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ENDOGENOUS INSTITUTIONS AND ECONOMIC OUTCOMES.*

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Abstract

This paper evaluates the relative importance of a “culture of cooperation,” understood as the implicit reward from cooperating in prisoner’s dilemma and investment types of interactions, and “inclusive political institutions,” which enable voters to check the power delegated to their representatives. I divide Europe into $120\text{km} \times 120\text{km}$ grids and exploit exogenous variation in both institutions driven by persistent Medieval history. To elaborate, I document strong first-stage relationships between present-day norms of trust and respect and the forces that produced consumption risk—i.e., climate volatility—over the 1000-1600 period and between present-day regional political autonomy and the factors that shaped the returns from elite-citizenry investments in the Middle Ages, i.e., terrain ruggedness and direct access to the coast. Using this instrumental variables approach, I show that only culture has a first order effect on development, even after controlling for country fixed effects, Medieval innovations, and other norms of conduct. Conditional on these observables, the excluded instruments have no direct impact on development and the effect of culture holds within pairs of adjacent grids with different Medieval climate volatility. An explanation for these results is that culture but not democracy is necessary to produce public-spirited politicians and push voters to punish political malfeasance. Micro-evidence supports this idea.

Keywords: Geography; Culture; Democracy; Development; Political Accountability.

JEL classification: Z10; H10; O10; D72.

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1 Introduction

Overwhelming evidence suggests that a “culture of cooperation,” understood as the implicit reward from cooperating in prisoner’s dilemma and investment types of interactions, and “inclusive political institutions,” which enable voters to check their representatives, foster economic development and are correlated with past inclusive political institutions (Tabellini, 2010; Guiso, Sapienza, and Zingales, 2013). Yet, documenting that the two types of arrangements reinforce one another and are persistent does not help in identifying their relative importance. This paper tackles this issue by devising a multiple instrumental variables approach that exploits exogenous variation in both present-day culture and inclusive political institutions created at the European regional level by persistent Medieval history.

In particular, the anarchy created by the fall of the Western Roman empire pushed the population to seek the protection of strong patrons who, empowered by the feudal contract, pacified their estates (Stearns, 2001). This new order fueled an institutional revolution that changed Europe to date. On the one hand, attracted by the prospect of farming investments and long-distance trade partnerships, the lords started to offer high powered contracts to the peasants and both protection against pirates and tax breaks to the merchants (Stearns, 2001). These innovations flourished where reforms towards a more inclusive political process fortified their credibility (Stearns, 2001), e.g., in the communes of Northern Italy (1050-1628), the maritime republics of Genoa and Venice (1095-1297), the *Giudicati* in Sardinia (1100-1297), the towns of Aragon and Catalonia (1150-1213), and with the opening of the Atlantic routes in England (1215-1707) and the Provinces (1384-1795). On the other hand, the Cistercian and Franciscan orders, founded in 1098 and 1209 respectively, started to meet the population’s demand for insurance against consumption shocks in exchange for the acceptance of a culture of cooperation. Together with the population, the Cistercians reclaimed undeveloped lands, organized trade fairs, and introduced major technological advances like the waterwheel and the greenhouse [Tobin 1995, p. 74-132]. The risk of being deprived of such support drove the population to accept an ideal of charity pursued not through alms but “via moral consideration and practical engagement” [Muzzarelli 2001, p. 115]. This approach was so attractive that hundreds of communities first pressed the nearest monasteries

to join the order and then embraced the same culture [Berman 2000, p. 95, 107, and 223]. Similarly, the Franciscans organized a network of thousands of houses launching the first micro-credit institutions, i.e., *Monti di Pietà*. Once summoned by a community, they first gathered sufficient alms to start and run these pawnshops and then improved “the morality [...] of the customers evaluating the loan use [in order to] make the citizenry cohabitation more cooperative and fair” [Muzzarelli 2001, p. 7 and 216]. Only the Protestant Reformation deprived Medieval Western monasticism of its pivotal role [Tobin 1995, p. 155-180].

Inspired by these institutional discontinuities and previous related research (Fleck and Hanssen, 2006; Durante, 2010; Andersen et al., 2013),¹ Boranbay and Guerriero (2013) employ a panel of 90 European regions spanning the 1000-1600 period to test the idea that the elite introduces more inclusive political institutions to convince the citizens that their returns from joint investments will not be expropriated, whereas the citizenry accumulates a culture of cooperation to share consumption risk and commit to cooperate while investing with the elite. Such a “commitment dimension of cultural accumulation” reduces the elite’s incentive to repeal inclusive political institutions. Consistent with these predictions, reforms towards tighter constraints on the elite’s power were driven by the factors determining the observability and thus the profitability of farming investments and the value of long-distance trades, i.e., respectively the ruggedness of the terrain and the direct access to the coast. In addition, the discounted number of years Cistercian and Franciscan houses were active per square kilometers was positively related to the risk of harvest destruction, as driven by the volatility of the growing season temperature, and to the factors depressing the value of investments, i.e., opening of the Atlantic routes. Given that present-day institutions can be traced back to this Medieval revolution, the correlation between past institutions created by the commitment dimension produces first-stage relationships between past political infrastructures and present-day culture and democracy. These however are not distinct and thus are insufficient to identify the relative importance of each of the two institutions.

To deal with these issues, I exploit the geographic determinants of past institutions

¹While Fleck and Hanssen (2006) show that in Ancient Greece democratization was stronger where the elite found more difficult to monitor the citizens’ farming investments, Durante (2010) documents that Europeans living today in regions where the climate was more erratic between 1500 and 1750 trust more others. Finally, Andersen et al. (2013) provide evidence supporting the idea that the Cistercians propelled pre-industrial development in England by spreading a cultural appreciation of hard work and thrift.

to devise a multiple instrumental variables approach (see figure 1). The success of this identification strategy depends on the power of the two sets of instruments isolating the role of each institution. Operationally, I divide Europe into $120\text{km} \times 120\text{km}$ grids and show that the volatility of the growing season temperature between 1000 and 1600 has a strong effect on present-day culture of cooperation, as captured by the strength of norms of trust and respect self-reported to the 2008 European Value Study (GESIS, 2008), and no impact on a measure of the inclusiveness of regional political institutions averaged between 1950 and 2010. This is obtained supplementing the Polity IV’s constraint on the executive score with information on the extent of political autonomy from the central government of the NUTS 2 regions in the sample. The latter has been recognized by a large literature as a key determinant of the citizenry’s ability to monitor politicians (Frey, 2005) and displays a strong within-country correlation with regional measures of property rights protection proposed by Charron, Dijkstra, and Lapuente (2014). The terrain ruggedness and the direct access to the coast instead have a large impact on current political institutions and a little effect on present-day culture. Building on these separate first-stages, I show that only culture has a first order effect on the natural logarithm of the GDP per capita averaged between 2002 and 2009, even after controlling for country fixed effects, Medieval innovations, present-day geography, intermediate outcomes, other norms of conduct, and factors modulating the role of institutions. Including this rich conditioning set assures that the excluded instruments have not direct impact on current development via channels other than permanent institutions.

To address the concern of whether indeed the exclusion restriction is satisfied, I perform a number of robustness tests. First, I document that conditional on observables the overidentifying restrictions cannot be rejected at a level nowhere lower than 39% and the excluded instruments have no direct impact on outcomes in the semi-reduced forms estimates. Second, I show that the effect of culture on economic success survives within neighboring grids falling in the same country and differing in their Medieval climate volatility. This exercise enables me to control for all unobserved features specific to the relevant $120\text{km} \times 240\text{km}$ grid-pairs. Finally, I perform the following falsification test to examine the reduced-form relationship between the volatility of the growing season temperature during the Middle Ages and today GDP per capita inside and outside my sample. Within Europe, I find a strong positive

link between the two variables as expected, given my two-stage least squares—2SLS from here on—estimates. Regions that experienced a more erratic weather, and thus needed the most the Cistercians’ and Franciscans’ support to accumulate culture, exhibit higher levels of income per capita today. If Medieval climate volatility affects income only through a risk-sharing-driven culture of cooperation, I should not find a similar relationship where the cost of accumulating culture was prohibitive because of the opposition to Western monasticism. This is what I find. Looking at a sample of 117 grids covering Turkey, I estimate a statistically insignificant relationship between Medieval climate volatility and present-day income. This is consistent with the barriers to Western monasticism erected by the Eastern Orthodox Church first and the Ottoman empire then [Tobin 1995, p. 144].

An explanation for these results is that more inclusive political institutions facilitate the monitoring of politicians by voters but are irrelevant if politicians have weak civic virtues or if citizens are not morally compelled to punish political malfeasance (Boix and Posner, 1998). To confirm this idea, I show that there are considerably fewer criminal prosecutions of Italian Parliament members in electoral districts in which culture is stronger but not in districts endowed with more inclusive political institutions. This pattern points to a key channel through which culture shapes the economy and cannot be driven only by a more diligent enforcement since prosecutions can be initiated by any Italian tribunal and are consistently correlated with measures of corruption (Chang, Golden, and Hill, 2010).

The papers most closely related to mine are Acemoglu and Johnson (2005) and Tabellini (2010). The latter also tries to overcome problems inherent to cross-country regressions by using past regional political institutions to measure the impact of current culture on the development of 69 European regions. Differently from this and the related contributions examining the within-country effect of past institutions (Dell, 2010; Michalopoulos and Papaioannou, 2013; Gennaioli et al., 2013), I devise an empirical strategy explicitly accounting for the existence of within-country confounding factors that might drive at the same time past institutions, present-day institutions, and present-day outcomes. Acemoglu and Johnson (2005) instead share with me the aim of unbundling institutions but focus on contracting and property rights institutions. No previous study however has attempted to estimate the separate roles of a culture of cooperation and inclusive political institutions. Crucially, I do

so by identifying the geographic determinants of permanent local institutions in a sample in which geography has neither shaped present-day economies through persistent technological innovations nor affected the spread of slavery (Nunn and Puga, 2012) and the colonizers’ settlement strategy (Acemoglu, Johnson, and Robinson, 2001) as elsewhere.

The rest of the paper is organized as follows. Section 2 discusses the data and the empirical strategy. Next, section 3 evaluates the relative importance of a culture of cooperation and the inclusiveness of political institutions showing the primacy of the former. Section 4 provides additional evidence documenting that only culture significantly shapes political accountability. Finally, section 5 concludes. The appendix gathers figures and tables.

2 Data and Empirical Strategy

The sample consists of 578 grids in 16 European countries for which I have sufficient historical data (see footnote 18 and table 1). The grids have width of 1° , which is the spatial resolution of the excluded instrument for which I have the most refined data.² Contrary to a region-based approach, this design allows me to compare units of similar size, sidestep the endogeneity of regional boundaries, and exploit a substantial within-country variation.³

2.1 Measuring a Culture of Cooperation

The proxy for culture is obtained from the 2008 European Value Study (GESIS, 2008). The most detailed level at which these data can be aggregated is that of the NUTS 2 regions in which the respondents resided at the time of the survey. NUTS 2 regions are defined by Eurostat on the basis of administrative criteria and have a population ranging from 800,000 to three million. The average (median) number of respondents per region is 313 (167).⁴

Following Boranbay and Guerriero (2013), I capture the present-day implicit reward from cooperating in prisoner’s dilemma and investment types of interactions spread in Medieval

²Grids located on the borders are divided in sub-grids each belonging entirely to a single country. Considering the undivided grids to deal with unobserved determinants of national boundaries produces similar results.

³Using as cross-section identifiers the regions considered by Boranbay and Guerriero (2013) reduces the within variation in the Medieval climate volatility (ruggedness) measure introduced below from 0.96 to 0.69 degree Celsius (0.120 to 0.73 Km) and makes the estimates extremely noisy (see the Internet appendix).

⁴I focus on the 2008 wave in order to maintain a temporal consistency with the other data I introduce below. Nevertheless, the empirical exercise will offer similar conclusions should I also take into account the previous three waves—i.e., 1981, 1990, 1999—because of the strong path-dependence of the recorded answers.

Europe by the Cistercians and Franciscans with the extent of “generalized” trust and respect for others. Both are meant as abstract rules of conduct applied also to individuals outside the family (Platteau, 2000). In particular, generalized trust not only favors cooperation in prisoner’s dilemma games as documented by a broad experimental evidence (Durante, 2010), but it also reduces transaction costs, expands anonymous market exchange, and facilitates the division of labor (Dixit, 2004). To measure it, I consider the share of answers “most people can be trusted” to the question “generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?”—i.e., *Trust*. Turning to respect, it makes individuals more reluctant to free-ride on others and more willing to participate in joint partnerships and politics (Tabellini, 2010). As seen above, this family-transmitted attention to humankind is the quintessential aspect of the Western monasticism’s concept of “Caritas.” Operationally, I use the share of answers mentioning “tolerance and respect for other people” as an important quality that children should be encouraged to learn, i.e., *Respect*. To isolate the common source of variation in both variables, I focus on the first principal component extracted from the individual observations for *Trust* and *Respect*, i.e., *Culture* (see table 2 for details on each variable). Yet, the evidence is very similar if I turn to either *Trust* or *Respect* (see the Internet appendix). If a grid belongs to multiple NUTS 2 regions, I assign it a figure equal to the average of the values culture assumes in each represented region weighted by the region’s relative contribution to the grid’s land area. I follow the same procedure in the case of the other variables measured at the regional level.

Tabellini (2010) also considers the conviction that individual effort is likely to pay off—i.e., *Control*—and the refusal of hierarchical control—i.e., a low level of *Obedience*—as norms conducive to development. Neither of the two however is strictly connected to the incentive to cheat others in exchange and joint partnership interactions. A legacy of cross-cultural psychology has indeed provided copious evidence that *Control* mainly concerns “the desirability of individuals independently pursuing their own ideas [whereas *Obedience*] refers to a cultural emphasis on obeying role obligations within a legitimately unequal distribution of power” [Licht, Goldschmidt, and Schwartz 2007, p. 115].⁵ In any case, the message of the

⁵Gorodnichenko and Roland (2011) provide cross-country evidence of the positive impact of genetically-driven individualism on income and of a two-way causal effect between culture and democracy.

analysis will be the same should I proxy culture with the first principal component extracted from *Trust*, *Respect*, *Control*, and *Obedience*, i.e., *Culture-T* (see the Internet appendix).

The upper right map in figure 2 illustrates the large variation in *Culture* across Europe and the size of the grids I use as cross-section identifiers in the empirical exercise relative to the NUTS 2 regions surveyed by the European Value Study. Even if continuous measures are used in the analysis, in this and the other maps data are displayed in five intervals whose break points are chosen to best group similar values and maximize the differences between groups.⁶ Darker colors correspond to higher values. While the England, Western France, Northern Italy, and Northern Spain exhibit the strongest culture of cooperation, Southern Italy, Czech Republic, Eastern Poland, and Portugal display the most limited one.⁷

As clarified by the comparison between this pattern and that described by the upper left map of figure 2, present-day norms of trust and respect are deeply rooted in the Medieval risk-sharing-driven culture of cooperation that I proxy with the discounted number of years per capita Cistercian and Franciscan houses were active averaged over the 1000-1600 period,⁸ i.e., *Culture-M*.⁹ In particular, the diffusion of the Cistercians in England, Western France, and Northern Spain and that of the Franciscans in Northern Italy are related to a more intense culture of cooperation today. As discussed above, both monastic orders assumed a key role in the accumulation of culture organizing risk-sharing activities together with the population, proposing norms of trust and respect, monitoring their effective spread, and punishing the defectors by withdrawing their support. Given the substantial homogeneity of the two orders' action [Tobin 1995, p. 41] and that no other order covered a similar role [Logan 2002, p. 126-135], *Culture-M* gages the input to the technology that transformed the citizenry's involvement with culture into evolutionary stable norms of cooperation (see also

⁶The goodness of variance fit method minimizes the average deviation of the interval's values from its mean, while maximizing the average deviation of the interval's values from the means of the other intervals.

⁷In the light of the extant literature (Tabellini, 2010), one may worry that considering the countries that experienced the most disparate regional political trajectories—i.e., Belgium and Italy—can produce a selection bias. Yet, consistent with idea that culture is mainly driven by differences in past risk-sharing needs, my estimates are similar but more noisy if these countries are excluded from the sample (see Internet appendix).

⁸While the data on Cistercian (Franciscan) houses are collected from Van Der Meer (1965) (Moorman, 1983), those on the population between 10,000 BC and 2000 are available at five minutes spatial resolution for the whole globe from Goldewijk et al. (2011), who estimate them through time-variant allocation algorithms.

⁹For each of the 712 (2952) Cistercian (Franciscan) houses, this figure equals in year t the difference between the years of operation of the house and those elapsed by its possible closure if positive and zero otherwise.

Boranbay and Guerriero, [2013]). This is consistent with the key insights of evolutionary psychology (Barkow, Cosmides, and Tooby, 1992) and Malthusian growth theories (Clark and Hamilton, 2006): group-specific cultural values result from a process that instills, via natural selection or cross-punishment, norms maximizing the fitness of the group’s members. Hence, higher values of *Culture-M* should detect a stronger culture of cooperation in the past.¹⁰

Focusing on the Cistercians’ activity, Andersen et al. (2013) propose a similar mechanism but describe the order as aimed at spreading values of hard work and thrift. Albeit consistent with a strand of economic history (Baumol, 1990), this vision is at odds with the analysis of a more recent and substantial historical literature (Tobin 1995; Berman, 2000). The latter highlights that the Cistercians’ foundation chart, which functioned as a commitment device for all houses, explicitly imposed to each monk to diffuse the doctrine that individual choices should not be shaped around social competition and accumulation of capital [Berman 2000, p. 1-23 and 93-97].¹¹ The relationships among the worshipers should instead be rooted in “mutual love and esteem, combined with a benevolent eye to human frailty [i.e.,] charity rather than the exercise of power” [Tobin 1995, p. 40]. Similar provisions are part of the 1223 *Regula Bullata*, which requires that Franciscans commit to a life of poverty and social engagement [Muzzarelli 2001, p. 7-9]. Consistent with these studies, I show that while *Trust* and *Respect* are positively and significantly correlated with both *Culture-M* and Medieval climate volatility, none among *Control*, *Obedience*, and the proxies for “hard work” and “thrift” used by Andersen et al. (2013) are (see the Internet appendix). Crucially, when the proxy for culture is extracted from “hard work” and “thrift,” *Trust*, and *Respect*—i.e., *Culture-A*, the message of the empirical analysis is the same (see the Internet appendix).

2.2 Measuring the Inclusiveness of Political Institutions

I define the inclusiveness of political institutions as the strength of the rules enabling

¹⁰To further cross-validate this variable, Boranbay and Guerriero (2013) report its high correlation—0.8—with the discounted number of years the *Monti* were active per square kilometers. Since these pawnshops survived only if loans were repaid [Muzzarelli 2001, p. 189-244], their endurance is related to the share of successful risk-sharing interactions and so it is an outcome-based measure of past culture just as the electoral turnout and the diffusion of blood donations are of present-day culture (Guiso, Sapienza, and Zingales, 2013).

¹¹Indeed, the 1165 *Carta Caritatis* attributed to Stephen Harding describes the order’s members as “unprofitable [servants of] our Lord [who wish] to be of service to [our brothers,] avoid the evil of avarice [and] retain the care of their souls for the sake of charity” (see <http://www.cistercian.org/abbey/our-life/pdf>).

voters to select more public-spirited representatives and check more closely their decisions. To capture both aspects, I consider the average over the 1950-2010 period of the sum of the Polity IV's constraint on the executive score and a regional political autonomy index, i.e., *Democracy*.¹² Such index takes value 1 if the region had exclusive control over a limited set of policy—e.g., education, 2 if it is also fiscally decentralized, 3 if it had substantial political autonomy from the central government,¹³ and 0 otherwise. Conditional on fixed effects, *Democracy* gages two important sources of institutional variation, i.e., the differences between the totalitarian regime and the democracy that ran respectively Eastern and Western Germany before their unification and the diverging experiences of the autonomous regions of Austria, Belgium, France, Italy, Spain, and the UK. Despite previous contributions have exclusively studied the former aspect (Persson and Tabellini, 2009), a growing body of regional studies documents that such a strategy offers a highly distorted picture because of the sizable sub-national variation in political autonomy (Charron, Dijkstra, and Lapuente, 2014). Differently from those elected in normal regions, politicians selected in autonomous ones are directly accountable for local policies, chosen for their fit with the preferences of the region's population, and can design public goods fulfilling the most these preferences (Frey, 2005). Accordingly, the regional political autonomy index I develop displays a strong within-country correlation with regional measures of property rights protection (see the Internet appendix).¹⁴ This dimension, which has been recognized by the extant literature as crucial in distinguishing differently inclusive political regimes (Acemoglu and Johnson, 2005), will be lost if one relied only on cross-country variation. My results do not rest merely on the way in which the proxy for the inclusiveness of political institutions is defined since I obtain similar estimates when I either consider only the regional political autonomy by averaging inclusiveness over the 2000-2010 period or use the first principal component extracted from the Polity IV's score and the regional political autonomy index (see the Internet appendix).

The bottom right map of figure 2 displays the considerable variation in *Democracy*.

¹²The Polity IV's constraint on the executive score ranges between one and seven and higher values indicate stronger constraints on the decision-making power of chief executives (Marshall and Jaggers, 2011).

¹³I consider a region as fiscally decentralized if it can raise part of its fiscal revenues through region-specific taxes and spend them on local public goods. I treat a unit as politically autonomous if it is fiscally decentralized, can elect its own parliament, and controls all policies except those of national relevance like defense.

¹⁴These are a measure of honesty, impartiality, and quality of law enforcement, one of the overall quality of governance, and an inverse metrics of the relevance of corruption (Charron, Dykstra, and Lapuente, 2014).

On the one hand, the experience of authoritarian regimes has created an institutional gap between the regions situated on the two sides of the Iron Curtain. On the other hand, South Tyrol, Région Wallonne, Vlaams Gewest, Corse, the Italian and Spanish regions, Northern Ireland, Scotland, and Wales have been entrusted in the postwar period a more or less complete political autonomy by their central governments. These arrangements range from the exclusive legislative power on specific policies, like education, granted to all Italian regions in 2001 (Article 117, Italian Constitution) to the almost complete autonomy obtained by the linguistic areas of Belgium in 1962 and the devolved UK regions in 1999. In these last cases, the central governments have kept their responsibility for excepted matters like defense, whereas the regional Parliaments have acquired residual legislative power and the ability to invest regional tax revenues into local public goods. As a result of these patterns, *Democracy* ranges from a minimum of 3.20 scored by the ex-Eastern Germany regions of Brandenburg and Sachsen to a maximum of 9 observed, for instance, in Vlaams Gewest.

The bottom left map of figure 2 clearly shows that the present-day heterogeneity in regional political institutions has its roots in Medieval history. This map depicts the average over the 11th-16th centuries of the “constraint on executive” score coded by Boranbay and Guerriero (2013) for each half a century between 1000 and 1600, *Democracy-M*. The score is obtained by first matching groups of present-day NUTS 2 regions to the major polities existing during the Medieval period (see table 1) and then looking at the history of each polity in a 40-year window around each date (see also Acemoglu, Johnson, and Robinson, [2005]). Between 1100 and 1350, the first reforms towards a more inclusive political process were implemented by the agrarian communities of the kingdom of Aragon, the commercial “Giudicati” (communes) of Sardinia (Northern Italy), and the maritime cities of Genoa and Venice (Stearns 2001). Initially organized as “a sworn association of free men endowed with political and economic independence” [Stearns 2001, p. 216], such polities were governed by a public assembly that attended to general interest matters and selected the executive. Later on, the shift of long-distance trades towards the Atlantic harbors of Cape Town and Havana allowed the merchants of the Provinces and the Reign of England to constrain the power of the respective monarchs (Acemoglu, Johnson, and Robinson, 2005). In the postwar period, Medieval parliaments have been restored with the justification that the

specific preferences for public good of a historically homogeneous community should be satisfied by local representatives (Frey, 2005). The two bottom maps of figure 2 document the long-term journey towards more inclusive political institutions of these European regions.

2.3 Unbundling Institutions

The options open to a society characterized by a weak culture of cooperation but more inclusive political institutions are very different from those left to a society in which the political process is less democratic but cooperation is facilitated by solid norms of trust and respect. While the former can barely sustain decentralized markets and support both investments and division of labor, the latter has always the option of side-stepping centralized powers and relying on informal networks of cooperation enforcing contracts and protecting property rights (Dixit, 2004; Greif, 2006). Moreover, culture shapes the way citizens participate in policy making and the behaviors of public officials. On the one hand indeed, it reduces the citizens’ cost of punishing political malfeasance by relaxing the collective action constraint, building their qualities of judgment, and shifting their preferences towards community-oriented policies (Boix and Posner, 1998). On the other hand, inconsiderate public officials are likely to engage in nepotism and corruption even in the face of “de jure democratic institutions” (Putnam, Leonardi, and Nanetti, 1993). The very unequal performances of the public administration and the judiciary in Northern and Southern Italy despite the similar 150-years-long political trajectory constitute a glaring example.

Thus, it is reasonable to suppose that the performance of a region characterized by a forceful culture of cooperation but significantly less inclusive political institutions—e.g., Emilia Romagna—will be superior to that of a region in which a more democratic political process is left in the hands of less respectful citizens, e.g., Sardinia. Next, I test this prediction.

2.4 Identification Strategy

Ignoring nonlinearities, I can write the relationship I am interested in identifying as

$$Y_{i,c} = \alpha_c + \beta_0 C_{i,c} + \gamma_0 D_{i,c} + \mathbf{X}'_{i,c} \delta_0 + \epsilon_{i,c}, \quad (1)$$

where $Y_{i,c}$ is the natural logarithm of the GDP per capita in grid i of country c , in euro,

averaged between 2002 and 2009, i.e., *Income*. The data source is Eurostat, which collects the series at the NUTS 2 regional level. I obtain similar results if I switch to the G-Econ’s estimate of the GDP per capita in 1985, which is in grid format at one degree spatial resolution (see the Internet appendix).¹⁵ $C_{i,c}$ and $D_{i,c}$ denote *Culture* and *Democracy* respectively, whereas $\mathbf{X}_{i,c}$ gathers the latitude and longitude of the centroid of the grid—i.e., *Latitude* and *Longitude*—and a series of controls discussed below. α_c account for country-wide unobservables like the legacy of past wars, legal origins, and genetic diversity (Ashraf and Galor, 2013a).¹⁶ Since the correlation between $C_{i,c}$ and $D_{i,c}$ is 0.27, multicollinearity is not an issue.

The simplest strategy is to estimate equation (1) using OLS regression. There are two distinct issues with this strategy. First, both culture and democracy are endogenous, so I may be capturing reverse causality, or the effect of some omitted characteristics like religious beliefs. Second, both variables are measured with error, so there may be a downward attenuation bias. To evaluate these concerns and cope with them, I compare the inconsistent OLS estimates with those obtained by using 2SLS with distinct instruments for culture and democracy. The instruments should be correlated with the endogenous regressors but orthogonal to any other omitted variable, i.e., uncorrelated with the outcome of interest through any channel other than their effect via the endogenous regressors. A successful instrumental variables strategy would correct not only for the reverse causality and omitted variable biases, but also for differential measurement errors in the two endogenous variables as long as the measurement errors have the classical form and β_0 and γ_0 can be consistently estimated (see Acemoglu and Johnson, [2005]). The specifications of the two first-stages are

$$\begin{aligned} C_{i,c} &= \alpha_c + \zeta_1 T_{i,c} + \eta_1 R_{i,c} + \theta_1 I_{i,c} + \mathbf{X}'_{i,c} \delta_1 + \omega_{i,c}, \\ D_{i,c} &= \alpha_c + \zeta_2 T_{i,c} + \eta_2 R_{i,c} + \theta_2 I_{i,c} + \mathbf{X}'_{i,c} \delta_2 + \nu_{i,c}, \end{aligned} \quad (2)$$

where $T_{i,c}$ is the volatility of the growing season temperature averaged between 1000 and 1600 and corresponds to the instrument for culture (see section 2.5). $R_{i,c}$ and $I_{i,c}$ label respectively the terrain ruggedness and a dummy for direct access to the coast and represent instead the instruments for inclusive political institutions (see section 2.5). The exclusion

¹⁵Given the seesawing performances of some European regions, it would be more instructive to link the Medieval institutional revolution to the development of each cell averaged over a longer spell of time, e.g., a century. Unfortunately, the only proxies for $Y_{i,c}$ in equation (1) at the regional level are those I consider.

¹⁶Failing to account for these confounding factors makes the estimates more noisy (see the Internet appendix).

restriction is that in the population $Cov(\epsilon_{i,c}, T_{i,c}) = Cov(\epsilon_{i,c}, R_{i,c}) = Cov(\epsilon_{i,c}, I_{i,c}) = 0$.

In judging the adequacy of this strategy, the drawbacks and merits of alternative approaches should be considered. First, using past institutions as excluded instruments does not unbundle present-day institutions because of the commitment dimension of cultural accumulation. As Boranbay and Guerriero (2013) show, there is a strong correlation between the diffusion of Western monasticism and the inclusiveness of political institutions in the Middle Ages since cultural accumulation by the population served as a commitment device when the value of investments fell and so the elite wanted to repeal political concessions, i.e., Franciscans' spread following the opening of the Atlantic routes. Thus, the stickiness of institutions produces first-stages that are not distinct. Even worse, they are also weaker than those detailed in equation (2) since past institutions are measured with error. Accordingly, this different approach delivers estimates that are similar but more noisy than those discussed below (see the Internet appendix). Second, there could be a non zero correlation among $\epsilon_{i,c}$, $\omega_{i,c}$, and $\nu_{i,c}$. Thus, I compare the 2SLS results with those obtained estimating equations (1) and (2) as a system by three-stage least squares—3SLS from here on.

2.5 The Geographic Determinants of Institutions

Building on the aforementioned historical events, Boranbay and Guerriero (2013) study accumulation of culture and democratization in a simple and yet general society. Formally, “citizens” and “elite” members either share risk with any other individual or invest with a member of a different group. The inherent differences between these activities discriminate between a more fundamental form of cooperation aimed at hedging against consumption shocks and one directed towards surplus formation, e.g., long-distance trades. First, each group costly instills into its members a psychological gain from cooperating, for instance, by attracting a monastic order. This implicit reward substantiates culture. Second, the elite decides whether to introduce democracy or preserve autocracy. Democracy allows the citizens to fix the share of investment value to be spent on the production of a public good and its type, whereas autocracy gives this right to the elite. Third, agents are randomly matched and the elite selects the activity if she meets a citizen. Finally, taxation and public good production possibly follow investment. The investment value and the risk-sharing

payoff are shaped by activity-specific exogenous factors—e.g., geography, and heterogeneity in the abilities to produce the public goods and in the preferences for them renders investment infeasible under autocracy. In equilibrium, a rise in the investment value encourages the elite to expand democracy so that the credible prospect of redistribution incentivates the citizens to cooperate. In addition, accumulation of culture increases with the forces aggravating consumption risk if they are not too strong and so cheating is not too appealing.

Consistent with this prediction, culture over the 1000-1600 period and its present-day counterpart are stronger in the regions where it was more necessary to cope with consumption risk because of the higher but never extreme climate volatility (Durante, 2010; Boranbay and Guerriero, 2013).¹⁷ On top of this evidence, I elect as instrument for *Culture* the standard deviation of the spring-summer temperature over the period 1000-1600 in Celsius, i.e., *Temperature_SD-M*. The raw data are collected from Guiot et al. (2010) and cover most of Europe at five degrees spatial resolution for all the years between 600 and 2000.¹⁸ Each observation is derived, through a process of “reconstruction,” from a multiplicity of indirect proxies such as tree-rings, ice cores, pollens, and indexed climate series based on historical documents. To the best of my knowledge, this dataset is currently the only one estimating the European climate before 1500 at the grid level. If grid i belongs to multiple climatic cells, I assign this grid a figure equal to the average of the values Medieval climate volatility assumes in each represented cell weighted by the cell’s relative contribution to grid i ’s land area. Allowing clustering by country to account for the within-country correlation in the error term produced by the climate data resolution implies similar second-stages but weakens the first-stages (see the Internet appendix). The same happens when I deal with generic spatial dependence in the error term by relying on the Conley (1999) standard errors (see the Internet appendix). Higher resolution gridded data on temperature and rainfall have

¹⁷Medieval climate volatility squared is not significantly related to culture (Boranbay and Guerriero, 2013).

¹⁸Because of data availability (To have sufficient within variation), I exclude from the sample the Canarias and part of Castilla y León, Galicia, Ireland, Portugal, and Scotland (Andorra, Gibraltar, Luxembourg, Malta, and San Marino). Both choices have no relevant impact on the estimates. Finally, I do not consider the Scandinavian countries and the European countries east of Poland and Slovakia and south-east of Hungary and Slovenia even if all covered by the Guiot et al.’s (2010) cells for two reasons. First, there are insufficient data on the rest of the Medieval historical polities to which these countries belonged (Boranbay and Guerriero, 2013). Second, Western monasticism did not spread in these regions because of either a too erratic climate (Boranbay and Guerriero, 2013) or the opposition of the Orthodox Church [Tobin 1995, p. 144].

been devised for the post-1500 period building mainly on instrumental sources (see Durante, [2010]). These series however are much less accurate than reconstructed data in describing the climate changes preceding 1800 because of the scarceness of climate stations operative at the time (Guiot et al., 2010). Thus, these data cannot be incorporated in the analysis.¹⁹

The exposition so far reveals that the single and most relevant dimension that could undermine the exclusion restriction is the persistent impact of the development and, in particular, of the technological progress that was triggered, together with institutional discontinuities, by Medieval geography. To elaborate, since *Temperature_SD-M* is related to early economic success through agricultural productivity and the diffusion of the technological discoveries introduced by Western monasticism, it might directly affect present-day outcomes if the innovation it shaped had enduring consequences. Even if this occurrence seems unlikely given the intrinsically Malthusian structure of Medieval economies (Galor, 2011) and the limited importance of the primary sector in the sample,²⁰ I explicitly consider proxies for Medieval farming innovations and show that none of them has any impact on present-day economic development. Conditional on these observables, country fixed effects, present-day geography, intermediate outcomes, and factors modulating the role of institutions, it is extremely difficult to envision that the climate volatility of more than four centuries ago affects present-day regional performances through a channel other than a culture of cooperation.

Boranbay and Guerriero (2013) also show that between 1000 and 1600 reforms towards tighter constraints on the elite’s power were mostly driven by the factors shaping the value of farming and long-distance trade investments. For what concerns the former, the central driver of the Medieval agriculture revolution was the adoption of the heavy plow, which required as many as eight oxen to pull it and forced the peasants to combine their ox teams and split their lands into interspersed strips to ensure that everyone got some land plowed (Slocum, 2005). As a result, the elite’s prospective returns from such a complex investment were higher the more difficult were its monitoring and the plowing itself (see for a similar argument Fleck and Hanssen, [2006]). Consistent with this view, one of the first and most

¹⁹The average volatility over the 16th century of the Luterbacher et al.’s (2004) measure of the growing season temperature, which is estimated building on instrumental data, is nine times bigger than that of the Guiot et al.’s (2010) reconstructions, which are instead tailored to preserve a meaningful comparison over time.

²⁰The share of active population employed in the primary sector between 2002 and 2008 was 6% (see table 2).

notable episodes of democratization in the sample was Peter II of Aragon’s attempt to bolster olives production by the difficult-to-reach Pyrenean communities by granting them communal privileges [Orvietani Busch 2001, p. 66-80]. Building on these observations, I employ as second excluded instrument the terrain ruggedness in km, i.e., *Ruggedness*. This is retrieved from the G-Econ dataset, which is in grid format and covers the globe at one degree spatial resolution. Turning to long-distance trade investments, their value was significantly higher if a direct access to the coast was available being terrestrial movements heavily regulated in the Middle Ages (Brady, Oberman, and Tracy, 1994). Thus, my third excluded instrument is a dummy for direct access to the Mediterranean or the Atlantic Ocean, i.e., *Coast*.

Since *Ruggedness* and *Coast* are related respectively to Medieval farming and long-distance and in particular Atlantic trades, they might affect present-day economies if the progress they fostered had long-lasting effects. Below, I control for Medieval farming innovations and the relevance of Atlantic trades and show that none of these factors has a permanent role in the sample. Conditional on these features, country fixed effects, present-day geography, intermediate outcomes, and factors modulating the role of institutions, *Ruggedness* and *Coast* should have no impact on *Income* through a channel other than *Democracy*.

A comparison between the two upper (bottom) maps of figure 2 and the central (right-most) map of figure 3 plus the estimates listed in table 3 confirm that the results got by Boranbay and Guerriero (2013) hold here as well. Both past institutions and their determinants are powerful drivers of present-day institutions.²¹ Not only do all the coefficients reflect the theoretical predictions, but geography enters the first-stages in a nice separable way whereby the factor driving the risk-sharing needs shapes mostly current culture, whereas the forces determining the value of investments drive mainly current political institutions.

2.6 Confounding Factors

To assure that the exclusion restriction holds, I include into $\mathbf{X}_{i,c}$ not only the alternative channels through which the excluded instruments could shape *Income*, but also those determinants of development either driven by or affecting institutions. Including these last two

²¹While a series of recent theoretical papers has clarified that cultural norms inherited from earlier generations deeply shape the prevailing culture (see Tabellini, [2008]), an expanding body of empirical contributions has highlighted the persistence of political infrastructures (Acemoglu, Johnson, and Robinson, 2001).

sets of covariates helps me assess the effective magnitude of the role of each institution.

Starting with the other channels through which the excluded instruments could affect present-day outcomes, I consider one variable gaging the possibly persistent impact of Medieval farming innovations, one capturing the possibly long-lasting role of Atlantic trade, one accounting for both, and the geographic features most relevant for present-day farming and shipping activities. The first of these covariates is the employment share in agriculture and fishing averaged between 2002 and 2008 and collected at the NUTS 2 regional level by the Regio project, i.e., *Primary-Sector*. Since it is conceivable that Medieval climate variability has influenced the patterns of sectoral specialization and, within agriculture, the relative success of crops with different weather sensitivity, including *Primary-Sector* into $\mathbf{X}_{i,c}$ picks this channel. Measures of the relevance of Atlantic trade can be obtained building on Acemoglu, Johnson, and Robinson (2005). In the following, I employ the number of Atlantic ports between 1500 and 1850 in the grid, i.e., *Atlantic-Trade*. Yet, the essence of my empirical results will be the same should I turn to: 1. the number of potential Atlantic ports between 1500 and 1850; 2. the natural logarithm of voyages per year equivalent or the share of total Atlantic trade from the Atlantic ports in the polity to which the grid's belonged averaged between 1500 and 1850. The last variable I consider is the natural logarithm of the population per square kilometer averaged over the cells used in Goldewijk et al. (2011) and the 1000-1600 period, i.e., *LPD-M*. Since in the Malthusian epoch urbanization corresponded to development (Galor, 2011), *LPD-M* picks the remainder possible effects of farming innovations and long-distance trades. I will obtain similar results should I instead measure past outcomes with the natural logarithm of either the urbanization rate or the population again retrieved from Goldewijk et al. (2011) and averaged between 1000 and 1600.

I summarize the geography affecting the most modern farming and shipping sectors with the temperature in degree Celsius—i.e., *Temperature*—and the precipitation in ml—i.e., *Precipitation*—both averaged between 1961 and 1990, the land quality for agriculture defined as the probability that a particular grid may be cultivated as determined by the climate and the land organic content—i.e., *Land-Quality*, and the average distance to the coast in km in the grid, i.e., *Distance-to-Coast*. All these measures except *Land-Quality*, which is averaged over the 60km $\times$ 60km cells used in the Atlas of the Biosphere, are collected from the G-

Econ dataset. While the first three features capture the regional suitability for agriculture (Michalopoulos, 2012), the last one gages the present-day relevance of the sea as a means of exchange since, in Europe, terrestrial movements are free nowadays but, as seen above, were restricted in the Middle Ages. Together the four variables exclude that Medieval geography affects present-day development through its stickiness. I get similar estimates if I also take into account the standard deviation of the temperature (precipitation) in degree Celsius (mm) averaged over the 1961-1990 period, the standard deviation of the land quality for agriculture, and the land area of the grid (see Internet appendix). These characteristics could affect *Income* by modulating the extent of ethnic diversity (Michalopoulos, 2012).

Two are the intermediate economic outcomes that are mostly likely affected by Medieval institutions. First, the micro-credit activities introduced by the Franciscans have possibly shaped present-day regional financial markets. Accordingly, I consider the 2000 real capital stock per capita, in millions of euro, estimated at the NUTS 2 regional level by Derbyshire, Gardiner, and Waights (2013), i.e., *Real-Capital*. By including this proxy, I also deal with the possibility that more politically autonomous regions have received more transfer payments from the central government (Tabellini, 2010). Second, the diffusion of the Cistercians and Franciscans could have modulated the intensity of Catholic beliefs and, thus, influenced the economy in ways different from those discussed above (see McCleary and Barro, [2006]). Therefore, I also incorporate into the analysis *Catholicism*, which is the share of respondents to the 2008 European Value Study declaring themselves Roman Catholic who answered “very important” to the question “how important is religion in your life?” (GESIS, 2008).

For what finally concerns those dimensions shaping the role of institutions, I focus on the six factors that have received the closest attention by the most recent literature (see for a review Olsson and Paik, [2014]). First, Becker and Woessmann (2009) argue that the distance to Wittenberg, the place of origin of Protestantism, is a strong predictor of the regional prevalence of Protestantism within Europe and, in turn, of work ethic and human capital. Second, Hansen, Jensen, and Skovsgaard (2013) and Olsson and Paik (2014) claim that, in societies that made an early transition to agriculture in the Neolithic, the persistence of more patriarchal values has respectively determined a higher inequality in gender roles and delayed the adoption of more inclusive political institutions. To test this aspect, I evaluate the

average time since agricultural transition in the cell calculated exploiting calibrated carbon dates from various Neolithic sites gathered by Pinhasi, Fort, and Ammerman (2005), i.e., *Neolithic*. Third, Ashraf and Galor (2013a; 2013b) empirically establish that the extent of genetic diversity within a country, as driven by the migratory distance from East Africa, has an inverted U-shaped relationship with development, a negative effect on generalized trust, and a positive one on conflicts and ethnolinguistic and, in general, cultural fragmentation. Since country-specific genetic diversity is absorbed by the fixed effects, I focus on the Homo Sapiens' exodus out of Africa by including into the specification the migratory distance from Addis Ababa to the centroid of each grid, i.e., *Migratory-Distance*.²² Fourth, Iyigun, Nunn, and Qian (2014) argue that the soil suitability for potato—i.e., *Potato*—has modulated Medieval conflicts in Europe. The raw data are in grid format, cover the entire World at 0.5 degree spatial resolution, and were estimated by the GAEZ project. Fifth, Voigtländer and Voth (2009) put forward the idea that the mortality rates due to the Black Death affected both the marriage patterns and the incentive to trade so that the mostly damaged European regions could consequently escape the Malthusian trap. To shed more light on this issue, I control for the mortality rate from Black Plague in the general population between 1346 and 1353 estimated at the regional level by Benedictow (2004), i.e., *Black Death*. Finally, a growing body of research prompts that institutions are affected by education, which also directly determines economic growth (Tabellini, 2010; Gennaioli et al., 2013). To avoid that $C_{i,c}$ and $D_{i,c}$ absorb the variation in education, I consider *Human-Capital*, which is the percentage of the population aged 20-24 enrolled in tertiary education averaged between 2002 and 2009 and available at the NUTS 2 level from Eurostat.

3 Culture Versus Political Institutions

A glance at figures 2 and 3 already reveals the main result of the paper. The regional pattern of present-day per capita output in the leftmost map of figure 3 is strikingly similar to that of present-day culture in the upper right map of figure 2 and that of past climate volatility in the central map of figure 3. Northern Italy, Western France, and Northern Spain

²²To capture paleontological and genetic evidence on prehistoric human migration patterns, I always consider Cairo and Istanbul as obligatory intermediate stages (see Ashraf and Galor, [2013a]).

enjoy a higher development, display stronger norms of trust and respect, and experienced fiercer Medieval climate shocks than the rest of the sample. Instead, Czech Republic, Eastern Poland, and Portugal are marked by low values of all three variables. The correlation among economic outcomes, culture, and Medieval climate volatility is however imperfect. England is one of the most culturally and economically advanced European regions but did not face heavy climate shocks during the Middle Ages, whereas Southern Spain possesses low values of both *Income* and *Temperature_SD-M* but quite a strong culture of cooperation. On the contrary, the relationship among *Ruggedness*, *Coast*, *Democracy*, and *Income* is less clear-cut. Although graphical comparisons are instructive, multivariate analysis is more convincing.

3.1 Main Results

Table 4 reports the OLS, 2SLS, and 3SLS estimates of the different specifications of equation (1). A comparison between columns (1) and (2) suggests that OLS underestimate the impact of culture on per capita income. In fact, switching from OLS to 2SLS increases the coefficient on *Culture* from 0.225 to 0.874. On the contrary, the coefficient on *Democracy* is very similar in columns (1) and (2). This evidence is consistent with the idea that while culture is measured with error, more inclusive political institutions could be driven by better economic outcomes as suggested by the modernization theory (Lipset, 1959). The estimate of β_0 in column (2) is significant at 1% and implies that a one-standard deviation improvement in *Culture*—i.e., 0.29—will lead to a 25% rise in present-day GDP per capita and that moving from the lowest level of the proxy for culture—i.e., -0.87 in the Balearic Islands—to its mean will increase *Income* by 78 percentage points. In contrast, the coefficient on *Democracy* in column (2) is not statistically significant. The two upper (bottom) scatter plots in figure 4 display graphically the OLS (2SLS) estimates in column (1) (column (2)) clearly highlighting that they are not driven by a handful of abnormal observations.

3.2 Robustness and Sensitivity Checks

The basic estimates suggest that culture has a first-order effect on income per capita, whereas the impact of more inclusive political institutions albeit positive is economically small and statistically insignificant. This is consistent with an expanding empirical literature concluding that the average effect of democracy on economic performance is at most weak

(see Glaeser et al., [2004]; Persson and Tabellini, [2009]; and for a different view Acemoglu et al., [2014]). Next, I illustrate a number of robustness and sensitivity checks.

3.2.1 Controlling for Observables

The remainder of table 4 prompts the following observations. First, the significant coefficient on *Culture* is not driven by either the persistent role of Medieval innovations—i.e., farming progress and Atlantic trades—or the correlation between the excluded instruments and the geography relevant for present-day farming and shipping sectors (see columns (3) to (6) of panel A and columns (1) and (2) of panel B). Crucially, none among the proxies for Medieval innovations is significant in the specifications controlling for all the observable confounding factors (see columns (7) to (9) of panel B). This is consistent with both the limited relative importance of agriculture in present-day economies and recent evidence suggesting that the experience of more inclusive Medieval political institutions has often curbed instead of favoring present-day prosperity. In particular, Grafe (2012) shows how in early modern Spain the peripheral regions home of the autonomous Medieval polities obstructed both state formation and market integration to safeguard their own commercial interests. Second, the proxy for culture is not simply picking differences in either financial development or Christian religious beliefs (see columns (7) and (8) of panel A). As expected, financial development is a key mechanism through which culture fosters economic growth. Third, except *Wittenberg* none of the factors modulating the functioning of permanent institutions modifies in any sizable manner the basic evidence. Fourth, conditional on all the confounding factors, *Culture* preserves its preponderance and high statistical significance, the overidentifying restrictions cannot be rejected at 63%, and the Anderson canonical correlations (Angrist-Pischke F) test rejects that equation (1) is underidentified (any endogenous variable is unidentified) at 2% (2% or better).²³ This time, a one-standard deviation rise in the strength of a culture of cooperation—i.e., 0.27—will imply an 11.4% improvement in present-day GDP per capita (see column (8) of panel B). Finally, the 3SLS estimates are fully consistent with their two-step counterparts (see columns (8) and (9) of panel B). Taking stock of this evidence, it is fair to claim that there is little doubt that the exclusion restriction holds.

²³With multiple endogenous regressors, it makes little sense to judge underidentification from the size of the F-test since each instrument is called upon to play a role in each first-stage (Angrist and Pischke, 2008).

3.2.2 Semi-Reduced-Form

The validity of the exclusion restriction is also confirmed by the semi-reduced-form estimates (see table 5). Here, I explicitly address the potential concern that even conditional on observables the excluded instruments might be affecting the economy through channels other than permanent institutions. In column (1) (column (2)), *Culture* is conditioned on all the observables and instrumented by *Temperature_SD-M* and *Coast* (*Temperature_SD-M*) but *Ruggedness* (*Ruggedness* and *Coast*) enters (enter) the second-stage regression directly and is (are) also included in the first-stage regression. The estimated effect of *Culture* has about the same magnitude as in column (8) of panel B of table 4 and it is always significant at 1%, whereas both *Ruggedness* and *Coast* are not significant. In addition, both the underidentification tests and the Sargan statistic support the identification strategy at the usual significance level. In column (3) (column (4)), *Democracy* is conditioned on all the observables and instrumented by *Ruggedness* and *Coast* (*Ruggedness*) but *Temperature_SD-M* (*Temperature_SD-M* and *Coast*) enters (enter) the second-stage regression directly and is (are) also included in the first-stage regression. Crucially, *Democracy*, *Temperature_SD-M*, and *Coast* have no significant effect on economic development in column (4).

3.2.3 Pairwise Analysis of Adjacent Grids

In spite of employing a rich conditioning set, one may still be worried that some unobservable feature is driving the results. To tackle this issue, I focus on contiguous grids with different Medieval climate volatility to confirm that the link between culture and development survives even conditional on all unobserved features specific to the relevant 120km × 240km dyads (see also Michalopoulos and Papaioannou, [2013]). This exercise cannot be tailored to contrast culture and democracy, but it is naturally fitted to confirm the casual impact of culture. Operationally, I first identify contiguous grids falling in the same country whose difference in *Temperature_SD-M* is at least 0.01 Celsius.²⁴ When one of these grids is adjacent to more than one other grid with different *Temperature_SD-M*, I include all pairs. Next, to avoid that the results are driven by redistribution towards the country administrative center or by pairs with very diverse land area, I exclude the grids to which the national

²⁴This is the first quartile of the strictly positive differences in *Temperature_SD-M* between contiguous grids. The gist of this section will be the same should I use as threshold either the second or the third quartile.

capitals belong and those with a land area lower than 200 square kilometers. This procedure leaves me with 204 pairs of grids. I run second-stage regressions of the form

$$Y_{i(j),c} = \alpha_{i(j),c} + \beta_1 C_{i,c} + \mathbf{X}'_{\mathbf{i},c} \delta_{\mathbf{3}} + \epsilon_{i(j),c}, \quad (3)$$

where $Y_{i(j),c}$ is *Income* in grid i of country c that is adjacent to grid j of the same country c with grid i and j differing in their *Temperature_{SD-M}* values. Since I am now including country-specific, grid-pair fixed effects $\alpha_{i(j),c}$, the coefficient on a culture of cooperation, β_1 , captures whether differences in Medieval climate volatility translate into differences in GDP per capita through culture within pairs of contiguous grids in the same country conditional on the rich set of observables contained in $\mathbf{X}_{\mathbf{i},c}$ and unobserved grid-pair specific features like other geographic features, natural resources, and local persistent beliefs.

Table 6 reports the results of the contiguous-grid analysis. First, *Temperature_{SD-M}* is always a strong predictor of *Culture*. Second, taking into account the correlation between the error terms in the first and second stages, *Income* is significantly higher in the grids that display stronger norms of trust and respect today because they experienced a more erratic climate during the Middle Ages even after partialling out all the observable confounding factors and unobserved grid-pair specific features (see column (9) of panel B). A one-standard deviation rise in *Culture*—i.e., 0.24—will lead to an almost 11% increase in *Income*. Finally, for the same specification I cannot reject the overidentifying restrictions at the 58%.

3.2.4 Falsification Test

Consistent with the first- and second-stages results reported in tables 4 to 6, there is a positive and significant link between Medieval climate volatility and present-day income and, in particular, the estimated OLS coefficient equals 1.407 with a t-statistic of 9.10 for the sample used in column (2) of table 4 (see left graph of figure 5). Populations that were more exposed to the risk of harvest destruction accumulated a stronger culture of cooperation, and today their descendants are more cooperative and richer. My identification strategy rests on the assumption that risk-sharing-driven cultural accumulation is the only channel through which Medieval climate volatility affects current outcomes. If this is true, then a positive relationship between the volatility of the growing season temperature during the 1000-1600

period and present-day income should not exist where the cost of accumulating culture was prohibitive because of the opposition to Western monasticism. This was the case of Turkey where first the East-West Schism of 1058 and then the rise the Ottoman empire arrested the expansion of both the Cistercians and Franciscans [Tobin 1995, p. 144]. In particular, the Eastern Orthodox church steadily upheld the idea that monks should embrace an ascetic life shying away from any involvement with the worshipers' life (Stearns, 2001).²⁵

To test whether there is no reduced-form relationship between Medieval climate volatility and present-day economic outcomes in Turkey, I first divide its surface into 117 one degree grids. Next, I construct for this sample the variable *Temperature_SD-M* and the natural logarithm of the 2009 GDP per capita from the same sources used above. Finally, I condition the two variables on both the latitude and longitude of the centroid of the grid. As clearly revealed by the right graph of figure 5, there is a negative and insignificant relationship between Medieval climate volatility and present-day income per capita in Turkey. In fact, the estimated OLS coefficient equals -1.643 with a t-statistic of -1.52.

4 Inside the Black Box

The evidence so far establishes that a culture of cooperation has a first order effect on long-run economic development, whereas the inclusiveness of political institutions does not play a relevant role. What could be the micro-mechanisms justifying this pattern? While an exhaustive answer to this question is beyond the scope of the present paper, in this section I exploit data on the misbehaviors of the members of the House of Representatives of the Italian Parliament gathered by Chang, Golden, and Hill (2010) to substantiate the idea that culture but not democracy is necessary to produce public-spirited politicians and push voters to punish political malfeasance. Ideally, this test would need data on the misbehaviors of all regional representatives in the sample. Yet, it is extremely hard to identify comparable measures of misbehaviors across NUTS 2 regions. Focusing instead on Italian Parliament members has several major advantages. First, it is available an extremely homogeneous and precise measure of political malfeasance. Second, more inclusive regional institutions

²⁵Van Der Meer (1965) (Moorman, 1983) reports only one (six) Cistercian (Franciscan) house(s)—i.e., Istanbul (Beyoğlu, Istanbul, Izmir, Samsun, Sinop, and Trabzon)—active over the 1000-1600 period.

should strengthen the voters' incentive to monitor all their representatives and not only the regional ones. Third, autonomous regions are typically run by region-specific parties, which usually obtain also the majority of regional preferences at national elections. For instance, since 1945, the Südtiroler Volkspartei has represented the interests of Ladin minorities and gained about two-thirds of the preferences in both regional and national elections held in the province of Bolzano.²⁶ Finally, Italy provides large variation in the strength of a culture of cooperation, the inclusiveness of regional political institutions, and geography both across Northern and Southern regions and within the two clusters (see figures 2 and 3).²⁷

I rely on data from the first to ninth legislatures elected between 1948, year of the first parliamentary election of the Italian Republic, and 1987, last year in which the members of the Parliament enjoyed immunity from criminal prosecution,²⁸ for 31 of the 32 electoral districts existing at the time. Data for the 31st district of Sardinia are unavailable. Typically these districts group several NUTS 3 Italian units, i.e., *province*. After having dropped politicians with missing values, the total number of observations is 5,755. Immunity could be waived by a vote of Parliament, at the request of the prosecutor. The prosecutor's request to continue with her/his criminal investigation—i.e., *Richiesta di Autorizzazione a Procedere* or RAP from here on—typically received a lot of attention from the media (Nannicini et al., 2013). Accordingly, I use as main measure of misbehaviors a binary turning on whenever the politician received a request by the prosecutor for removal of parliamentary immunity because suspected of a crime, i.e., *RAP*. Since not all alleged criminal offenses were actually very serious, I show in the Internet appendix that the core of my analysis will be the same should the measure of misbehaviors be a dummy turning on only for RAP triggered by more serious crimes like corruption, private interest in official duties, racketeering organization, fraud, and violence, i.e., *Serious-RAP*. By definition, a RAP is an allegation of malfeasance, rather than a conviction, and as such it could also capture judicial zeal and prejudice. Yet, members of Parliament could receive a RAP from any Italian tribunal and at the provincial

²⁶See http://it.wikipedia.org/wiki/Categoria:Elezioni_regionali_in_Trentino-Alto_Adige

²⁷Focusing on the excluded instruments, the standard deviations of *Temperature_SD-M*, *Ruggedness*, and *Coast* within the Northern (Southern) regions are respectively 0.04 (0.08), 0.11 (0.09), and 0.50 (0.41).

²⁸Following the scandals that destroyed the major political parties, the XI legislative term opened the so-called *Second Republic*. Nannicini et al. (2013) also present two measures of political misbehaviors for this period, i.e., the absenteeism rate and the politician's propensity to propose laws targeted to local constituencies. I do not consider these two conducts because much less disruptive and publicized than those eliciting a RAP.

level *RAP* is strongly correlated with a measure of corruption based on the extent of missing infrastructures in public works in the 1990s (Chang, Golden, and Hill, 2010).

Nannicini et al. (2013) propose a model implying that a larger fraction of civic voters discourages moral hazard by politicians. Moreover, a stronger culture of cooperation produces representatives who are less opportunistic and more likely to internalize social welfare. Finally, immoral politicians might self select in low culture districts in search of a lenient electorate. A more inclusive political process, instead, can produce more information on the behaviors of politicians but is irrelevant if voters are not morally compelled to use it and politicians are inconsiderate (Boix and Posner, 1998). Therefore, I expect that only culture is significantly associated with lower values of *RAP*. A glance at figures 2 and 4 already confirms this idea whereby representatives elected in districts in which culture is weaker are more likely to receive both types of criminal prosecutions, and those elected in autonomous regions do not seem to be more virtuous than an average Italian politician.

4.1 Empirical Strategy and Main Results

Turning to multivariate analysis, I add to the specification proposed by Nannicini et al. (2013) the variable *Democracy* running as a result second-stage regressions of the type

$$M_{p,d,t} = \kappa_t + \beta_2 C_d + \gamma_1 D_d + \mathbf{X}'_d \delta_4 + \mathbf{Z}'_{p,d,t} \chi + \xi_{p,d,t}, \quad (4)$$

where $M_{p,d,t}$ is *RAP* for politician p elected in the electoral district d and measured during the legislature t .²⁹ The excluded instruments for C_d and D_d are *Temperature_SD-M*, *Ruggedness*, and *Coast*. The legislature fixed effects κ_t account for aggregate legislative term shocks, whereas the vector $\mathbf{Z}_{p,d,t}$ gathers individual characteristics like age, education, political experience, and region of birth dummies.³⁰ Finally, $\mathbf{X}_d$ pools the other controls discussed above except *Latitude* and *Longitude* to avoid collinearity with the region of birth dummies.

²⁹Switching to an instrumental variables probit estimator is not feasible since the routine maximizing the relative likelihood function often fails to converge.

³⁰To be precise, $\mathbf{Z}_{p,d,t}$ gathers the member of Parliament's years of schooling, tenure in legislative terms, age, and age squared in years, whether she/he was a minister or vice-minister, whether she/he had previous government experience at the local level, whether her/his previous parliamentary tenure is zero, whether she/he was part of the government coalition, job dummies—i.e., lawyer, executive, politician, entrepreneur, and teacher, legislative term dummies, and region of birth dummies (see for details Nannicini et al., [2013]).

To match data measured at the NUTS 2 unit (cell) level to districts, I construct averages weighted by each represented unit's (cell's) relative contribution to the district's land area.

The estimates in table 7 reveal that the incidence of RAP is significantly lower in districts in which internalized norms of trust and respect are stronger but not in those historically characterized by more inclusive political institutions. According to columns (7) and (8) of panel B, an increase in *Culture* equal to its standard deviation—i.e., 0.19—will reduce the incidence of receiving a RAP by about 20 percent and moving from the lowest level of culture—recorded in Puglia—to the highest level of culture—observed in Emilia Romagna—will decrease the expected value of *RAP* by about 61 percent.³¹ Once again, the consistency of the estimates is confirmed by the underidentification tests and the Sargan statistic.

I interpret this evidence as supporting the notion that my measure of culture and the sources of variation I exploit are related to the willingness of voters to punish their representatives and to the politicians' morality. Since political accountability constitutes the key instrument through which society can curb the risk of expropriation by politically powerful elites and assure that taxation is transformed in public goods, this mechanism also represents a crucial channel through which a culture of cooperation shapes economic activities.

5 Concluding Comments

Overwhelming evidence suggests that a culture of cooperation and inclusive political institutions foster development and are correlated with past experiences of an inclusive political process. Yet, showing that the two types of institutions reinforce one another and are persistent does not help in identifying their separate roles. This paper tackles this issue by exploiting exogenous variation created at the European regional level by Medieval history.

I divide Europe into 120km $\times$ 120km grids and proxy culture with measures of self-reported trust and respect for others and the inclusiveness of the political process with the sum of the Polity IV's constraint on the executive score and an index gaging the political autonomy from the central government of the NUTS 2 regions in the sample. Next, I show that Medieval history induces strong and distinct first-stages between past climate volatil-

³¹A concern with these estimates is that culture discourages criminal prosecution through the behaviors of the judiciary, rather than those of voters. As underlined by Nannicini et al. (2013), this is not very likely since the presence of more zealous judges in high-culture districts might actually increase the likelihood of RAPs.

ity and present-day culture on the one hand and between past investment-specific factors and present-day political institutions on the other hand. Using this instrumental variables strategy, I document that only culture has a major influence on development even after controlling for country fixed effects, Medieval innovations, present-day geography, intermediate outcomes, other norms of conduct, and factors modulating the role of permanent institutions.

To identify a possible channel of causality, I test the idea that more inclusive political institutions facilitate the monitoring of politicians by voters but are irrelevant if citizens are not morally compelled to punish political malfeasance or if politicians have weak civic virtues. In particular, I show that there are considerably fewer criminal prosecutions of Italian Parliament members in electoral districts in which culture is stronger but not in districts endowed with more inclusive political institutions. The former are also the districts witnessing a harsher electoral punishment of the incumbent's misbehavior (Nannicini et al., 2013). The role of culture in strengthening political accountability points to a key channel through which it also shapes contract enforcement and property rights protection. This is only one possible mechanism inducing the primacy of culture, and more work is needed to characterize the different conduits through which institutions affect the economy.

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Figures and Tables

Figure 1: Unbundling Formal and Informal Institutions — Conceptual Framework
11th - 16th Centuries Present-day

Table 1: Historical Polities

GENOA: Italy (<i>Liguria</i>); France (<i>Corse</i>). HOLY ROMAN EMPIRE: Austria (<i>Styria, Tyrole</i>); Belgium (<i>Région Bruxelles, Région Wallonne</i>); Germany (<i>Baden-Wuerttemberg, Bayern, Brandenburg, Bremen - Hamburg - Niedersachsen, Hessen, Mecklenburg - Vorpommern, Nordrhein - Westfalen, Rhainland-Pfalz-Saarl, Sachsen, Schleswig-Holstein, Thuringen-Sachsen-Anhalt</i>); Slovenia (<i>Carniola, Styria</i>). KINGDOM OF BOHEMIA: Czech Republic (<i>Eastern Czech Republic, Western Czech Republic</i>); Poland (<i>Western Poland</i>). KINGDOM OF PORTUGAL: Portugal (<i>Alentejo, Algarve, Centro, Norte</i>). KINGDOM OF SICILY: Italy (<i>Abruzzo - Molise, Basilicata - Campania, Calabria, Sicilia</i>). KINGDOM OF TUSCANY: Italy (<i>Toscana</i>). PAPAL STATE: Italy (<i>Emilia-Romagna, Lazio</i>). PROVINCES: Netherlands (<i>Noord Nederland - Groningen, Oost Nederland, West Nederland, Zuid Nederland</i>). REIGN OF ENGLAND: Ireland (<i>Eastern Ireland, Western Ireland</i>); UK (<i>East Anglia - London, East Midlands, North-Eastern UK, North-Western UK, Northern Ireland, Scotland, South-Eastern UK, South-Western UK, Wales, West Midlands, Yorkshire - Humberside</i>). REIGN OF FRANCE: Belgium (<i>Vlaams Gewest</i>); France (<i>Eastern France, Ile De France, Mediterrean France, Northern France, Paris Basin, South-Eastern France, South-Western France, Western France</i>). REIGN OF HUNGARY: Hungary (<i>Central Hungary, Styria-Hungary, Western Hungary</i>); Slovakia (<i>Eastern Slovakia, Western Slovakia</i>). REIGN OF POLAND: Poland (<i>Eastern Poland, Northern Poland, Southern Poland</i>). REIGN OF SPAIN: Spain (<i>Andalucia, Aragon, Asturia-Cantabria, Baleares, Castilla-La Mancha, Castilla y León, Cataluna, Comunidad Valenciana, Extremadura, Galicia, Madrid, Murcia, Navarra - Rioja, Pais Vasco</i>). SARDINIAN GIUDICATI: Italy (<i>Sardegna</i>). SAVOY: Italy (<i>Piemonte - Valle D'Aosta</i>). STATE OF MILAN: Italy (<i>Lombardia</i>). SWISS CANTONS: Switzerland (<i>Northern Switzerland, Southern Switzerland</i>). VENICE: Italy (<i>Friuli-Venezia Giulia - Trentino-Alto Adige - Veneto</i>).

Note: 1. The names of the historical polities are in capital letters, those of the regions constructed by Boranbay and Guerriero (2013) are in Italic lowercase, and those of the present-day countries to which these regions belong are in regular lowercase.

Table 2: Summary of Variables

	Variable	Definition and Sources	Statistics
Economic outcomes:	<i>Income:</i>	Natural logarithm of the annual GDP per capita in euro averaged over the NUTS 2 regions to which the grid belongs and the 2002-2009 period. Source: Eurostat, available at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/	9.837 (0.545)
	<i>Culture-M:</i>	See text. Source: Van Der Meer (1965) and Moorman (1983).	0.004 (0.012)
Institutions:	<i>Culture:</i>	See text. Source: European Value Study, GESIS (2008).	0.018 (0.289)
	<i>Democracy-M:</i>	“Constraint on the executive” score averaged over the historical regions to which the grid belonged and the 1000-1600 period. Source: Boranbay and Guerriero (2013).	1.841 (0.621)
	<i>Democracy:</i>	See text. Sources: Marshall and Jagers (2011) and Author’s codification.	5.982 (1.426)
Political accountability:	<i>RAP:</i>	Dummy equal to one if the Parliament received a request for removal of the politician’s immunity because suspected of a crime. Source: Chang, Golden, and Hill (2010).	0.233 (0.423)
	<i>Temperature-SD-M:</i>	Standard deviation of the growing season temperature in Celsius between 1000 and 1600 averaged over the cells used in Guiot et al (2010). Source: Guiot et al. (2010).	0.531 (0.128)
Excluded Instruments:	<i>Ruggedness:</i>	Terrain ruggedness in km. Source: G-Econ, available at http://gecon.yale.edu/	0.042 (0.200)
	<i>Coast:</i>	Dummy equal to one if the grid has a direct access to the Mediterranean or the Atlantic Ocean, 0 otherwise.	0.367 (0.482)
	<i>Latitude:</i>	Latitude of the centroid of the grid.	47.663 (5.348)
Other controls:	<i>Longitude:</i>	Longitude of the centroid of the grid.	6.986 (8.802)
Culture-related confounding factors:	<i>Primary-Sector:</i>	Share of the active population employed in agriculture and fishing averaged over the NUTS 2 regions to which the grid belongs and the 2002-2008 period. Source: Eurostat, available at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/	0.065 (0.054)
	<i>LPD-M:</i>	Natural logarithm of the population per square kilometer averaged over the cells used in Goldewijk et al. (2011) and the 1000-1600 period. Source: Goldewijk et al. (2011).	3.027 (0.933)
	<i>Temperature:</i>	Temperature in degree Celsius averaged between 1961 and 1990. Source: G-Econ, available at http://gecon.yale.edu/	10.169 (3.423)
	<i>Precipitation:</i>	Precipitation in ml averaged between 1961 and 1990. Source: G-Econ, available at http://gecon.yale.edu/	954.413 (313.521)
	<i>Land-Quality:</i>	Land quality for agriculture, defined as the probability that a particular grid may be cultivated, averaged over the cells used in the Atlas of the Biosphere, which is available at http://www.sage.wisc.edu/iamdata/	0.620 (0.200)
	<i>Real-Capital:</i>	Real capital stock per capita in 2000, in millions of euro, averaged over the NUTS 2 regions to which the grid belongs. Source: Derbyshire, Gardiner, and Waights (2013).	0.052 (0.026)
	<i>Catholicism:</i>	See text. Source: European Value Study, GESIS (2008).	0.258 (0.151)
	<i>Wittenberg:</i>	Distance to Wittenberg in km.	928.382 (521.789)
	<i>Atlantic-Trade:</i>	Number of Atlantic ports between 1500 and 1850. Source: Acemoglu, Johnson, and Robinson (2005).	0.123 (0.457)
	<i>Distance-to-Coast:</i>	Average distance to the coast in km. Source: G-Econ, available at http://gecon.yale.edu/	160.470 (158.693)
Inclusive political institutions-related confounding factors:	<i>Neolithic:</i>	Average time since agricultural transition in years. Source: Pinhasi, Fort, and Ammerman (2005).	6747.321 (657.154)
	<i>Migratory-Distance:</i>	Migratory distance from Addis Ababa to the cell in thousands of kilometers.	5.704 (0.626)
	<i>Potato:</i>	Land suitability for white potato ranging between 0 and 100 and averaged over the cells used in the GAEZ dataset, which is available at http://www.gaez.iiasa.ac.at/	26.335 (13.756)
	<i>Black-Death:</i>	Mortality rate from Black Plague in the general population between 1346 and 1353 averaged over the NUTS2 regions to which the grid belongs. Source: Benedictow (2004).	59.542 (2.999)
	<i>Human-Capital:</i>	Percentage of the population aged 20-24 enrolled in tertiary education—i.e., ISCED 5-6—averaged over the NUTS 2 regions to which the grid belongs and the 2002-2009 period. Source: Eurostat, available at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/	51.057 (15.845)

Note: 1. The last column reports the mean value and, in parentheses, the standard deviation of each variable. The statistics are computed for the sample used in tables 3 and 4 except *RAP*, which is calculated for the sample employed to obtain table 7.

Figure 2: Persistent Institutions

Note: 1. The range of each variable is divided into five intervals using the goodness of variance fit method.

Figure 3: Income and Geography

Note: 1. The range of each variable is divided into five intervals using the goodness of variance fit method.

Table 3: Persistent Endogenous Institutions

	(1)	(2)	The dependent variable is:	
	<i>Culture</i>	<i>Culture</i>	<i>Democracy</i>	<i>Democracy</i>
<i>Culture-M</i>	1.592 (0.659)**			
<i>Democracy-M</i>			0.178 (0.059)***	
<i>Temperature_SD-M</i>		0.478 (0.087)***	- 0.048 (0.291)	- 0.025 (0.294)
<i>Ruggedness</i>	0.162 (0.041)***	0.095 (0.072)	- 0.028 (0.139)	0.688 (0.242)***
<i>Coast</i>	- 0.068 (0.020)***	- 0.053 (0.020)***		0.115 (0.060)**
p-value for <i>Latitude</i> and <i>Longitude</i>	[0.00]	[0.00]	[0.00]	[0.00]
Estimation	Country fixed effects OLS			
Within R ²	0.15	0.18	0.08	0.07
Number of observations	578	578	578	578

Notes: 1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.

Figure 4: Institutions and Economic Outcomes — Partial Correlations Plots

Note: 1. Residuals and fitted values lines are obtained from regressions run on the sample used in columns (1) and (2) of table 4.

Table 4: Institutions and Outcomes — Country Fixed Effects OLS, 2SLS, and 3SLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. The dependent variable is <i>Income</i>									
<i>Culture</i>	0.225 (0.037)***	0.874 (0.155)***	0.852 (0.147)***	0.994 (0.172)***	0.779 (0.193)***	1.025 (0.154)***	0.532 (0.140)***	0.897 (0.153)***	0.582 (0.134)***
<i>Democracy</i>	0.071 (0.011)***	0.123 (0.099)	0.129 (0.096)	0.230 (0.116)**	0.112 (0.133)	0.181 (0.134)	0.099 (0.072)	0.130 (0.104)	0.186 (0.084)**
<i>Primary-Sector</i>			0.143 (0.175)						
<i>LPD-M</i>				0.062 (0.013)***					
<i>Temperature</i>					- 0.004 (0.007)				
<i>Precipitation</i>					- 0.0000 (0.0001)				
<i>Land-Quality</i>						0.246 (0.117)**			
<i>Real-Capital</i>							5.178 (1.308)***		
<i>Catholicism</i>								0.115 (0.155)	
<i>Wittenberg</i>									- 0.001 (0.0001)***
First-Stage for <i>Culture</i>									
<i>Temperature_{SD-M}</i>		0.478 (0.087)***	0.507 (0.088)***	0.472 (0.087)***	0.487 (0.086)***	0.508 (0.086)***	0.487 (0.088)***	0.485 (0.087)***	0.479 (0.087)***
<i>Ruggedness</i>		0.095 (0.072)	0.088 (0.072)	0.083 (0.073)	- 0.037 (0.088)	0.166 (0.074)**	0.061 (0.076)	0.097 (0.072)	0.088 (0.072)
<i>Coast</i>		- 0.053 (0.020)***	- 0.058 (0.020)***	- 0.054 (0.020)***	0.009 (0.024)	- 0.058 (0.020)***	- 0.050 (0.020)**	- 0.054 (0.020)***	- 0.046 (0.021)**
P-value of Angrist-Pischke F test		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
First-Stage for <i>Democracy</i>									
<i>Temperature_{SD-M}</i>		- 0.025 (0.294)	- 0.032 (0.300)	- 0.047 (0.295)	- 0.151 (0.298)	- 0.115 (0.293)	- 0.335 (0.272)	- 0.174 (0.285)	- 0.035 (0.291)
<i>Ruggedness</i>		0.688 (0.242)***	0.694 (0.244)***	0.640 (0.247)***	0.395 (0.303)	0.479 (0.250)**	0.393 (0.234)*	0.647 (0.234)***	0.755 (0.241)***
<i>Coast</i>		0.115 (0.060)**	0.118 (0.060)**	0.111 (0.067)*	0.125 (0.080)*	0.125 (0.060)**	0.237 (0.062)***	0.118 (0.060)**	0.042 (0.069)
P-value of Angrist-Pischke F test		0.00	0.00	0.01	0.06	0.03	0.00	0.00	0.01
Estimation	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Within R ²	0.14								
P-value of underidentification test		0.01	0.00	0.01	0.06	0.03	0.00	0.00	0.01
P-value of Sargan statistic		0.24	0.24	0.22	0.11	0.14	0.98	0.26	0.05
Number of observations	578	578	573	578	578	578	563	578	578
Panel B. The dependent variable is <i>Income</i>									
<i>Culture</i>	0.869 (0.144)***	0.903 (0.165)***	0.829 (0.160)***	0.916 (0.153)***	0.877 (0.157)***	0.820 (0.167)***	0.078 (0.029)***	0.424 (0.130)***	0.424 (0.129)***
<i>Democracy</i>	0.119 (0.095)	0.066 (0.087)	- 0.004 (0.094)	0.150 (0.130)	0.186 (0.112)*	0.103 (0.094)	0.019 (0.008)**	0.046 (0.073)	0.046 (0.071)
<i>Atlantic-Trade</i>	- 0.011 (0.024)								
<i>Distance-to-Coast</i>		- 0.0001 (0.0001)							
<i>Neolithic</i>			0.0000 (0.0000)						
<i>Migratory-Distance</i>			- 0.971 (0.129)***						
<i>Potato</i>				0.0006 (0.001)					
<i>Black-Death</i>					- 0.016 (0.006)***				
<i>Human-Capital</i>						0.002 (0.001)**			
P-value for Medieval innovations							[0.90]	[0.89]	[0.89]
First-Stage for <i>Culture</i>									
<i>Temperature_{SD-M}</i>	0.496 (0.086)***	0.480 (0.087)***	0.451 (0.082)***	0.526 (0.089)***	0.468 (0.087)***	0.400 (0.086)***		0.514 (0.084)***	0.519 (0.081)***
<i>Ruggedness</i>	0.105 (0.071)	0.094 (0.072)	0.134 (0.071)*	0.177 (0.082)**	0.086 (0.072)	0.087 (0.070)		0.124 (0.100)	0.104 (0.088)
<i>Coast</i>	- 0.065 (0.020)***	- 0.047 (0.024)*	- 0.030 (0.020)	- 0.051 (0.020)**	- 0.059 (0.020)***	- 0.058 (0.019)***		- 0.010 (0.025)	- 0.007 (0.023)
P-value of Angrist-Pischke F test	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
First-Stage for <i>Democracy</i>									
<i>Temperature_{SD-M}</i>	- 0.062 (0.294)	0.012 (0.293)	- 0.071 (0.314)	- 0.072 (0.304)	- 0.068 (0.293)	- 0.013 (0.298)		- 0.480 (0.297)	- 0.479 (0.287)*
<i>Ruggedness</i>	0.668 (0.242)***	0.676 (0.242)***	0.738 (0.272)***	0.566 (0.278)**	0.647 (0.242)***	0.690 (0.243)***		0.350 (0.354)	0.348 (0.341)
<i>Coast</i>	0.135 (0.068)**	0.212 (0.082)**	0.118 (0.077)	0.111 (0.067)*	0.089 (0.067)	0.113 (0.067)*		0.201 (0.088)**	0.202 (0.085)**
P-value of Angrist-Pischke F test	0.00	0.00	0.01	0.04	0.01	0.00		0.02	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R ²							0.73		
P-value of underidentification test	0.00	0.00	0.02	0.04	0.01	0.01		0.02	
P-value of Sargan statistic	0.26	0.12	0.67	0.23	0.44	0.12		0.63	0.62
Number of observations	578	578	518	577	578	578	500	500	500

- Notes:
- Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
 - All specifications also include *Latitude*, *Longitude*, and country fixed effects. The extra controls considered in the specifications reported in columns (7) to (9) of panel B are *Primary-Sector*, *LPD-M*, *Temperature*, *Precipitation*, *Land-Quality*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Atlantic-Trade*, *Distance-to-Coast*, *Neolithic*, *Migratory-Distance*, *Potato*, *Black-Death*, and *Human-Capital*.
 - In columns (2) to (9) of panel A and columns (1) to (6) and (8) of panel B, the endogenous variables are *Culture* and *Democracy* and the excluded instruments are *Temperature_{SD-M}*, *Ruggedness*, and *Coast*. In column (9) of panel B, the endogenous variables are *Income*, *Culture*, and *Democracy*. The control variables used in the second-stage are also included in the first-stage.
 - The proxies for Medieval innovations are *Primary-Sector*, *Atlantic-Trade*, and *LPD-M*.
 - The null hypothesis of the Angrist-Pischke test is that the specific endogenous variable is unidentified; that of the Anderson (Sargan) under(over)identification test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

Table 5: Institutions and Economic Outcomes — Semi-reduced Form

	(1)	(2)	(3)	(4)
Panel A. The dependent variable is <i>Income</i>				
<i>Culture</i>	0.381 (0.113)***	0.395 (0.115)***		
<i>Democracy</i>			0.063 (0.072)	0.443 (1.145)
<i>Temperature_SD-M</i>			0.234 (0.065)***	0.413 (0.558)
<i>Ruggedness</i>	- 0.000 (0.070)	- 0.010 (0.072)		
<i>Coast</i>		0.014 (0.018)		- 0.083 (0.247)
P-value for Medieval innovations	[0.69]	[0.96]	[0.91]	[0.87]
First-stage for <i>Culture</i>				
<i>Temperature_SD-M</i>	0.514 (0.084)***	0.514 (0.084)***		
<i>Coast</i>	- 0.010 (0.025)			
P-value of Angrist-Pischke F test	0.00	0.00		
First-stage for <i>Democracy</i>				
<i>Ruggedness</i>			0.064 (0.162)	0.064 (0.162)
<i>Coast</i>			0.212 (0.087)**	
P-value of Angrist-Pischke F test			0.05	0.69
2SLS with country fixed effects				
P-value of underidentification test	0.00	0.00	0.04	0.69
P-value of Sargan statistic	0.42		0.39	
Number of observations	500	500	500	500
Notes:	<ol style="list-style-type: none"> Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%. All specifications also include <i>Latitude</i>, <i>Longitude</i>, <i>Primary-Sector</i>, <i>LPD-M</i>, <i>Temperature</i>, <i>Precipitation</i>, <i>Land-Quality</i>, <i>Real-Capital</i>, <i>Catholicism</i>, <i>Wittenberg</i>, <i>Atlantic-Trade</i>, <i>Distance-to-Coast</i>, <i>Neolithic</i>, <i>Migratory-Distance</i>, <i>Potato</i>, <i>Black-Death</i>, and <i>Human-Capital</i>. The control variables used in the second-stage are also included in the first-stage. In column (1) (column (2)), the endogenous variable is <i>Culture</i> and the excluded instruments are (instrument is) <i>Temperature_SD-M</i> and <i>Coast</i> (<i>Temperature_SD-M</i>). In column (3) (column (4)), the endogenous variable is <i>Democracy</i> and the excluded instruments are (instrument is) <i>Ruggedness</i> and <i>Coast</i> (<i>Ruggedness</i>). The proxies for Medieval innovations are <i>Primary-Sector</i>, <i>Atlantic-Trade</i>, and <i>LPD-M</i>. The null hypothesis of the Angrist-Pischke test is that the specific endogenous variable is unidentified; that of the Anderson (Sargan) under(over)identification test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous). 			

Table 6: Institutions and Economic Outcomes — Pairwise Analysis of Adjacent Cells

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. The dependent variable is <i>Income</i>									
<i>Culture</i>	0.117 (0.046)**	0.351 (0.209)*	0.330 (0.200)*	0.361 (0.210)*	0.437 (0.264)*	0.400 (0.222)*	0.269 (0.195)	0.352 (0.209)*	0.369 (0.210)*
First-Stage for <i>Culture</i>									
<i>Temperature_SD-M</i>		0.531 (0.159)***	0.583 (0.167)***	0.528 (0.159)***	0.454 (0.164)***	0.527 (0.164)***	0.510 (0.158)***	0.533 (0.159)***	0.531 (0.159)***
P-value of Angrist-Pischke F test		0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Estimation	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Within R ²	0.04								
P-value of underidentification test		0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Number of observations	408	408	394	408	408	408	408	408	408
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel B. The dependent variable is <i>Income</i>									
<i>Culture</i>	0.362 (0.211)*	0.357 (0.224)	0.351 (0.262)	0.381 (0.247)	0.353 (0.211)*	0.296 (0.177)*	0.031 (0.042)	0.432 (0.295)	0.443 (0.216)**
P-value for Medieval innovations							[0.28]	[0.21]	[0.03]
First-Stage for <i>Culture</i>									
<i>Temperature_SD-M</i>	0.525 (0.159)***	0.502 (0.160)***	0.480 (0.175)***	0.478 (0.166)***	0.526 (0.156)***	0.521 (0.158)***		0.409 (0.193)**	0.409 (0.129)***
P-value of Angrist-Pischke F test	0.00	0.00	0.01	0.00	0.00	0.00		0.04	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R ²							0.54		
P-value of underidentification test	0.00	0.00	0.01	0.00	0.00	0.00		0.03	
P-value of Sargan statistic									0.59
Number of observations	408	408	346	406	408	408	332	332	332
Notes:	<ol style="list-style-type: none"> Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%. All specifications also include <i>Latitude</i>, <i>Longitude</i>, and adjacent-cells fixed effects. The specifications in columns (3) to (9) of panel A consider also <i>Primary-Sector</i>, <i>LPD-M</i>, <i>Temperature</i> and <i>Precipitation</i>, <i>Land-Quality</i>, <i>Real-Capital</i>, <i>Catholicism</i>, and <i>Wittenberg</i> respectively, whereas those in columns (1) to (6) of panel B incorporate also <i>Atlantic-Trade</i>, <i>Distance-to-Coast</i>, <i>Neolithic</i> and <i>Migratory-Distance</i>, <i>Potato</i>, <i>Black-Death</i>, and <i>Human-Capital</i> respectively. The extra controls considered in the specifications reported in columns (7) to (9) of panel B are <i>Primary-Sector</i>, <i>LPD-M</i>, <i>Temperature</i>, <i>Precipitation</i>, <i>Land-Quality</i>, <i>Real-Capital</i>, <i>Catholicism</i>, <i>Wittenberg</i>, <i>Atlantic-Trade</i>, <i>Distance-to-Coast</i>, <i>Neolithic</i>, <i>Migratory-Distance</i>, <i>Potato</i>, <i>Black-Death</i>, and <i>Human-Capital</i>. The control variables used in the second-stage are also included in the first-stage. In columns (2) to (9) of panel A and columns (1) to (6) and (8) of panel B, the endogenous variable is <i>Culture</i> and the excluded instrument is <i>Temperature_SD-M</i>. In column (9) of panel B, the endogenous variables are <i>Income</i> and <i>Culture</i>. The proxies for Medieval innovations are <i>Primary-Sector</i>, <i>Atlantic-Trade</i>, and <i>LPD-M</i>. The null hypothesis of the Angrist-Pischke test is that the specific endogenous variable is unidentified; that of the Anderson (Sargan) under(over)identification test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous). 								

Figure 5: Risk-Sharing Needs and Economic Outcomes — Placebo Test

Note: 1. The residuals and the fitted values line are obtained from a regression run on the sample used in column (2) of table 4 in the case of the left graph and from a regression run on a sample of 117 grids covering Turkey in the case of the right graph.

Figure 6: Malfeasance by the Italian First Republic Politicians

Notes: 1. The range of each variable is divided into five intervals using the goodness of variance fit method.
2. Summary statistics for *Serious-RAP* are reported in the Internet appendix.

Table 7: Institutions and Political Accountability — The Case of the First Republic in Italy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. The dependent variable is <i>RAP</i>									
<i>Culture</i>	- 0.274 (0.057)***	- 0.341 (0.120)***	- 0.396 (0.170)**	- 0.342 (0.119)***	- 0.355 (0.104)***	- 0.287 (0.148)**	- 0.396 (0.158)***	- 0.344 (0.120)***	- 0.343 (0.226)
<i>Democracy</i>	- 0.015 (0.016)	- 0.049 (0.081)	- 0.066 (0.077)	- 0.047 (0.081)	- 0.070 (0.059)	- 0.023 (0.056)	- 0.047 (0.079)	- 0.050 (0.072)	- 0.022 (0.229)
<i>Primary-Sector</i>			- 0.390 (0.812)						
<i>LPD-M</i>				0.017 (0.019)					
<i>Temperature</i>					- 0.003 (0.005)				
<i>Precipitation</i>					- 0.0001 (0.0001)				
<i>Land-Quality</i>						0.035 (0.120)			
<i>Real-Capital</i>							1.076 (1.486)		
<i>Catholicism</i>								- 0.011 (0.220)	
<i>Wittenberg</i>									- 0.0000 (0.0004)
First-Stage for <i>Culture</i>									
<i>Temperature_SD-M</i>		1.782 (0.015)***	1.728 (0.017)***	1.782 (0.015)***	1.650 (0.017)***	1.846 (0.018)***	1.369 (0.017)***	1.808 (0.015)***	1.482 (0.024)***
<i>Ruggedness</i>		0.224 (0.008)***	0.232 (0.008)***	0.255 (0.008)***	0.108 (0.011)***	0.249 (0.009)***	0.227 (0.007)***	0.221 (0.008)***	0.211 (0.008)***
<i>Coast</i>		- 0.050 (0.002)***	- 0.046 (0.002)***	- 0.045 (0.002)***	- 0.059 (0.002)***	- 0.048 (0.002)***	- 0.036 (0.002)***	- 0.049 (0.002)***	- 0.051 (0.002)***
P-value of Angrist-Pischke F test		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
First-Stage for <i>Democracy</i>									
<i>Temperature_SD-M</i>		- 3.199 (0.110)***	- 4.334 (0.120)***	- 3.198 (0.109)***	- 1.465 (0.108)***	- 5.933 (0.117)***	- 3.135 (0.143)***	- 3.652 (0.108)***	0.698 (0.172)***
<i>Ruggedness</i>		- 0.010 (0.060)	0.153 (0.059)***	- 0.111 (0.063)*	1.516 (0.073)***	- 1.052 (0.059)***	- 0.010 (0.060)	0.034 (0.058)	0.163 (0.057)***
<i>Coast</i>		- 0.131 (0.016)***	- 0.044 (0.016)***	- 0.148 (0.016)***	- 0.028 (0.013)**	- 0.216 (0.014)***	- 0.134 (0.016)***	- 0.144 (0.015)***	- 0.118 (0.015)***
P-value of Angrist-Pischke F test		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Estimation	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Within R ²	0.08								
P-value of underidentification test		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-value of Sargan statistic		0.52	0.64	0.71	0.88	0.55	0.63	0.52	0.51
Number of observations	5755	5755	5755	5755	5755	5755	5755	5755	5755
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Panel B. The dependent variable is <i>RAP</i>									
<i>Culture</i>	- 0.586 (0.324)*	- 0.508 (0.424)	- 0.320 (0.125)***	- 0.284 (0.137)**	- 0.348 (0.121)***	0.074 (0.192)	- 1.057 (0.649)*	- 1.057 (0.649)*	
<i>Democracy</i>	- 0.166 (0.181)	- 0.054 (0.091)	- 0.030 (0.086)	- 0.021 (0.089)	- 0.050 (0.081)	0.039 (0.036)	- 0.049 (0.095)	- 0.049 (0.095)	
<i>Distance-to-Coast</i>	0.0007 (0.0007)								
<i>Neolithic</i>		3.27E ⁻⁶ (0.0000)							
<i>Migratory-Distance</i>		0.162 (0.307)							
<i>Potato</i>			0.0002 (0.0017)						
<i>Black-Death</i>				0.014 (0.011)					
<i>Human-Capital</i>					0.0000 (0.0005)				
First-Stage for <i>Culture</i>									
<i>Temperature_SD-M</i>	1.791 (0.015)***	1.645 (0.023)***	1.765 (0.015)***	1.773 (0.015)***	1.742 (0.013)***		0.937 (0.046)***	0.937 (0.046)***	
<i>Ruggedness</i>	0.237 (0.009)***	0.189 (0.008)***	0.300 (0.010)***	0.203 (0.009)***	0.336 (0.008)***		0.142 (0.016)***	0.142 (0.016)***	
<i>Coast</i>	- 0.055 (0.003)***	- 0.056 (0.002)***	- 0.046 (0.002)***	- 0.049 (0.002)***	- 0.031 (0.002)***		- 0.007 (0.002)***	- 0.007 (0.002)***	
P-value of Angrist-Pischke F test	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
First-Stage for <i>Democracy</i>									
<i>Temperature_SD-M</i>	- 3.407 (0.111)***	- 8.293 (0.140)***	- 3.115 (0.109)***	- 3.248 (0.110)***	- 3.156 (0.110)***		- 6.710 (0.237)***	- 6.710 (0.235)***	
<i>Ruggedness</i>	- 0.296 (0.067)***	- 0.595 (0.051)***	- 0.387 (0.073)***	- 0.124 (0.068)*	- 0.131 (0.064)**		1.417 (0.081)***	1.417 (0.081)***	
<i>Coast</i>	- 0.026 (0.019)	0.081 (0.013)***	- 0.149 (0.010)***	- 0.128 (0.016)***	- 0.152 (0.016)***		- 0.046 (0.011)***	- 0.046 (0.011)***	
P-value of Angrist-Pischke F test	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2LS	3LS	
Within R ²						0.09			
P-value of underidentification test	0.00	0.00	0.00	0.00	0.00		0.00		
P-value of Sargan statistic	0.35	0.50	0.47	0.89	0.50		0.90	0.99	
Number of observations	5755	5755	5755	5755	5755	5755	5755	5755	
Notes:	<ol style="list-style-type: none"> Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%. All specifications also include <i>Latitude</i>, <i>Longitude</i>, and the regressors listed in footnote 30. The extra controls considered in the specifications reported in columns (6) to (8) of panel B are <i>Primary-Sector</i>, <i>LPD-M</i>, <i>Temperature</i>, <i>Precipitation</i>, <i>Land-Quality</i>, <i>Real-Capital</i>, <i>Catholicism</i>, <i>Wittenberg</i>, <i>Distance-to-Coast</i>, <i>Neolithic</i>, <i>Migratory-Distance</i>, <i>Potato</i>, <i>Black-Death</i>, and <i>Human-Capital</i>. The control variables used in the second-stage are also included in the first-stage. In columns (2) to (9) of panel A and columns (1) to (5) and (7) of panel B, the endogenous variables are <i>Culture</i> and <i>Democracy</i> and the excluded instruments are <i>Temperature_SD-M</i>, <i>Ruggedness</i>, and <i>Coast</i>. In column (8) of panel B, the endogenous variables are <i>RAP</i>, <i>Culture</i>, and <i>Democracy</i>. The null hypothesis of the Angrist-Pischke test is that the specific endogenous variable is unidentified; that of the Anderson (Sargan) under(over)identification test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous). 								