Trade and Geography in the Spread of Islam*

Stelios Michalopoulos[†], Alireza Naghavi[‡], Giovanni Prarolo[§]

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Abstract

In this study we explore the historical determinants of contemporary Muslim representation. Motivated by a plethora of case studies and historical accounts among Islamicists stressing the role of trade for the adoption of Islam, we construct detailed data on pre-Islamic trade routes, harbors and ports to determine the empirical regularity of this argument. Our analysis conducted across countries and across ethnic groups within countries establishes that proximity to the pre-600 CE trade network is a robust predictor of today's Muslim adherence in the Old World. We also uncover that Islam spread successfully in regions that are ecologically similar to the birthplace of the religion, the Arabian Peninsula. Namely, territories characterized by a large share of arid and semi-arid regions dotted with few pockets of fertile land are more likely to host Muslim communities. We discuss the various mechanisms that may give rise to the observed pattern.

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[†]Brown University, CEPR and NBER. E-mail: smichalo@brown.edu.

[‡]University of Bologna. Department of Economics, Piazza Scaravilli 2, 40126 Bologna, Italy, E-mail: alireza.naghavi@unibo.it

[§]University of Bologna. Department of Economics, Piazza Scaravilli 2, 40126 Bologna, Italy, E-mail: giovanni.prarolo@unibo.it.

" O you who believe! Eat not up your property among yourselves unjustly
except it be a trade amongst you, by mutual consent.
And do not kill yourselves (nor kill one another).
Surely, Allah is Most Merciful to you."
The Noble Qur'an (Hilali-Khan translation), Surah An-Nisa', 4:29 [1]

1 Introduction

Religion is widely viewed in the realm of social sciences as instrumental for the understanding of socioeconomic processes. In economics there is a growing body of work that links religious affiliation and religiosity to differences in economic and political outcomes across countries. Similarly, within political science, sociology, anthropology, psychology and history, the volume of research investigating the causes and effects of religion attests to its paramount importance. In the recent years, the focus has shifted towards understanding the role of religion in the Muslim world as Islamist-oriented regimes have been on the rise. The late prominence of the consequences of Islam as a focal research topic naturally engenders the question of its origins.[2] Are there systematic forces shaping the contemporary spatial distribution of Muslim communities? Understanding the roots of Muslim representation across societies is likely to enhance our understanding of the phenomenon and its implications for comparative political and economic development.

This study provides a step towards this direction. In particular, we offer a systematic exploration of the determinants of contemporary Muslim representation within as well as across countries shedding light on its historical roots. Motivated by numerous case studies and historical accounts among Islamicists stressing the role of trade for the adoption of Islam, we construct detailed data on pre-Islamic trade routes, ports and harbors to determine the empirical regularity of this argument. Proximity to the pre-600 CE trade network is a robust predictor of today's Muslim adherence in the Old World. We also uncover that Islam spread successfully in regions that are ecologically similar to the birthplace of the religion, the Arabian Peninsula.

The uncovered empirical association between Muslim adherence and proximity to pre-Islamic trade routes offers large-scale econometric evidence in support of the Islamic historiography emphasizing the role of trade in the spread of Islam. For example, the role of long-distance trade has been extensively discussed by prominent Islamicists, like Lapidus (2002), Berkey (2003) and Lewis (1993), noting both the diffusion of Muslims along trade routes (see Geertz (1968), Lewis (1980) and Trimingham (1962)), and the importance that Islamic scriptures confer on trade-related matters (see Cohen (1971), Hiskett (1984) and Last (1979)). Merchants converting to Islam enjoyed substantial externalities like access to the Muslim trade network, steady trade flows and a reduction in transaction costs.[3] Kuran and Lustig (2012) note that the highly personal practice of exchange created

[1] Traslation by Dr. Muhammad Taqi-ud-Din Al-Hilali and Dr. Muhammad Muhsin Khan in 1999.

[2] See Kuran (2004b) on the economic and democratic development of the Muslim world and Blydes (2014) for the role of women under Islamist regimes.

[3] Ensminger (1997) offers case studies comparing trade within Muslim and non-Muslim indigenous African societies, stressing how the institutional guarantee of Islam provided an additional impetus for trade by facilitating the flow of

preference for Muslims to conduct trade with co-religionists, see also Chaudhuri (1985).[4] An innovation of Islam was the practice of direct trade, where Muslim merchants personally carried the goods over long distances along the trade routes rather than relying on intermediaries. For example, the acceptance of Islam in most of Inner Asia, Southeast Asia, and Sub-Saharan Africa is known to have occurred primarily through contacts with Muslim merchants, see Levzion (1979), Lapidus (2002) and Insoll (2003). A prominent instance is Indonesia whose location along highly lucrative commercial routes precipitated the spread of Islam starting from the $11th$ century, Ricklefs (1991). In Section 2 below we provide a brief overview illustrating how trade led the Islamization process in the various parts of the Old World.

We conduct the analysis at two levels of aggregation: countries and ethnic homelands within countries. Exploiting within-country variation has straightforward advantages. First, it allows us to test in a sharper manner whether differences in the proximity to pre-Islamic trade routes and differences in the geographic endowments across ethnic homelands are meaningful predictors of local adherence to Islam. Second, leveraging within contemporary-state variation in Muslim representation mitigates concerns related to the endogeneity of current political boundaries. Modern states, arguably, have affected religious affiliation in a multitude of ways including state-sponsored religion. As such it is crucial to account for these nationwide histories.

Although the primary contribution of this study is to establish how proximity to pre-Islamic trade routes has influenced the distribution of Muslim communities in the Old World, we also explore whether ecological similarity to the Arabian peninsula of a given region predicts the presence of Muslim communities. But which are the salient geographic features of the cradle of Islam? The Arabian peninsula has a distinct geography, primarily consisting of desert and semi-arid landscapes with only few regions in today's Yemen, Bahrain and Central Arabia, and scattered oases in the interior of moderate fertility. On the eve of Islam frankincense, myrrh, vine, dyes and dates (Ibrahim, 1990) were produced in these fertile pockets. To capture this distinct landscape we construct for each country/ethnic homeland the Gini coefficient of land suitability for agriculture and show that ecological similarity to the Arabian Peninsula (reflected in the degree of inequality in the potential for farming across regions) increases Muslim representation.

We discuss various explanations consistent with this less-well-known fact and show that groups residing along geographically unequal territories have a particular productive structure (both historically and today) with pasture dominating the semi-arid landscape and farming taking place in the few relatively fertile regions. These differences in the underlying productive endowments may generate gains from specialization and provide a basis for trade as a means of subsistence. This is indeed the case for a cross-section of ethnographic societies we examine. So, to the extent that trade is likely to flourish when the parties involved adhere to a common code of exchange, the trade-promoting institutional framework of Islam, imposing rules to its adherents and penalties to those deviating, would find likely converts across such territories.

credit.

[4] Along similar lines, Jha (2013) explores the importance of the Pilgrimage to Mecca (Hajj) and argues that the latter mitigated economic inequalities by easing the entry of Muslim immigrants and converts into trade.

A complementary interpretation links geographic inequality to social inequality and predation and echoes Khaldun (1377), one of the greatest philosophers of the Muslim world, who observed that a crucial factor for understanding Muslim history is the central social conflict between the primitive Bedouin and the urban society ("town" versus "desert"). The argument is that long-distance trade opportunities confer differential gains to populations residing in the relatively more fertile regions, fostering predatory behavior from the poorly endowed ones. Along the same lines, contemporary scholars have noted that when farmers and herders coexisted in absence of an institutional framework coordinating their actions, their interactions were often conflictual disrupting trade flows across these territories, see Richerson (1996). We conjecture that Islam with its redistributive economic principles was a unifying force aiming at reining in the underlying inequality in exchange of security for the trading caravans, see Michalopoulos, Naghavi, and Prarolo (2016). The premise that geographic inequality becomes more salient when long distance trade opportunities arise, generates an auxiliary prediction. Namely, the intensity of adoption of Islam across unequally endowed regions should increase with proximity to trade routes. This prediction is borne out in the data.

Related Literature The cross–country growth literature has seen an increased interest in the relationship between religion and politico-economic outcomes (see Barro and McCleary (2006a, 2006b) for an overview). Nevertheless, the evidence regarding the impact of Islam on economic indicators is ambiguous. Some studies identify a negative effect, see La Porta et al. (1997), Campante and Yanagizawa-Drott (2015) and Barro and McCleary (2003), whereas others conclude that the effect is positive or insignificant, see Pryor (2007) and Martin, Doppelhofer, and Miller (2004). Our findings provide a justification to this growing empirical literature that treats Muslim representation as predetermined with respect to contemporary socioeconomic outcomes. However, the uncovered deep-rooted determinants are likely to interact with contemporary development beyond their relationship with Islam.

The present study belongs to the literature in economics starting with Greif (1994), Benabou and Tirole (2001), Platteau (2008, 2009), Becker and Woessmann (2009), Botticini and Eckstein (2005, 2007), Greif and Tabellini (2010), Cervellati, Jansen, and Sunde (2008), Rubin (2009), and Guiso, Sapienza, and Zingales (forthcoming) that explores the role of the economic and political environment in determining the adoption of (religious) beliefs and rules and vice versa. Moreover, by contributing to our understanding of the spread of religion our work is closely related to that of Cantoni (2012) who explores how proximity to Wittemberg, the birthplace of Martin Luther, influences the diffusion of Protestantism.

The uncovered evidence also makes contact with the studies by Engerman and Sokoloff (1997, 2002) and Acemoglu et al. (2001, 2002) among others, that stress the role of geography in shaping the type of institutions that Europeans established during the colonial period. Our findings complement this literature by empirically demonstrating that the Muslim world follows a consistent geographic pattern.

The rest of the paper is organized as follows. Section 2 provides a brief historical narrative of

the significance of trade for the spread of Islam. In Section 3 we discuss the data and present the empirical analysis conducted across countries and ethnic groups. In Section 4 we dig deeper into what distance to trade routes and geographic inequality reflect and outline possible explanations consistent with the uncovered evidence. Section 5 summarizes and discusses avenues for further research.

2 The Spread of Islam along Historical Trade Routes

Islam spread at a breathless pace since the time of Muhammad. Nevertheless, the mode of expansion differed across time and space ranging from conquests, to trade, to proselytization and migrations. During the early phase after the passing of the religion's founder, for example, Islam expanded mainly through conquests within a certain radius around Mecca. These initial military conquests, even if they did not entail forced conversion, eventually resulted in Muslim majority populations over large swaths of land. These areas overlap with contemporary countries close to Mecca including the entire Arab World in the Middle East and North Africa, Iran, Afghanistan, Pakistan, and slightly further away Uzbekistan and Turkmenistan. These territories featured important trade hubs during the pre-Islamic era, particularly those along the Silk Road in Asia and the Red Sea in North Africa. Most of these lands were part of the Persian Empire, which was the largest and most important empire of the time to be conquered and concede to Islam. Famous trade hubs along the routes of the Persian Empire were Rey (in Iran), Samarkand and Bukhara (in Uzbekistan), and Merv (in Turkmenistan).

The process of Islamization further away from the birthplace of Islam was intimately linked to trade. The Islamic world came to dominate the network of the most lucrative international trade routes that connected Asia to Europe (and by sea North Africa). Taking full control of the western half of the Silk Road by mid-8th century, any long-distance exchange had to traverse Muslim lands, giving trade a central role in the further dissemination of the religion. Merchants were the carriers of the religion and spread the message of Islam by propagating it wherever they travelled. This was possible because of the Muslim practise of "direct" trade, one of the most remarkable innovations of Islam. Prior to Muslim conquests, trade was conducted by the connection of local merchants who exclusively traded in their homelands. In other words, they played the role of intermediary agents with goods (generally spices) being transported from one carrier to another through short journeys creating a trade-relay. Muslims instead did not rely on intermediaries and personally travelled the entire length of the journey, crucial for the exposure of the religion along the trade routes and in the destination. The spread of Islam was hence greatly enhanced by social contact as a consequence of trade (Miller, 1969; Wood, 2003).

On the receiving end, the new religion appealed to merchants because it legitimated trade activity more than most belief systems present at that time. Merchants converting to Islam had clear advantages including (1) cooperation within the Muslim trading network, (2) valuable contacts to expand their trade, and (3) rules governing commercial activities naturally favoring Muslims over non-Muslims (Sinor, 1990; Foltz, 1999).

Proselytization was a third factor that influenced the spread of Islam across locations most distant to Mecca. Trade routes were also important in this process as the charismatic Sufi preachers

travelled along these routes to perform missionary activities. Finally, migration of Muslims (again through trade routes) and their inter-marriages at the destination also contributed in the spread of Islam in other cultures along the trade routes distant from Mecca.

2.1 The Adoption of Islam by Ethnic Groups in the Vicinity of Trade Routes

The historical accounts linking trade routes and Muslim adherence across countries are indicative of their importance for the spread of Islam. Nevertheless, given the power of the state to influence its religious composition one may wonder whether a similar nexus between proximity to trade hubs and Muslim representation exists within countries that are not religiously homogeneous. In what follows, we go over the historical record on the emergence of Islam for specific countries of differing religious diversity including China, Tanzania, Mali (the location of the former Ghana Empire), Indonesia, and India. A systematic empirical analysis at the ethnic group level for each of these countries is relegated to Section 3.3.

Figures 1a, 1b, 1c, 1d, and 1e provide snapshots of pre-Islamic trade routes along with contemporary Muslim representation for groups located in these five regions making apparent the link between the two (see Section 3.1 below for a description of the underlying data).

2.2 Inner Asia

By the $8th$ century, Islam was no longer the religion of the Arab world and expanded geographical borders along the Silk Road. Conversions were often a result of financial considerations and the beneficial economic policies afforded to those joining the Ummah. Even among the conquered people in Central Asia, Islam continued to gain a hearing without coercion as merchants spread the religion. Muslim traders traveled as far as the capital of the Tang dynasty, Chang'an, in the Chinese Empire. The $9th$ century saw the rise of Islamic kingdoms in Central Asia, especially the Samanid Empire, the first Persian dynasty in power after the Arab conquests. The Islamization of the nomadic Turkic peoples of Central and Inner Asia occurred in the $10th$ century along the trade routes. This process has been linked mainly to their participation in the oasis-based Silk Road trade, and was accelerated by the conversion and the expansion of three Turkic Muslim dynasties of the Karakhanids, the Ghaznavids, and the Seljuks (Meri, 2006).

The major ethnic groups close to trade routes with a substantial Muslim representation in this region are the Uyghurs, the Hui people, the Kazakhs, the Kyrgyz and the Tajiks. These ethnic groups also exist within China today and comprise the Muslim minority in the country. They are all located around Xianjiang, a vast region of deserts and mountains along the Silk Road in Northwest China.

The Uyghurs are one of the largest ethnic groups in Inner Asia, and their Islamization goes back to the Karakhanids in early $10th$ century, the first Turkic dynasty to convert to the new religion. Prior to the adoption of Islam, they practiced different religions, including Shamanism, Manichaeism, Nestorianism, Zoroastrianism and Buddhism. Currently, the Uyghurs in China mostly live to the South of the Tianshan Mountains in Xinjiang. The core of Uyghurs' homeland was Kashgar, an oasis city located in the West of China near the current-day border of Tajikistan and Kyrgystan, which

historically served as a strategic trade hub between China, the Middle East, and Europe (Roemer, 2000).

The Hui people are another Muslim Chinese minority historically connected to Muslim merchants travelling along the Silk Road. Besides Xianjiang, they also live more to the East in Central China. A cluster of this ethnic group can be found today in Xi'an, where they form the majority of a large Muslim community. Xi'an was the first city in China where Islam was introduced. Emperor Gaozong of the Tang dynasty is known to have allowed the practice of Islam for the first time all the way back in 651 CE (Soucek, 2000).

The longest segment of the Silk Road lies across the territory of Central Asia and Kazakhstan. The religion practiced by the majority of Kazakhs is Islam since its introduction in the region by the Arabs during the $9th$ century. The Kazakhs live mainly on animal husbandry, and those in China mainly live to the North of Tianshan Mountains, Xinjiang. The Kyrgyz tribes also adopted Islam as Muslim traders and then Sufi missionaries began to move out from scattered towns to the nomadic steppes, spreading Islam among the tribal groups. They are known to have adopted Islam between the $8th$ and $12th$ centuries. Most of the Kyrgyz people in China also live in Xinjiang around the Tianshan Mountains with animal husbandry as their primary means of subsistence. The Tajiks on the other hand were initially Zoroastrian and started converting to Islam in the late $11th$ century. The Tajiks in China mostly live in the Taxkorgan Tajik Autonomous County in the northwest extreme of the country (Minahan, 2014).

2.3 East and West Africa

Islam spread through the well-established trade routes of the East coast of Africa by merchants rather than armies. The earliest records for trade in East Africa is the Greco-Roman trade down the Red Sea and along the Somali coast to the Tanzanian coast. This was followed by the trade of frankincense, myrrh, and spices with the Persian Gulf from the $2nd$ to the $5th$ century. Soon after Zanzibar island became a trade hub until the $9th$ century, when Bantu traders settled on the Kenyan-Tanzanian coast and joined the Indian Ocean trade networks interacting with the Somali and Arab proselytizers. Shanga, an early Swahili town on Pate island in the Lamu Archipelago is a good example of early influence through Muslim traders as they built the first small wooden mosque in the region around 850 CE (Shillington, 2005). Islam was established on the Southeast coast soon after, and eventually a full-scale prosperous Muslim dynasty known for trading gold and slaves was established at Kilwa on the coast of modern Tanzania. By the $11th$ century several settlements down the east coast were equipped with mosques, and Islam emerged as a unifying force on the coast to form a distinct Swahili identity. Indeed, the Swahili culture that emerged through contact with Muslim Arab and Persian traders on the East African coast evinces Islamic influences not seen in the traditional Bantu culture (Trimingham, 1964).

Historical accounts suggest that the early penetration of Islam was even more effective down the caravan routes of West Africa. Trans-Saharan trade started on a regular basis during the $4th$ century and presents a clear example of subsistence from trade between the people of Sahara, forest,

Sahel, and savanna (Boahen, et al., 1986). While present since 500 CE, the significance of the trans-Saharan trade rose and declined according to the empire in power and the security that could be maintained along the routes (Devisse, 1988). Islam was introduced through Muslim traders along several major trade routes that connected Africa below the Sahara with the Mediterranean Middle East, such as Sijilmasa to Awdaghust and Ghadames to Gao. Muslims crossed the Sahara into West Africa trading salt, horses, dates, and camels for gold, timber, and foodstuff from ancient Ghana. As Islam spread, it was first adopted by the elite, specifically rulers and merchants. The trade-friendly elements of Islam, such as credit or contract law, together with the information networks it helped create, facilitated long-distance trade. By the $10th$ century merchants to the South of the trade routes had converted to Islam. In the $11th$ century the rulers began to convert. The first Muslim ruler in the region is the king of Gao, from about the year 1000 followed by the kingdoms of Takrur and Kanem. The latter were located in the ecological transition zone between the Sahara desert and forests, where the contact between North African communities with those south of Sahara was concentrated. (Trimingham, 1962; Levtzion and Pouwels, 2000; Robinson, 2004).

An example of a country with high religious diversity is Nigeria. Two large ethnic groups in Northern Nigeria (once the Kingdom of Kanem and the Hausa city-states) were the Kanuri and the Hausa, both recognized for the early adoption of Muslim polities as a result of their proximity to the trade routes of the era. Specifically, the Kanem empire to the Northeast of Lake Chad is known to be the first area in the region to be exposed to Islam through North African traders, Berbers and Arabs. It was located at the southern end of the trans-Saharan trade route between Tripoli and the region of Lake Chad. Islam was accepted for the first time by the Kanem ruler, Umme Jilmi, who ruled during the last decade of the $11th$ century. The Hausa people were instead concentrated in the Northwest of modern Nigeria. Hausa states were historically important for international trade as they provided goods, soldiers and access to trade. Islam was brought to Hausaland by merchants and pilgrims as early as the $11th$ century (Falola, 1998; Falola and Heaton, 2008).

2.4 South and Southeast Asia

There is ample historical evidence indicating that Arabs and Muslims interacted with India from the very early days of Islam, although trade relations had existed since ancient times. Malabar and Kochi were two important princely states on the western coast of India where Arabs and Persians found fertile ground for their trade activities. The trade in the Malabar coast prospered due to the local production of pepper and other spices. Islam was first introduced to India by the newly converted Arab traders reaching the Western coast of India (Malabar and the Konkan-Gujarat) during the $7th$ century (Elliot and Dowson, 1867; Rawlinson, 2001; Makhdum, 2006).

Cheraman Juma Masjid in Kerala is thought to be the first mosque in India. It was built towards the end of Muhammad's lifetime during the reign of the last ruler of the Chera dynasty, who converted to Islam and facilitated the proliferation of Islam in Malabar. The $8th$ century constituted the start of a period of expansion of Muslim commerce along all major routes in the Indian Ocean, suggesting that the Islamic influence during this period was essentially one of commercial nature.

Initially settling in Konkan and Gujarat, the Persians and Arabs extended their trading bases and settlements to southern India and Sri Lanka by the $8th$ century, and to the Coromandel coast in the $9th$ century. These ports helped develop maritime trade linkages between the Middle East and Southeast Asia during the $10th$ century (Wink, 1990).

The people of the Malay world have been active participants in trade and maritime activities for over a thousand years. Their settlements along major rivers and coastal areas were important means of contact with traders from the rest of the world. The strategic location of the Malay Archipelago at the crossroad between the Indian Ocean and East Asia, and in the middle of the China-India trade route with the annual monsoonal system linking these major markets, had helped in the rapid development of trade in the region (Wade, 2009). Not surprisingly then several prominent seaports and trading centers emerged in the Malay world. In particular, the Srivijaya kingdom ($7th$ -$13th$ century CE) on the straits of Malacca had attracted ships from China, India, and Arabia plying the China-India trade routes by ensuring safe passage through the Straits of Malacca. Bordered in the North by the Malay Peninsula and in the South by the island of Sumatra, it was the main connection between the Indian Ocean and the South China Sea (Andaya and Andaya, 1982).

Islam spread in Southeast Asia like a slow giant wave through trade between the Middle East and India starting from the ports and continuing to inland areas eager to trade with the more prosperous coastal cities. Similar to Africa, rulers in Southeast Asia often converted to Islam through the influence of Muslim merchants who set up or conducted business there. While the landed Hindu-Buddhists were content to let the trade come to them, the Muslim merchants lacking a fixed land base made their profits from trade at the location of exchange. Consequently, people of Southeast Asia began to accept Islam and create Muslim towns and kingdoms. By the late $13th$ century, the kingdom of Pasai in northern Sumatra had converted to Islam. It was King Merah Silu (Malikulsalih), who first converted to Islam in 1267 AD. Also the collapse of Srivijayan power at the end of the 13th century drew foreign traders to the harbors on the northern Sumatran shores of the Bay of Bengal, safe from the pirate lairs at the southern end of the Strait of Malacca (Houben, 2003; Ricklefs, 1991).

A powerful and influential kingdom in the history of Islam in Southeast Asia was the Sultanate of Malacca located on the narrow straits of Malacca through which most trade traffic in the region passed. Around the year 1400 CE, a local king, Parameshwara (Iskender Shah), established a new kingdom in Malacca (on the North Shore of the Malacca Strait), announced his conversion to Islam and declared himself the Sultan of Malacca. The rulers of Malacca accepted Islam precisely in order to attract Muslim and Javanese traders to their port. Offering legal security under Islamic law, the adoption of Islam indeed brought advantages by attracting large numbers of Indian cloth merchants. Within decades, the Sultanate of Malacca became one of the major promoters of Islam in the region by providing a common culture for the surrounding region and neighboring states to adopt. The Malacca kingdom was a center of learning throughout the $15th$ century (Holt, 1970; Esposito, 1999). The Bugis ethnic group along Java's northern coast adopted Islam later in the $16th$ century through Muslim proselytizers from West Sumatra when they came into contact with the people of this region who conducted trade (Mattulada, 1983).

3 Empirical section

3.1 The Data Sources

The historical overview vividly illustrates the importance of pre-existing trade routes for the expansion of Islam but also suggests the beneficial impact of Islam on the further expansion of the trade network. To make sure we capture the first part of this two-way relationship, we construct our main explanatory variable by measuring the distance between the relevant unit of analysis (a country or an ethnic group) to the closest historical trade route or port before 600 CE reflecting the structure of trade flows already present in the Old World on the eve of Islam.

The location of trade routes is outlined in Brice and Kennedy (2001) whereas the location of ancient ports and harbors is taken from the work of Arthur de Graauw (2014) who collected and identified their precise locations based on existing documentation. The result is an impressive list of approximately $2,900$ ancient ports and harbors mentioned in the writings of 66 ancient authors and a few modern authors, including the Barrington Atlas. We complement the pre-600 CE routes mapped in Brice and Kennedy (2001) with information on the Roman roads identified in the Barrington Atlas, McCormick, Huang, Zambotti, and Lavash (2005). Finally, we also extend the trade network up to 1800 CE digitizing the relevant information from Brice and Kennedy (2001) and supplement it by routes within Europe, SE Asia, West Africa and China mapped in Brien (1999) during the same time period. We expect these data to be of usefulness to other researchers besides the current study.[5] See Figures 2*a* and 2*b* for the reconstruction of the pre-Islamic and pre-1800 CE trade network, respectively.

In the cross-country analysis the dependent variable employed is the fraction of Muslims in the population as early as 1900 CE reported by Barrett, Kurian, and Johnson (2001). For the ethnic group analysis the dependent variable is the fraction of Muslims and of other religious denominations in 2005 from the World Religion Database (WRD).[6] These estimates are extracted from the World Christian Database and are subsequently adjusted based on three sources of religious affiliation: census data, demographic and health surveys, and population survey data.[7] In absence of historical estimates of Muslim representation at an ethnic group level, we are constrained in using contemporary

[5] All distance measures are constructed in the following manner. We generate a grid of 0.5 by 0.5 decimal degrees and intersect the resulting cells with the country and homeland boundaries. We then calculate the distance from the centroid of each cell within the country/homeland to the nearest feature. To arrive at a single distance term for each unit of aggregation we take the mean value of the distances across the cells that fall within the country/ethnic homeland borders. This procedure is more accurate than using only the country's or homeland's centroid. Moreover, using the minimum or the maximum distance instead of the mean distance to the attributes of interest delivers more noisy coefficients.

[6] WRD classifies as Muslims the followers of Islam in its 2 main branches (with schools of law, rites or sects): Sunnis or Sunnites (Hanafite, Hanbalite, Malikite, Shafiite), and Shias or Shiites (Ithna- Ashari, Ismaili, Alawite and Zaydi versions); also Kharijite and other orthodox sects; reform movements (Wahhabi, Sanusi, Mahdiya), also heterodox sects (Ahmadiya, Druzes, Yazidis), but excluding syncretistic religions with Muslim elements, and partially-islamized tribal religionists.

[7] Hsu, Gibbon, Hackett, and Reynolds (2008) show that the country level estimates for Muslim representation in WRD are highly correlated (above 0.97) with similar statistics available from World Values Survey, Pew Global Assessment Project, CIA World Factbook, and the U.S. Department of State. At the ethnic group level there are no comparable statistics.

data. Reassuringly, country-level Muslim fractions derived from the WRD group-specific estimates are highly correlated (0.93) with the respective country numbers on Muslim adherence in 1900 AD.

Information on the location of ethnic groups' homelands is available from the World Language Mapping System (WLMS) database. This data set maps the locations of the language groups covered in the $15th$ edition of the Ethnologue (2005) database. The location of each ethnic group is identified by a polygon. Each of these polygons delineates the traditional homeland of an ethnic group; populations away from their homelands (e.g., in cities, refugee populations, etc.) are not mapped. Also, the WLMS (2006) does not attempt to map immigrant languages. Finally, ethnic groups of unknown location, widespread ethnicities (i.e., ethnic groups whose boundaries coincide with a country's boundaries) and extinct languages are not mapped and, thus, not considered in the empirical analysis. The matching between the WLMS (2006) and the WRD is done using the unique Ethnologue identifier for each ethnic group within a country.[8]

To capture how similar is the ecology of a given region to that of the Arabian Peninsula we construct the distribution of land quality and, in turn, the Gini coefficient of regional land productivity across countries and homelands of ethnic groups. Under the assumption that land quality dictates the productive capabilities of a given region, populations on fertile areas would engage in farming whereas in poorly endowed ones pastoralism would be the norm (see more on this in Section 4). In absence of historical data on land quality we use contemporary disaggregated data on the suitability of land for agriculture, to proxy for regional productive endowments. The global data on current land quality for agriculture were assembled by Ramankutty, Foley, Norman, and McSweeney (2002) to investigate the effect of future climate change on contemporary agricultural suitability and have been used extensively in the recent literature in historical comparative development. Each observation takes a value between 0 and 1 and represents the probability that a particular grid cell may be cultivated.[9]

Finally, we combine anthropological information on ethnic groups from Murdock (1967) with the Ethnologue (2005) enabling us to examine the pre-colonial societal and economic traits of Muslim groups. We discuss these two datasets in more detail as we introduce them to our analysis.

3.2 Cross-Country Analysis

We start by investigating the relationship between distance to trade routes in the Old World and Muslim adherence across modern-day countries. The cross-country summary statistics and the corresponding correlation matrix of the variables of interest are reported in Appendix Table 1.

To estimate how proximity to trade routes shapes Muslim adherence we adopt the following OLS specification:

$$\%\ \text{Muslim } 1900_i = \gamma_0 + \gamma_1 \text{Distance to Trade Routes}_i + \boldsymbol{\gamma}_2 \mathbf{X}_i + \nu_i \tag{1}$$

[8] For some language groups in WLMS (2006) the WRD offers information at the subgroup level. In this case the religious affiliation is the average across the subgroups.

[9] In the online Appendix we discuss in detail the components of the land quality index and present the sources of the data used in the empirical analysis.

where % Muslim 1900_i is the fraction of the population in country i adhering to Islam in 1900 AD.[10]

In column 1 of Table 1 we report the univariate results of our estimation. The association between distance from trade routes and Muslim adherence is large and precisely estimated. At a cross-country setting, variation in the distance to trade routes accounts for roughly 9% of the observed differences in Muslim representation. The magnitude of the estimated coefficient, moreover, suggests that a country located $1,000$ kilometers further from the 600 CE trade routes has 15% lower Muslim representation. Naturally, one may wonder whether this association remains robust to other possible determinants of Muslim adherence that may be correlated to distance to trade routes. In column 2 we add a series of distance terms that may be confounding our relationship. The literature reviewed in Section 2 unequivocally suggests that proximity to Mecca is likely to be a strong predictor for the spread of Islam and this is indeed what we find. The precisely estimated coefficient on distance to Mecca suggests that countries that are $1,000$ kilometers closer to Mecca see an increase in their Muslim share of 7% whereas countries further away from the equator are also less likely to be Muslim. Distance to the coast by itself does not significantly affect Muslim representation. These three additional location attributes significantly increase the predictive power of the empirical model, the R^2 jumps to 23%, nevertheless the coefficient of interest only slightly declines and remains precisely estimated.

In the rest of the columns of Table 1 we add additional geographic variables. The goal is twofold. First, to make sure that the uncovered relationship between distance to trade routes and Muslim adherence is not driven by some other geographic factor and second, and perhaps more importantly, doing so we attempt to shed light on the geographic covariates of Islam. Given the recent interest among growth economists on the environmental determinants of comparative development the list of potential geographic candidates is long. So, our choice of variables is disciplined in the following manner. Since we are interested in exploring whether ecological similarity to the Arabian peninsula of a given region predicts the presence of Muslim communities we construct the Gini coefficient of land suitability for agriculture using the data from Ramankutty, Foley, Norman, and McSweeney (2002).

The following example may help illustrate the type of geographies that this measure reflects. Uzbekistan and Poland are both equally close to pre-Islamic trade routes (approximately 190 kilometers) but have a very different ecology. On the one hand, Uzbekistan has less than 10% of its territory in river valleys and oases that serve as a cultivable lands whereas the rest of the country is dominated by the Kyzyl Kum desert and mountains. In our data the Gini coefficient of land quality is estimated to be 0.59 (82nd percentile) with an average land quality of 0.25. On the other hand, Poland has a much more homogeneous geography in terms of farming potential with a Gini coefficient of 0.16 (30th percentile) and an average of 0.56. As of 1900 CE Uzbekistan was 98% Muslim whereas there was no Muslim representation in Poland. These stark geographic differences across Muslim and non-Muslim countries are readily visible in the our sample. Out of the 127 countries in the Old

[10] We focus on countries with at least 3 regional observations of land quality to ensure that our findings are not driven by countries with limited regional coverage. Using as dependent variable the Muslim representation in 2000 the coefficients of interest are larger and more precisely estimated. Presumably this is because earlier estimates of religious affiliation are more noisy.

World those 35 (92) that have a Muslim absolute majority (minority) have median land quality equal to 0.22 (0.50) and median Gini coefficient in land quality of 0.54 (0.20). In column 4 of Table 1 we add both these geographic indexes in logs to our benchmark specification. The estimated coefficient on proximity to pre-Islamic trade routes remains qualitatively and quantitatively intact. Moreover, the estimates suggest that low land suitability for agriculture and high inequality in the spatial distribution of this scarce factor are strongly predictive of the presence of Muslims across countries. Adding these two features in the regression increases the R^2 by 25 percentage points revealing the importance of geographic features in the spread of Islam. One may naturally wonder what are the potential mechanisms behind this strong associations. We will return to this question in Section 4.

In the rest of the columns of Table 1 we check the robustness of our findings. Specifically, in column 4 we add four more geographic traits. The log area of each country, the log of terrain ruggedness, an indicator reflecting the presence of a desert and an indicator reflecting whether a country has any irrigation potential.[11] These geographic variables are chosen for the following reasons. First, Bulliet (1975) observed that Arab armies had a comparative advantage over desert terrain. In our sample of 127 countries 38 feature some desert. Moreover, Bentzen, Kaarsen, and Wingender (2016) show that Muslim countries have higher irrigation potential and the latter may be correlated both with proximity to trade routes and inequality in the spatial distribution of land quality across cells within a country. Finally, ruggedness is added as it is likely that more rugged countries limit the ability of foreign powers to penetrate them, and it also seems plausible that ruggedness is associated with the quality of land and trade routes, Chaney and Hornbeck (2016). Adding these controls neither changes the magnitude nor the precision of the estimates of our main explanatory variables. Among these new covariates the only consistent predictor of Muslim representation is the potential for irrigation in line with Bentzen, Kaarsen, and Wingender (2016). Finally, in column 5 we add continental fixed effects to account for the broad geographic and historical differences between the continental masses finding similar results. Figure 3 plots non-parametrically the relationship between Muslim representation and distance to the pre-Islamic trade network after partialling out the covariates included in column 5.

3.3 Cross-Ethnic-Group Analysis

The evidence so far reveals a strong cross-country association between Muslim representation and proximity to pre-Islamic trade routes as well as an unequal distribution of land endowments. However, the spread of Islam is a historical process that predated the emergence of modern nation states. Moreover, the historical record is replete with examples of modern-day countries actively influencing their religious composition by promoting or demoting specific religious identities. Would the uncovered cross-country patterns survive if we were to account for the idiosyncratic historical legacies of contemporary states? To answer this we look at the religious affiliation of ethnic groups within countries. This allows us to control for country-specific constants and thus produce reliable estimates

[11] We follow Bentzen, Kaarsen, and Wingender (2016) and define the irrigation potential of an area as land that is classified in irrigation Impact Class 5. Impact Class 5 are those cells where irrigation can more than double agricultural yields. Out of the 127 countries 72% have some irrigation potential whereas 28% of countries feature no such cells.

of the impact of trade routes on Muslim adherence.

In Appendix Table 2 Panel A we report the summary statistics of the main variables employed in the cross-ethnic-group analysis.[12] An average ethnic group in the Old World has 21% of its population adhering to Islam in 2005, is $5,230$ kilometers far from Mecca and $1,345$ kilometers away from trade routes before 600 AD. Appendix Table 2 Panel B shows the raw correlations among the main variables of interest. Ethnic-specific Muslim representation is negatively related to distance to Mecca (-0.24) and distance to trade routes in 600 AD (-0.22).

We adopt the following specification:

$$\%\text{ Muslim in } 2005_{i,c} = \beta_0 + \beta_1 \text{Distance pre-600CE Trade Routes}_{i,c} + \boldsymbol{\beta}_2 \mathbf{X}_{i,c} + \delta_c + v_{i,c}, \quad (2)$$

where δ_c represents the country-specific fixed effects.[13]

Before showing the results for all groups across the Old World, and motivated by the historical accounts summarized in section 2, in Table 2 we report bivariate regressions linking distance to pre-600 CE trade routes to contemporary Muslim adherence across linguistic groups within specific countries. In columns 1, 2, and 3 we look at the religious composition of language groups in China, Mali (the location of the ancient Ghana empire), and Tanzania, respectively. Within each of these countries with varied historical legacies, and as foreshadowed by our early discussion, proximity to trade routes is a systematic predictor of Muslim communities. In column 4 we focus on Indonesia, the country with the largest Muslim population worldwide. Across the 615 linguistic groups mapped by the Ethnologue, variation in the proximity of these homelands to pre-Islamic trade routes accounts for almost a quarter (22%) of the observed variation in contemporary Muslim adherence. In column 5 we show that a similar pattern holds for India, a country where although Muslims are a minority they nevertheless represent the third-largest Muslim population across countries. In what follows, instead of showing country-specific estimates we use the entire sample of linguistic groups across the Old World to assess this link.

To facilitate comparison across the different levels of analysis the layout of Table 3 mimics that of Table 1. The pattern uncovered in the cross-country analysis resurfaces in the cross-ethnicity sample. The difference between columns 1 and 2 in Table 3 is that in the latter we include country-specific constants. Doing so the coefficient on proximity to pre-Islamic trade routes increases considerably. Within modern-day countries ethnic groups whose historical homelands are closer to the trade routes before 600 CE experience a significant boost in their Muslim representation. Namely, a one-thousand-kilometers increase in the former decreases Muslim representation by 17 percentage points. Columns 3 to 5 confirm the pattern obtained in columns 2 to 4 of Table 1. Regions closer to pre-Islamic trade routes, characterized by overall low land quality interspersed with pockets of fertile land are more likely to be populated by Muslim communities today. One noteworthy difference between the two levels of aggregation is that in the cross-group sample proximity to Mecca is now a reliable and precisely

[12] Similar to the cross-country regressions we focus on ethnic groups with at least 3 regional land quality observations. Using all ethnic groups irrespective of the underlying geographic coverage does not change the results.

[13] The results presented here are OLS estimates with the standard errors clustered at the country level. Adjusting for spatial autocorrelation following Conley (1999) delivers more conservative standard errors.

estimated correlate of Muslim adherence. In Figure 4 we graph non-parametrically the association between Muslim representation across groups and distance to the pre-Islamic routes after partialling out all covariates included in column 5 of Table 3.

Groups of people coming under the direct rule of a Muslim empire might face other incentives for converting to Islam related to social mobility, Bulliet (1979), career within a Muslim bureaucracy, Eaton (1996), or lower tax rates, Chaney (2008). For example, the lower tax rates granted to Muslims over non-Muslims within Muslim Empires or the status achieved by switching to the ruler's religion might differentially affect conversion rates. Likewise, instances of forced conversion, religious persecution during the Muslim expansion, or Arab migration movements within the Muslim empires might have shaped the observed religious affiliation. Hence, in column 6 we focus on ethnic groups outside the Muslim empires as classified by Iyigun (2010). We categorize an ethnic group as being outside a Muslim empire if the country to which it belongs today has never been part of a Muslim empire. The negative relationship of Muslim adherence and distance from trade routes and the positive link with geographic inequality both remain significant outside the former Muslim empires.

One might argue that the link between trade and Muslim adherence is not particular to Islam. We tackle this issue by asking whether the identified relationship between Islam and the distance to trade routes systematically holds for other major religions. To facilitate comparisons in column 1 of Table 4 we use as a dependent variable the fraction of Muslims (essentially replicating column 5 of Table 3). In columns 2, 3 and 4 we use as a dependent variable the percentage of people within an ethnic group adhering to three other major religions i.e., Christianity, Hinduism and Buddhism, respectively. Lastly in column 5 we use the fraction of people adhering to local animistic, or shamanistic religions, called Ethnoreligionists. No other religion shows a systematic negative relationship with distance to ancient trade routes. Interestingly the association appears to be the opposite for Christianity.

These findings uncover the so far neglected crucial role of trade in shaping the differential adherence to Islam across ethnic groups and shed new light on the geographical origins and spatial distribution of Muslims within modern-day countries.

Robustness Checks In the Appendix we offer a series of sensitivity checks of the main pattern established in Tables 1 and 3. First, in columns 1 and 4 of Appendix Table 3 we replicate the specifications reported in the column 5 of Tables 1 and 3 with the difference being that we replace the dependent variable with a dummy equal to one for countries/groups where Muslims are the absolute majority. The estimated coefficients suggest that a $1,000$-kilometers increase in the distance to pre-Islamic trade routes decreases the probability of finding a country (group within a country) with a Muslim majority by 15% (10%). Second, in columns 2 and 5 we explore the non-linearity of proximity to pre-Islamic trade routes to capture the plausibly diminishing role of distance for regions further away from the trade hubs. The quadratic term on distance to pre-600 CE trade routes alternates in sign across levels of aggregation and is highly insignificant. There are couple of ways to rationalize this finding. The first may reflect the fact that despite our systematic efforts to collect a comprehensive

set of indicators regarding the presence of pre-Islamic regional trade opportunities (manifested in routes, roads, and ports) we are fully aware that measurement error in the mapping of ancient routes is non-trivial.

A second more nuanced interpretation of the non-significance of the quadratic term is that Muslims starting from the pre-600 CE trade network and over the next $1,000$ years till the beginning of the European colonialism significantly expanded trade routes adding myriad new connections, reaching vast areas in Sub-Saharan Africa and Asia. This implies that the network relevant for discerning a diminishing role of the proximity to trade routes on the spread of Islam is not the pre-600 CE one but the routes on the eve of the colonial era. To explore the empirical validity of this conjecture we expanded our trade routes dataset with information up to 1800 CE. Columns 3 and 6 of Appendix Table 3 clearly show that Muslim representation both across countries and across-groups within countries has a concave relationship with proximity to trade. Further increasing distance to pre-industrial trade hubs for regions already far from them has little bearing on their Muslim adherence. A note of caution is in order. Using data on trade routes after 600 CE implies that the empirical relationship cannot be unequivocally interpreted as it clearly reflects a two-way interplay from initial trade routes to the spread of Islam and from the latter to the further development of the trade network.

4 Unpacking Proximity to Trade Routes and Inequality in Land Endowments

We have so far established a strong positive association between proximity to ancient trade routes and contemporary Muslim adherence and a positive link between geographically unequal regions and the presence of Muslim communities. In this section we do two things. First, we investigate whether a group's proximity to trade routes predicts its reliance on trade. Second, we open the black box of what inequality in land quality reflects using contemporary data on land use and historical data on the subsistence pattern across groups.

Historical Trade Routes and Historical Dependence on Trade Is it the case that groups closer to trade routes are more likely to engage in trade? Historical data on dependence on trade are notoriously difficult to come by. To the best of our knowledge the only dataset that records the extent of trade at the group level in the pre-industrial era is the Standard Cross Cultural Sample (SCCS), which reports detailed information for 186 historical societies worldwide.[14] The entry we are interested in, is the share of overall subsistence needs that comes from trade ($v819$). Across the 121 societies in the Old World we compute the distance from their centroids (reported in the SCCS) to the closest trade routes before 600 CE and 1800 CE.

In Table 5 we report the results. The coefficient estimate on distance to the pre-600 CE trade

[14] The SCCS comprises of ethnographically well-described societies, selected by George P. Murdock and Douglas R. White, published in the journal Ethnology in 1969, and followed by several publications that coded the SCCS societies for many different types of societal characteristics.

routes is negative but statistically insignificant. The absence of significance is easy to understand. All but four of the SCCS societies were recorded by ethnographers after 1750 CE which implies that the trade exposure that these groups had was that of the trade network as of 1800 and not the one of 600 CE. Indeed when we replace the distance to 600 CE trade routes with the one of 1800 CE a strong negative relationship emerges. Groups closer to the trade network consistently derive a larger share of subsistence from trade. Examples include the Javanese in Indonesia and the Rwala Bedouin, a large Arab tribe of northern Arabia and the Syrian Desert. Both groups are a mere 70 kilometers far from the trade routes and ports in 1800 CE and derived as much as 25% of their subsistence from trade. In column 3 we drop the 4 SCCS societies that were documented by ethnographers before 1750, namely the Babylonians, the Hebrews, the Khmer, and the Romans finding a similar pattern.

What Does Land Inequality Capture? Our motivation for constructing the inequality in the distribution of agricultural potential across regions is that this statistic reflects the ecological conditions of the Arabian peninsula, the birthplace of Islam. Indeed, across the $36,582$ land quality observations in the Old World among the $1,285$ cells that belong to the Arabian Peninsula the Gini coefficient of land quality is 0.87 with an average land quality of 0.03 whereas the statistics for the rest of the regions are 0.57 and 0.32, respectively.[15] In a stage of development when land quality dictates the productive structure of the economy one would expect societies along unequally endowed territories to have a specific productive structure with herding dominating the arid and semi-arid regions and farming taking place in the few fertile ones. This was certainly the economic landscape of pre-industrial Arabian peninsula. Below we verify this link using historical and contemporary data across groups on the dependence on pastoralism and agriculture.

The data on land use come from Ramankutty, Foley, Monfreda, and Foley (2008) that provide at the grid level of 0.083 by 0.083 decimal degrees an estimate of the shares of land allocated to pasture and agriculture in 2000, respectively. We aggregate this information at the homeland level to obtain a measure of how tilted is land allocation in favor of pasture. The data on the historical traits across groups come from Murdock (1967) who produced an Ethnographic Atlas (published in twenty nine installments in the anthropological journal Ethnology) that coded around 60 variables, capturing cultural, societal and economic characteristics of $1,270$ ethnicities around the world. We linked Murdock's Ethnographic Atlas groups to the Ethnologue's linguistic homelands in the Old World. These two datasets do not always use the same name to identify a group. Utilizing several sources and the updated version of Murdock's Atlas produced by Gray (1999), we were able to identify the pre-colonial traits as recorded in the Ethnographic Atlas for $1,210$ linguistic homelands in the Ethnologue (2005).[16]

In the first three columns of Table 6 the dependent variable is the log ratio of pastoral over agricultural area in 2000 across linguistic groups.[17] All columns include country-specific constants.

[15] The Arabian Peninsula consists of the following 9 contemporary countries: Yemen, Oman, Iraq, Jordan, Qatar, Bahrain, Kuwait, Saudi Arabia and the United Arab Emirates.

[16] Unlike the SCCS dataset, Murdock's Ethnographic Atlas does not have information on trade-related statistics.

[17] Note that the number of groups in columns 1 to 3 is $2,845$ instead of the $3,181$ covered in Table 3. This is because for 336 linguistic homelands the allocation of land either towards farming or towards pasture in 2000 is 0 so the log of

Within countries groups residing along poor and unequally endowed regions display a larger land allocation towards animal husbandry compared to farming. Adding the geographic variables discussed above in column 2 does not change the pattern. The only additional finding is that groups located in rugged regions are also more dependent on pastoralism than agriculture. In column 3 we verify that Muslim groups today live in homelands that display this particular type of land use, i.e., an allocation of land skewed against agriculture and in favor of pastoral activities.

Is it the case that groups residing in habitats where farming today is limited and herding significantly more common had a similarly lopsided type of subsistence in the pre-industrial era? This is what we ask in column 4 where the dependent variable is the log ratio of the share of subsistence derived from animal husbandry over agriculture as recorded in the Ethnographic Atlas. Groups that today allocate more of their land towards pastoralism also used to derive more of their livelihood from similar activities in the past suggesting the persistence in the structure of production across groups.

In columns 5 to 7 we replicate the pattern shown in columns 1 to 3 with the difference being that on the left hand side of the equation instead of the contemporary land allocation, we use the log ratio of the historical subsistence share from animal husbandry relative to agriculture. Homelands characterized by low land potential for agriculture dotted with few pockets of fertile land used to obtain more from herding and less from agricultural products. Adding the geographical covariates in column 6 reveals that the presence of desert and of lands with irrigation potential also skew subsistence towards animal husbandry. Finally, in column 7 we show that indeed Muslim groups are those that historically were more dependent on pastoralism and less on farming corroborating one of the long-standing themes in the environmental history of Islamic Eurasia and North Africa; namely, the interface between the steppe and the sown, Mikhail (2012).

In this environment where each area specializes in its comparative advantage (farmers in the fertile pockets and herders in the relatively arid ones) a larger geographical Gini coefficient may correspond to larger potential gains from trade. Richerson (1996), for example, observes that "despite the emphasis on animals, most herders are dependent on crop staples for part of their caloric intake ... procured by client agricultural families that are often part of the society and the presence of specialized tradesmen that organize the exchange of agricultural products for animal products". This suggests that an exchange economy may be more vibrant within a community of many herders and few farmers. To shed light on this conjecture we rely on the Standard Cross Cultural Sample (SCCS). Specifically, in column 8 of Table 6 we ask whether societies relying more on pastoralism relative to agriculture, also derive more of their subsistence needs from trade; across the 186 ethnographic societies worldwide this is indeed the case. Overall, the results in Table 6 reveal how the specific geographic endowments of Muslim homelands give rise to a distinct specialization pattern; a pastoral economy with few farmers and that such communities are more likely to depend on trade than others.

Why Ecological Similarity to the Arabian Peninsula Matters for the Spread of Islam? At first blush showing that Muslim regions are ecologically similar to the birthplace of

their ratio is not well defined.

Islam, i.e., the Arabian peninsula, is consistent with various interpretations.

First, Michalopoulos (2012) argues that cultural groups have location-specific human capital derived from the type of geography they inhabit. Hence, when members of such groups leave their group's homeland they are likely to target regions that are productively similar to their ancestral territories to ensure transferability of their skills. For example, early farmers and pastoralists moving out of the Fertile Crescent on the eve of the Neolithic Revolution follow such pattern of dispersal, i.e., farmers moving to land suitable for agriculture whereas herders finding themselves in landscapes appropriate for animal husbandry. One may apply a similar reasoning to the diffusion of Islam. Since the productive toolset of early Muslims was fine-tuned to the arid landscapes of the Arabian Peninsula, seeing Muslims migrating in lands similar to their ancestral regions can be easily rationalized.

Second, along similar lines Bulliet (1975) convincingly argues that one crucial element for understanding the spread of Muslim empires is the use of the camel that conferred the Arab armies a military edge over their rivals. So, terrains suitable for deploying the camel would be more easily conquered whereas others would remain beyond the reach of Muslim rulers. Chaney (2012) shows empirically how a desert ecosystem is indeed predictive of the Arab conquests and Muslim adherence across countries today.

Both these arguments are very relevant for understanding the spread of Islam in places that experienced either a Muslim conqueror and/or a significant influx of Muslims. Nevertheless, in many of the cases discussed in the historical section, Islam was often voluntarily adopted by the local rulers in absence of significant Muslim population movements. What arguments may then rationalize the voluntary adoption of Islam across geographically unequal regions? Below we offer some tentative explanations.

Islam, Trade and Unequal Geography Several Islamicists have stressed the pro-trade elements of Islam. Ensminger (1997), for example, maintains that Islam has been an attractive option to communities through the institutional advantages it created by facilitating trade. According to Cohen (1971) "[Islam is a] blue-print of a politico-economic organization which has overcome the many basic technical problems of trade." Trade called for new types of economic organization that required stronger authority, Davidson (1969). An important advantage of Islam with respect to previous arrangements was the fact that it was a religion offering a powerful ideology with built-in sanctions which contributed to contract enforcement. Believers had a non-material interest in holding to the terms of contracts even when presented with the opportunity to deviate. This common framework allegedly contributed to the reduction in transaction costs while doing business with fellow Muslims. The importance of safeguarding exchange in the Muslim doctrine is not surprising when one considers that not only Muhammad but also the majority of those who contributed to the crystallization of the Muslim law over time had a merchant or craftsman background, Cohen (1970).

We offer two complementary explanations that highlight the pro-trade stance of Islam. The first one derives from the observation that historically within geographically unequal societies trade is likely to play an important role for subsistence (see Column 8 of Table 6). Hence, to the extent that

Islam offered an institutional framework promoting exchange, groups across geographically unequal territories would have an added incentive to convert.

Second, in our companion paper, Michalopoulos, Naghavi, and Prarolo (2016), we advance theoretically an interrelated albeit more nuanced hypothesis where the Islamic economic rules arise to mitigate social tensions across Arabia's tribes exposed to long-distance trade opportunities during the 7th century. In a nutshell we argue that trade diversion over Arabia created new potential economic benefits for the scattered oases by transforming them to trade hubs providing services to the trading community (Watt, 1961). Caravans, however, for thousands of miles were constantly exposed to raids by the Bedouins, who made up a considerable fraction of the population at that time (Berkey, 2003). In this historical backdrop, we hypothesize that Islamic rules were devised in response to the costly nature of predation between the Bedouins and oasis dwellers offering a framework whose redistributive principles safeguarded exchange over numerous and heterogeneous tribal territories, (Bogle, 1998).[18]

This view of Islam as an institutional package engineered to allow for long-distance trade to flourish across unequally endowed regions generates an auxiliary prediction, that is, Islam should be able to gain a hearing more readily across unequal territories close to trade routes. Empirically, this can be tested by adding the interaction between distance to trade routes and ports and the degree of geographic inequality. Columns 1 and 2 of Table 7 are country-level regressions and 3 and 4 focus on ethnic groups within countries. Across both units of aggregation the interaction term enters with a negative sign and it is statistically significant.[19] The point estimates in specification 1 suggest that the effect of land inequality on Muslim adherence across countries becomes insignificant for countries further than 650 kilometers from the trade routes as of 600 CE pointing to the differential incentives to convert to Islam among the geographically unequal regions in the vicinity of historical trade routes.

Although the decline in the predictive power of land inequality in agricultural endowments further from trade routes is consistent with the proposed view that Islamic rules were better suited for geographically unequal communities close to trade routes, it is far from a proof. To establish that converting to Islam indeed facilitated trade and changed the underlying institutional framework of the communities increasing redistribution and mitigating conflict one would need data before and after Islamization of these group-level characteristics. Cross-sectional variation only cannot shed light on whether Islamization changed the societal structure or that groups with similar traits already found it easier to become Muslim. Taking these qualifiers into account in the Appendix we show that Muslim groups are different from non-Muslim groups in some of their institutional and societal arrangements. Specifically, in Appendix Table 4 we show that Muslim societies as recorded by ethnographers in the Old World are more likely to be (i) politically centralized, (ii) harbor beliefs in moral gods, (iii)

[18] The link between the structure of production, institutional formation and religion can be readily glimpsed in the works of Ibn Khaldun (1377) and Marx (1833 [1970]). Ibn Khaldun (1377) notes that "... it is the physical environment-habitat, climate, soil, and food, that explain the different ways in which people, nomadic or sedentary, satisfy their needs, and form their customs and institutions" whereas Marx (1833 [1970]) highlights that religion, like any other social institution, is a by-product of the society's productive forces.

[19] Note that when we use the trade network before 1800 CE the direct effect of distance to trade routes also reflects reverse causality. Nevertheless, irrespective of who set up the routes, we may still explore whether it is unequally endowed regions that are differentially impacted.

follow equitable inheritance rules, and (iv) that, unlike non-Muslim groups where there is a strong link between an unequal geography and social stratification, across Muslim groups this association is muted.

5 Conclusion

In this study we examine the historical roots of Muslim adherence within as well as across countries. First, by digitizing and combining a multitude of historical sources we construct detailed data on ancient, pre-Islamic trade routes, harbors and ports and show that regions in the vicinity of such locations are systematically more likely to be Muslim. We view this finding as offering large-scale econometric support to a widely held conjecture among prominent Islamicists like Lapidus (2002), Berkey (2003) and Lewis (1993), and complement this empirical regularity with historical accounts illustrating the importance of trade contacts in the process of Islamization of various prominent locations in Africa and Asia.

Second, we establish that Muslim communities tend to reside in habitats that are ecologically similar to those of the Arabian Peninsula, the birthplace of Islam. Specifically, we show that Muslim homelands are dominated by arid and semi-arid lands where animal husbandry is the norm, and dotted with few niches of fertile land where farming is feasible. Overall, a poor and unequal distribution of agricultural potential predicts Muslim adherence. We discuss the various mechanisms that may give rise to this pattern and offer some evidence consistent with the view of Islam as an institutional package appropriate for societies residing along unequally endowed regions in the vicinity of trade opportunities.

The empirical analysis is conducted across countries and across ethnic groups within countries. Exploring within-country variation is crucial in our context given the intimate relationship between country formation and religious denomination. Across both levels of aggregation, there is a robust link between proximity to pre-Islamic trade routes, geographic inequality, and Muslim representation. The identified pattern is unique to the Muslim denomination and it obtains for regions that historically have not been part of a Muslim empire. Overall, the empirical analysis highlights the prominent role of history in shaping the contemporary spatial distribution of Muslim societies.

We view these findings as a stepping stone for further research. For example, focusing on specific regions where historical data may be available one may explore time variation in the speed at which Islam made inroads to the respective communities. Moreover, one element we do not touch upon is why religious beliefs once adopted persist over time. Insights from the rapidly growing theoretical and empirical literature on the persistence of beliefs and attitudes may shed light on this phenomenon, see Bisin and Verdier (2000) and Voigtlander and Voth (2012). Finally, having identified some of the forces behind the formation and spread of Islam one might examine the economic and political consequences for the short-run and the long-run development of the Muslim world, see Michalopoulos, Naghavi, and Prarolo (2016). We plan on tackling some of these issues in subsequent research.

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Supplementary Appendix for "Trade and Geography in the Spread of Islam"

6 Appendix

6.1 Data: Geographical Variables

Absolute Latitude: Absolute distance from the equator averaged across the centroids of each 0.5 by 0.5 decimal degrees cell that fall within a country or ethnic group in decimal degrees.

Source: Constructed using ArcGis.

Average Land Quality: Average suitability for farming based on climatic and soil characteristics within the respective unit of analysis.

Source: Michalopoulos (2012). The raw dataset is available at the Atlas of the Biosphere.[20]

In order to construct this index Ramankutty, Foley, Norman, and McSweeney (2002) empirically estimate the probability density function of the percentage of croplands around 1990 with respect to climate and soil characteristics. Then the authors combine the derived probability with data on climate and soil quality to predict regional suitability for agriculture at the resolution of 0.5 degrees latitude by 0.5 degrees longitude worldwide. The climatic characteristics are based on mean-monthly climate conditions for the 1961–1990 period and capture (i) monthly temperature (ii) precipitation and (iii) potential sunshine hours. All the climatic conditions weakly increase the suitability of land for agriculture. Regarding the soil suitability the traits considered are a measure of the total organic content (carbon density) and the nutrient availability (soil pH). The relationship of these indexes with agricultural suitability is non-monotonic. Low and high values of pH limit cultivation potential, since these values signal that soils are too acidic or too alkaline, respectively. Specifically, Average Land Quality, lq, is the product of two components capturing the climatic suitability for cultivation, lq_{clim}, and the soil suitability, lq_{soil}. Hence, $lq = lq_{clim} * lq_{soil}$. Each component is constructed in the following way: $lq_{clim} = f_1(GDD) * f_2(m)$, where GDD denotes growing degree days and m is a moisture index capturing the availability of water to plants. Regarding soil characteristics, $lq_{soil} = g_1(C_{soil}) * g_2(pH_{soil})$, where C_{soil} stands for soil carbon density and pH_{soil} captures the acidity or alkalinity of soil. Each functional form is derived from the probability density function of actual cropland area versus each component. For example, in the case of $f_1(GDD)$ and $f_2(m)$ according to Ramankutty, Foley, Norman, and McSweeney (2002) a sigmoidal function best fits the observed empirical relationship between the fraction of a cell that was cultivated in 1990 and the GDD and m respectively. Specifically, $f_1(GDD) = 1/(1 + \exp(a(b - GDD)))$ and $f_2(m) = 1/(1 + \exp(c(d - m)))$ with $a = 0.0052$, $b = 1334$, $c = 14.705$ *and* $d = 0.3295$. The functional forms of $g_1(C_{soil})$ and $g_2(pH_{soil})$ are the following: $g_1(C_{soil}) = (a/(1 + \exp(b(c - C_{soil})))) * (a/(1 + \exp(d(e - C_{soil}))))$ with $a = 3.9157$, $b = 1.3766$, $c = 3.468$ *and* $d = -0.0791$ and $g_2(pH_{soil}) =$

[20] It may be dowloaded from http://www.sage.wisc.edu/iamdata/grid_data_sel.php.

$$\left\{\begin{array}{ccc} -2.085+0.475pH_{soil} & if & pH_{soil}\leq 6.5 \\ 1.0 & if & 6.5<pH_{soil}<8 \\ 1.0-2.0pH_{soil} & if & pH_{soil}\geq 8 \end{array}\right\}.$$

Distance to Mecca: Great-circle distance from Mecca averaged across the centroids of each 0.5 by 0.5 decimal degrees cell that fall within a country or ethnic group in thousand kilometers.

Source: Calculated using the Haversine Formula.

Distance to Trade Routes before 600 AD: Great-circle distance from the nearest trade route before 600 AD averaged across the centroids of each 0.5 by 0.5 decimal degrees cell that fall within a country or ethnic group in thousand kilometers.

Source: Use the trade routes mapped in Brice and Kennedy (2001) in 600 CE; the digital version of the Roman roads identified in the Barrington Atlas ; and a list of around $2,900$ ancient ports based on the writings of 66 ancient authors and a few modern authors, including the Barrington Atlas, .

Distance to Trade Routes in 1800 AD: Great-circle distance from the nearest trade route in 1800 CE averaged across the centroids of each 0.5 by 0.5 decimal degrees cell that fall within a country or ethnic group in thousand kilometers.

Source: Calculated using the all trade routes mapped in Brice and Kennedy (2001) before 1800 CE. This information is supplemented by maps from Brien (1999) which contain information on trade routes within Europe, SE Asia, West Africa and China during the same time period; the digital version of the Roman roads identified in the Barrington Atlas ; and a list of around $2,900$ ancient ports based on the writings of 66 ancient authors and a few modern authors, including the Barrington Atlas, .

Land Inequality: Inequality in the regional suitability for agriculture within country or linguistic homeland. The measure used in the regressions is the log of the Gini index.

Source: See **Average Land Quality**

Sea Distance: Distance from the nearest coastline (1000's of km.) averaged across the centroids of each 0.5 by 0.5 decimal degrees cell that fall within a country or ethnic group in thousand kilometers.

Source: The coastline shapefile comes from the coastlines of seas and oceans dataset. Publisher: Global Mapping International, Colorado Springs, Colorado, USA. Series name: Global Ministry Mapping System. Series issue: Version 3.0

Irrigation Potential: indicator that takes the value 1 if there are regions in a given country/homeland classified as Impact Class 5, i.e., there are cells where irrigation can more than double agricultural yields.

Source: GAEZ available at http://webarchive.iiasa.ac.at/Research/LUC/SAEZ/index.html. The raster file is plate number 47.

Ruggedness: Apply the ruggedness index formula by Nunn and Puga (2012) using the topographical data of the Global Land One-Kilometer Base Elevation (GLOBE) digital elevation model.

Ratio of Land Allocation of Pasture Relative to Agriculture in 2000: The data on

land use come from Ramankutty, Foley, Monfreda, and Foley (2008) that provide at the grid level of 0.083 by 0.083 decimal degrees an estimate of the shares of land allocated to pasture and agriculture in 2000, respectively. We aggregate this information at the homeland level to obtain a measure of how tilted is land allocation in favor of pasture.

6.2 Data: Historical Variables

% **Muslim in 2005 AD**: Fraction of Muslim population in 2005 within an ethnic group.

Source: World Religion Database, available at: http://www.worldreligiondatabase.org/

% **Muslim in 1900 AD**: Fraction of Muslim population in 1900CE within country.

Source: Religion Adherence Data - McCleary and Barro (2005) available at http://ksghome.harvard.edu/~rmcclea/data.html

Muslim Majority: Dummy variable equals 1 if the percentage of Muslims either in a country or an ethnic group is larger than 90%.

Source: See **% Muslim in 2005 AD / % Muslim in 1900 AD.**

Animal Husbandry: $0-9$ scale index reflecting the intensity of pastoralism. The index equals 0 when there $0\% - 5\%$ dependence; 1 when there is $6\% - 15\%$ dependence; 2 when there is $16\% - 25\%$ dependence; 3 when there is $26\% - 35\%$ dependence; 4 when there is $36\% - 45\%$ dependence; 5 when there is $46\% - 55\%$ dependence; 6 when there is $56\% - 65\%$ dependence; 7 when there is $66\% - 75\%$ dependence; 8 when there is $76\% - 85\%$ dependence; and 9 when there is $86\% - 100\%$ dependence. *Source: Murdock (1967); variable code in the Ethnographic Atlas v4.*

Agriculture: $0 - 9$ scale index reflecting the intensity of agriculture. The index equals 0 when there $0\% - 5\%$ dependence; 1 when there is $6\% - 15\%$ dependence; 2 when there is $16\% - 25\%$ dependence; 3 when there is $26\% - 35\%$ dependence; 4 when there is $36\% - 45\%$ dependence; 5 when there is $46\% - 55\%$ dependence; 6 when there is $56\% - 65\%$ dependence; 7 when there is $66\% - 75\%$ dependence; 8 when there is $76\% - 85\%$ dependence; and 9 when there is $86\% - 100\%$ dependence. *Source: Murdock (1967); variable code in the Ethnographic Atlas v5.*

Ratio of Historical Subsistence Share of Pastoralism Relative to Agriculture: ln((1+v4)/(1+v5)).

Dependence on Trade: Percent importance in contribution to subsistence from trade; variable *v819* from the Standard Cross-Cultural Sample (SCCS).

Takes the following values: 0%, 5%, 10%, 15%, 20%, 25%, 55%, 65%. *Source: Murdock and White (1967); variable code in the Standard Cross Cultural Sample v819.*

Class Stratification Indicator: Following Gennaioli and Rainer (2007) we define a dummy stratification index that equals zero when Murdock's variable equals zero indicating "*absence of significant class distinctions among freemen, ignoring variations in individual repute achieved through skill, valor, piety, or wisdom,*" and one when Murdock's class stratification measure equals 1, 2, 3, or 4. *Source: Murdock (1967); variable code in the Ethnographic Atlas v66.*

Inheritance Distribution for Movable Property: Non-Ordered variable that equals 1 when distribution is "equal or relatively equal", 2 when it is "exclusively", 3 when it is "ultimogen-

iture", 4 when it is "primogeniture" and 9 when there is "absence of inheritance of real property". *Source: Murdock (1967); variable code in the Ethnographic Atlas v77.*

Egalitarian Inheritance Distribution for Movable Property Indicator: takes on the value of 1 when the **Inheritance Distribution for Movable Property** is "equal or relatively equal" and when there is "absence of inheritance of real property" and zero otherwise. *Source: Murdock (1967); variable code in the Ethnographic Atlas v77.*

Egalitarian Inheritance Distribution for Land Property Indicator: takes on the value of 1 when the **Inheritance Distribution for Land Property** is "equal or relatively equal" and when there is "absence of inheritance of real property" and zero otherwise. *Source: Murdock (1967); variable code in the Ethnographic Atlas v76.*

High Gods: A "High God" is described as "a spiritual being who is believed to have created all reality and/or to be its ultimate governor, even though his/her sole act was to create other spirits who, in turn, created or control the natural world." The values of this variable are: (1) absent or not reported; (2) present but not active in human affairs; (3) present and active in human affairs but not supportive of human morality; and (4) present, active, and specifically supportive of human morality. We recoded values 1–3 into 0, thus, creating a variable "High Gods Supportive of Human Morality", with two values: either supportive of human morality,or not. *Source: Murdock (1967); variable code in the Ethnographic Atlas v34 ("High Gods").*

Jurisdictional Hierarchy beyond Local Community: Ordered variable ranging from 1 to 5 indicating the number of jurisdictional levels (political complexity) in each society above the local level**.** A 1 indicates stateless societies, 2 and 3 indicate petty and large paramount chiefdoms (or their equivalent), 4 and 5 indicate large states. *Source: Murdock (1967); variable code in the Ethnolinguistic Atlas v33; Murdock's Atlas is available at:*
http://eclectic.ss.uci.edu/~drwhite/worldcul/EthnographicAtlasWCRevisedByWorldCultures.sav.

Muslim Empires: Territories of Muslim empires are classified those countries which at some point hosted Islamic empires, kingdoms, and Sultanates according to Iyigun (2010).

6.3 Appendix Tables

6.3.1 Discussion on Muslim Societal Traits

In Appendix Table 4 we investigate whether Muslim groups are different from non-Muslim ones with respect to various societal and institutional traits. The unit is the ethnic group and the sample comprises all groups in the Old World for which we have created a correspondence between the Ethnologue and the Murdock's Ethnographic Atlas. All columns include country-specific constants.

The dependent variable in column 1 is the number of jurisdictional levels beyond the local community, an index that has been used to capture historical state capacity at the ethnicity level, see Michalopoulos and Papaioannou (2012). To the extent that Islam by offering an institutional framework facilitating trade one would expect Muslim groups to be more politically centralized. The positive and significant association between Muslim adherence and political complexity is consistent with the idea that Islam was successful in gaining a hearing across tribal populations politically

integrating them into more centralized units.

One may wonder why a group needs to adopt a religion rather than just the appropriate economic principles. Such question is vast in its scope and a comprehensive answer cannot be provided within the confines of the present study. Nonetheless, among the pre-colonial traits recorded by Murdock (1967) there is an entry describing whether a group believes in gods that are supportive of human morality. Peoples and Marlowe (2012) and Roes and Raymond (2003)) have shown that the presence of moral gods in historical societies is associated with intensive competition for resources, high threat of free-riding, and collective action problems. For trade to flourish across geographically unequal territories cooperation across the underlying tribal clans was necessary. Islam's religious ideology with built-in penalties offered such a platform. With this background in mind, in column 2 we regress Muslim representation on whether a group believes in moral gods. The coefficient suggests that a 50% increase in Muslim adherence within a group (close to one standard deviation) increases the likelihood that the group believes in gods that dictate what should (not) be done by 29% pointing to the importance of Islam as a commitment device.

Column 3 in Appendix Table 4 shows that land inequality harbors heterogeneous economic opportunities leading to the emergence of economically stratified societies. One-standard-deviation increase in geographic inequality increases the probability that a group will be stratified by 2%. Unlike non-Muslim groups, for which the link between geographic and social inequality is strong (column 5), the tendency of an unequal geography to breed social inequality is muted for Muslim-majority societies (column 4).

But what type of economic traits characterize Muslim communities? Unfortunately data on the extent of charity or usury laws within a group are not available; however, there is information on the type of the pre-colonial inheritance system that Kuran (2003, 2004b) among others have stressed as a key aspect of Islam. The dependent variable in columns 6 (7) of Appendix Table 4 is a dummy that takes the value 1 when the inheritance of movable (land) property is "equal or relatively equal" or when there is "absence of inheritance". The estimates suggest that Muslim groups are more likely to follow equal inheritance rules.

Figure 1 – Muslim Adherence and Ancient Trade Rotes – Selected Countries

Figure 1a - China

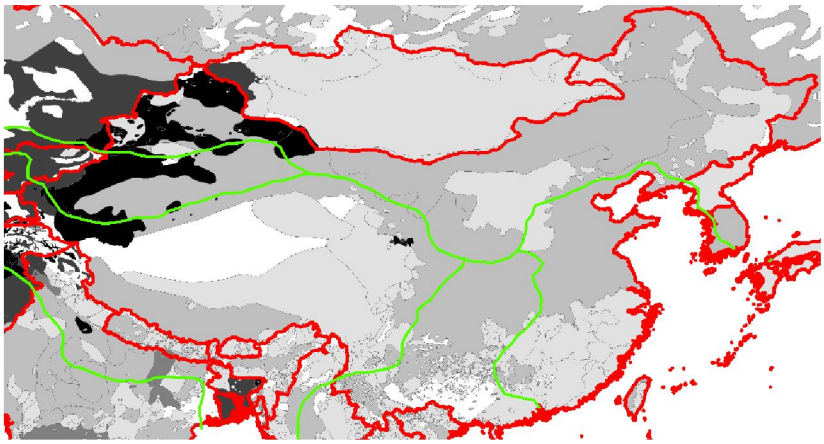


Figure 1b - Mali

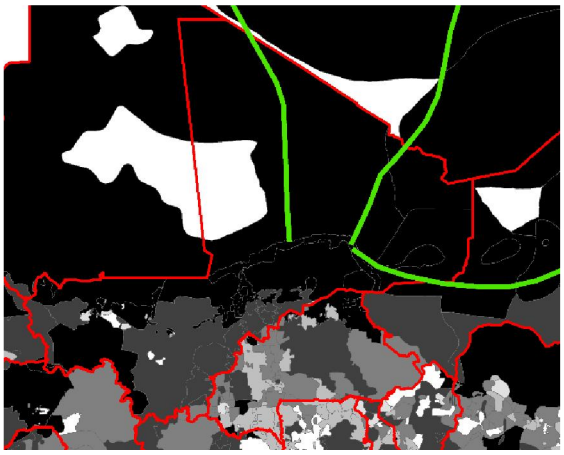


Figure 1c - Tanzania

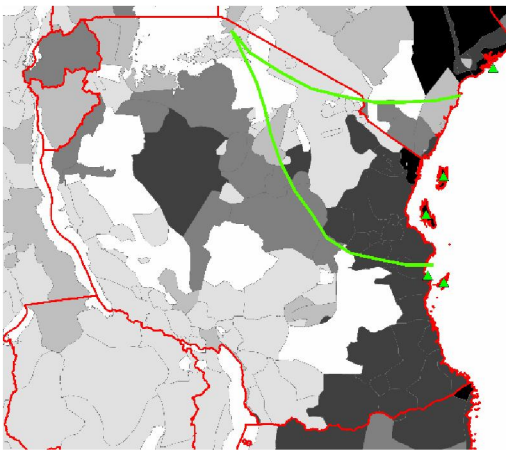


Figure 1d - Indonesia

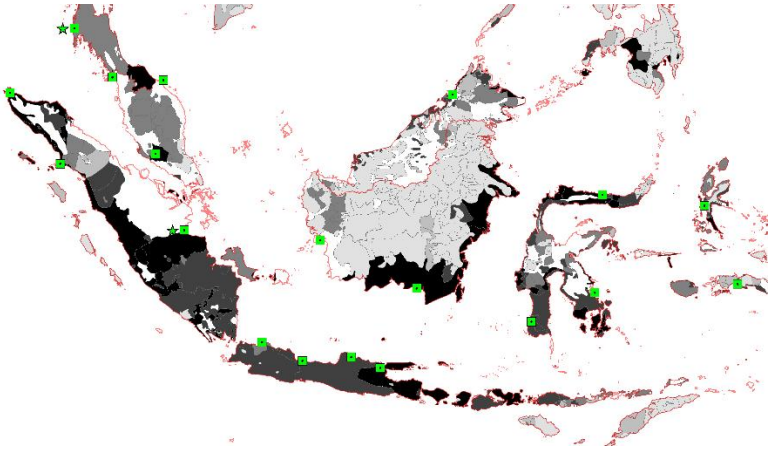
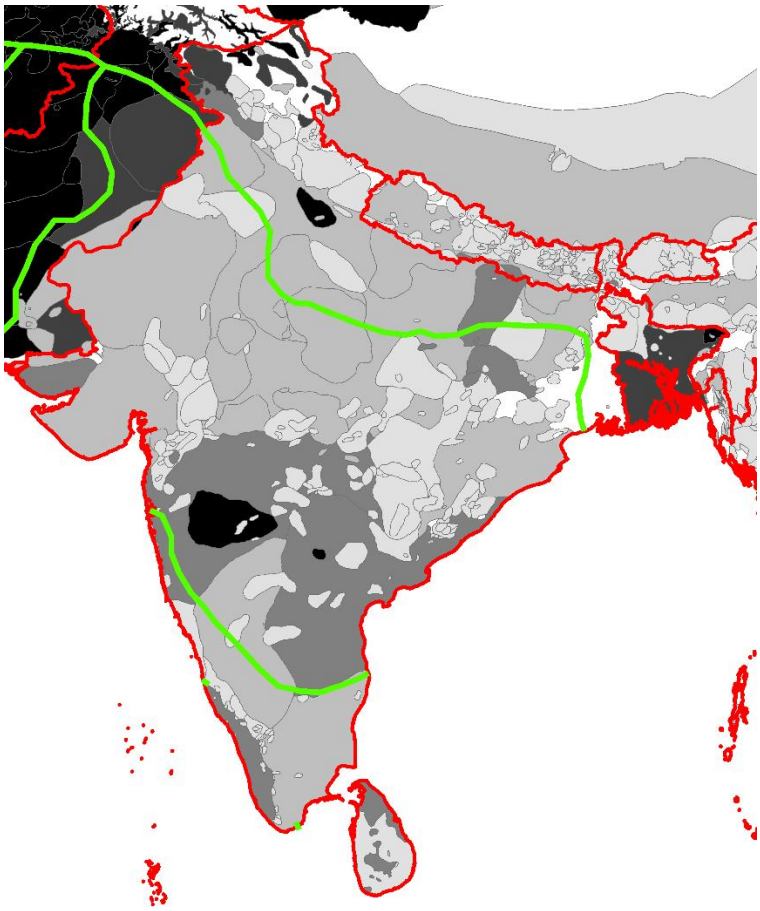


Figure 1e - India



Figures 1a-1e map Muslim adherence and trade routes in five broader regions (1a China, 1b Mali, 1c Tanzania, 1d Indonesia and 1e India). Muslim adherence is represented in quintiles at the level of ethnic group (actual homelands are from the Ethnologue and data on religious affiliation from the World Religion Database). Darker shades represent higher Muslim share in the population. In Figures 1a, 1c, and 1e the trade routes are depicted as green lines and correspond to pre-600 CE. These routes are digitized from Brice and Kennedy (2001). The ancient ports and harbors, depicted as green triangles, are from Arthur de Graauw (2014). In figure 1b trade routes are relative to 900 AD, while in figure 1d ports in year 600 AD (1800 AD) are represented with green stars (squares).

Figures 2a, 2b – Main Old World trade routes

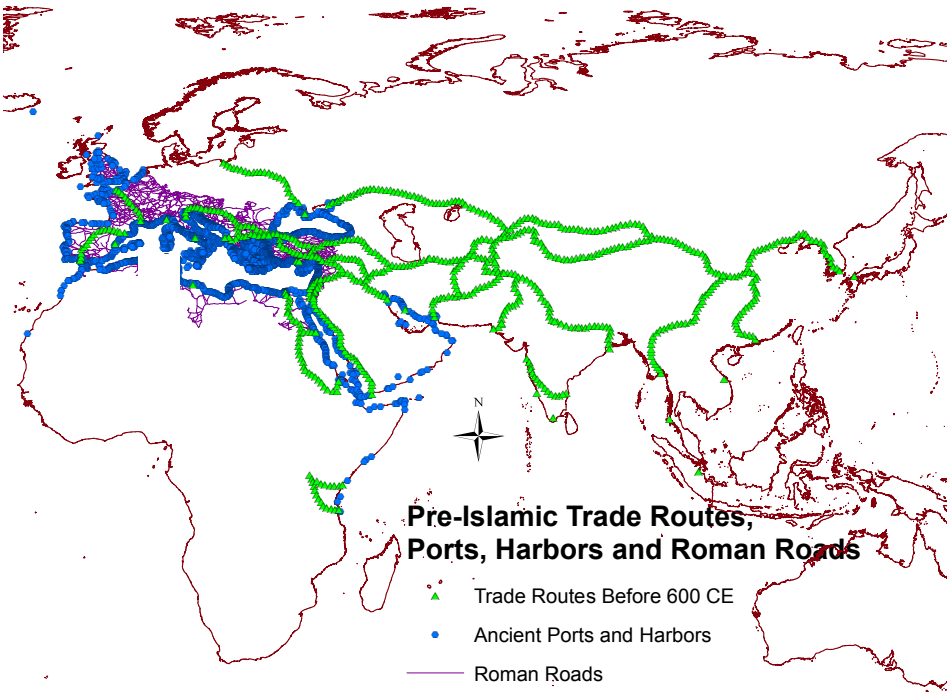


Figure 2a

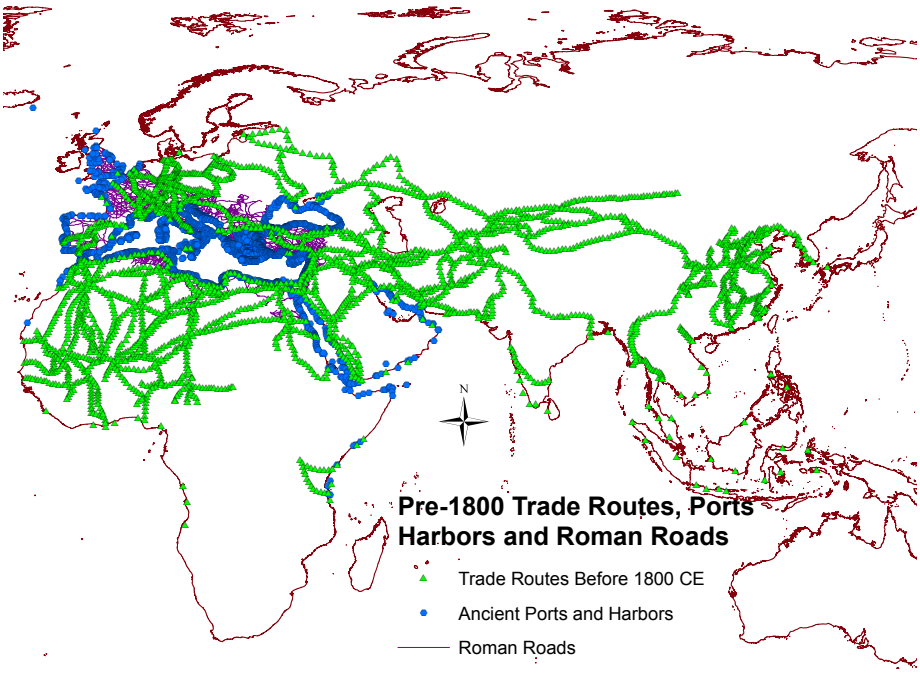


Figure 2b

Figure 2a (2b) shows the Old World network of Roman roads (from the Barrington Atlas), ancient ports and harbours (from Arthur de Graauw, 2014) and trade routes (from Brice and Kennedy, 2001) in 600 AD (1800 AD).

Figure 3 – Non-parametric conditional correlation – Cross-country

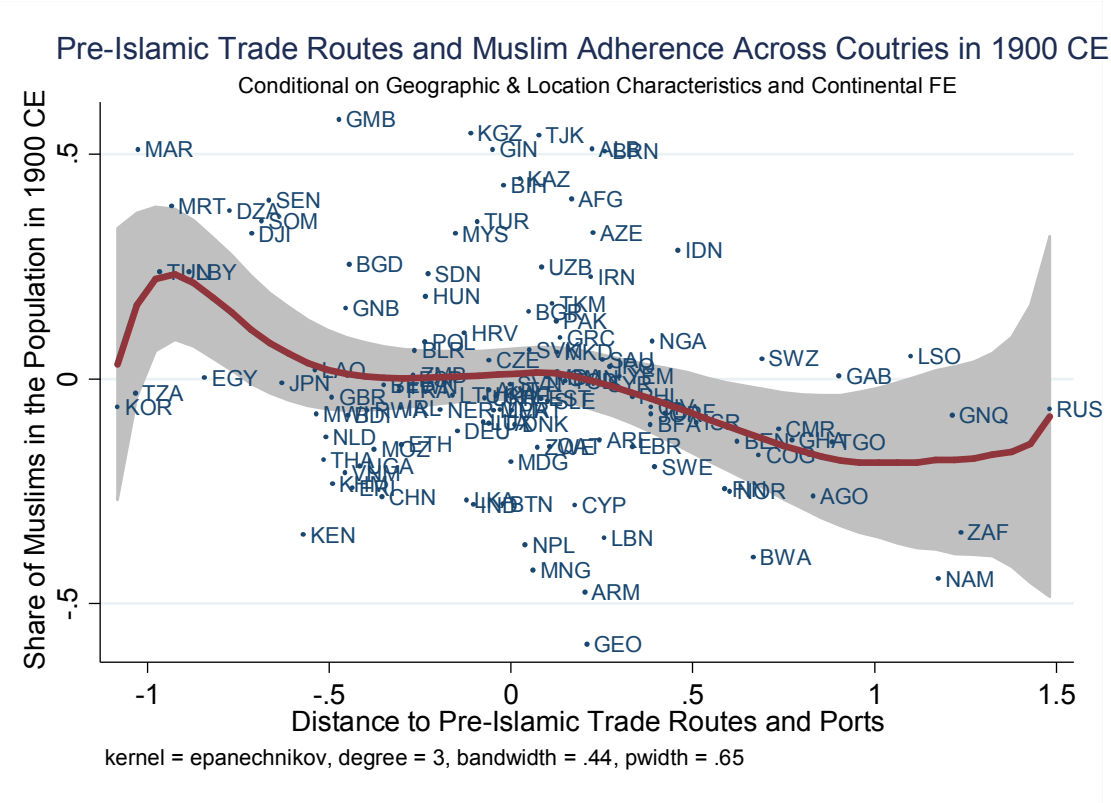


Figure 4 – Non-parametric conditional correlation – Cross-ethnic group

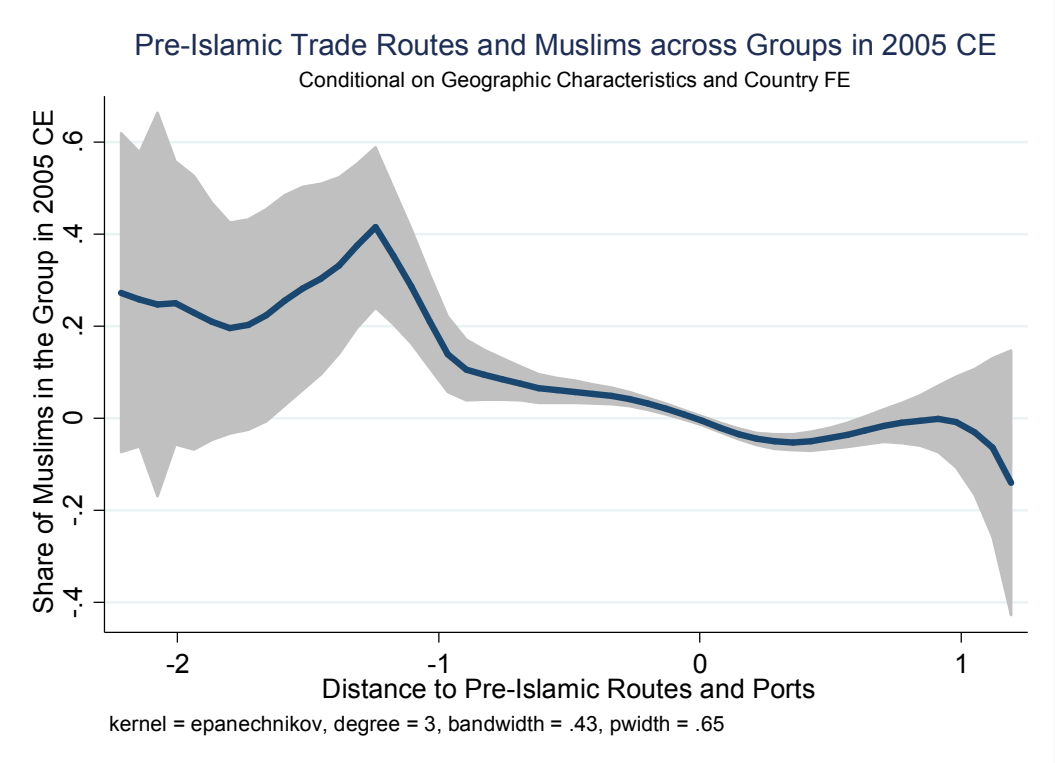


Table 1 – Countries

	(1)	(2)	(3)	(4)	(5)
Distance to 600 AD Trade Routes	-0.1500***	-0.1391***	-0.1650***	-0.1415***	-0.1307***
	(0.0284)	(0.0351)	(0.0320)	(0.0366)	(0.0383)
Distance to Mecca		-0.0706***	-0.0309**	-0.0004	-0.0237
		(0.0159)	(0.0144)	(0.0185)	(0.0194)
Distance to the Coast		-0.0398	-0.1499	-0.1526	-0.1925*
		(0.1055)	(0.0981)	(0.1147)	(0.1016)
Absolute Latitude		-0.0054***	-0.0063***	-0.0026	0.0034
		(0.0020)	(0.0018)	(0.0020)	(0.0033)
Ln Gini Index of Land Quality			0.1357***	0.0932**	0.0965**
			(0.0393)	(0.0446)	(0.0425)
Ln Average Land Quality			-0.1010***	-0.0842***	-0.0640***
			(0.0186)	(0.0205)	(0.0185)
Ln Land Area				-0.0487**	-0.0331
				(0.0245)	(0.0224)
Ln Ruggedness				-0.0069	-0.0390*
				(0.0247)	(0.0222)
Irrigation Potential Indicator				0.2508***	0.1740***
				(0.0686)	(0.0635)
Presence of Desert Indicator				0.2174**	0.1035
				(0.0956)	(0.0927)
Continental FE	NO	NO	NO	NO	YES
Observations	127	127	127	127	127
R-squared	0.09	0.23	0.48	0.55	0.62

Table 1 reports OLS estimates associating the share of Muslims with geographical variables. Observations are at the level of countries, the sample is the Old World (Europe, Asia and Africa). In all specifications the dependent variable is the share of Muslims in 1900 from McCleary and Barro (2005). All specifications include the constant (not reported) and column (6) includes a set of continental effects. The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Standard errors in parentheses are robust to heteroskedasticity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 2 – Within-country Across Groups Univariate Specifications

	(1)	(2)	(3)	(4)	(5)
Country	China	Mali	Tanzania	Indonesia	India
Distance from Trade routes 600AD	-0.2401***	-0.7736***	-0.4139***	-0.1619***	-0.1183***
	(0.0839)	(0.2418)	(0.1474)	(0.0114)	(0.0425)
Observations	188	44	109	615	300
R-squared	0.03	0.23	0.05	0.22	0.01

Table 2 reports OLS estimates associating the share of Muslims with distance from trade routes in 600AD in selected countries, at the level of ethnic group. In all specifications the dependent variable is the share of Muslims in 2005 at ethnic group level from the World Religion Database. All specifications include a constant (not reported). The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Standard errors in parentheses are robust to heteroskedasticity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3 - Ethnic Groups

	(1)	(2)	(3)	(4)	(5)	(6)
Distance to 600 AD Trade Routes	-0.0652***	-0.1712***	-0.0997***	-0.1071***	-0.1151***	-0.1384*
	(0.0167)	(0.0190)	(0.0298)	(0.0328)	(0.0326)	(0.0746)
Distance to Mecca			-0.0791***	-0.0717***	-0.0596***	-0.0784***
			(0.0190)	(0.0221)	(0.0225)	(0.0155)
Distance to the Coast			-0.0343	-0.0370	-0.0411	-0.0685
			(0.0603)	(0.0585)	(0.0594)	(0.0702)
Absolute Latitude			0.0119**	0.0091	0.0086*	0.0050
			(0.0059)	(0.0057)	(0.0052)	(0.0069)
Ln Gini Index of Land Quality				0.0333***	0.0261**	0.0307***
				(0.0107)	(0.0105)	(0.0099)
Ln Average Land Quality				-0.0275	-0.0278*	-0.0464**
				(0.0173)	(0.0158)	(0.0185)
Ln Land Area					-0.0026	-0.0071
					(0.0058)	(0.0067)
Ln Ruggedness					0.0083	-0.0029
					(0.0105)	(0.0159)
Irrigation Potential Indicator					0.0900***	0.0811**
					(0.0304)	(0.0359)
Presence of Desert Indicator					0.0576	0.1096*
					(0.0419)	(0.0571)
Country FE	NO	YES	YES	YES	YES	YES
Observations	3181	3181	3181	3181	3181	2015
R-squared	0.05	0.51	0.52	0.53	0.54	0.40

Table 3 reports OLS estimates associating the share of Muslims with geographical variables. Observations are at the level of ethnic group, the sample is the Old World (Europe, Asia and Africa). In all specifications the dependent variable is the share of Muslims in 2005 from World Religion Database. Column (1) includes the constant (not reported), while the remaining columns include a set of country fixed effects. Specification (6) restricts the sample to those ethnic groups outside the Muslim empires as classified by Iyigun (2010). The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Standard errors in parentheses are clustered at the country level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4 - Ethnic Groups, Other Religions

	(1)	(2)	(3)	(4)	(5)
DEPENDENT VARIABLE	% Muslim	% Christian	% Hindu	% Buddhists	% Ethnoreligious
Distance to 600 AD Trade Routes	-0.1151***	0.1408**	0.0405	0.0188	-0.0527
	(0.0326)	(0.0590)	(0.0413)	(0.0204)	(0.0356)
Distance to Mecca	-0.0596***	0.0072	-0.0387	-0.0104	0.0753**
	(0.0225)	(0.0529)	(0.0385)	(0.0163)	(0.0349)
Distance to the Coast	-0.0411	-0.0473	-0.0055	0.0583***	0.0605
	(0.0594)	(0.0581)	(0.0227)	(0.0201)	(0.0488)
Absolute Latitude	0.0086*	-0.0048	-0.0019	-0.0016	-0.0017
	(0.0052)	(0.0042)	(0.0016)	(0.0015)	(0.0044)
Ln Gini Index of Land Quality	0.0261**	-0.0104	-0.0009	0.0223*	-0.0343***
	(0.0105)	(0.0099)	(0.0076)	(0.0115)	(0.0122)
Ln Average Land Quality	-0.0278*	0.0143	0.0188	-0.0331*	0.0174
	(0.0158)	(0.0128)	(0.0177)	(0.0172)	(0.0209)
Ln Land Area	-0.0026	0.0087*	0.0028	0.0021	-0.0177***
	(0.0058)	(0.0049)	(0.0035)	(0.0032)	(0.0039)
Ln Ruggedness	0.0083	0.0055	-0.0151*	0.0078	-0.0022
	(0.0105)	(0.0101)	(0.0087)	(0.0056)	(0.0088)
Irrigation Potential Indicator	0.0900***	-0.0296	0.0079	-0.0147	-0.0546**
	(0.0304)	(0.0185)	(0.0090)	(0.0105)	(0.0247)
Presence of Desert Indicator	0.0576	-0.0484	0.0111	-0.0520	0.0172
	(0.0419)	(0.0374)	(0.0146)	(0.0335)	(0.0482)
Country FE	YES	YES	YES	YES	YES
Observations	3181	3181	3181	3181	3181
R-squared	0.54	0.61	0.46	0.33	0.33

Table 4 reports OLS estimates associating the share of different religions with geographical variables. Observations are at the level of ethnic group, the sample is the Old World (Europe, Asia and Africa). In all specifications the dependent variable is the share of the population belonging to a given religion in 2005 measured at ethnic group level from the World Religion Database. All columns include a set of country fixed effects. The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Standard errors in parentheses are clustered at the country level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5 – Distance to Routes and Dependence on Trade

	(1)	(2)	(3)
Distance to 600 AD Trade Routes	-0.0765		
	(0.0528)		
Distance to 1800 AD Trade Routes		-0.1515***	-0.1511***
		(0.0542)	(0.0541)
Observations	121	121	117
R-squared	0.01	0.03	0.04

Table 5 reports OLS estimates associating the relative importance of trade with distance to trade routes. Observations are at the level of a historical society, the sample is the Old World (Europe, Asia and Africa). In all specifications the dependent variable is the (log of 1 plus) share from trade in subsistence measured as reported in the Standard Cross Cultural Sample (SCCS). Column (3) excludes societies that were documented by ethnographers before 1750 (Babylonians, Hebrews, Khmer, and Romans). The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Standard errors in parentheses are robust to heteroskedasticity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6 – What Does Land inequality Reflect?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	Ethnologue			Ethnologue & Murdock's Ethnographic Atlas				SCCS
DEPENDENT VARIABLE	Log Ratio of Land Allocation of Pasture Relative to Agriculture in 2000			Log Ratio of Historical Subsistence Share of Pastoralism Relative to Agriculture				Log 1+ Share of Subsistence from Trade
Ln Gini Index of Land Quality	0.2328***	0.2203***			0.1854***	0.1004**		
	(0.0764)	(0.0789)			(0.0379)	(0.0445)		
Ln Average Land Quality	-0.3790***	-0.3068**			-0.1569***	-0.1025**		
	(0.1273)	(0.1405)			(0.0502)	(0.0433)		
Absolute Latitude		0.0728**				0.0386***		
		(0.0310)				(0.0123)		
Ln Land Area		-0.0931***				0.0122		
		(0.0305)				(0.0215)		
Ln Ruggedness		0.1630**				0.0376		
		(0.0715)				(0.0385)		
Presence of Desert Indicator		0.4325				0.3564**		
		(0.3031)				(0.1537)		
Irrigation Potential Indicator		0.1404				0.1917**		
		(0.1576)				(0.0749)		
Share of Muslims in 2005			0.7402***				0.5232***	
			(0.1807)				(0.1510)	
Log Ratio of Historical Subsistence Share of Pastoralism Relative to Agriculture				0.1115***				0.2938***
				(0.028)				(0.0797)
Country FE	YES	YES	YES	YES	YES	YES	YES	NO
Observations	2845	2845	2845	1131	1210	1210	1210	186
R-squared	0.68	0.69	0.67	0.35	0.39	0.43	0.36	0.05

Table 6 reports OLS estimates associating (contemporary and historical) measures of dependence on pastoralism and agriculture with land inequality, adherence to Islam and other historical and geographic variables. The dependent variable in columns 1 to 3 is the log ratio of pastoral to agricultural lands from Ramankutty et al., 2008. The log ratio of historical subsistence of pastoral to agricultural share, from Murdock's Ethnographic Atlas is the dependent variable in columns 4 to 7 and the (log +1) share of subsistence from trade from the SCCS dataset in column 8. Observations are at the ethnic group level in columns 1 to 7 and at the level of historical societies in column 8. The sample used is the Old-World part of the Ethnologue (columns 1 to 3), its intersection with the Murdock's Ethnographic Atlas (columns 4 to 7) and all groups in the Standard Cross Cultural Sample in column 8. The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Columns 1 to 7 include a set of country fixed effects with errors clustered at the country level in parentheses, while those of column 8 are robust to heteroscedasticity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7 – Land Inequality and Proximity to Trade Routes

	(1)	(2)	(3)	(4)
Sample	Countries	Countries	Ethnic Groups	Ethnic Groups
(a) Ln Gini Index of Land Quality	0.1546***	0.1135**	0.0458**	0.0368**
	(0.0425)	(0.0443)	(0.0176)	(0.0158)
(b) Distance to 600 AD Trade Routes	-0.3120***		-0.1587***	
	(0.0551)		(0.0299)	
(a)*(b)	-0.1328***		-0.0174*	
	(0.0314)		(0.0097)	
(c) Distance to 1800 AD Trade Routes		-0.3759***		-0.2271**
		(0.0884)		(0.1005)
(a)*(c)		-0.1397***		-0.0366**
		(0.0431)		(0.0143)
Controls	ALL	ALL	ALL	ALL
Continental FE	YES	YES	NO	NO
Country FE	NO	NO	YES	YES
Observations	127	127	3181	3181
R-squared	0.65	0.64	0.54	0.54

Table 7 reports OLS estimates associating the share of Muslims with geographical variables. Observations are at the level of countries (columns 1 and 2) or ethnic groups (columns 3 and 4). The sample is the Old World (Europe, Asia and Africa). In columns 1 and 2 the dependent variable is the share of Muslims in 1900 across countries from McCleary and Barro (2005), while in columns 3 and 4 the dependent variable is the share of Muslims across ethnic groups from the World Religion Database (WRD). Controls are Distance to Mecca, Distance to the Coast, Absolute Latitude, Ln Average Land Quality, Ln Land Area, Ln Ruggedness, Irrigation Potential Indicator and Presence of Desert Indicator. The Supplementary Appendix gives detailed definitions, data sources and summary statistics for all variables. Columns 1 and 2 (3 and 4) include a set of continental (country) fixed effects. Standard errors, in parentheses, are robust to heteroscedasticity (columns 1 and 2) and clustered at the country level (columns 3 and 4). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Appendix Table 1 – Descriptive Statistics and Correlations, County level

Panel A

Variable	Obs	Mean	Std. Dev.	Min	Max
% Muslim (1900)	127	0.29	0.39	0	1
Distance to 600 AD Trade Routes	127	0.70	0.79	0	2.74
Distance to Mecca	127	4.05	1.87	0.74	9.17
Distance to the Coast	127	0.33	0.34	0.01	1.51
Absolute Latitude	127	28.66	17.48	0.55	65.26
Ln Gini Index of Land Quality	127	-1.37	0.75	-3.45	-0.13
Ln Average Land Quality	127	-1.32	1.36	-5.84	-0.05
Ln Land Area	127	12.19	1.59	7.87	16.65
Ln Ruggedness	127	4.33	1.09	1.30	6.61
Irrigation Potential Indicator	127	0.72	0.45	0	1
Presence of Desert Indicator	127	0.30	0.46	0	1

Panel B

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	% Muslim (1900)	1										
(2)	Distance to 600 AD Trade Routes	-0.31	1									
(3)	Distance to Mecca	-0.44	0.39	1								
(4)	Distance to the Coast	0.03	0.15	-0.15	1							
(5)	Absolute Latitude	-0.09	-0.48	-0.04	-0.23	1						
(6)	Ln Gini Index of Land Quality	0.42	-0.05	-0.23	0.38	0.10	1					
(7)	Ln Average Land Quality	-0.57	0.04	0.35	-0.07	0.07	-0.52	1				
(8)	Ln Land Area	0.11	0.19	0.06	0.46	-0.13	0.53	-0.21	1			
(9)	Ln Ruggedness	-0.06	-0.34	0.07	-0.10	0.19	-0.08	0.29	-0.15	1		
(10)	Irrigation Potential Indicator	0.41	0.07	-0.32	0.33	-0.45	0.24	-0.20	0.41	-0.07	1	
(11)	Presence of Desert Indicator	0.56	-0.07	-0.36	0.33	-0.10	0.65	-0.56	0.50	-0.16	0.41	1

Appendix Table 1, Panel A, reports summary statistics for the main variables employed in the empirical analysis at the county level. Panel B gives the correlation structure of these variables. The Supplementary Appendix gives detailed variable definitions and data sources.

Appendix Table 2 – Descriptive Statistics and Correlations, Ethnic Group Level

Panel A

Variable	Obs	Mean	Std. Dev.	Min	Max
Muslim Majority (2005)	3181	0.20	0.40	0	1
% Muslim (2005)	3181	0.21	0.36	0	1
Distance to 600 AD Trade Routes	3181	1.34	1.23	0	5.19
Distance to Mecca	3181	5.23	2.76	0.45	12.92
Distance to the Coast	3181	0.45	0.44	0.00	2.15
Absolute Latitude	3181	16.02	14.44	0.00	72.42
Ln Gini Index of Land Quality	3181	-2.19	0.89	-4.61	-0.03
Ln Average Land Quality	3181	-1.03	0.93	-4.60	0.00
Ln Land Area	3181	8.14	1.75	3.04	15.90
Ln Ruggedness	3181	4.14	1.43	0	7.06
Irrigation Potential Indicator	3181	0.25	0.44	0	1
Presence of Desert Indicator	3181	0.05	0.22	0	1

Panel B

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Muslim Majority (2005)	1											
(2)	% Muslim (2005)	0.96	1										
(3)	Distance to 600 AD Trade Routes	-0.21	-0.22	1									
(4)	Distance to Mecca	-0.22	-0.24	0.62	1								
(5)	Distance to the Coast	0.06	0.07	-0.21	-0.49	1							
(6)	Absolute Latitude	0.09	0.07	-0.42	-0.17	0.01	1						
(7)	Ln Gini Index of Land Quality	0.25	0.26	-0.14	-0.21	0.16	0.35	1					
(8)	Ln Average Land Quality	-0.28	-0.28	0.01	0.10	-0.14	-0.28	-0.39	1				
(9)	Ln Land Area	0.14	0.14	-0.19	-0.21	0.14	0.21	0.43	-0.23	1			
(10)	Ln Ruggedness	-0.04	-0.05	-0.26	0.17	-0.13	0.21	-0.01	0.16	-0.09	1		
(11)	Irrigation Potential Indicator	0.30	0.31	-0.20	-0.34	0.19	0.11	0.30	-0.15	0.39	-0.19	1	
(12)	Presence of Desert Indicator	0.32	0.32	-0.15	-0.16	0.11	0.17	0.28	-0.44	0.32	-0.06	0.32	1

Appendix Table 2, Panel A, reports summary statistics for the main variables employed in the empirical analysis at the ethnic group level. Panel B gives the correlation structure of these variables. The Supplementary Appendix gives detailed variable definitions and data sources.

Appendix Table 3 – Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Countries	Countries	Countries	Ethnic Groups	Ethnic Groups	Ethnic Groups
DEPENDENT VARIABLE	Muslim Majority Dummy	Share of Muslim in 1900		Muslim Majority Dummy	Share of Muslim in 2005	
Distance to 600 AD Trade Routes	-0.1565***	-0.1192		-0.1164***	-0.2095***	
	(0.0459)	(0.1478)		(0.0325)	(0.0789)	
Distance to 600 AD Trade Routes Squared		-0.0043			0.0219	
		(0.0546)			(0.0163)	
Distance to 1800 AD Trade Routes			-0.4980***			-0.4038***
			(0.1353)			(0.0723)
Distance to 1800 AD Trade Routes Squared			0.1760***			0.0921***
			(0.065)			(0.0134)
Controls	ALL	ALL	ALL	ALL	ALL	ALL
Continental FE	YES	YES	YES	NO	NO	NO
Country FE	NO	NO	NO	YES	YES	YES
Observations	127	127	127	3181	3181	3181
R-squared	0.50	0.62	0.63	0.48	0.54	0.55

Appendix Table 3 reports OLS estimates associating measures of Muslim adherence with geographical variables. Observations are at the level of countries (columns 1 to 3) or ethnic group (columns 4 to 6), the sample is the Old World (Europe, Asia and Africa). In column 1 (4) the dependent variable is a dummy equal to one if the share of Muslim in the country (ethnic group) in 1900 (2005) is greater than 50%, from McCleary and Barro (2005) (World Religion Database). In columns 2 and 3 the dependent variable is the share of Muslim population in 1900 measured at country level, while in columns 5 and 6 the dependent variable is the share of Muslim population in 2005 at the ethnic group level. Included controls are Distance to Mecca, Distance to the Coast, Absolute Latitude, Ln Average Land Quality, Ln Land Area, Ln Ruggedness, an Irrigation Potential Indicator and the Presence of Desert Indicator. The Supplementary Appendix gives detailed variable definitions, data sources and summary statistics for all variables. Columns 1 to 3 (4 to 6) include a set of continental (country) fixed effects. Standard errors, in parentheses, are robust to heteroscedasticity (columns 1 to 3) and clustered at the country level (columns 4 to 6). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Appendix Table 4 – Historical Traits of Muslim Communities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Full Sample	Full Sample	Full Sample	Muslim Share >95%	Muslim Share <10%	Full Sample	
DEPENDENT VARIABLE	Jurisdictional Hierarchy	Belief in Moral Gods	Class Stratification			Egalitarian inheritance – Movable Property	Egalitarian inheritance – Land Property
% Muslim (2005)	0.7179***	0.5868***				0.1550*	0.1439**
	(0.1845)	(0.0739)				(0.0783)	(0.0587)
Ln Gini Index of Land Quality			0.0556*	-0.0024	0.0706**		
			(0.0282)	(0.0480)	(0.0288)		
Controls	NO	NO	YES	YES	YES	NO	NO
Country FE	YES	YES	YES	YES	YES	YES	YES
Observations	1183	838	1132	167	700	1042	1000
R-squared	0.32	0.62	0.16	0.05	0.17	0.24	0.26

Appendix Table 4 reports OLS estimates associating Muslim adherence across groups to various societal traits and geographical variables. In column 1 the dependent variable is the degree of jurisdictional hierarchy beyond the local community level. In column 2 the dependent variable is a dummy reflecting whether the local gods are supportive of human morality. In columns 3 to 5 the dependent variable is an indicator whether a group is socially stratified and in columns 6 and 7 the dependent variable reflects whether there is egalitarian inheritance with respect to movable and land property, respectively. In column 4 (5) the sample is restricted to ethnic groups with a share of Muslim population above 95% (below 10%). Observations are at the ethnicity level and the sample comprises of groups in the Old World for which we have created a correspondence between the Ethnologue and the Murdock's Ethnographic Atlas. Controls are Absolute Latitude, Ln Average Land Quality, Ln Land Area, Ln Ruggedness, an Irrigation Potential Indicator and Presence of Desert Indicator. The Supplementary Appendix gives detailed variable definitions, data sources and summary statistics for all variables. Standard errors in parentheses are clustered at the country level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.