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 activities, and "inclusive political institutions," which enable the citizenry to check the executive authority. I divide Europe into 120 km × 120 km grid cells, and I 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 severity of consumption risk—i.e., climate volatility—over the 1000-1600 period and between present-day regional political autonomy and the factors that raised the returns on elite-citizenry investments in the Middle Ages, i.e., the terrain ruggedness and the 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, the present-day role of medieval geography, and the factors modulating the impact of institutions. Crucially, the excluded instruments have no direct impact on development, and the effect of culture holds within pairs of adjacent grid cells with different medieval climate volatility. An explanation for these results is that culture, but not a more inclusive political process, is necessary to produce public-spirited politicians and push voters to punish political malfeasance. Micro-evidence on Italian Parliament data supports this idea.
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1 Introduction

Huge empirical evidence suggests that a "culture of cooperation," understood as the implicit reward from cooperating in prisoner's dilemma and investment types of activities, and "inclusive political institutions," which enable the citizenry to check the executive authority, foster economic development and are correlated with past inclusive political institutions (Tabellini, 2010; Guiso et al., 2016). Documenting however that the two types of arrangements reinforce one another and are persistent does not help identify their relative importance. This paper tackles this issue by devising a multiple instrumental variables approach that exploits exogenous variation in both present-day culture of cooperation and inclusive political institutions created at the European regional level by persistent medieval history.

From the 11th century on indeed, the lords started to offer the peasants high powered farming contracts to exploit the improved land productivity and to enter into commercial partnerships with a rising class of merchants engaged in the first long-distance trades. These innovations flourished where the lords also introduced more inclusive political institutions and persisted where the population sought the support of the Cistercians and Franciscans. These monks dictated a culture of cooperation in exchange for guidance on how to share consumption shocks. Inspired by these facts and previous related research (Fleck and Hanssen, 2006; Durante, 2010),[1] Boranbay and Guerriero (2015) employ a panel of 90 European regions spanning the 1000-1600 period to test the following two ideas. First, the elite introduces more inclusive political institutions when the return on investment with the citizens is large enough in order to convince them that a sufficient part of it will be shared. Second, the citizenry accumulates culture to share consumption risk and credibly commit to cooperate while investing with the elite. This "commitment dimension of cultural accumulation" also reduces the elite's temptation to repeal political reforms after a fall of the investment value. Consistent with these predictions, medieval reforms toward tighter constraints on the elite's power are positively driven by the factors determining the observability and thus the profitability of farming investments and by the value of long-distance trades, i.e., respectively the

[1] While 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 in which the climate was more erratic between 1500 and 1750 trust more others.

ruggedness of the terrain and the direct access to the coast. In addition, cultural accumulation, as captured by the discounted number of years Cistercian and Franciscan houses were active per square km, rises with the risk of harvest destruction, as driven by the volatility of the growing season temperature, and with shocks depressing the investment value, i.e., the opening of the Atlantic routes. Since present-day institutions can be traced back to medieval ones, this correlation between past institutions, created by the commitment dimension, produces first-stage relationships between past political infrastructures and both present-day culture and inclusive political institutions. These however are not distinct and so insufficient to identify the relative importance of the two present-day institutional arrangements.

To deal with these issues, I devise a multiple instrumental variables approach exploiting the geographic determinants of past institutions. 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 km $\times$ 120 km grid cells, and I show that the volatility of the 1000-1600 growing season temperature 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, 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 constraints on the executive authority score with information on the 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 it displays a strong within-country correlation with regional measures of property rights protection proposed by Charron et al. (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, intermediate outcomes, factors modulating the impact of permanent institutions, and the present-day role of medieval geography, i.e., present-day climate volatility, average distance from the sea, and average within-grid traveling distance.

Including this rich conditioning set makes difficult to envision that the excluded instru-

ments might have a direct impact on current outcomes via channels other than permanent institutions and, in particular, through their present-day economic role. To address the concern of whether indeed the exclusion restriction is satisfied, I perform a number of robustness tests. First, I document that the overidentifying restrictions cannot be rejected at a level nowhere lower than 18% conditional on all observables and that the excluded instruments have no direct impact on outcomes in the semi-reduced form regressions. Second, I show that the effect of culture on economic success survives within pairs of neighboring grid cells differing in their medieval climate volatility. This exercise enables me to control for all unobservables specific to the 120 km $\times$ 240 km grid cell-pairs. Finally, I perform the following falsification test to examine the reduced form relationship between the volatility of the 1000-1600 growing season temperature and present-day 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, which experienced a more erratic weather and thus accumulated a stronger culture by attracting more Cistercians and Franciscans, are more developed today. If medieval climate volatility affects income only through a persistent risk-sharing-driven culture of cooperation, I should not find a similar relationship where the cost of accumulating past culture was prohibitive because of the opposition to western monasticism. This is what I find. Looking at 117 Turkish grid cells, I estimate a statistically insignificant relationship between medieval climate volatility and present-day income. This is consistent with the barriers to western monasticism erected there by the Eastern Orthodox Church first and the Ottoman empire then.

An explanation for these results is that more inclusive political institutions are irrelevant in facilitating the monitoring of politicians by voters if the latter are not morally compelled to punish political malfeasance or if the former have weak civic virtues (Boix and Posner, 1998; Padró i Miquel et al., 2015). To confirm this idea, I show that there are fewer criminal prosecutions of Italian Parliament members in electoral districts in which culture is stronger but not in those endowed with more inclusive political institutions (see also Nannicini et al., [2013]). This evidence points at a key mechanism inducing the primacy of culture.

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 data by focusing

on a cross-section of 69 European regions and using past political institutions as excluded instrument for present-day culture in growth regressions. Differently from this and the related contributions on the within-country effect of past institutions (Dell, 2010; Michalopoulos and Papaioannou, 2013; Gennaioli et al., 2013; Di Liberto and Sideri, 2015), I devise an empirical strategy dealing explicitly with the possibility that within-country confounding factors may 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 contract enforcement and property rights. No previous study however has identified the separate roles of culture and inclusive political institutions. Crucially, I do so by exploiting their geographic determinants in a sample in which geography has neither shaped present-day economies through persistent innovations nor modulated the spread of slavery (Nunn and Puga, 2012) and the colonizers' settlement strategy (Acemoglu et al., 2001).

The paper proceeds as follows. I illustrate the key historical facts about the medieval institutional revolution in section 2. Next, I describe the data and the empirical strategy in section 3. Then, I assess the relative importance of culture and inclusive political institutions in section 4, and I present the micro-evidence on political accountability in section 5. Finally, I conclude in section 6, and I gather tables and figures in the appendix.

2 The Medieval Origins of European Institutions

The anarchy created by the fall of the western Roman empire pushed the population to seek the protection of lords who, empowered by the feudal contract, pacified their estates [Stearns 2001, p. 165-176]. This new order fueled a revolution that changed Europe to date.

Attracted by the prospect of improved land productivity and the opportunity of long-distance trades, the lords began to enter into high-powered farming contracts with the peasants and commercial partnerships with a rising class of merchants, who obtained protection against piratical incursions and exemption from the duties required to cross the lord's domain [Stearns 2001, p. 191-222]. These contractual innovations flourished where the lords also introduced more inclusive political institutions to fortify their credibility, e.g., in the *Giudicati* in Sardinia (952-1297), the communes of Northern Italy and France (1080-1282), the maritime republics of Genoa, Pisa, and Venice (1099-1406), the towns of Aragon and Cataluña

(1150-1213), the German imperial cities (1152-1806), the Swiss Cantons (1291-1515), and with the opening of the Atlantic routes in England (1215-1707) and the Provinces (1384-1795). To illustrate, Peter II of Aragon granted the communal privileges to the difficult-to-reach Pyrenean communities to bolster olives production and the relative tax revenues [Orvietani Busch 2001, p. 66-80], whereas the *communes jurées* of Northern France and the Flanders were chartered by the Capetian kings interested in gaining from the extremely lucrative exchanges of woolens for Eastern spices [Stearns 2001, p. 199].

Meanwhile, 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 lay brothers and sisters known as *conversi*, the Cistercians reclaimed underdeveloped lands located where the climate was more unpredictable leasing them at rates lower than those offered by the lords, organized trade fairs, and introduced major technological advances like the water wheel and the greenhouse [Tobin 1995, p. 24-47 and 74-138]. The risk of being deprived of such valuable support drove the local communities to accept charity-based norms of cooperation pursued not through alms but "via moral consideration and practical engagement" [Muzzarelli 2001, p. 115]. The attractiveness of the risk-sharing activities organized by the Cistercians encouraged the neighboring populations to pressure the nearest monasteries to join the order and thus deliver the same cultural accumulation services [Berman 2000, p. 95, 107, and 223]. Not surprisingly, in 1153 there were already 435 closely-linked Cistercian houses scattered all around Europe. In the aftermath of the 1348 Black Death and the subsequent collapse of the *conversi* system, the Cistercians left the European scene to the Franciscans [Tobin 1995, p. 125 and 236]. Differently from the Augustinians, Cluniacs, and Dominicans (Carmelites, Carthusians, Cathars, and Waldensians), who specialized in intellectual work (contemplation), the Friars Minor committed to a life of poverty and social engagement and built a network of thousands houses connected in the Cistercian fashion [Logan 2002, p. 126-135]. Most important, they organized in Italy, France, and Spain the first European micro-credit institutions, i.e., *Monti di Pietà*. Once summoned by a community, they first gathered alms to start 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" [Muz-

zarelli 2001, p. 7 and 216]. Crucially, the *Monte* obligation to back up the citizenry-nobility partnerships in the case of liquidity shocks strengthened the relationship between the two groups to the point that the Franciscans' diffusion after the opening of the Atlantic routes delayed the return to autocracies [Muzzarelli 2001, p. 83]. Only the Protestant Reformation deprived western monasticism of its pivotal role [Tobin 1995, p. 155-180].

In the following, I exploit this rich natural historical experiment to assess the relative importance of present-day culture and inclusive political institutions in Europe.

3 Data and Empirical Strategy

The sample consists of 578 grid cells in 16 European countries for which I possess sufficient information (see footnote 17 and table 1). The grid cells have width of 1°, which is the spatial resolution of the excluded instrument for which I observe 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]

3.1 Measuring a Culture of Cooperation

The proxy for culture is obtained from the 2008 European Value Study (GESIS, 2008).[4] The most detailed level at which these data are available 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).

Following Boranbay and Guerriero (2015), I capture the present-day implicit reward from cooperating in prisoner's dilemma and investment types of activities spread in medieval 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

[2]Grid cells located on the borders are divided in units each entirely belonging to a single country. Considering the undivided grid cells to deal with unobserved determinants of national boundaries produces similar results.

[3]Using as cross-section identifiers the regions considered by Boranbay and Guerriero (2015) reduces the average within-country standard deviation in the medieval climate volatility (ruggedness) proxy from 0.05 to 0.04 degree Celsius (0.09 to 0.06 km) and makes the estimates very noisy (see the Internet appendix).

[4]I 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 consider the previous three European Value Study waves—i.e., 1981, 1990, 1999—because of the strong path-dependence in the answers.

the family (Platteau, 2000). In particular, not only generalized trust favors cooperation in prisoner's dilemma games as documented by a broad experimental evidence (Durante, 2010), but it also reduces transaction costs, expands 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 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 capture both cultural norms, 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). The empirical results are similar if I turn to either *Trust* or *Respect* (see the Internet appendix). If a grid cell 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 relative contribution to the grid cell land area. I follow the same procedure for 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 incentives to cooperate in exchange and investment activities disseminated by western monasticism. A legacy of cross-cultural psychology has indeed documented how *Control* 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 et al. 2007, p. 115].[5] Nevertheless, the gist of my 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 1 illustrates the large variation in *Culture* across Europe

[5]Gorodnichenko and Roland (2016) 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.

and the size of the grid cells I use below as cross-section identifiers relative to the NUTS 2 regions surveyed by the European Value Study. Even if continuous measures are used in the empirical analysis, data are displayed in all the maps 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 Benelux, England, Western France, Northern Italy, and Northern Spain exhibit the strongest culture of cooperation, Southern Italy, the Czech Republic, Eastern Poland, and Portugal display the most limited one.

As clarified by the comparison between this pattern and that described by the upper-left map in figure 1, 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 Cistercian and Franciscan houses were active per square km averaged over the 1000-1600 period, i.e., *Culture-M*.[7] In particular, the diffusion of the Cistercians in England, the Flanders, Western France, and Northern Spain and that of the Franciscans in Northern Italy are related to a more intense present-day culture of cooperation. As seen above, both monastic orders played a key role in the accumulation of culture by 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 and that no other order covered a similar role, *Culture-M* gages the input to the technology that transformed the citizenry's involvement with culture into evolutionary stable norms, and thus higher values of this variable detect a stronger culture of cooperation in the past.[8] This interpretation is consistent with a fundamental insight of evolutionary psychology (Barkow et al., 1992) and Malthusian growth theories (Clark and Hamilton, 2006): social groups instill into their members, via natural

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

[7]For each of the 712 (2952) Cistercian (Franciscan) houses and each half-century between 1000 and 1600, this figure equals the difference between the number of years in which the house had operated and those elapsed from its possible closure per square km if positive and zero otherwise. The discounting is immaterial to my main results. The raw data are collected from respectively Van Der Meer (1965) and Moorman (1983).

[8]To further cross-validate this variable, Boranbay and Guerriero (2015) report its high correlation—0.8—with the number of years the *Monti* were active per square km. Since these pawnshops survived only when loans were repaid [Muzzarelli 2001, p. 189-244], their endurance is positively related to the likelihood of successful risk-sharing activities, and therefore it is an outcome-based measure of past culture just as the electoral turnout and blood donations are of present-day culture (see Guiso et al., [2016]).

selection and cross-punishment, cultural norms maximizing the fitness of the group.

Focusing on the Cistercians, Andersen et al. (2016) propose a similar mechanism but describe them as aimed at spreading values of hard work and thrift. Albeit consistent with 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 was carefully respected by all houses, explicitly warned the novices to abhor social competition and accumulation of capital [Berman 2000, p. 1-23 and 93-97].[9] 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 *Control* and the proxies for "hard work" and "thrift" used by Andersen et al. (2016) (*Obedience*) are (is) not positively (negatively) and significantly correlated with *Culture-M* and medieval climate volatility (see the Internet appendix). Crucially, when the proxy for culture is extracted from "hard work," "thrift," *Trust*, and *Respect*—i.e., *Culture-A*, the message of the empirical analysis is the same (see the Internet appendix). Finally, it is worth to note that, because of the two orders' will to keep a minimum distance between houses—e.g., 24 km in the Cistercians' case [Tobin 1995, p. 74]—and their focus on initially underdeveloped and thus underpopulated areas, considering the houses' activity per capita grossly misrepresents their diffusion patterns.

3.2 Measuring the Inclusiveness of Political Institutions

I define the inclusiveness of present-day political institutions as the strength of the rules enabling 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 constraints on the executive authority score and a regional political autonomy index, i.e., *Democracy*.[10] Such index takes value 1 if the region had exclusive con-

[9] Accordingly, 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).

[10] The Polity IV constraints on the executive authority score ranges between one and seven, and higher values indicate stronger constraints on the decision-making power of chief executives (Marshall and Jaggers, 2011).

trol over a limited set of policy—e.g., education, 2 if it was also fiscally decentralized, 3 if it had substantial political autonomy from the central government,[11] and 0 otherwise. Conditional on fixed effects, *Democracy* gages two important sources of institutional variation, i.e., the differences between the autocracy 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 et al., 2014). Politicians elected in autonomous regions are directly accountable for local policies, chosen for their fit with the preferences of the region population, and can design public goods fulfilling the most these preferences (Kappeler et al., 2013). 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).[12] This dimension, which the extant literature recognizes as crucial in distinguishing differently inclusive political regimes (Acemoglu and Johnson, 2005), will be lost if one relies only on cross-country variation (see also Di Liberto and Sideri, [2015]). My results do not merely rest on the way in which *Democracy* is defined since I obtain similar estimates when I consider only the regional political autonomy index, I focus on the 2000-2010 period, or I use the first principal component extracted from the Polity IV score and the regional political autonomy index (see the Internet appendix).

The bottom-right map in figure 1 displays the considerable variation in *Democracy*. On the one hand, the experience of differently inclusive political regimes has created an institutional gap between the regions located 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 matters, like education, granted to all

[11] I 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.

[12] These 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 et al., 2014).

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 the residual legislative power and the ability to invest regional tax revenues into local public goods. All in all, *Democracy* ranges from a minimum of 3.20 scored by the ex-Eastern Germany regions of Brandeburg and Sachsen to a maximum of 9 observed in, for instance, Vlaams Gewest.

The bottom-left map in figure 1 prompts 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 constraints on the elite's power score coded by Boranbay and Guerriero (2015) for each half-century between 1000 and 1600, *Democracy-M*. The score is obtained by first matching groups of present-day NUTS 2 regions to the major medieval polities (see table 1) and then looking at the history of each of them in a 40-year window around each date (see also Acemoglu et al., [2005]). Between 1100 and 1350, the first reforms toward a more inclusive political process were experienced by the agrarian communities of Aragon and Cataluña, the commercial "Giudicati" of Sardinia and communes of Northern Italy, and the maritime republics. 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 toward the Atlantic harbors of Cape Town and Havana allowed also the merchants of the Provinces and the Reign of England to constrain the power of the respective monarchs (Acemoglu et al., 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). Accordingly, the two bottom maps of figure 1 document the long-term journey toward more inclusive political institutions of these European regions.

3.3 Empirical Strategy

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, investment, and division of labor (Putnam et al., 1993; Dixit, 2004; Boranbay and Guerriero, 2015), the latter has always the option of relying on informal networks enforcing contracts and protecting property rights (Greif, 2006). Moreover, culture shapes the way citizens participate in policy-making and the behaviors of public officials. On the one hand, it reduces the citizens' cost of punishing political malfeasance by relaxing collective action constraints, building their qualities of judgment, and shifting their preferences toward community-oriented policies (Boix and Posner, 1998; Padró i Miquel et al., 2015). 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 et al., 1993). The very unequal performance of the public administration and the judiciary in Northern and Southern Italy despite the 150 years of common political trajectory constitutes a glaring example (de Oliveira and Guerriero, 2015).

Hence, it is reasonable to suppose that the performance of a region characterized by a forceful culture but 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. In the following, I show how this observation helps make sense of the comparison between culture and inclusive political institutions.

3.3.1 Unbundling Institutions

Lacking sufficient exogenous variation to identify nonlinearities,[13] I focus on the equation

$$Y_{i,c} = \alpha_c + \beta_0 C_{i,c} + \gamma_0 D_{i,c} + \delta_{\mathbf{0}}' \mathbf{X_{i,c}} + \epsilon_{i,c}, \tag{1}$$

where $Y_{i,c}$ is the natural logarithm of the GDP per capita in grid cell i of country c, in euro, averaged between 2002 and 2009, i.e., *Income*.[14] Its source is Eurostat, which collects the data at the NUTS 2 regional level. I obtain similar results if I switch to the G-Econ estimate of the GDP per capita in 1985, which is available at the one degree spatial resolution (see

[13] When the three excluded instruments are used to identify $C_{i,c}$, $D_{i,c}$ and their interaction, they become weak.

[14] Given the seesawing performance of some European regions, it would be more instructive to link the medieval institutional revolution to the development of each grid cell over a longer spell of time. Unfortunately, to the best of my knowledge, the only proxies for $Y_{i,c}$ at the regional level are those I consider.

the Internet appendix). $C_{i,c}$ and $D_{i,c}$ denote *Culture* and *Democracy* respectively, and $\mathbf{X_{i,c}}$ gathers the latitude and longitude of the centroid of the grid cell—i.e., *Latitude* and *Longitude*—and possibly the controls discussed below. α_c accounts for country-wide unobservables like the legacy of past wars, legal origins, and genetic diversity (Ashraf and Galor, 2013a).[15] 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) by OLS. There are two key issues with this strategy. First, both *Culture* and *Democracy* are endogenous, so I may capture reverse causality or the effect of an omitted variable like religious beliefs. Second, both variables are measured with error, so there may be a downward attenuation bias. To evaluate these concerns, I compare the inconsistent OLS estimates with those obtained by using 2SLS with distinct excluded instruments for culture and inclusive political institutions. These should be correlated with the endogenous regressors but orthogonal to any omitted variable, i.e., uncorrelated with the dependent variable through any channel other than the endogenous regressors. This strategy should take care of the reverse causality and omitted variable biases as well as of the differential measurement errors in the two endogenous regressors, 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 two first-stage regressions are

$$C_{i,c} = \alpha_c + \zeta_1 T_{i,c} + \eta_1 R_{i,c} + \theta_1 I_{i,c} + \boldsymbol{\delta_1'} \mathbf{X_{i,c}} + \omega_{i,c},$$

$$D_{i,c} = \alpha_c + \zeta_2 T_{i,c} + \eta_2 R_{i,c} + \theta_2 I_{i,c} + \boldsymbol{\delta_2'} \mathbf{X_{i,c}} + \nu_{i,c}, \tag{2}$$

where $T_{i,c}$ is the volatility of the 1000-1600 growing season temperature and corresponds to the excluded instrument for culture (see section 3.3.2). $R_{i,c}$ and $I_{i,c}$ label respectively the terrain ruggedness and a dummy for direct access to the coast and represent instead the excluded instruments for inclusive political institutions (see section 3.3.2). The exclusion restriction is that in the population $Cov\left(\epsilon_{i,c}, T_{i,c}\right) = Cov\left(\epsilon_{i,c}, R_{i,c}\right) = Cov\left(\epsilon_{i,c}, I_{i,c}\right) = 0$.

In judging the adequacy of this strategy, the drawbacks 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 (2015) show, there is a strong correlation between the diffusion of

[15] Failing to account for these confounding factors makes the estimates very noisy (see the Internet appendix).

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 was tempted to repeal political reforms, i.e., Franciscans' spread following the opening of the Atlantic routes. Therefore, 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.

3.3.2 The Geographic Determinants of Medieval Institutions

Building on the historical events illustrated in section 2, Boranbay and Guerriero (2015) study accumulation of culture and democratization in a simple and yet general society. Formally, "elite" members and "citizens" either share consumption 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 toward surplus formation, e.g., long-distance trades. First of all, each group costly instills into its members a psychological gain from cooperating, for instance, by attracting a monastic order. This implicit reward represents a culture of cooperation. Next, the elite decides whether to introduce democracy or keep autocracy. Democracy allows the citizenry to fix the share of investment value to be spent on the production of a public good and its type, whereas autocracy gives these prerogatives to the elite. Then, 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 activity-specific factors—i.e., the severity of consumption risk and the investment value—are exogenous, e.g., geography. Since heterogeneity in the abilities to produce the public goods and in the preferences for them renders investment infeasible under autocracy, the equilibrium has the following key feature. While a rise in the investment value encourages the elite to introduce democracy to convince the citizen that a sufficient part of the returns

on joint investments will be shared, accumulation of culture increases with the severity of consumption risk if this is not too large and thus cheating is not too appealing.

Consistent with these prediction, culture over the 1000-1600 period and its present-day counterpart are stronger in the regions in which it was more necessary to cope with consumption risk because of the higher but never extreme climate volatility (Durante, 2010).[16] On top of this evidence, I elect as instrument for *Culture* the standard deviation of the 1000-1600 spring-summer temperature in degree Celsius, i.e., *Climate-M*. The raw data are collected from Guiot et al. (2010) and cover most of Europe at the five degrees spatial resolution for all the years between 600 and 2000.[17] Each observation is "reconstructed" from 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 the only one estimating the pre-1500 European climate at the grid level. If grid cell i belongs to multiple climatic grids, I assign this grid cell a figure equal to the average of the values medieval climate volatility assumes in each represented grid weighted by the grid relative contribution to grid cell i 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 turning to the Conley's (1999) standard errors (see the Internet appendix). Higher resolution gridded data on temperature and rainfall have been devised for the post-1500 period building mainly on instrumental sources (Durante, 2010). Since however pre-1800 climate stations are scarce, these series are much less accurate than reconstructed data and so cannot be incorporated into the analysis (Guiot et al., 2010).[18]

The exposition so far suggests that the most relevant feature that could undermine the

[16] Medieval climate volatility squared is not significantly related to culture (Boranbay and Guerriero, 2015).

[17] Because of data availability (To have sufficient within-country 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). This choice has 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 covered by the Guiot et al.'s (2010) grid cells for two reasons. First, there are insufficient data on the rest of the medieval polities to which they belonged. Second, western monasticism did not spread in some of these countries because of the Orthodox Church's opposition [Tobin 1995, p. 144].

[18] The 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.

exclusion restriction is the persistent impact of the economic progress that was triggered, together with the institutional revolution, by medieval geography. To illustrate, since *Climate-M* is related to medieval development through agricultural productivity and the adoption of the advances in farming technology spread by the Cistercians, it might directly affect present-day outcomes if this progress 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,[19] I show that key measures of medieval farming progress do not confound the effect of permanent institutions. The same can be said of present-day climate volatility and those present-day intermediate outcomes most heavily influenced by western monasticism, i.e., financial development and Catholic beliefs. As a consequence, it is quite difficult to envision that the climate volatility of more than four centuries ago shapes present-day performance through a channel other than a culture of cooperation conditional on country fixed effects, medieval farming progress, present-day climate volatility, and present-day intermediate outcomes.

Boranbay and Guerriero (2015) also document that between 1000 and 1600 reforms toward 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). Thus, the elite's prospective returns on 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]). Building on these remarks, I employ as second excluded instrument the terrain ruggedness in km retrieved from the G-Econ dataset, i.e., *Ruggedness*. 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 et al., 1994; Acemoglu et al., 2005). 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-

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

distance and in particular Atlantic trades, they might affect *Income* if the advances they fostered are long-lived. Below, I control not only for medieval farming progress, as aforementioned, but also for the relevance of Atlantic trades, and I show that these innovations do not confound the effect of permanent institutions. The same can be said of the average distance from the sea and the average within-grid traveling distance, and thus the two excluded instruments are not shaping present-day economies via their present-day impact on the shipping and tourism sectors on the one hand and traveling costs on the other hand. On top of these observations, it is hard to think that *Ruggedness* and *Coast* drive directly *Income* conditional on country fixed effects, medieval innovations, and their present-day role.

A gaze at figures 1 and 2 reveals not only the sizable variation in both institutions and geography but also that the results obtained by Boranbay and Guerriero (2015) hold in my sample. As table 3 shows, both past institutions and their determinants are powerful drivers of present-day institutions, and the coefficients confirm the theoretical predictions.[20]

4 Culture Versus Inclusive Political Institutions

A glance at figures 1 and 2 already hints at the main result of the paper. The regional pattern of present-day per capita output in the leftmost map in figure 2 is similar to that of present-day culture in the upper-right map in figure 1 and that of medieval climate volatility in the central map in figure 2. Northern Italy, Western France, and Northern Spain enjoy a higher development, display stronger norms of trust and respect, and experienced a more erratic medieval climate than the rest of the sample. On the contrary, Czech Republic, Eastern Poland, and Portugal are marked by very low values of all three variables. The correlations among outcomes, culture, and medieval climate volatility are however imperfect. England is one of the most culturally and economically advanced European regions but did not face a very unpredictable climate during the Middle Ages, whereas Southern Spain possesses low values of *Income* and *Climate-M* but quite a strong culture of cooperation. Similarly, the relationships among *Ruggedness*, *Coast*, and *Income* are not clear-cut. Although graphical comparisons are instructive, multivariate analysis is more convincing.

[20] While a series of recent theoretical papers has clarified that cultural norms inherited from earlier generations deeply shape current culture (see Tabellini, [2008]), an expanding body of empirical contributions has highlighted the persistence of political infrastructures (Acemoglu et al., 2001; Di Liberto and Sideri, 2015).

4.1 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* remains very similar in the two columns. This evidence is consistent with the aforementioned idea that the performance of a region, in which the vacuum opened by less inclusive political institutions is filled by informal networks sustained by a forceful culture, will be superior to that of a region in which a more democratic political process is left in the hands of less respectful citizens. To illustrate, the estimate of β_0 in column (2) is significant at 1% and implies that a one-standard deviation rise 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 *Culture*—i.e., - 0.87 in the Balearic Islands—to its mean will increase *Income* by 78%. In contrast, the coefficient on *Democracy* in column (2) is not statistically significant. The two upper(bottom)-scatter plots in figure 3 display graphically the OLS (2SLS) estimates in column (1) (column (2)) highlighting quite clearly that they are not driven by a handful of abnormal observations.

4.2 Robustness and Sensitivity Checks

The basic estimates imply 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.

4.2.1 Controlling for Observables

To ascertain whether 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 covariates also helps me assess the effective magnitude of the impact 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 progress, one capturing the possibly long-lasting role of Atlantic trade, one accounting for both, and measures of the present-day economic role of the excluded instruments. The first of these covariates is the share of the active population employed 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*. Including this variable into $\mathbf{X_{i,c}}$ accounts for the possibility that medieval climate volatility has influenced the patterns of sectoral specialization. Measures of the relevance of Atlantic trade can be obtained from Acemoglu et al. (2005). Albeit I focus on the number of Atlantic ports active in the grid cell between 1500 and 1850—i.e., *Atlantic-Trade*, the essence of my results will be the same should I turn to the number of potential Atlantic ports between 1500 and 1850 or either 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 cell belonged averaged between 1500 and 1850. The last variable I consider is the natural logarithm of the population per square km averaged over the 1000-1600 period, i.e., *LPD-M*. Demographic data are available from Goldewijk et al. (2011) for the 10,000 BC-2000 period and the whole globe at the five minutes spatial resolution and are estimated through time-variant allocation algorithms. Since in the Malthusian epoch urbanization corresponded to development (Galor, 2011), *LPD-M* picks other possible effects of medieval farming progress and long-distance trades. I will obtain similar results should I turn to the natural logarithm of either the urbanization rate or the population averaged between 1000 and 1600 and collected from Goldewijk et al. (2011).

I capture the present-day role of medieval geography with: 1. the normalized first principal component extracted from the standard deviation of the temperature in degree Celsius and that of the precipitation in mm both averaged between 1961 and 1990, i.e., *Climate*; 2. the average distance to the coast in the grid cell in km, i.e., *Distance-to-Coast*; 3. the average traveling distance between the centroid and the corners of the grid cell in km, i.e., *Traveling-Distance*. While including *Climate* tests whether the stickiness of *Climate-M* is directly affecting present-day agriculture and in turn outcomes, considering *Distance-to-Coast* and *Traveling-Distance* allows me to check whether *Coast* and *Ruggedness* are directly determining *Income* by respectively affecting the success of the shipping and tourism sectors

and shaping traveling costs. I get similar estimates if I also consider the temperature (precipitation) in degree Celsius (mm) averaged over the 1961-1990 period, the land quality for agriculture and its standard deviation, and the grid cell land area (see Internet appendix). These features could affect *Income* by modulating ethnic diversity (Michalopoulos, 2012).

Building on section 2, two are the intermediate outcomes that are most likely affected by medieval institutions. First, the micro-credit activities introduced by the Franciscans have possibly fortified 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 et al. (2013), i.e., *Real-Capital*. By including this proxy, I also deal with the possibility that more politically autonomous regions have received larger 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 impact 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, [2015]). First, Becker and Woessmann (2009) argue that the distance to Wittenberg, the place of origin of Protestantism, is a strong predictor of its diffusion and, in turn, of cooperation and human capital. Second, Hansen et al. (2015) (Olsson and Paik, 2015) claim that, in societies that made an early transition to agriculture in the Neolithic, the persistence of more patriarchal values has determined a higher inequality in gender roles (delayed the adoption of more inclusive political institutions). To consider this aspect, I look at the average time since the agricultural transition in the grid cell calculated exploiting calibrated carbon dates from various Neolithic sites gathered by Pinhasi et al. (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 cell, i.e., *Migratory-Distance*.[21] Fourth, Iyigun et al. (2015) argue that the soil suitability for potato—i.e., *Potato*—has modulated conflicts and, in turn, institutional evolution in medieval Europe. The raw data are in grid format, cover the entire World at the 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 in such a way that the mostly damaged European regions could escape the Malthusian trap. To shed more light on this issue, I control for the mortality rate from the 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 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.

Turning to the empirical results, table 4 prompts the following observations. First, neither the possibly persistent impact of medieval innovations—i.e., farming progress and Atlantic trades—nor the present-day economic role of the excluded instruments confound the effect of *Culture* (see columns (3) to (5) of panel A and columns (1) to (3) of panel B). Crucially, these proxies are not jointly significant in the specifications controlling for all confounding factors (see columns (7) to (9) of panel B). This evidence is consistent with the aforementioned limited relevance of the primary sector, the fact that traveling costs are negligible and thus neither *Ruggedness* nor *Coast* should directly determine outcomes,[22] and recent contributions on persistent European regional institutions. In particular, Grafe (2012) documents that 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

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

[22] According to data collected from http://ec.europa.eu/eurostat, the average share of household expenditure on transport services (operation of personal transport means) over the sample was about 2 (4) percent.

interests losing, in this way, their supremacy over time. Second, *Culture* is not simply picking differences in either financial development or Christian religious beliefs driven by the western monasticism diffusion (see columns (6) and (7) of panel A). Third, none of the factors modulating the functioning of permanent institutions modifies the message of my analysis (see columns (8) and (9) of panel A and columns (4) to (6) of panel B). Finally, conditional on all the confounding factors, the 3SLS estimates are fully consistent with their two-step counterparts and, in particular, a one-standard deviation rise in the strength of a culture of cooperation—i.e., 0.27—will imply a 9.6% rise in present-day GDP per capita, which is significant at 5%, whereas *Democracy* is again insignificant (see columns (8) and (9) of panel B). For the same regressions moreover, the overidentifying restrictions cannot be rejected at 18% or more, the Anderson canonical correlations (Sanderson-Windmeijer F) test rejects that equation (1) is underidentified (any endogenous variable is unidentified) at 9% (10% or less),[23] and geography enters the first-stages in a separable way. To illustrate, *Climate-M* shapes only *Culture*, whereas the direct access to the coast drives only *Democracy*. All in all, these observations suggest that not only the exclusion restriction holds, but my instrumental variables strategy is taking contemporaneously care of reverse causality, the omitted variable bias, and the differential measurement errors in the endogenous regressors.

4.2.2 Semi-Reduced Form Regressions

The validity of the exclusion restriction is also confirmed by the semi-reduced form regressions in table 5. Here, I explicitly address the concern that the excluded instruments might directly affect the economy. To evaluate this possibility, I include one at the time each instrument in both the first- and second-stages. Then, *Culture* has about the same estimated effect as in column (2) of panel A of table 4 and it is always significant at 1%, whereas none among *Democracy*, *Climate-M*, *Ruggedness*, and *Coast* have a significant direct impact on outcomes. Crucially, both the Anderson canonical correlations and the Sanderson-Windmeijer F test reject underidentification except in the case of column (2) where *Ruggedness* is included in the second-stage and thus the first-stage for *Democracy* becomes weak. By "horse racing" predicted institutions with excluded instruments, these regressions reveal that there is no

[23] With multiple endogenous regressors, it makes little sense to judge identification from the size of the F-test since each instrument is called upon to play a role in each first-stage (Sanderson and Windmeijer, 2015).

direct significant influence of medieval geography on present-day performance.

4.2.3 Pairwise Analysis of Adjacent Grid Cells

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 grid cells 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 120 km $\times$ 240 km dyads (see also Michalopoulos and Papaioannou, [2013]). This exercise cannot be tailored to contrast culture and inclusive political institutions, but it is naturally fitted to confirm the casual impact of culture. First, I identify contiguous grid cells falling in the same country whose difference in *Climate-M* is at least 0.01 Celsius.[24] When one of these grid cells is adjacent to more than one other grid cell with different *Climate-M*, I include all pairs. Next, to avoid that the results are driven by redistribution toward the country administrative center or by pairs with very diverse land area, I exclude the grid cells to which the national capitals belong and those with a land area lower than 200 square km. This choice leaves me with 204 pairs of grid cells. I run second-stage regressions of the form

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

where $Y_{i(j),c}$ is *Income* in grid cell i of country c that is adjacent to grid cell j of the same country c with grid cells i and j differing in their *Climate-M* values. Since I am now including country-specific, grid cell-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 culture and in turn GDP per capita within pairs of contiguous grid cells in the same country conditional on the rich set of observables contained in $\mathbf{X_{i,c}}$ and unobserved grid cell-pair specific features like local natural resources, technological inputs, and persistent beliefs.

Table 6 reports the results of the contiguous grid cell analysis. First, *Climate-M* is always a strong predictor of *Culture*. Second, once I take into account the correlation between the error terms in the two stages, *Income* is significantly higher in the grid cells that display

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

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 cell-pair specific features (see column (9) of panel B). For this specification moreover, a one-standard deviation rise in *Culture*—i.e., 0.24—will lead to a 7.3% increase in *Income*, and I cannot reject the overidentifying restrictions at the 77%.

4.2.4 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. To illustrate, the estimated OLS coefficient equals 1.407 with a t-statistic of 9.12 for the sample used in column (2) of table 4 (see left graph in figure 4). 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 medieval growing season temperature and present-day income should not exist where the cost of accumulating culture was prohibitive. This was the case in Turkey where first the 1058 East-West Schism and then the rise of the Ottoman empire blocked both the Cistercians' and the Franciscans' penetration.[25] While indeed the Eastern Orthodox church required that monks shied away from any involvement with the worshipers' life [Tobin 1995, p. 144], Islam considers monasticism an excessive austere practice that thus should be discouraged (The Qur'an, 57.27). I test whether there is no link between medieval climate volatility and present-day economic outcomes in Turkey as follows. First, I divide its surface into 117 one degree grid cells. Then, I construct for this sample the variable *Climate-M* and the natural logarithm of the 2009 GDP per capita from the same sources used above. Finally, I condition both variables on the latitude and the longitude of the centroid of the grid cell. As the right graph of figure 4 reveals, there is a negative and insignificant relationship between medieval climate volatility and present-day income in Turkey with an estimated OLS coefficient of - 1.643 and a t-statistic of - 1.53.

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

5 Inside the Black Box

All in all, it is fair to take stock of the evidence presented so far as consistent with, if not proving, causality going from medieval geography to present-day institutions and the primacy of a culture of cooperation. While an exhaustive account of this last result 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 et al. (2010) to test the idea that culture but not inclusive political institutions 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, a homogeneous and precise measure of political malfeasance is available and more inclusive regional institutions should strengthen the voters' incentive to monitor all their representatives and not only the regional ones. Second, autonomous regions are typically run by region-specific parties, which usually obtain the majority also 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 the regional and national elections held in the province of Bolzano. Finally, Italy provides large variation in the strength of culture, the inclusiveness of regional political institutions, and geography both across Northern and Southern regions and within both clusters (see figures 1, 2, and 5).

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, 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 focus on 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*.[26] By definition, a RAP is an allegation of malfeasance, rather than a conviction, and as such it could also capture judicial zeal and/or prejudice. Nevertheless, members of Parliament could receive a RAP from any Italian tribunal and at the provincial level *RAP* is strongly correlated with a measure of corruption based on the extent of missing infrastructures in public works in the 1990s (Chang et al., 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 facilitate the monitoring of politicians by voters but is irrelevant if the latter are not morally compelled to punish political malfeasance or it the former are inconsiderate (Boix and Posner, 1998; Padró i Miquel et al., 2015). Therefore, I expect that only culture is significantly related to lower values of *RAP*.

5.1 Empirical Strategy and Main Results

A glance at figures 1 and 5 already confirms this idea whereby representatives elected in more respectful districts appear to be more likely to receive a *RAP*, whereas those elected in autonomous regions do not. Next, I turn to multivariate analysis to confirm this remark. I add *Democracy* to the Nannicini et al.'s (2013) model, and so I run the second-stage

$$M_{p,d,t} = \kappa_t + \beta_2 C_d + \gamma_1 D_d + \mathbf{X}'_{\mathbf{d}}\delta_{\mathbf{4}} + \mathbf{Z}'_{\mathbf{p,d,t}}\chi + \xi_{p,d,t}, \tag{4}$$

where $M_{p,d,t}$ is *RAP* for politician p, elected in the electoral district d, in the legislature t.[27] The excluded instruments for C_d and D_d are *Climate-M*, *Ruggedness*, and *Coast*. The legislature fixed effects κ_t account for aggregate legislative term shocks, whereas the vector

[26] Following 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.

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

$\mathbf{Z_{p,d,t}}$ gathers individual characteristics like age, education, political experience, and region of birth dummies.[28] Finally, $\mathbf{X_d}$ pools the other control variables discussed above except *Latitude* and *Longitude* to avoid collinearity with the region of birth dummies. To match data measured at the NUTS 2 unit (grid cell) level to districts, I construct averages weighted by each represented unit (grid cell) relative contribution to the district 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 characterized by more inclusive political institutions. Conditional on all observables indeed, an increase in *Culture* equal to its standard deviation—i.e., 0.19—will reduce the incidence of RAP by about 20 percent and moving from the lowest level of culture, which is - 0.37 in Puglia, to its highest level, which is 0.21 in Emilia Romagna, will decrease the expected value of *RAP* by about 62 percent (see columns (7) and (8) of panel B).[29] Once again, the consistency of the estimates is confirmed by the underidentification tests and the Sargan statistic.

All in all, I interpret these results as supporting the idea that a culture of cooperation but not more inclusive political institutions significantly strengthens political accountability. Since this constitutes a key instrument through which society can curb the risk of expropriation by politically powerful elites and assure that taxation is properly transformed in public goods, the estimates in table 7 suggest a key mechanism inducing the primacy of culture.

6 Concluding Comments

This paper has exploited exogenous variation created at the European regional level by medieval history to identify the separate roles of present-day culture of cooperation and inclusive political institutions. First, I divide Europe into 120 km $\times$ 120 km grid cells, and I proxy culture with self-reported norms of trust and respect for others and the inclusiveness of the political process with a measure of regional political autonomy. Next, I document

[28] To 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 was 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]).

[29] A 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.

strong and distinct first-stage relationships between present-day culture and the severity of consumption risk—i.e., climate volatility—over the 1000-1600 period and between the inclusiveness of present-day political institutions and the factors that raised the returns on elite-citizenry investments in the Middle Ages, i.e., the terrain ruggedness and the direct access to the coast. Building on these first-stages, I report 2SLS estimates suggesting that only culture has a major impact on development even after controlling for country fixed effects, medieval innovations, the present-day role of medieval geography, intermediate outcomes, and factors modulating the impact of permanent institutions. Crucially, the excluded instruments have no direct impact on development, and the effect of culture holds within pairs of adjacent grid cells with different medieval climate volatility.

To identify a possible channel of causality, I test the idea that more inclusive political institutions are irrelevant in facilitating the monitoring of politicians by voters if the latter are not morally compelled to punish political malfeasance or if the former 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. This evidence points at a key mechanism inducing the primacy of culture. Yet, more work is needed to fully characterize the different conduits through which (in)formal institutions affect the economy.

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Tables and Figures

Table 1: Historical Polities

GENOA: Italy (*Liguria*); France (*Corse*). HOLY ROMAN EMPIRE: Austria and Italy (*Styria*, *Tyrol - Trentino-Alto Adige*); Belgium (*Région Bruxelles*, *Région Wallone*); Germany (*Baden-Wurttemberg*, *Bayern*, *Brandenburg*, *Bremen - Hamburg - Niedersachsen*, *Hessen*, *Mecklenburg-Vorpommern*, *Nordrhein-Westfalen*, *Rheinland-Pfalz - Saarland*, *Sachsen*, *Schleswig-Holstein*, *Thüringen - Sachsen-Anhalt*); Slovenia (*Carniola*, *Styria*). KINGDOM OF BOHEMIA: Czech Republic (*East Czech Republic*, *West Czech Republic*); Poland (*South Poland*, *West Poland*). KINGDOM OF PORTUGAL: Portugal (*Alentejo*, *Algarve*, *Centro*, *Lisboa - Vale do Tejo*, *Norte*). KINGDOM OF SICILY: Italy (*Abruzzo - Molise*, *Basilicata - Campania*, *Calabria*, *Puglia*, *Sicilia*). KINGDOM OF TUSCANY: Italy (*Toscana*). PAPAL STATE: Italy (*Emilia-Romagna*, *Lazio*, *Marche - Umbria*). PROVINCES: Netherlands (*Noord Nederland - Groningen*, *Oost-Nederland*, *West-Nederland*, *Zuid-Nederland*). REIGN OF ENGLAND: Ireland (*East Ireland*, *West Ireland*); UK (*East Anglia - London*, *East Midlands*, *North-East UK*, *North-West UK*, *Northern Ireland*, *Scotland*, *South-East UK*, *South-West UK*, *Wales*, *West Midlands*, *Yorkshire - Humberside*). REIGN OF FRANCE: Belgium (*Vlaams Gewest*); France (*East France*, *Île de France*, *Mediterranean France*, *North France*, *Paris Basin*, *South-East France*, *South-West France*, *West France*). REIGN OF HUNGARY: Hungary (*Central Hungary*, *Styria-Hungary*, *West Hungary*); Slovakia (*East Slovakia*, *West Slovakia*). REIGN OF POLAND: Poland (*East Poland*, *North Poland*). REIGN OF SPAIN: Spain (*Andalucia*, *Aragon*, *Asturias - Cantabria*, *Baleares*, *Castilla-La Mancha*, *Castilla y León*, *Cataluña*, *Comunidad Valencian*, *Extremadura*, *Galicia*, *Madrid*, *Murcia*, *Navarra - Rioja*, *Pais Vasco*). SARDINIAN GIUDICATI: Italy (*Sardegna*). SAVOY: Italy (*Piemonte - Valle D'Aosta*). STATE OF MILAN: Italy (*Lombardia*). SWISS CANTONS: Switzerland (*North Switzerland*, *South Switzerland*). VENICE: Italy (*Friuli-Venezia Giulia - Veneto*).

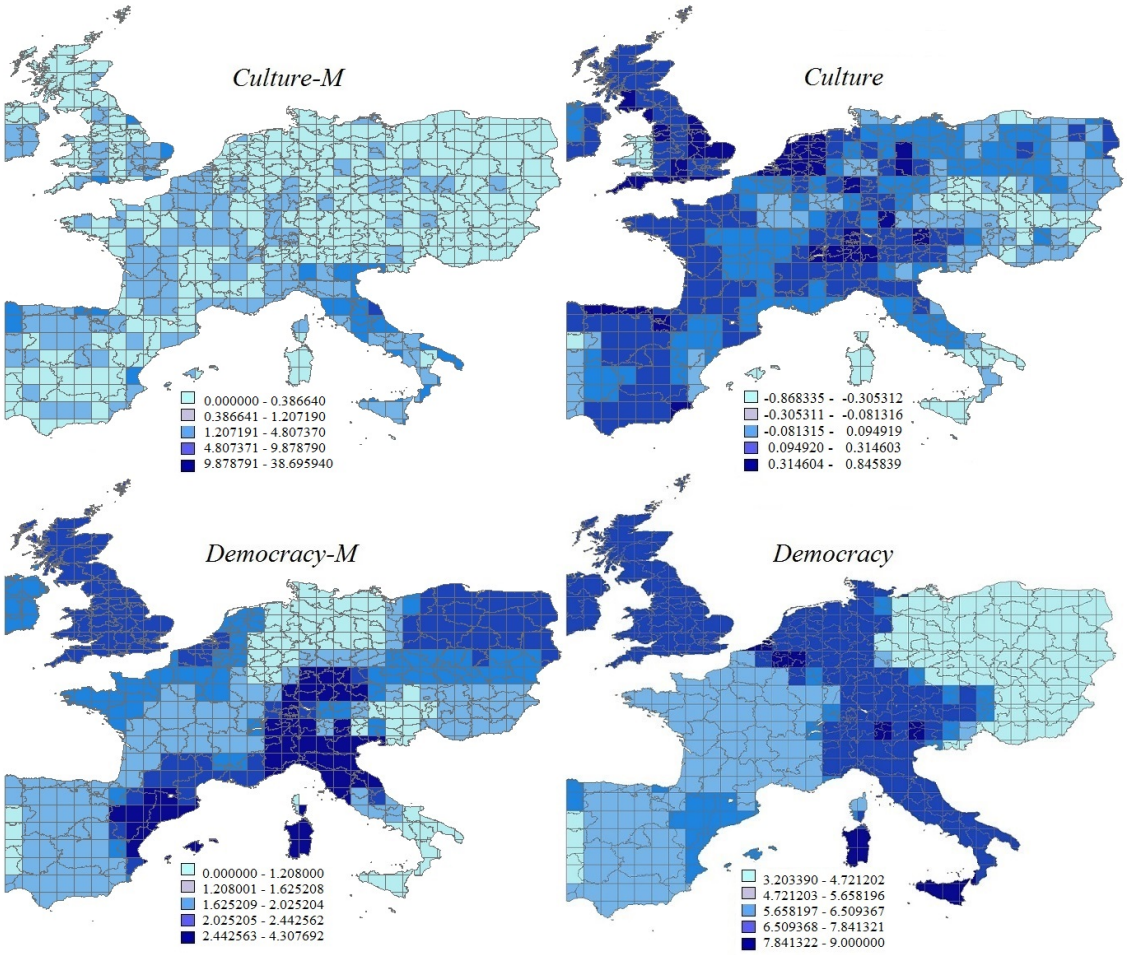
Note: 1. The names of the historical polities are in capital letters, those of the regions constructed by Boranbay and Guerriero (2015) are in Italic lowercase letters, and those of the present-day countries to which these regions belong are in regular lowercase.

Table 2: Summary of Variables

	Variable	Definition and Sources	Statistics
Economic outcomes:	*Income*:	Natural logarithm of the annual GDP per capita in euro averaged over the NUTS 2 regions to which the grid cell belongs and the 2002-2009 period. Source: Eurostat, http://epp.eurostat.ec.europa.eu/	9.837 (0.545)
Institutions:	*Culture-M*:	See text. Sources: Van Der Meer (1965) and Moorman (1983).	0.576 (2.504)
	Culture:	See text. Source: European Value Study, GESIS (2008).	0.018 (0.289)
	Democracy-M:	Constraints on the elite's power score averaged over the historical regions to which the grid cell belongs and the 1000-1600 period. Source: Boranbay and Guerriero (2015).	1.816 (0.594)
	Democracy:	See text. Sources: Marshall and Jaggers (2011) and Author's codification.	5.982 (1.426)
Political accountability:	*RAP*:	Dummy equal to one if the Parliament received a request for removal of the politician's immunity because suspected of a crime. Source: Chang et al. (2010).	0.233 (0.423)
Excluded Instruments:	*Climate-M*:	Standard deviation of the 1000-1600 growing season temperature in degree Celsius. Source: Guiot et al. (2010).	0.531 (0.128)
	Ruggedness:	Terrain ruggedness in km. Source: G-Econ, http://gecon.yale.edu/	0.163 (0.150)
	Coast:	Dummy equal to one if the grid cell has a direct access to the Mediterranean or the Atlantic Ocean, 0 otherwise.	0.367 (0.482)
Other controls:	*Latitude*:	Latitude of the centroid of the grid cell.	47.663 (5.348)
	Longitude:	Longitude of the centroid of the grid cell.	6.986 (8.802)
Culture-related confounding factors:	*Primary-Sector*:	Share of the active population employed in agriculture and fishing averaged over the NUTS 2 regions to which the grid cell belongs and the 2002-2008 period. Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/	0.065 (0.054)
	LPD-M:	Natural logarithm of the population per square km averaged over the grids used in Goldewijk et al. (2011) and the 1000-1600 period. Source: Goldewijk et al. (2011).	3.027 (0.933)
	Climate:	Normalized—to range between 0 and 1—first principal component extracted from the standard deviation of the temperature in degree Celsius and that of the precipitation in mm both averaged between 1961 and 1990. Source: G-Econ, http://gecon.yale.edu/	0.295 (0.184)
	Real-Capital:	Real capital stock per capita in 2000, in millions of euro, averaged over the NUTS 2 regions to which the grid cell belongs. Source: Derbyshire et al. (2013).	0.052 (0.026)
	Catholicism:	See text. Source: European Value Study, GESIS (2008).	0.258 (0.152)
	Wittenberg:	Distance from Wittenberg to the grid cell centroid in km.	928.382 (521.789)
	Neolithic:	Average time since agricultural transition in years. Source: Pinhasi et al. (2005).	6747.321 (657.154)
	Migratory-Distance:	Migratory distance from Addis Ababa to the grid cell centroid in thousands of km. Source: Ashraf and Galor (2013a).	5.704 (0.626)
Inclusive political institutions-related confounding factors:	*Atlantic-Trade*:	Number of Atlantic ports in the grid cell between 1500 and 1850. Source: Acemoglu et al. (2005).	0.123 (0.457)
	Distance-to-Coast:	Average distance to the coast within the grid cell in km. Source: G-Econ, http://gecon.yale.edu/	160.470 (158.693)
	Traveling-Distance:	Average traveling distance between the centroid and the corners of the grid cell in km. Source: http://www.distancefromto.net	256.548 (289.872)
	Potato:	Land suitability for white potato ranging between 0 and 100 and averaged over the grids used in the GAEZ dataset. Source: http://www.gaez.iiasa.ac.at/	26.335 (13.756)
	Black-Death:	Mortality rate from Black Plague in the population between 1346 and 1353 averaged over the NUTS2 regions to which the grid cell belongs. Source: Benedictow (2004).	59.542 (2.999)
	Human-Capital:	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 cell belongs and the 2002-2009 period. Source: Eurostat, http://epp.eurostat.ec.europa.eu/	51.057 (15.845)

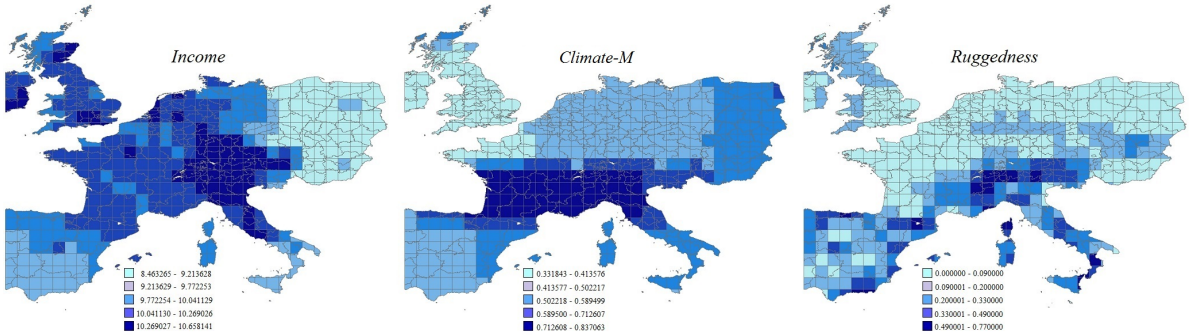
Note: 1. The last column reports the mean and, in parentheses, the standard deviation of each variable. Both are computed building on the samples used in tables 3 and 4 except in the case of *RAP*, when they are calculated exploiting the sample used in table 7.

Figure 1: Persistent Institutions



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

Figure 2: 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)	(3)	(4)
	The dependent variable is:			
	Culture	*Culture*	*Democracy*	*Democracy*
Culture-M	0.006 (0.003)**			
Democracy-M			0.137 (0.055)***	
Climate-M		0.478 (0.087)***	0.017 (0.286)	- 0.025 (0.294)
Ruggedness	0.227 (0.070)***	0.095 (0.072)		0.688 (0.242)***
Coast	- 0.067 (0.020)***	- 0.053 (0.020)***		0.112 (0.067)*
p-value for *Latitude* and *Longitude*	[0.00]	[0.00]	[0.00]	[0.00]
Estimation			OLS	
Within R^2	0.14	0.18	0.07	0.08
Number of observations	578	578	578	578

Notes: 1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider country fixed effects.

Figure 3: Institutions and Outcomes — Partial Correlations

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 *Income*					
Culture	0.225	0.874	0.852	0.994	0.532	0.532	0.897	0.582	0.829
	(0.037)***	(0.155)***	(0.147)***	(0.172)***	(0.436)	(0.140)***	(0.153)***	(0.134)***	(0.160)***
Democracy	0.071	0.123	0.129	0.230	0.592	0.099	0.130	0.186	- 0.004
	(0.011)***	(0.099)	(0.096)	(0.116)**	(0.483)	(0.072)	(0.104)	(0.084)**	(0.094)
Primary-Sector			0.143						
			(0.175)						
LPD-M				0.062					
				(0.013)***					
Climate					- 0.738				
					(0.581)				
Real-Capital						5.178			
						(1.308)***			
Catholicism							0.115		
							(0.155)		
Wittenberg								- 0.001	
								(0.0001)***	
Neolithic									0.00001
									(0.00002)
Migratory-Distance									- 0.971
									(0.129)***
				First-Stage for *Culture*					
Climate-M		0.478	0.507	0.472	0.434	0.487	0.485	0.479	0.451
		(0.087)***	(0.088)***	(0.087)***	(0.086)***	(0.088)***	(0.087)***	(0.087)***	(0.082)***
Ruggedness		0.095	0.088	0.083	0.191	0.061	0.097	0.088	0.134
		(0.072)	(0.072)	(0.073)	(0.075)**	(0.076)	(0.072)	(0.072)	(0.071)*
Coast		- 0.053	- 0.058	- 0.054	- 0.020	- 0.050	- 0.054	- 0.046	- 0.030
		(0.020)***	(0.020)***	(0.020)***	(0.021)	(0.020)**	(0.020)***	(0.021)**	(0.020)
Sanderson-Windmeijer test p-value		0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00
				First-Stage for *Democracy*					
Climate-M		- 0.025	- 0.032	- 0.047	0.103	- 0.335	- 0.174	- 0.035	- 0.071
		(0.294)	(0.300)	(0.295)	(0.293)	(0.272)	(0.285)	(0.291)	(0.314)
Ruggedness		0.688	0.694	0.640	0.407	0.393	0.647	0.755	0.738
		(0.242)***	(0.244)***	(0.247)***	(0.253)*	(0.234)*	(0.234)***	(0.241)***	(0.272)***
Coast		0.112	0.118	0.111	0.014	0.237	0.118	0.042	0.118
		(0.067)*	(0.067)*	(0.067)*	(0.072)	(0.062)***	(0.064)*	(0.069)	(0.077)
Sanderson-Windmeijer test p-value		0.00	0.00	0.01	0.55	0.00	0.00	0.01	0.02
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	0.54	0.00	0.00	0.01	0.02
P-value of Sargan statistic		0.24	0.24	0.22	0.90	0.98	0.26	0.05	0.67
Number of observations	578	578	573	578	578	563	578	578	518
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel B. The dependent variable is *Income*					
Culture	0.869	0.903	0.717	0.916	0.877	0.820	0.091	0.356	0.356
	(0.144)***	(0.165)***	(0.195)***	(0.153)***	(0.157)***	(0.167)***	(0.028)***	(0.108)***	(0.107)***
Democracy	0.119	0.066	0.209	0.150	0.186	0.103	0.020	0.085	0.085
	(0.095)	(0.087)	(0.121)*	(0.130)	(0.112)*	(0.094)	(0.008)**	(0.093)	(0.091)
Atlantic-Trade	- 0.011								
	(0.024)								
Distance-to-Coast		- 0.0001							
		(0.0001)							
Traveling-Distance			- 0.0001						
			(0.0001)						
Potato				0.0006					
				(0.001)					
Black-Death					- 0.016				
					(0.006)***				
Human-Capital						0.002			
						(0.001)**			
P-value for medieval innovations and current role of medieval geography							[0.12]	[0.24]	[0.22]
P-value for all extra controls							[0.00]	[0.00]	[0.00]
				First-Stage for *Culture*					
Climate-M	0.496	0.480	0.466	0.526	0.468	0.400		0.461	0.483
	(0.086)***	(0.087)***	(0.087)***	(0.089)***	(0.087)***	(0.086)***		(0.087)***	(0.082)***
Ruggedness	0.105	0.094	0.094	0.177	0.086	0.087		0.243	0.216
	(0.071)	(0.072)	(0.071)	(0.082)**	(0.072)	(0.070)		(0.087)***	(0.081)***
Coast	- 0.065	- 0.047	- 0.025	- 0.051	- 0.059	- 0.058		- 0.022	- 0.016
	(0.020)***	(0.024)*	(0.024)	(0.020)**	(0.020)***	(0.019)***		(0.026)	(0.025)
Sanderson-Windmeijer test p-value	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
				First-Stage for *Democracy*					
Climate-M	- 0.062	0.012	0.015	- 0.072	- 0.068	- 0.013		- 0.302	- 0.246
	(0.294)	(0.293)	(0.294)	(0.304)	(0.293)	(0.298)		(0.302)	(0.289)
Ruggedness	0.668	0.676	0.692	0.566	0.647	0.690		0.277	0.210
	(0.242)***	(0.242)***	(0.242)***	(0.278)**	(0.242)***	(0.243)***		(0.302)	(0.287)
Coast	0.135	0.212	0.021	0.111	0.089	0.113		0.170	0.185
	(0.068)**	(0.082)***	(0.082)	(0.067)*	(0.067)	(0.067)*		(0.091)*	(0.087)**
Sanderson-Windmeijer test p-value	0.00	0.00	0.05	0.03	0.01	0.00		0.10	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R^2							0.73		
P-value of underidentification test	0.00	0.00	0.05	0.04	0.01	0.01		0.09	
P-value of Sargan statistic	0.26	0.12	0.76	0.23	0.44	0.12		0.18	0.60
Number of observations	578	578	578	577	578	578	500	500	500

Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects. The extra controls included in the specifications reported in columns (7) to (9) of panel B are *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital*.
3. In columns (2) to (9) of panel A and columns (1) to (6) and (8) of panel B (column (9) of panel B), the endogenous variables are *Culture* and *Democracy* (*Income*, *Culture*, and *Democracy*) and the excluded instruments are *Climate-M*, *Ruggedness*, and *Coast*. The control variables used in the second-stage are also included in the first-stage.
4. The proxies for medieval innovations are *Primary-Sector*, *LPD-M*, and *Atlantic-Trade*, whereas those for the current role of medieval geography are *Climate*, *Traveling-Distance*, and *Distance-to-Coast*.
5. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

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

	(1)	(2)	(3)
		The dependent variable is *Income*	
Culture	1.267	0.710	0.727
	(0.459)***	(0.238)***	(0.196)***
Democracy	0.141	- 0.124	0.210
	(0.124)	(0.266)	(0.130)
Climate-M	- 0.260		
	(0.275)		
Ruggedness		0.235	
		(0.230)	
Coast			- 0.037
			(0.031)
P-value of the Sanderson-Windmeijer test in the first-stage for *Culture*	0.00	0.01	0.00
P-value of the Sanderson-Windmeijer test in the first-stage for *Democracy*	0.00	0.15	0.02
Estimation		2SLS	
P-value of underidentification test	0.00	0.15	0.02
Number of observations	578	578	578

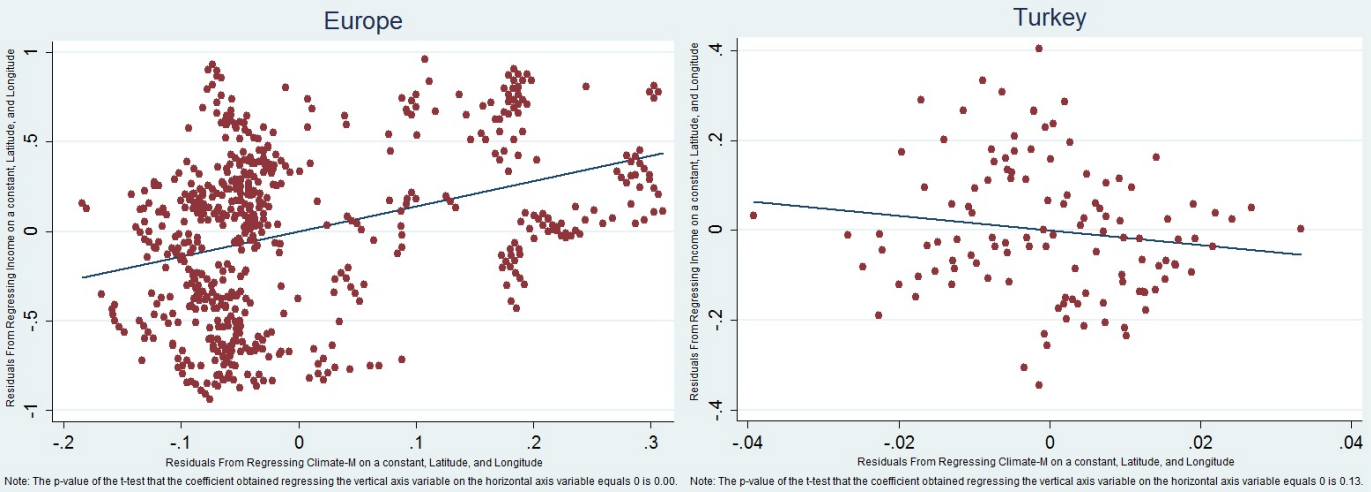
Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects. The control variables used in the second-stages are also included in the first-stages, which are as in column (2) of panel A of table 4 and thus not reported in the present table.
3. The endogenous variables are *Culture* and *Democracy*, whereas the excluded instruments in columns (1) to (3) are respectively *Ruggedness* and *Coast*, *Climate-M* and *Coast*, and *Climate-M* and *Ruggedness*.
4. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification test is that the excluded instruments are uncorrelated with the endogenous variables.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel A. The dependent variable is *Income*					
Culture	0.117	0.351	0.330	0.361	0.318	0.269	0.352	0.369	0.351
	(0.046)**	(0.209)*	(0.200)*	(0.210)*	(0.206)	(0.195)	(0.209)*	(0.210)*	(0.262)
				First-Stage for *Culture*					
Climate-M		0.531	0.583	0.528	0.530	0.510	0.533	0.531	0.480
		(0.159)***	(0.167)***	(0.159)***	(0.160)***	(0.158)***	(0.159)***	(0.159)***	(0.175)***
Sanderson-Windmeijer test p-value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
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	0.00	0.00	0.00	0.00	0.01
Number of observations	408	408	394	408	408	408	408	408	346
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel B. The dependent variable is *Income*					
Culture	0.362	0.357	0.363	0.381	0.353	0.296	0.028	0.299	0.304
	(0.211)*	(0.224)	(0.217)*	(0.247)	(0.211)*	(0.177)*	(0.042)	(0.230)	(0.150)**
P-value for medieval innovations and current role of medieval geography							[0.23]	[0.20]	[0.01]
P-value for all extra controls							[0.00]	[0.00]	[0.00]
				First-Stage for *Culture*					
Climate-M	0.525	0.502	0.515	0.478	0.526	0.521		0.454	0.454
	(0.159)***	(0.160)***	(0.159)***	(0.166)***	(0.156)***	(0.158)***		(0.188)**	(0.126)***
Sanderson-Windmeijer test p-value	0.00	0.00	0.00	0.00	0.00	0.00		0.02	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R^2							0.55		
P-value of underidentification test	0.00	0.00	0.00	0.00	0.00	0.00		0.01	
P-value of Sargan statistic									0.77
Number of observations	408	408	408	406	408	408	332	332	332

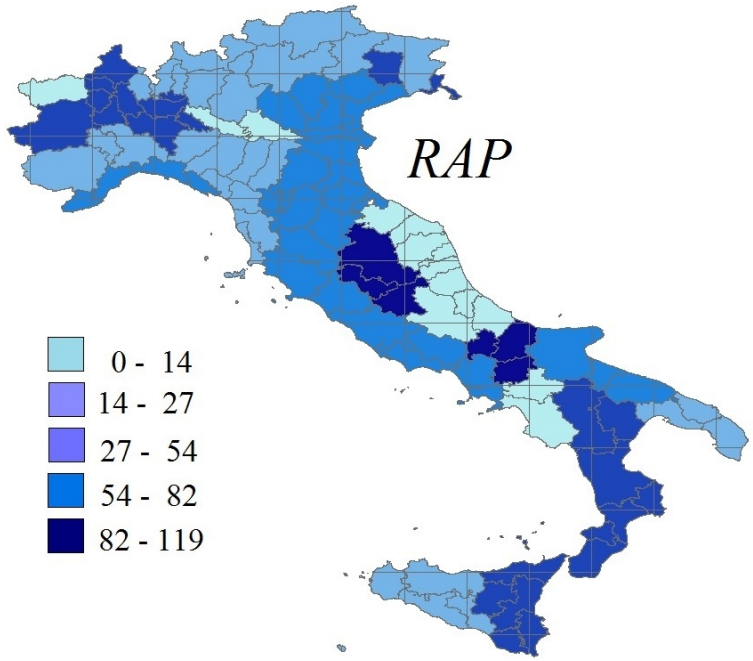
Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and adjacent grid cells fixed effects. The specifications in columns (3) to (9) of panel A also include *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic* and *Migratory-Distance*, *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital* respectively. The extra controls considered in the specifications reported in columns (7) to (9) of panel B are *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital*. The control variables used in the second-stage are also included in the first-stage.
3. In columns (2) to (9) of panel A and columns (1) to (6) and (8) of panel B (column (9) of panel B), the endogenous variable(s) is (are) *Culture* (*Income* and *Culture*) and the excluded instrument is *Climate-M*.
4. The proxies for medieval innovations are *Primary-Sector*, *LPD-M*, and *Atlantic-Trade*, whereas those for the current role of medieval geography are *Climate*, *Traveling-Distance*, and *Distance-to-Coast*.
5. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

Figure 4: Severity of Consumption Risk and 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 grid cells covering Turkey in the case of the right graph.

Figure 5: Malfeasance by the Italian First Republic Parliament



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

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 *RAP*					
Culture	- 0.274	- 0.341	- 0.396	- 0.342	- 0.354	- 0.396	- 0.344	- 0.343	- 0.508
	(0.057)***	(0.120)***	(0.170)**	(0.119)***	(0.119)***	(0.158)***	(0.120)***	(0.226)	(0.424)
Democracy	- 0.015	- 0.049	- 0.066	- 0.047	- 0.069	- 0.047	- 0.050	- 0.022	- 0.054
	(0.016)	(0.081)	(0.077)	(0.081)	(0.081)	(0.079)	(0.072)	(0.229)	(0.091)
Primary-Sector			- 0.390						
			(0.812)						
LPD-M				0.017					
				(0.019)					
Climate					0.054				
					(0.087)				
Real-Capital						1.076			
						(1.486)			
Catholicism							- 0.011		
							(0.220)		
Wittenberg								- 0.00003	
								(0.0004)	
Neolithic									$3.27E^{-6}$
									(0.00003)
Migratory-Distance									0.162
									(0.307)
				First-Stage for *Culture*					
Climate-M		1.782	1.728	1.782	1.811	1.369	1.808	1.482	1.645
		(0.015)***	(0.017)***	(0.015)***	(0.016)***	(0.017)***	(0.015)***	(0.024)***	(0.023)***
Ruggedness		0.224	0.232	0.255	0.198	0.227	0.221	0.211	0.189
		(0.008)***	(0.008)***	(0.008)***	(0.010)***	(0.007)***	(0.008)***	(0.008)***	(0.008)***
Coast		- 0.050	- 0.046	- 0.045	- 0.052	- 0.036	- 0.049	- 0.051	- 0.056
		(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Sanderson-Windmeijer test p-value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				First-Stage for *Democracy*					
Climate-M		- 3.199	- 4.334	- 3.198	- 3.336	- 3.135	- 3.652	0.698	- 8.293
		(0.110)***	(0.120)***	(0.109)***	(0.121)***	(0.143)***	(0.108)***	(0.172)***	(0.140)***
Ruggedness		- 0.010	0.153	- 0.111	0.114	- 0.010	0.034	0.163	- 0.595
		(0.060)	(0.059)***	(0.063)*	(0.076)	(0.060)	(0.058)	(0.057)***	(0.051)***
Coast		- 0.131	- 0.044	- 0.148	- 0.123	- 0.134	- 0.144	- 0.118	0.081
		(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.015)***	(0.015)***	(0.013)***
Sanderson-Windmeijer test p-value		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	0.19	0.63	0.52	0.51	0.50
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 *RAP*				
Culture	- 0.586	- 0.413	- 0.320	- 0.284	- 0.348	- 0.198	- 1.078	- 1.078
	(0.324)*	(0.122)***	(0.125)***	(0.137)**	(0.121)***	(0.176)	(0.464)**	(0.464)**
Democracy	- 0.166	- 0.069	- 0.030	- 0.021	- 0.050	- 0.001	- 0.080	- 0.080
	(0.181)	(0.079)	(0.086)	(0.089)	(0.081)	(0.028)	(0.081)	(0.081)
Distance-to-Coast	0.0007							
	(0.0007)							
Traveling-Distance		- 0.0001						
		(0.00005)						
Potato			0.0002					
			(0.0017)					
Black-Death				0.014				
				(0.011)				
Human-Capital					0.00005			
					(0.0005)			
P-value for medieval innovations and current role of medieval geography						[0.27]	[0.30]	[0.30]
P-value for all extra controls						[0.58]	[0.36]	[0.36]
				First-Stage for *Culture*				
Climate-M	1.791	1.742	1.765	1.773	1.742		1.009	1.009
	(0.015)***	(0.015)***	(0.015)***	(0.015)***	(0.013)***		(0.043)***	(0.042)***
Ruggedness	0.237	0.232	0.300	0.203	0.336		0.306	0.306
	(0.009)***	(0.008)***	(0.010)***	(0.009)***	(0.008)***		(0.011)***	(0.011)***
Coast	- 0.055	- 0.042	- 0.046	- 0.049	- 0.031		0.004	0.004
	(0.003)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***		(0.002)	(0.002)
Sanderson-Windmeijer test p-value	0.00	0.00	0.00	0.00	0.00		0.00	
				First-Stage for *Democracy*				
Climate-M	- 3.407	- 3.050	- 3.115	- 3.248	- 3.156		- 9.002	- 9.002
	(0.111)***	(0.114)***	(0.109)***	(0.110)***	(0.110)***		(0.273)***	(0.272)***
Ruggedness	- 0.296	- 0.039	- 0.387	- 0.124	- 0.131		0.202	0.202
	(0.067)***	(0.061)	(0.073)***	(0.068)*	(0.064)**		(0.073)***	(0.072)***
Coast	- 0.026	- 0.159	- 0.149	- 0.128	- 0.152		0.012	0.012
	(0.019)	(0.017)***	(0.016)***	(0.016)***	(0.016)***		(0.015)	(0.015)
Sanderson-Windmeijer test p-value	0.00	0.00	0.00	0.00	0.00		0.00	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R^2						0.08		
P-value of underidentification test	0.00	0.00	0.00	0.00	0.00		0.00	
P-value of Sargan statistic	0.35	0.80	0.47	0.89	0.50		0.62	0.99
Number of observations	5755	5755	5755	5755	5755	5755	5755	5755

Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and the regressors listed in footnote 28. The extra controls included in the specifications reported in columns (6) to (8) of panel B are *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital*. The control variables used in the second-stage are also included in the first-stage.
3. In columns (2) to (9) of panel A and columns (1) to (5) and (7) of panel B (column (8) of panel B), the endogenous variables are *Culture* and *Democracy* (*RAP*, *Culture*, and *Democracy*) and the excluded instruments are *Climate-M*, *Ruggedness*, and *Coast*.
4. The proxies for medieval innovations are *Primary-Sector* and *LPD-M*, whereas those for the current role of medieval geography are *Climate*, *Traveling-Distance*, and *Distance-to-Coast*.
5. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

APPENDIX (FOR ONLINE PUBLICATION)

Constructing the *Political-Autonomy* Index

Political-Autonomy equals 1 if a region has exclusive control over a limited set of policy—e.g., education, 2 if it is fiscally decentralized, 3 if it has substantial political autonomy from the central government, and 0 otherwise. I 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. Next, I clarify how I computed the index for the NUTS 2 regions in the sample.

Austria

The 1971 Austro-Italian treaty stipulated that the South Tyrol region would be granted an autonomous status in all similar to the one of the Trentino-Alto Adige within Italy. The autonomy recognized by the special statute covers the political, legislative, administrative, and fiscal institutions with very limited legislative or executive competencies left to the central government (Parolari, 2012). Thus, I assigned a score of 2 to South Tyrol from 1971 on and 1 to the remaining NUTS 2 regions belonging to Austria.

Belgium

Starting from the four language areas (the Dutch, bilingual, French and German language areas), the 1962-3, 1970, and following revisions of the Belgian constitution established that Belgium is a unique federal state with two segregated political power—i.e., region Wallone and the Vlaams Gewest—with independent political and taxation power (Verbeke, 2012). The overlapping boundaries of the Regions and Communities have created two notable peculiarities: the territory of the Brussels-Capital Region is included in both the Flemish and French Communities, and the territory of the German-speaking Community lies wholly within the Walloon Region. Jurisdictional conflicts are resolved by the Constitutional Court.

The Federal State's authority includes justice, defense, federal police, social security, nuclear energy, monetary, fiscal, and foreign policies, and other aspects of public finances which together amount to the 50% of the national fiscal income (Verbeke, 2012). The

communities exercise their authority on policies related to education, use of language, health policy, employment, agriculture, water policy, housing, public works, energy, transport, the environment, town and country planning, nature conservation, and credit. They supervise the provinces, municipalities and inter-communal utility companies. There is almost no possible veto by the Belgian State and, often, Belgium is not even able to sign an international treaty without the agreement of the Walloon and Flemish Parliaments (Verbeke, 2012).

Based on these peculiarities, the Région Wallonne and Vlaams Gewest are assigned a value of 3 for 1962 on whereas the Brussels-Capital region has always a value of 1.

France

With the 1992 Joxe statute, the central government has granted to a Corse Parliament exclusive powers on local policies but without fiscal privileges (Chaubin et al., 2003). I assigned a score of 1 to Corse from 1992 on and 0 to the other French regions.

Italy

Article 116 of the Italian Constitution (1948) grants to the regions of Friuli-Venezia Giulia, Sardegna, Sicilia, Trentino Alto Adige, and Valle D'Aosta not only the power of legislate over public schools, health-care, and local infrastructures but also to retain the vast majority (at least the 70%) of their own tax revenue. With the constitutional decree n. 2 released on the 31/01/2001, the regions with ordinary statutes acquired residual legislative powers. In particular, they now have exclusive legislative power with respect to any matters not expressly reserved to state law (Article 117). Yet their financial autonomy is not complete and the can keep only 20% of all levied taxes, mostly used to finance the region-based healthcare system (Pennino, 2009). On top of this discussion, I have assigned a score of 2 to Friuli-Venezia Giulia, Sardegna, Sicilia, Trentino Alto Adige, and Valle D'Aosta from 1948 on and a score of 1 to all the other regions between 2001 and 2010.

Spain

The starting point in the territorial organization of Spain was the second article of the 1978 constitution, which gave the way to an eventual process of devolution to be realized according to two possible "routes" (Beltrán et al., 2005). The "fast track" was established in article 151, and was implicitly reserved for the three "historical nationalities" of the Cataluna,

Galicia, and Pais Vasco constituted in 1979. To this groups was added Navarra (1982), which acceded to autonomy through the recognition of its historical "charters" and as such it is known as a "chartered community". The constitution also explicitly established that the institutional framework for these communities would be a parliamentary system, with a Legislative Assembly elected by universal suffrage, a cabinet or "council of government", a president of such a council, elected by the Assembly, and a Supreme Court of Justice. They were also granted a maximum level of devolved competences. The "slow track" was established in article 143. This route was taken by the other Spanish communities which got constituted in the following years (Andalucia, 1981; Aragon, 1982; Asturias, 1981; Baleares, 1983; Cantabria, 1982; CastillaLa Mancha, 1982; Castilla-Len, 1983; Extremadura, 1983; La Rioja, 1982; Madrid, 1983; Murcia, 1982; Comunidad Valenciana, 1982) and acquired in the 80s and 90s a very similar structure to the one devised for the "historical nationalities".

Since the late 90s then, all regions have acquired the power to manage their own finances and are responsible for the administration of education, health and social services, and cultural and urban development (Beltrán et al., 2005). Yet, Aragon, Baleares, Cataluna, Comunidad Valenciana, Galicia, and Pais Vasco still keep a wider control of policy-making to the point of adopting a regional civil code (Beltrán et al., 2005). Thus, I assigned starting with the year of foundation of each community a value of 3 to Aragon, Baleares, Cataluna, Comunidad Valenciana, Galicia, and Pais Vasco and 2 to the remaining regions.

United Kingdom

Northern Ireland.—Since the 1998 Good Friday Agreement, Northern Ireland has devolved government within the United Kingdom. The UK Government and UK Parliament are responsible for reserved and excepted matters. Reserved matters are a list of policy area—such as civil aviation, units of measurement, and human genetics, which Parliament may devolve to Northern Ireland Assembly at some time in future (Aughey, 2005). Excepted matters—such as international relations, UK taxation and elections—are never expected to be considered for devolution. On all other matters, the Northern Ireland Executive together with the 108-member Northern Ireland Assembly may legislate and govern for Northern Ireland (Aughey, 2005). In addition, devolution in Northern Ireland is dependent upon

participation by members of the Northern Ireland executive in the North/South Ministerial Council, which co-ordinates areas of co-operation—such as agriculture, education and health—between Northern Ireland and the Republic of Ireland. Elections to the Northern Ireland Assembly are by single transferable vote with six representatives elected from 18 parliamentary constituencies. Eighteen representatives to the lower house of the UK parliament are elected from the same constituencies using the first-past-the-post system. However, not all of these take their seats. In addition, the upper house of the UK parliament, the House of Lords, currently has some 25 appointed members from Northern Ireland. The Northern Ireland Office represents the UK government in Northern Ireland on reserved matters and represents Northern Ireland within the UK Government. The Northern Ireland Office is led by the Secretary of State for Northern Ireland, who sits in the UK Cabinet (Aughey, 2005).

Because of the devolution, I gave to Northern Ireland a score of 3 from 1999 on.

Scotland.—Scotland has partial self-government within the United Kingdom as well as representation in the UK Parliament. From 1999, executive and legislative powers have been devolved to the Scottish Government and the Scottish Parliament in Edinburgh, respectively (Hearn, 2002). The UK Parliament retains power over a set list of areas explicitly specified in the Scotland Act 1998 as reserved matters, including, for example, levels of UK taxes, social security, defence, international relations and broadcasting (Hearn, 2002). The Scottish Parliament has legislative authority for all other areas accounting for approximately around 70% of total identifiable public sector expenditures, as well as limited power to vary income tax (Hearn, 2002). The Scottish Parliament can give legislative consent over devolved matters back to Westminster by passing a Legislative Consent Motion (Hearn, 2002).

To account for the devolution, I assigned to Scotland a score of 3 from 1999 on.

Wales.—Wales is a country that is part of the United Kingdom. Constitutionally, the UK is a de jure, unitary state, its parliament and government in Westminster. 40 out of the 650 representatives of the House of Commons come the from Welsh constituencies. A Secretary of State for Wales sits in the UK cabinet and is responsible for representing matters pertaining to Wales. The referendum held in 1997 chose to establish a form of self-government. The consequent process of devolution began with the Government of Wales Act 1998, which created the National Assembly for Wales. Powers of the Secretary of State for

Wales were transferred to the devolved government on 1 July 1999, granting the Assembly responsibility to decide how the Westminster government's budget for devolved areas is spent and administered (Davies et al., 2008). The 1998 Act was amended by the Government of Wales Act 2006 which enhanced the Assembly's powers, giving it legislative powers akin to the Scottish Parliament and Northern Ireland Assembly (Davies et al., 2008). The Assembly consists of 60 members, elected for four-year terms under an additional member system. The Assembly must elect a First Minister, who selects ministers to form the Welsh Government.

The twenty areas of responsibility devolved to the Welsh Government, known as "subjects", include agriculture, economic development, education, health, housing, local government, social services, tourism, transport and the Welsh language (Davies et al., 2008). A referendum on extending the law-making powers of the National Assembly was accordingly held on 3 March 2011. It asked the question: "Do you want the Assembly now to be able to make laws on all matters in the 20 subject areas it has powers for?" The result of the vote was that 63.49% voted "yes", and 36.51% voted "no". Hence, the Assembly is now able to make laws, known as Acts of the Assembly, on all matters in the subject areas, without needing the UK Parliament's agreement on the final implementation (Davies et al., 2008).

To account for the devolution, I assigned to Wales a score of 3 from 1999 on.

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Tables

Table I: Summary of Variables

	Variable	Definition and Sources	Statistics
Economic outcomes:	*Income-1995*:	Natural logarithm of the GDP per capita in 1995 US dollars at the 1995 purchasing power parity exchange rates. Source: G-Econ, http://gecon.yale.edu/	9.454 (0.700)
Institutions:	*Control*:	Unconditional average of the responses to the question "some people feel they have completely free choice and control over their lives, while other people feel that what we do has no real effect on what happens to them. Please use this scale (from 1 to 10) [...] to indicate how much freedom of choice and control in life you have over the way your life turns out." Source: European Value Study, GESIS (2008).	6.767 (0.685)
	Obedience:	Share of answers mentioning "obedience" as an important quality that children should be encouraged to learn. Source: European Value Study, GESIS (2008).	0.308 (0.153)
	Hard-Work:	Share of answers mentioning "hard work" as an important quality that children should be encouraged to learn. Source: European Value Study, GESIS (2008).	0.454 (0.250)
	Thrift:	Share of answers mentioning "thrift" as an important quality that children should be encouraged to learn. Source: European Value Study, GESIS (2008).	0.387 (0.120)
	Culture-T:	See text. Source: European Value Study, GESIS (2008).	0.005 (0.300)
	Culture-A:	See text. Source: European Value Study, GESIS (2008).	0.030 (0.398)
	Political-Autonomy:	See text. Source: Author's codification.	0.304 (0.535)
	Democracy-2000-2010:	*Democracy* averaged between 2000 and 2010. Sources: Marshall and Jaggers (2011) and Author's codification.	7.620 (1.280)
	Democracy-F:	First principal component extracted from the Polity IV constraints on the executive authority score and the regional political autonomy indicator each averaged between 1950 and 2010. Sources: Marshall and Jaggers (2011) and Author's codification.	0.001 (1.003)
Quality of governance:	*Law-Enforcement*:	First principal component extracted from 2010 measures of honesty, impartiality, and quality of law enforcement and averaged over the NUTS 2 regions to which the grid cell belongs. Source: Charron et al. (2013).	0.013 (0.992)
	Honesty:	Extent to which public education, health care, and law enforcement are shielded from corruption averaged over the NUTS 2 regions to which the grid cell belongs. Source: Charron et al. (2013).	0.193 (0.742)
	Governance:	Composite quality of governance index score rescaled in order to range between 0 and 100 and averaged over the NUTS 2 regions to which the grid cell belongs. Source: Charron et al. (2013).	65.650 (18.647)
Other confounding factors:	*Temperature*:	Temperature in degree Celsius averaged over the 1961-1990 period. Source: G-Econ, http://gecon.yale.edu/	10.169 (3.423)
	Precipitation:	Precipitation in mm averaged over the 1961-1990 period. Source: G-Econ, http://gecon.yale.edu/	954.413 (313.521)
	Land-Quality:	Land quality for agriculture, defined as the probability that the grid cell may be cultivated, averaged over the grids used in the Atlas of the Biosphere and to which the grid cell belongs. Source: http://www.sage.wisc.edu/	0.620 (0.200)
	Land-Quality-SD:	Standard deviation of the land quality for agriculture, defined as the probability that the grid cell may be cultivated, averaged over the grids used in the Atlas of the Biosphere and to which the grid cell belongs. Source: http://www.sage.wisc.edu/	0.199 (0.085)
	Area-of-Grid:	Land area of the grid cell in square km. Source: G-Econ, http://gecon.yale.edu/	4769.189 (3237.387)

Note: 1. The last column reports the mean and, in parentheses, the standard deviation of each variable. Both are computed building on the samples used in tables II, III, V, and VI.

Table II: Alternative Persistent Cultural Norms

	(1)	(2)	(3)	(4)
	Panel A. The dependent variable is			
	Control	*Control*	*Obedience*	*Obedience*
Culture-M	0.011		- 0.001	
	(0.007)		(0.002)	
Climate-M		- 0.245		- 0.068
		(0.182)		(0.041)
Ruggedness	0.397	0.444	- 0.031	- 0.012
	(0.143)***	(0.150)***	(0.033)	(0.034)
Coast	- 0.024	- 0.029	- 0.005	- 0.007
	(0.041)	(0.041)	(0.009)	(0.009)
Estimation			OLS	
Within R^2	0.20	0.20	0.01	0.02
Number of observations	578	578	578	578
	(1)	(2)	(3)	(4)
	Panel B. The dependent variable is			
	Hard-Work	*Hard-Work*	*Thrift*	*Thrift*
Culture-M	- 0.0005		- $8.51E^{-7}$	
	(0.002)		(0.002)	
Climate-M		0.001		- 0.181
		(0.045)		(0.041)***
Ruggedness	0.059	0.059	- 0.140	- 0.093
	(0.035)*	(0.037)	(0.033)***	(0.034)***
Coast	0.018	0.018	0.014	0.010
	(0.010)*	(0.010)*	(0.009)	(0.009)
Estimation			OLS	
Within R^2	0.09	0.09	0.11	0.14
Number of observations	578	578	578	578

Notes: 1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects.

Table III: Cross-Validating the Proxy for the Inclusiveness of Political Institutions

	(1)	(2)	(3)
	The dependent variable is:		
	Law-Enforcement	*Honesty*	*Governance*
Political-Autonomy	0.140	0.154	2.777
	(0.047)***	(0.018)***	(0.838)***
Estimation		OLS	
Within R^2	0.01	0.02	0.01
Number of observations	547	547	563

Notes: 1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider country fixed effects.

Table IV: Institutions and Outcomes — Looking at the Overall and Regional Variation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	The dependent variable is *Income*							
Culture	1.448	0.757	- 0.740	- 0.740	0.730	- 0.404	0.176	0.176
	(0.214)***	(0.156)***	(1.106)	(1.317)	(1.037)	(0.770)	(0.347)	(0.314)
Democracy	0.289	- 0.005	- 0.265	- 0.265	- 0.225	0.313	0.051	0.051
	(0.077)***	(0.099)	(0.303)	(0.367)	(0.502)	(0.257)	(0.270)	(0.244)
Alternative channels	YES	YES	YES	YES	YES	YES	YES	YES
Modulators of institutions	NO	YES	YES	YES	NO	YES	YES	YES
Intermediate outcomes	NO	NO	YES	YES	NO	NO	YES	YES
Fixed effects	NO	NO	NO	NO	YES	YES	YES	YES
P-value of the Sanderson-Windmeijer test in the first-stage for *Culture*	0.00	0.00	0.57		0.72	0.62	0.85	
P-value of the Sanderson-Windmeijer test in the first-stage for *Democracy*	0.00	0.06	0.53		0.78	0.67	0.88	
Estimation	2SLS	2SLS	2SLS	3SLS	2SLS	2SLS	2SLS	3SLS
P-value of underidentification test	0.00	0.08	0.56		0.75	0.59	0.84	
P-value of Sargan statistic	0.41	0.42	0.68	0.90	0.33	0.78	0.27	0.68
Number of observations	573	512	500	500	88	85	83	83

Notes: 1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude* and *Longitude*. While the alternative channels are *Primary-Sector*, *LPD-M*, *Climate*, *Atlantic-Trade*, *Distance-to-Coast*, and *Traveling-Distance*, the intermediate outcomes are *Real-Capital* and *Catholicism*. Finally, the modulators of institutions are *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Potato*, *Black-Death*, and *Human-Capital*. The control variables used in the second-stage are also included in the first-stage.
3. In columns (1) to (3) and (5) to (7) (columns (4) and (8)), the endogenous variables are *Culture* and *Democracy* (*Income*, *Culture*, and *Democracy*) and the excluded instruments are *Climate-M*, *Ruggedness*, and *Coast*.
4. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

Table V: Institutions and an Alternative Measure of Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A. The dependent variable is *Income-1995*								
Culture	0.186	0.872	0.854	0.980	0.507	0.479	0.844	0.600	0.868
	(0.043)***	(0.180)***	(0.171)***	(0.182)***	(0.397)	(0.164)***	(0.174)***	(0.154)***	(0.222)***
Democracy	0.093	0.030	0.036	0.126	0.541	0.036	0.028	0.075	- 0.122
	(0.013)***	(0.115)	(0.111)	(0.122)	(0.440)	(0.084)	(0.118)	(0.097)	(0.130)
P-value of the Sanderson-Windmeijer test in the first-stage for *Culture*		0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00
P-value of the Sanderson-Windmeijer test in the first-stage for *Democracy*		0.00	0.00	0.01	0.55	0.00	0.00	0.01	0.02
Estimation	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Within R^2	0.15								
P-value of underidentification test		0.01	0.00	0.01	0.54	0.00	0.00	0.01	0.02
P-value of Sargan statistic		0.61	0.62	0.51	0.71	0.29	0.59	0.02	0.89
Number of observations	578	578	573	578	578	578	563	578	518

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel B. The dependent variable is *Income-1995*								
Culture	0.866	0.891	0.764	0.944	0.873	0.895	0.115	0.494	0.494
	(0.168)***	(0.194)***	(0.215)***	(0.174)***	(0.172)***	(0.204)***	(0.042)***	(0.160)***	(0.158)***
Democracy	0.029	- 0.003	0.083	0.084	0.095	0.033	0.060	0.146	0.146
	(0.111)	(0.103)	(0.133)	(0.148)	(0.123)	(0.115)	(0.013)***	(0.137)	(0.135)
P-value of the Sanderson-Windmeijer test in the first-stage for *Culture*	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
P-value of the Sanderson-Windmeijer test in the first-stage for *Democracy*	0.00	0.00	0.05	0.03	0.01	0.00		0.10	
Estimation	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	2SLS	3SLS
Within R^2							0.53		
P-value of underidentification test	0.00	0.00	0.05	0.04	0.01	0.01		0.09	
P-value of Sargan statistic	0.63	0.47	0.86	0.58	0.89	0.66		0.05	0.05
Number of observations	578	578	578	577	578	578	500	500	500

Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects. The specifications in columns (3) to (9) of panel A also include *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, and both *Neolithic* and *Migratory-Distance* respectively, whereas those in columns (1) to (6) of panel B also incorporate *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital* respectively. The extra controls considered in the specifications in columns (7) to (9) of panel B are *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital*. The control variables used in the second-stage are also included in the first-stage.
3. In columns (2) to (9) of panel A and columns (1) to (6) and (8) of panel B (column (9) of panel B), the endogenous variables are *Culture* and *Democracy* (*Income*, *Culture*, and *Democracy*) and the excluded instruments are *Climate-M*, *Ruggedness*, and *Coast*.
4. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

Table VI: Alternative Measures of Institutions, Controls, and Instruments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	The dependent variable is *Income*									
Trust	0.694 (0.253)***									
Respect		1.321 (0.534)**								
Culture-T			0.503 (0.156)***							
Culture-A				0.390 (0.119)***						
Culture					0.314 (0.102)***	0.344 (0.103)***	0.779 (0.193)***	0.775 (0.148)***	0.801 (0.188)***	6.736 (16.675)
Democracy	0.004 (0.086)	0.176 (0.147)	0.045 (0.095)	0.043 (0.094)			0.112 (0.133)	0.163 (0.112)	0.202 (0.152)	0.659 (2.387)
Democracy-2000-2010					0.027 (0.088)					
Democracy-F						0.060 (0.071)				
Temperature							- 0.004 (0.007)			
Precipitation							- 0.0000 (0.0001)			
Land-Quality								0.328 (0.104)***		
Land-Quality-SD								0.647 (0.138)***		
Area-of-Grid									$4.64E^{-6}$ ($5.96E^{-6}$)	
	P-value of the Sanderson-Windmeijer test in the first-stage for the proxy for a culture of cooperation									
	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.70
	P-value of the Sanderson-Windmeijer test in the first-stage for the proxy for inclusive political institutions									
	0.08	0.16	0.09	0.09	0.05	0.01	0.06	0.02	0.12	0.68
Estimation	2SLS									
P-value of underidentification test	0.08	0.16	0.08	0.08	0.05	0.00	0.06	0.02	0.12	0.69
P-value of Sargan statistic	0.02	0.87	0.42	0.44	0.10	0.15	0.11	0.47	0.34	
Number of observations	500	500	500	500	500	500	578	578	578	510

Notes:
1. Standard errors in parentheses. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects. The extra controls included in the specifications in columns (1) to (6) and (10) are *Primary-Sector*, *LPD-M*, *Climate*, *Real-Capital*, *Catholicism*, *Wittenberg*, *Neolithic*, *Migratory-Distance*, *Atlantic-Trade*, *Distance-to-Coast*, *Traveling-Distance*, *Potato*, *Black-Death*, and *Human-Capital*. The control variables used in the second-stage are also included in the first-stage.
3. The endogenous variables are *Trust* and *Democracy* in column (1), *Respect* and *Democracy* in column (2), *Culture-T* and *Democracy* in column (3), *Culture-A* and *Democracy* in column (4), *Culture* and *Democracy-2000-2010* in column (5), *Culture* and *Democracy-F* in column (6), and *Culture* and *Democracy* in columns (7) to (10). The excluded instruments are *Climate-M*, *Ruggedness*, and *Coast* in columns (1) to (9) and *Culture-M* and *Democracy-M* in column (10).
4. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).

Table VII: Allowing for Clustering by Country and Dealing With Spatial Correlation

	(1)	(2)	(3)	(4)	(5)	(6)
	The dependent variable is:					
	Culture	*Democracy*	*Income*	*Culture*	*Democracy*	*Income*
Culture			0.874 (0.380)**			0.577 (0.158)***
Democracy			0.123 (0.179)			0.217 (0.267)
Climate-M	0.478 (0.193)**	- 0.025 (0.510)		0.480 (0.122)***	0.246 (0.347)	
Ruggedness	0.095 (0.123)	0.688 (0.241)**		0.126 (0.035)***	- 0.028 (0.126)	
Coast	- 0.053 (0.023)**	0.112 (0.082)		- 0.053 (0.030)*	0.112 (0.103)	
Sanderson-Windmeijer test p-value	0.01	0.01				
Estimation	OLS	OLS	2SLS	OLS	OLS	2SLS
R^2	0.18	0.08				
P-value of underidentification test			0.14			
P-value of Sargan statistic			0.40			
Number of observations	578	578	578	578	578	578

Notes:
1. Robust standard errors allowing for clustering by country (Conley's (1999) standard errors) in the parentheses of columns (1) to (3) (columns (4) to (6)). *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
2. All specifications also consider *Latitude*, *Longitude*, and country fixed effects. The control variables used in the second-stage are also included in the first-stage.
3. The endogenous variables are *Culture* and *Democracy*, and the excluded instruments are *Climate-M*, *Ruggedness*, and *Coast*.
4. The null hypothesis of the Sanderson-Windmeijer F test is that the endogenous variable is unidentified, and that of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).