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# Endogenous Institutions and Economic Outcomes

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To evaluate the relative importance of a culture of cooperation and inclusive political institutions, I divide Europe into 120 km × 120 km grid cells, and exploit the exogenous variation in both institutions created by medieval history. I document strong first-stage relationships between present-day norms of respect and trust and the severity of consumption risk—i.e. climate volatility—over the period 1000–1600 and between the inclusiveness of present-day regional political institutions and the factors that raised the returns on elite-citizenry investments—i.e. terrain ruggedness and direct access to the coast. Building on these first stages, I show that only culture has a first-order effect on income, even after controlling for country fixed effects, proxies for the alternative roles of the excluded instruments, factors modulating the roles of institutions, and intermediate outcomes. Two possible explanations for these results are that more inclusive regional political institutions might have impeded, in the early modern era, state-building and market integration, and that in modern representative democracies, they are irrelevant in easing the monitoring of politicians by voters when the latter are not morally compelled to punish political malfeasance or the former have weak civic virtues. Macro and micro evidence supports these ideas.

## Introduction

Overwhelming evidence suggests that a 'culture of cooperation', which is the implicit reward from cooperating in any prisoner's dilemma and investment types of activity, and 'inclusive political institutions', which enable the citizenry to better select public-spirited representatives and check their decisions, represent the most successful humanly devised social structures,[1] and that they are correlated with past inclusive political institutions (Putnam *et al*. 1993; Guiso *et al*. 2016). However, documenting that the two institutional arrangements reinforce one another and are persistent does not help to identify their absolute and relative economic roles. This paper simultaneously tackles all these issues by devising a multiple two-stage least squares (2SLS) approach that exploits the exogenous variation in both institutions created at the European local level by medieval history.

Starting in the 11th century, lords began offering peasants high-powered farming contracts to exploit improved land productivity, and entering into commercial partnerships with a rising class of merchants engaged in the first long-distance trades. These innovations flourished where the lords also gave up some political power to gain credibility as investment partners, and they persisted where the citizenry credibly committed to cooperate in investment by attracting the Cistercians and the Franciscans. Uniquely within Western monasticism, both monastic orders dictated charity-based norms of cooperation in exchange for guidance on how to share consumption risk, and accordingly, they were most welcomed by communities facing erratic climates. Inspired by these facts, Boranbay and Guerriero (2017) employ a panel of 90 European regions spanning the period 1000–1600 to test two key ideas. First, the prospect of a sufficiently profitable investment pushes the elite to introduce more inclusive political institutions in an effort to convince the citizens that a sufficient part of its value will be shared via public spending, thus they should cooperate. Second, the citizenry accumulates culture to share consumption risk and to credibly commit to cooperating with the elite in the more profitable investment activity, especially when its value is intermediate relative to the

consumption risk. Then the citizenry foresees limited public spending, and the elite is uncertain whether to enact democracy. This 'commitment dimension of cultural accumulation' also reduces the elite's temptation to repeal political reforms after a fall in the investment value. Consistent with these predictions, reforms towards tighter constraints on the elite's power were driven by the factors curbing the observability of farming investments and by a higher value of long-distance trades—that is, respectively, the ruggedness of the terrain and the direct access to the coast. In addition, cultural accumulation, as captured by the activity of Cistercian and Franciscan houses, rose with the risk of harvest destruction, as driven by the climate volatility, and with shocks depressing the investment value, that is, Franciscans' spread in the Mediterranean after the opening of the Atlantic routes.

Since present-day norms of trust and respect and present-day inclusive political institutions spring from the accumulation of past culture and a legacy of strong constraints on the elite's power (Boranbay and Guerriero 2017), respectively, the link between past institutional arrangements created by the commitment dimension of cultural accumulation produces the first-stage relationships between past political infrastructures and both present-day culture and inclusiveness of political institutions exploited by the extant literature (Tabellini 2010). There are, however, three distinct reasons why, even relying on the aforementioned measure of past culture as an instrument for the present-day culture, this strategy cannot be used fruitfully to consistently identify the absolute and relative importance of the two present-day institutional arrangements. First, the ensuing first stages are weak since the errors in the measurement of institutions worsen as our attention shifts towards the past. Second, the predictions of the two present-day institutional infrastructures obtained from these first-stages are not distinct because of the commitment dimension of cultural accumulation, thus they cannot disentangle the single impact of each institution. Third, since a well-known tradition has linked past institutions to difficult-to-observe intermediate outcomes, such as social conflicts (Grafe 2012; Besley and Persson 2019), it is difficult to defend the exclusion of past institutional arrangements from the structural equation for development. Here, I deal with all these issues by devising a multiple 2SLS approach that instead exploits the geographic drivers of past institutions. First, I divide Europe into 120 km$\times$120 km grid cells. Second, I show that the volatility of the 1000–1600 growing season temperature has a strong effect on present-day culture, as captured by the strength of norms of respect and trust self-reported to the 2008 European Values Study, and has no impact on a measure of the inclusiveness of regional political institutions averaged between 1950 and 2010. This is obtained by supplementing the Polity IV constraints on the executive authority score with an index of regional political autonomy, which has been recognized by a growing literature as key driver of the citizenry's ability to enforce political accountability. Crucially, this political autonomy index also displays a strong within-country correlation with a regional measure of the strength of the rule of law, the key product of inclusiveness (Acemoglu and Johnson 2005). Third, I document that the ruggedness of the terrain and the direct access to the coast have a large impact on the inclusiveness of present-day political institutions and a small effect on present-day culture. Building on these separate first stages, I finally show that only culture has a first-order effect on the logarithm of the GDP per capita averaged between 2002 and 2009, even after controlling for country fixed effects, factors modulating the roles of institutions, intermediate outcomes, and proxies for the alternative roles of the excluded instruments, which rule out that medieval geography has a long-lasting impact on

present-day agriculture, scope for agglomeration, technological diffusion, tourism, and trade.

To further evaluate the validity of the assumptions underlying my multiple 2SLS approach, I perform a number of robustness and sensitivity checks, always conditioning on all available observable factors. First, I document that the overidentifying restrictions cannot be rejected at a level lower than 30%, and that the excluded instruments have no direct impact on outcomes in the semi-reduced-form regressions. Second, I show that not only is the weakness of the excluded instruments rejected by all the canonical tests of the power of either each or all first stages at a level higher than 8%, but also the basic results are very similar when I switch to the less biased—by underidentification—limited information maximum likelihood (LIML) estimator. Crucially, the very same tests reject the overidentifying restrictions and/or do not reject underidentification for the specifications employing past institutions either as exogenous instruments or as the main measures of institutional variation. Third, I report three-stage least squares (3SLS) estimates, which reveal that there are no efficiency gains in allowing a non-zero correlation among first- and second-stage residuals. Fourth, I show that the effect of culture on income survives within pairs of neighbouring grid cells that differ in their medieval climate volatility. Considering this sample enables me to control for all unobserved features specific to the 120 km$\times$240 km grid cell pairs. Finally, I perform a falsification test to examine the reduced-form relationship between medieval climate volatility and present-day development within and outside of my sample. Within Europe, I find that regions that experienced more erratic weather and thus accumulated a stronger culture by attracting more Cistercian and Franciscan houses are more developed today. If medieval climate volatility affects income only through a risk-sharing-driven culture, I should not find a similar link where the cost of accumulating culture was prohibitive. This is what I find. Focusing on 117 Turkish grid cells, I estimate an insignificant impact of the medieval growing season temperature on present-day income per capita. This is consistent with the barriers to the spread of the Cistercian and Franciscan orders erected by both the Eastern Orthodox Church and the Ottoman empire.

I offer two possible explanations for these patterns, both grounded on the underlying idea that a more inclusive political process can favour an otherwise unfeasible citizenry-elite investment in the short run, but might become irrelevant, if not detrimental, when technological and/or social innovations deprive joint investment activities of their economic importance. First, the most institutionally and economically developed medieval polities—like the peripheral Spanish regions and the Belgian language communities—are also those that, during the early modern era, obstructed state-building and market integration to safeguard their own interests (Grafe 2012). Second, in modern representative democracies, more inclusive political institutions are irrelevant in easing 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). I confirm the relevance of these two mechanisms by presenting two further pieces of evidence. First, I document that pre-industrial population density is strongly correlated with the spread of the Cistercians and Franciscans, but not with the strength of the medieval constraints on the elite's power. Moreover, it is unrelated to present-day institutions, which in turn implies that my estimates are not likely to be driven by reverse causality. Second, I show that there are fewer criminal prosecutions of the members of postwar Italian Parliaments in electoral districts in which culture is stronger, but not in those endowed with more inclusive political institutions.

The papers most closely related to mine are Acemoglu and Johnson (2005) and Tabellini (2010). While the former paper shares with me the aim of unbundling institutions but focuses on contract enforcement and property rights protection, Tabellini (2010) also tries to overcome problems inherent to cross-country data by studying 69 European regions and using past political institutions as the excluded instrument for present-day culture in growth regressions. Different from this and the related literature comparing permanent within-country institutions to explain present-day development (Michalopoulos and Papaioannou 2013; Gennaioli *et al*. 2013; Di Liberto and Sideri 2015; Becker *et al*. 2016; Gorodnichenko and Roland 2017), I identify for the first time the separate current roles of culture and inclusive political institutions by reconstructing their evolution over time and pinpointing those among the determinants of past institutions that are conditionally independent from present-day economic development. To do so, I take inspiration from previous research on the geographic drivers of persistent institutions (Acemoglu *et al*. 2005; Fleck and Hanssen 2006; Durante 2010),[2] and I rely on a sample in which geography has neither modulated slavery (Nunn and Puga 2012) nor guided the colonizers' settlement strategy (Acemoglu and Johnson 2005).

The paper proceeds as follows. I illustrate the key historical facts about the medieval institutional revolution in Section I. Next, I describe the data and the empirical strategy in Section II. Then I assess the relative importance of a culture of cooperation and inclusive political institutions in Section III, and I present evidence on possible mechanisms in Section IV. I conclude in Section V, and I gather further tables and figures in an Online Appendix.

## I. 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 the lords who, empowered by the feudal contract, pacified their estates (Stearns 2001, pp. 165–76). This new order fuelled a revolution that changed Europe forever.

As mentioned above, the lords began entering into high-powered farming contracts with the peasants and commercial partnerships with a rising class of merchants, who obtained exemption from the tolls necessary to cross the land (Stearns 2001, pp. 191–222). These enterprises thrived where the lords also introduced more inclusive political institutions to establish themselves as investment partners (Stearns 2001, p. 216), for example, *Giudicati* in Sardinia (952–1297), communes of northern Italy and France (1080–1282), maritime republics of Genoa, Pisa and Venice (1099–1406), towns of Aragon and Cataluña (1150–1213), German imperial cities (1152–1806), and Swiss cantons (1291–1515). To illustrate, Frederick I granted communal privileges to the difficult-to-reach northern Italian towns in exchange for the sizeable payments fixed by the 1183 Peace of Constance (Stearns 2001, p. 208), whereas the *communes jurées* of northern France and Flanders were chartered by the early Capetian kings interested in gaining from the lucrative exchanges of woollens for Eastern spices (Stearns 2001, p. 199). Organized as a sworn association of free men and governed by a public assembly selecting the executive, these states were 'aimed at economic prosperity [and favoured by the lord's] immediate political and financial considerations' (Stearns 2001, p. 199).

Meanwhile, Western monasticism was transforming interpersonal relationships. Imported from the East during the 5th century, it spread out across Europe through some ascetic and many lax initiatives until a group of dissatisfied Cluniac monks

abandoned Molesme in Burgundy and founded in 1098 a new monastery in Cîteaux (Burton and Kerr 2011, pp. 9–10). This event opened a new and highly influential phase of the medieval Church. The Cistercians indeed revived the original Benedictine emphasis on poverty, prayer and manual labour to diffuse the novel and powerful idea, illustrated in their 1119 *Carta Caritatis*, that both the partnership among monasteries and the interaction among worshippers should 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). Crucially, these charity-based norms of conduct should materialize not through alms but through cooperation (Burton and Kerr 2011, pp. 28–9), which the Cistercians themselves supported by organizing a series of risk-sharing activities with the help of local laypeople known as *conversi* and secular labourers (Burton and Kerr 2011, pp. 150–63; Donkin 1978, p. 39). First, they accepted as grants mainly undeveloped lands, and turned them into fertile compact holdings, disseminating at the same time advanced farming techniques (Donkin 1978, pp. 172–3; Tobin 1995, p. 43). Initially targeted at assuring the self-sufficiency of the neighbouring villages, with the demise of the *conversi* system, these estates were leased to the peasants at rates lower than those set by the lords (Donkin 1978, p. 111; Burton and Kerr 2011, p. 166). Second, they further insulated the population from shocks by setting up trade fairs, developing international trade agreements, and diversifying economic activities with the introduction of forges and mills (Tobin 1995, p. 128; Burton and Kerr 2011, p. 185). Third, they provided a series of other risk-sharing services, such as shelter for those in need and food for the starving, significantly limiting social conflicts (Burton and Kerr 2011, pp. 47–50, 191–4). These activities, so crucial in a world of risk-minimization, eased the diffusion of the charity-based norms of cooperation that the Cistercians championed in the communities first exposed to their action and so desperate to preserve it (Burton and Kerr 2011, p. 120). Moreover, they urged the populations of the neighbouring areas—especially those located where the climate was very unpredictable, but not too erratic to force re-siting—to either offer the White monks a site for building a new house or push local houses to join the order (Knowles 1948, p. 64; Donkin 1978, p. 36; Berman 2000, pp. 95, 107, 223; Burton and Kerr 2011, pp. 23–36). Finally, the relationship of 'kinship' among houses assured the homogeneity of the order's action (Tobin 1995, p. 41; Burton and Kerr 2011, p. 82) and connected regions divided by national conflicts, making the Cistercian morality 'generalized' (Burton and Kerr 2011, p. 94). Not surprisingly, in 1153 there were already 435 Cistercian houses scattered around Europe.

When the 14th century 'emancipation of the villein class … combined with the visitations of pestilence' (Knowles 1948, p. 77) undermined the *conversi* system, the Cistercians slowly left the scene to the Franciscans (Tobin 1995, pp. 125, 236). Exactly as the former had 'opened the monastic vocation to the agrarian peasantry' (Lawrence 2001, p. 178), the latter embraced the apostolic life of 'poverty[,] active preaching mission … and example' (Lawrence 2001, pp. 247, 259) prompted by St Francis in his 1223 *Regula* to offer a rising 'town-dwelling laity … the idea of the devout life for the laity' (Lawrence 2001, pp. 240, 259), that is, a life of 'charity pursued through moral consideration and practical engagement' (Muzzarelli 2001, p. 115). Similarly to the Cistercians and uniquely within the remainder of Western monasticism,[3] the Friars Minor accepted 'unenviable sites' (Knowles 1948, p. 192) to build with the help of the lay brothers part of the 'Third Orders' a dense network of houses, linked by a Cistercian-like kinship, and supervise several key risk-sharing—for example, microcredit and public health—activities (Muzzarelli 2001, p. 40). Among these practices, the most noteworthy was to run the *Monte di Pietà*, which accommodated customers with loans in return for a

pledge auctioned if the loan plus an interest payment evaluated at a rate lower than that charged by private bankers—that is, 3% versus 30%—was not paid back (Muzzarelli 2001, pp. 205–6). Summoned by the representatives of those towns more prone to economic shocks and internal unrests (Muzzarelli 2001, pp. 11, 60), the Franciscan preachers would first gather donations (Muzzarelli 2001, pp. 24, 60, 227), then draft the *Monte*'s constitution having in mind 'the customers' material and moral destinies' (Muzzarelli 2001, p. 219), and finally help run the pawnshop (Muzzarelli 2001, p. 243). In doing so, they subjected the loan issuance to an evaluation of the 'morality and social behaviors of the customers' (Muzzarelli 2001, p. 216), that is, those citizens who required credit to overcome a moment of need (Muzzarelli 2001, pp. 166, 170, 244) and, if helped, would have actively contributed to make 'cohabitation more cooperative and fair' (Muzzarelli 2001, p. 41). Crucially, the *Monte*'s obligation to back up the citizenry–nobility partnerships in the case of liquidity shocks also strengthened the relationship between the two groups (Muzzarelli 2001, p. 193). Accordingly, the Franciscan penetration in the Mediterranean delayed the return to autocratic regimes after the opening of the Atlantic routes and the consequent fall in the profitability of the Mediterranean trades (Muzzarelli 2001, pp. 36, 228) and democratization of the Reign of England and the Provinces (Acemoglu *et al.* 2005). Only the Protestant Reformation deprived Western monasticism of its pivotal role by stigmatizing ecclesiastic property and professional preaching (Tobin 1995, p. 158).

## II. Data and Empirical Strategy

In the following, I exploit these historical stylized facts to assess the relative importance of present-day culture of cooperation and inclusiveness of political institutions in Europe.

The full sample consists of 578 grid cells covering a great part of the 16 European countries for which I have sufficient information (see note 14 and Table 1).[4] The grid cells have the same width ($1^{\circ}$) and centroid as those used by the G-Econ project to construct the measure of the ruggedness of the terrain, which in turn has the highest granularity among the excluded instruments measured at the grid cells level. Contrary to a region-based approach, this design allows me to compare cross-sectional units of similar size, sidestep the endogeneity of regional boundaries, and exploit a substantial within-country variation.[5]

### *Measuring a culture of cooperation*

To measure present-day culture, I consider the relevance of respect and the extent of trust self-reported to the 2008 European Values Study, which is the only wave listing the NUTS 2 region where the respondent lived when she/he was 14 and thus culturally mature (Andersen *et al.* 2017). Both values represent norms of 'generalized' morality applied outside the group of friends and relatives (Platteau 2000), thus they embody the implicit reward from cooperating in any prisoner's dilemma and investment types of activity analysed in the Boranbay and Guerriero (2017) model and spread by the Cistercians and Franciscans.

To elaborate, respectful individuals are more reluctant to free-ride on others and are more willing to participate in joint partnerships and engage in politics (Tabellini 2010). Similarly, trust not only favours cooperation in prisoner's dilemma games, as documented by broad experimental evidence (Durante 2010), but also reduces

TABLE 1
THE SAMPLE—MEDIEVAL STATES, HISTORICAL REGIONS AND PRESENT-DAY COUNTRIES

| Medieval state | Present-day country | Historical regions |
|---|---|---|
| Genoa | Italy | Liguria |
| | France | Corse |
| Holy Roman Empire | Austria and Italy | Styria-Austria, Tyrol—Trentino-Alto Adige |
| | Belgium | Région Bruxelles, Région Wallone |
| | Germany | Baden-Württemberg, Bayern, Brandenburg, Bremen—Hamburg—Niedersachsen, Hessen, Mecklenburg-Vorpommern, Nordrhein-Westfalen, Rheinland-Pfalz—Saarland, Sachsen, Schleswig-Holstein, Thüringen—Sachsen-Anhalt |
| | Slovenia | Carniola, Styria-Slovenia |
| 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 and the Humber |
| 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 |

*Notes*
The names of the medieval states are in column (1), those of the historical regions that constitute the cross-section identifiers are in column (2), and those of the present-day countries to which the regions belong are in column (3).

transaction costs, expands market exchange, and facilitates the division of labour (Dixit 2004). To capture both norms, I construct the variable *Culture* as the first principal component extracted from the share of answers mentioning 'tolerance and respect for other people' as important qualities that children should be encouraged to learn—that is, *Respect*—and 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?'—that is, *Trust*. If a grid cell belongs to multiple NUTS 2 regions, then I assign it a figure equal to the average of the values that the first principal component assumes in each represented region weighted by such a region's relative contribution to the grid cell land area (see Table 2 for a summary of each variable). I follow the same procedure for the other variables measured at the regional level.

Tabellini (2010) also considers the conviction that effort will pay off—that is, *Control*—and the acceptance of hierarchies—that is, *Obedience*—as norms shaping development. Neither of the two is, however, connected to the charity-based norms of cooperation disseminated by the Cistercians and Franciscans. A legacy of cross-cultural psychology has indeed documented that *Control* concerns 'the desirability of individuals independently pursuing their own ideas' and *Obedience* 'refers to a cultural emphasis on obeying role obligations within a legitimately unequal distribution of power' (Licht *et al.* 2007, p. 662). Consistent with this remark, the estimated coefficients will have a similar magnitude, but a lower precision, if I turn to either the first principal component extracted from *Respect*, *Trust*, *Control* and *Obedience*—that is, *Culture-T*—or one between *Respect* and *Trust* (see Section III).

Even if focusing on the items most consistent with the underlying concept of a 'culture of cooperation' is key to improving the precision of the estimation, OLS estimates are still bound to be greatly attenuated since self-reported norms of conduct 'are not targeting the same construct or they differ in metric' (Boer *et al.* 2018, p. 713) across cultures. For instance, measuring culture in increasingly market-oriented societies might induce cognitive dissonance or self-serving biases because of the liberal and open-minded ideals of the respondents. Accordingly, Alwin (2007) suggests that these conduct and method biases alone account for approximately 50% of the variance of the proxies for culture.

The upper-right map in Figure 1 illustrates the large variation in *Culture* across Europe and the size of the grid cells that I use as cross-section identifiers, relative to the NUTS 2 regions surveyed by the European Values Study. Even if I employ continuous measures in the empirical analysis, I display the data in the maps in five intervals whose break points are chosen to best group similar values and maximize the differences between groups. Darker areas correspond to higher values. The Benelux countries, England, France, northern Italy and northern Spain exhibit the highest levels of a culture of cooperation, whereas the Czech Republic, Poland and Portugal display the most limited ones. As clarified by the comparison between this pattern and that in the upper-left map in Figure 1, present-day norms of respect and trust are deeply rooted in the medieval risk-sharing-driven culture of cooperation proxied by *Culture-M*, *Culture-M-C* and *Culture-M-F*, where *Culture-M* is the discounted number of years that the Cistercian and Franciscan houses were active per square km averaged over the period 1000–1600, and *Culture-M-C* and *Culture-M-F* are constructed in a similar manner but focus on the Cistercian and Franciscan houses, respectively.[6] The activity of the Cistercians in England and western France, and that of the Franciscans in northern Italy and Spain, have established a more intense

TABLE 2
SUMMARY OF VARIABLES

| | Variable | Definition and sources | Statistics |
|---|---|---|---|
| Economic outcomes | *Income* | Natural log of annual GDP per capita in euros averaged across NUTS 2 regions and period 2002–9. Source: http://epp.eurostat.ec.europa.eu | 9.808 (0.563) |
| | *LPD-1600* | Natural log of 1600 population per square km averaged across grid cells used by Goldewijk *et al*. (2010). Source: www.pbl.nl/hyde | 3.519 (1.006) |
| | *LPD-1700* | Natural log of 1700 population per square km averaged across grid cells used by Goldewijk *et al*. (2010). Source: www.pbl.nl/hyde | 3.586 (1.060) |
| | *LPD-1800* | Natural log of 1800 population per square km averaged across grid cells used by Goldewijk *et al*. (2010). Source: www.pbl.nl/hyde | 3.923 (1.046) |
| | *LPD-1900* | Natural log of 1900 population per square km averaged across grid cells used by Goldewijk *et al*. (2010). Source: www.pbl.nl/hyde | 4.533 (1.110) |
| Institutions | *Culture*-M | See text. Sources: www.cistercensi.info; Van Der Meer (1965); http://users.bart.nl/∼roestb/franciscan/province.htm; Moorman (1983) | 0.202 (1.220) |
| | *Culture-M-C* | See text. Sources: www.cistercensi.info; Van Der Meer (1965) | 0.049 (0.208) |
| | *Culture-M-F* | See text. Sources: http://users.bart.nl/∼roestb/franciscan/province.htm; Moorman (1983) | 0.153 (1.116) |
| | *Culture* | See text. Source: www.europeanvaluesstudy.eu | 0.128 (0.322) |
| | *Culture-T* | See text. Source: www.europeanvaluesstudy.eu | 0.081 (0.341) |
| | *Culture-A* | See text. Source: www.europeanvaluesstudy.eu | 0.167 (0.428) |
| | *Democracy-M* | Constraints on elite power score averaged across historical regions and period 1000–1600. Source: Boranbay and Guerriero (2017) | 1.810 (0.600) |
| | *Democracy* | See text. Sources: author's codification and Polity IV dataset, available at www.systemicpeace.org | 5.967 (1.476) |
| | *Rule-of-Law* | See text. Source: Charron *et al*. (2014) | 66.134 (19.182) |
| Political accountability | *RAP* | Dummy equal to 1 if Parliament received request for removal of politician's immunity because suspected of a crime. Source: Chang *et al*. (2010) | 0.233 (0.423) |

TABLE 2
CONTINUED

| | Variable | Definition and sources | Statistics |
|---|---|---|---|
| Excluded instruments | *Climate-M* | Standard deviation of 1000–1600 growing season temperature in °°C averaged over grid cells used in Guiot *et al*. (2010). Source: Guiot *et al*. (2010) | 0.527 (0.126) |
| | *Ruggedness* | Ruggedness of terrain in km. Source: http://gecon.yale.edu | 0.150 (0.142) |
| | *Coast* | Dummy equal to 1 if grid cell has direct access to Mediterranean or Atlantic Ocean, 0 otherwise | 0.356 (0.479) |
| Alternative roles of excluded instruments | *Climate* | Normalized first principal component extracted from standard deviation of temperature in °C and that of precipitation in mm both averaged within grid cell and over period 1961–90. Source: http://gecon.yale.edu | 0.283 (0.182) |
| | *Distance-to-Coast* | Distance to coast in km averaged within grid cell. Source: http://gecon.yale.edu | 165.032 (162.721) |
| | *Travelling-Distance* | Average travelling distance between centroid and corners of grid cell in km. Source: www.distancefromto.net | 243.159 (277.411) |
| | *Primary-Sector* | Share of active population employed in agriculture and fishing averaged across NUTS 2 regions and period 2002–8. Source: http://epp.eurostat.ec.europa.eu | 0.067 (0.054) |
| | *Atlantic-Trade* | Number of Atlantic ports in grid cell between 1500 and 1850. Source: Acemoglu *et al*. (2005) | 0.124 (0.474) |
| | *LPD-M* | Natural log of population per square km averaged across grid cells used by Goldewijk *et al*. (2010) and between 1000 and 1600. Source: www.pbl.nl/hyde | 3.082 (0.857) |
| Modulators of institutions | *Neolithic* | Average time since agricultural transition in years. Source: Pinhasi *et al*. (2005) | 6746.628 (664.334) |
| | *Migratory-Distance* | Migratory distance between Addis Ababa and grid cell centroid in thousands of km. Source: Ashraf and Galor (2013) | 5.645 (0.617) |
| | *Medieval-Church* | Cumulated discounted number of years of activity of dioceses of historical region's cities per square km and averaged over period 1000–1600. Source: www.gcatholic.org | 0.062 (0.179) |

TABLE 2
CONTINUED

| | Variable | Definition and sources | Statistics |
|---|---|---|---|
| | *Black-Death* | Mortality rate from Black Plague averaged across NUTS 2 regions and over period 1346–1353. Source: Benedictow (2004) | 59.294 (3.039) |
| | *Potato* | Land suitability for growing white potatoes ranging between 0 and 100, and averaged across GAEZ dataset grid cells. Source: www.gaez.iiasa.ac.at | 27.311 (13.702) |
| | *Plough* | Share of land area with luvisol and land suitability for growing barley greater than 55 and averaged across NUTS 2 regions. Source: https://esdac.jrc.ec.europa.eu | 0.097 (0.112) |
| | *Land-Suitability* | Land suitability for cultivation ranging between 0 and 100, and averaged across GAEZ dataset grid cells. Source: www.gaez.iiasa.ac.at | 0.613 (0.199) |
| Intermediate outcomes | *Real-Capital* | Real capital stock per capita in 2000, in millions of euros, averaged across NUTS 2 regions. Source: Derbyshire *et al.* (2013) | 0.052 (0.027) |
| | *Human-Capital* | Percentage of population aged 20–24 and enrolled in tertiary education, averaged across NUTS 2 regions and period 2002–9. Source: http://epp.eurostat.ec.europa.eu | 51.326 (16.094) |
| | *Catholicism* | See text. Source: www.europeanvaluesstudy.eu | 0.265 (0.156) |
| Other control variables | *Latitude* | Latitude of centroid of grid cell. | 48.372 (4.907) |
| | *Longitude* | Longitude of centroid of grid cell. | 7.886 (8.760) |

*Notes*
All URLs accessed 20 April 2019.
The final 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 8.

culture today, as confirmed by the estimates in columns (1) and (2) of Table 3. Albeit immaterial to my findings, the discounting emphasizes the importance of the monks' activity. Scaling the years of activity by the region's area instead of its population is necessary to correctly represent the two orders' diffusion since a minimum distance between houses was compulsory (Burton and Kerr 2011, p. 44).

As seen in Section I, both monastic orders dictated norms of respect and trust in exchange for guidance on how to share consumption risk, and under the threat of defecting, to the populations subject to a higher risk of harvest destruction and thus more interested in securing their services. Given the substantial homogeneity of the two orders' activities and their distinctiveness within medieval Western monasticism, *Culture-M* then gauges the input to the technology that transformed the citizenry's interest in cooperating

into evolutionarily stable norms, and higher values detect a stronger culture of cooperation in the past.[7] This interpretation is consistent with two key insights of evolutionary dynamics and Malthusian growth theories: a social group dictates to its members, via natural selection and cross-punishment, cultural norms maximizing its fitness (Clark 2005), and these values are stronger the larger the culturally driven reproductive advantage is (Nowak 2006). Focusing on the Cistercians, Andersen *et al.* (2017) propose a similar mechanism but describe them as aimed at spreading values of hard work and thrift. Albeit consistent with Weber (1958) and Baumol (1990), this vision is at odds with the more recent and substantial historic literature introduced in Section I. Contrary to the speculation by Andersen *et al.* (2017), the fundamental issue distancing the order's founders from Molesme was not its 'failure to observe the Rule of St Benedict [but the fact that it] was rich [and] association of possession with virtues is not usually long-lasting' (Burton and Kerr 2011, p. 11).[8] This reasoning led the Cistercians to embrace a cult of corporate poverty and austerity, which was exemplified in very taxing rules of monastic life and a deep contempt for those members of the community enjoying social competition and seeking the accumulation of wealth (Burton and Kerr 2011, pp. 103–18, 155–6). To elaborate, even when managing market-oriented enterprises, the White monks considered effort and profit as merely instruments to fund their risk-sharing activities and so fulfil their moralization mission (Burton and Kerr 2011, p. 187).

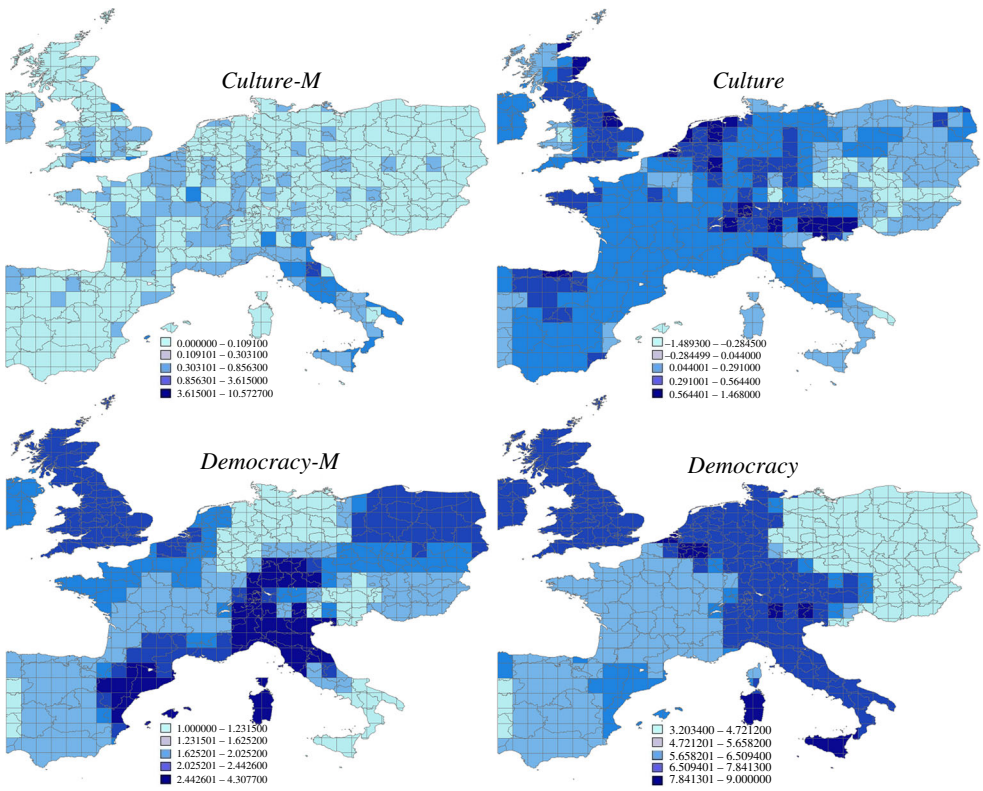


FIGURE 1. Persistent institutions.
*Notes*: The range of each variable is divided into five intervals using the goodness of variance fit method.

TABLE 3
PERSISTENT ENDOGENOUS INSTITUTIONS

| Dependent variable | *Culture-M* (1) | *Culture* (2) | *Culture* (3) | *Culture* (4) | *Democracy-M* (5) | *Democracy* (6) | *Rule-of-Law* (7) | *Democracy* (8) |
|---|---|---|---|---|---|---|---|---|
| *Culture-M* | | 0.048 | | | | | | |
| | | (0.008)*** | | | | | | |
| *Culture-M-C* | | | 0.110 | | | | | |
| | | | (0.052)** | | | | | |
| *Culture-M-F* | | | 0.042 | | | | | |
| | | | (0.010)*** | | | | | |
| *Democracy-M* | | | | | | 0.195 | 3.085 | |
| | | | | | | (0.064)*** | (0.570)*** | |
| *Climate-M* | 0.622 | | | 0.519 | 1.271 | −0.478 | 21.854 | −0.210 |
| | (0.329)* | | | (0.113)*** | (1.103) | (0.348) | (3.121)*** | (0.343) |
| *Ruggedness* | 0.790 | 0.435 | 0.428 | 0.411 | 0.721 | | | 0.511 |
| | (0.560) | (0.112)*** | (0.112)*** | (0.115)*** | (0.331)** | | | (0.348) |
| *Coast* | −0.097 | −0.086 | −0.086 | −0.080 | 0.003 | | | 0.179 |
| | (0.194) | (0.027)*** | (0.027)*** | (0.028)*** | (0.071) | | | (0.085)** |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Extra control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Within $R^2$ | 0.03 | 0.20 | 0.21 | 0.18 | 0.18 | 0.14 | 0.44 | 0.13 |
| Number of observations | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

*Notes*
Estimation: OLS.
Standard errors in parentheses (allowing for clustering by country) in columns (1) and (5) (columns (2)–(4) and (6)–(8)).
All specifications also consider *Atlantic-Trade*, *LPD-M*, *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough*, *Land-Suitability*, *Latitude* and *Longitude*.
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

First, it was the desire to rationalize neighbouring economies, inject liquidity in unstable markets, and make the lords' property available to the peasantry to guide the expansion of the order's holdings (Burton and Kerr 2011, pp. 160–8). Accordingly, it is not surprising that several houses experienced an endemic lack of savings, which possibly plunged them into bankruptcy first and then either royal custody or abandon (Burton and Kerr 2011, p. 174). Second, the fees and tolls obtained from the organization of fairs were often invested in charitable activities (Donkin 1978, p. 159). Finally, even when the demise of the *conversi* system made leasing the only viable market-oriented endeavour, these agreements were usually conditioned on the peasants' obligation to provide risk-sharing services (Burton and Kerr 2011, p. 177). Overall, while it is difficult to see in the order's action a desire to support 'cultural values [assisting] the rise of capitalism outside the monastic walls' (Andersen *et al*. 2017, pp. 1756–7), it seems natural to interpret it, as the Cistercians did in the *Carta Caritatis*, as their duty 'to be of service to [their brothers,] avoid the evil of avarice [and] retain the care of their souls for the sake of charity'. Similar conclusions can be drawn for the Franciscans, whose life 'demanded not only exterior imitation of Christ through poverty ... but also interior conformity through self-denial, obedience, humility, and love' (Daniel 1992, p. 46).

Consistent with these remarks, I show that none among the share of answers to the 2008 European Values Study mentioning 'hard work' as an important quality that children should be encouraged to learn—that is, *Hard-Work*—or that reporting 'thrift'—that is, *Thrift*, *Control* and *Obedience*—is positively and significantly correlated with *Culture-M*, *Culture-M-C*, *Culture-M-F* or medieval climate volatility (see the Online Appendix). Moreover, when culture is proxied by the first principal component extracted from *Hard-Work*, *Thrift*, *Respect* and *Trust*—that is, *Culture-A*—the essence of my analysis is similar (see Section III).

*Measuring the inclusiveness of political institutions*

I define the inclusiveness of political institutions as the strength of the rules enabling the citizenry to better select public-spirited representatives and check their decisions. To illustrate, inclusiveness consists of both 'the proportion of people possessing [these rights] and the degree to which they possess it' (Coppedge 2012, p. 12). Even though the extant literature on democratization has focused on the extensive margin only by relying on country-wide measures of the strength of the constraints on the decision-making power of chief executives (Persson and Tabellini 2009), a growing body of regional studies highlights the sizeable subnational variation in the intensive margin and, in particular, in the degree of regional political autonomy (Charron *et al*. 2014). Politicians elected in autonomous regions are chosen for their affinity with local preferences, can design public goods fulfilling the most these preferences, and are accountable for this task (Kappeler *et al*. 2013).

To capture both the extensive and intensive margins, I construct the variable *Democracy* as the average over the period 1950–2010 of the sum of the 1–7 Polity IV constraints on the executive authority score and a 1–3 regional political autonomy index that I construct for each NUTS 2 region in the sample. To illustrate, the political autonomy index equals 1 if the region had exclusive control over a limited set of policies like education, 2 if it was also fiscally decentralized, 3 if it had substantial political autonomy from the central government,[9] and 0 otherwise. Conditional on fixed effects, *Democracy* effectively gauges the two sources of institutional variation. First, it picks up the gap driven by the differential preunification extension of the franchise in the regions

located on the two sides of the Iron Curtain. This divide alone accounts for approximately half of the within-country variation in *Democracy*. Second, it captures the increasing political autonomy from the central governments acquired during the postwar period by South Tyrol, Region Wallonne, Vlaams Gewest, Corse, the Italian and Spanish regions, Northern Ireland, Scotland and Wales. These arrangements range from the exclusive legislative power on specific matters granted to all Italian regions in 2001 to the almost complete autonomy obtained by the linguistic communities of Belgium (devolved UK regions) in 1970 (1999),[10] and they are related to a stronger rule of law, which is the key product of inclusiveness (Acemoglu and Johnson 2005). Consistent with Charron *et al.* (2014), there is a significant (at 5%) within-country correlation between the political autonomy index and a 1–100 measure of the honesty, impartiality and quality of law enforcement, and the provision of education and healthcare, that is, *Rule-of-Law*. This institutional variation will be lost if one relies on cross-country data only. Overall, *Democracy* ranges from a minimum of 3.20 scored by the ex-East Germany regions of Brandeburg and Sachsen to a maximum of 9 observed, for instance, in Vlaams-Brabant.

Similar to the case of *Culture*, the coefficient on the proxy for inclusive political institutions remains stable across measurement strategies, that is, when either I switch to *Rule-of-Law* (see Section III), I average the sum of the Polity IV score and the political autonomy index over the period 2000–10 (see the Online Appendix), or I use the first principal component extracted from the two items (see the Online Appendix). This time, however, the error in the measurement of the 'inclusiveness of political institutions' concept is less of an issue.[11]

While the bottom-right map in Figure 1 displays the considerable variation in *Democracy*, the bottom-left map in the same figure depicts the average over the 11th–16th centuries of the constraints on the elite's power score coded by Boranbay and Guerriero (2017) for each half-century between 1000 and 1600, that is, *Democracy-M*. This score is obtained by first merging those neighbouring NUTS 2 administrative units that, according to Sellier and Sellier (2002), were part of the same state for most of the period (see Table 1) and then analysing the history of each of the medieval states in a 40-year window around each date. Exactly this focus on the historical regions implies that, different from the Polity IV constraints on the executive authority score, *Democracy-M* captures both the extensive and intensive margins of the inclusiveness of political institutions. A glance at both *Democracy* and *Democracy-M* shows that the present-day heterogeneity in regional political institutions has its roots in medieval history. During the Middle Ages, the most intense democratization processes were experienced by the communities of Aragon and Cataluña, the 'Giudicati' of Sardinia, and the communes of northern Italy first, and then by the Provinces and the Reign of England. Recently, the autonomy of these polities has been restored with the justification that the specific and homogeneous preferences for the public goods of a historical community should be satisfied by local representatives (Frey 2005). Accordingly, both *Democracy* and *Rule-of-Law* are significantly related to *Democracy-M* (see columns (4) and (5) of Table 3).

### *Empirical strategy*

The options open to a society characterized by a strong culture, but not very inclusive political institutions, are very different from those available to a society in which a more

democratic political process is left in the hands of less civic citizens. While the latter can barely sustain trade, investment, and division of labour (Putnam *et al.* 1993; Dixit 2004; Boranbay and Guerriero 2017), the former always has the option of relying on informal networks enforcing contracts and protecting property rights (Greif 2006). Moreover, culture shapes the way citizens participate in politics and the behaviours of public officials. On the one hand, it reduces the citizens' cost of punishing legislative malfeasance by easing collective action and by building both quality of judgment and preferences for community-oriented policies (Padró i Miquel *et al.* 2015). On the other hand, amoral public officials are likely to engage in illegal activities despite democratic institutions (Putnam *et al.* 1993). The very unequal achievements of the central state in northern and southern Italy, despite more than 150 years of unification, constitute a glaring example (de Oliveira and Guerriero 2018). Finally, by favouring local interests, inclusive political institutions might have eased, in the early modern era, fiscal fragmentation and jurisdictional obstacles to trade (Grafe 2012).

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 and trustworthy citizens (e.g. Sardinia). Next, I explicitly test this idea.

*Unbundling institutions* Lacking sufficient exogenous variation to identify non-linearities in the outcome–institutions relationships, I focus on equations of the type

$$Y_{i,c} = \alpha_c + \beta_0 C_{i,c} + \gamma_0 D_{i,c} + \boldsymbol{\delta}_0' \mathbf{X}_{i,c} + \varepsilon_{i,c}, \tag{1}$$

where $Y_{i,c}$ is the natural logarithm of the GDP per capita in grid cell $i$ of country $c$, in euros, averaged between 2002 and 2009—that is, *Income*.[12] 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 $1^{\circ}$ spatial resolution (see the Online 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—that is, *Latitude* and *Longitude*, respectively—and possibly the controls discussed below. $\alpha_c$ takes into account country-wide unobservable factors relevant for development, such as the legacy of past wars (Iyigun *et al.* 2015), legal origins (Guerriero 2016a), and genetic diversity (Ashraf and Galor 2013).[13] The simplest strategy is to estimate equation (1) by OLS. There are two key problems with this strategy. First, albeit the persistence in institutions makes reverse causality less of an issue, as confirmed by the evidence discussed in Section IV, relevant omitted variables may bias the estimates of $\beta_0$ and $\gamma_0$. Second, $C_{i,c}$ and, to a much lesser extent, $D_{i,c}$ are measured with a sizeable error (see Section II). Hence the downward attenuation bias in $\beta_0$ is a crucial concern here. To evaluate both of these OLS failures, I compare the inconsistent least squares estimates with those obtained employing 2SLS with distinct excluded instruments for *Culture* and *Democracy*. These should be correlated with the endogenous regressors but should be orthogonal to any omitted variable, that is, uncorrelated with $Y_{i,c}$ through any channel other than the endogenous regressors. This strategy takes care of both the omitted-variable bias and the measurement errors in the two endogenous regressors, as long as

the latter have the classical form. The first-stage regressions for *Culture* and *Democracy* are, respectively,

$$C_{i,c} = \alpha_c + \zeta_1 T_{i,c} + \eta_1 R_{i,c} + \theta_1 I_{i,c} + \boldsymbol{\delta}_1' \mathbf{X}_{i,c} + \omega_{i,c}, \tag{2}$$

$$D_{i,c} = \alpha_c + \zeta_2 T_{i,c} + \eta_2 R_{i,c} + \theta_2 I_{i,c} + \boldsymbol{\delta}_2' \mathbf{X}_{i,c} + \nu_{i,c}, \tag{3}$$

where $T_{i,c}$ is the volatility of the 1000–1600 growing season temperature and corresponds to the excluded instrument for culture (see Section II). $R_{i,c}$ and $I_{i,c}$ denote the ruggedness of the terrain and a dummy for direct access to the coast, respectively, and represent instead the excluded instruments for inclusive political institutions (see Section II). The exclusion restriction is that in the population,

$$\mathrm{Cov}(\varepsilon_{i,c}, T_{i,c}) = \mathrm{Cov}(\varepsilon_{i,c}, R_{i,c}) = \mathrm{Cov}(\varepsilon_{i,c}, I_{i,c}) = 0.$$

In judging the adequacy of my empirical strategy, it is enlightening to stress the weakness of the two alternative approaches proposed by the extant literature. First, Tabellini (2010) suggests that instrumenting present-day institutions with past ones would tackle the issue of the endogeneity of the former. As mentioned before, this strategy suffers from three distinct problems. It produces first stages that are weak since the errors in the measurement of institutions worsen as our attention shifts towards the past, it delivers predictions of present-day institutions that are not distinct because of the commitment dimension of cultural accumulation, and it is based on an exclusion restriction, which is difficult to defend because difficult-to-observe intermediate outcomes are correlated with past institutional discontinuities. Accordingly, I reject the overidentifying restrictions, and I do not reject underidentification for this different specification (see Sections I and IV). Second, the literature on the within-country effect of permanent institutions implies that past institutional structures might be used as alternative explanatory variables. This approach makes it easier to satisfy the exclusion restriction but produces even weaker first stages (see Sections I and IV).

*The geographic determinants of medieval institutions* Building on the historical events illustrated in Section I, Boranbay and Guerriero (2017) study accumulation of culture and democratization in a simple and yet general society. Formally, 'elite' members and 'citizens' can either share the consumption risk with any other individual or invest with a member of a different group. While the first activity resembles a prisoner's dilemma interaction and gauges a more fundamental form of cooperation aimed at hedging against consumption shocks, the second, more profitable one captures a more advanced form of cooperation producing a taxable value, for example, long-distance trades. First, each group costly instils into its members a psychological gain from cooperating, for example by attracting a monastic order. This implicit reward embodies a culture of cooperation. Next, the elite selects the political regime. 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 the agents are randomly matched, and the elite selects the activity if she is paired off with the citizenry. Finally, taxation and public goods production follow a cooperative investment. The activity-specific factors—that is, severity of consumption risk and investment value—are

exogenous (e.g. geography). Since inefficiencies in public goods production render investment infeasible under an autocracy, the equilibrium has two key features. While the prospect of a sufficiently profitable investment pushes the elite to enact democracy to convince the citizens that a sufficient part of its return will be shared, and thus to cooperate, accumulation of culture rises with the severity of consumption risk at its moderate values and then drops at its high values, making cheating appealing.

Consistent with these predictions, culture over the period 1000–1600 and its present-day counterpart are stronger in those European regions in which it was more necessary to cope with consumption risk because of the higher, but never extreme, climate volatility (Boranbay and Guerriero 2017). Accordingly, I elect as the instrument for *Culture*, the standard deviation of the 1000–1600 spring–summer temperature in degrees Celsius—that is, *Climate-M*. The raw data are collected from Guiot *et al*. (2010) and cover most of Europe at the $5^{\circ}$ spatial resolution for all the years between 600 and 2000.[14] If grid cell $i$ belongs to multiple climatic grid cells, then I assign to $i$ a figure equal to the average of the values assumed by medieval climate volatility in each represented climatic grid cell weighted by its relative contribution to the land area of $i$. Climatic data are 'reconstructed' from both indirect proxies, such as tree rings, ice cores and pollens, and direct sources, such as historical indexed climate series. Gridded climate data with higher resolution have been developed building mainly on direct sources for the post-1500 period and exploiting only indirect proxies for the entire period (Luterbacher *et al*. 2004; He 2011). However, the choice to not combine the two approaches makes these series less accurate than the reconstructed data (Guiot *et al*. 2010).[15]

The exposition so far suggests that the most relevant feature that could undermine the exclusion restriction is the persistent impact of the economic progress that was triggered 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 was long-lasting. Even if this occurrence seems unlikely given the Malthusian structure of medieval economies (Clark 2005) and the limited importance of the primary sector in the sample,[16] I show that the key measures of medieval farming progress do not confound the effect of *Culture*. The same can be said of the present-day within-grid climate volatility, those intermediate outcomes most heavily influenced by *Culture-M*—that is, financial development, human capital and Catholic beliefs, and the dimensions shaping the impact of institutions. Hence it is quite difficult to envision that the climate volatility of more than four centuries ago may shape present-day economic performance through channels different from culture, conditional on country fixed effects and this large battery of observable factors.

Boranbay and Guerriero (2017) also document that between 1000 and 1600, reforms towards tighter constraints on the elite's power were mostly driven by the factors shaping the value of farming and long-distance trade investments. Regarding the former, the central driver of the medieval agriculture revolution was the adoption of the heavy plough, 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 had some of their land ploughed (Slocum 2005). Thus the elite's prospective returns on such a complex investment were higher the more difficult its monitoring and the ploughing itself were (for a similar argument, see Fleck and Hanssen 2006). Building on these remarks, I employ as second excluded instrument the ruggedness of the terrain in km, retrieved from the G-Econ project—that is, *Ruggedness*. Turning to long-distance trade investments, their value was significantly higher if direct access to the coast was

available since terrestrial movements were heavily regulated in the Middle Ages (Stearns 2001, p. 217). Thus my third excluded instrument is a dummy for direct access to the Mediterranean and/or the Atlantic Ocean—that is, *Coast*.

Since *Ruggedness* and *Coast* are related to medieval farming progress and long-distance and in particular Atlantic trades, respectively, they might affect *Income* if these innovations are persistent. Below, I exclude this channel by controlling not only for medieval farming progress but also for the relevance of Atlantic trades. Moreover, I also document that the present-day within-grid climate volatility, travelling distance, and distance to the coast do not drive the effect of permanent institutions. Thus neither *Ruggedness* nor *Coast* shapes present-day economies through any relevant non-institutional channel, that is, their long-lasting impact on present-day agriculture, scope for agglomeration, technological diffusion, tourism and trade. Overall, it is difficult to think that *Ruggedness* and *Coast* may directly drive *Income* conditional on country fixed effects, proxies for the alternative roles of the excluded instruments, factors modulating the roles of institutions, and intermediate outcomes.

Figures 1 and 2 reveal not only the sizeable variation in institutions and geography but also that the patterns discussed by Boranbay and Guerriero (2017) remain true across grid cells and, in particular, in the sample of 500 units for which I observe both the excluded instruments and all the control variables illustrated in Section III and that I always use for ease of comparison. To illustrate, conditional on the observable variables that can be considered predetermined in equation (1), three are the main patterns in the data (see Table 3). First, past institutions are determined by geography. Second, both past institutional arrangements and their determinants are powerful drivers of present-day institutions.[17] Finally, geography enters the first stages in a separable way, whereby *Climate-M* affects mainly *Culture*, and *Coast* especially drives *Democracy*. This evidence is reassuring about the differential measurement error in the two endogenous variables (Garber and Klepper 1980).

## III. Culture Versus Inclusive Political Institutions

A glance at Figures 1 and 2 already gives you a hint at the main result of the paper. The local patterns of present-day per capita output in the leftmost map in Figure 2 are similar to those 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 respect and trust,

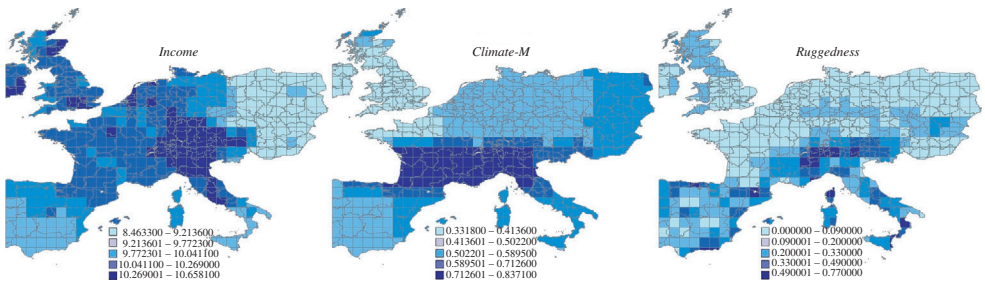


FIGURE 2. Income and geography.
*Notes*: The range of each variable is divided into five intervals using the goodness of variance fit method.

and experienced a more erratic medieval climate than the rest of the sample. In contrast, the Czech Republic, western Poland and Portugal are marked by very low values of all three variables. The correlations among economic outcomes, culture and medieval climate volatility are, however, imperfect. England is one of the most culturally and economically advanced European regions, but it did not face an unpredictable climate during the Middle Ages, whereas southern Spain exhibits 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.

### *Main results*

Table 4 contrasts the OLS and 2SLS estimates of equation (1). A comparison between columns (1) and (2) suggests that OLS underestimates the impact of culture on per capita income. In fact, switching from OLS to 2SLS increases the estimate of $\beta_0$ from 0.31 to 1.09, which is significant at 1% and implies that a one-standard-deviation rise in *Culture* (i.e. 0.32) will lead to a 35% increase in *Income*. In contrast, the estimate of $\gamma_0$ remains quite similar across estimators, but it becomes insignificant in column (2).

The basic estimates then imply that while culture has a first-order positive effect on *Income*, the impact of more inclusive political institutions is statistically insignificant.

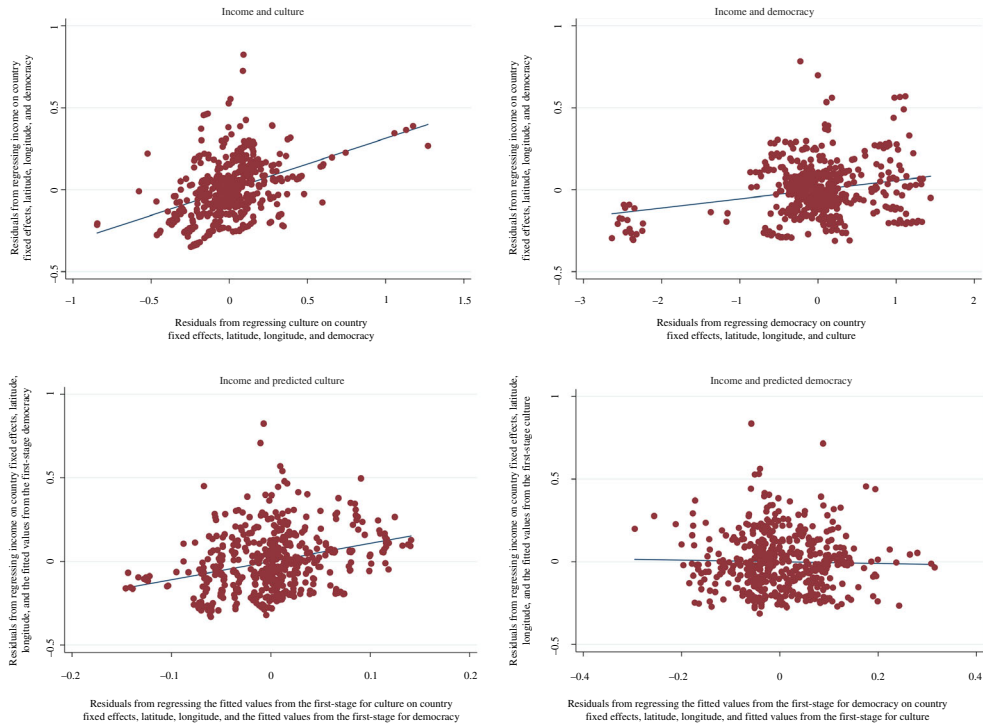


FIGURE 3. Institutions and outcomes—OLS versus 2SLS.
*Notes*: All graphs are obtained from the 500 grid cell sample used in Table 4 and conditioning on *Latitude*, *Longitude* and country fixed effects. The upper-left (right) graph depicts the significant positive effect of *Culture* (*Democracy*) on *Income*, estimated through OLS. The bottom-left (right) graph displays the significant (insignificant) positive (negative) impact of *Culture* (*Democracy*) on *Income*, estimated via 2SLS with excluded instruments *Climate-M*, *Ruggedness* and *Coast*.

TABLE 4
INSTITUTIONS AND OUTCOMES—OLS VERSUS 2SLS

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Dependent variable: *Income* | | | | | | | | | | |
| *Culture* | 0.314 | 1.089 | | | 0.930 | 0.970 | 0.732 | 0.568 | 0.077 | 0.495 |
| | (0.032)*** | (0.221)*** | | | (0.502)* | (0.238)*** | (0.122)*** | (0.234)** | (0.025)*** | (0.172)*** |
| *Culture-T* | | | 0.911 | | | | | | | |
| | | | (0.152)*** | | | | | | | |
| *Culture-A* | | | | 0.877 | | | | | | |
| | | | | (0.140)*** | | | | | | |
| *Democracy* | 0.056 | −0.052 | −0.061 | −0.071 | | 0.054 | 0.010 | −0.089 | 0.006 | 0.119 |
| | (0.011)*** | (0.125) | (0.104) | (0.100) | | (0.191) | (0.108) | (0.072) | (0.009) | (0.111) |
| *Rule-of-Law* | | | | | 0.003 | | | | | |
| | | | | | (0.011) | | | | | |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Alternative roles of excluded instruments | No | No | No | No | No | Yes | No | No | Yes | Yes |
| Modulators of institutions | No | No | No | No | No | No | Yes | No | Yes | Yes |
| Intermediate outcomes | No | No | No | No | No | No | No | Yes | Yes | Yes |
| First stage for the proxy for a culture of cooperation | | | | | | | | | | |
| *Climate-M* | | 0.415 | 0.486 | 0.517 | 0.415 | 0.355 | 0.489 | 0.317 | | 0.311 |
| | | (0.111)*** | (0.102)*** | (0.098)*** | (0.111)*** | (0.113)*** | (0.113)*** | (0.103)*** | | (0.108)*** |
| *Ruggedness* | | 0.197 | 0.251 | 0.261 | 0.197 | 0.377 | 0.399 | 0.080 | | 0.355 |
| | | (0.097)** | (0.088)*** | (0.085)*** | (0.097)** | (0.102)*** | (0.115)*** | (0.089) | | (0.108)*** |
| *Coast* | | −0.033 | −0.042 | −0.037 | −0.033 | −0.002 | −0.065 | −0.005 | | −0.031 |
| | | (0.026) | (0.023)* | (0.022)* | (0.026) | (0.035) | (0.028)** | (0.024) | | (0.033) |
| *p*-value of Sanderson–Windmeijer test | | 0.00 | 0.00 | 0.00 | 0.17 | 0.10 | 0.00 | 0.00 | | 0.00 |
| First stage for the proxy for inclusive political institutions | | | | | | | | | | |
| *Climate-M* | | −0.077 | −0.077 | −0.077 | 23.106 | 0.119 | −0.185 | −0.430 | | −0.261 |
| | | (0.330) | (0.330) | (0.330) | (2.987)*** | (0.341) | (0.341) | (0.295) | | (0.312) |
| *Ruggedness* | | 0.838 | 0.838 | 0.838 | 0.747 | 0.545 | 0.505 | 0.462 | | −0.042 |
| | | (0.287)*** | (0.287)*** | (0.287)*** | (2.598) | (0.308)* | (0.347) | (0.255)* | | (0.312) |

TABLE 4
CONTINUED

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *Coast* | | 0.120 | 0.120 | 0.120 | −2.496 | 0.167 | 0.157 | 0.242 | | 0.228 |
| | | (0.070)* | (0.070)* | (0.070)* | (0.686)*** | (0.106) | (0.083)* | (0.068)*** | | (0.094)** |
| *p*-value of Sanderson–Windmeijer test | | 0.01 | 0.01 | 0.01 | 0.15 | 0.24 | 0.05 | 0.00 | | 0.08 |
| Estimation | OLS | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS | OLS | 2SLS |
| Within $R^2$ | 0.23 | | | | | | | | 0.68 | |
| *p*-value of endogeneity test | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| *p*-value of Stock–Wright LM test | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| *p*-value of Anderson CC LM test | | 0.01 | 0.01 | 0.01 | 0.17 | 0.24 | 0.05 | 0.00 | | 0.07 |
| *p*-value of Sargan statistic | | 0.39 | 0.38 | 0.25 | 0.29 | 0.91 | 0.17 | 0.59 | | 0.31 |
| Number of observations | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

*Notes*
Standard errors in parentheses.
All specifications also consider *Latitude* and *Longitude*. The proxies for the alternative roles of the excluded instruments are *Climate*, *Distance-to-Coast*, *Travelling-Distance*, *Primary-Sector*, *Atlantic-Trade* and *LPD-M*, whereas the modulators of institutions are *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough* and *Land-Suitability*. Finally, the intermediate outcomes are *Real-Capital*, *Human-Capital* and *Catholicism*.
The endogenous variables are *Culture-T* and *Democracy* in column (3), *Culture-A* and *Democracy* in column (4), *Culture* and *Rule-of-Law* in column (5), and *Culture* and *Democracy* in columns (2), (6)–(8) and (10). In all these cases, the excluded instruments are *Climate-M*, *Ruggedness* and *Coast*, and the control variables used in the second stages are also included in the first stages.
The null hypothesis of the Sanderson–Windmeijer *F*-test is that the endogenous variable object of testing is unidentified. Moreover, the null hypothesis of the Stock–Wright LM test (endogeneity test) is that the endogenous regressors are insignificant in the structural equation (can be treated as exogenous). Finally, the null hypothesis of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

This is consistent with a legacy of empirical results suggesting that the effect of democracy is at most weak (Glaeser *et al*. 2004; Persson and Tabellini 2009; Abramson and Boix 2018), as well as the observation, elaborated below, that the error in the measurement of culture is much larger than both the error afflicting the measurement of the inclusiveness of political institutions and the bias from omitted variables, which is positive (see below).

The consistency of the 2SLS approach is confirmed by the following five pieces of extra evidence. First, I reject at less than 1% the endogeneity test that both *Culture* and *Democracy* can be treated as exogenous, and thus that the OLS estimator should be preferred to the 2SLS one. Second, I always reject that the first stages are weak at a level higher than 1%. To do so, I rely on three canonical and conceptually different tests of underidentification, explicitly taking into account that, with multiple endogenous regressors, each excluded instrument is called on to play a role in each first stage, and thus it makes little sense to judge identification from the size of the relative *F*-test in the first stages (Angrist and Pischke 2009). While the null hypothesis of the Sanderson–Windmeijer *F*-test is that the endogenous variable object of testing is unidentified, that of the Stock–Wright LM test is that the endogenous regressors are insignificant in the structural equation because the excluded instruments are irrelevant and thus insignificant in the reduced form (Baum *et al*. 2007). Finally, the null hypothesis of the Anderson canonical correlations test is that the excluded instruments are uncorrelated with the endogenous regressors. Being similar to those just discussed, I do not report the first stages prevailing in the remainder of my analysis. Third, I cannot reject the overidentifying restrictions at 39%, which is symptomatic of the fact that the exclusion restriction holds. Fourth, the two upper (lower) scatterplots in Figure 3 depict the OLS (2SLS) estimates in column (1) (column (2)), and they highlight quite clearly that these results are not driven by abnormal observations.[18] Fifth, I obtain similar second stages but weaker first stages when I consider possible within-country correlation in the error term by considering standard errors that allow for clustering by country (see the Online Appendix). Similar patterns prevail when I model unobserved spatial dependence among grid cells by switching to an IV model with spatial autoregressive disturbances, obtained through an inverse-distance spatial weighting matrix (see the Online Appendix).

*Robustness and sensitivity checks*

To further evaluate the validity of the assumptions underlying my multiple 2SLS approach, I perform a number of robustness and sensitivity checks.

*Alternative measures of institutions* A first possible issue with the estimates discussed so far is that they might be driven by the way in which I construct the proxies for present-day institutions. To check whether this is indeed the case, I repeat the basic analysis described above, substituting first either *Culture-T* or *Culture-A* for *Culture*, and then *Rule-of-Law* for *Democracy* (see columns (3)–(5) of Table 4). In a nutshell, relying on proxies partially inconsistent with the underlying concepts of either a culture of cooperation or inclusive political institutions delivers less precise estimates of the impact of present-day institutions.

*Controlling for observable factors* A second possible issue is that omitted variables are impairing the exclusion restriction. To evaluate this possibility, I include in $\mathbf{X}_{i,c}$ not only

the alternative channels through which the excluded instruments could shape *Income*, but also those determinants of development either affecting or driven by institutions. Including these covariates also helps me to 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 both proxies for the present-day role of medieval geography and measures of the persistent impact of medieval farming innovations and long-distance trades. Starting from the former, I employ three proxies:

- the normalized first principal component extracted from the standard deviation of the temperature in degrees Celsius and that of the precipitation in mm, both averaged between 1961 and 1990 and retrieved from the G-Econ project—that is, *Climate*;
- the average distance to the coast in the grid cell in km as collected from the G-Econ project—that is, *Distance-to-Coast*;
- the average travelling distance between the centroid and the corners of the grid cell in km—that is, *Travelling-Distance*.

Including *Climate* tests whether the stickiness of *Climate-M* is affecting present-day farming productivity and in turn outcomes, whereas considering *Distance-to-Coast* and *Travelling-Distance* allows me to check whether *Coast* and *Ruggedness* are directly determining *Income* by shaping the profitability of agriculture, tourism, trade and scope for agglomeration. I obtain similar estimates if I also consider other drivers of the productivity of medieval farming, such as the temperature in degrees Celsius and the precipitation in mm, both averaged over the period 1961–90, the standard deviation of the land suitability for cultivation, and the grid cell land area (see the Online Appendix). These features could also affect income by modulating cultural diversity and, in turn, property rights protection (Guerriero 2016b).

Turning to the measures of the persistence of medieval technological innovations, I consider three variables. The first is the share of active population employed in agriculture and fishing averaged between 2002 and 2008, and collected at the NUTS 2 regional level by the Regio project—that is, *Primary-Sector*. This variable takes into account the possibility that medieval geography has influenced the patterns of sectoral specialization. The second variable gauges the relevance of Atlantic trade through the number of Atlantic ports active in the grid cell between 1500 and 1850—that is, *Atlantic-Trade*—as collected from Acemoglu *et al.* (2005). The final regressor is the natural logarithm of the population per square km averaged over the period 1000–1600—that is, *LPD-M*. Goldewijk *et al.* (2010) estimate through time-variant allocation algorithms demographic data for the period 10,000BCE to 2000, and the whole globe at the 5′ spatial resolution. Since accelerated development of Malthusian economies induces higher population density rather than larger income (Clark 2005), *LPD-M* picks other unobserved effects of medieval farming innovations and long-distance trades.

Regarding other drivers of both institutions and outcomes that have received the closest attention by the literature, I focus on the following seven factors. First, Olsson and Paik (2016) claim that in societies that made an early transition to agriculture in the Neolithic period, the persistence of more patriarchal values has delayed the adoption of more inclusive political institutions. Hence I consider the average time since the agricultural transition in the grid cell calculated by exploiting calibrated carbon dates from various Neolithic sites gathered by Pinhasi *et al.* (2005)—that is, *Neolithic*. Second, Ashraf and Galor (2013) 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 effect on conflicts and cultural diversity. Since country-specific measures of genetic diversity would be absorbed by the fixed effects, I focus on the Homo Sapiens exodus out of Africa by including in $\mathbf{X}_{i,c}$ the migratory distance between Addis Ababa and the centroid of each grid cell—that is, *Migratory-Distance*.[19] Third, Belloc *et al*. (2016) interpret a negative correlation between earthquakes and more inclusive political institutions as suggestive of the ability of the Catholic church to manipulate catastrophic events to hinder reforms where it was more politically powerful, that is, in the episcopal cities. Since western monasticism sprang as a reactionary surge against the centralized power of the Church (see Section I), its effect might be due simply to its remoteness from the backward power of Rome. To evaluate this, I include in the specification the cumulated discounted number of years of activity of the dioceses of the region's cities per square km, averaged over the period 1000–1600 and retrieved from www.gcatholic.org—that is, *Medieval-Church*. Fourth, Voigtländer and Voth (2009) put forward the idea that the Black Death affected both marriage patterns and the incentive to trade in such a way that the most damaged European regions could escape the Malthusian trap. To incorporate this idea into my analysis, I control for the mortality rate from the Black Plague in the general population between 1346 and 1353 as estimated at the regional level by Benedictow (2004)—that is, *Black Death*. Fifth, Iyigun *et al*. (2015) argue that the soil suitability for potatoes—that is, *Potato*—has modulated conflicts and, in turn, institutional evolution in medieval Europe. The raw data are collected by the GAEZ project, are in grid format, cover the entire world at the $0.5^{\circ}$ spatial resolution, and capture the probability that the grid cell may be cultivated. Sixth, Alesina *et al*. (2013) document that the suitability of the land for growing plough-positive crops empowered men and nurtured the belief that the natural place for women is within the home, whereas Andersen *et al*. (2016) substantiate the idea that the same geographic features favour farming productivity and, in turn, long-run development. To evaluate whether the omission of such geographic features determines my results, I rely on the proxy devised by Andersen *et al*. (2016) for medieval Europe—that is, share of land area with luvisol and land suitability for growing barley greater than 55—that is, *Plough*—and collected from the European soil database, which builds on the GAEZ dataset. Seventh, from the latter I also recover the land suitability for cultivation—that is, *Land-Suitability*—to ensure that it is not the mere availability of productive arable land that produces the main patterns in the data.

Finally, past institutions and, in particular, culture might affect present-day economies through three major intermediate outcomes. First, since the microcredit activities introduced by the Franciscans have shaped financial markets (Pascali 2016), I also consider the 2000 real capital stock per capita, in millions of euros, estimated at the NUTS 2 regional level by Derbyshire *et al*. (2013)—that is, *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, since the Franciscans also heavily affected the medieval rise of the European universities (Knowles 1948, p. 213), I also incorporate in my analysis the variable *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. Considering *Human-Capital* also takes into account the interplay among human capital, institutions and growth (Gennaioli *et al*. 2013). Third, the spread of the Cistercians and Franciscans might have modulated the intensity of Catholic beliefs and their impact on present-day economies (see McCleary and Barro 2006). Accordingly, I also consider *Catholicism*, which is the share of the respondents to the 2008 European Values Study

who declare themselves Roman Catholic and answer 'very important' to the question 'How important is religion in your life?' (GESIS 2008).

Columns (6)–(10) of Table 4 document the impact on the basic estimates of considering the aforementioned groups of observable factors. Four observations are key. First, neither the present-day economic roles of the excluded instruments nor the possibly persistent impact of medieval innovations—that is, farming progress and Atlantic trades—confound the effect of *Culture* (see column (6)). This evidence is consistent with the limited relevance of the primary sector, the fact that travelling costs are negligible thus neither *Ruggedness* nor *Coast* should directly determine outcomes,[20] and the aforementioned evidence on the legacy of medieval institution-driven innovations (Grafe 2012). Second, none of the factors modulating the roles of institutions modifies the message of my analysis (see column (7)). Third, *Culture* is not simply picking differences in financial development, human capital and Christian beliefs driven by the medieval activity of the Cistercians and Franciscans (see column (8)). Fourth, the results of the basic specifications discussed above remain qualitatively unchanged conditional on all control variables. To elaborate, *Democracy* is again insignificant, whereas a one-standard-deviation rise in the strength of a culture of cooperation (i.e. 0.32) will imply a 16% increase in present-day GDP per capita, which is significant at 1%. Furthermore, I reject that OLS is the appropriate estimator at less than 1% and underidentification at a level higher than 8%, whereas I cannot reject the overidentifying restrictions at 30%. These results confirm that my 2SLS approach is solving at the same time the omitted-variable bias and the measurement error.

To further clarify that this is indeed the case, it is helpful to compare the $\beta_0$ estimated through a regression without fixed effects or control variables (i.e. $\widehat{\beta}_0 = 0.665$) and the estimates of $\beta_0$ in columns (9) and (10) of Table 4, maintaining, for ease of exposition only,[21] that the single erroneously measured regressor is $C_{i,c}$. To illustrate, the observed $\widehat{C}_{i,c}$ equals $C_{i,c}$ plus an error $u_{i,c}$. The latter and $\varepsilon_{i,c}$ are multinormally distributed with zero means, variances and covariances. Then the bias in $\widehat{\beta}_0$ equals

$$\widehat{\beta}_0 - \beta_0 = \frac{\sum_{j \in J} \delta_0^j \mathrm{Cov}(x_{i,c}^j, C_{i,c})}{\sigma_u^2 + \widehat{\sigma}_c^2} - \frac{\sigma_u^2}{\sigma_u^2 + \widehat{\sigma}_c^2} \beta_0 \equiv O + M,$$

where the $J$ variables $x_{i,c}^j$ are the part of the vector $\mathbf{X}_{i,c}$ that effectively explains *Income*—that is, *Climate*, *Plough*, the proxies for the intermediate outcomes, and the fixed effects; $\delta^j$ are the relative coefficients; $\sigma_u^2$ is the variance of the measurement error; and $\widehat{\sigma}_c^2$ equals $V(C_{i,c}|\alpha_c,\mathbf{X}_{i,c})$ and is defined by the auxiliary regression $E(C_{i,c} \mid \alpha_c, \mathbf{X}_{i,c}) = \alpha_c + \widehat{\boldsymbol{\delta}}' \mathbf{X}_{i,c}$ (see equation (2.4a) in Garber and Klepper 1980). The term $O$ constitutes the omitted-variable bias attenuated by the error in the measurement of $C_{i,c}$ and corresponds to the difference between $\widehat{\beta}_0$ and the estimated coefficient on *Culture* in column (9) of Table 4 (i.e. 0.588). Assuming, as suggested by Alwin (2007), that $\sigma_u^2$ equals half of the variance of *Culture* (i.e. 0.06), my estimates imply a calibrated value of the term $O$ equal to 0.581, which is almost indistinguishable from 0.588. The term $M$ is instead the attenuation bias and corresponds roughly to the difference in the estimated coefficients on *Culture* in columns (10) and (9) (i.e. −0.418). This time, the calibrated value of the term $M$ is −0.309, which is again very close to −0.418. This exercise confirms that my multiple 2SLS approach is consistently estimating the single impact of both institutional arrangements (see also notes 23 and 31).

*Alternative estimation strategies* A last set of worries is that, conditional on all observables, either the excluded instruments are still directly shaping *Income*, the first-stage regressions are weak in a way undetected by the underidentification tests, or my multiple 2SLS approach is not the most efficient available strategy. To check the importance of these issues, I operate as follows. First, I incorporate the excluded instruments one at a time in both the first and second stages to further evaluate the exclusion restriction. Second, I switch to an LIML estimator, which tends to be less biased than 2SLS in the presence of multiple—possibly weak—instruments, and a rich conditioning set (Bekker 1994). Third, I estimate equations (1), (2) and (3) as a system by 3SLS to assess whether the 2SLS assumption of zero correlation among $\varepsilon_{i,c}$, $\omega_{i,c}$ and $v_{i,c}$ entails any loss of efficiency. Finally, I implement the two alternative empirical strategies proposed by the extant literature (see Section II).

Table 5 gathers the results produced by this battery of alternative empirical methods. Starting with the estimates from the semi-reduced forms in columns (1)–(3), *Culture* has approximately the same magnitude and statistical significance of the baseline specification when the first stages are sufficiently strong. Moreover, neither *Democracy* nor the excluded instruments has a significant impact on income. Turning to the LIML and 3SLS results in columns (4) and (5), both the estimates of $\beta_0$ and $\gamma_0$ and the underidentification and overidentification tests are similar to those in Table 4. This is not the case for the specifications employing past institutions as either exogenous instruments or main measures of institutional variation (see columns (6) and (7)). This evidence confirms the drawbacks of the approaches proposed by the extant literature and further discussed in Section IV.

*Pairwise analysis of adjacent grid cells* A conceptually different way to assess whether the exclusion restriction is satisfied is to focus on contiguous grid cells differing in their medieval climate volatility and thus condition on all unobserved features specific to the relevant 120 km×240 km dyads. This exercise is naturally fitted to confirm the casual impact of one endogenous regressor, determined by differences in the geography of contiguous grid cells (Michalopoulos and Papaioannou 2013), but it cannot be tailored to test the consistency of both culture and inclusive political institutions, which are driven by three distinct geographic traits. Operationally, I first identify contiguous grid cells falling in the same country whose difference in *Climate-M* is at least 0.01°C.[22] Next, I exclude the grid cells to which the national capitals belong and those with a land area lower than 200 square km to avoid results that are driven by redistribution towards the national administrative center or by pairs with very diverse land areas. Finally, I run second-stage regressions of the type

$$Y_{i(j),c} = \alpha_{i(j),c} + \beta_1 C_{i,c} + \boldsymbol{\delta}_3' \mathbf{X}_{i,c} + \varepsilon_{i(j),c},$$

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. There are 123 pairs of such grid cells in the sample for which I can observe all the control variables. Since I am now including country-specific, grid-cell-pair fixed effects $\alpha_{i(j),c}$, $\beta_1$ 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 observable factors contained in $\mathbf{X}_{i,c}$ and unobserved grid-cell-pair-specific

TABLE 5
INSTITUTIONS AND OUTCOMES—ALTERNATIVE ESTIMATION STRATEGIES

| Dependent variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| *Culture* | 0.349 | 0.747 | 0.291 | 0.535 | 0.495 | 0.027 | |
| | (0.205)* | (0.390)** | (0.450) | (0.194)*** | (0.170)*** | (0.088) | |
| *Democracy* | 0.121 | 0.175 | −0.369 | 0.148 | 0.119 | −0.096 | |
| | (0.101) | (0.160) | (0.838) | (0.132) | (0.109) | (0.113) | |
| *Culture-M* | | | | | | | 0.068 |
| | | | | | | | (0.137) |
| *Democracy-M* | | | | | | | 0.138 |
| | | | | | | | (0.104) |
| *Climate-M* | 0.110 | | | | | | |
| | (0.099) | | | | | | |
| *Ruggedness* | | −0.139 | | | | | |
| | | (0.177) | | | | | |
| *Coast* | | | 0.110 | | | | |
| | | | (0.184) | | | | |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Extra control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *p*-value of Sanderson–Windmeijer test in first stage for *Culture* | 0.00 | 0.04 | 0.53 | 0.00 | | 0.00 | 0.78 |
| *p*-value of Sanderson–Windmeijer test in first stage for *Democracy* | 0.02 | 0.06 | 0.61 | 0.08 | | 0.19 | 0.78 |
| Estimation | 2SLS | 2SLS | 2SLS | LIML | 3SLS | 2SLS | 2SLS |
| *p*-value of endogeneity test | 0.15 | 0.01 | 0.00 | 0.00 | | 0.31 | 0.02 |
| | 0.08 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 |

TABLE 5
CONTINUED

| Dependent variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| *p*-value of Stock–Wright LM test | | | | | | | |
| *p*-value of Anderson CC LM test | 0.02 | 0.06 | 0.60 | 0.07 | | 0.18 | 0.78 |
| *p*-value of Sargan statistic | | | | 0.33 | 0.30 | 0.00 | 0.98 |
| Number of observations | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

*Notes*
Dependent variable: *Income*.
Standard errors in parentheses.
The extra control variables are *Latitude*, *Longitude*, *Climate*, *Distance-to-Coast*, *Travelling-Distance*, *Primary-Sector*, *Atlantic-Trade*, *LPD-M*, *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough*, *Land-Suitability*, *Real-Capital*, *Human-Capital* and *Catholicism*.
The endogenous variables are *Culture* and *Democracy* in columns (1)–(4) and (6), *Culture*, *Democracy* and *Income* in column (5), and *Culture-M* and *Democracy-M* in column (7). The excluded instruments are *Ruggedness* and *Coast* in column (1), *Climate-M* and *Coast* in column (2), *Climate-M* and *Ruggedness* in column (3), *Climate-M*, *Ruggedness* and *Coast* in columns (4), (5) and (7), and *Culture-M-C*, *Culture-M-F* and *Democracy-M* in column (6). The control variables used in the second stages are also included in the first stages.
The null hypothesis of the Sanderson–Windmeijer *F*-test is that the endogenous variable object of testing is unidentified. Moreover, the null hypothesis of the Stock–Wright LM test (endogeneity test) is that the endogenous regressors are insignificant in the structural equation (can be treated as exogenous). Finally, the null hypothesis of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

features, such as local natural resources, technologies and persistent beliefs (Caselli and Tesei 2016).

Table 6 reports the results of the contiguous grid cell analysis. *Income* is significantly higher in the grid cells that display a stronger culture today because they experienced a more erratic climate during the Middle Ages. Conditional on all observable factors and grid-cell-pair fixed effects (see columns (3)–(5)), a one-standard-deviation rise in *Culture* (i.e. 0.27) will lead to a 10% increase in *Income*.[23] For these specifications, I reject that OLS is the appropriate estimator at 12% and underidentification at a level higher than 1%, whereas I cannot reject the overidentifying restrictions at a level lower than 21%.

*Falsification test* My last check of the exclusion restriction takes the shape of the following placebo test. Consistent with the first and second stages discussed so far, there is a positive and significant link between medieval climate volatility and present-day development, and conditional on *Latitude* and *Longitude*, the estimated OLS coefficient is 1.174 with a *t*-statistic of 6.55 for the sample used in Table 4 (see the left-hand graph in Figure 4). Populations 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 culture 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 per capita should not exist where the cost of accumulating culture was prohibitive. A case in point is Turkey, where first the 1058 East–West Schism and then the rise of the Ottoman empire blocked both the Cistercians' and the Franciscans' penetration.[24] While the Eastern Orthodox church required that monks shied away from any involvement with the worshippers' life (Tobin 1995, p. 144), Islam considers monasticism an excessively austere practice that should then be discouraged (*The Qur'an*, 57.27). I test whether these barriers impeded cultural accumulation in Turkey as follows. First, I divide its surface into 117 grid cells of $1^{\circ}$ width. Second, I construct the variables *Latitude*, *Longitude*, *Climate-M* and the natural logarithm of the 2009 GDP per capita from the sources discussed above. Conditional on geographic coordinates, there is a negative and insignificant relationship between the medieval growing season temperature and present-day income per capita, with an estimated OLS coefficient of $-1.64$ and a *t*-statistic of $-1.52$ (see the right-hand graph of Figure 4).

## IV. Inside the Black Box

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 culture. While an exhaustive account of the mechanisms underlying this last result is beyond the scope of this paper, I evaluate two possible explanations. First, I tailor my approach to assess whether past outcomes are related to past culture and not to past inclusive political institutions at the European local level. This evidence would confirm that inclusive political institutions have impeded, in the early modern era, state-building and market integration. Second, I exploit postwar data on the misbehaviour of the members of the Italian Parliament to test the idea that culture, but not inclusive political institutions, is necessary to push voters to punish political malfeasance and produce public-spirited politicians.

TABLE 6
INSTITUTIONS AND OUTCOMES—PAIRWISE ANALYSIS OF ADJACENT GRID CELLS

| Dependent variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| *Culture* | 0.285 | 0.175 | 0.363 | 0.363 | 0.357 |
| | (0.041)*** | (0.042)*** | (0.138)*** | (0.138)*** | (0.096)*** |
| Adjacent grid cells fixed effects | Yes | Yes | Yes | Yes | Yes |
| Extra control variables | No | Yes | Yes | Yes | Yes |
| *p*-value of Sanderson–Windmeijer test in first stage for *Culture* | | | 0.00 | 0.00 | |
| Estimation | OLS | OLS | 2SLS | LIML | 3SLS |
| Within $R^2$ | 0.29 | 0.66 | | | |
| *p*-value of endogeneity test | | | 0.12 | 0.12 | |
| *p*-value of Stock–Wright LM test | | | 0.01 | 0.01 | |
| *p*-value of Anderson CC LM test | | | 0.00 | 0.00 | |
| *p*-value of Sargan statistic | | | | | 0.21 |
| Number of observations | 246 | 246 | 246 | 246 | 246 |

*Notes*
Dependent variable: *Income*.
Standard errors in parentheses.
All specifications also consider *Latitude* and *Longitude*. The extra control variables are *Climate*, *Distance-to-Coast*, *Travelling-Distance*, *Primary-Sector*, *Atlantic-Trade*, *LPD-M*, *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough*, *Land-Suitability*, *Real-Capital*, *Human-Capital* and *Catholicism*.
The endogenous variables are *Culture* in columns (3) and (4), and *Culture* and *Income* in column (5). In columns (3)–(5), the excluded instrument is *Climate-M*, and the control variables used in the second stages are also included in the first stages.
The null hypothesis of the Sanderson–Windmeijer *F*-test is that the endogenous variable is unidentified. Moreover, the null hypothesis of the Stock–Wright LM test (endogeneity test) is that the endogenous regressor is insignificant in the structural equation (can be treated as exogenous). Finally, the null hypothesis of the Anderson underidentification (Sargan) test is that the excluded instrument is uncorrelated with the endogenous variable (exogenous).
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

### *Institutions and outcomes in the early modern era*

As put nicely in Austin (2008), a crucial danger that any cross-sectional analysis of the long-lasting drivers of present-day economic development faces is to 'compress history', that is, to treat any point in time consecutive to the historical shock as a current date and thus 'over-simplif[y] causation' (Austin 2008, p. 996). In other words, the evidence discussed so far would not be convincing if the relationships between economic development and institutions varied between the end of the 16th century and today. To

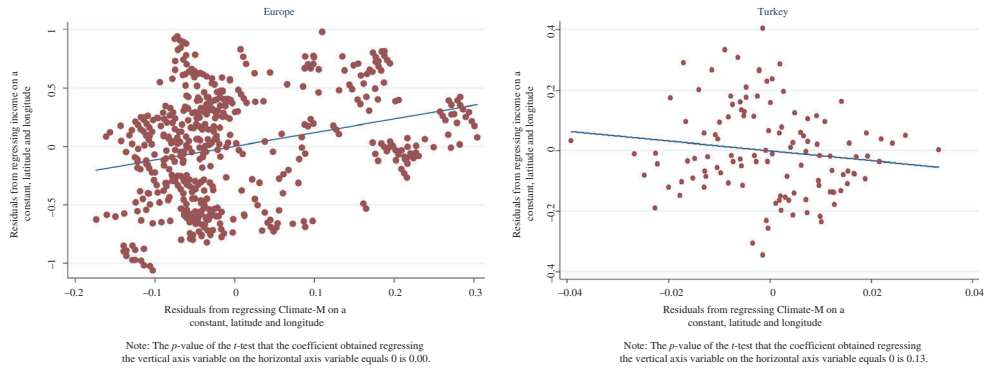


FIGURE 4. Severity of consumption risk and outcomes—placebo test.
*Notes*: The left-hand (right-hand) graph depicts the significant (insignificant) positive effect of *Climate-M* on *Income*, estimated through OLS from the sample of 500 grid cells used in Table 4 (117 grid cells covering Turkey) and conditional on *Latitude* and *Longitude*.

assess if this is the case, I consider the basic sample of 500 grid cells, and I run regressions of the type

$$\widetilde{Y}_{i,c} = \alpha_c + \widetilde{\beta}\widetilde{C}_{i,c} + \widetilde{\gamma}\widetilde{D}_{i,c} + \widetilde{\boldsymbol{\delta}}'\widetilde{\mathbf{X}}_{i,c} + \tau_{i,c}, \tag{4}$$

where $\widetilde{Y}_{i,c}$ is the natural logarithm of the population per square km in 1600, 1700, 1800 and 1900—that is, *LPD-1600*, *LPD-1700*, *LPD-1800* and *LPD-1900*—obtained again from Goldewijk *et al*. (2010). Even if adopted as a proxy for economic success in pre-industrial Europe by a growing development literature because of the lack of alternatives and the essentially Malthusian structure of this economy (Andersen *et al*. 2016, 2017; Ashraf and Galor 2013; Stasavage 2016; Abramson and Boix 2018),[25] population density does not capture all growth episodes (Fouquet and Broadberry 2015). Reassuringly, however, its correlation with contemporaneous measures of income per capita, which are available from the Maddison Project at the country level,[26] lies between 21% and 34%, and it is always significant at 1% or better, conditional on all observable geographic factors.

$\widetilde{C}_{i,c}$ and $\widetilde{D}_{i,c}$ represent *Culture-M* and *Democracy-M*. This data-driven choice is again less than ideal. While on the one hand it reduces the risk of compressing history, on the other hand it magnifies the measurement error—especially that of culture for which past self-reported information is unavailable—and makes the exclusion restriction more difficult to defend, since the analysed economies relied more heavily on agriculture. Hence I estimate equation (4) by OLS, possibly including in the specification *Climate-M*, *Ruggedness* and *Coast* to deal with the endogeneity of institutions. Moreover, differently from $\mathbf{X}_{i,c}$, $\widetilde{\mathbf{X}}_{i,c}$ does not incorporate *Primary-Sector*, *LPD-M*, *Real-Capital*, *Human-Capital* and *Catholicism*, which are determined simultaneously with past economic development, but it may gather *Culture* and *Democracy* when the dependent variable is *LPD-1600*. In this case, by comparing past and present-day institutions, I can explicitly test the possibility of reverse causality. If indeed the contemporaneous links between institutions and economic development are driven by the fact that the latter causes the former, then one would expect even stronger correlations between past economic success and present-day institutions (Angrist and Pischke 2009).

Table 7 reports the OLS estimates of equation (4). Culture continues to dominate inclusive political institutions for the entire period between the end of the medieval institutional revolution and the last century, even if the magnitude and significance of $\widetilde{\beta}$ fall as the dependent variable is measured in more recent times because of the growing error in the measurement of institutions. By the same token, the estimates of $\widetilde{\beta}$ and $\widetilde{\gamma}$ become larger when I control for the excluded instruments (see columns (2), (4), (6), (8) and (10)). Finally, past economic outcomes are not statistically correlated with present-day institutions conditional on past institutional arrangements, thus reverse causality should not be considered a source of concerns for my empirical exercise (see also Stasavage 2010).[27]

These patterns prompt three remarks. First, the anecdotal evidence provided by Grafe (2012) describes the data more accurately than a recent, but growing, literature contending instead that medieval regional political autonomy led to the primacy of Europe vis-à-vis the remainder of Eurasia in building state-capacity and accumulating capital (Stasavage 2016). Second, compression of history does not seem to be a major drawback for my analysis. Third, the limited ability of the available measures to capture institutional variation more distant in time sheds light on the weakness of those empirical designs focusing on the mere correlations between past institutions and present-day outcomes (see Section III).

*Institutions and political accountability*

An ideal test of the relationship between a culture of cooperation and inclusive political institutions on the one hand and political accountability on the other hand within my sample would need data on the misbehaviours of all the representatives of the NUTS regions. However, while a quite homogeneous measure of political malfeasance is available for the Italian regions, it is very difficult to find any comparable measure for the European sample. Focusing on the Italian Parliament, moreover, has two other major advantages. First, the autonomous Italian regions are typically run by region-specific parties, which usually also obtain the majority at national elections, thus more inclusive regional political institutions should strengthen the voters' incentive to monitor all their representatives and not only the regional ones. For instance, since 1945, the Südtiroler Volkspartei has represented the interests of Ladin minorities and has gained approximately two-thirds of the preferences in both the regional and national elections held in the province of Bolzano. Second, the Italian regions exhibit large dissimilarities in culture, inclusiveness, political accountability and geography, both across and within the northern and southern clusters (see Figures 1, 2 and 5).

I rely on data from Chang *et al*. (2010) and relative to the members of the House of Representatives elected in 31 of the 32 electoral districts during the first nine legislatures, that is, between 1948, the year of the first parliamentary election of the Italian Republic, and 1987, the last year in which the members of the Parliament enjoyed immunity from criminal prosecution. Data for the 31st district of Sardinia are unavailable. Typically, these districts group several NUTS 3 Italian units—that is, *provinces*. After having dropped politicians with missing values, the number of observations is 5755. Immunity could be waived by a vote of Parliament, at the request of the prosecutor. The prosecutor's request to continue with a criminal investigation—that is, *Richiesta di Autorizzazione a Procedere* (RAP)—received much 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 of suspicion

TABLE 7
INSTITUTIONS AND OUTCOMES—THE EARLY MODERN ERA

| Dependent variable | *LPD-1600* (1) | *LPD-1600* (2) | *LPD-1600* (3) | *LPD-1600* (4) | *LPD-1700* (5) | *LPD-1700* (6) | *LPD-1800* (7) | *LPD-1800* (8) | *LPD-1900* (9) | *LPD-1900* (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *Culture-M* | 0.067 | 0.074 | 0.059 | 0.063 | 0.064 | 0.070 | 0.038 | 0.050 | −0.002 | 0.008 |
| | (0.031)** | (0.031)** | (0.032)* | (0.032)** | (0.033)** | (0.033)** | (0.032) | (0.030)* | (0.034) | (0.034) |
| *Democracy-M* | −0.095 | −0.054 | −0.099 | −0.049 | −0.074 | −0.033 | −0.090 | −0.038 | −0.092 | −0.023 |
| | (0.077) | (0.081) | (0.079) | (0.082) | (0.083) | (0.087) | (0.080) | (0.084) | (0.085) | (0.088) |
| *Culture* | | | 0.127 | 0.237 | | | | | | |
| | | | (0.177) | (0.183) | | | | | | |
| *Democracy* | | | 0.012 | 0.001 | | | | | | |
| | | | (0.058) | (0.058) | | | | | | |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Extra control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Excluded instruments | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| Within $R^2$ | 0.26 | 0.27 | 0.26 | 0.27 | 0.23 | 0.24 | 0.29 | 0.30 | 0.30 | 0.31 |
| Number of observations | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

*Notes*
Estimation: OLS. Standard errors in parentheses.
The extra control variables are *Latitude*, *Longitude*, *Climate*, *Distance-to-Coast*, *Travelling-Distance*, *Atlantic-Trade*, *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough* and *Land-Suitability*. The excluded instruments are *Climate-M*, *Ruggedness* and *Coast*.
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

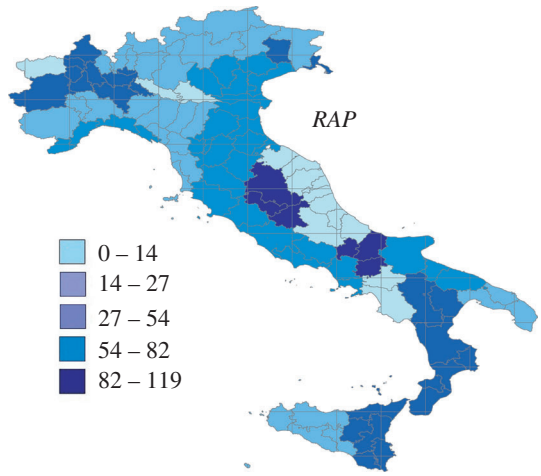


FIGURE 5. Malfeasance by the Italian First Republic Parliament.
*Notes*: The range of the variable is divided into five intervals using the goodness of variance fit method.

of a crime—that is, *RAP*.[28] Since a RAP is an allegation of malfeasance, rather than a conviction, it could also capture judicial zeal and/or prejudice. However, 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, that is, extent of missing infrastructures in public works in the 1990s (Chang *et al*. 2010).[29]

There are three key reasons why culture should enforce political accountability. First, a larger fraction of civic voters discourages moral hazard by politicians (Nannicini *et al*. 2013). Second, a stronger culture produces representatives who are more likely to internalize social welfare. Third, immoral politicians might self-select in low-culture districts in search of a lenient electorate. A more inclusive political process can instead facilitate the monitoring of politicians by voters, but it is irrelevant if the latter are not morally compelled to punish political malfeasance or if the former have weak civic virtues (Boix and Posner 1998). Overall, only culture should be significantly and negatively related to *RAP*.

Figures 1 and 5 confirm such an idea whereby representatives elected in more respectful and trustworthy districts seem more likely to receive a *RAP*, whereas those elected in autonomous regions do not. Next, I verify this remark through multivariate analysis. I add *Democracy* to the model by Nannicini *et al*. (2013), so I run the second stages

$$M_{p,d,t} = \kappa_t + \beta_2 C_d + \gamma_1 D_d + \mathbf{X}'_d \boldsymbol{\delta}_4 + \mathbf{Z}'_{p,d,t} \chi + \xi_{p,d,t},$$

where $M_{p,d,t}$ is *RAP* for politician $p$ elected in electoral district $d$ in legislature $t$. The excluded instruments for $C_d$ and $D_d$ are *Climate-M*, *Ruggedness* and *Coast*. The legislature fixed effects $\kappa_t$ take into account aggregate legislative term shocks, whereas the vector $\mathbf{Z}_{p,d,t}$ gathers individual characteristics, such as education and political experience, and the region of birth dummies.[30] 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 the 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. Furthermore, *Human-Capital* is now directly measured at the provincial level.

The estimates in Table 8 reveal that the frequency of RAP is significantly lower in the electoral districts displaying stronger norms of respect and trust but not in those characterized by more inclusive political institutions. Conditional on all observable factors (see columns (3)–(5)),[31] an increase in *Culture* equal to its standard deviation (i.e. 0.23) will reduce the incidence of a RAP by approximately 32%. For these specifications, I reject that OLS is the appropriate estimator at 12% and underidentification at a level

TABLE 8
INSTITUTIONS AND POLITICAL ACCOUNTABILITY—THE CASE OF THE FIRST REPUBLIC IN ITALY

| Dependent variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| *Culture* | −0.109 | 0.128 | −1.409 | −1.431 | −1.409 |
| | (0.040)*** | (0.085) | (0.610)** | (0.615)** | (0.610)** |
| *Democracy* | −0.002 | −0.006 | −0.047 | −0.047 | −0.047 |
| | (0.012) | (0.019) | (0.030) | (0.030) | (0.030) |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes |
| Extra control variables | No | Yes | Yes | Yes | Yes |
| *p*-value of Sanderson–Windmeijer test in first stage for *Culture* | | | 0.00 | 0.00 | |
| *p*-value of Sanderson–Windmeijer test in first stage for *Democracy* | | | 0.00 | 0.00 | |
| Estimation | OLS | OLS | 2SLS | LIML | 3SLS |
| Adjusted $R^2$ | 0.08 | 0.08 | | | |
| *p*-value of endogeneity test | | | 0.02 | 0.02 | |
| *p*-value of Stock-Wright LM test | | | 0.06 | 0.06 | |
| *p*-value of Anderson CC LM test | | | 0.00 | 0.00 | |
| *p*-value of Sargan statistic | | | 0.20 | 0.20 | 0.95 |
| Number of observations | 5755 | 5755 | 5755 | 5755 | 5755 |

*Notes*
Dependent variable: *RAP*. Standard errors in parentheses.
All specifications also consider the regressors listed in note 30, *Latitude* and *Longitude*. The extra control variables are *Climate*, *Distance-to-Coast*, *Travelling-Distance*, *Primary-Sector*, *LPD-M*, *Neolithic*, *Migratory-Distance*, *Medieval-Church*, *Black-Death*, *Potato*, *Plough*, *Land-Suitability*, *Real-Capital*, *Human-Capital* and *Catholicism*. The control variables used in the second stage are also included in the first stage.
The endogenous variables are *Culture* and *Democracy* in columns (3) and (4), and *Culture*, *Democracy* and *Income* in column (5). In columns (3)–(5), the excluded instruments are *Climate-M*, *Ruggedness* and *Coast*, and the control variables used in the second stages are also included in the first stages.
The null hypothesis of the Sanderson–Windmeijer *F*-test is that the endogenous variable object of testing is unidentified. Moreover, the null hypothesis of the Stock–Wright LM test (endogeneity test) is that the endogenous regressors are insignificant in the structural equation (can be treated as exogenous). Finally, the null hypothesis of the Anderson underidentification (Sargan) test is that the excluded instruments are uncorrelated with the endogenous variables (exogenous).
***, **, * denote significant at the 1%, 5%, 10% confidence level, respectively.

higher than 6%, whereas I cannot reject the overidentifying restrictions at a level lower than 20%.

Overall, I interpret these results as supporting the notion that a culture of cooperation, but not more inclusive political institutions, significantly enforces political accountability.

## V. Concluding Comments

This paper has exploited the exogenous institutional variation created at the European local level by medieval history to identify the absolute and relative roles of a culture of cooperation and inclusive political institutions. Operationally, I divide Europe into 120 km × 120 km grid cells, I proxy culture with norms of respect and trust and the inclusiveness of the political process with measures of its extensive and intensive margins, and I document strong first-stage relationships between present-day culture and the severity of consumption risk over the period 1000–1600, and between the inclusiveness of present-day political institutions and the factors that raised the returns on elite-citizenry investment in the Middle Ages. Building on these separate first stages, I show that only culture has a first-order effect on income, even after controlling for country fixed effects, proxies for the present-day roles of the excluded instruments, factors modulating the roles of institutions, and intermediate outcomes. The excluded instruments have no direct impact on income, and the effect of culture holds within pairs of adjacent grid cells that differ in their medieval climate volatility.

To identify channels of causality, I test two ideas. First, by favouring local interests, regional inclusive political institutions have impeded, in the early modern era, state-building and market integration. Consistent with this view, pre-industrial population density is correlated with the spread of the Cistercians and Franciscans, but not with tighter constraints on the elite's power. Second, in modern representative democracies, more inclusive political institutions are irrelevant in easing 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. Accordingly, there are fewer criminal prosecutions of the members of postwar Italian Parliaments in electoral districts in which culture is stronger, but not in those endowed with more inclusive political institutions. Despite the relevance of this evidence, more research is needed to characterize the micro-mechanisms through which institutions affect the economy.

## ACKNOWLEDGMENTS

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## NOTES

1. Nowak (2006) builds on evolutionary dynamics to show how cooperation and not individualism makes evolution constructive, representing its third key driver together with mutation and natural selection,

whereas Acemoglu and Johnson (2005) report strong correlations between an inclusive political process and outcomes.

2. While Acemoglu *et al*. (2005) document that Atlantic trade helped merchants to obtain tighter checks on the monarchy, Fleck and Hanssen (2006) contend that in Ancient Greece, democratization was stronger where the elite found more difficult to monitor the citizens' farming investments. Finally, Durante (2010) shows that Europeans living today where the climate was more erratic between 1500 and 1750 are more trusting of others.
3. Although in 1215 Pope Innocent III imposed on all monastic orders the Cistercian hierarchical structure, Benedictines, Cluniacs and Dominicans (Augustinians, Carmelites, Carthusians, Cathars and Waldensians) specialized instead in theological studies and university teaching (contemplation), possibly accepting lay brothers only as a support for the daily organization of the monastery (Knowles 1948; Lawrence 2001).
4. 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.
5. Using as cross-section identifiers the regions considered by Boranbay and Guerriero (2017) reduces the within-country standard deviation in the medieval climate volatility (ruggedness of the terrain) measure from 0.095°C to 0.069°C (0.110 km to 0.073 km) and makes the estimates very noisy (see the Online Appendix).
6. For each of the 685 (2931) Cistercian (Franciscan) houses and each half-century between 1000 and 1600, the discounted number of years equals those of operation less those elapsed from the possible house's closure if positive, and zero otherwise. To obtain the raw data, I eliminate from the list of monasteries reported in Van Der Meer (1965) (Moorman 1983) 2 (16) houses whose existence is not mentioned in at least one other of the available bibliographic and online sources, that is, www.cistercensi.info and http://users.bart.nl/∼roestb/franciscan/province.htm (both accessed 19 April 2019), and the bibliography therein. As illustrated in the Online Appendix, this measurement strategy has no effect on the gist of my empirical exercise.
7. To further cross-validate this variable, Boranbay and Guerriero (2017) report the large correlation (0.8) between the Franciscans' activity and the number of years the *Monti* were active per square km. Since these pawnshops survived only when loans were repaid (Muzzarelli 2001, pp. 189–244), their endurance is 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).
8. As emphatically reported in the *Exordium Parvum*, the Cistercians' narrative of the order's origins.
9. 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 defence.
10. Here, the central governments still rule on excepted matters like defence, whereas the regional Parliaments gained the residual legislative power and the ability to invest regional tax revenues into local public goods.
11. It would account for 10% of the variance of the proxy for inclusive political institutions (Coppedge 2012).
12. When the three excluded instruments are used to identify $C_{i,c}$, $D_{i,c}$ and their interaction, they become weak.
13. Failing to consider these confounding factors makes the estimates very noisy (see the Online Appendix).
14. Because of data availability (to have sufficient within-country variation), I exclude from the sample part of Ireland, Portugal, Scotland and Spain (Andorra, Gibraltar, Luxembourg, Malta and San Marino). This choice has no relevant impact on the estimates. Moreover, I do not consider Scandinavia and the areas east of Poland and Slovakia and south-east of Hungary and Slovenia, for two reasons. First, there are insufficient data on the rest of the medieval states to which they belonged. Second, the Cistercians and Franciscans did not spread there because of the Orthodox Church's opposition (Tobin 1995, p. 144).
15. To illustrate, the Luterbacher *et al*. (2004) measure of the growing season temperature, which is estimated building on instrumental data, has a 0.5-degree spatial resolution, covers the period 1500–2000, and displays, over the 16th century, an average volatility nine times bigger than that of the Guiot *et al*. (2010) reconstructions. This is because the latter are tailored to preserve a meaningful comparison over time, whereas the former are based on observations from climate stations, whose number was scarce before 1800. Similar figures prevail for the He (2011) data, which include yearly temperature and precipitation estimates for the last 22,000 years and 3.75×3.75 degree grid cells based uniquely on indirect sources.
16. The share of active population employed in the primary sector between 2002 and 2008 was 6% (see Table 2).
17. While a series of recent theoretical papers clarifies that cultural norms inherited from earlier generations deeply shape current culture (see Tabellini 2008), an expanding body of empirical contributions highlights the persistence of political infrastructures (Acemoglu and Johnson 2005; Di Liberto and Sideri 2015).
18. Accordingly, I document in the Online Appendix that the evidence remains essentially the same once I exclude from the analysis the outliers spotted with the Cook's distance (Cook 1977).
19. To take into account palaeontological and genetic evidence on prehistoric human migration patterns, I always consider Cairo and Istanbul as obligatory intermediate stages (see Ashraf and Galor 2013).
20. 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%).

21. The analysis is similar when I also allow inclusive political institutions to be measured with error since this accounts for 10% of the variance of *Democracy*, and $\gamma_0$ is 0 (see equation (3.2) in Garber and Klepper 1980).
22. This is the first quartile of the strictly positive differences in *Climate-M* between contiguous grid cells. The gist of this subsection would be the same should I use as threshold either the second or the third quartile.
23. The calibrated attenuation bias is similar to that implied by columns (2) and (3) of Table 6, that is, −0.242 versus −0.188.
24. My sources report only one (six) Cistercian (Franciscan) house(s)—that is, Istanbul (Beyoğlu, Istanbul, Izmir, Samsun, Sinop and Trabzon)—active in Turkey over the period 1000–1600.
25. Moreover, only technologically advanced and open—to trade—societies can sustain large urban centres and accommodate migration from the countryside (Pounds 1974; Acemoglu *et al*. 2005; Nunn and Qian 2011).
26. Albeit unsuited to proxy $\widetilde{Y}_{i,c}$ in equation (4), these measures will produce similar estimates should I disregard $\alpha_c$ (results available on request). I thank an anonymous reader who urged me to stress this point.
27. The partial correlations between past institutions and present-day income (log of 2009 GDP per capita and the inclusiveness of political institutions averaged between 1950 and 2000) are positive and significant (even conditional on the log of 2000 GDP per capita). Both links also come out against reverse causality (see the Online Appendix). I thank two anonymous readers who pushed me to dig further into this issue.
28. 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 misbehaviour for this period, namely, the absenteeism rate and the politician's propensity to propose laws targeted to local constituencies. I do not consider these two conducts because they are much less disruptive and publicized than those eliciting a RAP.
29. Moreover, more zealous judges in high-culture districts might raise the odds of RAPs (Nannicini *et al*. 2013).
30. 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. entrepreneur, executive, lawyer, politician and teacher legislative term dummies—and region of birth dummies (see Nannicini *et al*. 2013).
31. The calibrated attenuation bias is similar to that implied by columns (2) and (3) of Table 8, i.e. −1.243 versus −1.409.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**Table 1.** Summary of Variables.
**Table 2.** Alternative Proxy for Medieval Culture.
**Table 3.** Alternative Persistent Cultural Norms.
**Table 4.** Analyzing the Overall and Regional Variation.
**Table 5.** An Alternative Measure of Outcomes.
**Table 6.** Alternative Measures of Institutions, Outcomes and Controls.
**Table 7.** Excluding Outliers.
**Table 8.** Dealing With Spatial Correlation.