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What Explains Intensive Kinship? Natural Environment, Religion, and the State

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Abstract

This paper studies the determinants of intensive kinship norms in human societies throughout the world. We expand the existing literature by considering three separate determinants of kinship intensity: the natural environment, religion, and state rule. Our novel methodology takes advantage of recent datasets, linking the location of human societies from the Ethnographic Atlas to geospatial data on the territorial span of states throughout human history. For religion, we find that Islam has an effect of similar magnitude but opposite direction to Christianity. For state rule, we find that only states with high levels of institutional development lead to less intensive kinship norms.

Keywords: kinship norms; natural environment; religion; Islam; Christianity; state rule; institutional development.
JEL Codes: Z13, Z12, N40, O17, D02, Q56.

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1. Introduction

A rapidly growing literature is exploring the importance of kinship norms as a determinant of socioeconomic success. Empirical work has uncovered a negative relationship between measures capturing the intensity of kinship norms and variables denoting economic development (Enke 2019; Bahrami-Rad et al. 2024), and the intervening mechanisms appear to include less effective democratic institutions (Schulz 2022), lower levels of individualism (Schulz et al. 2019; Henrich 2020), and lower levels of interpersonal trust (Moscona et al. 2017). Kinship intensity is also positively related to corruption (Akbari et al. 2019) and the occurrence of armed conflict (Moscona et al. 2020). Similar relationships have been found with respect to variables measuring the strength of family ties (Alesina and Giuliano 2010, 2011, 2014), a concept closely related to the nature of kinship.

Intensive kinship norms may impede the transition of societies to a modern growth regime by acting against practices that make sustained technological progress possible (Enke 2019). Societies characterized by intensive kinship have a collectivist mindset, according to which the interest of the kin group comes before the interest of the individual, and non-kin members are regarded with mistrust. This confers benefits in agricultural societies using a stable knowledge base, as it facilitates collaboration within kinship lines. On the other hand, the strong preference for interactions with your own kin creates barriers for communication and the sharing of information (Alesina and Giuliano 2014; Moscona et al. 2017; Henrich 2020). Commercial ventures, for instance, tend to be organized using only kin members as partners (Greif 1989, 1994), while apprenticeship systems transmit knowledge only within kinship lines (Croix et al. 2018). These barriers to knowledge transmission result in lower levels of technological innovation - when ideas are not allowed to travel freely in society and combine with each other, less idea-generation results (Henrich 2016; Muthukrishna and Henrich 2016).

With kinship norms being increasingly recognized as an important determinant of economic development, the attention of researchers has naturally turned towards what made these norms

different in different societies. Two alternative explanations have received considerable attention in the literature.

The first explanation links kinship norms to the natural environment in which societies develop. The environment determines the forms of economic production available to the society in question, as well as the degree of cooperation required for those forms of production to proceed. Cooperation is then sustained by means of kinship norms, which become more strict in environments that require more extensive cooperation (Johnson and Earle 2000). In addition, the environment also determines the prevalence of dangerous pathogens such as those responsible for malaria or the sleeping sickness. In the presence of such pathogens, intensive kinship norms confer an advantage as they reduce interactions between human groups, lowering the risk of disease (Fincher et al. 2008; Fincher and Thornhill 2012; Enke 2019).

The second explanation relates the intensity of kinship norms to the presence or absence of the Christian religion. Schulz et al. (2019) and Henrich (2020), building on the seminal work of Goody (1983), put forward the thesis that Christianity is the reason why most European countries, together with countries whose population is largely of European descent, are characterized by low levels of kinship intensity today. These authors argue that the Christian Church "systematically undermined Europe's intensive kin-based institutions during the Middle Ages" (Schulz et al. 2019, p. 2), and did so by transforming social practices relating to marriage and family formation. According to them, Europe started the Middle Ages with similar kinship norms as the rest of Eurasia, but was fortunate enough to see these kinship structures dissolve thanks to, as Joseph Henrich puts it, "[t]he accidental genius of Western Christianity" (Henrich 2020, p. 161).

In this paper, we contribute to this flourishing literature in three important ways. First, we argue that Christianity is not the only form of organized religion having a major impact on kinship norms. Throughout the Muslim world, Islam was equally important and acted in the opposite direction. Where Christianity led to a weakening or disappearance of intensive kinship norms, Islam resulted in a reinforcement of these norms and their spread to a vast geographical area.

Second, we advance a new explanatory factor for the intensity of kinship norms, distinct from those already considered in the literature. In addition to the natural environment and the dominant form of religion, we argue that kinship norms may be related to the presence or absence of a state, ruling over the society in question. State and kinship are two alternative modes of social organization, and we might expect that the strength of the former brings about weakness for the latter. A society that is ruled by a state may not require intensive kinship norms to organize production, provide common goods, or ensure public safety, as the organization of these activities may be carried out directly by state institutions. If so, societies under state rule would be expected to have lower levels of kinship intensity - an hypothesis we propose to test, alongside the two already mentioned.

Our third contribution, finally, is methodological. The existing literature relies on the Ethnographic Atlas (Murdock 1967) as the source for measures of kinship intensity. The Ethnographic Atlas is a unique dataset gathering the work of generations of anthropologists, and coding this information into a format that lends itself to statistical analysis. The Atlas provides detailed information on cultural practices, institutional features, and economic activities for 1,267 societies (also referred to as ethnic groups) spread all over the world, and is meant to capture living conditions before significant industrialization. Albeit the size of these societies varies, they are often small and particular to a local environment. Empirical work using the Atlas is expected to employ these societies as the unit of analysis.

Keeping Atlas societies as the unit of analysis is indeed possible when analyzing the relationship between the natural environment and kinship intensity. Data on environmental factors is available in geospatial format at high resolution levels and for all corners of the world, and the precise geographic location of each society is provided in the Atlas. We can therefore know the values of factors such as rainfall, land productivity, or pathogen prevalence in the local environment of each society, and relate this to its kinship norms. Enke (2019) performs this type of analysis, showing that factors related to pathogen stress explain a sizeable share of the variation in kinship intensity across the globe.

When we want to expand the scope of the analysis to study the effects of religion and state rule, however, we quickly encounter a major problem. Societies from the Ethnographic Atlas were often too small to be organized as states, but they were nevertheless quite often under the influence of state rule, having been incorporated into the territory of a state foreign to them at some point in their history. This means we need information not only on the societies in question, but also on the states that ruled over them, in order to proceed with the analysis. The same problem interferes with our analysis of religion, given that Christianity and Islam were in many cases brought from abroad, financially supported, and sometimes forcefully implemented through the actions of a foreign state. To study the role of Christianity and Islam, then, we need to establish when any of the societies in our sample were under the rule of a state that had adopted either Christianity or Islam as its official religion.

Schulz et al. (2019), in the most detailed analysis of the relationship between Christianity and kinship intensity to date, bypass the above difficulty by changing the unit of analysis from the societies of the Atlas to modern-day countries - given that Christian rule can be easily established at the country level.[1] To create measures of kinship intensity for countries, Schulz et al. (2019) need to match every society in the Atlas to a modern-day language, match that language to the territory where it is spoken today, and use an estimate of that territory's population to construct a population-weighted average of the variable of interest for the different countries of the world. This is an impressive approach, but it does involve the creation of an artificial construct, the average level of kinship intensity for a modern-day country, when the original data only refers to small societies within those countries. While in no way diminishing the interest and importance of their work, we believe there is scope for considering alternative approaches that would keep the original societies from the Atlas as the unit of analysis.

The approach we follow in this paper does just that, and addresses directly the difficulty highlighted two paragraphs above: namely, the need to consider not just Atlas societies, but also

[1] Schulz et al. (2019) also use sub-national regions and individuals in parts of their analysis, but in those applications they do not compute an index of kinship intensity.

the states that ruled over them. By using two novel datasets, we match the location of each society to the territories of all the different states that exercised control over them at any point in history, and then to the characteristics of the states in question. We can thus identify the official religion of each state, as well as numerous indicators of the complexity of state institutions. Once we combine this information with existing data on environmental variables, we are in an excellent position to analyze the contributions of the three major factors we identify - the natural environment, religion, and state rule - on the degree of kinship intensity across societies. Our analysis complements those existing in the literature, and moves the literature forward by bringing state rule into the picture.

The rest of the paper is organized as follows. The next section offers a theoretical background, expanding on the definition of intensive kinship norms and how these relate to the evolution of human societies. We also justify in more detail the three explanatory factors of kinship norms we put forward in this paper. Section three discusses the data we use and how different datasets are matched with each other. Section four presents our baseline empirical results, while section five subjects these results to a range of robustness checks. The final section offers some concluding remarks.

2. Theoretical background

Human beings have always lived in communities (Fukuyama 2012), and have therefore always needed to regulate interpersonal relationships and, at least occasionally, act in a collective manner. A vast anthropological literature indicates that kinship norms are "the most fundamental of human institutions and have long been the primary framework for organizing social life in most societies" (Schulz et al. 2019, p. 1). Kinship norms typically dictate aspects as fundamental as marriage and reproduction, group defence, religious rituals, food production, help in times of need, etc.

Kinship norms tend to change with the scale of human societies and their stage of political organization. Over periods of several millennia, human societies tend to evolve from small-scale nomadic bands of hunter-gatherers to ever larger units such as tribes, chiefdoms and, eventually,

states (Service 1962; Fried 1967; Johnson and Earle 2000). The passage from band to tribe typically coincides with the adoption of early forms of agriculture, which are subsequently developed into more intensive forms as societies become chiefdoms and states. Albeit kinship was important among hunter-gatherers, anthropologists agree that the adoption of agricultural techniques signals a major transformation and, indeed, reinforcement of kinship structures. Where kinship norms among hunter-gatherers are typically loose and not overly constraining, agricultural societies are responsible for the creation of what is commonly referred to as intensive kinship norms (Walker and Bailey 2014; Henrich 2020, chap. 3).

Intensive kinship norms are characterized by practices such as unilineal descent, co-residence in extended families, shared ownership of land and other resources among kin members, high incidence of marriage to cousins and other relatives, and strong lines of authority based on age, gender, and genealogical position. This contrasts with so-called extensive kinship norms, typical among hunter-gatherers, and characterized by bilateral descent, residential arrangements that don't involve extended families, marriage to non-kin, and lack of strong lines of authority.

Intensive kinship norms increase the scale of cooperation and foster in-group loyalty (Schulz et al. 2019; Henrich 2020). Unilineal descent, for instance, dictates that every individual belongs to only one kinship group, typically that of the individual's father. This eliminates conflicts of loyalty that arise under bilateral descent, where every individual belongs to two kinship groups simultaneously, the father's and the mother's. Marriage to cousins and other relatives further ensures that no person with outside loyalties enters the kin group, and that land and other resources are not taken out of the group via inheritance. This also explains why widows are often required to take another husband from within the kinship group of their deceased husband - in many cases, a brother of the husband they just lost. Intensive kinship norms create cohesive social units known as lineages or clans, composed of a group of people who can trace their descent to a common ancestor.[2] The male members of such groups, linked to each other by blood ties, will fight effectively and

[2]In a lineage, people can trace their decent to a common ancestor through known lines of parentage. In a clan, people believe they have a common ancestor, but since the group is larger and the links go deeper into the past, the exact lines of parentage are often not known or proven. A clan may encompass several lineages.

outcompete other groups without this form of organization.

There are several mechanisms explaining why agricultural production typically led to the development of intensive kinship norms. First, the technology of production in agriculture often requires pooling labour resources across a large number of people. A perfect example of this is the construction of irrigation works. Second, agriculture typically leads to a higher incidence of warfare, as there is more to gain from it: agricultural societies cumulate wealth in the form of improved land, herds of domestic animals, and stores of grains. Societies that learn how to scale up collaboration among males can take advantage of this environment, and all societies must respond by organizing themselves for group defence. Third and finally, agriculture leads to an increased risk of infectious diseases. This happens both because many pathogens emerge from close contact between humans and domesticated animals, and because the sedentary life of agricultural communities makes contagion much more likely. Kinship intensity increases the survival chances of societies living in environments with high risk of disease, as they reduce interactions across human groups and limit the need to travel outside one's local community.

Given the above, kinship intensity will typically be related to environmental factors. Environments that make possible more productive forms of agriculture will also be environments where more collaboration is required, leading to more intensive kinship norms. A good example of this is China, where ecological conditions make paddy rice agriculture possible in the south, but not in the north of the country. Rice farming requires more collaboration than other forms of agricultural production and, as demonstrated by Talhelm et al. (2014) and Talhelm and English (2020), within China it is associated with higher levels of kinship intensity (what these authors refer to as "kinship tightness"). On a similar vein, Ang (2019) and Buggle (2020) have shown that, across the world, forms of agriculture that rely on irrigation, or that are more labour intensive, are associated with lower levels of individualism among the population - a typical marker of high kinship intensity. Finally, some environments have a higher incidence of pathogen stress irrespective of agricultural conditions - and will, as such, be conducive to more intensive kinship norms directly. As Joseph Henrich ably summarizes, "the differing intensities of kin-based institutions are traceable through

a variety of historical pathways back to differences in biogeography, climate, disease prevalence (e.g. malaria), soil fertility, navigable waterways, and the availability of domesticable plants and animals" (Henrich 2020, p. 225).

The second main determinant of intensive kinship norms that has been advanced in the literature is the Christian religion - more specifically, the version of Christianity that developed in Western Europe from the early Middle Ages onwards, under the leadership of the Roman Catholic Church. Starting from the 4th century AD, the Christian Church developed a package of doctrines and prohibitions that constrained people's marriage choices and family behaviour - what Henrich (2020) refers to as the Church's "Marriage and Family Program". The hallmarks of this program included: prohibition to marry blood relatives such as cousins (up to several degrees of relatedness), prohibition to marry relatives by marriage such as a brother-in-law (following the death of a husband), prohibition of all forms of polygamy, strong opposition to divorce, remarriage and adoption, and an insistence on marriage by mutual consent. All these elements run against marriage practices that were widespread throughout Eurasia, including Europe, at the time.

By the late Middle Ages, and thanks to a large extent to the status of Christianity as the official religion of European states, the Church had succeeded in its endeavour. Marriage practices in Europe had come to differ markedly from what could be observed in advanced agricultural societies elsewhere until the early 20th century. Based on the original work of Goody (1983), a number of authors has claimed that this change in marriage behaviour had the consequence of disempowering Europe's kinship institutions - resulting in a transition away from intensive kinship norms, to a European version of extensive kinship.[3] The Marriage and Family Program would have achieved this by blocking the use of marriage as an institution that served the interests of kinship groups, and turning it into an institution that responded to the needs of individuals and the Christian community at large. For instance, recall that marriage to cousins and brothers-in-law secured the loyalty of both marriage partners to a single kinship group, as well as the maintenance of kinship

[3]See, among others, Greif (2006, p. 308), Mitterauer (2010, p. 72), and Fukuyama (2012, p. 236). Empirical evidence is provided by Schulz et al. (2019) and Henrich (2020).

property. Prohibiting these practices resulted in a dispersal of kinship property, and made married couples less responsive to kinship demands. Along the same lines, the insistence on marriage by mutual consent made it difficult for parents to chose marriage partners for their children, a choice that had always been made with the interests of the kinship group in mind. In the words of Joseph Henrich, "[t]he Church dramatically undercut the potency of marriage as a social technology and a source of patriarchal power" . . . "[t]hese policies sapped the lifeblood from Europe's kin-based institutions, weakened traditional authorities, and eventually dissolved Europe's tribes" (Henrich 2020, p. 167).

Christianity, however, was not the only form of organized religion which, thanks to its association with political power, managed to influence the ways of life for millions of people during the premodern period. Starting in the 7th century AD, Islam achieved a similar position over an even larger geographical extent, bringing the Arab language together with numerous cultural practices to all the lands of Muslim conquest. As discussed by Courbage and Todd (2011), Islam served as a vehicle for the spread of marriage practices from the Middle East towards the rest of the Muslim world. As these authors point out, "the model [of intensive kinship practices] was adopted [. . .] because it was the practice of a prestigious group, the Arabs, bearers of the message of the Koran", adding that "[t]hey were worth imitating in the conquered regions, both religiously and in all kinds of social habits" (Courbage and Todd 2011, pp. 35–45). Since the kinship model of the Arabs was highly intensive, intensive kinship norms were exported to a vast area practicing the Islamic religion.

Moving forward, the notion that religion can change kinship norms when allied with state power should open our eyes to the importance of the state in general. The state influences society through channels other than its support for an official religion, and this may constitute a third (and separate) explanatory factor for the intensity of kinship norms.

State formation is characterized by the creation of bureaucratic institutions in charge of different aspects of state-making such as taxation, military organization, state religion, and large-scale

construction works (Spencer 2010; Redmond and Spencer 2012). State laws and institutions position themselves above the authority of kinship norms, and as such will challenge their power. Individuals may be appointed and promoted within state institutions according to their merit, as opposed to their status within a kinship hierarchy, which opens new opportunities for success outside the logic of kin relations. The state will demand the loyalty of all individuals towards itself which, inevitably, will challenge the loyalty that individuals have towards their kin group. "Once states come into being", says Francis Fukuyama, "kinship becomes an obstacle to political development" (Fukuyama 2012, p. 81). We will therefore advance the existence or absence of a state as a third determinant of the intensity of kinship norms, and start from the assumption that state power substitutes for kinship power - so that societies ruled by a state would tend to see a weakening of intensive kinship norms.

This starting assumption, however, must be very quickly modified. Much of the literature in anthropology and history suggests that states and kinship groups typically do not enter into conflict with each other, but agree on how to control society at different levels. As Fukuyama also points out, "[i]nstitutions based on territory and centralized legal authority [i.e., state institutions] had to be layered on top of strongly segmentary societies [i.e., kinship-dominated]", and "[i]n none of these cases did the top-down state-building effort succeed in abolishing kinship as a basis for local social organization" (Fukuyama 2012, p. 229). Authors often emphasize that intensive kinship norms survive, and may even thrive, under a state structure. "Premodern states still needed clan and tribal institutions to govern effectively", says Joseph Henrich, adding that "sometimes the state even buttressed or augmented the power of kin-based institutions" (Henrich 2020, p. 119). Indeed, premodern states were typically too weak to project power beyond the largest cities and on the frontiers - life in small villages and on the countryside was often left untouched by them. Under these circumstances, state leaders could take advantage of the existence of kinship groups and charge them with the maintenance of order at the local level. As long as taxes were paid and the superior authority of the state was recognized, kinship practices could continue as they had always been - and even be reinforced by state approval.

In light of the above, we find it adequate to modify our initial assessment of this third factor. State rule will not lead to a weakening of kinship norms when the state in question is not sufficiently developed to exert control over all corners of its territory. In states with limited fiscal capacity, a small bureaucracy, and poor transport infrastructure, local communities continue to rule themselves and the intensity of kinship norms is maintained, and perhaps even reinforced, as a result of state rule. Conversely, rule by a state that develops the means to exert its power at the local level would be accompanied by a weakening of kinship norms. To test these different assumptions we will require measures that capture not just the presence of a state, but also its level of institutional development. The effect of state rule on kinship intensity may be hypothesized to be positive or nil at low levels of institutional development, becoming negative only once high enough levels of institutional development are reached.

3. Data

3.1. Measuring kinship intensity and environmental conditions

Our point of departure is the Ethnographic Atlas, where we can find data on kinship practices for a total of 1,265 societies or ethnic groups dispersed all around the globe. We follow Schulz et al. (2019) in constructing five measures of kinship intensity based on different variables from the Atlas. The five measures identify typical features of societies where intensive kinship norms are prevalent - including cousin marriage, polygamy, residence in extended families, unilateral descent systems, the existence of clans, and the practice of endogamy (see Appendix for details). We then aggregate these five measures into a *Kinship Intensity Index* by standardizing their values to mean zero and unit variance, and taking their average.

The Ethnographic Atlas also provides geographical coordinates for every society that it covers. Figure 1 plots the location of all these societies on a global map, and assigns colors to them according to the value of the Kinship Intensity Index just introduced. The figure shows that Atlas societies are spread all over the world, but a higher density of observations characterizes some

regions such as tropical Africa, Western North America, and the island of New Guinea. We also see that, albeit both high and low values of the Kinship Intensity Index are found throughout the world, some geographic concentrations are in evidence. Low levels of kinship intensity are common in Europe, South-East Asia and much of North America, while high levels tend to predominate in much of Africa and Asia.

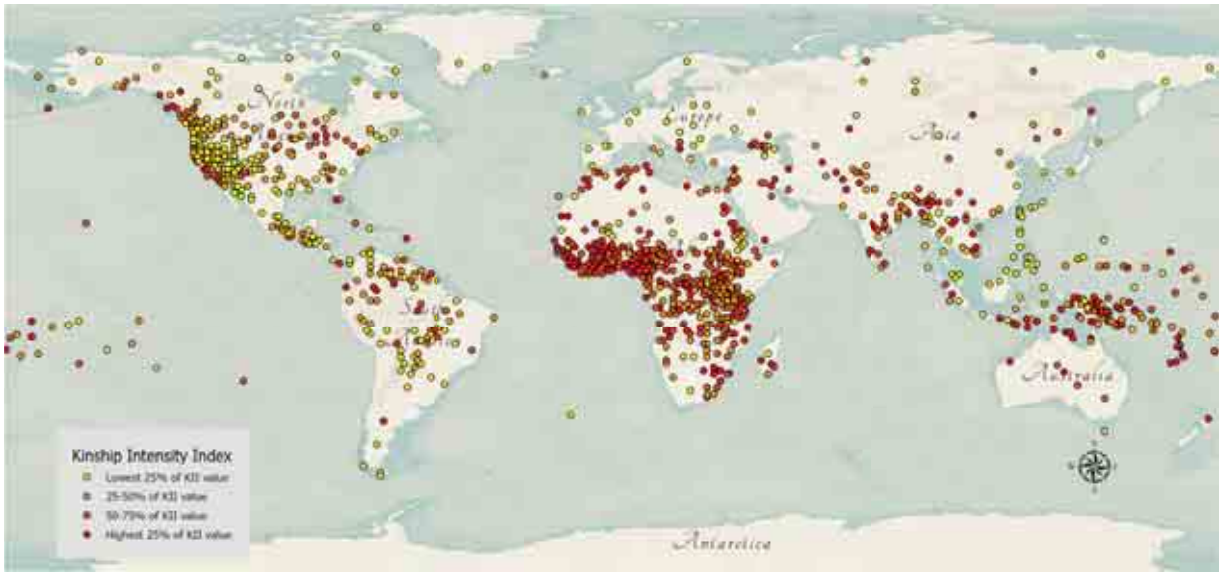

Figure 1: Location of societies from the Ethnographic Atlas, and values of the Kinship Intensity Index

To measure the environmental conditions prevalent for each society we consider three types of variables. First, the Ethnographic Atlas provides, in percentage terms, the dependence of each society on hunting and gathering for their food production. This variable reflects the overall adequacy of the environment for agricultural production. By the 19th and 20th centuries, when this measure is taken, a high dependence on hunting and gathering was observed only in those environments where agriculture was difficult or unproductive, such as deserts or the rainforest. A hunting-gathering lifestyle is typically associated with lower levels of kinship intensity - leading us to expect a negative effect for this variable.

Second, we obtain from Enke (2019) two variables capturing the pathogen stress prevalent in the local environment. The first variable is the malaria stability index of Kiszewski et al. (2004), available for the whole world and capturing conditions for the incidence of malaria. The second variable is the tsetse fly suitability index from Alsan (2015), available only for Africa and capturing conditions for the incidence of the sleeping sickness (transmitted by the tsetse fly). In order to use this second variable for our whole sample we give a value of zero to all societies located outside Africa, given that the tsetse fly is only found within this continent. Higher levels of pathogen stress are expected to lead to higher levels of kinship intensity.

Third and finally, we introduce a large battery of additional environmental characteristics, sourced from the work of Mayshar et al. (2022), which may act as further determinants of the intensity of agricultural production, as well as the prevalence of infectious diseases. This set of measures is composed of average temperature, latitude, distance to the coast, elevation, proximity to rivers, ruggedness, productivity of the land in agriculture, and average rainfall.

Table 1 presents summary statistics for all the environmental variables we use, as well as the Kinship Intensity Index. It reflects the state of our data gathering process using variables from the Ethnographic Atlas, as well as geospatial data on environmental factors, which can be matched to Atlas societies using geographic coordinates. To move beyond this point, and study the roles of religion and state rule, we will need to tap into additional data sources.

3.2. Matching local societies to states

Most societies in the Ethnographic Atlas are not organized as states. The Atlas provides a measure of the political complexity of each society, capturing the number of jurisdictional levels that exist above the local community (variable EA033). Societies organized into hunting-gathering bands or agricultural villages have no jurisdictional levels above the local community, chiefdoms would be characterized by one or two additional levels, while states and large states count three and four additional levels respectively. This measure reveals that about 90% of all societies in the Atlas have

Table 1: Descriptive Statistics: KII and Environment

	Obs.	Mean	Std. Dev.	Min	Max
Kinship Intensity Index (KII)	1257	0.074	0.557	-1.362	1.325
Hunting-gathering dependence	1184	0.276	0.264	0.050	1.025
Malaria stability index	1185	0.027	1.015	-0.641	3.516
Tsetse suitability	1173	0.00	1	-4.786	2.283
Temperature (/1000)	1256	7.237	2.753	0.035	10.830
Abs. Latitude (/1000)	1256	0.020	0.017	0	0.078
Distance to coast (/100)	1256	0.041	0.039	0	0.165
Elevation (/1000)	1256	0.163	0.026	0	0.230
River access	1256	0.271	0.445	0	1.000
Ruggedness (/1000)	1256	117.738	132.071	0	977.941
Land quality	1256	0.373	0.283	0	0.997
Mean Rainfall (/1000)	1256	1.318	0.927	0.006	10.864

a level of political complexity that does not qualify them as states, while close to 50% of the total are at the lowest level in the scale.

On the other hand, many of these societies are located, at some point in their history, within the territory of a large and complex state - in most cases, a state that is foreign to them. When that is the case, the society in question is not assigned a value of political complexity that would correspond to a state because the Atlas is meant to capture the internal organization of the group, without reference to foreign regimes claiming dominance over them. It follows that, in order to properly account for the influence of state rule on kinship practices, we need to go beyond the information provided by the Atlas. We need to identify all cases when Atlas societies have been under the rule of a foreign state.

We proceed by taking advantage of *Cliopatria* - a new and comprehensive geospatial dataset recording the territorial extent of all states that have emerged in human history from 3,400 BC to the present day (Bennet et al. 2025).[4] Cliopatria covers both the time and the spatial dimension - it gives the geographical boundaries of all states in existence at a given moment in time, and does this for all years since the appearance of the earliest states in human history. Figure 2 shows the

[4]With some exceptions, states have to control a territory of at least 5,000 square kilometers, and have a duration of at least 50 years, to be included in the dataset.

information for one particular year, the year 1,600 AD, projected into a map of the world.

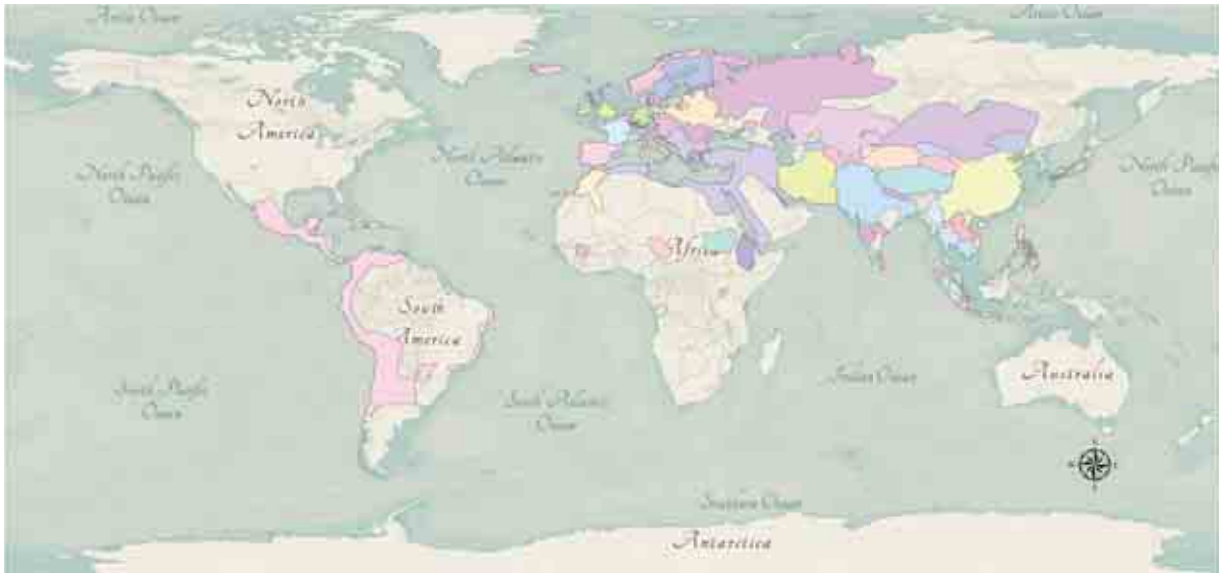

Figure 2: Territories of states in 1600 AD (Cliopatria dataset)

By combining the information in *Cliopatria* with the geographic coordinates of each society, we identify all instances in which a society from the Atlas found itself within the territory of an existing state. We can therefore establish, for each society, the identity of all states that have ruled over them, and the exact periods over which their rule took place.

Once this is done, we set aside all instances of state rule taking place after the year 1,800 AD. The objective of our empirical analysis will be to identify the causal effect of state rule on kinship intensity, and reverse causality must be a matter of concern. Low levels of kinship intensity could lead to state rule - either because societies with weak kinship norms are less effective in the military arena, and can be more easily conquered by a foreign state, or because a domestic state can emerge from the association of local societies when kinship barriers among them are weak. To identify the effect of state rule on kinship intensity, we make sure that exposure to state rule is measured for a period well before the measurement of kinship characteristics. Since almost all the information in the Ethnographic Atlas refers to studies carried out during the 19th and 20th centuries, a cutoff

point of 1,800 AD for our measure of state rule satisfies the required condition.[5]

It is worth highlighting that, for the world as a whole, state rule before the year 1,800 AD was not that common. Almost exactly two-thirds of all societies from the Atlas (66.2% of them) had no experience of state rule before the year in question. Among the remaining third of societies that did experience state rule, most of them experienced it for a relatively short period of time - say, less than three centuries. Figure 3 presents an histogram showing the distribution of the total duration of state rule for all societies that had been ruled by a state up to the year 1,800 AD (in other words, excluding instances where the total duration of state rule would be zero). As we see, the distribution is skewed towards its lower values, with about 20% of all cases experiencing less than 50 years of state rule up to the year 1,800. On the other hand, very high values do exist - with some societies experiencing several millennia of state rule.

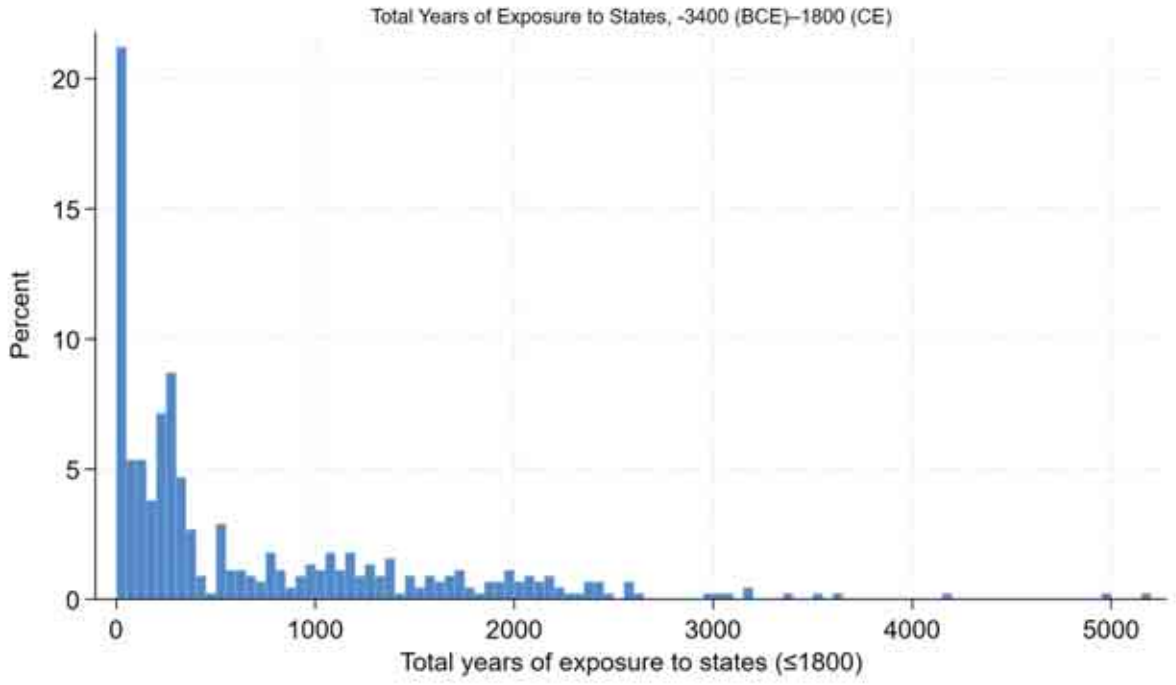

Figure 3: Histogram for total years of exposure to state rule (only positive values)

[5]In a small number of cases, the information in the Atlas refers to historical records, in which case it would reflect conditions before the year 1800 AD. We have dropped from our sample all cases in which the underlying information refers to conditions before the year 1500 AD, but have kept observations otherwise.

Once the above matching process is complete, we have enough information to estimate the effect of the total duration of state rule on kinship intensity, but we cannot yet take into consideration the nature of that rule. We know when states are present, but we have not considered yet the level of development of state institutions, and whether they would allow the state to project power at the local level. Equally important, the data we have incorporated so far says nothing about the official religion of the state, leaving us unable to consider the consequences of the Christian and Islamic faith on kinship norms. We address these limitations by expanding our use of data once again.

3.3. Capturing religion and state characteristics

The *Cliopatria* dataset is linked to a larger data-gathering project: the *Seshat Global History Databank* (Turchin et al. 2015). Seshat collects a wealth of information on a large number of state-level polities, from the beginning of human history to the present day. All polities in Seshat are given an identifying code (Seshat ID) which is also reported in Cliopatria, making the matching between the two datasets possible. Once this matching is done, we are able to identify the official or dominant religion of each state, as well as numerous measures capturing the development of state institutions.[6]

For religion, we start by identifying all polities whose dominant religion is given as "Christianity". Then, for each society in the Atlas, we add up the total number of years they have been ruled by states that satisfy this condition, and take this as a measure of their overall exposure to the Christian religion. To put it otherwise, exposure to Christianity in our paper should be understood as exposure to the rule of a Christian state. This approach is in line with the historical argument brought forward by Schulz et al. (2019) and Henrich (2020), who emphasize that the Marriage and Family Program of the Christian Church could be implemented in earnest only when the power of the state was recruited to enforce religious doctrine. We follow the exact same procedure to create

[6]One important caveat, however, is that the coverage in Seshat is not as comprehensive as the coverage in Cliopatria - Seshat does not claim to encompass all states in human history. This is reflected in two ways. First, the number of observations in our analysis drops by around 10% once we include state characteristics that have been obtained from Seshat. Second, the total years of exposure to any given state characteristic measured in Seshat may underestimate the true value, since some instances of state rule could be missing.

a variable measuring years of exposure to Islam and, for a further test on Christianity, years of exposure to either Western or Eastern Christianity.

For the development of state institutions, we use a range of binary variables recording whether a given institutional characteristic was either present or absent in each state listed in the Seshat dataset. We can therefore calculate, for each society in the Atlas, the number of years they have been ruled by states that possessed the institutional feature in question, as well as the number of years they have been ruled by states not possessing it. In other words, we can distinguish between rule by institutionally modern states and rule by institutionally archaic states. The institutional characteristics we employ for this purpose are the following:

- Specialized bureaucracy. This variable records the presence of full-time administrative specialists within the state bureaucracy. Note that all states have a bureaucracy of some form, but in less developed states officials may perform multiple and disparate functions - they may divide their time between taxation and the administration of public works, for instance. As states become more complex and institutionally developed, officials specialize in each of these different functions.

- Professional judges. This variable records the presence of full-time professional judges as part of the state structure, which we take as indication of a well-developed judicial system. In less developed states judicial functions may be performed by state officials, but only as one among several functions. Advanced states have judges that are fully specialized.

- Postal system. This variable records the presence of full-time professional couriers as part of the state structure, which we take as evidence of a fully functional postal system.

- Legal code. This variable records the presence of a formal legal code. This code is usually in written form, but oral transmission of a legal code is also deemed possible.

- Coinage production. This variable records the presence of coinage production within the state in question. If only coinage of foreign production circulates within the state the variable

records no coinage production.

- Written records. This variable records the presence of written records beyond short and fragmentary inscriptions. There is no requirement for these records to use either phonetic or alphabetic writing.

Table 2 presents summary statistics for the variables measuring total years of exposure to state rule, years of exposure to Christianity and Islam, and years of exposure to state rule satisfying each of the six institutional characteristics listed above. This completes our data gathering process.

Table 2: Descriptive Statistics: Religion and State Characteristics

	Obs.	Mean	Std. Dev.	Min	Max
Years of state rule	1257	244.50	595.75	0	5201
Years of Christianity	1156	30.06	101.43	0	1371
Years of Islam	1156	32.56	135.06	0	1089
Years of Western Christianity	1144	28.60	97.43	0	1251
Years of Eastern Christianity	1144	1.44	12.04	0	127
Years of bureaucracy	1220	145.02	403.80	0	3913
Years of judges	1231	119.92	325.01	0	2587
Years of postal/courier	1185	131.72	398.15	0	3993
Years of legal code	1234	137.45	373.05	0	3027
Years of coinage	1233	126.55	342.34	0	2024
Years of written records	1239	162.20	443.37	0	4009

4. Baseline results

We begin our empirical analysis by considering only environmental factors as a determinant of kinship intensity. We run linear regressions using the Kinship Intensity Index as our dependent variable, and assume heteroskedasticity-robust standard errors throughout. As indicated in the previous section, our measures for environmental factors are grouped in three categories, which we include progressively. Our results are reported in Table 3 below.

Table 3: Environmental factors and KII

	(1)	(2)	(3)
Hunting-gathering dependence	-0.659***	-0.518***	-0.352***
	(0.057)	(0.062)	(0.074)
Malaria stability index		0.127***	0.103***
		(0.013)	(0.016)
Tsetse suitability		0.035***	0.020
		(0.012)	(0.014)
Temperature (/1000)			0.041***
			(0.010)
Abs. latitude (/1000)			-0.242
			(1.819)
Distance to coast (/100)			-0.804*
			(0.437)
Elevation (/1000)			0.359
			(0.550)
River access			-0.063*
			(0.035)
Ruggedness (/1000)			-0.000
			(0.000)
Land quality			-0.070
			(0.056)
Rainfall (/1000)			-0.020
			(0.022)
Observations	1184	1172	1171
R-squared	0.100	0.158	0.199

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3 confirms our priors regarding the effects of the environment on kinship intensity. We find, first, that societies characterized by a more pronounced reliance on hunting and gathering have lower levels of kinship intensity - a result that reaches a high level of statistical significance, and is maintained in the three specifications we consider. We also find that societies living in an environment with a higher burden of disease due to the presence of pathogens have higher levels of kinship intensity - the coefficients on both the Malaria stability index and the tsetse suitability index are positive and statistically significant, as reported in column 2.

Once our full set of environmental variables is included in column 3, some additional findings emerge. We see a tendency for societies that are more geographically isolated, as measured by distance to the coast and access to rivers, to have lower levels of kinship intensity. This makes sense since geographic isolation brings about less competition from other societies for land and resources, and therefore less pressure to organize for warfare by adopting intensive kinship norms. We also find a positive association between kinship intensity and temperature, which may be explained by the higher disease burden typical of tropical regions, which goes beyond malaria and the sleeping sickness. This interpretation is further supported by the fact that our measure of tsetse prevalence loses statistical significance once temperature is controlled for. We note that our measure of hunting and gathering dependence on its own explains 10% of the variation in kinship intensity across the world, a figure that increases to 16% when we add measures of pathogen stress and to 20% with our full set of environmental factors.

Moving forward, we incorporate into the analysis our measures for overall exposure to state rule and for the presence of the Christian and Islamic religions, obtained following the matching of Atlas societies to state-level data. As we do so, we always control for the full set of environmental factors considered in the last column of Table 3 - albeit, for conciseness, we will only report results for the three environmental factors whose effects are most convincing: dependence on hunting-gathering, the malaria stability index, and temperature.

In Table 4, we begin by considering the total number of years that a society has been exposed to

state rule as an additional explanatory factor.[7] Controlling for the environment but not for religion, this variable is negatively related to kinship intensity - meaning that a longer exposure to state rule is associated with weaker kinship norms on average (column 1). This result, however, masks the fact that many of these states promoted either Christianity or Islam, and it may be exposure to these religious doctrines rather than state rule per se that explains this negative association.

Table 4: Religion, State Exposure, and KII

	(1)	(2)	(3)	(4)
Log yrs state exposure	-0.023***	0.017**	-0.007	-0.009
	(0.006)	(0.008)	(0.011)	(0.011)
Log yrs Christianity		-0.100***	-0.083***	
		(0.013)	(0.014)	
Log yrs Islam			0.056***	0.065***
			(0.015)	(0.015)
Log yrs Western Xt.				-0.090***
				(0.014)
Log yrs Eastern Xt.				0.020
				(0.035)
Hunting-gathering dependence	-0.450***	-0.361***	-0.349***	-0.291***
	(0.076)	(0.081)	(0.081)	(0.082)
Malaria stability index	0.080***	0.078***	0.071***	0.070***
	(0.017)	(0.016)	(0.017)	(0.017)
Temperature (/1000)	0.053***	0.043***	0.037***	0.035***
	(0.011)	(0.011)	(0.011)	(0.011)
Observations	1171	1071	1071	1060
R-squared	0.209	0.296	0.309	0.320

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To investigate this further, we add our controls for Christianity and for the Islamic religion in the second and third columns of Table 4. As indicated previously, these variables measure the number of years a society has been ruled by a state whose official or dominant religion is Christianity

[7] All variables measuring years of exposure are incorporated in log form.

or Islam, respectively. In accordance with our previous discussion and the existing literature, we find that exposure to Christianity leads to weaker kinship norms - the effect is negative and statistically significant in all considered cases. Turning to Islam, column 3 reveals that exposure to this religion has an effect of similar magnitude but of opposite sign. Societies under the influence of a Muslim state are characterized by higher levels of kinship intensity - a result that, to the best of our knowledge, is novel to the literature. Column 4 offers a further test of these relationships by separating Christian countries into countries practicing Western Christianity (Roman Catholicism, or any form of Protestantism) and those practising Eastern Christianity (the Orthodox Church). As expected, it is only exposure to Western Christianity that is associated with a negative effect on kinship intensity, with Eastern Christianity having an effect that is estimated as positive, but failing to reach standard levels of statistical significance.

Table 4 also reveals that the inclusion of our variables for Christianity and Islam renders the effect of total years of exposure to state rule much smaller, and not statistically significant (columns 3 and 4). It thus appears that the negative coefficient found for this variable on column 1 was hiding the effects of Christian and Muslim states - with the effect of Christian states dominating, due to the vast presence of European powers throughout the world in the form of colonial empires. Once the effects of Christianity and Islam are directly accounted for, the overall effect of state rule is quite close to zero. Finally, it is worth noting that the inclusion of all the additional variables considered in Table 4 have driven the explanatory power of our regressions to slightly over 30%, up from the 20% reached in the regressions of Table 3.

The muted response to state rule per se that we find in Table 4 deserves further investigation. As we have indicated previously, the consequences of state rule may depend on the nature of the state - in other words, on the level of development of state institutions. State rule may not weaken kinship norms when state institutions are poorly developed, but it may well do so as the capacity of the state grows and reaches all corners of society. We evaluate this claim in Table 5, by introducing our measures of state development.

Table 5: State Characteristics and KII

	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.072***	-0.069***	-0.072***	-0.074***	-0.081***	-0.084***
	(0.014)	(0.014)	(0.015)	(0.016)	(0.014)	(0.014)
Log yrs Islam	0.068***	0.063***	0.059***	0.081***	0.052***	0.049***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.014)	(0.014)
Hunting-gathering dependence	-0.302***	-0.304***	-0.311***	-0.315***	-0.323***	-0.315***
	(0.084)	(0.083)	(0.083)	(0.084)	(0.083)	(0.084)
Malaria stability index	0.073***	0.071***	0.072***	0.074***	0.073***	0.075***
	(0.017)	(0.017)	(0.017)	(0.018)	(0.017)	(0.017)
Temperature (/1000)	0.040***	0.039***	0.040***	0.042***	0.037***	0.036***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Log yrs bureaucracy	-0.038**					
	(0.015)					
Log yrs state exposure w/o bureaucracy	0.030**					
	(0.013)					
Log yrs judges		-0.043***				
		(0.014)				
Log yrs state exposure w/o judges		0.031***				
		(0.012)				
Log yrs written rec.			-0.030**			
			(0.015)			
Log yrs state exposure w/o written records			0.027**			
			(0.014)			
Log yrs postal/courier				-0.029		
				(0.020)		
Log yrs state exposure w/o courier				0.017		
				(0.016)		
Log yrs legal code					-0.014	
					(0.015)	
Log yrs state exposure w/o legal code					0.012	
					(0.013)	
Log yrs coinage						-0.008
						(0.014)
Log yrs state exposure w/o coinage						0.010
						(0.013)
Other Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	1055	1068	1071	1032	1071	1063
R-squared	0.322	0.320	0.313	0.322	0.310	0.308

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In Table 5 we no longer use the total number of years that a society has been exposed to state rule as a regressor, as this variable amalgamates rule by institutionally modern states with rule by institutionally archaic states. Instead, we introduce as separate regressors the number of years that a society has been ruled by states possessing a given institutional feature we associate with modern state rule, as well as the number of years it has been ruled by states that did not possess this feature. We try this exercise with the six different state institutions mentioned in the previous section. All regressions control for exposure to Christianity and Islam, and for our full set of environmental factors.

Results are strongly supportive of the thesis we put forward in this paper. In all six cases, we find that the two coefficients capturing exposure to state rule are of opposite sign, as well as similar magnitude. In all six cases we see the same pattern repeated: years of exposure to the rule of states with institutionally advanced features has a negative effect on kinship intensity, whereas rule by institutionally archaic states tends to increase kinship intensity. As we hypothesized previously, it is only when the state develops the means to influence society at the local level, by building up its institutional network, that the power of kinship norms is finally loosened. Before then, the state typically relies on kinship groups to impose its rule, and the intensity of kinship norms is actually reinforced.

The effects we find are statistically significant for three out of the six measures we consider, and this finding contains further confirmation of our priors. Effects are not significant for those institutional features that may be limited in their influence to the capital city and the main urban areas. The existence of a legal code, for instance, may make no difference without the judicial apparatus required to impose it. The production of coinage and the presence of postal services are important for commerce and communications, but coins may circulate only within urban areas due to their scarcity, and postal services may exist only to link important cities. On the other hand, we find statistically significant effects for the presence of a specialized bureaucracy, professional judges, and written records. The first two directly relate to the size and reach of the state apparatus, as state officials become specialized only when the state bureaucracy is large enough and its job is

perceived as permanent. Judges may be particularly important in this context, as they signal the existence of a judicial system capable of overruling local practices emanating from kinship norms. Written records, finally, constitute a major advance in the capacity of a state to process information - recording population, production, tax payments, etc. An advanced bureaucracy requires fiscal development, and fiscal development cannot proceed without the existence of written records.

5. Robustness checks

We subject our baseline results from the preceding section to a series of robustness checks considering alternative measures, samples, control variables, periods over which state exposure is calculated, and assumptions about the standard errors. In all cases, we use as baseline our set of regressions from Table 5 above, which estimates the effects of our three explanatory factors on kinship intensity, and which disaggregates the effects of state rule by using six different measures of institutional development.

We begin by considering an alternative measure of kinship intensity as a dependent variable. While the Kinship Intensity Index of Schulz et al. (2019) is our preferred measure, Enke (2019) employs what he refers to as an index of Kinship Tightness following a similar aggregation procedure as Schulz et al. (2019), but with a different set of variables from the Ethnographic Atlas.[8] Results using this measure are reported in Table 6. As we see, the sign and statistical significance of most coefficients is unchanged, and magnitudes remain similar to those obtained in Table 5. We still find strong results regarding the effects of our environmental variables, exposure to Christianity and Islam, and exposure to state rule. For this last one, results using the Enke measure continue to validate the importance of a specialized bureaucracy, professional judges, and written records as key factors of state development, but the existence of a postal service is also added to the list.

Next, we modify our sample to exclude societies from certain world regions that present a pattern of kinship intensity that may be considered peculiar when compared to the rest of the world.

[8]Enke (2019) does not consider cousin marriage or polygamy, like Schulz et al. (2019) do. They both consider domestic organization, marital residence, descent type, and the existence of clans.

Table 6: Robustness checks — Enke Kinship Measure

	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.036***	-0.035***	-0.037***	-0.031***	-0.040***	-0.043***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Log yrs Islam	0.019***	0.019***	0.016**	0.021**	0.013*	0.010
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Hunting-gathering dependence	-0.330***	-0.328***	-0.330***	-0.332***	-0.334***	-0.332***
	(0.047)	(0.046)	(0.046)	(0.046)	(0.046)	(0.047)
Malaria stability index	0.045***	0.044***	0.046***	0.040***	0.045***	0.047***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)
Temperature (/1000)	0.004	0.004	0.004	0.005	0.003	0.002
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Log yrs bureaucracy	-0.019**					
	(0.008)					
Log yrs state exposure w/o bureaucracy	0.016**					
	(0.007)					
Log yrs judges		-0.022***				
		(0.007)				
Log yrs state exposure w/o judges		0.017***				
		(0.006)				
Log yrs written rec.			-0.016**			
			(0.007)			
Log yrs state exposure w/o written records			0.016**			
			(0.007)			
Log yrs postal/courier				-0.027***		
				(0.010)		
Log yrs state exposure w/o courier				0.022***		
				(0.008)		
Log yrs legal code					-0.010	
					(0.007)	
Log yrs state exposure w/o legal code					0.010	
					(0.007)	
Log yrs coinage						-0.004
						(0.007)
Log yrs state exposure w/o coinage						0.007
						(0.007)
Other Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	1039	1052	1055	1016	1055	1047
R-squared	0.397	0.398	0.392	0.394	0.390	0.386

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Two regions are particularly suspect, due to the high prevalence of societies with low levels of kinship intensity: Europe and North America. Table 7 thus presents our results when we exclude all observations from the European continent (panel A) or from the North American one (panel B).

Table 7 brings strong support to our findings. In both panels we find that the effects of Christianity, Islam, and state rule continue unabated - with statistical significance and the magnitude of the coefficients maintained throughout. These results also apply to our measures of environmental factors, which are not reported in Table 7 for conciseness. It is particularly satisfying to note that the negative effect of Christianity on kinship intensity is still very much present once we exclude European societies, as the thesis has been formulated with the European case in mind. It goes on to show that the logic behind this result continues to apply once Christianity was exported from the European continent to societies all around the world.

For a third robustness check we add, as an additional control variable, the *internal* level of political complexity from each society in question, as recorded in the Ethnographic Atlas (variable EA033, "number of jurisdictional levels beyond the local community"). The focus of our attention so far has been on the presence or absence of state rule which, as indicated previously, differs from the internal level of political complexity because Atlas societies are often dominated by a foreign state. The internal level of political complexity is a likely determinant of kinship norms, but we have avoided its use so far due to a potential endogeneity problem. Since internal political complexity has been measured at the same time as kinship norms - they are both recorded in the Ethnographic Atlas on the basis of the same sources - kinship norms may be causing political complexity as much as being caused by them.

With the above in mind, we proceed by including this measure as an additional regressor in Table 8. As expected, the coefficient on this variable is negative and strongly significant: societies with more complex forms of political organization tend to be characterized by weaker kinship norms. Perhaps more important for us, our results continue to hold in their entirety following the

Table 7: Robustness Checks — Alternative Samples

	Panel A: Excluding Europe					
	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.061***	-0.058***	-0.058***	-0.063***	-0.070***	-0.078***
	(0.016)	(0.016)	(0.016)	(0.018)	(0.016)	(0.015)
Log yrs Islam	0.069***	0.063***	0.062***	0.084***	0.053***	0.049***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.014)	(0.014)
Log yrs bureaucracy	-0.045***					
	(0.016)					
Log yrs state exp. w/o bureaucracy	0.041***					
	(0.014)					
Log yrs judges		-0.050***				
		(0.016)				
Log yrs state exp. w/o judges		0.042***				
		(0.013)				
Log yrs written records			-0.044***			
			(0.016)			
Log yrs state exp. w/o written rec.			0.043***			
			(0.014)			
Log yrs postal/courier				-0.037*		
				(0.021)		
Log yrs state exp. w/o courier				0.025		
				(0.017)		
Log yrs legal code					-0.023	
					(0.015)	
Log yrs state exp. w/o legal code					0.024*	
					(0.013)	
Log yrs coinage						-0.013
						(0.015)
Log yrs state exp. w/o coinage						0.018
						(0.013)
All Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	1001	1014	1017	978	1017	1009
R-squared	0.323	0.320	0.315	0.323	0.309	0.306
	Panel B: Excluding North America					
Log yrs Christianity	-0.085***	-0.086***	-0.088***	-0.082***	-0.093***	-0.096***
	(0.016)	(0.015)	(0.016)	(0.018)	(0.016)	(0.016)
Log yrs Islam	0.066***	0.060***	0.054***	0.078***	0.048***	0.045***
	(0.016)	(0.015)	(0.016)	(0.018)	(0.015)	(0.015)
Log yrs bureaucracy	-0.045***					
	(0.016)					
Log yrs state exp. w/o bureaucracy	0.030*					
	(0.015)					
Log yrs judges		-0.046***				
		(0.015)				
Log yrs state exp. w/o judges		0.028*				
		(0.014)				
Log yrs written records			-0.027			
			(0.017)			
Log yrs state exp. w/o written rec.			0.014			
			(0.016)			
Log yrs postal/courier				-0.044**		
				(0.022)		
Log yrs state exp. w/o courier				0.019		
				(0.019)		
Log yrs legal code					-0.014	
					(0.015)	
Log yrs state exp. w/o legal code					0.004	
					(0.015)	
Log yrs coinage						-0.008
						(0.015)
Log yrs state exp. w/o coinage						0.002
						(0.015)
All Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	757	770	773	734	773	765
R-squared	0.278	0.271	0.256	0.275	0.254	0.254

Notes: Robust standard errors are reported in parentheses. All specifications include the full set of environmental controls. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

addition of this new control - with the roles of the environment, religion, and state rule as much in evidence as before.

Moving on, we may harbour some doubts regarding the length of time over which all our variables of exposure to state rule are calculated. These cover all human history since the emergence of the first states, which leads to some of our societies having experienced state rule over periods of several millennia. One could argue, perhaps plausibly, that exposure to state rule taking place several thousand years ago would exert no discernible influence on kinship norms in the present day. If that is the case, exposure to state rule ought to be calculated over a more restricted period.

To address this point, we produce alternative measures of state rule covering only the last ten centuries up to the year 1,800 AD - in other words, the period 800 AD – 1,800 AD. We present these results in Table 9.

As Table 9 shows, most of our results continue to hold in this alternative specification. We still find the strong effects from our variables capturing environmental factors, as well as from those capturing exposure to the Christian and Islamic faiths. For state rule, we continue to find the pattern whereby rule by an institutionally modern state leads to weaker kinship norms, whereas rule by an institutionally archaic state tends to strengthen them. These coefficients are now statistically significant in only one case, but the signs are correct for all measures except coinage production.

Finally, we conduct a robustness check allowing for spatial correlation in the error terms. While we already control for a rich set of environmental factors that are spatially correlated, unobserved factors may still induce spatial dependence in the residuals. To account for this, we compute Conley standard errors (Conley 1999), which allow for flexible spatial dependence in the error terms that decays with distance and is assumed to be zero beyond a cutoff of 500 km. Results are reported in Table 10, and once again confirm all findings from our paper. It is worth noting that these results continue to hold when the cutoff is set at distances of 250, 750, and 1,000 km.

Table 8: Robustness checks — Controlling for Internal Political Complexity

	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.065***	-0.063***	-0.066***	-0.066***	-0.072***	-0.077***
	(0.015)	(0.014)	(0.015)	(0.016)	(0.015)	(0.015)
Log yrs Islam	0.069***	0.063***	0.059***	0.083***	0.053***	0.050***
	(0.016)	(0.015)	(0.015)	(0.017)	(0.015)	(0.015)
Hunting-gathering dependence	-0.349***	-0.346***	-0.361***	-0.360***	-0.365***	-0.361***
	(0.084)	(0.083)	(0.084)	(0.085)	(0.084)	(0.085)
Malaria stability index	0.073***	0.071***	0.072***	0.073***	0.073***	0.074***
	(0.017)	(0.017)	(0.017)	(0.018)	(0.017)	(0.017)
Temperature (/1000)	0.041***	0.039***	0.039***	0.043***	0.037***	0.036***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Log yrs bureaucracy	-0.037**					
	(0.016)					
Log yrs state exposure w/o bureaucracy	0.032**					
	(0.013)					
Log yrs judges		-0.043***				
		(0.014)				
Log yrs state exposure w/o judges		0.034***				
		(0.012)				
Log yrs written rec.			-0.028*			
			(0.016)			
Log yrs state exposure w/o written records			0.025*			
			(0.014)			
Log yrs postal/courier				-0.031		
				(0.020)		
Log yrs state exposure w/o courier				0.018		
				(0.016)		
Log yrs legal code					-0.017	
					(0.015)	
Log yrs state exposure w/o legal code					0.017	
					(0.013)	
Log yrs coinage						-0.009
						(0.015)
Log yrs state exposure w/o coinage						0.012
						(0.013)
Political centralization	-0.177***	-0.170***	-0.165***	-0.168***	-0.163***	-0.165***
	(0.061)	(0.060)	(0.061)	(0.064)	(0.061)	(0.064)
Other Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	986	997	1000	964	1000	992
R-squared	0.323	0.321	0.312	0.322	0.311	0.308

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Robustness checks — State Exposure over the last 1000 years

	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.094***	-0.088***	-0.095***	-0.090***	-0.100***	-0.113***
	(0.016)	(0.015)	(0.016)	(0.018)	(0.016)	(0.016)
Log yrs Islam	0.040**	0.040**	0.031*	0.049***	0.026*	0.018
	(0.016)	(0.016)	(0.016)	(0.018)	(0.015)	(0.014)
Hunting-gathering dependence	-0.323***	-0.326***	-0.319***	-0.317***	-0.325***	-0.325***
	(0.083)	(0.083)	(0.083)	(0.084)	(0.083)	(0.083)
Malaria stability index	0.072***	0.069***	0.072***	0.073***	0.072***	0.074***
	(0.017)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)
Temperature (/1000)	0.041***	0.041***	0.040***	0.043***	0.038***	0.037***
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Log yrs bureaucracy	-0.016					
	(0.017)					
Log yrs state exposure w/o bureaucracy	0.021					
	(0.013)					
Log yrs judges		-0.027*				
		(0.015)				
Log yrs state exposure w/o judges		0.025**				
		(0.012)				
Log yrs written records			-0.012			
			(0.016)			
Log yrs state exposure w/o written records			0.021			
			(0.013)			
Log yrs courier				-0.017		
				(0.019)		
Log yrs state exposure w/o courier				0.018		
				(0.015)		
Log yrs legal code					-0.003	
					(0.015)	
Log yrs state exposure w/o legal code					0.012	
					(0.012)	
Log yrs coinage						0.015
						(0.014)
Log yrs state exposure w/o coinage						0.001
						(0.012)
Other Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	1056	1069	1072	1033	1072	1064
R-squared	0.325	0.324	0.319	0.325	0.318	0.317

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6. Summary and concluding remarks

Let us summarize the main contributions of this paper, and point out some directions for future research efforts. This paper contributes to the existing literature on the determinants of kinship norms across societies along several dimensions. First, it incorporates into the analysis two datasets not previously used within this context. The Cliopatria dataset identifies the territorial extent of all states over the last five thousand years of human history, allowing us to identify the duration of state rule for each society from the Ethnographic Atlas. The Seshat dataset adds a number of measures for the large majority of these states, including the official religion of the state and diverse indicators of institutional sophistication.

Second, we add exposure to state rule as an additional explanatory factor of kinship norms, and expand the role of religion to cover not just the case of Christianity, but also that of Islam. On both accounts we find important results, previously unknown to the literature. We find that rule by states with institutionally advanced features is related to weaker kinship norms, whereas rule by states that do not possess such features has the exact opposite effect - it appears to make kinship norms even stronger. For religion, we confirm the negative relationship between exposure to Christianity and intensive kinship norms - and find this effect to be present even when we exclude Europe from the sample. We also find a clear and positive association between exposure to Islam and the intensity of kinship norms - the effect is of similar magnitude but opposite direction to the one estimated for Christianity. Clearly, state-sponsored religion can relate to kinship norms in more than one way.

Third and finally, our methodology retains societies from the Ethnographic Atlas as the unit of analysis. While other forms of analysis have been advanced and certainly have their value, we believe it is important to test these different hypotheses using Ethnographic Atlas data in the format in which it was originally intended to be used.

Future research may manage to consider exposure to Christianity and Islam not only as an official state religion, as we do here, but as a faith brought over by non-state agents such as missionaries.

It may incorporate more detailed measures of the development of state institutions - measures that go beyond the binary indicators that we have employed here. Even further down the road, future researchers may be able to construct measures of kinship norms using sources other than the Ethnographic Atlas. Large societies have left us with a wealth of written records from which kinship norms may be deduced - for instance, by analysing the language used to refer to different types of family members. Any of these research directions is likely to teach us much more about kinship norms, their determinants, and their consequences on the socioeconomic development of societies.

Table 10: Robustness checks — Conley SEs

	(1)	(2)	(3)	(4)	(5)	(6)
Log yrs Christianity	-0.072***	-0.069***	-0.072***	-0.074***	-0.081***	-0.084***
	(0.015)	(0.014)	(0.016)	(0.016)	(0.016)	(0.016)
Log yrs Islam	0.068***	0.063***	0.059***	0.081***	0.052***	0.049***
	(0.015)	(0.015)	(0.016)	(0.017)	(0.015)	(0.016)
Small-scale society	-0.302***	-0.304***	-0.311***	-0.315***	-0.323***	-0.315***
	(0.116)	(0.115)	(0.115)	(0.115)	(0.115)	(0.116)
Malaria stability index	0.073***	0.071***	0.072***	0.074***	0.073***	0.075***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Temperature (/1000)	0.040***	0.039***	0.040***	0.042***	0.037**	0.036**
	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.015)
Log yrs w/ bureaucracy	-0.038**					
	(0.016)					
Log yrs w/o bureaucracy	0.030**					
	(0.015)					
Log yrs w/ judges		-0.043***				
		(0.015)				
Log yrs w/o judges		0.031**				
		(0.013)				
Log yrs w/ written rec.			-0.030*			
			(0.017)			
Log yrs w/o written rec.			0.027*			
			(0.015)			
Log yrs w/ courier				-0.029		
				(0.020)		
Log yrs w/o courier				0.017		
				(0.017)		
Log yrs w/ legal code					-0.014	
					(0.016)	
Log yrs w/o legal code					0.012	
					(0.015)	
Log yrs w/ coinage						-0.008
						(0.017)
Log yrs w/o coinage						0.010
						(0.016)
Other Environmental Controls	✓	✓	✓	✓	✓	✓
Observations	1055	1068	1071	1032	1071	1063
R-squared	0.322	0.320	0.313	0.322	0.310	0.308

Conley spatial standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Appendix

Kinship Intensity Index

The five measures that compose the Kinship Intensity Index, and the variables from the Ethnographic Atlas from which they are derived, are the following (please refer to (Schulz et al. 2019) for definitions of specialized anthropological terms):

1. Cousin marriage preference. Based on variable V26 ("Subtypes of Cousin Marriage"). The measure takes a value of 0 if cousin marriage is not preferred, 1 if second (but not first) cousin marriage is preferred, 2 if cross-cousin marriage is preferred, and 3 if parallel-cousin marriage is preferred.

2. Polygamy. Based on variable V09 ("Marital composition: monogamy/polygamy"). The measure takes a value of 0 for monogamy, 1 for occasional or limited polygyny, and 2 for common polygyny and polyandry.

3. Co-residence of extended families. We take the average of two measures. The first one, based on variable V8 ("Domestic organization"), takes a value of 0 for independent families, and values 1, 2 and 3 for increasing sizes of extended families. The second measure, based on variable V12 ("Marital residence"), takes a value of 0 for neo-locality, 1 for ambilocality, and 2 for patrilocality and matrilocality.

4. Lineage organization. Based on variable V43 ("Descent: major type"). The measure takes the value of 0 when the descent system is bilateral, and the value of 1 for all other descent systems.

5. Community organization. Based on variable V15 ("Community marriage organisation"). The measure takes the value of 0 if there are no clans in the society and the society practices endogamy. If either of these two features is present, the measure takes the value of 1.