Endogenous (In)Formal Institutions.*

Serra Boranbay and Carmine Guerriero

July 14, 2012

Abstract

Albeit the relevance of democracy and strong norms of cooperation in shaping the economy is well documented, we still lack a framework identifying the origins and isolating the separate roles of these institutions. In our model, citizens and elite members either hedge against consumption risk with everyone else or invest with a member of a different group. First, each group costly instills into its members a psychological gain from cooperating—i.e., culture. Next, the elite decides whether to allow the citizens to fix the share of investment surplus spent on public good production—i.e., democracy—or choose herself. Finally, agents are randomly matched. The incentive to cheat when risk-sharing and the investment surplus are each shaped by an exogenous factor—e.g., geography. In equilibrium, democratization is mainly and positively driven by the factors fostering time-inconsistency in investment, and cultural formation is strengthened by the forces aggravating consumption risk when they are not too harsh. Also, shocks that curb the investment value and so threaten democracy can push the citizens to overinvest in culture to credibly commit to cooperating in investment. Estimates based on the geography, the diffusion of monasticism, and the political institutions of 90 European regions over the 1000-1600 period are consistent with this prediction.
Keywords: Geography; Culture; Democracy; Development.
JEL classification: 013; H10; Z10; O10.

*We would like to thank Toke Aidt, Maristella Botticini, Brian Burgoon, Bertrand Crettez, Giuseppe Dari-Mattiacci, Pierluigi Guerriero, Andy Hanssen, James Lo, Jürg Luterbacher, Enrico Perotti, Andrea Ruggeri, Avi Tabbach, Kaj Thomsson, Geoffrey Underhill, Jeroen van de Ven, Hans-Joachim Voth, and seminar participants at UvA and Maastricht for useful comments on previous drafts and Raffaella Paduano for the invaluable help in organizing the data on monasticism. Mariyana Angelova and Yan Ostapchenko provided outstanding research assistance. Serra Boranbay: University of Mannheim, boranbay@uni-mannheim.de. Carmine Guerriero: ACLE and University of Amsterdam, c.guerriero@uva.nl.

1 Introduction

Overwhelming evidence suggests that democracy and strong norms of cooperation foster economic development because they facilitate, respectively, property rights protection (Persson and Tabellini, 2009) and economic exchange (Guiso, Sapienza, and Zingales, 2006). Yet, only recently economists have begun to uncover the origins of these phenomena building on the idea that the experience of an efficient political organization can shape formal and informal institutions permanently (Guiso, Sapienza, and Zingales, 2008). However, documenting that these two reinforce one another and are persistent neither detects the forces producing each nor identifies their separate economic role. This paper lays out a theoretical framework to tackle this issue, and explores its empirical implications using data on medieval Europe. Indeed, from the 11th century onwards, attracted by the opportunity of long-distance trade, the lords of several Mediterranean regions shifted their effort from war-waging to forming commercial partnerships with a rising class of bourgeoisie (Stearns, 2001). These innovations flourished where the magnates granted the communal charter and persisted where the population sought the support of the Cistercians and the Franciscans. These monks persuaded the local communities into embracing a norm of mutual cooperation in exchange for insurance against supply shocks (Tobin, 1995). This cultural formation contributed to bridle the rise of autocracies in Northern Italy after the Atlantic routes opened (Muzzarelli, 2001).

In the model, "citizens" and "elite" members either hedge against consumption risk with any other individual or invest in a new technology, like long-distance trade, with a member of a different group. First, each group costly instills into its members a psychological gain from cooperating, for instance, by attracting a monastic order. We refer to this implicit

reward as culture. Next, the elite chooses whether to allow the citizens to fix the share of investment surplus spent on public good production—i.e., democracy—or choose herself. Then, agents are randomly matched and the elite selects the economic activity if faced with a citizen. The incentive to cheat when risk-sharing and the investment value are each shaped by an exogenous factor—e.g., geography. The equilibrium has three features. First, when the investment-specific factor is dominant and so culture brings added value to investment, culture and democracy reinforce each other. Second, when the relative magnitudes of activity-specific factors are not skewed, the citizen can credibly commit to cooperating in investment by embracing a stronger culture whereas the elite can demand a higher investment payoff by repressing it. Third, if the risk-sharing-specific factor is dominant, either cultural formation hinders democratization since the elite picks risk-sharing or no activity is possible.

We can credibly test these predictions by focusing on the institutions prevailing in 90 European regions between the 11th and the 16th centuries. Indeed, our sample offers a substantial variation on economies sufficiently simple to link activity-specific factors to institutional evolution. Given that the main economic activities were farming and long-distance trade, we capture the severity of time-inconsistency with the difficulty of monitoring Mediterranean and Atlantic trades; and the need of consumption risk-sharing with the volatility of the average temperature during the growing season. We proxy the extent of democracy with the constraints on the elite's decision making power and the strength of culture with the discounted number of years per square km Cistercian and Franciscan houses were active. Consistently, regions with a higher concentration of monasteries in the past exhibit, today, stronger self-reported norms of respect and trust. Our estimates reveal that the diffusion of monasticism was shaped by the temperature volatility whereas the trend towards tighter

checks and balances was driven mostly by the potential for long-distance trade. Also, the opening of the Atlantic routes not only improved the political process on the Atlantic coasts but also expanded the monasticism in the Mediterranean regions where, as our model suggests, a higher investment in culture by the population was necessary to convince the elite to keep the existing check and balances despite the lower investment value.

The papers most closely related to ours are Fleck and Hanssen (2006) and Durante (2010). According to the former, democracy expands where it helps the elite convince the citizens that their returns from hard-to-observe investments will not be expropriated.[1] The latter shows that regions where the climate was more erratic between 1500-1750 present today stronger norms of cooperation. Even if innovative, these contributions do not fully characterize the interactions among activity-specific factors, institutions, and the economy.[2] In this perspective, our paper offers three main contributions. First, we develop a theory of endogenous (in)formal institutions based on time-inconsistency in investment and risk-sharing in consumption. In contrast to previous studies (Acemoglu and Robinson, 2000; Lizzeri and Persico, 2004), our model emphasizes the incentives and instruments of not only those granting democracy but also those trying to achieve it. Second, we test this framework by using a historical case that offers variation over both time and space; in doing so we introduce a time-dependent measure of past values of cooperation. Finally, we suggest a novel instrumental variables approach to separately estimate the role of each institution.

The rest of the paper is organized as follows. Section 2 motivates the model by describing

[1] Fleck and Hanssen (2006) document that, at the end of the Dark Ages, while the elite in Sparta could easily observe the farmers' investment in new harvesting technologies, the one in Athens was prevented by the hillside landscape. Hence, the latter but not the former extended the franchise to encourage investments.

[2] A related literature studies the impact on initially given cultural values of the agents' expectations about the economy and the actions of leaders (Dixit, 2003; Tabellini, 2008; Acemoglu and Jackson, 2011).

the main institutional and economic features of medieval Europe. Section 3 illustrates how a heterogeneous society designs its institutions when confronted with exogenous technological constraints. Section 4 states the predictions which are tested in section 5. Section 6 concludes. The appendix contains proofs, tables, figures, and the data description.

2 (In)Formal Institutions in Medieval Europe

Europe at the end of the 10th century.—During the 3rd, 4th, and 5th centuries, several waves of barbarian invasions destroyed the Roman Empire, which for a long time had provided western Europe with law and social order. The subsequent lack of a central power precipitated a sharp decline in the urban population, wiped out long-run trade, and made the isolated rural estate the typical form of economic organization (Stearns, 2001). The defenceless farmers—i.e., *laboratores*—sought the protection of strong patrons—i.e., *bellatores*—who, empowered by the feudal contract institutionalized by the Carolingian kings (877-1037), started to exploit their political power as private property and simultaneously pacified their estates (Vitolo, 2000). This trend along with the improved climate conditions fuelled an institutional and economic revolution which changed Europe forever.[3]

1000-1350: institutional changes, farming, and Mediterranean trades.—Attracted by the prospect of improved land productivity and the opportunity of long-distance trade, many lords began to enter into higher powered farming contracts with the peasants and commercial partnership with a rising class of bourgeoisie, who imported spices, silk, and perfumes from the East in exchange for precious metals, oil, and wine (Vitolo, 2000). The merchants

[3]According to the data developed by Guiot et al. (2010), the average European temperature rose from 6.46 degrees Celsius during 600-1000 to 9.38 degrees Celsius during 1000-1350. This change is significant at 1%.

obtained protection against piratical incursions and exemption from the charges required to cross the lord's domain.[4] These contractual innovations flourished where a marked process of democratization helped their credibility, particularly in the communes of Northern Italy (1050-1282) and North-Eastern France (1080-1270), the towns of Aragon and Catalonia (1150-1213), the imperial cities of Southern Germany (1150-1356), the Switzerland Cantons (1231-1483), the *Giudicati* in Sardinia (1100-1297), and the maritime republics of Genoa (1099-1191) and Venice (1095-1297) (Stearns 2001; Ortu, 2005). Initially organized as "a sworn association of free men endowed with political and economic independence" [Stearns 2001, p. 216], such polities were governed by a public assembly that attended to general interest matters and selected the executive. This institutional development was accompanied by an upturn in the public spending on sanitation and public granaries, the proliferation of commercial treaties with foreign powers, and the recovery of lost technologies like the crop rotation, the heavy plough, and the horse-shoeing (Vitolo, 2000).

Meanwhile, the monastic movement was transforming the society (Woods, 2005). Originated in the East, monasticism spread to Europe during the 5th and 6th centuries with both ascetic and laxness extremes up to the 1098 when a group of Cluniac monks abandoned the abbey of Molesme in Burgundy and founded a new monastery in Cîteaux. Driven by the desire to return to the original Benedictine emphasis on prayer and manual labor, the Cisterns developed the first religious order around the powerful idea, epitomized in their 1119 *Carta Caritatis*, that both the relationship between the different houses and the one among the worshippers must 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].

[4]Marriages "often sealed [the] contracts between rural nobility and [...] merchant[s]" [Stearns 2001, p. 216].

With the help of lay brothers and sisters known as *conversi*, the Cistercians drew the local population into a variety of risk-sharing activities. First, they accepted as grant mainly those undeveloped lands where the climate was more unpredictable and turned them into fertile farms (Berman, 2000). Second, they organized trade fairs to sell farming products (Berman, 2000). Third, they offered insurance against supply shocks and introduced major technological innovations.[5] Finally, they made lands available at rates lower and for leases longer than those offered by the lords (Woods, 2005). Such continuous cooperation helped substantiate and spread an ideal of charity pursued not through alms but "via moral consideration and practical engagement" [Muzzarelli 2001, p. 115]. This approach was so special within the medieval Church and attractive for a world where risk-minimization was an imperative that hundreds of communities pressured the nearest monasteries to join the Cistercians so that they could deliver the same risk-sharing and cultural formation services (Berman, 2000). Already in 1153 the order comprised 435 houses all around Europe.[6]

1350-1600: institutional changes and Atlantic trades.—The Cistercians were slowly substituted by the Franciscans once the *conversi* system collapsed due to the Black Death in 1348.[7] Between the 13th and 14th centuries, the Friars Minor were able to build a network of thousands houses linked in the Cistercian fashion (Logan, 2002), and organize the first European micro-credit institutions, the *Monti di Pietà* (1431-1611). These pawnshops gave loans in exchange for a pledge eventually auctioned if the loans plus an interest rate were paid back;

[5] They accepted children and widows seeking to retire; provided shelters for pilgrims and poor; stored up spring waters; produced salt to preserve the food; developed new hydraulic and metallurgy techniques; spread the use of the waterwheel, the greenhouses, and the iron furnaces slags as fertilizer (Woods, 2005). Thanks to the annual meeting, these achievements were shared among all houses (Gimpel, 1976).

[6] Because of the duty of the mother-houses to visit and eventually support the daughter-houses and the centralized dispute resolution, "no one could afford to stray from the prescribed path" [Tobin 1995, p. 41].

[7] Augustinians, Cluniacs, and Dominicans (Carmelites, Carthusians, Cathar, and Waldensian) were unable to do the same because they almost exclusive focused on intellectual work (contemplation) (Logan, 2002).

the interest rate they charged was usually much smaller than that charged by the Jewish bankers. Similarly to the Cistercian case, many communities asked the Franciscans to set up a house in order to gather sufficient alms to start and run a *Monte* (Muzzarelli, 2001). In doing so the monks would examine "the morality and the social behavior of the customers evaluating the loan use" [Muzzarelli 2001, p. 216] to "make the citizenry cohabitation more cooperative and fair" [Muzzarelli 2001, p. 7]. At the same time, the opening of new routes shifted the center of the trades towards the Atlantic. As a result, while the merchants of the Mediterranean France lost their communal privileges to new autocratic states, those of the Provinces and the Reign of England were instead able to increasingly constrain the power of the monarchy (Acemoglu, Johnson, and Robinson, 2005). The institutional decline was more gradual in Northern Italy where the communes turned into first commercial oligarchies and then, at the end of the 17th century, autocracies called *Signoria* (Stearns, 2001).

3 Theory

Inspired by the discussion above, we study the choices of culture, e.g., attracting a new monastic order, and political regime, e.g., becoming a city-state, by a society divided into a majority of "citizens" and a minority of "elite" members. The citizens can be pictured as peasants or merchants, and the elite as lords. The two possible economic activities are investing in a new technology, such as transatlantic trades, and sharing a consumption risk, for instance, by opening a *Monte*. The surplus from investment and the incentive to cheat when risk-sharing are shaped by activity-specific exogenous factors—e.g., geography. The model builds on Fleck and Hanssen (2006), and Kaplow and Shavell (2007). First, we present the basic setup and then we evaluate the implications of relaxing some key assumptions.

Preliminaries.—Society is split into two groups: a share $\mu < \frac{1}{2}$ consists of the elite and the rest are citizens. At time zero, group $i \in \{e, c\}$ decides a psychological gain from cooperating in any economic interaction, denoted by $d_i < \overline{d}$, to instill in its members.[8] Inculcating a level of culture d_i costs $\frac{(d_i)^2}{2}$. This assumption incorporates into the model the key insight of evolutionary psychology (Barkow, Cosmides, and Tooby, 1992): group-specific cultural values result from a process that selects, via natural selection or cross-punishment, norms maximizing the fitness of the group's members.[9] Hence, members of a groups facing a higher expected return from cooperation end up deriving a stronger psychological pleasure d_i.

At time one, the elite decides whether to introduce democracy. This choice determines the share s_j of the investment surplus λ_I spent on public good production in regime $j \in \{A, D\}$.

At time two, if the elite chose democracy, there is a majority voting on the share s_D, which is thus selected by the citizenry. Under autocracy, instead, s_A is decided by the elite.

At time three, each agent is randomly paired with another. Two agents of the same group play a risk-sharing game, otherwise the elite chooses between the investment and the risk-sharing games. In the latter, agent i receives d_i from cooperating but also loses λ_R when her partner does not. If agent i does not cooperate, she receives λ_R if her partner does cooperate and zero otherwise. λ_R summarizes the exogenous characteristics measuring the gain from cheating one's partner; climate risk is one example. When the elite chooses the investment game, she first decides whether to make an irrevocable input at the disposal of the citizen bearing a cost $f > 0$. Next, the citizen can either appropriate the value of the input or exert

[8]The existence of a cap is consistent with psychology studies showing that the human neurological system becomes less sensitive or even numb to repetition of feelings like the one of virtue (Frederick and Loewenstein, 1999). Kaplow and Shavell (2007) and Rayo and Becker (2007) impose a similar "crowding-out" constraint.

[9]In evolutionary games, a cooperator can invade a population of defectors with a probability implying a net selective advantage (Nowak et al., 2004) and a cooperative behavior based on the punishment of defectors tends to be stable if individuals are not constrained to participate to the joint endeavor (Hauert et al., 2007).

an effort at a cost equal to the elite's input f. The production is zero in the former case and λ_I in the latter. λ_I accounts for exogenous features apart from those summarized by λ_R, exacerbating the time inconsistency in investment and thereby increasing the value of mutual cooperation in the investment. For instance, λ_I could measure the distance from the center of long-distance trades. Both λ_R and λ_I are independently distributed on $\left[0, \overline{\lambda}\right]$.

Given that the elite always holds property rights on the investment surplus, a fraction $s_j \lambda_I$ of it is spent on the public good g and the remainder $(1 - s_j)\,\lambda_I$ stays with the elite. Only one of two types of public good, denoted by p_e and p_c, can be produced. The group selecting the sharing rule also chooses the type of public good. There are two differences between p_e and p_c. First, p_e is the elite's and p_c is the citizen's favourite good. Second, producing the other group's favourite good involves a technological constraint: only a fraction $\gamma \in (0, 1)$ of the initial investment can be converted into the good. Put differently, $(1 - \gamma)\, s_j \lambda_I$ is a pure waste capturing either the inability of a group unfamiliar with the production process or the transaction costs that arise when the group in power transfers the production oversight to the other. This last interpretation suggests that the inefficiencies driven by the heterogeneity in production abilities cannot be contracted away. Agents have quasi-linear utilities and the payoff from public spending, denoted by u, is such that $u' > 0$, $u'' < 0$, and $\lim_{g \to 0} u'(g) = \infty$. An investment g in p_e yields a payoff of $u(g)$ to the elite and $\theta_c u(g)$, with $\theta_c < 1$, to the citizenry under autocracy, and $u(\gamma g)$ to the elite and $\theta_c u(\gamma g)$ to the citizenry under democracy.[10] Analogously, under democracy, investing g in p_c brings $u(g)$ to the citizenry and $\theta_e u(g)$, with $\theta_e < 1$, to the elite; the same investment delivers $u(\gamma g)$ to the citizenry

[10] Should the number of citizens be finite, public spending also depends on the share of citizenry-elite matches. This change complicates the algebra without delivering additional insights. The proofs of this and the other extensions to the model mentioned below are available from the authors.

and $\theta_e u(\gamma g)$ to the elite under autocracy. We also assume that:

Assumption 1: *a.* $f > \overline{d} > \overline{\lambda} > 1$*; b.* $\theta_c < \left(f - \overline{d}\right)/u\left(\overline{\lambda}\right)$*; c.* $\gamma < u^{-1}\left(f - \overline{d}\right)/\overline{\lambda}$.

Starting from condition 1a, the first inequality implies that cooperating in the investment subgame is never a dominant strategy for the citizen, the second ensures that cooperation in risk-sharing is affordable, and the third allows for over-investment in culture. Condition 1b requires that the groups' preferences are sufficiently polarized and squares with the example discussed above: while the elite struggled to affirm a stable feudal power, the citizenry was only concerned with producing food for survival. Finally, restriction 1c imposes that each group is relatively inexperienced in producing its less desirable good and captures the medieval society's division into *laboratores* and *bellatores*. Assumption 1 can be relaxed creating additional scenarios to tackle but no further insights. Tables 1 to 5 display the payoff distribution for each possible subgame characterized by the particular economic activity and political system pair. We assume that agents of the same type act identically and the following two tie-breaking rules about the elite's decisions:

Assumption 2: *If risk-sharing is expected to be the economic activity under any political system, then the elite retains autocracy. Furthermore, the elite chooses investment if she enjoys the same payoff under both risk-sharing and investment.*

In interpreting the generality of the foregoing, several remarks should be heeded. First, the timing we consider is optimal from the elite's perspective (see section 3.2). Second, the model's message persists should the elite be able to make transfers to the citizen (see section 3.2) or if both goods can be concurrently produced (footnote 12). Finally, the model's message will remain intact should risk-sharing leave some taxable surplus (see section 3.2).

3.1 *Equilibrium (In)Formal Institutions*

Given that the game is finite, we start by analyzing the final decision that entails the elite's choice of economic activity upon meeting the citizen. Since autocracy implies risk-sharing by assumptions 1 and 2, we identify the conditions under which the elite picks investment after having chosen democracy and the citizen has selected the sharing rule.

Choosing investment.—The elite would preserve autocracy if the citizen cooperated in investment. Yet, assumptions 1b and 1c rule this out by imposing that the citizen is better off by not cooperating even when the highest possible surplus $\overline{\lambda}$ is pooled into the public good and he has built the highest possible culture $\overline{d}$. The two restrictions allow us to focus on the case in which time-inconsistency in investment and risk-sharing enable an otherwise impossible process of democratization. Under democracy, the citizen wants to spend on the production of p_c the highest share of the surplus that also assures to the elite a payoff weakly greater than the one from risk-sharing. Foreseeing this, the elite establishes democracy if:[11]

$$(I_c) \quad u\left(s_D\lambda_I\right) \geq f - d_c, \quad (I_e) \quad \theta_e u\left(s_D\lambda_I\right) + \left(1 - s_D\right)\lambda_I + d_e - f \geq \text{risk-sharing payoff.} \quad (1)$$

Provided that the citizen has selected an appropriate sharing rule, the first inequality assures that he cooperates in investment and the second inequality guarantees that the elite is better off by investing.[12] We treat d_e and d_c parametrically since they are already decided.

Choosing s_D^*.—Three remarks are key at this point. First, the citizen tries to pick a sharing

[11] Under the weaker conditions $\theta_c u\left(\overline{\lambda}\right) < f - d_c$ and $u\left(\gamma\overline{\lambda}\right) < f - d_c$, there are values of d_c making the citizen's cooperation feasible under autocracy but not chosen because either (i) too costly or (ii) unable to force the elite to introduce democracy. While the solution is similar in case (i), under scenario (ii) we should determine the d_c respecting the two weaker restrictions and conditions (I_c) and (I_e). This will not affect our results.

[12] Note that condition 1b and 1c also imply that the analysis is robust to the possibility that both goods can be concurrently produced since $\theta_c u\left(\alpha\overline{\lambda}\right) + u\left(\left(1-\alpha\right)\gamma\overline{\lambda}\right) < f - \overline{d}$ for any $\alpha \in [0,1]$.

rule that enables investment because his payoff from such activity is always weakly greater than f which, in turn, is higher than his maximum payoff from risk-sharing: $\max\{\lambda_R, d_c\}$. Second, the citizen's payoff from investment strictly increases in s_D. Third, a violation of either condition (I_c) or (I_e) renders investment infeasible and, anticipating this, the elite keeps autocracy. Formally, the citizen chooses a sharing rule which solves:

$$\text{maximize}_{s_D \geq 0} \quad u(s_D \lambda_I) \quad \text{such that} \tag{2}$$

$$(\nu \geq 0) \qquad \theta_e u(s_D \lambda_I) + (1 - s_D)\lambda_I \geq f - d_e + \text{risk-sharing payoff} \equiv RHS$$

$$(\psi \geq 0) \qquad (1 - s_D)\lambda_I \geq 0.$$

The corresponding first order condition, which is sufficient since all functions are concave, is $u'(s_D^* \lambda_I) = (\nu + \psi)(1 + \nu\theta_e)^{-1}$ where the superscript * labels equilibrium quantities. The citizen fixes $s_D^* = 1$ except when doing so violates constraint (I_e).[13] In this case, the highest $s_D < 1$ at which constraint (I_e) binds is selected. s_D^* depends on the already established levels of culture, d_c and d_e, as well as λ_I and λ_R, so that $s_D^* = s_D^*(d_e, d_c, \lambda_R, \lambda_I)$. For simplicity, we omit some arguments of s_D^* when this choice is irrelevant, and look at the case where $u(s_D^* \lambda_I) \geq f - d_c^*$, that is, the citizen does not renege on cooperation.

Because of the paramount role λ_I plays in influencing both agents' choices, it is useful to establish how this parameter affects the sharing rule. If λ_I is sufficiently high with respect to λ_R as to satisfy the inequality $\lambda_I > u^{-1}(\max\{f - d_c^*, RHS/\theta_e\})$, investment is very profitable for both groups and they implicitly agree to spend all the surplus on p_c. Yet, if λ_I is not as high, then condition (I_e) can only be satisfied if s_D^* is less than one given some pairs

[13] This means that it cannot be true that both constraints are slack. If they were both slack, the citizen could raise s_D until the first constraint held with equality. Note that $u'(s_j \lambda_I) \geq (\theta_e)^{-1}$ suffices to ensure $s_D^* = 1$.

of d_c and d_e. If so, constraint (I_e) binds, the objective function in (2) is supermodular in d_e and d_c, and so s_D^* and RHS respond to the choices of culture in opposite ways. Since RHS equals the risk-sharing outcome minus d_e, it increases in d_c because the elite derives a higher payoff from cheating a citizen and decreases in d_e. The lemma formalizes this discussion:

Lemma: *Under assumptions 1 and 2: (1) the sharing rule* $s_D^*(d_e, d_c)$ *is nondecreasing in the elite's culture* d_e *and nonincreasing in the citizen's culture* d_c*: i.e., for a given* d_e, $s_D^*(d_e, x) = s_D^*(d_e, y) > s_D^*(d_e, w) = s_D^*(d_e, z)$, $\forall x \neq y, z \neq w$ *such that* $y \vee x < \lambda_R \leq z \wedge w$*; (2)* $\forall d_c, d_e \leq \lambda_R$, $s_D^*(d_e, d_c) = 1$ *if and only if* $\lambda_I > u^{-1}(\max\{f - d_c^*, RHS/\theta_e\})$.

Choosing culture.—At time zero, each group chooses a level of culture anticipating its effect on the reservation values as determined by the risk-sharing interactions. We begin with the elite's decision. First, for values of λ_I which are relatively low with respect to λ_R, as defined by the range (A) identified in the appendix, investment is not viable and the elite only maximizes the payoff from risk-sharing.[14] This entails that the elite sets $d_e^* = 1$ if λ_R is not too high and $d_e^* = 0$ otherwise.[15] Second, for the relatively high values of λ_I defined by the range (B) found in the appendix, investment surely takes place and the elite decides whether to also cooperate in the risk-sharing game with her own kind. Hence, d_e^* equals $\max\{1, \lambda_R\}$ for values of λ_R that are not too high, and $1 - \mu$ at sufficiently high values of λ_R which make cooperation too costly. Third, for values of λ_I that are moderately high relative to λ_R defined by the ranges (C), (D), and (E) discussed in the appendix, investment is possible and mostly occurs when constraint (I_e) binds so that the two economic activities bring equal payoffs to the elite. Since the risk sharing payoff also determines the investment utility,

[14] In this range of λ_I the elite's payoff from investment is lower than any payoff from risk-sharing and strictly increasing in s_D^* because of the very high marginal utility from public good consumption (see the appendix).
[15] Building on individual beliefs, Butler, Giuliano, and Guiso (2011) obtain a similar result.

the elite's degree of cooperation becomes a function of the citizen's. By not acquiring any culture, the elite can extract a higher surplus from investment given a cooperative citizen. This incentive is very strong if the temptation to cheat given by λ_R is large. Confronted with a noncooperative citizen, the elite instead cooperates if cheating another elite's member in a risk-sharing interaction is not too lucrative—i.e., for values of λ_R that are not too high.

Similar intentions guide the citizen's choice of culture when the relative magnitudes of activity-specific factors are skewed: that is, when they fall in ranges (A) and (B). Yet, additional trade-offs kick when λ_I belongs to ranges (C), (D), and (E). On the one hand, the citizen is tempted to deny his cooperation to expose the elite to a low payoff from risk-sharing, 0 or $d_e^* - \lambda_R$. This strategy permits a higher investment on public good and saves culture-building costs. On the other hand, this move can threaten not only cooperative intra-group risk-sharing but also investment by undermining the citizen's credibility in the way of violating condition (I_c). To see this, suppose the citizen does not cooperate by choosing $d_c < \lambda_R$. Given the elite's culture, if d_c falls short of the level that commits the citizen to future cooperation under the best sharing rule he can pick, that is, if $f - u\left(s_D^*\left(d_e^*, d_c\right)\lambda_I\right) \equiv \widehat{d} > d_c$, then investment fails since condition (I_c) is violated. Hence, the citizen either inculcates $d_c^* \geq \widehat{d}$, or tries to risk-share only if signalling commitment is prohibitively costly. For the higher intermediate values of λ_I belonging to range (C), the citizen resolves this trade-off in favor of suppressing d_c since $\widehat{d}$ is likely to be lower than λ_R and investment goes through regardless. For the lower intermediate values of λ_I in range (D) and (E), $\widehat{d}$ is necessarily very high and a low d_c may endanger investment. Especially when $\widehat{d} \geq \lambda_R$ the citizen has to cooperate to permit investment as long as cultural formation is not too expensive. This result is novel in the literature (Acemoglu and Robinson, 2000; Lizzeri and Persico, 2004; Fleck

and Hanssen, 2006) and stems from our more realistic assumptions that ex ante investment inputs cannot be expropriated ex post and the group in power cannot exclude the other from the public good. Also, this finding survives in a dynamic setting with the possibility of new economic activities emerging—e.g., the opening of the Atlantic routes (see section 3.2).

To summarize, the strength of culture depends primarily on λ_R. Given small and moderate values of λ_R, both groups benefit from cooperating in risk-sharing, but high values of λ_R render the temptation to cheat too strong and only the prospect of democracy can enable some level of culture. Higher values of λ_I indeed, by expediting democracy, expand the range of λ_R in which cooperation is possible and weakly raise the level of risk-shared at each value of λ_R. Yet, the main effect of λ_I on the average cultural edifice $d^* = \mu d_e^* + (1-\mu)\, d_c^*$ is to force the citizenry to overinvest in culture when λ_I falls from range (B) to range (C), (D), or (E) so that to endanger democracy. Figure 1 depicts this pattern for the most likely case in which the elite's size is small and so $\mu \to 0$.[16] Proposition 1 fine-tunes the whole discussion:

Proposition 1: *Suppose that assumptions 1 and 2 hold: (1) the elite's culture, d_e^*, and the citizen's culture, d_c^*, weakly increase in λ_R at its moderate values, and then discretely drop; (2) while d_e^* weakly rises in λ_I, d_c^* is not-monotonic in λ_I.*

Sustaining democracy.—The exposition so far brings us to the next result: while λ_I enables democracy, λ_R has the reverse, but only second order, impact in ranges (C), (D), and (E). When the investment surplus λ_I increases, so does the likelihood of democracy, which is a way to realize mutually beneficial investments. On the contrary, when the citizen has to adjust his level of culture to urge the elite to pick investment, the temptation to cheat in risk-sharing threatens the prospect of investment. Proposition 2 restates this conclusion:

[16]The concavity of d_c^* in λ_R is due to the fact that, in this range, $\frac{d^2(d_c^*)}{d\lambda_R^2} = -u''(\cdot)\, \frac{\partial s_D^*}{\partial \lambda_R} \leq 0$ being $\frac{\partial s_D^*}{\partial \lambda_R} \leq 0$.

Proposition 2: *Under assumptions 1 and 2, λ_I facilitates democratization whereas λ_R has a second-order effect of hindering it given intermediate values of λ_I.*

3.2 *Robustness to Alternative Assumptions*

Dynamics.—One key result of our model is the possibility that the citizen overinvests in culture to credibly signal the elite the he will cooperate in investment. This nicely matches the institutional evolution experienced by the Mediterranean regions after the opening of the Atlantic routes. As the importance of long-distance trades towards East decreased—i.e., a fall in λ_I—only those regions that embraced the Franciscan movement, such as Northern Italy, were able to preserve democratic institutions. For instance, to reinforce their cultural investment, many communities of Northern Italy passed laws allowing the government to impose special taxes should the Monte incur a liquidity shock (Muzzarelli, 2001).

Now imagine that the benchmark setup is augmented by another period which is different from the first one in three aspects: 1. let $\lambda_{a,2}$, with $a = R, I$, denote period $t = 1, 2$ exogenous parameters defining the forthcoming interactions; 2. there emerges a group m of "high-skilled merchants", previously indistinguishable from the citizens; 3. the elite can join forces with the group m and organize a coup which is always successful and costless.[17] Group m constitutes a portion $\gamma \to 0$ of society, reducing the fraction of the citizens to $1 - \mu - \gamma$. By means of a new and exclusive technology, m produces a net payoff of $\gamma\alpha\lambda_{I,2} > 0$, where $\alpha > 0$.[18] To incorporate the unforeseen nature of the technological shock, we assume that the citizens and the elite believe in $t = 1$ that $\lambda_{a,2} = \lambda_{a,1}$ for all a and ignore the existence

[17] Relaxing these assumptions or having $\delta < 1$ complicates the algebra without delivering new insights.

[18] In other words, an m agent produces a negligible portion of the net surplus and is exempted from contributing $s_{j,2}\alpha\lambda_{I,2}$ to public spending. This captures the special laws regulating merchant guilds (Vitolo, 2000).

and size of m. While the elite inherits in $t = 2$ a stock $(1 - \delta) d_{e,1}$ of culture, the citizenry and the merchants start the second period with $(1 - \delta) d_{c,1}$. For simplicity, we assume the following conditions. First, $\delta = 1$; second, $\mu \to 0$; third, an m agent can only engage in the new activity. Finally, we maintain that democracy was embraced in the first period and we focus on the case where $\lambda_{I,2} < \lambda_{I,1}$. If the elite triggers the coup she gives up the possibility of investing with the citizen and gathers $\frac{\mu}{\mu+\gamma}\gamma\alpha\lambda_{I,2}$ as a tax payment from m. If instead democracy is retained, the citizen remains in power and collects $\frac{1-\mu-\gamma}{1-\mu}\gamma\alpha\lambda_{I,2}$ from m and plays with the elite either the risk-sharing or the investment game.

Since group m is always worst off when taxed by the citizens, he leaves to the elite the choice between seizing power or sustaining democracy. If the elite's payoff is the same under investment and risk-sharing—i.e., $\lambda_{I,2}$ belongs to the range (A) or (E), a coup always realizes since it allows the elite to obtain the extra payoff $\frac{\mu}{\mu+\gamma}\gamma\alpha\lambda_{I,2}$ by taxing the m group. If $\lambda_{I,2}$ is in range (C), under the extra mild assumption discussed in the appendix, the elite turns uncooperative and derives $\lambda_{R,2}$ when the citizen selects a culture that credibly signals his cooperation in investment. The sufficient condition for a coup is $\frac{\lambda_{I,2}}{\lambda_{R,2}} > \frac{\mu+\gamma-(\mu+\gamma)^2}{\mu\gamma\alpha}$. If this condition holds, then the elite initiates a coup irrespective of the citizen's choice and each group builds a culture maximizing only its risk sharing payoff. While the elite's decision is the same as in range (A), the citizen's is almost identical except for the minor modification that the probability of meeting a fellow citizen is now $1 - \mu - \gamma$. If the condition for a coup fails, then the citizen has a very good reason to sustain democracy since a reversion to autocracy costs the proceeds from $(1 - \mu - \gamma)(1 - \mu)^{-1}(\gamma\alpha\lambda_{I,2})$ and f. Hence, the citizen attains very high levels of culture to ensure that condition (I_e) holds. To elaborate, the highest $d_{c,2}$ that the citizen is prepared to build is the largest amount at which the following holds:

$$(1-\mu)\, d_{c,2} I_{d_{c,2}\geq\lambda_{R,2}} - \frac{d_{c,2}}{2} + \mu f + \frac{1-\mu-\gamma}{1-\mu}\gamma\alpha\lambda_{I,2} \geq \text{risk-sharing payoff.} \tag{3}$$

Inequality (3) implies that $d_{c,2}$ is higher the more productive group m is—i.e., the higher α is. The instances where $\lambda_{I,2}$ belong to range (B) (range (D)) can be studied analogously: since investment is more (less) lucrative, reviving autocracy is harder (easier) in this range.

Different timing of events.—In circumstances where cultural formation do not impact economic activity, such as when λ_I lies in range (A) or (B), the order of decisions is irrelevant. However, in the intermediate ranges of λ_I, deciding culture first is crucial since the culture pair establishes the elite's opportunity cost of investment. In other words, the particular order of events is relevant to permit credible commitment when needed. For example, were the elite to choose the economic activity before the levels of culture were set, then the citizen could no longer commit through his choice of d_c as it would not be subgame perfect. Anticipating this, the elite would not introduce democracy. By the same token, for our results to go through, the risk-sharing rule should be decided before the elite chooses the economic activity. Otherwise, once democracy and investment are in place, the citizen can no longer be trusted to pick a sharing rule that ensures (I_e) since it is no longer a requirement for sequential rationality.[19] Put differently, the particular order we opted in the benchmark scenario is one that resolves the credibility issues, encourages democracy, and would be preferred by the elite who is also likely to decide the sequence of decisions. Any other order would render democracy impossible when λ_I falls in the intermediate range.

The elite can make transfers to the citizen under autocracy.—We retain the assumption that

[19]In the internet appendix, we solve a version of the model where the economic activity is chosen at time zero.

the citizen cannot direct residual funds to herself under democracy but we assume that the elite can now transfer funds to the citizen under autocracy. Hence, attaining democracy becomes harder as the elite can now resort to transfers to obtain the citizen's cooperation. Indeed, in addition to assumption 1, democracy further requires the transfers to be no more valuable to the citizen than either public good when supplied under autocracy. This amounts to demanding that a public good's marginal benefit to the citizen is greater than one or $\min\left\{\theta_c u'\left(\overline{\lambda}\right), u'\left(\gamma\overline{\lambda}\right)\right\} \geq 1$, so that transfers are unsolicited to begin with.

Risk-sharing produces a surplus.—Let us now introduce an economic gain c created when two agents cooperate in the risk-sharing game. This c, as in the investment game, can then be converted into public goods. Yet, there are two key differences between this new risk-sharing game and investment: it can happen between any two agents and requires no up-front payment. This time, the group in charge specifies a sharing rule for risk-sharing, denoted by t_j, and another for investment, denoted by s_j. Under autocracy, the elite chooses the risk sharing game if both she and the citizen cooperate. This necessitates $u\left(t_r c\right) + \left(1 - t_r\right) c + d_e > \lambda_R$ for the elite and $\theta_c u\left(t_r c\right) + \left(1 - t_r\right) c + d_c > \lambda_R$ for the citizen. Thus, the chance of producing a public good in the risk-sharing game allows both groups to circumvent the constraints posed by the irreversible up-front payment f and if λ_I and c are not too disparate, the elite prefers risk-sharing and avoids both paying f and introducing democracy.

4 Empirical Implications

The theory provides us with the following basic insights. First, each activity-specific factor strengthens the institution whose payoff it directly determines, provided that the

factors specific to risk-sharing are not too harsh. Second, in the most likely case in which the size of the elite is small, as investment-specific factors become less important with respect to risk sharing factors, the citizen may over-invest in culture to signal his cooperation in investment and obtain democracy. These patterns lead to our testable predictions which refer to democratization and society's average level of culture:

Testable Predictions: *(1) Democratization is mainly and positively driven by the factors fostering time-inconsistency in investment; (2) The average level of culture is reinforced by the forces aggravating consumption risk when they are not too harsh, and responds positively to the shocks that curb the importance of investment and hence, threaten democracy.*

5 Evidence

To test our predictions, we require time dependent measures of both the quality of the political process and culture and proxies for the forces shaping the severity of time-inconsistency in investment or creating the need of risk-sharing. To do so we build on section 2.

Proxying the quality of the political process and cultural formation.—The sample consists of 90 European regions for which we have sufficient historical climatic data (see table 6 and footnote 26). As in Tabellini (2010), we define each region according to the Eurostat administrative classification. We consider either the NUTS 1 or the NUTS 2 level merging those smaller neighbouring units that, according to Sellier and Sellier (2002), were part of the same political entity between the 11th and 16th centuries.[20] In contrast to a grid-cell approach, this design allows us to match geographically homogeneous areas to the social groups which

[20]This approach produces some differences in the definition of 19 of the 69 regions we have in common with Tabellini (2010). Yet, these discrepancies have a negligible impact on our empirical results.

selected the extent of democracy and the prevailing culture (see also footnote 24). For what concerns the time dimension, we focus on the period 1000-1600 and take as unit of analysis half a century for a total of 13 time periods. Although our results are robust to the inclusion of data up to 1850, we focus on the first six centuries of the second millennium of three reasons. First, the within country variation in political institutions almost disappears with the rise of the national powers at the beginning of the 18th century (Stearns, 2001). Second, the Protestant Reformation deprived the monasticism movement of its pivotal relevance (Tobin, 1995). Third, the 19th and 20th centuries witnessed technology-driven economic changes whose links to geography are far less clear than those we identify.

Following Tabellini (2010), we capture political institutions by the variable "constraints on the executive" as defined in the data set POLITY IV—*Democracy*. This variable ranges between 1 and 7 and it is designed to capture institutionalized constraints on the decision making powers of chief executives.[21] As Acemoglu, Johnson and Robinson (2005) we base our coding on the history of each region in a 40-year window around each date.[22] Over the sample, we observe a general trend towards tighter checks and balances; most notably, the mean of *Democracy* increased from 1 in year 1000 to 2.22 in 1400. Yet, the upper left map in figure 2 reveals that this pattern was asymmetric across units: the Mediterranean regions of Northern Italy, Spain, and France enjoying a stronger process of democratization than the rest of Europe. These differences have persisted as can be seen from the regional distribution

[21] A value of 1 means that "there are no regular limitations on the executive's actions", 3 means that "there are some real but limited restraints", 5 means that "the executive [...] is subject to substantial constraints", and 7 means "accountability groups have effective authority equal to or greater than the executive in most activity". Scores of 2, 4, and 6 are used for intermediate situations (Marshall and Jaggers, 2009).

[22] The correlation of *Democracy* averaged over contemporaneous countries with the "constraints on the executive" measure devised by Acemoglu, Johnson and Robinson (2005) is 0.54. Also, *Democracy* has values very similar to those reported by Tabellini (2010) for the common observations.

of the "constraint on executive" variable collected from the polity IV data set and averaged between 1950 and 2000—*Democracy-1950-2000* (the upper right map of figure 2).

There is neither a self-reported measure of norms of cooperation, nor precise information about the total population in each region over the sample. Hence, our proxy for culture is the discounted number of years Cistercian and Franciscan houses were active in the region per square Km, *Culture*, as directly collected from Van Der Meer (1965) and Moorman (1983).[23] As discussed above, these two religious orders assumed a key cultural formation role by organizing risk-sharing activities together with the population, spreading a charity-based norm of mutual cooperation and respect, and punishing the defectors by withdrawing their support. Given the substantial homogeneity of the monasticism action over the sample (Tobin, 1995; Muzzarelli, 2001), it is reasonable to consider *Culture* as an imperfect measure of the input of the technology transforming the community's concern with culture into an evolutionary stable level of internalized values.[24] In this respect, higher values of *Culture* should detect stronger internalized psychological stimuli from cooperation. Over the sample there is a general trend towards a stronger culture of cooperation whose mean, indeed, increased from 0 in year 1100 to 0.42 in 1600. The two maps at the bottom of figure 2 visualize the strong relation between *Culture* and its contemporaneous counterpart—*Culture-2008*. Following Tabellini (2010), *Culture-2008* is obtained extracting the first principal component from the following two variables obtained averaging at the regional level answers

[23]For each of the 731 (2975) Cistercian (Franciscan) houses, this figure equals in year t the number of years in which the house had operated less those elapsed by its eventual closure if this number is positive and zero otherwise. Considering only the years of operation delivers almost identical estimates.

[24]Looking at one order at the time would produce estimates with the same sign but less significant. The decision to aggregate new monasteries was taken by the most prominent house within an administrative region—i.e.,"province". Since this often corresponds to the political entity existing at the time (Tobin, 1995; Moorman, 1988), our empirical design is the most appropriate to capture the individual decision unit.

to the 2008 wave of the European Value Study (GESIS, 2008): 1. the generalized trust; 2. the importance of respect as a value that children should be encouraged to learn.[25] Both "ought to encourage welfare-enhancing social interactions, such as anonymous exchange" (Tabellini, 2010) and are more common where monasticism was stronger. Our results are not materially affected if we focus on each variable singly or consider previous waves.

Proxying the severity of time-inconsistency and the need of risk-sharing.—Turning to the severity of time-inconsistency, we build on the argument put forward by Fleck and Hanssen (2006) and construct metrics which increase in the elite's incentives to grant democracy. These incentives consist of the prospect of profitable yet difficult-to-observe investment in long-distance trades. In the following, we discuss the results obtained by employing a dummy equal to 1 if the region borders the Mediterranean—*Mediterranean*—and another one equal to 1 if the region borders the Atlantic—*Atlantic*. The estimated coefficients would have the same sign and approximately the same significance when we use, instead: 1. *Trade-East* which equals either the average of the sea distance between the major region's harbour and Istanbul, and the one between the major region's harbour and Alexandria, or 0 if the region does not border the Mediterranean; 2. *Trade-West* which equals either the average of the sea distance between the major region's harbour and Havana, and the one between the major region's harbour and Cape Town, or 0 if the region does not border the Atlantic. We define a major harbour as one with the highest population in the region according to Bairoch, Batou and Chèver (1988). Since *Trade-East* and *Trade-West* increase in the distance from the major harbours channeling either the Mediterranean or the Atlantic trade (Brady, Oberman, and

[25]The former (latter) is the share of answers such as "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?" (mentioning "tolerance and respect for other people" as an important quality that children should be encouraged to learn). The average number of respondents in each region is 313 and the median 167.

Tracy, 1994), they better gauge the level of difficulty in observing transoceanic investment trades. However, the relative coefficients would be more difficult to interpret.

Turning to the need of consumption risk-sharing, we follow Durante (2010) and use the standard deviation of the average spring-summer temperature between two successive observations—*Temperature-SD*. The first observation refers to the 950-1000 period. The data are in grid format and directly collected from Guiot et al. (2010). They cover most of the European surface at a 5 degree spatial resolution for all the years between the year 600 and 2000.[26] No observation is obtained from actual weather station records, but instead each is derived, through a sophisticated process of "reconstruction", from a multiplicity of indirect proxies such as tree-rings, ice cores, pollens, and indexed climate series based on historical written documents. To the best of our knowledge, the data set is currently the only one which records the European climate before 1500. To compute *Temperature-SD* for region r at time t we first calculate the standard deviation of the growing season temperature for the 50 years before t for all the cells and then average these values across regions.

The mean of *Temperature-SD* was significantly higher than its 600-950 level whose mean is 0.39, ranging from 0.37 in 1300 to 0.56 in 1550. Yet, as figure 3 reveals, despite its relevance, the climate volatility in our sample was milder than elsewhere. Indeed, not only the maximum mean value of *Temperature-SD* averaged over the cells part of our sample regions is much lower than the maximum mean value of *Temperature-SD* averaged over the cells lying outside our regions—i.e., 1.12 versus 0.72, but also the average mean value of

[26] We exclude Azores, Madeira, and Canarias since they are not covered. Eliminating also the regions only partially covered—i.e., Castilla-La Mancha, Castilla y León, Extremadura, Galicia, Northern and Western Ireland, Scotland, and Portugal—leaves unchanged the message of this section. The Scandinavian countries, those that are east of Poland and Slovakia, and those that lie south-east of Hungary and Slovenia have been excluded since we lack sufficient data on the rest of the historical political entities to which they belonged.

Temperature-SD in the former units is significantly—at 5%—lower than the one in the latter units—i.e., 0.47 versus 0.52. This evidence implies that λ_R is not too high and thus, we should observe a monotonic relation between climate risk and cultural formation. This is consistent with the fact that *Temperature-SD* squared is never significant when included. An alternative proxy for λ_R is the rainfall volatility (Durante, 2010; Haber and Menaldo, 2011), which is however available only for the last three time periods in the sample.

Finally, we consider other time-varying controls which could affect institutional evolution. The first one is the average terrain ruggedness in each region—*Ruggedness*. These data are retrieved directly from the G-Econ data set, which is in grid format and covers most of the world surface at a 1-degree spatial resolution. Consistent with Fleck and Hanssen (2006), *Ruggedness* should pick up the difficult-to-observe investments in new farming technology that flourished at the end of the 11th century. Next, we consider the average number of years of war in the century preceding each time period (Acemoglu, Johnson, and Robinson, 2005)—*Wars*. According to a vast literature on state capacity (Besley and Persson, 2009), common interest public goods, such as fighting external wars, can contribute to institutional development. Finally, we control for the feedback economic development can have on institutions by including the average urban potential—*Urbanization*—calculated by using the cities which had more than 5,000 inhabitants for at least one year in the sample (Bairoch, Batou and Chèver, 1988). The urban potential of city c is the sum of the populations of all the other cities in the sample each weighted by the relative city's distance from c (de Vries, 1984). Assigning in this computation a weight zero to the population of the cities outside c's region delivers similar results. While the internet appendix briefly summarizes our main sources and examination, table 7 lists the summary of the variables.

Identification.—We test our predictions, by running panel regressions of the form:

$$I_{r,t} = \alpha_r + \beta_t + \gamma' \mathbf{x}_{r,t} + \delta' \mathbf{z}_{r,t} + \varepsilon_{r,t}, \tag{4}$$

where $I_{r,t}$ is either *Democracy* or *Culture* in region r at time t; α_r are region fixed effects accounting for long-run differences in resources due to, for instance, the suitability for growing crops of the region's terrain; β_t are time fixed effects picking up macroshocks like the Black Death; the vector $\mathbf{x}_{r,t}$ gathers *Temperature-SD*, β_t interacted with *Mediterranean*, and β_t multiplied by *Atlantic*. Finally, $\mathbf{z}_{r,t}$ incorporates the other time varying controls which are either *Ruggedness* interacted with the time fixed effects, or *Wars*, or *Urbanization*. We do not estimate each pair of equations with dependent variables *Democracy* and *Culture* as a system since we cannot reject, at a level nowhere lower than 0.18, the Breusch-Pagan test null hypothesis that the residuals of every pair of these equations are uncorrelated.

Empirical results.—The odd columns of table 8 report the estimated coefficients of the regression with dependent *Democracy*, the even ones the estimated coefficients of the regression with dependent *Culture*. All our results are consistent with our testable predictions and the implied effects are large. Before 1350, the regions with direct access to the Mediterranean sustained the fastest democratization process in Europe whereas the Atlantic regions, which were further away from the Silk Road, experienced the slowest. Only after the Atlantic routes opened, could these regions catch up and their merchant class successfully constrain the monarchical power. Yet, in contrast to Acemoglu Johnson, and Robinson (2005), our estimates show that this institutional discontinuity was much weaker than that caused by the Mediterranean trade. Most of these coefficients are significant at 5% or better.

As predicted by our model, the climate volatility does not explain democratization but has a significant—at 5% or better—impact on cultural formation. Furthermore, the fall in relevance of the Mediterranean routes—i.e., a fall in λ_I in its middle range—fostered cultural formation through risk-sharing as the explosion of the microcredit activities in Northern Italy documents (Muzzarelli, 2001). These patterns remain pretty stable when the terrain ruggedness, the incidence of external wars, and the contemporaneous urbanization are considered. Yet, only *Urbanization* is statistically significant: this confirms that "good" institutions promote economic development. Finally, consistent with the theoretical idea that formal and informal institutions interact only through their economic role, as captured by geography, *Culture* (*Democracy*) whether lagged or not is not statistically significant when included in the specification of (4) whose dependent variable is *Democracy* (*Culture*).

The institutional revolution can be traced by looking at table 9, where we study the determinants of *Democracy-1950-2000* in columns (1) and (2) and at those of *Culture-2008* in columns (3) and (4). In a nutshell both past institutions and their geographic factors are powerful determinants of contemporary institutions. Crucially, geography enters the regressions we estimated in a nice separable way whereby the forces shaping the severity of the time-inconsistency in long distance investments affect mainly the quality of the political process and the factors modulating the need of risk-sharing determine only the strength of culture. This evidence provides the foundation of a novel instrumental variables approach to separate the impact on development of each of the two institutions.[27]

[27]Different from the Cistercians, the Franciscans expanded mainly by founding new houses (Moorman, 1988). Hence, to take into account the outlier represented by the region in which Saint Francis was born, we also consider a dummy for Umbria—*Franciscans*—in the specification in column (3) of table 9.

6 Concluding Comments

The relevance of democracy and norms of cooperation in shaping the economy is well known. Yet, their determinants are still poorly understood: here, we have developed and tested a theory of "endogenous (in)formal institutions" based on time-inconsistency in investment and risk-sharing in consumption (see also Aghion, Alesina, and Trebbi, [2004]).

We close by highlighting avenues for further research. First, a relevant extension of our analysis is to study the relation between the power of farming, trading, and microcredit contracts and (in)formal institutions. Second, an open issue is the identification of more recent activity-specific factors, especially those related to the Industrial Revolution, shaping (in)formal institutions. This inquiry could shed light on the variation in contemporaneous institutions unexplained by Medieval economic activities. Finally, the most relevant policy-related follow up to our study is to employ the geographical features discussed above to measure the separate roles of democracy and culture in determining contemporaneous development through an instrumental variables approach (see also Guerriero, [2012]).

Appendix

Proof of Lemma

Building on section 3.1, it follows that $s_D^* = \max\{s \in [0,1] \mid \theta_e u(s\lambda_I) + (1-s)\lambda_I \geq RHS\}$. Thus, $s_D^* = 1$ when the last inequality holds strictly. If not, then $s_D^* < 1$ and problem (2) reduces to maximize the Lagrangian $u(s_D\lambda_I) + \nu[\theta_e u(s_D\lambda_I) + (1-s_D)\lambda_I - RHS]$, with $\nu > 0$. RHS equals: $f - d_e$ if $d_e, d_c < \lambda_R$; $f - d_e + \lambda_R$ if $d_e < \lambda_R \leq d_c$; $f - \lambda_R$ if $d_c < \lambda_R \leq d_e$; f if $d_e, d_c \geq \lambda_R$. Thus, by applying the Topkis' theorem (Topkis, 1998), it immediately follows that s_D^* is nondecreasing in d_e and, if $d_e, d_c \leq \lambda_R$, the following ranking arises:

$s_D^*(d_e, x) = s_D^*(d_e, y) > s_D^*(d_e, w) = s_D^*(d_e, z)$, $\forall x \neq y, z \neq w$ such that $y \vee x < \lambda_R \leq z \wedge w$. $\square$

Proof of Proposition 1

We begin with tracking how d_e^* varies with λ_R and λ_I, given d_c^*. For this purpose, we partition the range of λ_I according to its relative magnitude with respect to λ_R, based on the elite's incentives to invest under democracy, embodied by constraint (I_e), and the citizen's willingness to cooperate, captured by constraint (I_c). We then proceed with studying d_c^* through the same partition. Note that: 1. $RHS \in \left[f - \tilde{d}, f + \tilde{d}\right]$, with $\tilde{d} = \max\{1, \lambda_R\}$, since d_e can at most be λ_R when $\lambda_R \geq 1$ and at most 1 when $\lambda_R < 1$; 2. if $\theta_e u(\lambda_I) \geq f$ then constraint (I_c) is satisfied for $s_D^* = 1$.

Let $\widehat{d}(s_D, \lambda_I) = f - u(s_D(d_e, d_c)\lambda_I)$ be the minimum d_c necessary to satisfy constraint (I_c) given the sharing rule s_D. Also, let $U_i(d_c, d_e)$ denotes agent i's total payoff from investment given the culture pair. For each sub-range of λ_I, we first find for each group its optimal culture when she cooperates and when she does not, given any possible choice of the other group and λ_R. Next, we compare the payoffs from cooperation to that from noncooperation to trace the best response.

Choice of $d_e^*(d_c)$:

(A) For values of λ_I low relative to λ_R or $\lambda_I < \tilde{\lambda}_I \equiv \min\left\{\lambda_I \mid \theta_e u(\lambda_I) < f - \overline{\lambda}, \theta_e u'(\lambda_I) \geq 1\right\}$, the elite's payoff is always increasing in s_D but investment does not materialize because the (I_e)

constraint always fails.[28] The elite embraces a level of culture maximizing the risk-sharing payoff given λ_R. Indeed, if $d_c^* \geq \lambda_R$ then $d_e^* = 1$ if $\lambda_R \leq \frac{1}{2(1-\mu)} \in [1/2, 1)$ and $d_e^* = 0$ otherwise. If, instead, $d_c < \lambda_R$ then: 1. $\lambda_R \leq \mu \Rightarrow d_e^* = \mu$; 2. $\mu < \lambda_R \leq 2\mu \Rightarrow d_e^* = \lambda_R$; 3. $\lambda_R > 2\mu \Rightarrow d_e^* = 0$. Comparing the elite's payoffs from each such choice given the citizen's behavior, we find that the elite's best response is such that $d_e^* = 1 \Leftrightarrow \lambda_R \leq \frac{1}{2(1-\mu)}$ and $d_e^* = 0$ otherwise.

(B) For $\lambda_I \geq u^{-1}\left(\frac{f+\lambda_R}{\theta_e}\right) \Leftrightarrow \theta_e u(\lambda_I) > f + \lambda_R$, investment always takes place because it delivers a payoff higher than the highest payoff from risk-sharing. Hence, the elite decides between building the level of culture that induces also cooperation with her own kind or the one that maximizes only the investment payoff. Formally, we have that: $\arg\max_{d_e \geq \lambda_R} U_e(d_c, d_e) = \mu d_e + (1-\mu)[\theta_e u(\lambda_I) + d_e - f] - \frac{d_e^2}{2} = \tilde{d}(0)$ for $\lambda_R \leq 1 + \sqrt{2\mu - \mu^2}$ (otherwise); $\arg\max_{d_e < \lambda_R} U_e(d_c, d_e) = (1-\mu)[\theta_e u(\lambda_I) + d_e - f] - \frac{d_e^2}{2} = 1 - \mu(0)$ for $\lambda_R \leq 1 - \mu$ (otherwise). As a result, the elite's best response is $d_e^* = \tilde{d}$ if $\lambda_R \leq 1 + \sqrt{2\mu - \mu^2}$ and $d_e^* = 1 - \mu$ if $\lambda_R > 1 + \sqrt{2\mu - \mu^2}$.

In the remaining sub-ranges of λ_I, investment can fail because either constraint (I_c) or constraint (I_e) is violated. This happens due to one of the following four conditions:

(i) $\lambda_I < u^{-1}(f - d_c)$;

(ii) $\theta_e u(\lambda_I) < RHS$, $\exists s \in (0,1)$ such that $\theta_e u(s\lambda_I) + (1-s)\lambda_I = RHS$ but the citizen obtains a higher payoff from risk-sharing given s and d_e;

(iii) $\theta_e u'(\lambda_I) \geq 1$ and $\theta_e u(\lambda_I) < RHS$;

(iv) $\theta_e u'(\lambda_I) < 1$ and $\theta_e u(\widehat{s}\lambda_I) + (1-\widehat{s})\lambda_I < RHS$ where $\theta_e u'(\widehat{s}\lambda_I) = 1$.

Violation of constraint (I_c) captured by condition (i) and (ii) realizes when there is too little surplus to entice the citizen's cooperation in investment. Condition (i) informs us that the citizen will not cooperate in the investment game even if the entire surplus is spent on the public good; condition (ii) implies that the expected payoff from investment is not worth the additional culture

[28] Note that for $\theta_e u'(\lambda_I) < 1$ it can be the case that $\theta_e u(s_D^* \lambda_I) + (1 - s_D^*)\lambda_I > f - \lambda_R > \theta_e u(\lambda_I)$ for $s_D^* < 1$.

the citizen has to construct to convince the elite of his commitment. Violation of constraint (I_e), encapsulated by condition (iii), entails that although spending the entire surplus on investment is the most efficient way of garnering the elite's support, the level of surplus is too little to sustain it. Finally condition (iv) means that even the sharing rule preferred by the elite, as defined by $\widehat{s}$, is not sufficient. If one among condition (i)-(iv) holds, the elite's best response is as described in range (A). In the remaining sub-ranges of λ_I, we look at the cases in which none of these conditions hold. Observe that the feasibility of investment when $s_D^* < 1$ implies that $\theta_e u'(\lambda_I) < 1$.

(C) For $u^{-1}\left(\frac{f+\lambda_R}{\theta_e}\right) > \lambda_I \geq u^{-1}\left(\frac{f}{\theta_e}\right) \Leftrightarrow f \leq \theta_e u(\lambda_I) < f + \lambda_R$, investment always realizes. Yet, $d_e < \lambda_R \leq d_c$ implies $s_D^* = s_1 < 1$, where s_1 is implicitly defined by $\theta_e u(s_1\lambda_I) + (1 - s_1)\lambda_I = f - d_e + \lambda_R$. (I_e) is slack whenever $d_c < \lambda_R$, and the elite's motivations are identical to range (B): $d_e^*(d_c < \lambda_R) = 1$ for $\lambda_R \leq 1$, $d_e^*(d_c < \lambda_R) = \lambda_R$ for $1 < \lambda_R \leq 1+\sqrt{2\mu - \mu^2}$, and $d_e^*(d_c < \lambda_R) = 1-\mu$ when $\lambda_R > 1+\sqrt{2\mu - \mu^2}$. If $d_c \geq \lambda_R$, $U_e(d_c \geq \lambda_R, d_e) = \mu d_e I_{d_e \geq \lambda_R} + (1 - \mu)[\theta_e u(\lambda_I) + d_e - f] - \frac{d_e^2}{2}$ and the elite's incentive constraint is slack if she cooperates. Two are the important cases to distinguish. If $\theta_e u(\lambda_I) < f + \lambda_R - (1 - \mu)$, the elite's investment constraint always binds and she obtains her risk-sharing payoff of λ_R. Thus, choosing a nonzero noncooperative level of culture only causes a loss to the elite being her payoff equal to $(1 - \mu)\lambda_R - \frac{d_e^2}{2}$ for $0 \leq d_e < \lambda_R$. Hence, $d_e^* \in \left\{0, \tilde{d}\right\}$. For $\lambda_R > 1$, $U_e(d_c \geq \lambda_R, d_e = \lambda_R) = (1 - \mu)[\theta_e u(\lambda_I) - f] + \lambda_R - \frac{\lambda_R^2}{2}$ $(+)$ and $U_e(d_c \geq \lambda_R, d_e = 0) = (1 - \mu)\lambda_R$ $(++) \Rightarrow d_e = \lambda_R(0)$, $\forall \lambda_R \leq (>)\, \mu + \sqrt{\mu^2 + 2(1 - \mu)[\theta_e u(\lambda_I) - f]}$. For $\lambda_R \leq 1$: $U_e(d_c \geq \lambda_R, d_e = 1) = (1 - \mu)[\theta_e u(\lambda_I) - f] + \frac{1}{2}$ and $U_e(d_c \geq \lambda_R, d_e = 0) = (1 - \mu)\lambda_R$ so that $d_e^*(d_c \geq \lambda_R) = 1\,(0)$ if $\lambda_R \leq (>) \frac{1}{2(1-\mu)} + \theta_e u(\lambda_I) - f$. When instead (I_e) is slack since $f + \lambda_R - (1 - \mu) \leq \theta_e u(\lambda_I) < f + \lambda_R$, the elite also considers $d_e = 1 - \mu$, which is enough to maximize the investment payoff but eventually insufficient to sustain cooperation. This possibility identifies two further subcases: (a) $d_e^*(d_c \geq \lambda_R) \in \{0, 1 - \mu, \lambda_R\}$ for $1 < \lambda_R$; (b) $d_e^*(d_c \geq \lambda_R) \in \{0, 1\}$ if $1 \geq \lambda_R$. In case (a), $U_e(d_c \geq \lambda_R, d_e = 1 - \mu) = (1 - \mu)[\theta_e u(\lambda_I) - f] + \frac{(1-\mu)^2}{2}$. Com-

paring this payoff with (+) and (++) shows that the elite prefers $\lambda_R(1-\mu)$ to $1-\mu(\lambda_R)$ if $\lambda_R \leq (>)\, \mu + \sqrt{1+(1-\mu)^2}$; $1-\mu(0)$ to $0(1-\mu)$ if $\lambda_R \leq (>)\, \frac{1-\mu}{2} + \theta_e u(\lambda_I) - f$; $\lambda_R(0)$ to $0(\lambda_R)$ if $\lambda_R \leq (>)\, \mu + \sqrt{\mu^2 + 2(1-\mu)[\theta_e u(\lambda_I) - f]}$. To summarize, $d_e^*(d_c \geq \lambda_R) = 0$ if $\lambda_R > \max\left\{\frac{1-\mu}{2} + \theta_e u(\lambda_I) - f, \mu + \sqrt{\mu^2 + 2(1-\mu)[\theta_e u(\lambda_I) - f]}\right\}$. In case (b), $d_e^*(d_c \geq \lambda_R) = 1(0)$ if $\lambda_R \leq (>)\, \frac{1}{2[1-\mu]} + \theta_e u(\lambda_I) - f$. Thus, the citizen's and elite's choices are substitutes in this range.

(D) For $u^{-1}\left(\frac{f}{\theta_e}\right) > \lambda_I \geq u^{-1}\left(\frac{f-\lambda_R}{\theta_e}\right)$, investment can be possible and the elite's incentive constraint is slack only when she cooperates but the citizen does not. As long as the elite does not cooperate, her utility equal her payoff from risk-sharing; hence, $1-\mu$ cannot be an equilibrium level of culture. Since $u^{-1}\left(\frac{f}{\theta_e}\right) > \lambda_I$, $U_e(d_c < \lambda_R, 0) = 0$ and the equilibrium sharing rule s_2 is implicitly defined by $\theta_e u(s_2\lambda_I) + (1-s_2)\lambda_I = f$. $U_e(d_c < \lambda_R, d_e \geq \lambda_R) = \mu\left(\tilde{d} - \lambda_R\right) + (1-\mu)\left[\theta_e u(\lambda_I) + \tilde{d} - f\right] - \frac{\tilde{d}^2}{2}$. As a result, the elite sets $d_e^* = \tilde{d}$ if $U_e(d_c < \lambda_R, d_e \geq \lambda_R) \geq 0$ and $d_e^* = 0$ otherwise. $U_e\left(d_c \geq \lambda_R, \tilde{d}\right) = \tilde{d} - \frac{\left(\tilde{d}\right)^2}{2}$ and $U_e(d_c \geq \lambda_R, 0) = (1-\mu)\lambda_R$ because constraint (I_e) always binds. Hence, $d_e^*(d_c \geq \lambda_R) = 1$ for $\lambda_R \leq \frac{1}{2(1-\mu)}$ and $d_e^*(d_c \geq \lambda_R) = 0$, otherwise.

(E) For low values of λ_I identified by $\tilde{\lambda}_I \leq \lambda_I < u^{-1}\left(\frac{f-\lambda_R}{\theta_e}\right)$, when feasible, investment brings the same payoff as risk-sharing. Hence, the elite's choice of culture is identical to range (A).

In range (C) and (D), the pair of choices of culture determines constraint (I_e) and d_e^* decreases in d_c. Also, as λ_I becomes smaller, so does the range of λ_R that permits cooperation. Comparing ranges (A)-(D) reveals that: 1. d_e^* weakly increases in λ_R (λ_I) at its moderate values, and then discretely drops for given d_c and λ_I (for a given level of d_c and λ_R); 2. for $\mu \to 0$ and $d_c \geq \lambda_R$ the elite chooses $d_e^* = 0$ in range (C) (range (D)) whenever $\theta_e u(\lambda_I) < f + \lambda_R - (1-\mu)$ and when $f + \lambda_R - (1-\mu) \leq \theta_e u(\lambda_I) < f + \lambda_R$ for $\lambda_R > \sqrt{2[\theta_e u(\lambda_I) - f]}$ in case (a) and for $\lambda_R > 1/2 + \theta_e u(\lambda_I) - f$ in case (b) ($\lambda_R \leq 1/2$). This is the scenario studied in figure 1.

Choice of $d_c^*(d_e)$:

(A) The citizen can only maximize his risk-sharing payoff. If $d_e < \lambda_R$, then: 1. $\lambda_R \leq 1-\mu \Rightarrow$

$d_c^* = 1-\mu$; 2. $1-\mu < \lambda_R \leq 2(1-\mu) \Rightarrow d_c^* = \lambda_R$; 3. $\lambda_R > 2(1-\mu) \Rightarrow d_c^* = 0$. If, instead, $d_e \geq \lambda_R$, then: 1. $\lambda_R \leq 1-\mu \Rightarrow d_c^* = 1$; 2. $1-\mu < \lambda_R \leq 2(1-\mu) \Rightarrow d_c^* = \lambda_R$; 3. $\lambda_R > 2(1-\mu) \Rightarrow d_c^* = 0$. Given $d_e^*(d_c)$, the citizen's best response is $d_c^* = \tilde{d}$ for $\lambda_R \leq 2(1-\mu)$ and $d_c^* = 0$ otherwise.

(B) The citizen decides whether to cooperate always or only in the investment game so that: 1. $d_c^* = 1$ if $\lambda_R \leq 1$; 2. $d_c^* = \lambda_R$ for $1 < \lambda_R \leq 1+\sqrt{1-\mu^2}$; 3. $d_c^* = \mu$ for $\lambda_R > 1+\sqrt{1-\mu^2}$.

In the remaining sub-ranges of λ_I, investment can fail because one among conditions (i)-(iv) holds. In that case, the citizen's best response is as described in range (A). Once again, we look at the cases in which none of these conditions hold and consequently investment is feasible.

(C) Since (I_e) is slack unless the citizen cooperates but the elite does not, his best choices are $\mu = \arg\max_{d_c<\lambda_R} U_c(d_c, d_e) = \mu[u(\lambda_I)+d_c] - \frac{d_c^2}{2} \forall d_e$ and $\tilde{d} = \arg\max_{d_c \geq \lambda_R} U_c(d_c, d_e \geq \lambda_R) = d_c - \frac{d_c^2}{2} + \mu u(\lambda_I)$. Hence, $d_e \geq \lambda_R \Rightarrow d_c^* = \tilde{d}(\mu)\ \forall \lambda_R \leq (>) 1+\sqrt{1-\mu^2}$. When, instead, the citizen chooses to cooperate given a noncooperative elite, the sharing rule has to be strictly lower than 1 and, when $\widehat{d}(s_1) \leq \lambda_R$, the citizen gain $\tilde{d} - \frac{\tilde{d}^2}{2} + \mu u(s_1\lambda_I)$ $(\mu u(\lambda_I) + \frac{\mu^2}{2})$ from selecting $d_c = \tilde{d}$ $(d_c = \mu < \lambda_R)$. If $\widehat{d}(s_1) > \lambda_R$, instead, $U_c\left(\widehat{d}, d_e < \lambda_R\right) = (1-\mu)\widehat{d} - \frac{\widehat{d}^2}{2} + \mu f$ and $U_c(\mu, d_e < \lambda_R) = \mu u(\lambda_I) + \frac{\mu^2}{2}$. Hence: 1. if $\widehat{d}(s_1) \leq \lambda_R$, then $d_c^* = \tilde{d}(\mu)$ whenever $\tilde{d} < (\geq) 1+\sqrt{1-2\mu[u(\lambda_I)-u(s_1\lambda_I)]-\mu^2}$; 2. if $\widehat{d}(s_1) > \lambda_R$, then $d_c^* = \widehat{d}(\mu)$ if $\widehat{d} < (\geq) 1-\mu+\sqrt{(1-\mu)^2 - 2\mu[u(\lambda_I)-f]-\mu^2}$ or $\lambda_R < (\geq) \tilde{\lambda}_R$. Cooperation when λ_R is large can reduce s_D^* so much that the citizen must build a higher-than-desired level of culture to signal his commitment. This not only reduces his investment payoff but also the risk sharing one, which perhaps becomes negative. The lower s_1 is, the higher is $\widehat{d}$; and the narrower the range of λ_R in which the citizen cooperates.

(D)-(E) The citizen has to ensure (I_c). First, if $d_e < \lambda_R$ and $\widehat{d}(s_2) \geq \lambda_R$, then the citizen has to fix $d_c = \widehat{d}(s_1) > \widehat{d}(s_2)$ if he wants to induce investment and doing so is not prohibitively expensive; otherwise—i.e., $\lambda_R \geq \tilde{\lambda}_R$, the citizen chooses d_c^* only to maximize the risk sharing payoff. Second, if $\widehat{d}(s_2) < \lambda_R$, then not cooperating and choosing $\widehat{d}(s_2)$ is an option but the sharing rule has to be

equal to s_1 as soon as $d_c \geq \lambda_R$. Instead, when $d_e \geq \lambda_R$, the citizen has the opportunity to withhold cooperation and thereby, maximize her investment payoff. This is because (I_e) is slack only when $d_e \geq \lambda_R > d_c$. Therefore, $d_c^*(d_e \geq \lambda_R) = \mu(0)$ if $\lambda_R > (\leq) \mu$.

To investigate the relation between s_D^* and both λ_I and λ_R, the relevant cases are (C), (D), and (E) where $s_D^* \in (0,1)$. In these three scenarios, d_e^* weakly increases in λ_I and d_c^* weakly decreases in λ_I so that RHS decreases in λ_I. Hence, s_D^* rises in λ_I. Also, in the same ranges of λ_I, RHS equals either f or $f - d_e + \lambda_R$ and, thus, weakly increases in λ_R so that s_D^* weakly falls in λ_R. □

Proof of Proposition 2

While democracy cannot take place for the values of λ_I in the range (A), it surely ensues for those in range (B) when both conditions (I_c) and (I_e) are satisfied being $\lambda_I > u^{-1}\left(\frac{f+\lambda_R}{\theta_e}\right) > u^{-1}(f)$. In the other ranges, it arises except when one among conditions (i)-(iv) holds. Condition (i) and (iii) suggest that lower realizations of λ_I diminish the chances of democracy; items (ii) and (iv) reveal that if λ_I is not sufficiently high, higher values of λ_R render investment impossible. This is either because cooperation is expensive and cheating is lucrative or given risk-sharing yields a higher return than investment. This is most likely the case when λ_R lies in the intermediate range where both groups cooperate. Hence, while λ_I always facilitates democratization, λ_R has the second-order effect of hindering it given intermediate values of λ_I. □

References

Acemoglu, Daron, and Matthew O. Jackson. 2011. "History, Expectations, and Leadership in the Evolution of Social Norms." Unpublished.

Acemoglu, Daron, and James A. Robinson. 2000. "Why Did the West Extend the Franchise? Democracy, Inequality and Growth in Historical Perspective." *Quarterly Journal of Economics*, 115: 1167-1199.

Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2005. "The Rise of Europe: Atlantic Trade, Institutional Change and Economic Growth." *American Economic Review*, 95: 546-579.

Aghion, Philippe, Alberto Alesina, and Francesco Trebbi. 2004. "Endogenous Political Institutions." *Quarterly Journal of Economics*, 119: 565-611.

Bairoch, Paul, Jean Batou and Pierre Chèver. 1988. *La Population des Villes Europeenees de 800 a 1850: Banque de Données et Analyse Sommaire des Résultats.* Centre of International Economic History Series, No. 2. Geneva: Librarie Droz.

Barkow, Jerome H., Leda Cosmides, and John Tooby. 1992. *The Adapted Mind: Evolutionary Psychology and the Generation of Culture.* New York, NY: Oxford University Press.

Berman, Constance H. 2000. *The Cistercian Evolution: the Invention of a Religious Order in Twelfth-century Europe.* Philadelphia: University of Pennsylvania Press.

Besley, Timothy, and Torsten Persson. 2009. "The Origins of State Capacity: Property Rights, Taxation, and Politics." *American Economic Review*, 99: 1218-1244.

Brady, Thomas A., Heiko A. Oberman, James D. Tracy. 1994. *Handbook of European History, 1400-1600: Late Middle Ages, Renaissance, and Reformation.* Leiden, New York and Köln: Brill.

Butler, Jeffrey, Paola Giuliano, Luigi Guiso. 2011. "The Right Amount of Trust." Unpublished.

de Vries, Jan. 1984. *European Urbanization, 1500-1800.* Cambridge, MA: Harvard University Press.

Dixit, Avinash K. 2003. "Trade Expansion and Contract Enforcement." *Journal of Political Economy*, 111: 1293-1317.

Durante, Ruben. 2010. "Risk, Cooperation and the Economic Origins of Social Trust: an Empirical Investigation." Unpublished.

Fleck, Robert K., and F. Andrew Hanssen. 2006. "The Origins of Democracy: a Model with Application to Ancient Greece." *Journal of Law and Economics*, 49: 115-146.

Frederick, Shane, and George Loewenstein. 1999. "Hedonic Adaptation." In *Scientific Perspectives on Enjoyment, Suffering, and Well-Being*, ed. Daniel Kahneman, D., Ed Diener, and Norbert Schwarz. New York: Russell Sage Foundation.

Gimpel, Jean. 1976. *The Medieval Machine: The Industrial Revolution of the Middle Ages*. New York: Penguin.

Guerriero, Carmine. 2012. "Endogenous Legal Traditions and Economic Outcomes." Unpublished.

Guiot, Joel, Christophe Corona, and ESCARSEL members. 2010. "Growing Season Temperatures in Europe and Climate Forcings Over the Past 1400 Years." PLoS ONE 5: e9972.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2006. "Does Culture Affect Economic Outcomes?" *Journal of Economic Perspectives*, 20: 23-48.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2008. "Long Term Persistence." NBER Working Paper, 14278.

Haber, Stephen, and Victor Menaldo. 2011. "Rainfall, Human Capital, and Democracy." Unpublished.

Hauert, Christoph, Arne Traulsen, Hannelore Brandt, Martin A. Nowak, and Karl Sigmund. 2007. "The Emergence of Costly Punishment." *Science*, 316: 1905-1907.

Kaplow, Louis, and Steven Shavell. 2007. "Moral Rules, the Moral Sentiments, and Behavior: Toward a Theory of an Optimal Moral System." *Journal of Political Economy*, 115: 494-514.

Lizzeri, Alessandro, and Nicola Persico. 2004. "Why Did the Elites Extend the Suffrage? Democracy and the Scope of Government, with an Application to Britain's 'Age of Reform'." *Quarterly Journal of Economics*, 119: 707-765.

Logan, F. Donald. 2002. *A History of the Church in the Middle Ages*. London: Routledge.

Marshall, Monty G., and Keith Jaggers. 2009. "Polity IV Project, Political Regime Characteristics and Transitions 1800-1999, Dataset Users Manual." Center for International Development and Conflict Management, University of Maryland.

Moorman, John R.H. 1983. "Medieval Franciscan Houses." New York: Franciscan Institute Publications.

Moorman, John R.H. 1988. "A History of the Franciscan Order: From Its Origins to the Year 1517." New York: Franciscan Institute Publications.

Muzzarelli, Maria Giuseppina. 2001. "Il Denaro e la Salvezza. L'Invenzione del Monte di Pietà." Bologna: Il Mulino.

Nowak, Martin A., Akira Sasaki, Christine Taylor, and Drew Fudenberg. 2004."Emergence of Cooperation and Evolutionary Stability in Finite Populations." *Nature*, 428: 646-650.

Ortu, Gian Giacomo. 2005. "La Sardegna Dei Giudici." Nuoro (Italy): Il Maestrale.

Persson, Torsten, and Guido Tabellini. 2009. "Democratic Capital: The Nexus of Political and Economic Change." *American Economic Journal: Macroeconomics*, 1: 88-126.

Rayo, Luis, and Gary S. Becker. 2007. "Evolutionary Efficiency and Happiness." *Journal of Political Economy*, 115: 302-337.

Sellier, André, and Jean Sellier. 2002. *Atlas Des Peuples d'Europe Centrale et Occidentale*. Paris: La Découvert.

Stearns, Peter N. 2001. *The Encyclopedia of World History: Ancient, Medieval, and Modern, Chronologically Arranged*. Cambridge: James Clarke and Co.

Tabellini, Guido. 2008. "The Scope of Cooperation: Values and Incentives." *Quarterly Journal of Economics*, 123: 905-950.

Tabellini, Guido. 2010. "Culture and Institutions: Economic Development in the Regions of Europe." *Journal of European Economic Association*, 8: 677-716.

Tobin, Stephen. 1995. *The Cistercians: Monks and Monasteries of Europe*. New York: the Herbert Press.

Topkis, Donald M. 1998. *Supermodularity and Complementarity*. Princeton NY: Princeton University Press.

Van Der Meer, Frederic. 1965. *Atlas de L'Ordre Cistercien*. Amsterdam: Elsevier.

Vitolo, Giovanni. 2000. *Medioevo: I caratteri Originali di un' Età di Transizione*. Firenze: Sansoni.

Woods, Thomas. 2005. *How the Catholic Church Built Western Civilization*. San Francisco: Ignatius Press.

Tables and Figures

Table 1: The Investment Game Under Autocracy When p_e is Chosen

		Elite	
		Cooperate	*Non Cooperate*
Citizen	*Cooperate*	$\theta_c u(s_A\lambda_I)+d_c, u(s_A\lambda_I)+(1-s_A)\lambda_I+d_e-f$	$0,0$
	Non Cooperate	f, d_e-f	$0,0$

Table 2: The Investment Game Under Autocracy When p_c is Chosen

		Elite	
		Cooperate	*Non Cooperate*
Citizen	*Cooperate*	$u(s_A\gamma\lambda_I)+d_c, \theta_e u(s_A\gamma\lambda_I)+(1-s_A)\lambda_I+d_e-f$	$0,0$
	Non Cooperate	f, d_e-f	$0,0$

Table 3: The Investment Game Under Democracy When p_c is Chosen

		Elite	
		Cooperate	*Non Cooperate*
Citizen	*Cooperate*	$u(s_D\lambda_I)+d_c, \theta_e u(s_D\lambda_I)+(1-s_D)\lambda_I+d_e-f$	$0,0$
	Non Cooperate	f, d_e-f	$0,0$

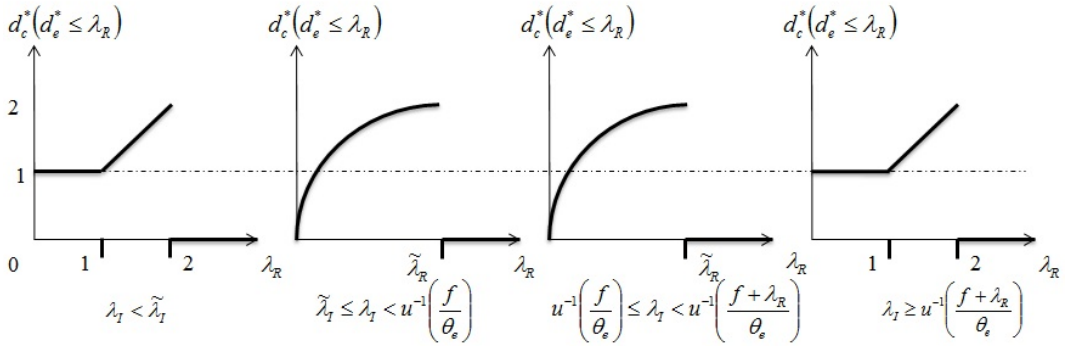
Table 4: The Investment Game Under Democracy When p_e is Chosen

		Elite	
		Cooperate	*Non Cooperate*
Citizen	*Cooperate*	$\theta_c u(s_D\gamma\lambda_I)+d_c, u(s_D\gamma\lambda_I)+(1-s_D)\lambda_I+d_e-f$	$0,0$
	Non Cooperate	f, d_e-f	$0,0$

Table 5: The Risk-sharing Game When a Type i Agent Meets a Type $-i$ Agent

		Type $-i$ Agent	
		Cooperate	*Non Cooperate*
Type i Agent	*Cooperate*	d_i, d_{-i}	$d_i-\lambda_R, \lambda_R$
	Non Cooperate	$\lambda_R, d_{-i}-\lambda_R$	$0,0$

Figure 1: Maximal Citizen's and Average Morality for $\mu \to 0$ and $d_e^* \leq \lambda_R$



Notes: 1. The citizen's choice is depicted under the assumptions that: a. the investment always goes through for $\lambda_I \geq \tilde{\lambda}_I$; b. $\mu \to 0$ so that $d_c^* \to d^*$; c. $d_e^* \leq \lambda_R$; d. $\widehat{d}(s_1) > \widehat{d}(s_2) \geq \lambda_R$; e. $\tilde{\lambda}_I$ and $\tilde{\lambda}_R$ are defined in the appendix.

Table 6: The Sample

ANDORRA, GIBRALTAR, and SPAIN (Andalucia, Aragon, Asturia-Cantabria, Baleares, Castilla-La Mancha, Castilla y León, Cataluna, Comunidad Valenciana, Extremadura, Galicia, Madrid, Murcia, Navarra - Rioja, Pais Vasco); AUSTRIA (Styria-Austria, Tyrole); BELGIUM and LUXEMBOURG (Region Bruxelles, Region Wallone, Vlaams Gewest); CZECH REPUBLIC (Eastern Czech Republic, Western Czech Republic); FRANCE (Corse, Eastern France, Ile De France, Mediterrean France, Northern France, Paris Basin, South-Eastern France, South-Western France, Western France); GERMANY (Baden-Wuerttemberg, Bayern, Brandenburg, Bremen - Hamburg - Niedersachsen, Hessen, Mecklenburg - Vorpommern, Nordrhein - Westfalen, Rhainland-Pfalz-Saarl, Sachsen, Schleswig-Holstein, Thuringen-Sachsen- Anhalt); HUNGARY (Central Hungary, Styria-Hungary, Western Hungary); IRELAND (Eastern Ireland, Western Ireland); ITALY, MALTA, and SAN MARINO (Abruzzo - Molise, Basilicata - Campania, Calabria, Emilia-Romagna, Lazio, Liguria, Lombardia, Piemonte - Valle D'Aosta, Puglia, Sardegna, Sicilia, Toscana, Trentino-Alto-Adige - Veneto - Friuli-Venezia-Giulia, Umbria - Marche); NETHERLANDS (Noord Nederland - Groningen, Oost Nederland, West Nederland, Zuid Nederland); POLAND (Eastern Poland, Northern Poland, Southern Poland, Western Poland); PORTUGAL (Alentejo, Algarve, Centro, Lisboa, Norte); SLOVAKIA (Eastern Slovakia, Western Slovakia); SLOVENIA (Carniola, Styria-Slovenia); SWITZERLAND (Northern Switzerland, Southern Switzerland); UK (East Anglia - London, East Midlands, North-Eastern UK, North-Western UK, Northern Ireland, Scotland, South-Eastern UK, South-Western UK, Wales, West Midlands, Yorkshire - Humberside).

Note: 1. The names of countries are in capital letters and those of the relative regions in lower-case within parentheses.

Figure 2: The Long Run Evolution of Formal and Informal Institutions

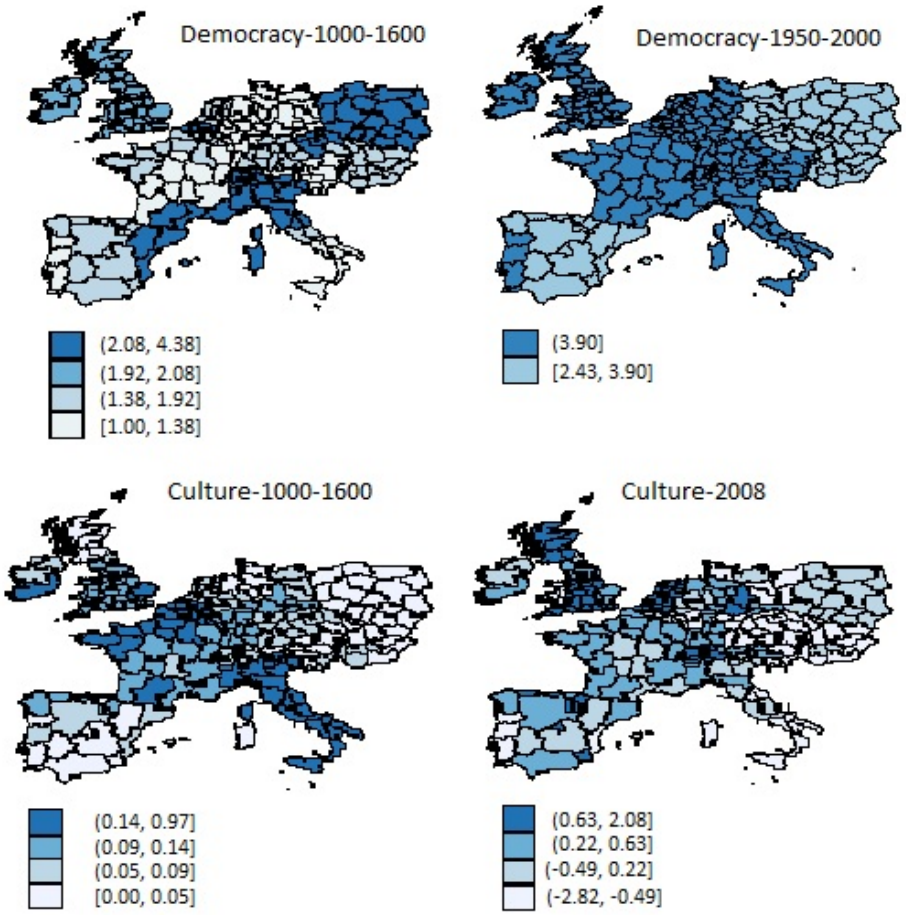


Figure 3: Climate Volatility in the Sample and in the Guiot et al.'s (2010) Cells

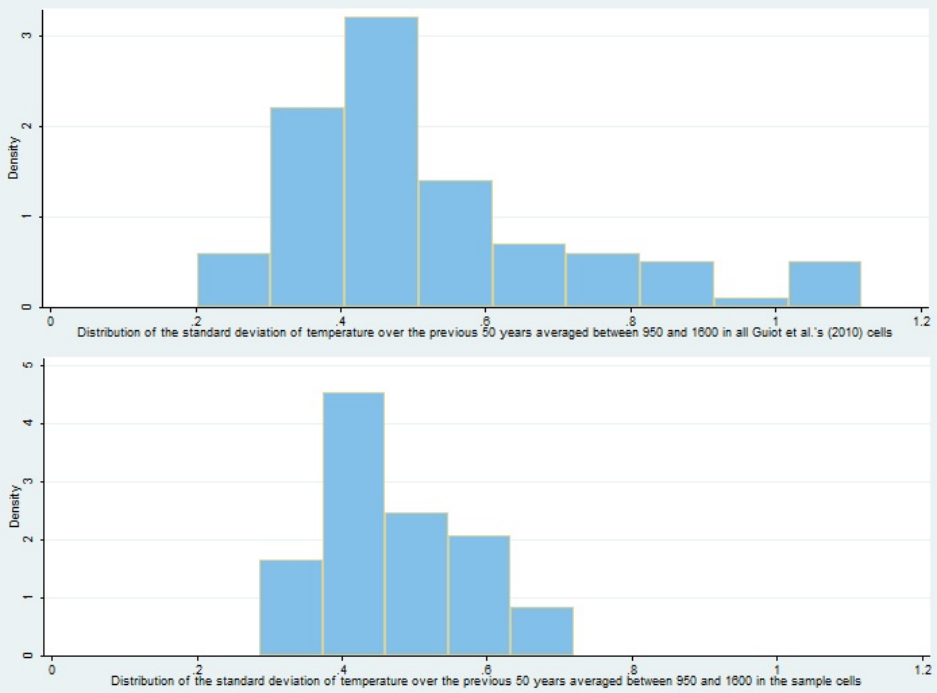


Table 7: Summary of Variables

	Variable	Definition and Sources	Mean (Standard Deviation)
In(Formal) Institutions:	*Democracy*:	See text. Source: Authors' codification.	1.814 (1.107)
	Democracy-1950-2000:	"Constraint on executive" from the polity IV data set averaged between 1950 and 2000. Source: Marshall and Jaggers (2008).	5.505 (1.599)
	Democracy-1000-1600:	*Democracy* averaged between the year 1000 and 1600.	1.800 (0.680)
	Culture:	See tect. Source: Van Der Meer (1965); Moorman (1983).	0.122 (0.251)
	Culture-2008:	See text. Source: European Value Study, GESIS (2008).	- 0.052 (0.938)
	Culture-1000-1600:	*Culture* averaged between 1000 and 1600.	0.121 (0.132)
Geography:	*Mediterranean*:	Dummy equal to 1 if the region borders the Mediterranean sea, 0 otherwise.	0.222 (0.416)
	Atlantic:	Dummy equal to 1 if the region borders the Atlantic sea, 0 otherwise.	0.367 (0.482)
	Temperature-SD:	Standard deviation of average growing season temperature in degree celsius over the previous half a century. Source: Guiot et al. (2010).	0.451 (0.135)
	Temperature-SD-950-1600:	*Temperature-SD* averaged between 950 and 1600.	0.451 (0.116)
	Franciscans:	Dummy for Umbria.	0.011 (0.106)
	Ruggedness:	Average terrain ruggedness in the region. Source: G-Econ (2010).	0.165 (0.124)
Other Controls:	*Wars*:	Average number of years of war in the century preceding each time period. Source: Acemoglu, Johnson, and Robinson (2005).	0.411 (0.400)
	Urbanization:	Urban potential. Source: Bairoch, Batou, and Chèver (1988).	192.157 (280.243)

Note: 1. All the statistics are computed for the sample used in table 8 except for *Democracy-1950-2000*, *Culture-2008*, *Franciscans*, *Temperature-SD-950-1600*, which have been calculated for the sample used to obtain the estimates reported in table 9.

Table 8: The Geographical Origins of Formal and Informal Institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	The dependent variable is:							
	Democracy	*Culture*	*Democracy*	*Culture*	*Democracy*	*Culture*	*Democracy*	*Culture*
Mediterranean × 1050	0.001	0.005	0.0003	0.004	0.001	0.005	0.002	0.004
	(0.010)	(0.003)*	(0.007)	(0.002)	(0.010)	(0.003)*	(0.009)	(0.002)*
Mediterranean × 1100	1.138	0.010	0.908	0.010	1.144	0.013	1.140	0.009
	(0.467)**	(0.005)**	(0.657)	(0.005)**	(0.466)**	(0.006)**	(0.467)**	(0.004)**
Mediterranean × 1150	1.210	0.005	0.933	- 0.001	1.216	0.009	1.211	0.005
	(0.469)**	(0.004)	(0.644)	(0.003)	(0.469)**	(0.005)*	(0.470)**	(0.003)
Mediterranean × 1200	1.127	- 0.002	0.796	0.0005	1.131	0.0006	1.082	0.015
	(0.436)**	(0.003)	(0.605)	(0.003)	(0.436)**	(0.004)	(0.446)**	(0.011)
Mediterranean × 1250	1.002	0.006	0.864	0.009	1.006	0.009	0.957	0.023
	(0.371)***	(0.008)	(0.407)**	(0.008)	(0.372)***	(0.008)	(0.382)**	(0.010)**
Mediterranean × 1300	0.482	0.038	0.380	0.041	0.493	0.044	0.472	0.042
	(0.320)	(0.021)*	(0.349)	(0.024)*	(0.320)	(0.021)**	(0.325)	(0.018)**
Mediterranean × 1350	0.630	0.093	0.481	0.114	0.640	0.099	0.620	0.097
	(0.336)*	(0.037)**	(0.354)	(0.044)**	(0.338)*	(0.038)**	(0.340)*	(0.035)***
Mediterranean × 1400	0.231	0.147	0.250	0.170	0.246	0.155	0.185	0.164
	(0.305)	(0.060)**	(0.305)	(0.072)**	(0.306)	(0.062)**	(0.308)	(0.055)***
Mediterranean × 1450	0.192	0.227	0.177	0.257	0.208	0.235	0.146	0.244
	(0.310)	(0.085)***	(0.344)	(0.101)**	(0.312)	(0.086)***	(0.313)	(0.079)***
Mediterranean × 1500	0.039	0.354	0.125	0.375	0.038	0.354	0.011	0.365
	(0.288)	(0.118)***	(0.355)	(0.141)***	(0.288)	(0.119)***	(0.292)	(0.114)***
Mediterranean × 1550	0.291	0.502	0.273	0.530	0.290	0.501	0.266	0.511
	(0.296)	(0.152)***	(0.358)	(0.180)***	(0.296)	(0.153)***	(0.300)	(0.148)***
Mediterranean × 1600	0.246	0.633	0.285	0.644	0.254	0.638	0.315	0.608
	(0.316)	(0.188)***	(0.390)	(0.224)***	(0.317)	(0.188)***	(0.308)	(0.190)***
Atlantic × 1050	- 0.0001	- 0.0006	$2.14e^{-06}$	0.00003	- 0.0001	- 0.0006	- 0.0003	- 0.0005
	(0.001)	(0.001)	(0.0001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Atlantic × 1100	- 0.280	0.006	- 0.181	0.008	- 0.280	0.006	- 0.278	0.006
	(0.229)	(0.003)**	(0.175)	(0.003)**	(0.230)	(0.003)**	(0.229)	(0.003)**
Atlantic × 1150	- 0.523	- 0.004	- 0.402	- 0.001	- 0.523	- 0.004	- 0.524	- 0.004
	(0.244)**	(0.003)	(0.203)**	(0.003)	(0.245)**	(0.003)	(0.244)**	(0.003)
Atlantic × 1200	- 0.636	0.006	- 0.492	0.006	- 0.629	0.010	- 0.660	0.015
	(0.236)***	(0.004)*	(0.187)***	(0.004)	(0.237)***	(0.005)*	(0.243)***	(0.008)**
Atlantic × 1250	0.077	0.010	0.136	0.009	0.083	0.013	0.052	0.019
	(0.219)	(0.006)	(0.221)	(0.007)	(0.222)	(0.008)*	(0.225)	(0.008)**
Atlantic × 1300	0.061	0.002	0.106	- 0.0001	0.061	0.002	0.030	0.013
	(0.213)	(0.012)	(0.214)	(0.013)	(0.213)	(0.012)	(0.215)	(0.010)
Atlantic × 1350	0.212	0.005	0.276	- 0.003	0.212	0.005	0.183	0.016
	(0.203)	(0.016)	(0.203)	(0.017)	(0.204)	(0.016)	(0.205)	(0.013)
Atlantic × 1400	0.485	- 0.001	0.478	- 0.012	0.492	0.002	0.455	0.010
	(0.168)***	(0.023)	(0.171)***	(0.026)	(0.169)***	(0.024)	(0.176)**	(0.018)
Atlantic × 1450	0.289	- 0.001	0.295	- 0.014	0.295	0.002	0.261	0.009
	(0.201)	(0.029)	(0.201)	(0.032)	(0.203)	(0.029)	(0.208)	(0.023)
Atlantic × 1500	- 0.102	- 0.022	- 0.139	- 0.031	- 0.100	- 0.021	- 0.131	- 0.011
	(0.193)	(0.038)	(0.187)	(0.042)	(0.193)	(0.038)	(0.203)	(0.034)
Atlantic × 1550	0.143	- 0.028	0.149	- 0.040	0.144	- 0.028	0.114	- 0.018
	(0.205)	(0.046)	(0.205)	(0.051)	(0.205)	(0.046)	(0.215)	(0.042)
Atlantic × 1600	0.730	- 0.075	0.715	- 0.082	0.735	- 0.073	0.699	- 0.064
	(0.274)***	(0.059)	(0.272)***	(0.065)	(0.273)***	(0.058)	(0.278)**	(0.057)
Temperature-SD	0.053	0.217	0.017	0.244	0.047	0.214	0.107	0.198
	(0.444)	(0.089)**	(0.451)	(0.090)***	(0.445)	(0.089)**	(0.435)	(0.088)**
p-value for *Ruggedness × year dummies, 1050-1600*			[0.08]	[0.12]				
Wars					- 0.030	- 0.017		
					(0.064)	(0.011)		
Urbanization							- 0.0005	0.0002
							(0.0003)	(0.0001)***
R^2	0.23	0.50	0.23	0.50	0.23	0.50	0.24	0.50
Number of observations	1170	1170	1170	1170	1170	1170	1170	1170

Notes: 1. Fixed time and region effects OLS with robust standard errors in parentheses.
2. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.

Table 9: Persistent Endogenous Formal and Informal Institutions

	(1)	(2)	(3)	(4)
	The dependent variable is:			
	Democracy-1950-2000	*Democracy-1950-2000*	*Culture-2008*	*Culture-2008*
Democracy-1000-1600	0.586			
	(0.246)**			
Culture-1000-1600			2.449	
			(1.124)**	
Mediterranean		0.700	- 0.630	- 0.437
		(0.415)*	(0.336)*	(0.242)*
Atlantic		0.580	0.292	0.424
		(0.427)	(0.211)	(0.228)*
Temperature-SD-950-1600	- 0.686	0.421		1.726
	(1.091)	(1.501)		(0.758)**
R^2	0.06	0.04	0.11	0.10
Number of observations	90	90	89	89

Notes: 1. OLS with robust standard errors in parentheses.
2. *** denotes significant at the 1% confidence level; **, 5%; *, 10%.
3. The specifications include always a constant and *Franciscans* in column (3).