3 makes apparent that an initial advantage has a cumulative effect over time. Six hundred years later the estimated difference is predicted to become about 470,000.<sup>21</sup>

### 3.2 From Urbanization to Per Capita Income

Because urbanization is only a proxy for development we proceed now to regress per capita income in 1870 and 1900, that is, at height of the industrial revolution, on urban density in 1800 (i.e., right before the process of takeoff occurred). The unit of analysis is the current NUTS-2 region (as defined by the European Union). The data covers eleven countries of western and central Europe.<sup>22</sup>

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<sup>19</sup>To see this, take as an example a non-stationary AR(1) process where  $\mu_{it} = \phi\mu_{it-1} + \epsilon_{it}$ . Iteratively substituting in for the lagged value yields

$$\mu_{it} = \epsilon_{it} + \phi\epsilon_{it-1} + \phi^2\epsilon_{it-2} + \dots + \phi^k\epsilon_{it-k}\dots \quad (2)$$

Since the series is non-stationary,  $\phi > 1$ , it implies that temporally distant shocks have a *greater* effect on the present than those which are closer in time. In simple terms, the effect of the past is not only persistent but compounding.

<sup>20</sup>This figure is derived from the dynamic system GMM estimates of Model 1 (reported in Table 1), employing the coefficient on the lagged value to obtain an estimate for each period and then taking the difference of these estimates. Because the first and second lags are needed to simulate this model, we add the mean increase between 1200 and 1300 of seven thousand to each of these values. For the subsequent five periods we simulate the predicted urban populations using the estimates from this model.

<sup>21</sup>This divergence also fits with recent evidence documenting a process of divergence in living standards between northwest Europe and eastern and southern Europe since the Middle Ages (Allen 2001).

<sup>22</sup>The United Kingdom, France, Germany, Spain, Austria, Italy, Sweden, the Netherlands, Denmark, Switzerland, and Belgium.

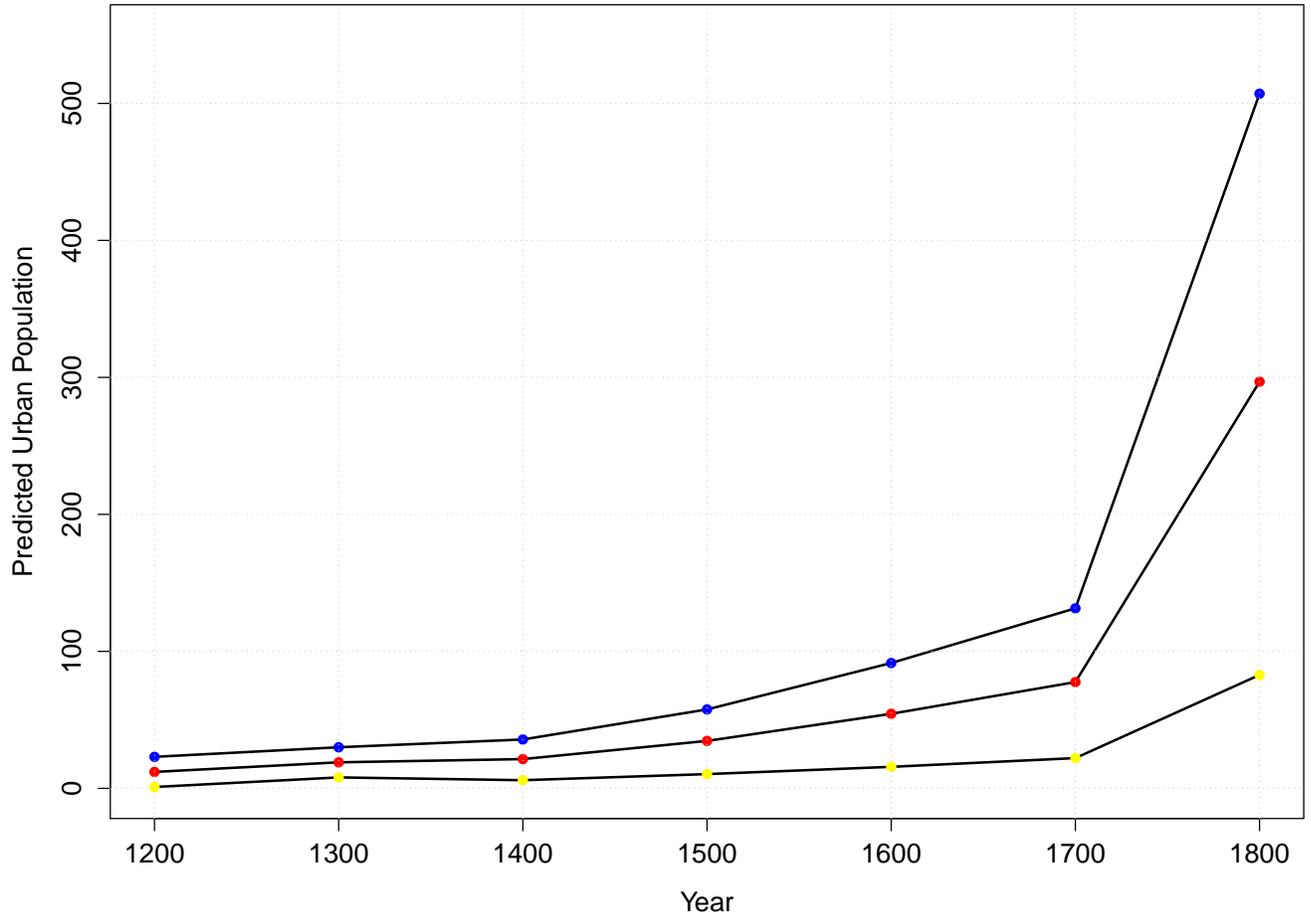


Figure 3: Estimates of the difference in urban population across time derived from the dynamic system GMM estimates of Model 1 with two lags. The predicted values are constructed using starting urban populations for two units of 1,000, 12,000 and 24,000 in the year 1200, approximately a one half, and one standard deviation difference for this period. The first lag is then constructed by increasing each unit by seven thousand, the mean increase across all units between 1200 and 1300. All successive estimates are derived from the estimates of the dynamic model

The Pre-Industrial Structure of Urban Growth (Autoregressive Models)

	Outcome: Urban Pop <sub><i>t</i></sub>			Outcome: log(Urban Pop) <sub><i>t</i></sub>		
	OLS		GMM	OLS		GMM
Urban Density <sub><i>t-1</i></sub>	1.29*** (0.05)	1.12*** (0.18)	1.26*** (0.22)	1.27*** (0.09)	0.94*** (0.08)	0.94*** (0.22)
Urban Density <sub><i>t-2</i></sub>		0.23 (0.20)	0.17 (0.16)		0.58*** (0.09)	0.42*** (0.11)
Urban Density <sub><i>t-3</i></sub>			-0.10 (0.17)		0.32* (0.14)	0.32* (0.14)
R <sup>2</sup>	0.85	0.86	0.87		0.70	0.77
<i>m</i> <sub>2</sub>				0.94	0.70	0.08
N	2664	2664	2220	2220	1776	1776

	Breitung Test (H <sub>0</sub> : All Panels Contain Unit Roots)		Hadri LM Test (H <sub>0</sub> : All Panels Are Stationary)	
	Y	N	Y	N
Unit Effects	8.51 (0.99)	24.33 (0.99)	28.85 (0.99)	22.00*** (0.00)
Time Trend	Y	Y	Y	Y

	Breitung Test (H <sub>0</sub> : All Panels Contain Unit Roots)		Hadri LM Test (H <sub>0</sub> : All Panels Are Stationary)	
	Y	N	Y	N
Unit Effects	8.51 (0.99)	24.33 (0.99)	28.85 (0.99)	22.00*** (0.00)
Time Trend	Y	Y	Y	Y

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

Table 1: This table presents the estimates of the autoregressive relationship between past and present urban development. The unit of observation is the 225 km x 225 km grid-square. The top panel measures total urban population and the lower takes the logarithm of this number. Heteroskedasticity robust standard errors clustered by unit in parentheses. *p*-value for the Arellano-Bond test of second order serial correlation in the errors denoted as *m*<sub>2</sub>. Table A3 in the appendix reproduces these results for units approximately one half the size.

Results are reported in the upper panel of Table 2.

The relationship is both statistically significant and strong from a substantive point of view. Taking the model from the first column of Table 2 and manipulating urban density across its interquartile range, we get predicted incomes of \$1,714 and \$2,213 in 1870 – extremely close to the true interquartile values in 1870 of \$1,312 and \$2,429. These results are robust to the log-transformation of income, the inclusion of country fixed effects, and the addition of geographic controls. Moreover, a sensitivity analysis (following the procedure proposed by Oster (2013)) indicates that these results are robust to the presence of unobservable factors.

The relationship between urban density in 1800 and income per capita persisted into the 20th century. Per capita income for all NUTS-2 regions in 2008 has a positive and statistically significant relationship with urban density in 1800 (lower panel of Table 2). The size of the point estimate is substantial - a one hundred percent change in urban density in 1800 is predicted to yield between a \$2583 and \$3060 increase in per capita income in 2008. To make the results directly comparable to the analysis for the 19th century, columns 7-12 in the lower panel exclude regions not employed in the upper panel. The results remain qualitatively unchanged. When we conduct Oster (2013)'s sensitivity analysis, the relationship between urban density in 1800 and incomes in the 19th century and early 20th centuries is robust to the presence of unobservables.

To sum up our results so far, very early random shocks to levels of early urban development explain later differences in urban density across Europe. Moreover, the growth of cities before the industrialization revolution was a non-stationary process where very early differences across location compounded upon each other, leading to the wide divergence in urban density observed in 1800. Finally, those differences in urban density just prior to the industrial revolution were correlated with both late 19th- and early 20th-century incomes.

## **4 The Backbone of Endogenous Growth: The Emergence of a Proto-Industrial Core**

To examine the claim that economic growth was ultimately a function of technological innovation, embodied in a class or sector of society, namely artisans and craftsmen, we turn to our data on

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	<b>GDP per capita 1870</b>						<b>GDP per capita 1900</b>					
	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>
log(Urban Density <sub>1800</sub> )	400.11* (129.27)	329.61*** (71.24)	370.20*** (50.78)	0.19** (0.06)	0.15** (0.04)	0.16** (0.04)	556.82** (155.45)	509.65*** (75.47)	581.52*** (55.21)	0.18** (0.06)	0.16*** (0.03)	0.18*** (0.03)
Constant	3969.30*** (804.35)	3365.79*** (420.85)	37.64 (429.47)	8.44*** (0.35)	8.04*** (0.24)	5.85*** (0.34)	5424.13*** (979.86)	4828.27*** (445.83)	70.33 (759.07)	8.72*** (0.33)	8.37*** (0.18)	6.25*** (0.23)
Controls	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Country Fixed Effects	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
N	104	104	104	104	104	104	106	106	106	106	106	106
R <sup>2</sup>	0.28	0.80	0.85	0.23	0.75	0.82	0.34	0.79	0.85	0.25	0.75	0.83
Effect at 1.3 × R <sup>2</sup> of Controlled Regression		362.16				0.16			588.74			0.18
	<b>All Europe</b>						<b>Western Europe</b>					
	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>GDP per capita</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>	<i>log(GDP per capita)</i>
log(Urban Density <sub>1800</sub> )	2583.81* (978.03)	3060.22*** (478.38)	3379.21*** (349.97)	0.12* (0.05)	0.10*** (0.02)	0.11*** (0.02)	1832.12* (867.93)	3029.52** (614.13)	3543.93*** (419.44)	0.04 (0.02)	0.07** (0.02)	0.09*** (0.02)
Constant	15411.75** (4609.22)	6794.65*** (516.70)	-2369.08 (26129.59)	9.52*** (0.25)	9.12*** (0.02)	9.26*** (1.05)	21045.11*** (3990.74)	32242.94*** (1414.37)	-13408.05 (18083.10)	10.07*** (0.11)	10.40*** (0.04)	8.74*** (0.67)
Controls	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Country Fixed Effects	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
N	254	254	254	254	254	254	163	163	163	163	163	163
R <sup>2</sup>	0.12	0.76	0.79	0.11	0.88	0.90	0.10	0.36	0.45	0.05	0.34	0.48
Effect at 1.3 × R <sup>2</sup> of Controlled Regression		3632.46				0.10			6162.70			0.15

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

Table 2: The top panel of this table describes the relationship between urban density in 1800 and per capita income in 1870 and 1900, respectively. The lower panel of this table describes the relationship between urban density in 1800 and per capita income in 2008. All observations are at the NUTS-2 level. In the lower panel the first six columns use all NUTS-2 regions for which there is income data. The last six columns use only those in Western Europe. Heteroskedasticity robust standard errors clustered by country are in parentheses. Controls are: terrain ruggedness, agricultural suitability, distance to coast, coast length, latitude, and longitude. Following Oster (2013) we provide sensitivity estimates of the effects under the hypothetical condition when unobservables account for 1.3 × the R<sup>2</sup> from the controlled regressions.

the existence of protoindustrial centers, which, as Figures 4 and 5 make apparent, matched the distribution of European urban population.

We model that process in two steps. In the first place, Table 3 regresses the number of textile or metallurgic centers in each geographical quadrant between 1200 and 1500 on level of urban population on the same unit in the year 1200. Columns 1-4 treat the number of textile centers separately. Columns 5-8 do so for iron centers. Columns 9-12 examine the sum of both types of protoindustry as the outcome. The unit of observation is the geographical quadrant. Employing OLS (the first two columns for each dependent variable) and negative binomial estimates (the last two columns), early urban density is positively associated with the presence of proto-industry. Moreover, the magnitude of this relationship is substantively large: the OLS estimates indicate that a one-hundred percent change in urban population in the year 1200 would result in between .28 and .45 of a new industrial center. Our findings survive the inclusion of the full set of controls and are robust well beyond rule-of-thumb levels of significance proposed in Oster (2013)'s method for detecting bias based on the presence of confounding unobservables.<sup>23</sup>

In Appendix A we provide further evidence that the relationship between early urban density and the development of proto-industrial skills is causal (Table A2). There, we exploit climatic shocks in the ability to feed large populations in order to identify this effect in an instrumental variables framework. The 2SLS estimates are larger, indicating a .85 predicted increase (in total proto-industry centers) following a 100% change in initial urban population. Assessing the robustness of these instrumental variables estimates through the more conservative union-of-confidence-intervals sensitivity analysis, we find that there would need to be a substantively large direct effect of our instrument (between 76% and 81% the magnitude of each of our estimated effects) to violate the exclusion restriction and make our results statistically insignificant.

In the second place, Table 4 turns to assess the impact of proto-industrial centers (in place before 1500) on urban density in 1500 controlling for the effect of urban density in 1200. The

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<sup>23</sup>In Table A9 in Appendix A we also show that these results are robust to successive changes in the specification of the independent variable, dichotomizing urban population to be above towns larger than 5,000, 10,000 and 20,000 inhabitants as well as to the dichotomization of the independent variable into similarly categorized binary treatments. Furthermore, in Table A13 we present results including a set of dummies for the ethnolinguistic characteristics of groups present on each grid-square.

# Metallurgic Centers

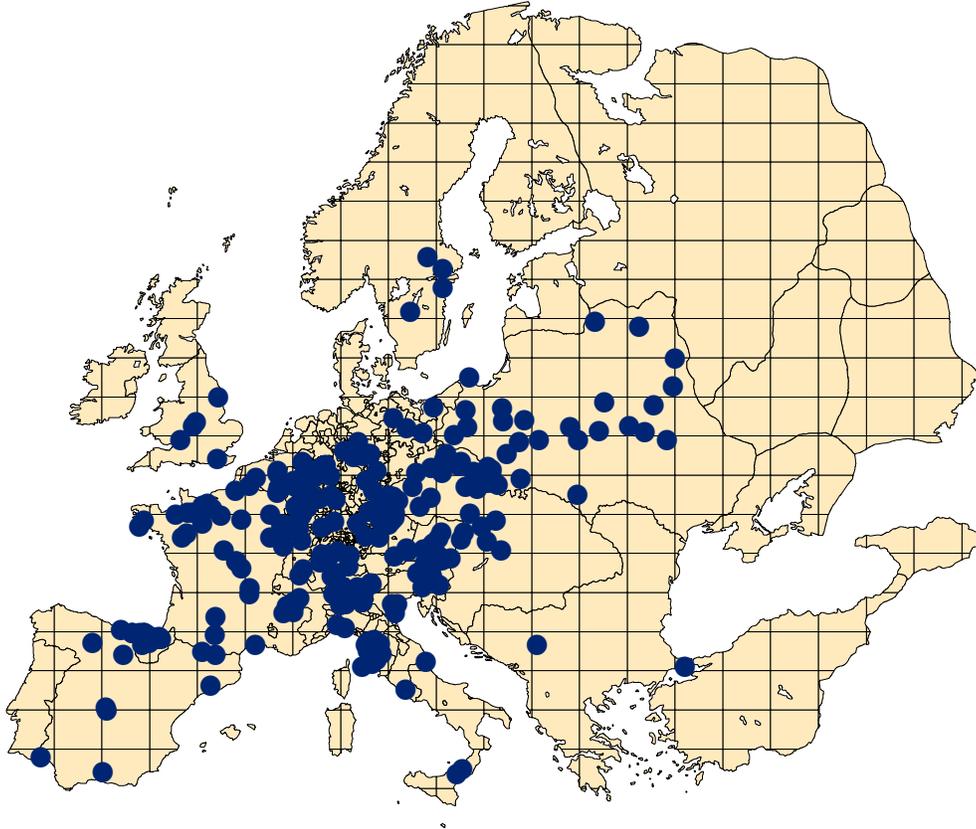


Figure 4: Iron Production Centers before 1500.

## Centers of Textile Production

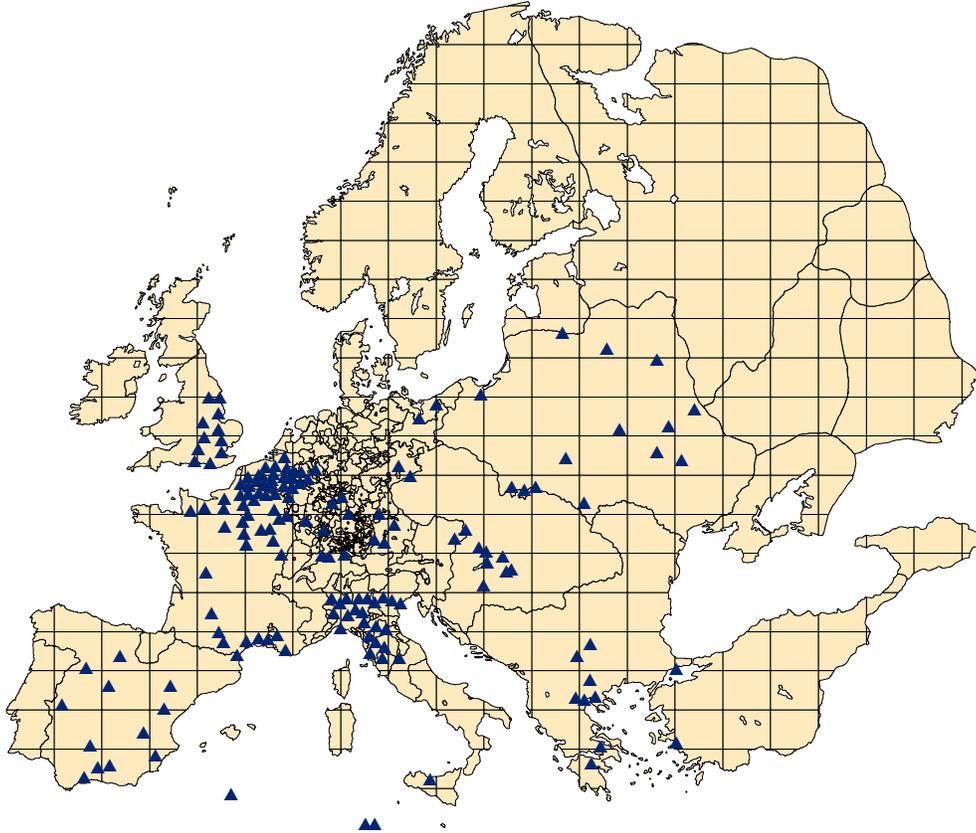


Figure 5: Textile Centers before 1500.

*The Effect of Early Urban Density on the Development of Protoindustry by 1500*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	Textile Production				Iron Production				Total Protoindustry			
Urban Density <sub>1200</sub>	0.03*** (0.01)	0.02*** (0.01)	0.05*** (0.01)	0.01*** (0.00)	0.03** (0.01)	0.02 <sup>†</sup> (0.01)	0.04*** (0.01)	0.01 (0.01)	0.06*** (0.02)	0.04** (0.02)	0.05*** (0.01)	0.01* (0.01)
R <sup>2</sup>	0.28	0.39	3.50	0.71	0.11	0.35	15.41	2.89	0.23	0.47	8.33	1.43
$\theta$												
Effect at $1.3 \times R^2$ of Controlled Regression		0.02				0.01				0.03		
<hr/>												
log(Urban Density <sub>1200</sub> )	0.19*** (0.04)	0.14*** (0.03)	0.30*** (0.03)	0.15*** (0.02)	0.26*** (0.05)	0.13* (0.06)	0.22*** (0.03)	0.11** (0.04)	0.45*** (0.08)	0.28*** (0.08)	0.24*** (0.03)	0.11*** (0.03)
R <sup>2</sup>	0.25	0.33	1.39	0.52	0.15	0.35	13.41	2.75	0.25	0.44	6.87	1.34
$\theta$												
Effect at $1.3 \times R^2$ of Controlled Regression		0.07				0.07				0.16		
<hr/>												
Model:	OLS	OLS	NegBin	NegBin	OLS	OLS	NegBin	NegBin	OLS	OLS	NegBin	NegBin
Controls	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
N	444	444	444	444	444	444	444	444	444	444	444	444

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ , <sup>†</sup> $p < 0.10$

Table 3: This table presents estimates of the effect of early urban development (in the year 1200) on the number of proto-industrial centers in existence on a given  $225 \text{ km} \times 225 \text{ km}$  unit. Heteroscedasticity robust standard errors in parentheses. Controls are: terrain ruggedness, agricultural suitability, distance to coast, river length, coast length, latitude, and longitude. Following Oster (2013) we provide sensitivity estimates of the effects under the hypothetical condition when unobservables account for  $1.3 \times$  the  $R^2$  from the controlled regressions. Table A5 in the appendix reproduces these results for units approximately one half the size.

*The Effect of Proto-industry on Urban Development in 1500*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	<i>UrbanDensity<sub>1500</sub></i>						<i>log(UrbanDensity<sub>1500</sub>)</i>					
Textiles	8.25*** (2.21)	5.85** (2.18)					0.45* (0.19)	-0.00 (0.12)				
Iron Production			2.53* (1.02)	0.75 (1.11)					0.48*** (0.07)	0.22** (0.07)		
Total Proto-Industry					3.04*** (0.85)	1.74† (0.97)					0.39*** (0.07)	0.14* (0.06)
<i>UrbanDensity<sub>1200</sub></i>	1.45*** (0.21)	1.40*** (0.21)	1.61*** (0.24)	1.53*** (0.24)	1.50*** (0.23)	1.47*** (0.23)						
<i>log(UrbanDensity<sub>1200</sub>)</i>							0.74*** (0.06)	0.48*** (0.06)	0.70*** (0.05)	0.45*** (0.05)	0.65*** (0.05)	0.44*** (0.06)
R <sup>2</sup>	0.75	0.77	0.72	0.75	0.74	0.76	0.40	0.59	0.44	0.60	0.44	0.59
N	444	444	444	444	444	444	444	444	444	444	444	444
Controls	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y

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

Table 4: This table presents results giving the relationship between the existence of proto-industrial centers on future urban development in the years 1500 after conditioning on earlier levels of urban development (in the year 1200). Units are 225 km × 225 km grid-squares. Heteroscedasticity robust standard errors in parentheses. Controls are: terrain ruggedness, agricultural suitability, distance to coast, coast length, latitude, and longitude.

relationship between proto-industrial activity (measured through number of proto-industrial centers in a particular unit before 1500) and urban density in 1500 is positive and statistically significant. The introduction of a full set of geographical controls (in the odd columns) does not substantively alter the relationship between the presence of these skills and density in 1500 even though it reduces the magnitude of the independent effect of proto-industry in some cases. Measuring the outcome in logs, the addition of a single center of proto-industrial activity is estimated to be between over one quarter and about one half of the magnitude associated with past urban development. For example, depending on the set of controls included, the addition of a single industrial center before 1500 is estimated to yield between a 14% and 39% increase in urban density in 1500. In comparison, the effect of a one-hundred percent change in urban population in 1200 is predicted to yield between a 44% and 65% change over the same period (Columns 11 and 12).

We interpret these results as corroborating endogenous growth theories (Romer 1990) as well as geographic concentration models that emphasize increasing return-to-scale and positive externalities derived from the agglomeration of individuals, (Krugman 1991). Urban or economic clusters fostered an endogenous process of economic specialization and technological innovation embodied in a network of proto-industrial centers (with a specialized artisanal class). Moreover, those regions that, having an initial advantage in their biogeographical endowments, urbanized and specialized in some proto-manufacturing sectors, experienced ever-faster growth rates than the rest.

## 5 Urban Development and Political Institutions

Were parliaments, i.e. institutions imposing checks and balances on rulers, related to development? And if so, in what ways? Did they lead to the development of commercial groups and cause economic growth or did they just reflect the economic needs of and distribution of power across social groups - typically urban, commercial, elites versus landed interests? We answer this question in three steps.

First, we estimate the impact of urban growth on parliamentary life, exploiting century on century within-unit changes in urban population to assess how changes in urban density were related with the frequency of parliamentary meetings (Table 5, Columns 1-4). Column 1 reports pooled

OLS estimates, regressing our index of parliamentary institutions (the fraction of years with parliamentary meetings in a given century) on the logged value of urban density (total urban population divided by square kilometers of a given political unit) measured at the beginning of the century. Throughout this section the units of analysis are sovereign and semi-sovereign territories. In Column 2 we introduce region and year fixed effects and the result remains substantively unchanged.<sup>24</sup> These models, where we are making comparisons across the entire pooled sample, demonstrate a statistically significant and positive relationship. However, when we successively introduce political unit (“country”) fixed effects (e.g., fixed effects for each sovereign or semi-sovereign state) and year fixed effects in Columns 3 and 4, the relationship between urban growth and the frequency of future parliamentary meetings disappears.

Second, we evaluate institutionalist theories of growth by regressing urban density on the frequency of parliamentary meetings (conditional on lagged urban density) for all states between 1200 and 1800 (Table 5, Columns 5 to 10).<sup>25</sup> Columns 5 to 7 report pooled OLS estimates. Column 5 reports the unconditional relationship between urban density and past parliamentary life, showing a positive and statistically effect of the latter on urban development. This effect remains nearly identical after including region and year effects (Column 6). However, once we control for past levels of urban density (Column 7), the magnitude of the estimate falls by over two-thirds. After including political unit fixed effects (Column 8), i.e. after identifying the relationship between city growth and parliamentary institutions from within political unit changes, the relationship becomes negative and statistically significant. Finally, the effect becomes null with time fixed effects (Column 9) and this null result persists after controlling for past value of urban density as well as unit and time effects (Column 10). In short, parliamentary constraints had a negative or null effect on urban growth.

Finally, Table 6 digs deeper into the causes of the robust cross-sectional relationship but null within-unit relationship obtained in Table 5, showing that initial economic conditions (urban density in 1200) were a consistently strong predictor of parliamentary meeting frequency (in each century)

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<sup>24</sup>We define the following regions: The British Islands, Galliae (contemporary France and historical Burgundy), The Holy Roman Empire, Eastern Europe, Scandinavia, Iberia, and Italy.

<sup>25</sup>In Appendix A we replicate all of our results treating the log of the parliamentary meeting index as the outcome (Table A6) and as the independent variable (Table A7). Our results remain substantively unchanged.

*The Coevolution of Urban Density and Parliamentary Constraints*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Outcome: Frequency of Parliaments <sub>t,t+1</sub>				Outcome: log(Urban Density <sub>t,t+1</sub> )					
log(Urban Density <sub>t</sub> )	0.099*** (0.01)	0.103*** (0.01)	0.003 (0.01)	0.001 (0.01)			0.717*** (0.049)			.300*** (0.148)
Frequency of Parliaments					1.033*** (0.167)	1.079*** (0.164)	.386*** (0.085)	-0.242** (0.119)	-0.135 (0.107)	-0.031 (0.157)
Region Effects	N	Y	N	N	N	Y	Y	N	N	N
Year Effects	N	Y	N	Y	N	Y	Y	N	N	Y
Country Effects	N	N	Y	Y	N	N	N	Y	Y	Y
System GMM	N	N	N	N	N	N	N	N	N	Y
R <sup>2</sup>	0.094	0.109	0.000	0.042	0.093	0.175	0.583	0.093	0.141	
N × T	1790	1790	1790	1790	1793	1793	1793	1793	1793	1793
N = 309, T=6										
m2										0.04

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1

Table 5: The first four columns of this table presents the estimated effect of urban density in period  $t$  on the frequency with which parliaments met in periods  $t$  to  $t+1$ . Columns 5-10 presents results of the relationship between the frequency of past parliamentary meetings and urban density in the subsequent century. Heteroscedasticity robust standard errors clustered by semi-sovereign unit in parentheses.

even after controlling for overall changes in urban population across each period. We control for those changes in two ways: Columns 1-5 only include the change over the entire interval between the initial period and the period of observation; Columns 6-9 control for urban density change in all previous centuries. Urban growth does not enter significantly into the regressions in columns 1-5 except for urban density change during the fourteenth century. When we include all the lagged values of urban density change, urban growth has a cyclical relationship with parliamentary growth: higher urban growth is associated with more parliamentary meetings in the five-, three-, and one-century differences and with stronger parliaments in four- and two-century differences.

In short, when we consider the findings of Tables 5 and 6 together, it becomes clear that initial conditions shaped the distribution of parliamentary institutions in the medium run. That result parallels the results obtained in Table 1, according to which the initial patterns of urban development in 1200 determined the subsequent path of urban growth across Europe until 1800 (and beyond). It also explains the null estimated impact of within unit changes in urban density on parliamentary frequency in Table 5. In other words, the rise and persistence of institutions was embedded within the general process of endogenous growth that started around the 12th and 13th centuries.

## 6 Trade

Easy access to transportation means, such as the sea, has been associated with the rise of trade, the expansion of urban life, and growth (Bairoch 1988, Tracy 1990, Jones 1991, Braudel 1995). Within this general interpretation of the effects of geography on the economy, several authors link the rise of incomes in the European northwest to the rise of the Atlantic trade (and the closing of Mediterranean routes after the fall of Constantinople) (Davis 1973, Acemoglu, Johnson and Robinson (2004)).

To examine the effect of having access to both the Atlantic and the Mediterranean, we estimate the following model:

*Initial Urban Conditions and Parliamentary Life Across Time*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	1700-1800	1600-1700	1500-1600	1400-1500	1300-1400	1700-1800	1600-1700	1500-1600	1400-1500
$\log(UrbanDensity)_{1200}$	0.127*** (0.024)	0.129*** (0.020)	0.129*** (0.019)	0.137*** (0.019)	0.160*** (0.020)	0.155*** (0.031)	0.163*** (0.021)	0.165*** (0.019)	0.178*** (0.022)
$\Delta_5 \log(UrbanDensity)$	-0.004 (0.002)					0.112*** (0.020)			
$\Delta_4 \log(UrbanDensity)$		0.002 (0.004)				-0.543*** (0.096)	-0.123*** (0.020)		
$\Delta_3 \log(UrbanDensity)$			0.003 (0.009)			0.974*** (0.191)	0.496*** (0.073)	0.115*** (0.020)	
$\Delta_2 \log(UrbanDensity)$				-0.024 (0.016)		-0.769*** (0.194)	-0.689*** (0.112)	-0.339*** (0.057)	-0.119*** (0.021)
$\Delta_1 \log(UrbanDensity)$					0.090*** (0.017)	0.183 (0.094)	0.352*** (0.076)	0.271*** (0.054)	0.219*** (0.036)
Intercept	1.158*** (0.193)	1.231*** (0.203)	1.104*** (0.156)	1.136*** (0.203)	1.169*** (0.147)	1.344*** (0.231)	1.434*** (0.209)	1.337*** (0.153)	1.406*** (0.212)
Region Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	288	287	286	289	290	288	287	286	289
R <sup>2</sup>	0.096	0.101	0.100	0.090	0.135	0.183	0.200	0.183	0.171

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

**Table 6:** This table provides estimates of the relationship between initial urban density and parliamentary meeting frequency. Each column regresses the fraction of years in a given century on the logged value of urban density in the year 1200. We account for the overall change between any set of periods, such that  $\delta_t$  represents the change in urban density over  $t$  centuries. Heteroskedasticity robust standard errors in parentheses.

$$\mu_{it} = \alpha + \sum_t^T \beta_t(\delta_t \times \text{Atlantic}_i) + \sum_t^T \gamma_t(\delta_t \times \text{Mediterranean}_i) + \eta_i + \delta_t + \epsilon_{it} \quad (3)$$

where  $\mu_{it}$  is total urban population living on grid square  $i$  in period  $t$ ,  $\eta_i$  is an individual fixed effect,  $\delta_t$  is a set of time effects, and  $\epsilon_{it}$  an error term. The parameters  $\beta_t$  and  $\gamma_t$  capture the time varying effect of access to the Atlantic and Mediterranean seas respectively, in interaction with the set of time dummies,  $\delta_t$ .

We operationalize access to the sea in two ways: as a dummy for whether or not a given grid-square contains Atlantic coast (where Atlantic coast is defined following Acemoglu et al. (2004)) or the Mediterranean coast; and employing distance in kilometers from the geometrical center of the quadrant to the coast. To compare the change in urban growth associated with Mediterranean versus Atlantic coasts, we test the restriction that Atlantic-exposed units grew at the same rate as those on the Mediterranean for each period ( $\beta_t - \gamma_t = 0$ ). Results are presented in the top panel of Table 7. While access to both the Atlantic and Mediterranean were associated with increases in urban population, we cannot reject the null that the access to the Mediterranean gave the same advantage as access to the Atlantic for any period.

The bottom panel of Table 7 examines the impact of having access to the Atlantic conditioned by level of urban density. The estimation includes a lagged dependent variable and allows the effect of the Atlantic to vary by period. In the specification that employs a dichotomous measure of access, the relationship is negative for 1300 and statistically insignificant for the years 1400 to 1700. It only becomes positive and statistically significant for 1800. When we use distance to the Atlantic as our measure of access, territories closer to the Atlantic were, on average, less developed than those far away.

Moving beyond a standard story stressing the unconditional effect of trade access on growth, Acemoglu et al. (2004) claim that the rise of Western Europe after 1500 can be traced back to the combination of constraining political institutions, e.g. parliaments, and access to the Atlantic trade. We revisit their analysis here using our political unit time-varying measures of parliamentary constraints - instead of their time-invariant measure (for the year 1415) coded at a much higher level of spatial aggregation.

To begin, we follow Acemoglu et al. (2004) in estimating the following baseline model:

$$\begin{aligned} \mu_{it} = & \alpha_i + \sum_{t \geq 1500}^T \beta_{1t} \times \delta_t \times \text{Atlantic}_i + \beta_{2t} \times \delta_t \times \text{Atlantic}_i \times \text{P-Index}_{it-1} \\ & + \sum_{t \geq 1500}^T \gamma_t \times \delta_t \times \text{W. Europe}_i + \delta_t + \theta \times \text{P-Index}_{it-1} + \epsilon_{it} \end{aligned} \quad (4)$$

where  $\beta_{1t}$  captures the effect of access to the Atlantic in period  $t$ ,  $\beta_{2t}$  captures how this effect varies with the frequency of parliamentary constraints,  $\theta$  captures the direct effect of parliamentary constraints, and  $\delta_t$  are a set of time dummies. As in Acemoglu et al. (2004) we estimate these parameters after having controlled for the broader trend of urban growth in Western Europe, given by the parameters  $\gamma_t$ , and unit fixed effects,  $\alpha_i$ . Our unit of observation is political unit as defined in each century.

Table 8 presents our results. Columns 1-4 use a dichotomous, time invariant, measure of potential for Atlantic trade. Column 1 reproduces the main result of Acemoglu et al. (2004) and confirms that, after the 17th century, access to the Atlantic was positively associated with changes in urban development. However, in Column 2, where we condition on the previous century's level of urban density, the relationship between access to the Atlantic and urban growth is null except for 1800 or 300 years after the discovery of the New World. The next two columns estimate the interactive relationship between the existence of parliamentary constraints and the Atlantic trade access dummy (Column 3) and between parliamentary constraints and the full set of Atlantic access and post 15th-century time dummies (Column 4). Both models provide no evidence of a statistically significant relationship between parliaments, trade, and growth.

In Columns 5-9 of Table 8, we use Acemoglu et al. (2004)'s second measure of potential for Atlantic trade: the ratio of Atlantic coast-line to the total area of the state. However, instead of using the boundaries of 20th century states to measure access to the Atlantic, we measure the ratio contemporaneously with urban density and parliamentary constraints, which gives us a time-varying measure of coast access. Because of this we can include it directly as a covariate instead of only estimating changes in its century-on-century effect via interactions with a series of time dummies, yielding the total effect of access to the Atlantic across time rather than just how access

*Coast Access and Urban Development Before the Industrial Revolution*

	<i>Effect of By Century</i>					
	1300	1400	1500	1600	1700	1800
Atlantic Coast	10.71** (3.90)	11.50 (5.91)	23.05*** (8.30)	41.59*** (13.10)	67.39*** (24.66)	138.00*** (38.34)
Mediterranean Coast	22.88*** (7.61)	7.19 (5.86)	14.96*** (7.54)	47.70*** (13.81)	44.01*** (13.68)	100.85*** (23.34)
p value from F test H <sub>0</sub> Mediterranean = Atlantic R <sup>2</sup> : .18 N: 444 T: 7	.16	.61	.48	.74	.42	.67
Distance to Atlantic Coast	-.35*** (0.08)	-.32*** (0.10)	-.62*** (0.10)	-.91*** (0.21)	-1.44*** (0.38)	-3.14*** (0.63)
Distance to Mediterranean Coast	-.45*** (0.11)	-.20*** (0.09)	-.41*** (0.12)	-1.03*** (0.23)	-.96*** (0.24)	-2.07*** (0.46)
p value from F test H <sub>0</sub> Mediterranean = Atlantic R <sup>2</sup> : .20 N: 444 T: 7	.48	.44	.30	.74	.37	.26
Urban Population <sub>it-1</sub>	1.25*** (0.09)					
Atlantic Coast <i>m</i> <sub>2</sub> : .88 N: 444 T: 6		-15.05** (6.71)	.74 (5.23)	5.71 (6.51)	6.05 (7.44)	46.71*** (16.11)
Urban Population <sub>it-1</sub>	1.37*** (15.47)					
Distance to Atlantic Coast <i>m</i> <sub>2</sub> : .86 N: 444 T: 6		.76*** (0.15)	.51*** (0.09)	.68*** (0.11)	1.23*** (0.15)	.21*** (0.03)

Table 7: The top panel presents results comparing access to the Atlantic to access to the Mediterranean. The lower panel estimates the relationship between access to the Atlantic and urban population after controlling for past values of urban population. All models contain unit and time fixed effects. When the lagged dependent variable is included we use a system GMM estimator. Heteroskedasticity robust standard errors in parentheses. The unit of analysis is the 225 km × 225 km grid square.

*The Effect of Atlantic Trade and Parliamentary Activity on Urban Density*

	Atlantic Potential: Dummy				Atlantic Potential: Atlantic Coast/Area				
Atlantic Potential					17.283***	12.837***	164.371	13.777***	11.660***
					(1.08)	(1.43)	(106.81)	(2.08)	(3.28)
log(Urban Density) <sub>t-1</sub>		0.318**					-0.038		
		(0.14)					(0.17)		
Atlantic Potential × 1500	0.152	0.142	0.077	0.071	3.300***	2.581**	1.745*	3.077**	
	(0.11)	(0.11)	(0.10)	(0.12)	(0.70)	(1.25)	(0.98)	(1.47)	
Atlantic Potential × 1600	0.183	0.163	0.103	0.085	4.653***	3.680**	2.702*	3.123	
	(0.14)	(0.14)	(0.12)	(0.18)	(1.06)	(1.53)	(1.49)	(4.25)	
Atlantic Potential × 1700	0.291*	0.092	0.222	-0.102	4.530***	3.767**	2.673	-0.519	
	(0.16)	(0.16)	(0.16)	(0.25)	(1.29)	(1.66)	(1.67)	(2.78)	
Atlantic Potential × 1800	0.319**	0.186	0.267	0.282	4.973***	4.771***	3.439**	7.828***	
	(0.15)	(0.16)	(0.14)	(0.19)	(1.29)	(1.66)	(1.67)	(2.78)	
P-Index <sub>t-1</sub>			-0.159	-0.252			-0.158	-0.261*	
			(0.12)	(0.16)			(0.11)	(0.15)	
P-Index <sub>t-1</sub> × 1500				0.147				0.153	
				(0.17)				(0.16)	
P-Index <sub>t-1</sub> × 1600				0.222				0.216	
				(0.16)				(0.15)	
P-Index <sub>t-1</sub> × 1700				-0.085				-0.040	
				(0.17)				(0.16)	
P-Index <sub>t-1</sub> × 1800				0.332				0.350**	
				(0.18)				(0.17)	
Atlantic Potential × P-Index <sub>t-1</sub>			0.285	0.003			2.228	3.098	
			(0.33)	(0.38)			(2.23)	(2.26)	
P-Index <sub>t-1</sub> × Atlantic Potential × 1500				0.024				-2.306	
				(0.25)				(2.05)	
P-Index <sub>t-1</sub> × Atlantic Potential × 1600				0.022				-1.232	
				(0.31)				(4.53)	
P-Index <sub>t-1</sub> × Atlantic Potential × 1700				0.650				3.294	
				(0.38)				(8.16)	
P-Index <sub>t-1</sub> × Atlantic Potential × 1800				-0.101				-6.934	
				(0.35)				(3.94)	
N	2106	1793	1793	1793	2106	2106	1793	1793	1793
R <sup>2</sup>	0.182		0.144	0.150	0.181	0.186		0.147	0.153
m <sup>2</sup>	.	0.04	.	.	.	.	0.16	.	.

Table 8: This table estimates the relationship between access to the Atlantic and urban development as well as the interactive effect between Atlantic access and the existence of parliamentary constraints on the same outcome. The unit is the polity. Heteroskedasticity robust standard errors in parentheses. When the lagged dependent variable is included we use the system GMM estimator.

to the Atlantic changed across time.

Column 5 estimates the average effect across time, finding a statistically significant relationship between Atlantic access and urban growth. The next two columns repeat the same exercise as in columns 1 and 2, estimating the effect of access to the Atlantic across time. The time varying components are each statistically significant but the direct effect is null when we condition on past values of urban population. The last two columns, which report the interactive effect of access to the Atlantic and parliaments, find no significant relationship between them and urban density. To sum up, while the time varying effect of the Atlantic trade as estimated by Acemoglu et al. (2004) is significant and positive, the total effect of access to the Atlantic, which in their models is absorbed by unit-fixed effects, is indistinguishable from zero across time periods when we control for past levels of urban density. Moreover, there is no positive interaction of Atlantic trade and institutional set-up on growth.

## 7 Conclusion

Employing fine-grained geographic, economic and political data covering 700 years of history and all sovereign and semi-sovereign units during that period, we have shown that the long-run rise of the core of Europe (from an economic and political backwater around 1000 CE to having a flourishing urban economy and eventually housing the industrial revolution) conformed to an endogenous economic and institutional developmental process. After political conditions stabilized around the turn of the millennium, the introduction of new techniques such as the heavy plow and the three-field rotation led to larger crop yields in those regions endowed with rich soils and suitable climate conditions. Areas with a substantial cereal surplus sustained a growing non-farming population that joined in urban agglomerations and specialized in a variety of artisanal and proto-industrial activities. In turn, those urban clusters made up of traders and artisans fostered an incremental process of technological innovation and of capital accumulation. These productive classes designed a complex set of institutional rules to enable contract enforcement between ordinary individuals (Ogilvie and Carus 2014). They also gave rise to political institutions that constrained the exercise of power.

Our results provide strong support for current endogenous growth models that emphasize how development depends crucially on a process of learning-by-doing, advanced by engineers, craftsmen, and artisans who hold and develop what, Joel Mokyr (2004) has defined, in his work on the industrial revolution, as  $\lambda$ -knowledge, that is, useful or technical knowledge. The strong role of technological continuity (and accumulation) in fostering growth would also explain why, in line with a growth model with increasing returns to scale and positive intra-sectoral externalities, urban growth exhibited a divergent pattern across the continent. Cities that were relatively larger at the beginning of the period kept adding population at a faster rate than smaller towns, eventually generating a highly urbanized core extending from Barcelona-Lyon-Naples in the south to Liverpool-Manchester in the northwest and Hamburg-Dresden-Prague in the east. Finally, it would explain why urban life and the distribution of proto-industries in medieval and early modern Europe predict cross-regional variation in per capita income in the late 19th century and at the turn of the 21st century quite strongly.

Our findings also qualify our current understanding of the evolution and role of parliamentary institutions, which appear to have been endogenous to the structure of economic and commercial life, hence contradicting the North and Weingast's (1989) insights and recent empirical work (based on a smaller number of observations) by De Long and Shleifer (1993) and by Van Zanden, Buringh and Bosker (2012). Pluralistic governance structures emerged and remained in place in those areas that had a sufficiently wealthy and cohesive class of "burghers" that could block the landed and monarchical elites and sustain the process of endogenous growth that eventually led to the industrial revolution. The wealth and population of Italian and Flemish towns allowed them to defeat their ecclesiastical or feudal lords over the 12th and 13th centuries (Weber 1968, Pirenne 1969, Najemy 2006). Likewise, in modern Europe parliamentary institutions only persisted in those proto-capitalist enclaves where a wealthy urban class had the means to oppose absolutism. Dutch cities joined in a military league and then a republic that eventually defeated Spain. In England the parliamentary forces and the pro-trade party won over the royal forces in 1640 and again in 1688. As Pincus (2009) writes in his landmark study of the Glorious Revolution, England in the second half of the 17th century was already becoming a modern society with a booming economy,

growing cities and expanding trade. Inspired by the Dutch example, the opponents of James II supported the principle of limited government, rejected James II's political-economic program based on land interests at home and territorial acquisition abroad and embraced urban culture, manufacturing and economic imperialism - understood as - commercial hegemony (ibid, 484). It was that unbroken economic dynamism that at some point brought Britain into the doorstep of the Industrial Revolution. And it was arguably the reservoir of artisanal know-how in the rest of the core of Europe that allowed it to take advantage of the British breakthrough.

## References

- Abramson, Scott F. 2017. "The Economic Origins of the Territorial State." *International Organization* pp. 71(1) 97–130.
- Acemoglu, D., S. Johnson and J.A. Robinson. 2002. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics* 117(4):1231–1294.
- Acemoglu, D., S. Johnson and J.A. Robinson. 2004. "The Rise of Europe: Atlantic Trade, Institutional Change and Economic Growth." *American Economic Review* .
- Alesina, Alberto, Johann Harnoss and Hillel Rapoport. 2016. "Birthplace diversity and economic prosperity." *Journal of Economic Growth* 21(2):101–138.
- Allen, R.C. 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History* 38(4):411–447.
- Arellano, M. and O. Bover. 1995. "Another look at the instrumental variable estimation of error-components models." *Journal of econometrics* 68(1):29–51.
- Arellano, M. and S. Bond. 1991. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *The Review of Economic Studies* 58(2):277–297.
- Arrow, Kenneth. 1962. Economic welfare and the allocation of resources for invention. In *The rate and direction of inventive activity: Economic and social factors*. Princeton University Press pp. 609–626.
- Bairoch, P. and C. Braider. 1991. *Cities and Economic Development: From the Dawn of History to the Present*. University of Chicago Press.
- Bairoch, P., J. Batou and C. Pierre. 1988. *Population des villes européennes de 800 à 1850: banque de données et analyse sommaire des résultats (la)*. Librairie Droz.
- Blundell, R. and S. Bond. 1998. "Initial conditions and moment restrictions in dynamic panel data models." *Journal of econometrics* 87(1):115–143.
- Boix, C. and M. Svolik. 2013. "The foundations of limited authoritarian government: Institutions and power-sharing in dictatorships." *The Journal of Politics* 75(2):300–316.
- Boix, Carles. 2015. *Political Order and Inequality: Their Foundations and Their Consequences for Human Welfare*. Cambridge University Press.
- Cagé, Julia and Valeria Rueda. 2016. "The long-term effects of the printing press in Sub-Saharan Africa." *American Economic Journal: Applied Economics* 8(3):69–99.
- Carus-Wilson, E.M. 1966. *The Woollen Industry. Cambridge Economic History of Europe. Volume II*. Cambridge University Press.
- Caselli, Francesco, Gerardo Esquivel and Fernando Lefort. 1996. "Reopening the convergence debate: a new look at cross-country growth empirics." *Journal of economic growth* 1(3):363–389.
- Chanda, A. and L. Putterman. 2007. "Early Starts, Reversals and Catch-up in the Process of Economic Development." *The Scandinavian Journal of Economics* 109(2):387–413.

- Clark, Gregory. 2008. *A farewell to alms: a brief economic history of the world*. Princeton University Press.
- Conley, Timothy G, Christian B Hansen and Peter E Rossi. 2012. "Plausibly exogenous." *Review of Economics and Statistics* 94(1):260–272.
- De Long, J.B. and A. Shleifer. 1993. "Princes and Merchants'." *Journal of Law and Economics* 36.
- De Vries, J. 1984. *European Urbanization, 1500-1800*. Methuen London.
- Diamond, Jared M. 1998. *Guns, germs and steel: a short history of everybody for the last 13,000 years*. Random House.
- Duby, G., H.B. Clarke and M.B. Becker. 1974. "The early growth of the European economy: warriors and peasants from the seventh to the twelfth century." *History: Reviews of New Books* 2(8):208–208.
- FAO. 2000. "Global Agro-ecological Assessment for Agriculture in the 21st Century." <http://www.iiasa.ac.at/Research/LUC/SAEZ/index.html> .
- Galor, Oded. 2005. "From stagnation to growth: unified growth theory." *Handbook of economic growth* 1:171–293.
- Galor, Oded, Omer Moav and Dietrich Vollrath. 2009. "Inequality in landownership, the emergence of human-capital promoting institutions, and the great divergence." *The Review of economic studies* 76(1):143–179.
- Gandhi, J. and A. Przeworski. 2007. "Authoritarian Institutions and the Survival of Autocrats." *Comparative Political Studies* 40:1279–1300.
- Gutmann, M.P. 1988. *Toward the Modern Economy: Early Industry in Europe, 1500-1800*. Temple University Press.
- Hibbs, D.A. and O. Olsson. 2004. "Geography, Biogeography, and Why Some Countries Are Rich and Others Are Poor." *Proceedings of the National Academy of Sciences of the United States of America* 101(10):3715.
- Klein Goldewijk, Kees, Arthur Beusen, Gerard Van Dreht and Martine De Vos. 2011. "The HYDE 3.1 spatially explicit database of human-induced global land-use change over the past 12,000 years." *Global Ecology and Biogeography* 20(1):73–86.
- Kremer, M. 1993. "Population Growth and Technological Change: One Million BC to 1990." *The Quarterly Journal of Economics* 108(3):681–716.
- Krugman, P.R. 1991. *Geography and Trade*. The MIT Press.
- Laitin, David D and Rajesh Ramachandran. 2016. "Language policy and human development." *The American Political Science Review* 110(3):457.
- Lopez, R.S. 1976. *The Commercial Revolution of the Middle Ages, 950-1350*. Cambridge University Press.
- Nicholas, D. 1997. *The Growth of the Medieval City: From Late Antiquity to the Early Fourteenth Century*. Longman (London and New York).
- Nickell, Stephen. 1981. "Biases in dynamic models with fixed effects." *Econometrica: Journal of the Econometric Society* pp. 1417–1426.
- North, D.C. and B.R. Weingast. 1989. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-century England." *Journal of Economic History* 49(4):803–32.

- North, Douglass C. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press.
- Ogilvie, Sheilagh and André W Carus. 2014. "Institutions and Economic Growth in Historical Perspective: Part 2."  
**URL:** [https://papers.ssrn.com/sol3/papers2.cfm?abstract\\_id=2463601](https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=2463601)
- Olson, M. 1993. "Dictatorship, democracy, and development." *American Political Science Review* pp. 567–576.
- Olson, M. 2000. *Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships*. Basic books.
- Oster, Emily. 2013. Unobservable selection and coefficient stability: Theory and validation. Technical report National Bureau of Economic Research.  
**URL:** <https://www.brown.edu/research/projects/oster/sites/brown.edu.research.projects.oster/files/uploads/selection.pdf>
- Post, Alison. Forthcoming. "Comparative Politics Scholarship on Cities in the Developing World: The Case for an Urban Lens." *Annual Review of Political Science* .
- Putnam, R.D. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press.
- Romer, P.M. 1996. "Why, Indeed, in America? Theory, History, and the Origins of Modern Economic Growth." *American Economic Review* 86(2):202–206.
- Sachs, J.D. and A.M. Warner. 1997. "Fundamental Sources of Long-run Growth." *The American Economic Review* 87(2):184–188.
- Satyanath, Shanker, Nico Voigtländer and Hans-Joachim Voth. 2013. Bowling for fascism: social capital and the rise of the Nazi Party. Technical report National Bureau of Economic Research.  
**URL:** <http://www.nber.org/papers/w19201>
- Shaver, Andrew, David B Carter and Tsering Wangyal Shawa. 2016. "Terrain ruggedness and land cover: Improved data for most research designs." *Conflict Management and Peace Science* p. 0738894216659843.
- Smith, A. 1937. "The Wealth of Nations." *New York: Modern Library* p. 740.
- Sprandel, R. 1968. *Das Eisengewerbe im Mittelalter*. A. Hiersemann.
- Stasavage, D. 2011. "When Distance Mattered: Geographic Scale and the Development of European Representative Assemblies." *American Political Science Review* .
- Stasavage, David. 2014. "Was Weber right? The role of urban autonomy in Europe's rise." *American Political Science Review* 108(02):337–354.
- Strayer, J.R. 1973. *On the Medieval Origins of the Modern State*. Princeton University Press.
- Svolik, M.W. 2009. "Power sharing and leadership dynamics in authoritarian regimes." *American Journal of Political Science* 53(2):477–494.
- Tilly, C. 1990. *Coercion, capital, and European states, AD 990-1990*. Basil Blackwell.
- Van Zanden, Jan Luiten, Eltjo Buringh and Maarten Bosker. 2012. "The rise and decline of European parliaments, 1188–1789." *The Economic History Review* 65(3):835–861.
- Wang, Yuhua. 2017. "Sons and Lovers: Political Stability in China and Europe before the Great Divergence." Working paper.
- Weber, M. 1968. "Economy and Society (G. Roth & C. Wittich, Eds.)." *New York: Bedminster* .