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Macrogenetic Structure and Religion: Evidence from the Recent African Origin Hypothesis*

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Abstract

This research is the first to investigate the impact of the complexity of economic, political and social environment, captured by population diversity, on religion. To address the endogeneity of genetic differentiation, we use migratory distance to East Africa as the source of identifying variation. In the pre-colonial era, results document that societies with a greater degree of genetic diversity are more likely to believe in supernatural screening. Analysis using contemporary cross-country data sets on social and formal regulation of and restrictions involving faith shows that genetic diversity causes an increase in the likelihood of societal and governmental involvement with religion. Finally, estimates relying on survey data find that individuals living in diversely populated countries are more likely to become a believer, report being pious, and exhibit a greater degree of religious participation. This research establishes that the macrogenetic structure of human populations has been fundamental in determining the emergence and persistence of religious beliefs and practices as well as making religion a central component of social interaction in the current era.

KEYWORDS: Genetic Diversity, Religiosity, Belief in Supernatural Punishment, Societal and Governmental Involvement with Religion
JEL CLASS: Z12, Z13, N30

"*There are many questions in philosophy to which no satisfactory answer has yet been given. But the question of the nature of the gods is the darkest and most difficult of all.*" –Cicero, *The Nature of the Gods*

I. Introduction

According to Durkheim (1912), religion is an eminently social phenomenon, and people's conception of god emerges out of their experience with society.[2] He argued that religion acts as the source of solidarity and identification as well as providing a meaning for life and authoritative figures. To him, most importantly, religion stimulates the adoption of moral values and social norms followed by all within a society. Alternatively, Darwin (1888) attributes the emergence of religion to human imagination, wonder, and curiosity together with some power of reasoning. To Darwin, these properties induce people to naturally crave to understand their surroundings and speculate on their own existence and therefore form religious beliefs and follow organized religion. Although different strands of literatures in anthropology, psychology, neuroscience and other fields provide evidence in line with both Durkheim's view that religion is in the situation (Swanson, 1960; Underhill, 1975; Norenzayan and Shariff, 2008) and Darwin's explanation that religion is in the brain (Barrett, 2004), our current understanding of the causes

[2] Needless to say, every society has been associated with some form of a belief system (Culotta, 2009) and religion has been and continues to be heavily involved with social interaction at the family, community, national, and international levels. In many countries, religious activity is regulated by social norms and/or government (Pew Research Center, 2016b). It is also common that informal social contract and official state laws are inspired by faith (Pew Research Center, 2016b). Moreover, religion has been held responsible for wars, civil conflict, and the determination of political systems throughout history (Huntington, 1993; Gurr, 1993; Fearon,2003). People of the third Millennium are also very much influenced by religion. Eighty four percent of the world population associate themselves with a religion, and even those who are unaffiliated with organized religion hold religious or spiritual beliefs (Hackett, 2012). Many individuals form their daily life practices (e.g., diet, physical activity, sleep, and work) based on norms dictated by supernatural powers, and consider faith as an important part of their life (Pew Research Center, 2016a). There exists a relatively large religious economy as well. For instance, in the U.S., charitable donations for religious purposes account for roughly 1 percent of GDP (Iannaccone1998), the total revenue of faith-based organizations is about $375 billion annually, and the total size of religious economy is estimated to be greater than $1 trillion annually (Grim and Grim, 2016). In addition, spiritual leaders, including Pope, and Dalai Lama are considered among the most influential people in the world (Time Magazine, December 11 2013).

of the emergence and persistence of religion is far from settled (Culotta, 2009; Norenzayan and Gervais 2012). Methodological shortcomings and the paucity of suitable data sets may include the reasons behind Cicero's assertion as to why "the question of the nature of the gods is the darkest and most difficult of all" has remained relatively intact up to this day.

Inspired by similar long-standing questions, an emerging literature in economics has shifted focus on detecting deep rooted causes of development outcomes making use of historical natural experiments that took place a long time ago (Spolaore and Wacziarg, 2013; Nunn, 2014, 2009). Among these, an innovative line of inquiry led by Ashraf and Galor (2013a) study the implications of genetic diversity, which is a first order determinant of ethnic, cultural, and linguistic fragmentation (Ashraf and Galor, 2013b). Using distance to East Africa through prehistoric migration tracks as the source of exogenous variation, Ashraf and Galor (2013a), Ashraf, Galor and Klemp (2014), Arbatli, Ashaf, and Galor (2015), Depetris-Chauvin and Özak (2017), and Galor and Klemp (2017) document that genetic diversity, measured by the degree of differentiation in genetic material between two randomly selected individuals within a given population, has played a fundamental role in shaping the economic, social, and political structure of human societies throughout history via its effects on comparative economic development, intrastate conflict, economic specialization, and the formation of autocratic institutions (Ashraf and Galor 2017).

With a focus on long-run effects of social, economic, and political environment on emergence and persistence of religion, the current article investigates the impact of genetic diversity on outcomes of faith.[3] Given that it is a principal source of the complexity of the

[3] While the literature on economics of religion is relatively sparse, the question of what factors affect outcomes of faith and religious behaviors has also received increased attention from economists in the recent past. This line of inquiry, for the most part, focus on how changes in people's budget constraints and/or preferences impact demand for religious goods and services (Gruber and Hungerman, 2008; Chen, 2010; Hungerman, 2014, 2005; Buser, 2015;

economic, political, and social environment, genetic diversity may impact the outcomes of religion both in the course of initial stages of human civilization and in the current era. During the earlier phases of development, the emergence of religion and especially belief in divine retribution are associated with the need for increased social cohesion and cooperation (Swanson, 1960; Underhill, 1975; Norenzayan and Shariff, 2008; Norenzayan, 2013). Thus, in a diverse environment, belief in high gods, defined as supernatural beings who closely monitor human behavior and support morality, may be encouraged by governing bodies to boost cooperation, promote pro-social behavior, achieve social harmony, motivate people to unite behind a common cause, and therefore establish a common identity.

In the contemporary era, how genetic diversity influences the persistence of religion in social interaction and piousness of individuals may be more complex. On the one hand, genetic diversity is inversely associated with the quality of governance through increased conflict, lowered trust, and presence of autocratic and extractive institutions (Ashraf and Galor 2017). As heightened diversity may lead to the under provision of public goods (e.g., safety network and education), religious entities, including various congregations, cults, and sects, may assume an active role in providing such goods and services within their networks conjoined with promoting religious adherence. Such government failures may also empower religion to dictate what is permissible and impermissible in social interaction through similar pathways. Likewise, if a diverse environment assigns religion a lead role in organizing social interaction, imposing

Cesur and Mocan, *forthcoming*; Gruber 2004; Becker et al. 2017; Bentzen, 2015; Ager et al. 2016; Cesur et al. 2017), what influences the rise or spread of a specific denomination or religion (Iyigin, 2008; Michalopoulos, Naghavi, and Prarolo 2012), and explaining the rationale behind why individuals submit to seemingly irrational restrictive norms dictated by religious organizations and belief systems (Iannaccone 1992; Berman 2000; Carvalho 2013). Notably, because of data unavailability and/or lack of suitable natural experiments to tease out the cause-and-effect relationships, many outstanding questions with respect to what determine belief in supernatural powers, the relative role of religion in social interaction, as well as the piousness of individuals remain unanswered (Iannaccone, 1998; Iyer, 2016).

policies on religious grounds and/or directly regulating religious activity may be to the best interest of government. Furthermore, to the degree that genetic differentiation elevates the relative importance of religion in the society, it may also influence individual religious practices and spirituality.

On the other hand, it is conceivable that increased diversity in terms of religions, ethnicities, and languages may hinder the role of religion in societal affairs. This may happen if such plurality lowers the power of social and governmental entities to impose the rules and values of a particular religion on broader society. Exposure to different religious and cultural traits may also lower the importance of religion. For example, it can cause people to acknowledge that religion is a cultural reality as opposed to reflecting the voice of supernatural powers.

Exploiting the exodus of Homo sapiens of out of Africa tens of thousands of years ago as the source of identifying variation, we estimate the effect of genetic diversity on three distinct outcomes of religion. We begin our analysis by employing data from Murdock's Ethnographic Atlas (EA) (Murdock 1967), and the Standard Cross-Cultural Sample (SCCS) (Murdock and White, 1969) to examine the impact of genetic diversity on belief in high gods in the pre-colonial era. Next, using information from the International Religious Freedom Data (IRF), and the Pew Research Center's Global Restrictions on Religion Data (GRRD), we test whether genetic diversity affects the relative standing of religion in social interaction in the current era. Lastly, we estimate the impact of genetic diversity on religiousness of individuals utilizing data drawn from the World Values Survey (WVS).

Results show that, prior to colonization, a greater degree of genetic diversity caused an increase in the likelihood of belief in omniscient, omnipresent, omnipotent, and moralizing deities.

Analysis using contemporary data on informal and formal regulation of religion documents that population diversity has a direct effect on the likelihood of both social, and governmental involvement with religion through regulations and restrictions. Finally, employing survey data from the WVS, we find evidence that increased within society heterogeneity has a positive impact on self-reported religiosity indicators as measured by being a believer, degree of piousness, importance of belief, and religious participation. These findings survive a number of sensitivity tests.

The current research contributes to different strands of literatures. First, we show that belief systems and religious practices are the byproducts of developments that took place more than 50,000 years ago. Second, in line with explanations arguing that religion emerged as a solution to cooperation problem, our findings in the precolonial era imply that genetic differentiation, a first order determinant of the complexity of social environment, have played an important role in emergence of belief in supernatural surveillance. Third, estimates of the impact of genetic diversity on outcomes of religion in the current era suggest that population diversity contributed to the persistence of religion as well. That is, in societies with higher levels of population heterogeneity: (i) religion takes a greater role in social interaction via influencing various forms of regulation and conflict; (ii) and individuals are more likely to believe in god and comply with religious rituals. Lastly, our study also supplements the rising literature documenting the significance of macrogenetic structure of human societies in defining the long-run economic, political, and social outcomes.

The rest of the article is organized as follows. Section II describes the ‘Out of Africa” hypothesis, upon which our identification strategy rests, and discusses the role of genetic diversity in shaping the world history. Section III summarizes the related literature and highlights the conceptual framework. Section IV describes the data sets used in the analysis. Section V lays out the empirical methodology. Section VI presents the results and performs the robustness tests pertaining to the models estimating the impact of within society genetic variation on conceptions of god. In a similar fashion, sections VII and VIII undertake the analysis of the impact of genetic diversity on (societal and governmental) regulation of religion, and individual level religiosity indicators, respectively. Finally, Section IX concludes.

II. The 'Out of Africa' Hypothesis and the Prominence of Macrogenetic Structure

The Exodus of Homo Sapiens out of Africa and Genetic Diversity

The recent African origin model (RAO) argues that anatomically modern humans (i.e., Homo sapiens) originated in East Africa. This hypothesis, which is also known as the 'Out of Africa' theory of human evolution, proposes a single area of origin for Homo Sapiens. That is, Homo erectus evolved into Homo sapiens *first* around Ethiopia about 200,000 years ago (Lewin, 1987). This premise is backed by the discovery of anatomically modern human fossils in the Middle Awash archeological site along Awash River in Ethiopia (Clark et al., 2003).[4]

According to the 'Out of Africa' hypothesis, Homo sapiens migrated out of East Africa and dispersed to all around the world roughly between 50,000 to 100,000 years ago, through a chain of migrations to the Middle East, Europe, Asia, Oceania and Americas. Figure 1 displays the prehistoric migratory tracks through which the dispersals of anatomically modern humans took place (Ramachandran et al. 2005). Population geneticists argue that this dispersion shaped human population-genetic variation across the globe through a series of founder effects, defined

[4] Albeit less popular, an alternative explanation, the Multi-Regional Evolution Theory, argues that Homo erectus first dispersed out of Africa; then, evolved into modern humans in several different places around the globe (White et al. 2003).

as the loss of genetic variation via establishment of a new population group by a subset of the larger population. Given that the movements occurred as sequential steps over time, each succeeding departure involved a sub-population of founders from the previous colony at the front of expansion. These series of founder effects caused a stepwise increase in genetic drift; hence, a decrease in genetic diversity along the migratory routes.[5]

Empirical evidence based on DNA sequencing support this argument. For example, using data from the HGDP–CEPH Human Genome Diversity Cell Line Panel of 53 indigenous ethnic groups, each of whom was genotyped for 783 autosomal microsatellite loci- short repetitive parts of DNA, allelic frequencies, Ramachandran et al. (2005) show that the average heterozygosity at these microsatellite loci as a measure of genetic diversity decreases linearly with geographical distance from East Africa via migratory tracks. Using a larger data set, containing information on expected heterozygosity of more than 230 population across the globe, Pemberton et al. (2013) also verify such inverse relationship between genetic diversity and migratory distance to East Africa.[6] Figure 2 summarizes this inverse relationship between migratory distance to Addis Ababa and genetic diversity using data from Pemberton et al. (2013).

The Significance of Genetic Diversity

[5] Genetic drift, gene flow, mutation, non-random mating, and natural selection are forces that drive changes in composition of gene pool, allele frequencies, in a population.

> "Genetic drift occurs as the result of random fluctuations in the transfer of alleles from one generation to the next, especially in small populations formed, say, as the result adverse environmental conditions (the bottleneck effect) or the geographical separation of a subset of the population (the founder effect). The result of genetic drift tends to be a reduction in the variation within the population, and an increase in the divergence between populations."
>
> http://www2.le.ac.uk/departments/genetics/vgec/schoolscolleges/topics/population-genetics

[6] A handful of other articles testing the "Out of Africa" hypothesis, confirmed that human genetic differentiation is inversely related to migratory distance from East Africa (Harpending and Rogers 2000; Prugnolle, Manica, and Balloux 2005; Ashraf and Galor 2013a).

A growing number of studies in economics link various measures of diversity, captured by the degree of heterogeneity within a population in terms of ethnicity, language, and religion, to economic, political, and social outcomes, including comparative economic development, quality of institutions, provision of public goods, and civil war (Alesina and La Ferrara, 2005; Habyarimana et al 2007; Alesina et al 2003; Fearon, 2003; Montalvo and Reynal-Querol, 2005; Estaban et al 2011; Easterly and Levine 1997; Desmet et al. 2012).

To advance the body of work examining the role of diversity, Ashraf and Galor (2013a) investigate the impact of genetic diversity on economic development. Their study identifies the impact of genetic diversity by exploiting the power of serial founder effect in predicting within society genetic variation across planet Earth. In a parallel article, these authors formally establish why it is vital to study the effects of genetic diversity. That is, using distance from Addis Ababa as an instrumental variable, Ashraf and Galor (2013b) show that genetic diversity, a byproduct of prehistoric exodus of anatomically modern humans out of Africa, is a root cause of within country ethnic and cultural fragmentation, quantified by the number of ethnic groups, the extent of ethnic and ethnolinguistic fractionalization, and polarization. This conclusion and the availability of migratory distance from the cradle of human civilization as the source of exogenous variation in within society population diversity empowered researchers to study the impact of genetic differentiation on economic, political and social outcomes.

The revolutionary study of Ashraf and Galor (2013a) shows a hump shaped (first increasing and then decreasing) relationship between genetic differentiation and comparative economic development. This finding is attributed to opposing effects of diversity on the development process. On the one hand, increased innovation and competition due to diversity is likely to have favorable effects on prosperity. On the other hand, fractionalization may hinder growth due to mistrust, lack of cooperation, and conflict. They conclude that prosperity increases in genetic diversity until the marginal product of diversity becomes zero around the intermediate levels of diversity, and further increases in genetic differentiation beyond the optimal levels have detrimental effects on development. In a follow-up article, this result is confirmed by Ashraf, Galor and Klemp (2015), using more granular data on observed genetic diversity of 230 ethnic groups and predicted genetic diversity of 1331 ethnic groups.

Following Ashraf and Galor (2013a, b), a new line of literature studying the impact of genetic diversity on various economic, political, and social outcomes has emerged.[7] For instance, in line with the view that elevated heterogeneity leads to lower levels of trust and cooperation, Arbatli, Ashraf and Galor (2016) documents that genetic diversity has been a key determinant of the onset, intensity and reoccurrence of intrastate conflict since 1960s.

Galor and Klemp (2017) examine the impact of population diversity on emergence and persistence of extractive institutions. They argue that genetic diversity has shaped the evolution of institutions in two iterations. Initially, within society heterogeneity stimulated the formation of institutions favoring social cohesiveness as a solution to cooperation problem due to diversity. Nevertheless, heterogeneity in cognitive and physical traits in genetically diverse societies gave rise to economic inequality and class stratification, which eventually caused the emergence of more autocratic and extractive institutions.

Depetris-Chauvin and Özak (2017) study economic specialization in pre-modern societies as a function of genetic diversity. They conjecture that the availability of a wide spectrum of skills, abilities, and cognitive capacity in genetically diverse societies may increase economic specialization and therefore gains from trade, which then entails the existence of state

[7] For a review of this literature see Ashraf and Galor (2017).

like institutions for solving coordination and enforcement problems associated with trade. Their empirical analysis documents that, in the pre-colonial era, genetic diversity gave rise to economic specialization in various production activities, trade and statehood. Using contemporary data, their further investigation shows that places occupied by pre-colonial societies with greater specialization have greater occupational heterogeneity and higher light intensity, which is an alternate measure of development.

There is also evidence that genetic diversity is linked to better health. Using the aforementioned identification strategy, Cook (2015) shows that through its effect on human leukocyte antigen (HLA) system, increased genetic diversity causes a decline in infectious disease mortality and therefore increases longevity.

III. Conceptual Framework and Related Literature

Swanson (1960) uses data from Murdock's World Ethnographic Atlas to perform an empirical test of the implications of Durkheim's theory of religion. Specifically, he investigates the relationship between the number of hierarchically organized sovereign groups and belief in moralizing gods, as well as examining which specific social relationships (such as sovereign state, family, clan, and chiefdom) are associated with what kind of super natural beliefs, e.g. belief in high gods, polytheism, and ancestral spirits. He finds that the number of hierarchically organized sovereign groups, defined as original and independent jurisdiction over some sphere of life, in a society is directly associated with the presence of a high god, described as an omniscient, omnipresent, omnipotent, and moralizing deity. Swanson (1960) concludes that this finding is consistent with the argument that religion acts as a cooperation tool for a sovereign group trying to achieve cohesion among subordinate sovereign groups. Underhill (1975) revisits this question relying on a Marxian approach of religion, which asserts that religion is the reflection of existing economic and social relationships. His analysis demonstrates that belief in high gods is strongly related to the economic and political complexity of society.[8]

As demonstrated by Galor and Klemp (2017) and Depetris-Chauvin and Özak (2017), in the pre-colonial era, evidence shows that genetic diversity has a positive impact on economic and political complexity. In light of this evidence, we conjecture that genetic diversity may lead to an increase in the likelihood of belief in high gods as a solution to cooperation problem during earlier stages of humanity.

As population diversity has persistent effects on political and economic complexity of today's societies (Ashraf and Galor, 2013; Arbatli, Ashraf and Galor 2015; Galor and Klemp 2017; Depetris-Chauvin and Özak, 2017), increased within society heterogeneity can also influence the outcomes of religion in the current era through various and potentially contradicting mechanisms. For instance, while genetic differentiation can induce belief in moralizing deities, such as following a monotheistic religion, it may also cause the proliferation of different religions, cults and sects. Different ethnicities and cultures may choose to adhere to different religions or different denominations within a given belief system to protect their identity if faith plays a key role in uniting people behind a common identity. According to the club model of religion illustrated by Iannaccone (1992), and Berman (2000), religious organizations, such as congregations, cults, and sects, are efficient providers of various public

[8] In line with these arguments, belief in all-knowing, watchful, and morally concerned deities is found to be associated with prosocial behavior (Norenzayan, and Shariff, 2008; Purzycki et al., 2016) and increased societal cooperation (Johnson, 2005) among genetically unrelated large groups, which are beyond their kinship units. There is also evidence that belief in such gods provided fitness advantages in intergroup competition, and it became a fundamental component of prosocial world religions like Christianity, Islam, and Judaism (Shariff, Norenzayan and Henrich, 2011; Johnson and Kruger, 2004; Johnson, 2005; Iyigun 2007). In addition to belief in a moralizing deity, Guiso, Sapienza, and Zingales et al. (2003) show that religiosity in general is directly associated with economic attitudes conducive to higher per capita income growth.

goods and services based on voluntary exchange. Importantly, if increased fragmentation and intrastate conflict leads to the suboptimal provision of public goods by government and/or a failure to meet the nuanced demands of different groups, the importance of such religious organizations may be magnified. Consistent with this view, a handful of studies show that there exists a substitution relationship between the services provided by government and organized religion. Gill and Lundsgaarde (2004) find that welfare expenditures are inversely related to church attendance across countries. Frank and Iannaccone (2014) find evidence for a negative effect of welfare spending on church attendance in eight European countries, Canada, and the United States. Hungerman (2005) shows that a decrease in the availability and use of welfare services, induced by the 1997 welfare reform, led to an increase in church activity in the United States. While the coexistence of various belief systems and religious entities may cause individuals to be more religious through increased competition in the market for religion, witnessing different religious practices and belief systems, and interacting with those who follow other faiths may have a counterbalancing impact on piousness.

If religion becomes a vital part of social interaction because of increased diversity, it stands to reason that societies may choose to regulate religious activity and/or impose restrictions involving religion. Note that while such regulations may be based on informal social contract, they may also appear as written laws. For instance, governments may have incentives to regulate the market for religion and/or favor/oppose to certain religions depending on the ability of religion to confer legitimacy on political rulers, helping them claim more compliance and revenue from populace (Gill, 1998, 2008; Cosgel and Miceli, 2009). Conversely, one may also argue that joint presence of different ethnic and religious groups may have the opposite effect on the likelihood of both societal and government involvement with religion if such plurality lowers the power of society and/or government to impose religious norms and rules (Barro and McCleary 2005; Cosgel et al 2017).

On another note, Aghion et al. (2010) document a strong relationship between the level of distrust in a society and state regulation of different measures of economic activity. They conclude that citizens of countries with low-trust levels demand more government intervention although they know that government is corrupt. Given that genetic diversity negatively affects the level of trust (Arbatli, Ashraf, and Galor, 2015) and quality of institutions (Galor and Klemp 2017), it may increase state's and society's involvement with religious activity through imposing rules and regulations due to motives driven by religion and/or implementing policies that favor certain religious groups over others.

Lastly, according to a group scholars in evolutionary psychology and cognitive science, religion may be predisposed in human brain due to natural selection. They view religion as a product of certain cognitive processes and argue that religion may have emerged from the evolution of mind and brain, which might be the result of dealing with important and recurrent problems associated with survival in the ancestral past. Preconditions such as agency detections, imagination, and social learning that evolved for reasons unrelated to religion or concept of god gave rise to certain mental capacities that religion exploits to display costly rituals and beliefs in supernatural agents (Boyer, 2001; Atran, 2002; Barrett ,2004). This explanation does not necessarily contradict the role of external factors, such as population diversity, in promoting the emergence and persistent of religion. Instead, if human brain is predisposed with a cognitive architecture suitable to believe in supernatural agents, it may help magnifying the effect of genetic diversity on outcomes of faith.

IV. Data

This section introduces the data used in the analysis. In addition to information on genetic diversity, we use data from multiple sources capturing the significance of religion both at the individual and societal levels. The outcomes we analyze include (i) measures for conceptions of god, (ii) indexes for social and state involvement with religion, (iii) and self-reported piousness indicators.

Data on Genetic Diversity

To quantify the extent of within population genetic variation, geneticists use the expected heterozygosity measure. Similar to other diversity measures, this index may be interpreted as the probability that two randomly selected individuals from a given population will differ with respect to a given range of genetic traits. The expected heterozygosity measure is constructed by population geneticists using allele frequencies in genome. More formally, suppose that genetic locus l has M_l distinct alleles with frequencies $p_{l1}, p_{l2}, \dots, p_{lM_l}$ such that $\sum_{i=1}^{M} p_{lM} = 1$. Then, the expected heterozygosity in locus l is calculated as $H_l = 1 - \sum_{i=1}^{M_l} p_{li}^2$. The expected heterozygosity for L loci in genome is $H_{exp} = \frac{1}{L}\sum_{l=1}^{L}(1 - \sum_{i=1}^{M_l} p^2{}_{li})$, which is the average expected heterozygosity, and regarded as an estimate of genome-wide genetic diversity.

For ethnic group level analysis in the Murdock's Ethnographic Atlas (EA), the expected heterozygosity measure is based on Pemberton et al. (2013), which is the most comprehensive human population genetic dataset available up to date. This dataset, making use of information on 5795 individuals from eight human population genetic datasets and combining them at 645 common microsatellite loci, contains expected heterozygosity for 267 population across the world. Following Galor and Klemp (2017), and Depetris-Chauvin and Özak (2015), we calculate predicted genetic diversity for each ethnic group in the EA, using the estimated relationship, to estimate the effect of within society population heterogeneity on conceptions of god.

Furthermore, we are able to estimate the relationship between observed genetic diversity and measures of conceptions of god by merging Pemberton (2013) with the EA, which provides information on conceptions of god. While such information can be combined for only 75 ethnic groups in the Pemberton data, this exercise significantly enhances our analysis.

In the country level analysis of contemporary religiosity outcomes, we use ancestry-adjusted predicted genetic diversity measure constructed by Ashraf and Galor (2013). Their measure considers the obstacle posed by the fact that the populations of current societies are largely not indigenous to the places they live, and may consist of more than one ethnic group. To overcome this problem, they first account for the influence of post-1500 population movements on contemporary diversity by constructing average expected heterozygosity weighted by post-1500 population flows. Second, they integrated the diversity that stems from differences between ethnic groups constituting the population of a country by incorporating genetic diversity of pre-colonial ancestral population of the current subnational population in the light of the fact that genetic distance between any two population increases as the migratory distance between them gets larger.[9]

Data on Conceptions of God

Information on divine surveillance come from the Ethnographic Atlas (EA) (Murdock, 1967), which is a worldwide ethnic level dataset constructed by George Peter Murdock that contains information for 1267 ethnic groups. This data set was constructed to enable comparative

[9] See Ashraf and Galor (2013) for a detailed discussion about the construction of this index.

analysis in social sciences (e.g., anthropology, history, political science, psychology, sociology) prior to industrialization. Each data point in the EA was created using the earliest available information. While such information come from written sources when available, the EA uses information from the earliest observation possible for the societies without a written history. Although for some societies the earliest observations come from as late as the 20th century, Murdock's Ethnographic Atlas targets to capture the ethnic group characteristics preceding the European colonization (Alesina, Giuliano, and Nunn 2013). The EA contains a rich set of variables including social organization, economic structure, technology adoption, language characteristics and belief in supernatural screening.

The measures of conceptions of god are created using the variable High Gods, which is defined as "a spiritual being who is believed to have created all reality and/or to be its ultimate governor, even though his sole act was to create other spirits who, in turn, created or controls the natural world" (Murdock 1967, p.52). There are 632 societies with non-missing information on both High Gods variable and geographic controls in the EA.[10] Each society is placed into one of the four mutually exclusive categories with respect to the presence of High Gods as follows: (i) "Absent or not reported," (ii) "Present but not active in human affairs," (iii) "Present and active in human affairs but not supportive of human morality," and (iv) "Present, active, and specifically supportive of human morality" (Divale 2000). Using this information, we construct three dichotomous variables reflecting varying degrees of belief in supernatural punishment. *High God* is set equal to 1 for societies in which a high god is present, and it is set equal to 0 otherwise. *Active High God* is coded as 1 for cultures with a present active high god, and it is

[10] The EA includes 748 societies with information High Gods. However, geographic covariates are only available for 632 of them. The results are very similar to our main estimates when we estimate the effect of genetic diversity on conceptions of gods using the full sample without specifying geographic covariates.

coded as 0 for those without a present active high god. Finally, the binary variable *Moralizing High God* reflects the presence of an active high god supportive of human morality. *High God*, *Active High God*, and *Moralizing High God* represent the presence of level of supernatural punishment as low, medium, and high, respectively (Johnson, 2005).

As the 1267 societies included in the sample are not independent from each other due to common origin and interactions among them, analysis using the EA may suffer from correlated error terms, which is also described as Galton's problem in cross-cultural analysis. To get a handle around this issue, Murdock and White (1969) grouped that in 186 clusters of closely related cultures to come up with the Standard Cross-Cultural Sample (SCCS), which is arguably more suitable for cross-cultural analysis (Alesina, Giuliano, and Nunn 2013). Therefore, we also use the SCCS, which is a subset of the EA that includes more than 2000 variables on various characteristics of 186 preindustrial societies, at a time when cultural independence was maximal. In the SCCS sample, there are 141 observations with information on High Gods variable and geographic controls.[11]

Data on Societal and Governmental Involvement with Religion

We employ information from two different sources to explore the impact of genetic diversity on persistence of religion in social interaction in the current era. Specifically, International Religious Freedom Data (IRF) and Pew Research Center's Global Restrictions on Religion Data (GRRD) provide information on societal and governmental involvement with and/or regulation of religion.

[11] We obtain similar results when we estimate the impact of genetic diversity on measures of supernatural screening using all the of available 186 observations without controlling for geographic variables.

Using multiple measures from the U.S. Department of State's International Religious Freedom Reports, Grim and Finke (2006) came up with country level indexes summarizing the degree to which societal norms and governments intervene in people's lives.[12] The *Social Regulation of Religion* index (IRFSRI) and the *Government Regulation of Religion* index (IRFGRI) are constructed using data from 196 countries and territories around the globe.

The IRFSRI represents the degree to which societal norms and culture regulates religious practices and or impose restrictions on people's lives because of religion. Specifically, Grim and Finke (2006) define social regulation as "the restrictions placed on the practice, profession, or selection of religion by other religious groups, associations, or the culture at large" (p. 6). What this index captures ranges from subtle conventions and norms imposed by the culture of the larger society to extreme cruel acts undertaken by militia groups due to religion (Grim and Finke 2006). While the items contributed to the creation of this index may or may not have been defined by governmental actions, they can be equally or more restrictive of religion (Grim and Finke 2006). The values of IRFSRI ranges between 0 and 10 with lower values indicating less regulation. In the analysis, we use the natural logarithm of the average for all the available survey years, including 2003, 2005 and 2008.

The second measure we borrow from the IRF pertains to state's involvement with religion. Specifically, the IRFGRI captures "*the restrictions placed on the practice, profession, or selection of religion by the official laws, policies, or administrative actions of the state"* (Grim and Finke, 2006, p. 5), including imposing limits on religious freedom, foreign missionary

[12] The U.S. Department of State initiated issuing the International Religious Freedom Reports with the enactment of the 1998 International Religious Freedom Act. Information compiled in these reports is based on U.S embassies' evolution of religious freedom, adhering to a common set of guidelines, in their host countries. With respect to bias that may emerge in these report, Grim and Finke (2006) claim "that there was remarkably little evidence of editing that would fatally bias the data" (p. 11).

activities, proselytizing, and worships. This index also varies between 0 and 10 and higher values pertains to a greater degree of government regulation. We use the natural log of the average values of IRFGRI for all the available years, 2003, 2005 and 2008.

The second set of social and state involvement with religion variables come from the PEW research center's GRRD, which contains information on social hostilities involving religion and government restrictions on religion for more than 190 countries across the globe for the period 2007-2014. *The Social Hostilities Index* (PEWSHI) is a composite measure made of 13 indicators of social animosities involving religion, such as measures that are related to crimes and violence provoked by religious hatred in society. The PEWSHI ranges between 0 and 10, where higher values indicate greater hostility. *The Government Restriction Index* (PEWGRI) is also a composite measure constructed by using 20 indicators of government restrictions on religion, capturing such things as limits on proselytizing, foreign missionary activities, religious worships, and freedom of religion in the constitution. Similar to the PEWSHI, this index also ranges from 0 to 10, and higher values indicate greater degrees of restrictions. In the analysis, we specify the natural log of PEWSHI and PEWGRI averaged over all the available years as dependent variables.

Note that while what these indexes measure is not necessarily very specific, they are fairly reasonable proxies capturing the degree of importance assigned to religion in a society. At a minimum, the use of these covariates as dependent variables allows us to test whether genetic diversity causes religion to be an important component of social interaction.

Data on Piousness of Individuals

The analysis pertaining to the religiosity of individuals is implemented using data from the World Values Survey (WVS), which is integrated with the European Value Survey (EVS).[13] Between 1981 and 2014, the WVS completed six waves which were conducted in a total of 106 countries and surveyed more than 500,000 respondents.

Our first individual level religiousness measure is constructed using responses to the following survey item: "Independently of whether you attend religious services or not, would you say you are*"* [with possible responses] "a religious person (=1)"; "not a religious person (=2)"; "an atheist (=3)." We construct the dichotomous variable *Believer*, which indicates whether the survey respondent reported himself or herself as a believer (as opposed to an atheist). Similarly, using the same survey question, we construct the dichotomous variable *Religious* is set equal to 1 for those who declared themselves as religious, and it is coded as 0 for those reported themselves as a not religious or an atheist person.

Standard religiosity measures employed in the literature also include covariates reflecting how important god and religion are in people's lives. Using the following survey question, we create a binary variable capturing the significance of religion: "Please say, for each of the following, how important it [religion] is in your life." Available options include "Very important (=1)"; "Rather important (=2)"; "Not very important (=3)"; and "Not very important (=4)." We code *Religion Important* as 1 for respondents who declared that religion is very important or rather important for them, and 0 otherwise. Similarly, we constructed an analogous variable representing the relative importance of god in a person's life using the following question: "How important is god in your life?" Possible answers range between "Not at al important (=1)" and

[13] We merge WVS with EVS as it is described in http://www.worldvaluessurvey.org/WVSContents.jsp. We use the integrated data in the examination of individual religiosity.

"Very important (=10)." The dichotomous *God Important* variable is set equal to 1 for those who rated god's importance as six or higher and 0 otherwise.[14]

Frequency of attendance to the place of worship is another religiosity indicator used in the literature. This measure is based on the question: *"*Apart from weddings, funerals and christenings, how often do you attend religious services?*"* Responses range on 7-scale point from "never (=1)", to "more than once a week (=7)." Considering that regular religious participation is often times a weekly occurrence, the binary variable *Attend Weekly* is set equal to 1 for those who declared attending religious services at least once a week or more than once a week and 0 otherwise. Analysis of religious participation based on the frequency of attending the place of worship may fail to capture the piousness of a person if he or she belongs to a religious tradition that does not require routine formal gatherings. For example, unlike Christianity, Judaism, and Islam, some religions, including Buddhism and Shintoism, do not have the notion of regular temple attendance as a component of practicing religion. To address the potential limitation of *Attend Weekly* in representing piousness, we construct another indicator of religious participation using answers to the following question: "How often do you pray or meditate outside of religious services?" Possible answers range from "Several times a day (=1)" to "Never, practically never (=8)." *Pray Weekly*, which captures the frequency of praying and/or meditating independent of temple attendance and/or participating in religious ceremonies, measures whether the respondent prays at least once a week, or more than once a week on her own.

[14] Results are robust to constructing the *God is Important* variable in alternate ways, including using the raw 1 to 10 scale, normalizing the 1 to 10 scale to mean zero and standard deviation of 1, and choosing a cut-off value of 7 or 8 instead of 6.

To supplement the analysis in the WVS and test the robustness of our estimates, we also use data on individual level religiosity obtained from other multinational surveys, the International Social Survey Program (ISSP), the PEW Research Center's Global Attitudes & Trends Survey, and the Global Barometer. We use similar questions from these surveys to generate religiosity measures analogous to the ones presented above for the sake of conducting a consistent analysis. In the empirical analysis, we use ~~the natural log of~~ individual level religiosity indicators aggregated at the country level.

V. Econometric Framework

We examine the link from genetic diversity to outcomes of faith using three different set of outcomes: (i) measures of conceptions of god; (ii) individual level religiousness indicators; and (iii) social and governmental regulation of religion indexes.

Equation (1) estimates the impact of genetic diversity on measures of conceptions of god in the pre-colonial sample:

(1) $$G_s = \beta_0 + \beta_1 PGD_s + \beta_2 \delta_s + C_s^k + \varepsilon_s$$

where G_s represents belief in high gods, active high gods, and moralizing high gods in society s depending on the estimated equation; PGD_s is the predicted genetic diversity; δ_s is the vector of societal level control variables including the natural logarithm of absolute latitude, terrain ruggedness, mean elevation, suitability of soil for agriculture, mean annual temperature, temperature range and distance to the closest river; C_s^k indicates whether society s is located in continent k; and ε_s is the idiosyncratic error term.

In equation (2), we test if the estimated relationship between population heterogeneity and conceptions of god hold when we replace PGD with observed genetic diversity:

$$(2) \qquad G_s = \Omega_0 + \Omega_1 OGD_s + \Omega_2 \delta_s + \mathcal{C}_s^k + e_s$$

where OGD is the observed genetic diversity we obtained from Pemberton (2013). The remaining parameters and covariates are specified analogously to equation (1). If factors that are not captured by continent fixed effects and observable societal characteristics influence both genetic diversity and conceptions of god, equation (2) may produce a biased estimate of Ω_1. To address this concern, we employ distance to East Africa as an instrumental variable. Equation (3), depicts the first stage effect of migratory distance from Addis Ababa to OGD:

$$(3) \qquad OGD_s = ¥_0 + ¥_1 MDIST_s + ¥_2 \delta_s + \mathcal{C}_s^k + ¢_s$$

where MDIST is the migratory distance from Addis Ababa. The validity of the instrumental variable strategy at hand relies on the assumption that, conditional on continent fixed effects and exogenous geographic controls, migratory distance from East Africa is orthogonal to the outcomes of interest. In other words, within society genetic variation is the only channel through which MDIST is linked to the outcomes of interest.

Next, we turn our attention to the relationship between genetic diversity and the likelihood of societal and state involvement with religion in the current era. To do so, we use data from the IRF and GRRD to estimate the following equation:

(4) $$RR_c = \lambda_0 + \lambda_1 AAGD_c + \lambda_2 \mathcal{X}_c + \mathcal{C}_c^k + \tilde{n}_c$$

where RR_c pertains to the indexes of informal and formal involvement with religion in country c, $AAGD_c$ is the ancestry adjusted genetic diversity, $\mathcal{X}_c$ is a set of country level exogenous covariates including mean elevation, dispersion in elevation, total land area, absolute latitude, terrain roughness, land suitability for agriculture, range of land suitability, mean distance to nearest waterway, precipitation, and temperature; $\mathcal{C}_c^k$ represents continent fixed effects, and $\tilde{n}_c$ is the white noise.

Finally, following upon Ashraf and Galor (2013b), and Arbatli, Ashraf, and Galor (2015), we exploit individual level data from the WWS aggregated at the country level to estimate the models of the form:

(5) $$IR_c = \psi_0 + \psi_1 AAGD_c + \psi_2 \mathcal{X}_c + \mathcal{C}_c^k + £_c$$

where IR_c is one of the self-reported piousness measures pertaining to belief in supernatural powers, the degree of religiousness, importance of religion, importance of god, and religious participation for country c. The remaining covariates are constructed analogously to equation (3).

Note that we regress the measures of social and governmental involvement with religion indexes and individual level religiosity indicators in equations 2 and 3 on the contemporary ancestry adjusted genetic diversity measure using an ordinary least squares estimator. Because the *AAGD* is adjusted based on post-1500 migration flows, the estimated coefficient on the contemporary measure of genetic diversity may be biased if factors determining such population movements are related to religiosity. For example, people living in highly diverse societies may have moved to countries with a lesser degree of genetic diversity to gain freedom to practice their religion, and/or they may have moved for missionary purposes to promote their faith among new populations. Therefore, following upon Ashraf and Galor (2013b), Arbatli, Asraf, and Galor (2015) and Galor and Klemp (2017), we use migratory distance from Ethiopia as an instrumental variable as a precursor of ancestry adjusted genetic diversity. Equation (6) articulates the first stage relationships between migratory distance from East Africa and AAGD:

$$(6) \qquad AAGD_c = \Phi_0 + \Phi_1 MDIST_c + \Phi_2 \mathcal{X}_c + \mathcal{C}_c^k + \mu_c$$

where MDIST is the migratory distance from Addis Ababa, and the rest of the variables in equation (6) are barrowed from equations (4) and (5).

VI. The Impact of Genetic Diversity on Conceptions of God

"*If God did not exist, it would be necessary to invent him.*" –Voltaire

This section analyzes of the impact of population diversity on conceptions of god in the precolonial period. Table 1 displays the summary statistics of all the variables used in the analysis for the EA and SCCS in panels A and B, respectively. Panel C presents the mean values for conceptions of god in the Pemberton (2013) sample, which provide information on observed genetic diversity. In the EA sample, 68 percent of the societies believe in existence of an omniscient, omnipresent, omnipotent *High God*. In 32.4 percent of the societies, high gods are considered active. Finally, in 26.3 percent of the sample, high gods are believed to be active and supportive of human morality. Rates of belief in supernatural screening are similar across the EA, SCCS, and Pemberton (2013) samples.

Table 2 presents findings from the estimates of equation (2) in the EA. In Panel A, we perform the univariate estimates of indicators for conceptions of god on predicted genetic diversity in a sample of 632 ethnic groups. In columns (1) to (3), a one percentage-point increase in genetic diversity is associated with a 3, 1.8, and 1.6 percentage point increase in the likelihood of belief in high gods, active high gods, and moralizing high gods, respectively. In each case, β_1 is statistically significant at the one percent level. Because PGD is constructed using a regression coefficient, which is a function of distance to East Africa, we also employ a two-step bootstrapping method to test the robustness of the standard errors, which are presented in square brackets when relevant. Inference based on bootstrapped standard lead to identical conclusions.

To capture the unobserved heterogeneity within continents, we control for continent fixed effects in Panel B. Accounting for continent specific unobservables causes the estimated coefficients in columns (1), (2) and (3) to increase by 48, 174, and 207 percent, respectively. This pattern suggest that genetic diversity is not randomly distributed across societies, and continent specific factors have played an important role in the formation of the relationship between genetic diversity and the evolution of religion; thus, failing to control for continent fixed effects may lead to biased estimates of β_1. In Panel C, we control for a host of society specific geographic covariates, including the natural logarithm of absolute latitude, terrain ruggedness, mean elevation, suitability of soil for agriculture, mean annual temperature, temperature range and distance to the closest river. Controlling for these variables should guard against the potential endogeneity of pre-historical migratory routes to the outcome of interest that may stem from differences between societies within a continent. For example, geographic factors, including elevation, climate and agricultural suitability could influence how the pre-historical migratory paths gradually emerged as well as the conception of god. Results show that accounting for exogenous geographic controls does not have a meaningful bearing on our estimates. In light of the findings shown in Panels A to C, we conclude that genetic diversity has a large, positive and statistically significant effect on belief in high gods as well as the notion that they impose moral values on humans.

If the ethnic groups in the EA are interrelated, results derived from this sample may be biased because of correlated error terms. To address this issue, in Table 3, we estimate the relationship between genetic diversity and conceptions of god in the SCCS. These estimates are 50 to 80 percent larger than the ones shown in Panel C of Table 2, suggesting that the potential interrelatedness between societies in the EA sample leads to the attenuation of β_1.

Next, we test whether our findings hold when we employ observed genetic diversity instead of PGD. This analysis is performed in the EA sample by using observed population diversity information on 75 ethnic groups that come from Pemberton (2013). In Panel A of Table 4, we start with estimating the effect of PGD on conceptions of god in the observed genetic diversity sample. Results are consistent with those presented in Tables 2 and 3.

In Panel B of Table 4, we show the estimates of measures of divine surveillance on observed population heterogeneity, measured by expected heterozygosity within ethnic group. In column (1), a one percentage-point increase in observed genetic diversity is associated with a (statistically insignificant) 16.6 percentage point increase in *High God*. In columns (2) and (3), one percentage-point increase in observed genetic diversity is linked to 13.8 and14.4 percentage point increase in *Active High God*, and *Moralizing High God*, respectively. If, for various reasons, both belief in supernatural punishment and genetic diversity are determined by common unobserved factors, these estimates may not represent the causal effect of genetic diversity on outcomes of interest. Equally important, potential measurement error in observed genetic diversity can bias Ω_1 toward zero.

Thus, following upon Galor and Klemp (2017), we use distance from Addis Ababa to address the potential endogeneity of OGD. The first stage relationship between migratory distance to East Africa and OGD is tested in Appendix Table 1. In column (1), we find that every 1000 km increase in distance from the home of the anatomically modern humans leads to a 2.5 percentage point decrease in observed heterogeneity in genetic material. In column (2), we test the nonlinearity in the relationship between OGD and distance East Africa via employing a quadratic specification. While both specifications show that OGD is a function of distance to Addis Ababa, the linear specification provides a better fit because it produces a larger first stage f-test value (19.08 vs. 9.56).

In Panel C of Table 4, we display the instrumental variable estimates of the effect of OGD on supernatural surveillance. The IV specifications produce coefficients which are 78 to 207 percent larger than the OLS estimates. This suggest that the potential measurement error in observed population heterogeneity is the dominant source of bias in OLS models (Acemoglu et al. 2001).

As previously discussed, belief in omniscient, omnipresent, omnipotent, and moralizing deities may be encouraged in complex societies as a solution to cooperation problem (Johnson, 2005; Norenzayan, 2013). We investigate whether such factors explain the relationship between diversity and conceptions of god. To do so, using the available information in the EA, we construct three variables measuring jurisdictional hierarchy beyond local community, economic specialization, and class stratification as proxy indicators.[15] In Appendix Table 2, we show that these complexity indicators are positively correlated with belief in divine screening. Next, we estimate the impact of genetic diversity on the aforementioned complexity measures in Appendix Table 3. Results show that genetic diversity has a positive and statistically significant effect on all three indicators of societal complexity. Finally, in Appendix Table 4, we descriptively explore whether and to what extent these covariates mediate the relationship between population diversity and conceptions of god. A caveat to employing these covariates as potential mediating mechanisms is the following. While it may be the case that genetic diversity impacts the outcomes of religion through these potential pathways, it is also possible that population diversity may be linked to measures of social complexity through its effects on religion. Hence, caution must be exhibited in interpreting the implications of these and similar mediation tests. The estimates of *High God*, *Active High God*, and *Moralizing High God* are shown in Panels A to C of Appendix Table XX, respectively. Results show that controlling for these measures explain up to 10 to 23 percent of the relationship between *PGD* and belief in supernatural punishment. This exercise provides evidence in line with the argument that the conditions of the economic, social, and political environment affected the evolution of religious beliefs.

VII. The Impact of Genetic Diversity on the Relative Role of Religion in Social Interaction

[15] The measure of jurisdictional hierarchy beyond local community (v33) has five levels: 1-no level (no political authority beyond local community), 2- one level (e.g. petty chiefdoms), 3-two levels (e.g. larger chiefdoms), 4- three levels (e.g. states), 5- four levels (e.g. larger states). Following Depetris-Chauvin and Özak (2017) economic specialization is defined as count of specialized activities at ethnic group level such as weaving and animal husbandry based on variables v44-v54 and v55-v65. Following Galor and Klemp (2017) we generate Class stratification based on variable v66 and it takes value 0 when the original variable indicates "Absence among freemen", 1 when it indicates "Wealth distinctions" or "Elite based on control of land or other resources", and 2 when it indicates "Dual hereditary aristocracy" or "Complex social classes".

We estimate the impact of ancestry adjusted expected genetic differentiation on indexes representing societal and governmental involvement with religion using the set of covariates presented in Table 5.

In Panel A of Table 6, we find that a one percentage-point increase in ancestry adjusted genetic diversity causes a 2.7 points increase in IRF's social regulation index (column 1), and a 1.8 points increase in PEW research center's social hostilities index (column 2). When we turn our attention to governmental involvement with religion in columns (3) and (4), we find that a one percentage-point increase in *AAGD* leads to a 1.7 and 1.1 points increase in the composite state regulation and restriction indexes constructed by IRF and PEW.

In Panels B and C, we sequentially add continent fixed effects and country level geographic controls, respectively. Results shown in Panels B and C document that the estimates of the impact of genetic diversity on indicators of informal and formal involvement with religion are robust to accounting for continent level unobservable heterogeneity and exogenous geographic controls. Note that we observe xx to xx percent increases in the estimated effect of genetic diversity from Panel A to C, which suggests that the endogeneity of genetic diversity to the outcome variables biases λ_1 towards zero.

If post-1500 population movements are caused by factors which are also related to the evolution of religion, OLS estimates of λ_1 may not necessarily correspond the causal impact of *AA~~P~~GD*. A further complication may arise if variables capturing the regulation of religion are measured with error as well. Specifically, when the outcome variable is measured with error, the confidence intervals for λ_1 may include values from both sides of the null value of zero. To account for the potential endogeneity of genetic differentiation, we use migratory distance from Addis Ababa linearly in column (1) and quadratically in column (2) in Appendix Table 5 as an instrumental variable to exogenously predict *AAGD*. As displayed in Appendix Table 5, the first stage regression of the impact of MDIST on the ancestry adjusted diversity documents a powerful relationship between the two. We also observe that the quadratic specification in column (2) provides a better fit as the associated first stage f-statistic is much greater.

We present the instrumental variable estimates of social and state regulation of religion in Table 7. Given that the first-stage f-statistic is about 100, the instrumental variable we employ meets the power requirement. We find that addressing the potential endogeneity of *AAGD* leads to 62 to 140 percent increase in the estimated coefficients. Furthermore, the IV estimates are statistically significant at least at the five percent level for each model we estimate.[16]

Next, we explore whether and to what extent the available covariates on potential mediating pathways explain the link between genetic differentiation and regulation of religion. We first estimate the impact of genetic diversity on these covariates in Appendix Table 6. We find that genetic diversity has economically and statistically significant effects on religious fractionalization (column 1), ethnic fractionalization (column 2), ethnolinguistic fractionalization (column 3), state failure index (column 4), and intrastate conflict (column 5).[17] We also explore whether these potential mediators are associated with measures of social and formal regulation of religion. Findings displayed in Appendix Table 7 show that, except religious diversity, and ethnolinguistic fractionalization, the associations between these measures and regulation of religion outcomes are usually statistically significant.

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[16] We also show results from models in which we instrument ancestry adjusted genetic diversity on linearly specified migratory distance from East Africa. As shown in Appendix Table AAA, these estimates are similar to those displayed in Table XX.

[17] Religious/ethnic/linguistic fractionalization ranges between 0 and 1, and measures the probability that two randomly selected people from a given country will not belong to the same religious/ethnic/linguistic group (Fearon and Laitin, 2003 Desmet et al. (2012).

In Appendix Table 8A, we test whether and how much controlling for these measures absorb the coefficient on *AAGD* in predicting IRFs social regulation index. Column (1) displays the baseline IV estimate in the mediation sample. In column (2), controlling for religious fractionalization causes a 16 percent increase in λ_1, suggesting that increased religious diversity has a counter balancing effect on the link between genetic diversity and social regulation of religion. Stated differently, coexistence of different religious groups due to genetic differentiation lowers the degree of social regulation of religion. In columns (3) to (7), we observe that controlling for ethnic fractionalization, linguistic fractionalization, state failure, intrastate conflict, and per capita income lower λ_1 by 3.5 to 32 percent. In Table 8B, we repeat the same exercise for PEWSHI and reach at very similar conclusions. The mediation exercises shown in Tables 8A and 8B suggest that while increased religious diversity lowers the likelihood of social regulation, ethnic and linguistic fractionalization seem to increase the degree of non-government regulation. Furthermore, these exercises suggest that higher levels of intrastate conflict and lower quality of governance, which resulted from increased genetic diversity, seem to play a larger role in increasing the extent of social regulation of as well as hostilities involving religion. In both cases, controlling for state failure index explain the greatest amount of variation between genetic diversity and the outcome of interest.

In Appendix Table 8C and 8D, we explore the potential role of these mediators in explaining the relationship between genetic differentiation and governmental involvement with religion. Estimates displayed in these two tables uniformly suggest that increased diversity, measured by religious, ethnic and linguistic differentiation, seem to lower the degree of state involvement with religion. However, greater levels of state failures and intrastate conflict due to genetic differentiation seem to increase the likelihood of government involvement with religion.

In particular, failed state index explains 48 and 51 percent of the relationship between genetic diversity and state involvement with religion in Appendix Tables 8C and 8D respectively.

A joint evaluation of the estimates presented in Appendix Tables 8A and 8D suggest that there is a relatively strong substitution relationship between the relative importance of religion and quality of governance.

VIII. The Impact of Genetic Diversity on Self-Reported Piousness

Using the variables displayed in Table 8, we estimate the impact of within country genetic diversity on measures of people's religiosity in this section. In Panel A of Table 9, we present the estimates of self-reported piousness indicators on ancestry adjusted genetic diversity without controlling for any other covariates in the specifications. Out of six models we estimate, only in one case (column 2), the estimated coefficient is statistically significant. In Panel B, when we control for continent fixed effects, we see a considerable increase in the effect sizes, and in two out of six cases the estimated relationship become statistically significant. In Panel C, specifying country level exogenous variables further increases both the magnitude and precision of our estimates. Specifically, in five out of six cases, $\psi_1$is statistically significant and the effect sizes range between 1.31 and 4.76. The pattern of results displayed in Panels A to C, suggest that the potential endogeneity of *AAGD* to self-reported religiosity attenuates the variation between genetic diversity and piousness of individuals.

To further guard against the endogeneity of AAGD, we next present the estimates form the instrumental variable estimation strategy in Table 10 where we specify the distance from East Africa and square of it as instrumental variables. The instrument at hand satisfies the power requirement because the first stage f-statistic is greater than 10 in every column. Results show that a one percentage-point increase in genetic diversity increases the self-reported rate of being a believer by 2 percentage points. The effect sizes for the coefficient of genetic diversity on being a pious, assigning a high importance to religion, and assigning a high importance to god are 5.3, 4.7 and 4.8 respectively. In columns (5) and (6), results show that a 1 percentage-point increase in genetic diversity increases the weekly rates of the place of worship attendance and self-prayer by (statistically insignificant) 1.7 and (statistically significant) 5.3 percent, respectively.[18]

To test of the robustness of the findings in the WVS, we used data coming from the surveys implemented by International Social Survey Programme (ISSP), Global Barometer (GB), and Global Attitudes & Trends Survey of PEW Research Center (PEW). Specifically, we constructed measures of self-reported religiosity indicators obtained from these surveys for survey questions which are asked analogously to those collected by the WVS. In Appendix Table 10, we display the estimates of the effect of genetic diversity on self-reported piousness indicators, constructed from the ISSP, (GB), and PEW surveys. Despite significant reductions in sample sizes, these findings are similar to those presented in Tables 9 and 10.

We explore also whether measures of fractionalization, institutional quality, intra-state conflict and income in explain the relationship between genetic diversity and self-reported piousness measures.[19] The descriptive mediation tests, which are displayed in Appendix Tables 11A to 11F, lead to conclusions which are very similar to the ones we performed for social involvement with religion measures presented in Appendix Tables 8A and 8B. That is, while

[18] In Appendix Table 9, we display the instrumental variables estimates of the impact of genetic diversity on religious adherence indicators using the linear migratory distance from East Africa as an instrumental variable. Albeit reduced precision in the first stage (i.e., lower f-statistic), these estimates produce a similar pattern of results.
[19] Estimates, displayed in Appendix Table 10, show that the associations between ethnic fractionalization, state failure index, and per capita income, and self-reported religiosity measures are usually statistically significant and economically meaningful.

increased religious fractionalization as a byproduct of genetic diversity seem to lower self-reported religiosity, we find that changes in ethnic differentiation, linguistic fractionalization, institutional quality, intrastate conflict, and income due to population diversity seem to increase the piousness of individuals. Although the indexes for non-governmental involvement with religion and the self-reported piousness indicators come from completely different sources, the fact that we observe a very similar pattern of results in analyzing these two set of outcomes increases our confidence in the validity of our estimates and the identification strategy.

IX. Conclusion

The current article is the first to examine the causal effect of the complexity of economics, political and social environment on outcomes of religion. In doing so, we rely on evidence documenting that genetic diversity is a byproduct of the exodus of early modern humans out of Africa. That is, every iteration in population movements through the prehistorical migratory tracks carried a subsample of the genetic pool from the origin to the destination; therefore, within society variation in genetic material declines in migratory distance from the cradle of human civilization. Exploiting distance from East Africa via migratory pathways as the source of exogenous variation, our estimates document that genetic differentiation has significantly affected the belief in supernatural screening as well as contributing significantly to the persistence of religion in the current era.

In the historical analysis, using ethnic group and society level ethnographic data from the EA and SCCS, we find that genetic diversity increases the likelihood of belief in high gods. These results are consistent with explanations suggesting that belief in supernatural powers emerged as a solution to cooperation problem.

Using data on social, and state involvement with religion in the contemporary era, we document that genetic diversity significantly increases the extent of societal, and governmental regulation of and involvement with religion.

Lastly, using survey data on self-reported religiousness indicators, we find that those who live in a genetically diverse society are significantly more likely to report being a believer, give a higher importance to belief, and exhibit religious participation.

Altogether our findings suggest that genetic diversity not only contributed to the rise of belief in moralizing deities but also greatly affected the persistence of the active role of religion in social interaction to this day.

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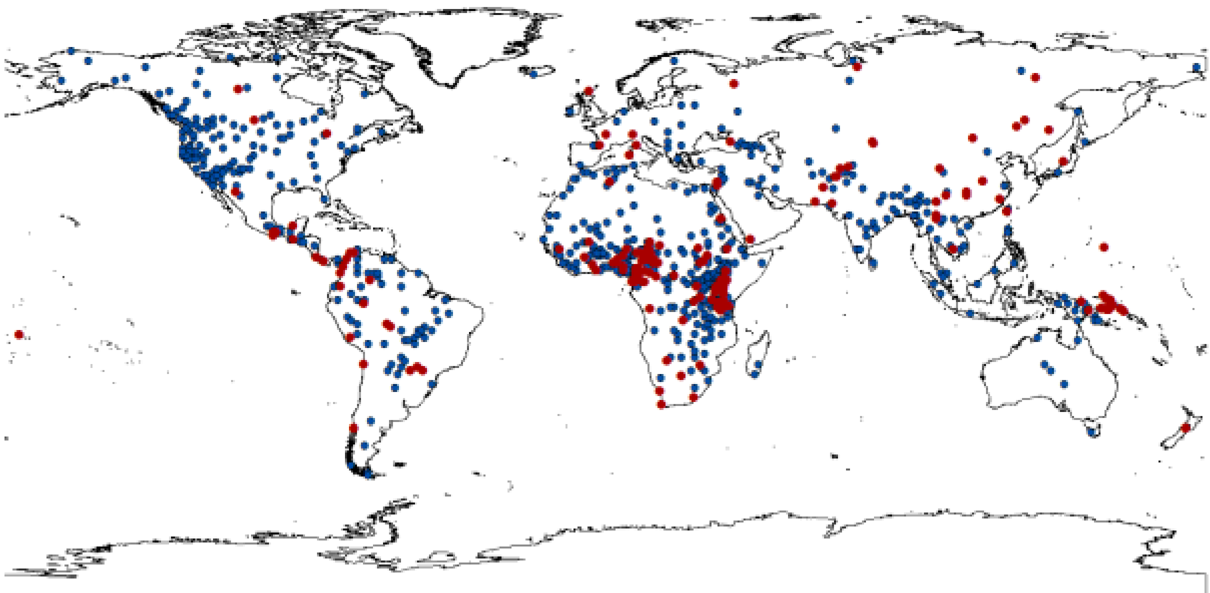


Figure X. This shows locations of ethnic groups used in the historical analysis. The sample of ethnic groups with known predicted genetic diversity is denoted by blue points; and the sample of ethnic groups for which observed genetic diversity available is marked by red points.

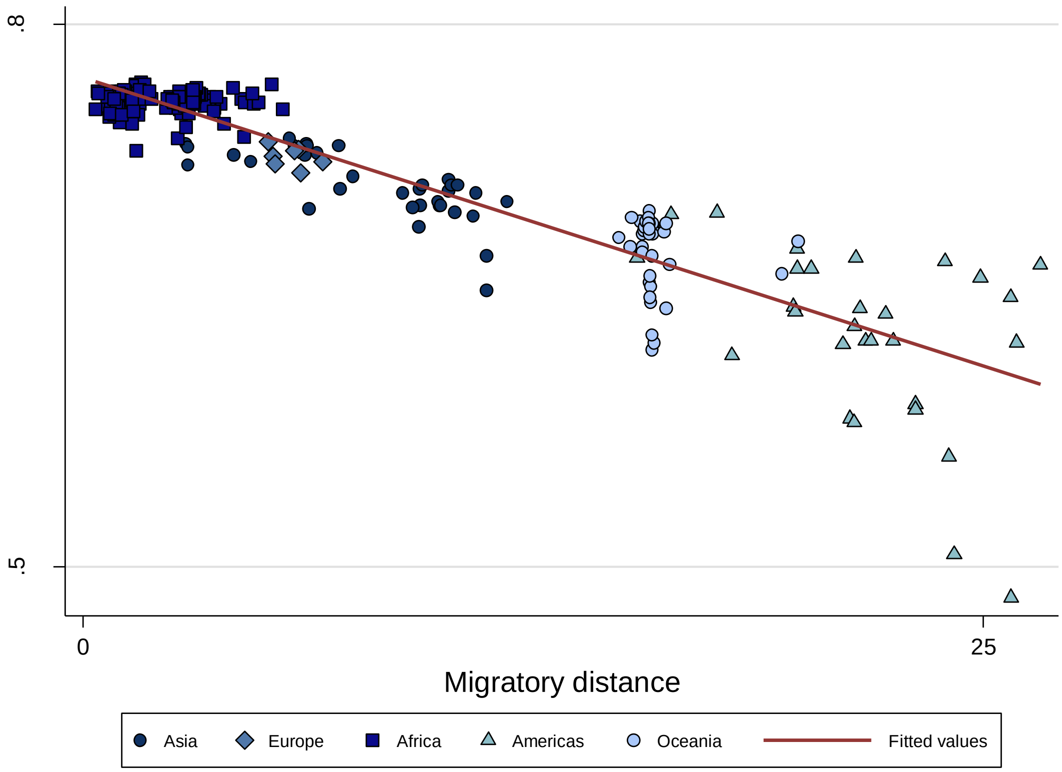
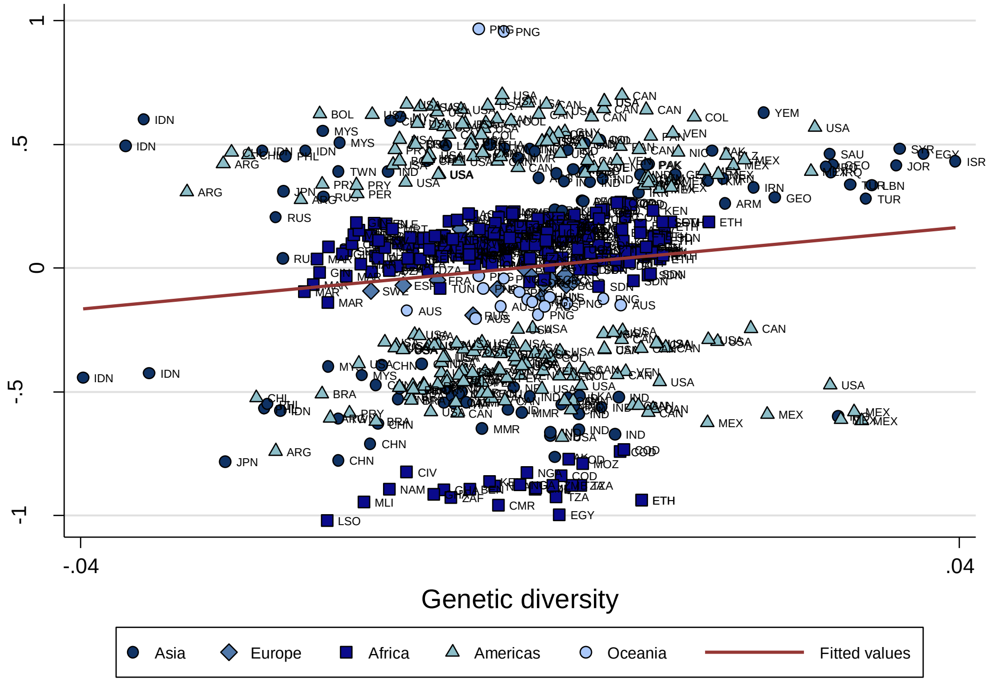
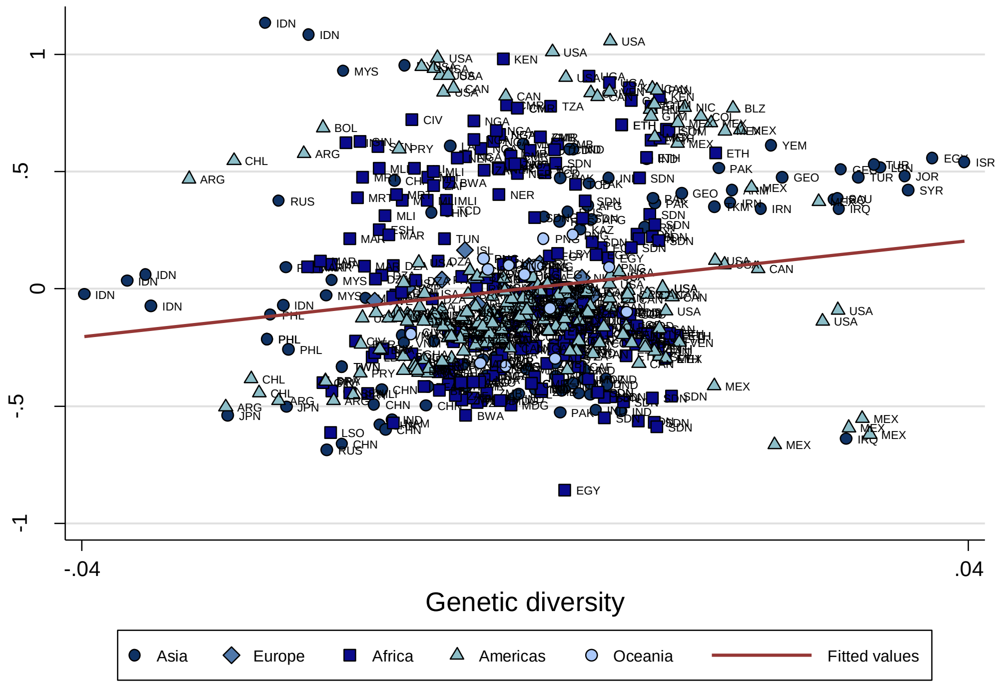


Figure 1 Relationship between observed genetic diversity and migratory distance based on Pemberton sample



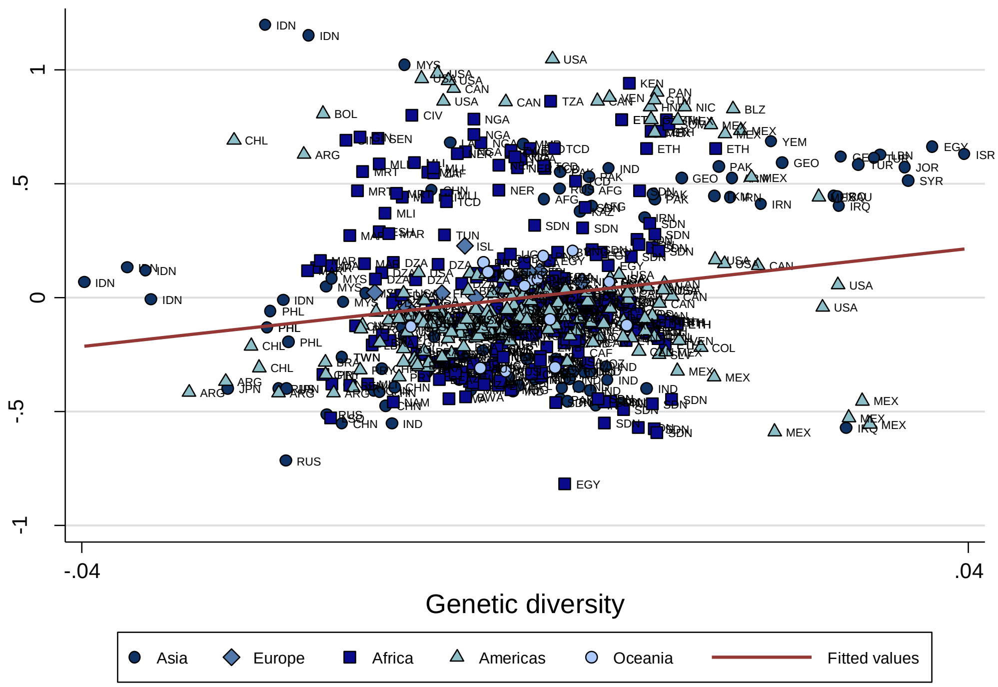
coefficient = 4.11, standard error = 1.53, t-stat = 2.68, partial R2 = 0.01

Figure 2 Partial effect of predicted genetic diversity on the conception of high god as in Table x column x in Murdock's Ethnographic Atlas sample



coefficient = 5.09, standard error = 1.53, t-stat = 3.32, partial R2 = 0.02

Figure 3 Partial effect of predicted genetic diversity on the conception of active high god as in Table x colum x in Murdock's Ethnographic Atlas sample



coefficient = 5.38, standard error = 1.51, t-stat = 3.57, partial R2 = 0.03

Figure 4 Partial effect of predicted genetic diversity on the conception of moralizing high god as in Table x column x in Murdock's Ethnographic Atlas sample

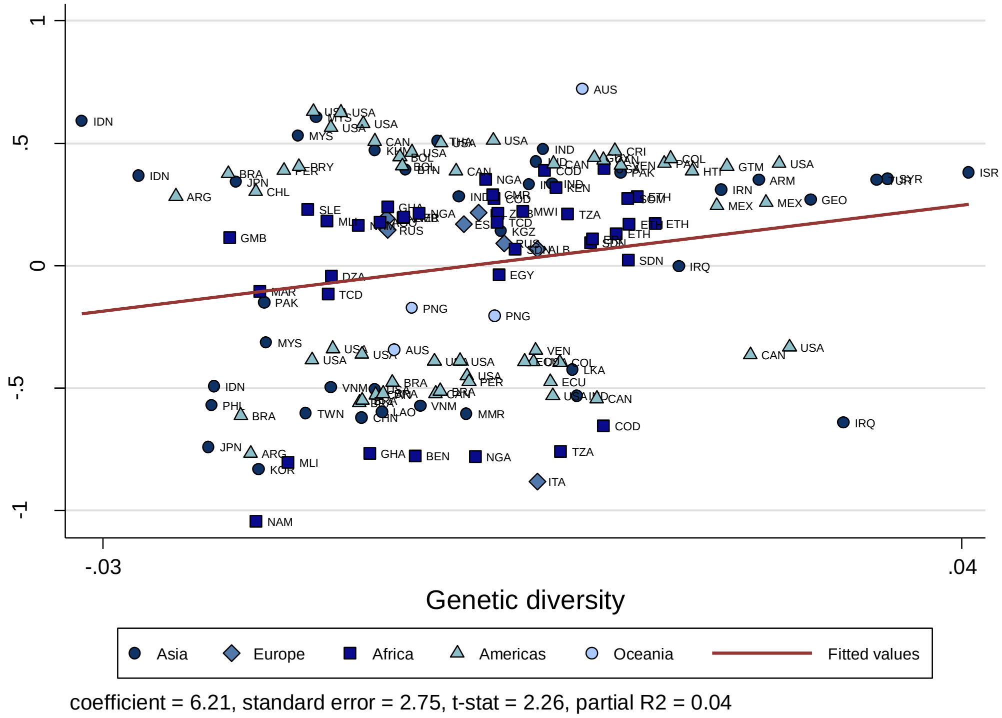
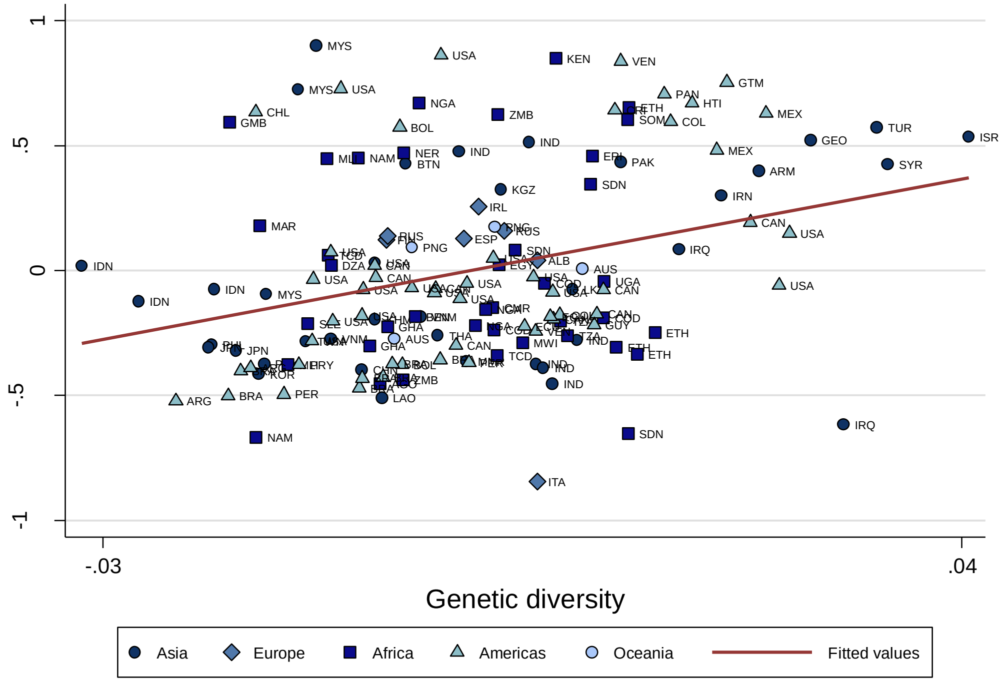


Figure 5 Partial effect of observed genetic diversity on the conception of high god as in Table x column x in SCCS sample



coefficient = 9.18, standard error = 2.37, t-stat = 3.87, partial R2 = 0.10

Figure 6 Partial effect of predicted genetic diversity on the conception of active high god as in Table x column x in SCCS sample

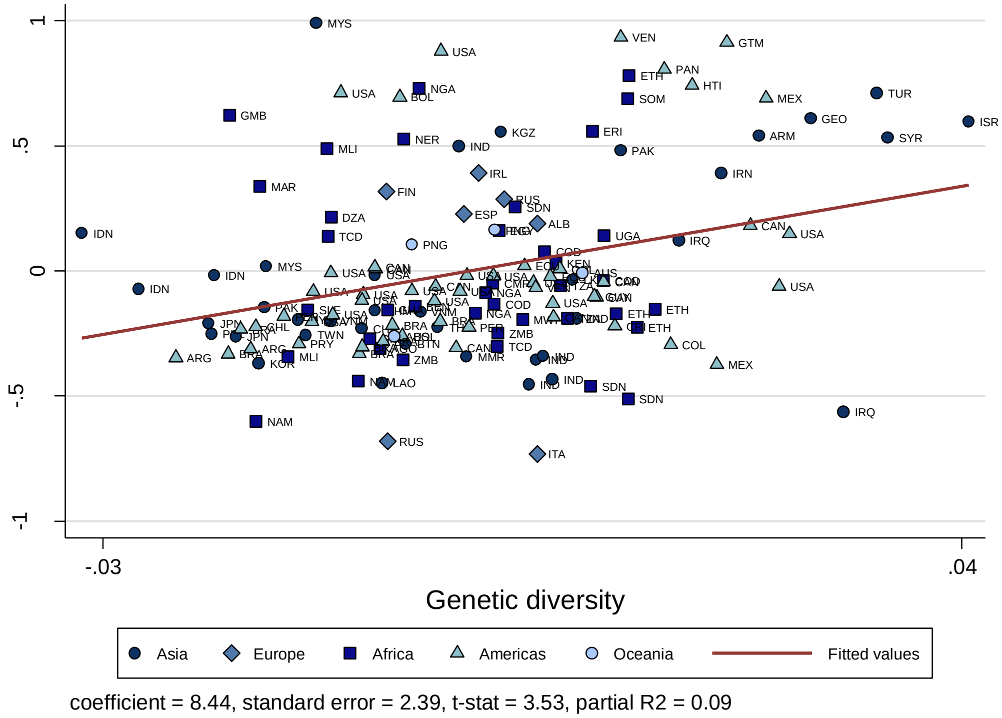


Figure 7 Partial effect of predicted genetic diversity on the conception of moralizing high god as in Table x column x in SCCS sample

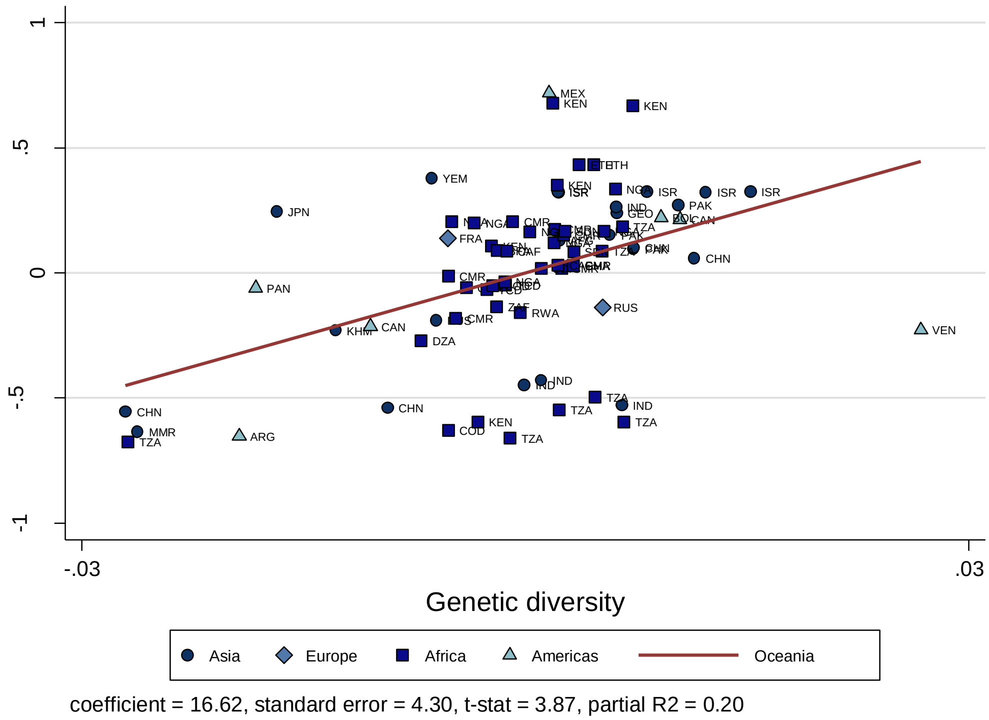
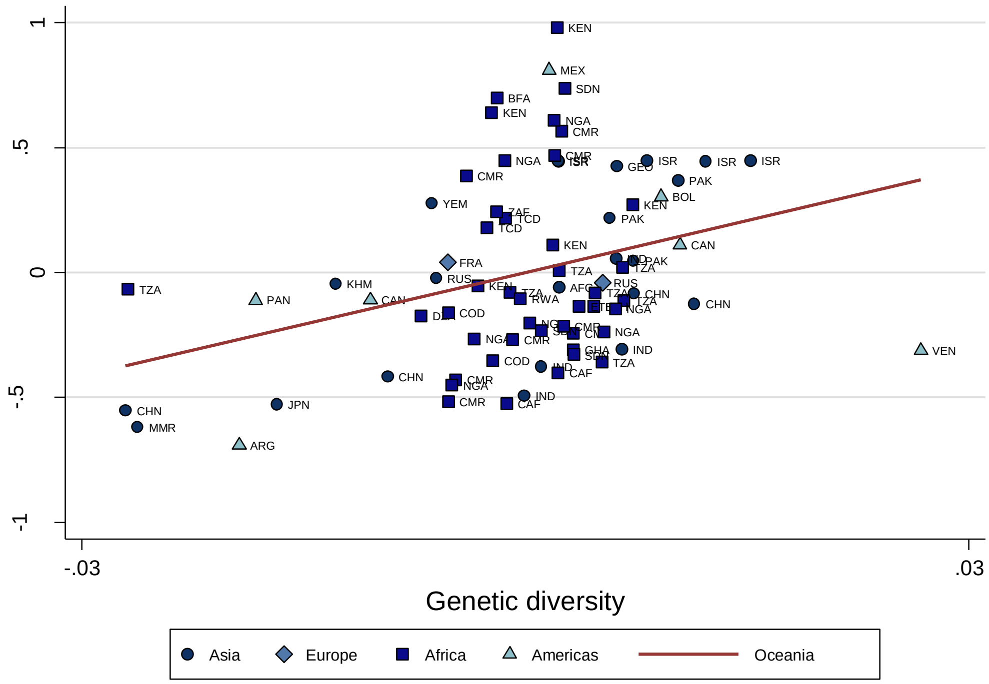
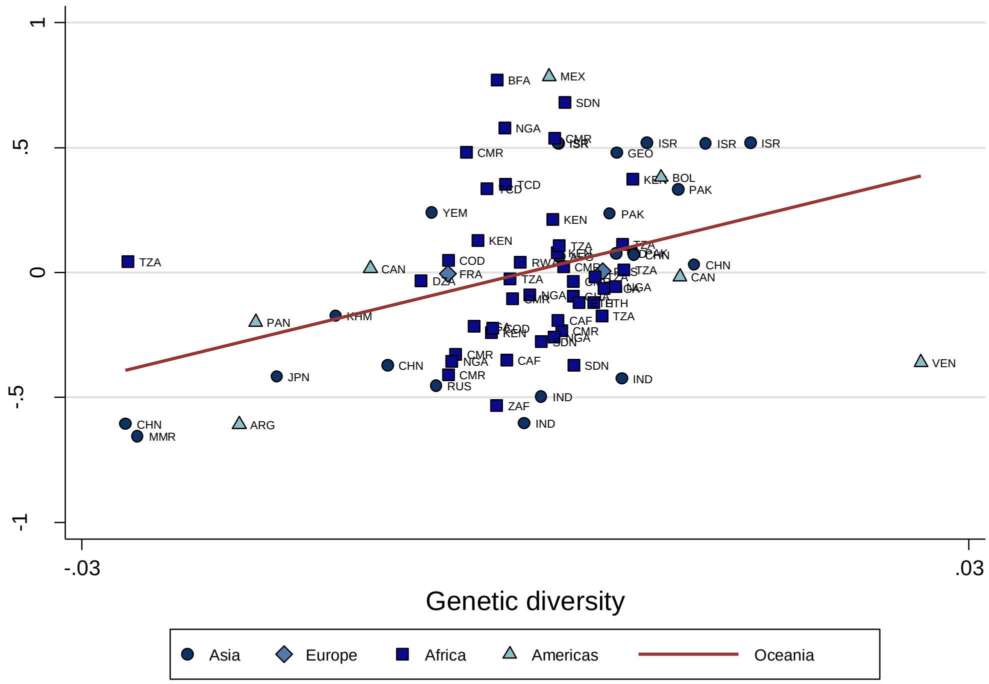


Figure 8 Partial effect of observed genetic diversity on the conception of high god as in Table x column x



coefficient = 13.83, standard error = 4.43, t-stat = 3.12, partial R2 = 0.11

Figure 9 Partial effect of observed genetic diversity on the conception of active high god as in Table x column x



coefficient = 14.43, standard error = 4.73, t-stat = 3.05, partial $R2$ = 0.14

Figure 10 Partial effect of observed genetic diversity on the conception of moralizing high god as in Table x column x

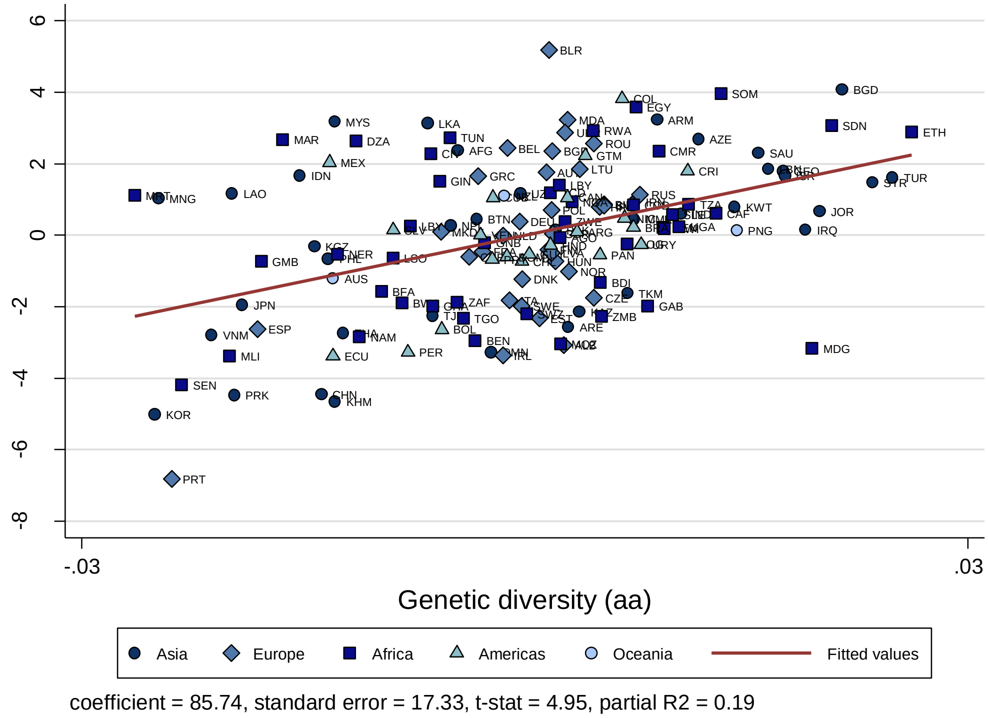
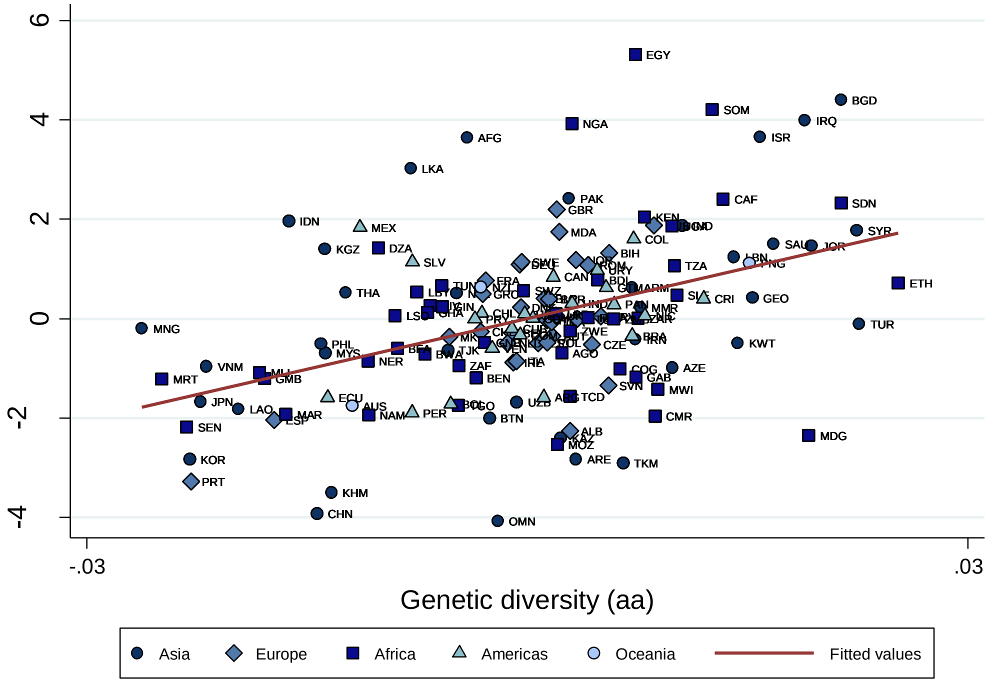


Figure 11 Partial effect of ancestry adjusted genetic diversity on IRF's social regulation of religion index as in IV TABLE FULL CONTROL



coefficient = 67.92, standard error = 4.36, t-stat = 15.58, partial R2 = 0.19

Figure 12 Partial effect of ancestry adjusted genetic diversity on PEW's social hostilities of religion index as in IV TABLE FULL CONTROL

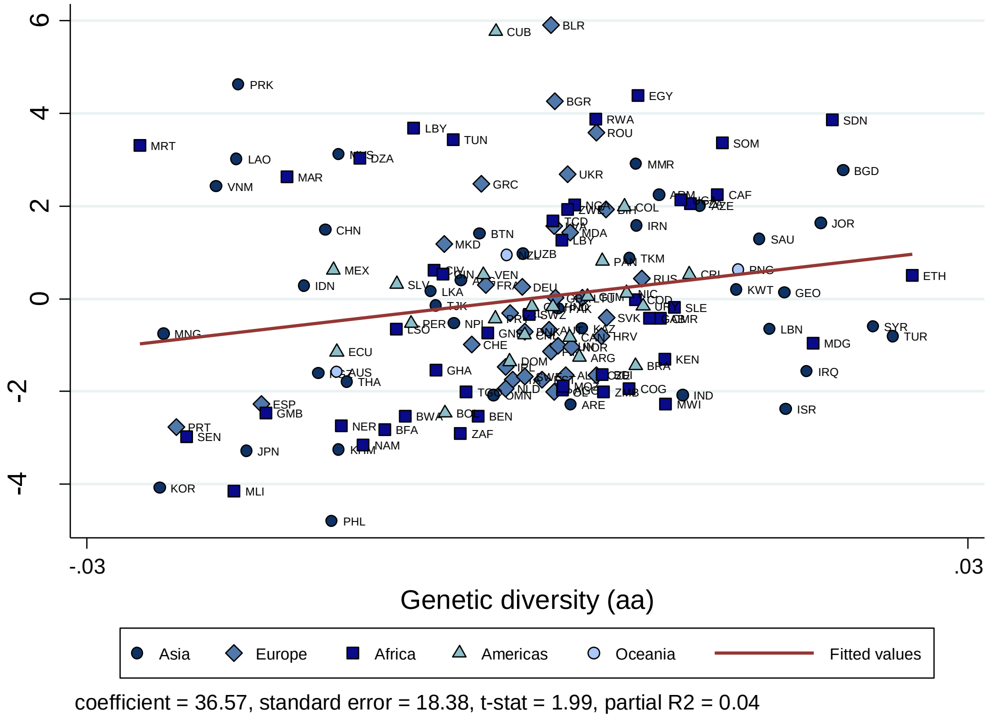


Figure 13 Partial effect of ancestry adjusted genetic diversity on IRF's government regulations of religion index as in IV TABLE FULL CONTROL

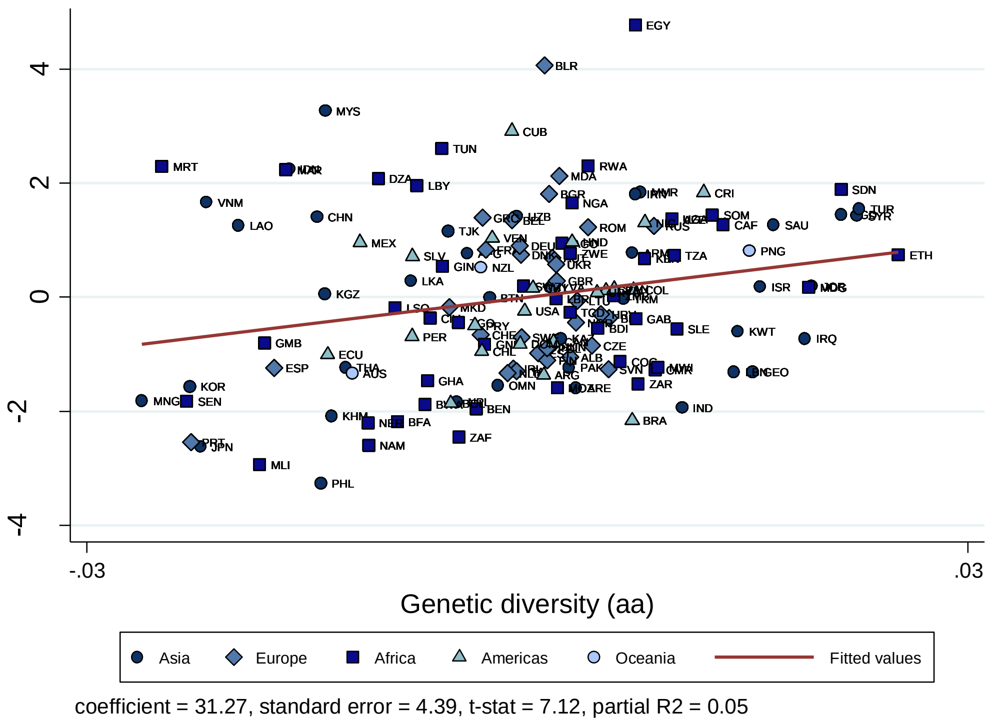


Figure 14 Partial effect of ancestry adjusted genetic diversity on PEW's government restrictions of religion index as in IV TABLE FULL CONTROL

Table 1. Descriptive Statistics - Analysis of Conceptions of God

Variable	Obs.	Mean	Std. Dev.	Min	Max
Panel A: Ethnographic Atlas Sample					
High God	632	0.680	0.467	0.000	1.000
Active High God	632	0.324	0.469	0.000	1.000
Moralizing High God	632	0.263	0.440	0.000	1.000
Predicted genetic diversity	632	0.697	0.063	0.559	0.767
Absolute latitude	632	22.481	17.215	0.000	71.000
Soil suitability	632	0.348	0.307	0.000	0.999
Terrain ruggedness index	632	0.002	0.003	0.000	0.025
Distance to river	632	58.935	85.723	0.045	824.094
Mean temperature	632	184.659	93.436	-167.417	302.333
Temperature range	632	245.644	105.583	86.000	658.000
Mean elevation	632	716.481	686.545	0.027	5063.662
Oceania	632	0.027	0.162	0.000	1.000
Europe	632	0.038	0.191	0.000	1.000
Africa	632	0.432	0.496	0.000	1.000
Americas	632	0.332	0.471	0.000	1.000
Sub-Saharan Africa	632	0.353	0.478	0.000	1.000
Latin America	632	0.128	0.335	0.000	1.000
Asia	632	.170	.376	0.000	1.000
Panel B: SCCS sample					
High god	141	0.638	0.482	0.000	1.000
Active high god	141	0.348	0.478	0.000	1.000
Moralizing high god	141	0.262	0.442	0.000	1.000
Predicted genetic diversity	141	0.691	0.053	0.588	0.765
Absolute latitude	141	23.514	17.058	0.333	68.700
Soil suitability	141	0.398	0.333	0.000	0.997
Terrain ruggedness index	141	0.002	0.003	0.000	0.026
Distance to river	141	65.334	110.372	0.281	908.499
Mean temperature	141	182.954	90.939	-79.500	292.167
Temperature range	141	240.504	105.721	93.000	536.000
Mean elevation	141	688.413	709.092	2.886	4270.864
Oceania	141	0.028	0.167	0.000	1.000
Europe	141	0.383	0.488	0.000	1.000
Africa	141	0.050	0.218	0.000	1.000
Americas	141	0.277	0.449	0.000	1.000
Sub-Saharan Africa	141	0.199	0.400	0.000	1.000

Latin America	141	0.234	0.425	0.000	1.000
Asia	141	0.269	0.445	0.000	1.000
Panel C: Pemberton Sample					
High god	75	0.747	0.438	0.000	1.000
Active high god	75	0.427	0.498	0.000	1.000
Moralizing high god	75	0.347	0.479	0.000	1.000
Observed genetic diversity	75	0.736	0.032	0.624	0.766
Migratory distance from East Africa	75	5.433	5.710	0.406	25.928
Absolute latitude	75	17.520	15.603	0.000	62.983
Soil suitability	75	0.435	0.308	0.000	0.929
Terrain ruggedness index	75	0.002	0.003	0.000	0.015
Distance to river	75	48.979	79.611	0.045	604.526
Mean temperature	75	200.558	90.707	-107.417	283.417
Temperature range	75	231.427	101.765	99.000	658.000
Mean elevation	75	851.324	932.806	5.761	4270.864
Africa	75	0.573	0.498	0.000	1.000
Americas	75	0.093	0.293	0.000	1.000
Sub-Saharan Africa	75	0.520	0.503	0.000	1.000
Latin America	75	0.067	0.251	0.000	1.000
Asia	75	75.306	.464	0.000	1.000

Note:

Table 2. The Impact of Genetic Diversity on Conceptions of God – Ethnographic Atlas Sample

VARIABLES	(1) High God	(2) Active High God	(3) Moralizing High God
Panel A. No Control Variables			
Predicted Genetic Diversity	3.053***	1.794***	1.643***
	(0.284)	(0.277)	(0.253)
	[0.374]***	[0.327]***	[0.303]***
Observations	632	632	632
R-squared	0.169	0.058	0.055
Panel B. Controls for Continent FE			
Predicted Genetic Diversity	4.525***	4.923***	5.043***
	(1.420)	(1.513)	(1.487)
	[1.554]***	[1.678]***	[1.635]***
Observations	632	632	632
R-squared	0.255	0.234	0.284
Panel C. Controls for Continent FE and + Exogenous Covariates			
Predicted Genetic Diversity	4.111***	5.090***	5.377***
	(1.550)	(1.550)	(1.522)
	[1.671]**	[1.691]***	[1.645]***
Observations	632	632	632
R-squared	0.285	0.347	0.404

Robust standard errors in parentheses. Standard errors in square brackets are obtained using two-step bootstrapping algorithm *** p<0.01, ** p<0.05, * p<0.1. Control variables include Log of distance to the closest river, Terrain ruggedness, Log of Absolute Latitude, Soil suitability for agriculture, Mean temperature and Temperature range, Mean elevation. “Continental FE” accounts for Asia, Africa, Oceania, Europe and Americas along with the regions sub-Saharan Africa and Latin America.

Table 3. The Impact of Genetic Diversity on Conceptions of God - SCCS Sample

VARIABLES	(1) High God	(2) Active High God	(3) Moralizing High God
Predicted Genetic Diversity	6.207**	9.185***	8.437***
	(2.886)	(2.490)	(2.512)
	[3.561]*	[3.053]***	[3.096]***
Observations	141	141	141
R-squared	0.190	0.386	0.363
Continent FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Robust standard errors in parentheses. Standard errors in square brackets are obtained using two-step bootstrapping algorithm *** p<0.01, ** p<0.05, * p<0.1. Control variables include Log of distance to the closest river, Terrain ruggedness, Log of Absolute Latitude, Soil suitability for agriculture, Mean temperature and Temperature range, Mean elevation. "Continental FE" accounts for Asia, Africa, Oceania, Europe and Americas along with the regions sub-Saharan Africa and Latin America.

Table 4. Observed Genetic Diversity and Conception of God

VARIABLES	(1) High God	(2) Active High God	(3) Moralizing High God
Panel A: OLS Estimates			
Predicted Genetic Diversity	5.855	9.450**	11.888***
	(4.239)	(4.280)	(3.665)
Observations	75	75	75
R-squared	0.190	0.212	0.328
Panel B: OLS Estimates			
Observed Genetic Diversity	16.616***	13.831***	14.426***
	(4.700)	(4.843)	(5.174)
Observations	75	75	75
R-squared	0.519	0.494	0.541
Panel B: IV Estimates			
Observed Genetic Diversity	29.641***	41.413***	44.351***
	(9.313)	(10.232)	(10.446)
Observations	75	75	75
R-squared	0.446	0.241	0.220
F test of excluded instruments	19.08	19.08	19.08
Continent FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Control variables include Log of distance to the closest river, Terrain ruggedness, Log of Absolute Latitude, Soil suitability for agriculture, Mean temperature and Temperature range, Mean elevation. "Continental FE" accounts for Asia, Africa, Oceania, Europe and Americas along with the regions sub-Saharan Africa and Latin America.

Table 5. Descriptive Statistics- Analysis of the Relative Role of Religion in Social Interaction

Variable	N	Mean	SD	Min	Max
Government Regulation of Religion Index (IRF)	141	3.287	3.057	0.000	9.815
Social Regulation of Religion Index (IRF)	141	4.892	2.949	0.000	10.000
Government Restriction Index (PEW)	141	3.229	2.197	0.350	8.350
Social Hostilities Index (PEW)	141	2.713	2.264	0.000	9.038
Genetic Diversity (Ancestry Adjusted)	141	0.727	0.027	0.628	0.774
Migratory Distance from Addis Ababa	141	8.064	6.741	0.000	26.771
Mean Elevation	141	0.578	0.508	0.024	2.674
Dispersion in Elevation	141	1.729	1.390	0.043	6.176
Total Land Area (km^2/10000)	141	84.193	199.407	1.000	1638.134
Absolute Latitude	141	27.339	17.158	1.000	64.000
Terrain Roughness	141	0.180	0.137	0.013	0.602
Mean Land Suitability for Agriculture	141	0.383	0.245	0.003	0.960
Range of the Land Suitability	141	0.725	0.252	0.002	0.999
Mean Distance to Nearest Waterway	141	0.363	0.464	0.020	2.386
Precipitation	141	87.181	59.084	2.911	259.952
Temperature	141	17.779	8.412	-7.929	28.639
Europe	141	0.234	0.425	0.000	1.000
Asia	141	0.277	0.449	0.000	1.000
Oceania	141	0.021	0.145	0.000	1.000
Americas	141	0.149	0.357	0.000	1.000
Africa	141	0.319	0.468	0.000	1.000

Table 6. OLS Estimates of the Impact of Genetic Diversity on Societal and State Involvement with Religion

VARIABLES	(1) Social regulation Index (IRF)	(2) Social hostilities index (PEW)	(3) Government regulation index (IRF)	(4) Government restriction index (PEW)
Panel A. OLS No Controls				
Genetic diversity (aa)	27.995***	18.338***	17.195**	11.684**
	(7.741)	(5.893)	(7.712)	(5.655)
Observations	141	141	141	141
R-squared	0.067	0.048	0.024	0.021
Panel B. OLS Continent FE				
Genetic diversity (aa)	41.627***	21.576**	29.446***	18.548**
	(10.834)	(8.276)	(11.172)	(8.355)
Observations	141	141	141	141
R-squared	0.358	0.250	0.451	0.397
Panel C. OLS Full Controls				
Genetic diversity (aa)	47.046***	28.256***	22.455*	14.434*
	(11.544)	(8.237)	(12.350)	(8.035)
Observations	141	141	141	141
R-squared	0.527	0.494	0.541	0.560

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature.

Table 7. Instrumental Variable Estimates of the Effect of Genetic Diversity on Social and State Involvement with Religion

	(1)	(2)	(3)	(4)
VARIABLES	Social regulation Index (IRF)	Social hostilities index (PEW)	Government regulation index (IRF)	Government restriction index (PEW)
Genetic diversity (aa)	85.738***	67.922***	36.575**	31.270**
	(17.880)	(13.380)	(18.503)	(12.620)
Observations	141	141	141	141
R-squared	0.482	0.416	0.536	0.545
Continent FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Adjusted R-squared	0.420	0.346	0.480	0.491
F-test of excluded instrument	115.8	98.14	115.8	98.14

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature.

Table 8. Descriptive Statistics- Analysis of Individual Religiosity

Variable	N	Mean	SD	Min	Max
Religious Person	88	0.714	0.183	0.151	0.976
Believer Person	88	0.957	0.055	0.707	1.000
Importance of Religion	88	0.707	0.252	0.136	0.998
Importance of God	87	0.751	0.231	0.212	0.994
Religious Service Attendance	87	0.340	0.248	0.026	0.887
Self-Praying	49	0.524	0.305	0.000	0.958
Genetic Diversity (Ancestry Adjusted)	88	0.726	0.026	0.643	0.774
Migratory Distance from East Africa	88	8.246	6.741	0.000	26.771
Mean Elevation	88	0.544	0.433	0.024	2.432
Dispersion in Elevation	88	1.789	1.431	0.074	6.176
Total Land Area (km2/10000)	88	118.154	260.853	1.023	1638.134
Absolute Latitude	88	33.836	17.087	1.000	64.000
Terrain Roughness	88	0.190	0.139	0.017	0.602
Mean Land Suitability for Agriculture	88	0.407	0.247	0.004	0.960
Range of Land Suitability	88	0.775	0.241	0.002	0.999
Mean Distance to Nearest Waterway	88	0.338	0.479	0.023	2.386
Precipitation	88	77.650	52.098	2.911	233.933
Temperature	88	14.827	8.338	-7.929	28.639
Europe	88	0.375	0.487	0.000	1.000
Asia	88	0.273	0.448	0.000	1.000
Oceania	88	0.023	0.150	0.000	1.000
Americas	88	0.148	0.357	0.000	1.000
Africa	88	0.182	0.388	0.000	1.000

Table 9. The Impact of Genetic Diversity on Piousness of Individuals in the World Values Survey

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Believer person	Religious person	Importance of religion	Importance of god	Religious service attendance	Self-praying
Panel A. OLS No Controls						
Genetic diversity (aa)	0.318	1.884**	0.519	-0.090	0.002	0.588
	(0.273)	(0.812)	(1.012)	(0.910)	(1.135)	(1.445)
Observations	88	88	88	87	87	49
R-squared	0.022	0.071	0.003	0.000	0.000	0.003
Panel B. OLS Continent FE						
Genetic diversity (aa)	0.725*	2.601**	1.281	1.575	-1.841	1.092
	(0.428)	(1.124)	(1.454)	(1.157)	(1.178)	(2.015)
Observations	88	88	88	87	87	49
R-squared	0.138	0.302	0.498	0.526	0.554	0.438
Panel C. OLS Continent FE+ Controls						
Genetic diversity (aa)	1.499***	4.762***	3.515**	3.477***	1.316	3.802*
	(0.514)	(1.231)	(1.426)	(1.066)	(1.259)	(1.985)
Observations	88	88	88	87	87	49
R-squared	0.396	0.494	0.699	0.710	0.718	0.661

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. (aa) stands for ancestry adjusted. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature

Table 10. The Impact of Genetic Diversity on Piousness of Individuals in the World Values Survey, Instrumental Variable Estimates

	(2)	(1)	(3)	(4)	(5)	(6)
VARIABLES	Believer person	Religious person	Importance of religion	Importance of god	Religious service attendance	Self-praying
Genetic diversity (aa)	2.037***	5.349***	4.749***	4.809***	1.765	5.322**
	(0.549)	(1.495)	(1.607)	(1.180)	(1.325)	(2.406)
Observations	88	88	88	87	87	49
R-squared	0.378	0.492	0.695	0.704	0.718	0.655
Adjusted R-squared	0.248	0.386	0.631	0.642	0.658	0.499
F-test of excluded instrument	74.10	74.10	74.10	73.87	73.87	32.76

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. (aa) stands for ancestry adjusted. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature

APPENDIX TABLES

Appendix Table 1. First Stage Relationship between Observed Genetic Diversity and Migratory Distance to East Africa

VARIABLES	(1) Observed genetic diversity	(2) Observed genetic diversity
Migratory distance to East Africa	-0.00256***	-0.00182
	(0.00059)	(0.00111)
Migratory distance to East Africa squared		-0.00005
		(0.00007)
Observations	75	75
R-squared	0.940	0.941
1st stage F-test	19.08	9.56
Range of the distance		[.406, 25.928]
Optimum distance		18.343

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Control variables include Log of distance to the closest river, Terrain ruggedness, Log of Absolute Latitude, Soil suitability for agriculture, Mean temperature and Temperature range, Mean elevation. "Continental FE" accounts for Asia, Africa, Oceania, Europe and Americas along with the regions sub-Saharan Africa and Latin America.

Appendix Table 2. Associations between Societal and Economic Complexity Measures, and Conceptions of God

	(1)	(2)	(3)
VARIABLES	High god	Active high god	Moralizing high god
Jurisdictional hierarchy	0.035*	0.055***	0.083***
	(0.018)	(0.019)	(0.017)
R-squared	0.288	0.328	0.406
Economic specialization	0.008	0.017	0.033**
	(0.015)	(0.017)	(0.016)
R-squared	0.283	0.317	0.381
Class stratification	0.045**	0.104***	0.095***
	(0.022)	(0.023)	(0.020)
R-squared	0.288	0.343	0.400
Jurisdictional hierarchy	0.027	0.023	0.061***
	(0.022)	(0.022)	(0.020)
Economic specialization	-0.008	-0.011	0.000
	(0.015)	(0.018)	(0.017)
Class stratification	0.031	0.095***	0.055**
	(0.026)	(0.027)	(0.023)
R-squared	0.290	0.344	0.413
Observations	567	567	567
Continent FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Appendix Table 3. The Impact of Genetic Diversity on Measures of Social Complexity

VARIABLES	(1) Jurisdictional hierarchy	(2) Economic specialization	(3) Class stratification
Predicted genetic diversity	6.204*	17.810***	11.178***
	(3.360)	(4.969)	(2.738)
Observations	567	567	567
R-squared	0.366	0.277	0.277
Continent FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Appendix Table 4. Exploring the Role of Measures of Social Complexity in Explaining the Relationship between Genetic Diversity and Conceptions of God (EA Sample)

	(1)	(2)	(3)	(4)	(5)
Panel A: Dependent variable- High god					
Predicted genetic diversity	3.828**	3.627**	3.798**	3.425**	3.620**
	(1.662)	(1.663)	(1.684)	(1.686)	(1.696)
Jurisdictional hierarchy		0.032*			0.030
		(0.018)			(0.022)
Economic specialization			0.002		-0.013
			(0.015)		(0.015)
Class stratification				0.036	0.023
				(0.023)	(0.027)
Observations	567	567	567	567	567
R-squared	0.291	0.295	0.291	0.294	0.296
Panel B: Dependent variable- Active high god					
Predicted genetic diversity	4.836***	4.517***	4.673***	3.779**	4.015**
	(1.645)	(1.644)	(1.676)	(1.676)	(1.680)
Jurisdictional hierarchy		0.052***			0.026
		(0.019)			(0.022)
Economic specialization			0.009		-0.017
			(0.018)		(0.018)
Class stratification				0.095***	0.086***
				(0.024)	(0.027)
Observations	567	567	567	567	567
R-squared	0.328	0.339	0.329	0.351	0.353
Panel C: Dependent variable- Moralizing high god					
Predicted genetic diversity	4.859***	4.365***	4.400***	3.909**	4.046**
	(1.613)	(1.601)	(1.653)	(1.668)	(1.657)
Jurisdictional hierarchy		0.080***			0.064***
		(0.017)			(0.019)
Economic specialization			0.026		-0.005
			(0.017)		(0.018)
Class stratification				0.085***	0.045*
				(0.021)	(0.024)
Observations	567	567	567	567	567
R-squared	0.389	0.419	0.393	0.409	0.423
Continent FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Appendix Table 5. The Impact of Migratory Distance from East Africa on Ancestry Adjusted Genetic Diversity

	(1)	(2)
VARIABLES	Predicted genetic diversity (aa)	Predicted genetic diversity (aa)
Migratory distance to East Africa	-0.005074***	-0.011008***
	(0.001015)	(0.001058)
Migratory distance to East Africa squared		0.000259***
		(0.000067)
Observations	141	141
R-squared	0.754	0.813
Adjusted R-squared	0.724	0.789
F test of excluded instruments	24.29	115.76

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature.

Appendix Table 6. The Impact of Genetic Diversity on the Measures of Fractionalization, Intrastate Conflict, and State Failure

VARIABLES	(1) Religious fractionalization	(2) Ethnic fractionalization	(3) Ethno linguistic fractionalization	(4) Failed state index	(5) No. of intrastate conflict
Genetic diversity (aa)	4.869***	5.267***	3.238**	380.355***	257.470**
	(1.314)	(1.333)	(1.587)	(116.289)	(102.736)
Observations	141	141	141	141	141
R-squared	0.385	0.453	0.451	0.604	0.269
Continent FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.311	0.388	0.385	0.556	0.182
F-test of excluded instrument	115.8	115.8	115.8	115.8	115.8

Appendix Table 7. Associations between Fractionalization, Institutional Quality Intrastate Conflict, and Income, and Societal and State Regulation of Religion

	(1)	(3)	(2)	(4)
VARIABLES	Social regulation index (IRF)	Social hostilities index (PEW)	Government regulation index (IRF)	Government restriction index (PEW)
Religious fractionalization	-0.283	0.151	-0.642	-1.224*
	(1.141)	(0.863)	(1.009)	(0.714)
Observations	141	141	141	141
Ethnic fractionalization	1.204	0.783	-1.296	-1.148
	(1.105)	(0.841)	(1.070)	(0.777)
Observations	141	141	141	141
Ethno linguistic fractionalization	-0.005	-0.131	-2.041**	-1.294**
	(0.976)	(0.704)	(0.884)	(0.581)
Observations	141	141	141	141
Failed state index	0.062***	0.048***	0.049***	0.037***
	(0.015)	(0.010)	(0.015)	(0.009)
Observations	141	141	141	141
No. of intrastate conflict	0.052***	0.054***	0.009	0.015
	(0.014)	(0.012)	(0.018)	(0.011)
Observations	141	141	141	141
GDP per capita	-0.317	-0.317	-0.175	-0.076
	(0.309)	(0.244)	(0.286)	(0.191)
Observations	141	141	141	141
Continent FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Appendix Table 8A. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Societal Regulation of Religion (IRF sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Social regulation index (IRF)							
Genetic diversity (aa)	85.738***	100.220***	86.950***	86.402***	64.686***	74.448***	84.638***
	(17.880)	(18.659)	(18.273)	(17.361)	(18.289)	(17.232)	(18.083)
Religious fractionalization		-3.013***					
		(1.104)					
Ethnic fractionalization			-0.223				
			(0.949)				
Ethno linguistic fractionalization				-0.095			
				(0.907)			
Failed state index					0.056***		
					(0.012)		
No. of intrastate conflict						0.044***	
						(0.013)	
Log GDP per capita							-0.324
							(0.266)
Observations	141	141	141	141	141	141	140
R-squared	0.482	0.474	0.479	0.480	0.591	0.534	0.486
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.420	0.406	0.412	0.413	0.538	0.474	0.419
F-test of excluded instrument	115.8	92.93	111.8	116.4	131.4	121.1	114.9

Appendix Table 8B. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Societal Regulation of Religion (PEW sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Social hostilities index (PEW)							
Genetic diversity (aa)	67.922***	78.150***	69.315***	68.585***	48.151***	55.109***	66.042***
	(13.380)	(15.038)	(14.198)	(13.226)	(11.636)	(12.705)	(13.241)
Religious fractionalization		-2.012**					
		(0.891)					
Ethnic fractionalization			-0.269				
			(0.818)				
Ethno linguistic fractionalization				-0.152			
				(0.649)			
Failed state index					0.042***		
					(0.009)		
No. of intrastate conflict						0.049***	
						(0.011)	
Log GDP per capita							-0.280
							(0.212)
Observations	141	141	141	141	141	141	141
R-squared	0.416	0.395	0.411	0.413	0.541	0.520	0.430
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.346	0.317	0.335	0.338	0.482	0.459	0.357
F-test of excluded instrument	98.14	77.84	98.34	100.2	107.2	104.1	99.28

Appendix Table 8C. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and State Regulation of Religion (IRF sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Government regulation index (IRFGRI)							
Genetic diversity (aa)	36.575**	45.586**	47.549**	43.719**	18.884	35.279*	34.371*
	(18.503)	(20.814)	(18.740)	(17.075)	(19.061)	(18.183)	(18.686)
Religious fractionalization		-1.883*					
		(1.077)					
Ethnic fractionalization			-2.076**				
			(0.990)				
Ethno linguistic fractionalization				-2.086**			
				(0.841)			
Failed state index					0.047***		
					(0.014)		
No. of intrastate conflict						0.005	
						(0.016)	
Log GDP per capita							-0.233
							(0.260)
Observations	141	141	141	141	141	141	140
R-squared	0.536	0.538	0.541	0.552	0.589	0.537	0.534
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.480	0.478	0.482	0.494	0.537	0.477	0.473
F-test of excluded instrument	115.8	92.93	111.8	116.4	131.4	121.1	114.9

Appendix Table 8D. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and State Regulation of Religion (PEW sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Log Government restriction index (PEW)							
Genetic diversity (aa)	31.270**	43.521***	40.329***	35.660***	15.110	28.100**	30.883**
	(12.620)	(14.372)	(13.152)	(11.834)	(11.562)	(12.738)	(12.564)
Religious fractionalization		-2.428***					
		(0.730)					
Ethnic fractionalization			-1.761**				
			(0.736)				
Ethno linguistic fractionalization				-1.305**			
				(0.563)			
Failed state index					0.035***		
					(0.009)		
No. of intrastate conflict						0.012	
						(0.010)	
Log GDP per capita							-0.059
							(0.172)
Observations	141	141	141	141	141	141	141
R-squared	0.545	0.554	0.549	0.554	0.609	0.555	0.546
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test of excluded instrument	98.14	77.84	98.34	100.2	107.2	104.1	99.28

Appendix Table 9. The Impact of Genetic Diversity on Piousness of Individuals in the World Values Survey, Instrumental Variable Estimates with a Linear Instrument

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Believer person	Religious person	Importance of religion	Importance of god	Religious service attendance	Self-praying
Genetic diversity (aa)	4.161***	10.479***	12.853**	10.075**	9.926*	13.072**
	(1.576)	(3.903)	(5.745)	(4.096)	(5.245)	(6.204)
Observations	88	88	88	87	87	49
F-test of excluded instrument	3.816	3.816	3.816	3.766	3.766	4.059

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 9. The Impact of Genetic Diversity on Individual Religiosity in the ISSP, Global Barometer and PEW Surveys

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	ISSP religious person	ISSP believe in God	ISSP religious service attendance	GB religious person	GB religious service attendance	PEW importance of religion	PEW religious service attendance
Panel A. OLS Estimates							
Genetic diversity (aa)	-0.135	1.703	-0.481	3.867*	9.403***	1.952	0.450
	(2.250)	(1.586)	(0.755)	(2.041)	(2.312)	(1.205)	(1.151)
Observations	39	39	39	29	28	51	43
R-squared	0.379	0.505	0.623	0.841	0.803	0.729	0.695
Panel B. IV Estimates							
Genetic diversity (aa)	1.469	3.620***	-0.518	7.729***	9.684***	4.068***	1.588
	(2.035)	(1.198)	(0.793)	(1.900)	(1.741)	(1.120)	(1.040)
Observations	39	39	39	29	28	51	43
R-squared	0.368	0.489	0.623	0.776	0.803	0.702	0.689
Adjusted R-squared	-0.0446	0.156	0.377	0.582	0.646	0.575	0.517
F-test of excluded instrument	21.61	21.61	21.61	7.805	1322	38.40	21.23

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. (aa) stands for ancestry adjusted. Controls include natural logarithm of Mean Elevation, Dispersion in Elevation, Total Land Area (km^2/10000), Absolute Latitude, Terrain Roughness, Land Suitability for Agriculture, Range of Land Suitability, Mean Distance to Nearest Waterway, Precipitation, and Temperature

Appendix Table 10. Associations between Measures of Fractionalization, Institutional Quality, Intrastate Conflict, and Income, and Piousness of Individuals

	(1)	(2)	(3)	(4)	(5)	(6)
	Log believer person	Log religious person	Log importance of religion	Log importance of god	Log religious service attendance	Log self-praying
Religious fractionalization	-0.019	-0.022	-0.103	-0.060	0.090	0.173
	(0.025)	(0.101)	(0.099)	(0.100)	(0.102)	(0.204)
Observations	88	88	88	88	87	49
Ethnic fractionalization	0.071**	0.190**	0.167*	0.145*	0.173**	0.198
	(0.030)	(0.086)	(0.094)	(0.077)	(0.082)	(0.123)
Observations	88	88	88	88	87	49
Ethno linguistic fractionalization	0.080**	0.194**	0.189**	0.129*	0.180**	0.106
	(0.031)	(0.081)	(0.082)	(0.070)	(0.075)	(0.142)
Observations	88	88	88	88	87	49
Failed state index	0.001***	0.003***	0.004***	0.004***	0.001	0.004**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	88	88	88	88	87	49
No. of intrastate conflict	0.001**	0.001	0.003*	0.001	0.002*	0.004*
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
Observations	88	88	88	88	87	49
Log GDP per capita	-0.027**	-0.086***	-0.076**	-0.081***	-0.034	-0.147**
	(0.010)	(0.027)	(0.033)	(0.028)	(0.026)	(0.058)
Observations	88	88	88	88	87	49
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Appendix Table 11A. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Believer Person

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Believer Person							
Genetic diversity (aa)	2.037***	2.139***	1.831***	1.931***	1.727***	1.910***	1.734***
	(0.549)	(0.546)	(0.503)	(0.502)	(0.520)	(0.554)	(0.563)
Religious fractionalization		-0.047**					
		(0.022)					
Ethnic fractionalization			0.044**				
			(0.021)				
Ethno linguistic fractionalization				0.064***			
				(0.022)			
Failed state index					0.001***		
					(0.000)		
No. of intrastate conflict						0.001	
						(0.000)	
Log GDP per capita							-0.022***
							(0.008)
Observations	88	88	88	88	88	88	88
R-squared	0.378	0.395	0.415	0.446	0.450	0.395	0.446
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.248	0.259	0.283	0.321	0.326	0.258	0.321
F-test of excluded instrument	74.10	66.43	65.75	71.74	83.73	87.56	83.37

Appendix Table 11B. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Religious Person

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Religious person							
Genetic diversity (aa)	5.349***	5.548***	4.794***	5.096***	4.517***	5.359***	4.338***
	(1.495)	(1.461)	(1.469)	(1.474)	(1.479)	(1.413)	(1.566)
Religious fractionalization		-0.095					
		(0.083)					
Ethnic fractionalization			0.119*				
			(0.066)				
Ethno linguistic fractionalization				0.152***			
				(0.057)			
Failed state index					0.002***		
					(0.001)		
No. of intrastate conflict						0.000	
						(0.001)	
Log GDP per capita							-0.074***
							(0.022)
Observations	88	88	88	88	88	88	88
R-squared	0.492	0.500	0.511	0.525	0.530	0.492	0.546
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.386	0.387	0.401	0.418	0.424	0.378	0.444
F-test of excluded instrument	74.10	66.43	65.75	71.74	83.73	87.56	83.37

Appendix Table 11C. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Importance of Religion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Importance of Religion							
Genetic diversity (aa)	4.749***	5.115***	4.247***	4.448***	3.500**	4.367***	3.870**
	(1.607)	(1.591)	(1.567)	(1.561)	(1.542)	(1.523)	(1.786)
Religious fractionalization		-0.170**					
		(0.085)					
Ethnic fractionalization			0.104				
			(0.078)				
Ethno linguistic fractionalization				0.152**			
				(0.065)			
Failed state index					0.004***		
					(0.001)		
No. of intrastate conflict						0.002	
						(0.001)	
Log GDP per capita							-0.065**
							(0.028)
Observations	88	88	88	88	88	88	88
R-squared	0.695	0.707	0.705	0.714	0.743	0.702	0.721
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.631	0.641	0.638	0.649	0.685	0.635	0.658
F-test of excluded instrument	74.10	66.43	65.75	71.74	83.73	87.56	83.37

Appendix Table 11D. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Importance of God

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Log of Importance of God							
Genetic diversity (aa)	4.574***	4.813***	4.181***	4.356***	3.304***	4.702***	3.655***
	(1.205)	(1.197)	(1.212)	(1.203)	(1.207)	(1.140)	(1.382)
Religious fractionalization		-0.123					
		(0.086)					
Ethnic fractionalization			0.083				
			(0.066)				
Ethno linguistic fractionalization				0.094*			
				(0.056)			
Failed state index					0.003***		
					(0.001)		
No. of intrastate conflict						-0.000	
						(0.001)	
Log GDP per capita							-0.070***
							(0.024)
Observations	88	88	88	88	88	88	88
R-squared	0.702	0.709	0.710	0.712	0.748	0.701	0.737
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.640	0.644	0.645	0.647	0.692	0.634	0.677
F-test of excluded instrument	66.58	59.88	59.83	64.97	77.72	85.70	65.39

Appendix Table 11E. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Religious Service Attendance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Log of Religious Service Attendance							
Genetic diversity (aa)	1.765	1.556	1.054	1.458	1.697	1.311	1.368
	(1.325)	(1.391)	(1.234)	(1.262)	(1.319)	(1.320)	(1.446)
Religious fractionalization		0.069					
		(0.095)					
Ethnic fractionalization			0.158**				
			(0.072)				
Ethno linguistic fractionalization				0.169***			
				(0.065)			
Failed state index					0.001		
					(0.001)		
No. of intrastate conflict						0.002	
						(0.001)	
Log GDP per capita							-0.030
							(0.024)
Observations	87	87	87	87	87	87	87
R-squared	0.718	0.721	0.734	0.740	0.719	0.724	0.723
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.658	0.657	0.673	0.680	0.655	0.661	0.659
F-test of excluded instrument	73.87	66.33	65.71	71.66	82.71	86.41	83.78

Appendix Table 11F. Exploring the Role of Fractionalization, Intrastate Conflict, Institutional Quality and Income in Explaining the Relationship between Genetic Diversity and Self-Praying

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Log of Self-Praying							
Genetic diversity (aa)	5.322**	5.026**	4.812*	5.179**	3.900*	4.627**	2.780
	(2.406)	(2.503)	(2.642)	(2.422)	(2.094)	(2.326)	(2.267)
Religious fractionalization		0.069					
		(0.165)					
Ethnic fractionalization			0.102				
			(0.127)				
Ethno linguistic fractionalization				0.058			
				(0.118)			
Failed state index					0.004**		
					(0.002)		
No. of intrastate conflict						0.003	
						(0.002)	
Log GDP per capita							-0.121**
							(0.050)
Observations	49	49	49	49	49	49	49
R-squared	0.655	0.659	0.662	0.657	0.689	0.667	0.695
ContinentFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.499	0.488	0.494	0.486	0.534	0.500	0.542
F-test of excluded instrument	32.76	28.29	25.86	31.83	37.77	31.60	29.05