

NBER WORKING PAPER SERIES

ISLAM, INEQUALITY AND PRE-INDUSTRIAL COMPARATIVE DEVELOPMENT

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Working Paper 21506
<http://www.nber.org/papers/w21506>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2015

We would like to thank Daron Acemoglu, Quamrul Ashraf, Roland Benabou, Maria Bigoni, Maristella Botticini, Richard Bulliet, Matteo Cervellati, Allan Drazen, Skander Esseghaier, Mohammad Reza Farzanegan, Oded Galor, Gordon Hanson, Laurence Iannaccone, Timur Kuran, Georg Leube, Gilat Levy, Beatrice Manz, Peter Neary, Gianmarco Ottaviano, Arsen Palestini, Elias Papaioannou, Jean-Philippe Platteau, Ronny Razin, Jared Rubin, Thierry Verdier, Christoph Werner, and participants at the Collegio Carlo Alberto, University of Bologna, NBER SI Political Economy Group, the NBER conference on the Economics of Religion, the CEPR conference on Economics of Culture, Institutions, and Crime in Milan, ASREC annual conference at Chapman University, the International Economic Association conference in Jordan, Silvaplane Workshop in Political Economy in Pontresina, Center for Near and Middle Eastern Studies (Marburg), Northeastern University, Toulouse School of Economics, Stockholm University, Tufts University, University College Dublin, University of Los Andes, University of Milan and University of Oxford for constructive comments. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 21506
August 2015
JEL No. F10,O1,Z0,Z12

ABSTRACT

This study explores the interaction between trade and geography in shaping the Islamic economic doctrine. We build a model where an unequal distribution of land quality in presence of trade opportunities conferred differential gains from trade across regions, fostering predatory behavior by groups residing in the poorly endowed territories. We show that in such an environment it was mutually beneficial to institute an economic system of income redistribution featuring income transfers in return for safe passage to conduct trade. A commitment problem, however, rendered a merely static redistribution scheme unsustainable. Islam developed a set of dynamic redistributive rules that were self-enforcing, in regions where arid lands dominated the landscape. While such principles fostered the expansion of trade within the Muslim world they limited the accumulation of wealth by the commercial elite, shaping the economic trajectory of Islamic lands in the pre-industrial era.

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*“ For the protection of the Quraysh.
Their protection during their trading caravans in the winter and the summer.
So let them serve the Lord of this House.
Who feeds them against hunger and gives them security against fear. ”*¹
*(Qur’an, 106: 1-4; MH Shakir’s translation)*²

1 Introduction

In the last two decades, the empirical growth literature has seen a renewed interest in the relationship between religion and politico-economic performance.³ This voluminous body of work, which traces its intellectual roots in the pioneering study of Weber (1905 [1930]) stressing the independent role of Protestant ethics in fostering economic progress, treats religious beliefs and attitudes as fundamental drivers of economic outcomes.⁴ Nevertheless, despite the prominence of religion as a focal research topic across disciplines, its economic origins are poorly understood. Identifying the forces behind the formation of religious principles will greatly enhance our understanding of the phenomenon and its implications for comparative economic performance. This study theoretically examines the economic origins of the Islamic doctrine and explores the consequences of its adoption for the process of development in the Muslim world.⁵

The starting point of our theory lies in the observation that Islam originated in the Arabian peninsula, a region featuring a distinctively unequal geography, and at a historical time period when trade routes gained importance in this area. With this particular historical background in mind we build a model where the interplay between inequality in regional natural productivity and the emergence of trade possibilities dictates the nature of the Islamic economic principles. The argument is as follows. In a stage of development when land determines productive capabilities, regional agricultural suitability plays a fundamental role in shaping the potential of a region to produce a surplus and thus engage in and profit from trade. Motivated by this observation, the theory illustrates how an unequal distribution of land quality across regions may induce instead of productive and mutually advantageous activities predation by groups residing in the less privileged territories, (Olson, 2000). In particular, it suggests that

¹Quraysh was the tribe dominating Meccan trade in the eve of Islam. Mohammad himself was member of the Quraysh.

²Tahrirke Tarsile Qur’an, Inc., (1983).

³See for example, Barro and McCleary (2003, 2006a, 2006b) , Campante and Yanagizawa-Drott (2015), Chaney (2012b), Porta, de Silanes, Shleifer, and Vishny (1997), Pryor (2007), and Martin, Doppelhofer, and Miller (2004).

⁴See Becker and Woessmann (2009), and Botticini and Eckstein (2005, 2007), for more work on the Protestant ethic and Judaism, respectively.

⁵It is important to note that the proposed theory is an attempt to rationalize the set of economic principles embedded in the Islamic doctrine, remaining agnostic as to its theological underpinnings.

inequality in agricultural productivity in presence of trade opportunities conferred differential gains from trade across regions, fostering predatory behavior by those residing in the poorly endowed ones. The costly nature of predation created room for intervention and redistribution, leading to concessions towards the dwellers of arid regions in exchange for secure passage and access to the trade networks.

The link between the structure of production and institutional formation was early identified by Marx (1833 [1970]). According to Marx (1833 [1970]), religion, like any other social institution, is dependent upon the economic realities of a given society, i.e., it is an outcome of its productive forces. Similarly, this study argues that since Islam emerged when land capabilities dictated productive decisions, the Islamic institutional arrangement had to be compatible with the conflicting interests of groups living in regions characterized by an unequal distribution of agricultural endowments. Hence, Islamic principles were devised as a means of governing the divergent interests of geographically unequal regions in Arabia during the 6th century AD, at a critical juncture when trade routes were diverted over the peninsula. This is a prime example of how historical accidents, trade diversion in this case, may interact with geographical features to shape a particular institutional framework, that of Islam. We do not claim that Islamic principles are the only rules that may emerge under unequal geographic conditions once trade opportunities arise. We do show, nevertheless, that these rules prescribed in the Islamic economic doctrine may provide a solution to the conflicting interests that emerge in such environments.

In the theory provided we highlight that rules featuring only static *intragenerational* income transfers were prone to commitment problems and, hence, were not sustainable. As a result, the institutional complex of Islam evolved to include elements of *intergenerational* redistribution as well, where bequests no longer exclusively benefited the heirs of the rich. We show that such a dynamic scheme can be mutually beneficial for populations living in differentially endowed regions in the presence of trade opportunities and is more likely than static mechanisms to be viable in the long-run. To render the intergenerational transfers individually optimal, the Islamic doctrine had to distort the relative returns to the factors of production against private wealth accumulation and in favor of investments that would diffuse wealth within the society over time. Throughout the history of Islam, such investments often manifested in the religious endowments which frequently benefited, either directly or indirectly, the less privileged in the ummah.

It has been argued that Islam acted as a state-building force, unifying warring clans and tribes through a common identity under one god that transcended clan and class divisions (Stearns, Adas, Schwarz, and Gilbert, 2010). In the context of the model, the Islamic economic

principles offered the means for materializing this goal. This is in line with Levy and Razin (2012) who argue that religious organizations arise endogenously to foster social cooperation and social behavior by instilling beliefs in the connection between rewards and punishments. Moreover, offering a rationale for the distortion of the allocation of productive assets in the Muslim world our study is complementary to the works of Iannaccone (1992) and Aimone, Iannaccone, Makowsky, and Rubin (2013), who view religion as a club good which features unproductive costs, but is nevertheless socially optimal because it overcomes free-rider problems associated with collective action.

We conjecture that the adoption of Islam across geographically unequal regions gave them an early developmental lead by facilitating trade over territories that would otherwise remain in a state of constant strife. However, by discouraging the concentration of wealth via its wealth-fragmenting principles, it reduced the investment capabilities necessary for keeping pace with the progressively capital intensive modes of trade. The resulting anemic commercial elite may have contributed to the eventual decline of the Muslim lands vis-à-vis Western Europe. Incidentally, this line of thinking may provide an angle for understanding the democratic deficit in the Muslim world today, see Huntington (1993), Platteau (2008) and Chaney (2012a). Contrary to the Islamic lands, in the Western world transatlantic trade gave rise to a powerful and wealthy commercial class that was able to turn the political scene in its favor, limiting the rulers' powers and contributing to the rise of constitution and eventually democracy, (Acemoglu, Johnson, and Robinson, 2005). In sum, the Islamic economic principles that allowed the Muslim world to escape from a state of constant feuding and flourish in the pre-industrial era, limited their potential for growth on the eve of large scale shipping trade and capital-based industrialization (Chaudhuri, 1985).

The rest of the paper is organized as follows. Section 2 discusses the role of trade and geography in the formation of Islam as detailed in the historical account and presents the elements of the Muslim economic doctrine. Section 3 presents the theory and the results. Section 4 summarizes the key findings and concludes.

2 Historical Background

The proposed theory emphasizes that the formation of Islam was a response to two historical facts of 7th century Arabia: (i) valuable trade routes had recently been redirected through the region, and (ii) an unequal distribution of land quality resulted in these trade flows conferring differential gains across the region. In fact, in Michalopoulos, Naghavi, and Prarolo (2012) we show that the interaction between proximity to trade routes and geographic inequality is not only important for understanding the origins of Islam, but is also a key determinant of the

spatial distribution of contemporary Muslim societies across as well as within countries.

We argue that the interaction of these two features led to the emergence of a set of economic rules: (i) static income redistribution through arrangements known as *ilaf* prior to and *zakat* upon the advent- of Islam, and (ii) a dynamic redistribution system, which on the one hand, imposed explicit costs on wealth accumulation via the anti-riba laws, and on the other hand, encouraged public investments through donations to build religious or philanthropic endowments to serve the common good in perpetuity. This echoed the concept of *sadaqa* in the Qur'an and was later institutionalized in the legal entity of the *waqf*.⁶

2.1 The Origins

Arabia has a distinct geography, primarily consisting of desert and semi-arid landscapes. Only some regions in today's Yemen, Bahrain and Central Arabia, and several scattered oases in the interior were fertile enough to produce on the eve of Islam frankincense, myrrh, vine, dyes and dates (Ibrahim, 1990). While farming dominated these fertile pockets, herding was the main subsistence pattern in the relatively arid ones. It has been argued that this distinctive geography shielded the local populations from urbanization, allowing them to maintain their tribal culture and prevent the formation of a unifying social structure (Haber and Menaldo, 2010). At the same time, the limited number of urban commercial economies in the oases exacerbated social and economic inequities between clans (Berkey, 2003). Differences in climate and endowments led to local trade between farmers and nomadic herders, who exchanged agricultural products for animal products. Despite gains from intra-regional trade, long-distance trade opportunities were biased in favor of the oasis dwellers and often resulted in predatory behavior by the Bedouins (Richerson, 1996). Across infertile swaths of land, tribes were directly involved in the collection of booty by conducting raids, known as *ghazw*, on commercial caravans trading local produce as well as spices, gold, ivory, pearls, precious stones, and textiles - arriving at the local ports from Africa, India, and the Far East (Berkey, 2003).

In the pre-Islamic era, safety of trade activities was maintained in the Peninsula by peripheral kingdoms along the edges of Arabia, namely the Himyarites, Ghassanids and Lakhmids, who guarded the routes and policed the Bedouin tribes. These kingdoms all disintegrated in the course of the 6th century. As a result, political and commercial control over the Bedouin communities could no longer be exerted and the Arabian economy went into decline (Lapidus, 2002). In parallel, the Persian and Byzantine empires had been fighting a series of long and

⁶Although a comparison between communism and Islamic economic principles is beyond the scope of the study it is perhaps interesting to note that the common goal of narrowing income inequality was pursued via very different means. Notably, Islam encouraged a market economy tolerating individual property rights while limiting capital accumulation, whereas communism featured the opposite characteristics.

exhausting wars since the start of the 6th century. By the early 7th century the conflicts had disrupted long-distance trade crossing the two empires (Lewis, 1993). In addition, piracy in the Red Sea was on the rise due to the declining sea power of the Byzantines (Winder, 2008). These events caused long-distance trade diversion through the peninsula, giving profound commercial value to overland trade routes in Arabia. The resulting trade flows created new potential economic benefits for the scattered oases. First, by selling to the merchants they could take advantage of markets outside Arabia. Second and perhaps more pertinent to the case of Mecca, the increased merchant traffic increased demand for local amenities to accommodate the passing caravans. The attractiveness of such oases along the routes contributed to the emergence of profitable trade hubs nearby, which specialized in the provision of services to the trading community.⁷

In order to materialize these benefits safe passage needed to be maintained for thousands of miles of trails through the desert, crossing numerous tribal territories (Bogle, 1998). Caravans were constantly exposed to raids by the Bedouins, who made up a considerable fraction of the population in the Arabian peninsula at that time (Berkey, 2003). This situation prompted early attempts to mitigate conflict in pre-Islamic Arabia. For example, in search of security the Meccan merchants offered the arrangement of *ilaf*, according to which they would carry commodities produced by other tribes to be sold in markets and fairs. In exchange, these tribes would provide security and protection for Meccan caravans passing through their territories. Such attempts, coupled with the formation of tribal alliances, partially decreased tensions; however, these measures were short-lived since many tribes were not bound by the institution of *ilaf* and alliances were constantly switching. Ibrahim (1990) succinctly summarizes the economic conditions prevailing on the eve of Islam: "An unequal distribution of wealth and resources already existed in and around Mecca. This unequal distribution had the potential to disrupt its network of alliances and trade routes."

It was in this cross-section of historical events that Muhammad was born. In Muhammad's Arabia there was no government at any level. The Prophet formed his own state, and he gave it a sacred law prescribed by Allah (Muller, 1958). The importance of trade in the formation of Islamic principles can hardly be underestimated.⁸ Muhammad himself was a Meccan merchant, and the majority of those who contributed to the crystallization of the Muslim law over time had a merchant or craftsman background (Cohen, 1970).⁹ To reach out to the

⁷Crone (2007) discusses the possibility that Meccans benefited directly from the Persian and Byzantine wars supplying leather and hides to the Roman army.

⁸See Bairoch (1988) for a discussion on how trade preceded urbanization in the Middle East.

⁹In addition, Hodgson and Burke (1993) stress that the interests of merchants who wanted to gain access to the widest possible network of trade routes coupled with the casteless and egalitarian message of Islam contributed to its massive expansion.

heterogeneous Arabian tribes, a doctrine with a political base appealing to the divergent interest groups was necessary. It is perhaps interesting to note that Muhammad's message was first accepted in Medina as a result of Medina's oasis cultivators facing increased conflict from nomads in the periphery, consistent with the proposed argument that Islamic economic principles were forged to align these clashing interests nurtured by an underlying unequal geography, (Aswad, 1963).

2.2 The Adoption

The conditions predating the adoption of Islam in later periods in different parts of the Old World are reminiscent of the geographic and social conditions prevailing in its birthplace. Below, we offer two examples where the spread of Islam took place in the presence of trade across geographically unequal regions and its voluntary adoption worked towards mitigating conflict.

The Mali empire After the breakup of the Ghana empire, the Mali empire flourished in the western part of the Sahel, the African biogeographic zone where the Sahara desert and savannas meet. This region includes part of today's territories of Ghana, Mali, Mauritania and Senegal, an undoubtedly unequal zone in terms of agricultural suitability given the very small portion of arable land. At the end of the first millennium AD, natural resources such as gold and salt helped the Ghana Empire achieve a primal position in the area by satisfying the increasing demand coming from the rich Northern African Empires, in particular the Almoravids (Chu and Skinner, 1965). Although the Ghana Empire experienced its first contact with Islam through trade, it did not convert from local tribal religions to Islam. The Ghana Empire disintegrated at the beginning of 11th century due to repeated attacks by the nomadic tribes located in the northern part of Ghana, in attempts by these tribes to gain control of the increasingly lucrative trade routes linking North Africa with Ghana (Goucher, et al., 1998). Similar to Saudi Arabia at the beginning of 7th century, the unequal geography of Mali and the availability of trade opportunities made the inhabitants there prone to the implementation of Islamic economic principles. After more than a century of feuding, during which the contact between Mali tribes and Muslim traders grew, around 1235 the Muslim king Sundiata founded the Mali Empire. Islam was initially an elite religion and coexisted with other previously established animist religions. Islamic adherence increased in subsequent decades and in 1312, at the apex of the Mali Empire's extension, Mansa Musa became the first truly devout Muslim Mali Emperor. Mansa Musa gathered fame for his efforts to establish many universities and mosques, and the further development of extraction and trade of gold and salt (Stride and Ifeka, 1971).

Inner Asia Another instance of voluntary adoption of Islam by newly established elites is that of Inner Asia in the 13th century. This region, characterized by the coexistence of arid and fertile regions, was invaded in the 13th century by the Golden Horde, a Mongol army which established a Turco-Mongol khanate there until around the beginning of the 16th century. After destroying the Abbasid Caliphate, the Mongols initially a shamanic culture conquered Muslim lands and soon converted to Islam themselves, beginning an era of Turkic and Mongol expansions of Muslim rule into Eastern Europe and the Golden Horde. With the Silk Road passing through Sarai, the capital of Golden Horde became a prosperous center of commerce. Genghis Khan's grandson Berke was the first ruler of the Golden Horde, who converted to Islam. Later, it was the Mamluk ruler Baibars, the Khan's long-standing trade partner in the Mediterranean who played an important role in bringing many Golden Horde Mongols to Islam. By AD 1330's three of the four major khanates of the Mongol Empire had become Muslim. These were the Golden Horde, Hulagu's Ulus and Chagatai's Ulus. It was Uzbek Khan (1312–41) who adopted Islam as the official religion of the Golden Horde, while allowing for religious tolerance and free trade across the whole empire (Halperin, 1987; Mantran, 1986; De Weese, 1994). Interestingly, the only khanate that did not convert to Islam was that of the Yuan Empire found by Kublai Khan which spanned most of present-day China featuring a rather homogeneously fertile geography.

Other cases of voluntary adoption of Islam in which geography and trade possibly played an important role are those of the Volga Bulgaria State and Karakhans Empire. The regions that hosted these two entities (the confluence of Volga and Kama river, in today's Russia, and an area including parts of Tajikistan, Kyrgyzstan, Uzbekistan, Kazakhstan and China) were both endowed with fairly unequal geography and, for at least three centuries after Muhammad's death, they were crossed by one of the most important trade routes that connected Europe to Asia.

2.3 The Codes

We now describe in some detail the specific socioeconomic institutions that are at the core of our theory. The Islamic doctrine is known to have been inspired by institutions from pre-existing monotheistic religions and adjusted into codes that became the building blocks of the Islamic institutional complex.

In Islam, acts of charity are divided into obligatory (*zakat*) and voluntary (*sadaqa*), Their origins can be traced, at least in part, back to the poverty-alleviating institutions already present in Judaism and Christianity. *Zakat* is a religious obligation and is one of the Five Pillars

of Islam.¹⁰ As outlined in the Qur'an, Zakat requires a believer of sufficient economic means to give a fraction of her accumulated income for alms. The collected alms are then allocated among the needy, the poor, those in debt, travelers, the zakat collector and for buying the freedom of slaves or captives. During the early history of Islam, zakat was collected and distributed by government appointed officials, in a centralized manner and it was effective in alleviating poverty. While zakat remained a main pillar of Islam its centralized collection was less frequently enforced over time and adherence was left to the discretion of local authorities (Kuran, 2008b).¹¹

The Islamic doctrine has several remarkable features including its dynamic nature of re-distribution and wealth-fragmenting principles. Indeed, Islam prescribes detailed rules limiting the accumulation of private wealth. Two of the most well-known rules are those governing inheritance and usury, respectively. Regarding the inheritance laws Qur'an specifies that two-thirds of one's wealth be allocated to various family members, including very distant relatives making it a rather egalitarian distribution system (Kuran, 2008a). Equitable inheritance laws coupled with the fact that more wealthy individuals were allowed to have more wives and consequently children, was an additional force against the concentration of wealth. For a thorough discussion on the economic principles of Islam, see Kuran (2004a). Also Kuran (2003) argues that a by-product of such inheritance laws was an increase in the costs of dissolving a business partnership following a partner's death rendering business enterprises small, simple, and generally ephemeral. An additional force against the mobilization and pooling of resources can be traced in the fact that the Islamic law by recognizing only natural persons effectively blocked the emergence of more complex organizational forms such as corporations.

Different forms of interest bans existed in various pre-industrial societies as a primitive means of social insurance and were more common in the presence of high inequality (Glaeser and Scheinkman, 1998). Hence, it is perhaps not surprising that the most widely known Muslim economic principle, particularly in finance, is the prohibition against *riba*, which most Muslim scholars have interpreted as "interest".¹² *Riba* in the pre-Islamic days was a system whereby the principal owed by a borrower doubled each time that he or she was due to repay a loan and unable to do so. This arrangement would frequently lead to unpayable debts and hence the

¹⁰For a discussion on how the doctrines of salvation and damnation provide different incentives for performing economic activities and charitable deeds in Hinduism, Buddhism, Christianity, and Islam, see McCleary (2007).

¹¹Kuran (2001) notes that the third Caliph Uthman turned the obligation to pay *zakat* essentially into a tax on agricultural output. Also, Jalili (2006) recognizes that although the tax systems differ considerably among the Shi'ite and the four Sunni Schools (Malekite, Shafeite, Hanafite and Hanbalite) they share the common key objectives of alleviating poverty and improving the income distribution.

¹²There was substantial controversy among early Muslims regarding the scope of this prohibition or even on the definition of "interest", see Rahman (1964) for a detailed discussion. Nevertheless, in the Islamic lands, Christians and Jews who were not subject to this restriction, systematically engaged in money lending.

imprisonment or enslavement of the borrower. As a result of the *riba*-ordinance of the Qur'an, Islam was formally committed to the eradication of interest in loan contracts. Kuran (2004b) argues that in practice, money lending continued, however, uncertainty about the legitimacy of interest, combined with the lack of corporate law, imposed significant transactions costs on lenders and borrowers. It is worth noting that although the prohibition on charging interest became less of an obstacle over time in Islam, it was never fully eradicated, as it was in Christianity (Rubin, 2009, 2011).¹³

One could use either of the principles described above to formalize the frictions on wealth accumulation under Islamic law. In the context of the proposed theory we focus on the limitations regarding interest bearing loans as well as on the formation of more efficient organizational forms. Such restrictions distorted the relative returns to the factors of production against capital accumulation and in favor of investments featuring societal returns. In fact, the Qur'an declares that the opposite of *riba* is *sadaqa* which is spending to the benefit of people, that is, investing in assets enhancing the welfare of the community (Rahman, 1964). In Islam, the institution that eventually emerged to allow for investing in such public functions was the *waqf*, an inalienable endowment created by a person who granted land or other immovable property in perpetuity for the advancement of a charitable or pious purpose.

While *zakat* catered to the immediate needs of the poor, a *waqf* was a permanent asset that created positive externalities across generations, for the society at large. Its purpose was to integrate heterogeneous societies and its particularities were twofold: first, it offered a mechanism for managing and anticipating the future returns of bequeathed assets (Raissouni, 2001) and second, it acted as a vehicle for the economic and social integration of the various layers of the Muslim society (Kato, 2004). The institution of *waqf* is known to have been formalized in the centuries following the birth of Islam. Therefore, all references to the origins of *waqf* during the first century of Islam are only based on preserved *hadith* collections (Hennigan, 2004). Early indications of *waqf* during the time of Muhammad are also documented in Cizakca (1998), Gil (1998), Kuran (2001), and Habib (2004). The first known *Waqf* is the mosque of Quba' in Medina built upon the arrival of the Prophet Muhammad in 622 C.E. It stands now on the same lot with a new and enlarged structure. Six months later, Quba' was followed by the mosque of the Prophet in the center of Medina. There are also records of a fountain in Medina, *bi'r ru'ma*, purchased by Uthman for the purpose of providing free drinking water to the public as *waqf*. A preserved *waqf* narrative is Muhammad asking Umar to make the land he received in Khaybar *waqf* for the Muslim community. Hennigan (2004) also lists the market in Medina and the seven gardens of Mukhayriqor as some of the first examples of the prophetic

¹³See Rubin (2009) for a comprehensive overview of interest bans in different religions.

waqf.¹⁴ The earliest solid evidence of waqfs, however, begin about a century after the birth of Islam. In particular, a widespread form of waqf was the building of caravanserais to provide accommodation to merchants. Waqfs endowed later were mostly geared towards the provision of labor-productivity enhancing public goods such as education, health care, and public utilities. For example, Shatzmiller (2001) stresses that “what conferred a unique historical significance on the public waqf, was the fact that for hundreds of years it provided the *only* regular financial support for the *medresa*, a provider of higher education”.

Waqfs contributed to the integration of Islamic society initially by financing mosques as religious, political, and cultural centers, in the rising Islamic cities and eventually schools, hospitals, and several infrastructure projects. The former places promoted social interactions and mitigated existing stratification (Babacan, 2011). Moreover, it has been argued that in the newly-created Islamic urban hubs the public facilities frequently funded by waqfs gave an incentive to the nomadic populations nearby to join the rising urban centers contributing to what is known as the sedentarization of the Arabs. For instance, the Islamic caliphate in the seventh century A.D. rose out of the large-scale sedentarization of previously nomadic tribes who settled in Basra and Kufa. The success of these settlements is attributed to the development of the caravan trade and the concomitant rise of the urban centers, which brought about a close economic integration of the nomads and the farmers or city-dwellers (Bulliet, 1980). Even for those that remained nomadic the various caravanserais built throughout their territories allowed them to benefit from the trade flows passing through (Bamyeh, 1999). Moreover, once in the cities the common use of public facilities was the main source of interaction across the different clans and facilitated the rise of an Islamic identity. Patel (2007) provides an extensive discussion of the role of Islamic cities in developing an Islamic supra-identity across tribes, and of the horizontal transmission of Islamic cultural norms among initially inward-oriented Arab tribes through attendance in entities such as schools and central mosques.

Both the intragenerational redistributive aspects of Islam exemplified by the zakat and its intergenerational components discussed above will form the heart of the theoretical framework below. We will establish that although zakat was not self-sustained on its own, in conjunction with its inter-generational elements it provided a self-enforcing structure attractive to both urban-dwellers and nomads.

¹⁴In general, Bonine (1987) specifies agricultural land, irrigation projects, and even entire villages as examples of common waqfs endowed in rural areas, whereas in urban areas they usually consisted of real estate such as land, houses, or commercial property.

3 The Model

The theory illustrates the conditions under which residents of geographically unequal regions once exposed to trade opportunities adopt the Islamic economic principles. The crux of the argument is as follows. The appearance of trade routes exacerbates differences in economic opportunities between arid and fertile lands by creating a marketplace (i.e., trade hub) in the latter naturally increasing the value of goods and services offered by those in the oasis. In this case, however, the nomads may predate on the caravans crossing their territories. To the extent that the mass of arid regions is large enough to significantly threaten trade flows, i.e., few fertile pockets of land surrounded by vast arid steppes, we show that a set of rules resembling the economic principles of Islam may be adopted. As in Anderson and Bandiera (2006) the interaction of predators and prey is crucial. A confrontation between the trading caravan and the Bedouins taking place in the desert on the way to trade routes results in a loss of cargo. The more desert to cross, the more vulnerable are merchants' activities, giving geographic inequality a crucial role in determining the emergence of economic institutions.

Consider an overlapping-generations economy in which economic activity extends over infinite discrete time. Each group produces a single homogeneous good in every period using effective labor, capital, and land quality (a technological parameter). Regional output grows over time due to the accumulation of capital and effective labor, while land quality is exogenous and fixed. Denoting T_i as the land quality of the region where each tribe resides $i = \{L, H\}$ (low or high) and setting $T_H = 1$, we can define the relative land quality as $v = \frac{T_H}{T_L} = \frac{1}{T_L} > 1$. Without loss of generality, the fertile region (oasis) is surrounded by a desert of mass $0 \leq \lambda \leq 1$. With the vector (v, λ) we may characterize the economy-wide land quality distribution whose inequality is increasing in both arguments.

Assume that the price of the good is initially normalized to unity, so that $p = 1$. The appearance of trade routes in the vicinity results in an increase in the demand for products/amenities of the fertile region because they can better accommodate merchants and provide trading services: $p > 1$. Thus, the diversion of trade routes over the Arabian peninsula favors the few oases and leads to predatory behavior by nomads.¹⁵ Engaging in long-distance trade is costly since it requires food and shelter for the merchants. We model the latter as a fixed cost $\mu < 1/2$.¹⁶ Moreover, the more desert merchants have to cross (larger λ), the more likely they are to be ambushed and incur losses. Roving bandits can challenge the caravans by

¹⁵Allowing for differentiated products and local trade between regions, a price shock as such would also result in a lower purchasing power of the tribe in the arid region due to a deterioration in their terms of trade.

¹⁶We assume that it is prohibitively costly to engage in long-distance trade at the individual level. This is consistent with the historical record, where long-distance trade expeditions were organized and implemented at the community/clan level.

incurring a cost equal to $\theta < 1/2$, where θ is the fraction of the booty lost at the end of a raid.

Additionally, we assume agents cannot migrate between regions since adapting to different ecologies requires the accumulation of very different types of specific human capital (Chaney, 2012; Michalopoulos, 2012). In the Middle East and North Africa region for example, people living in arid lands were predominantly nomadic, while those living in fertile zones were mainly sedentary (Mikhail, 2012). It will be seen later in Section 3.3.2 that allowing for migration of nomads into fertile land or for their direct engagement in trade will not affect the core results.

Within each period, the timing of the events can be summarized as follows: (1) agents inherit effective labor and/or private wealth from the previous generation; (2) production takes place; (3) static or dynamic redistribution is offered by the tribe in the fertile region; (4) caravan sets off to trade; (5) the nomads in arid lands decide whether or not to attack the caravan; (6) raid/redistribution/trade outcomes are realized; (7) decisions regarding consumption and bequests of wealth and/or investment in waqf take place.

3.1 Production

Production in each region displays constant-returns-to-scale with respect to the reproducible factors of production. The output produced at time t in region i , is $x_{i,t}$:

$$x_{i,t} = T_i(1 - \alpha)h_{i,t} + \alpha k_{i,t} ; \alpha \in (0, 1), i = \{L, H\}.$$

where T_i is land quality in region i , $h_{i,t}$ and $k_{i,t}$ represent the regional effective labor and the amount of capital employed at period t in region i . Marginal product of effective labor and capital are equal to the wage rate per unit of effective labor w_i and the rate of return to capital r_i respectively. With perfect substitutability, the producers' inverse demand for factors of production is:

$$\begin{aligned} w_i &= (1 - \alpha)T_i \\ r_i &= \alpha T_i, \end{aligned} \tag{1}$$

that is constant over time in each region i . We assume that capital depreciates fully every period and that

$$\alpha > \frac{1}{2}, \tag{C1}$$

implying that capital is relatively more productive than labor.

3.2 Income and Preferences

A representative agent from each tribe lives two periods. An adult at time t is an individual of generation t . In the first period, agents are economically idle. In the second period, they supply inelastically their effective labor $h_{i,t}$ in region i where they are born, earning the prevailing wage

rate w_i . Moreover, they may receive capital bequests, $s_{i,t-1}$, from their parents, generating an income that is the return rate on capital r_i times the amount of bequests. Each agent's gross income is therefore:

$$I_{i,t} = w_i h_{i,t} + r_i s_{i,t-1}, \quad (2)$$

which can be consumed locally or traded abroad. Moreover, the *rich* tribe can transfer a part of their gross income to the *poor* tribe in order to avoid the risk of being raided.

An individual's preferences are defined over consumption in the second period of his life, $c_{i,t}$, and potential gross income of his offspring, $I_{i,t+1}$. We assume that people consume up to a satiation level \tilde{c} , after which they maximize utility on the basis of the gross income of their child. Consider a utility function $U(c_t; I_{t+1})$ defined as:

$$U(c_t; I_{t+1}) = c_t + \beta I_{t+1}, \quad (3)$$

together with the constraint $c_t \leq \tilde{c}$, where $\beta < 1$. As will become apparent this utility function is adopted to capture the spirit of Kaldorian-Keynesian savings behavior i.e., bequests and savings are an increasing function of wealth. Allowing for a more standard utility function, like $U_{i,t} = \beta \ln c_{i,t} + (1 - \beta) \ln I_{i,t+1}$, would deliver qualitatively similar results. However, in this case the adult's income threshold of investing in children's income (either through savings or effective labor enhancing investments) becomes endogenous to the anticipated factor returns, making the analysis more cumbersome without adding material insights. More generally, the qualitative predictions would be equivalent as long as there are non-convexities in the economic environment.

3.3 Optimal Consumption and Transfers

Proceeding backward, in this section we look at the optimization problem of rich and poor agents given their net income, $Y_{i,t}$. Gross income $I_{i,t}$ evolves into net income $Y_{i,t}$ through the process of trade and conflict, as described in Section 3.4 below.

3.3.1 Bequests and Waqf Investments

Waqfs allowed the rich to earn some returns on their assets, and at times were the only way to do so securely, Kuran (2001). Without loss of generality, we model this as effective labor accumulating over time through the waqf investment, $e_{H,t}$. The following law of motion describes how effective labor evolves over time:

$$h_{H,t+1} = 1 + \gamma e_{H,t}. \quad (4)$$

Each rich individual is endowed with one unit of effective labor in absence of any waqf investment and $0 < \gamma < 1$ captures the marginal benefit of waqf.¹⁷ Alternatively, waqf could take the form of an investment that increases the productivity of land in the fertile region, $T_{H,t+1}$. It could as well be described as an investment that enhances the value of products and services of the fertile region, p_{t+1} . The common feature of the different descriptions of waqf is the fact that the investment directly increases the next period gross income of the region endowed with fertile land, i.e., $\partial I_{H,t+1}/\partial e_{H,t} > 0$.

It follows from (3) that an adult allocates her net income towards own consumption up to the level of \tilde{c} , and devotes her remaining income to maximize the potential gross income of her child in (2). In deciding how to best finance a child's gross income, an adult anticipates future wage rates and capital returns and optimally splits bequests between private capital $s_{H,t}$ and a waqf investment, $e_{H,t}$. Investment in capital delivers a marginal benefit equal to r_H whereas from (4) the marginal benefit of investing in waqf is γw_H . If net income is $Y_{H,t} \leq \tilde{c}$, it is entirely spent on consumption, while if $Y_{H,t} > \tilde{c}$, utility (3) is maximized subject to budget constraint:

$$s_{H,t} + e_{H,t} \leq Y_{H,t} - \tilde{c}, \quad (5)$$

where $Y_{H,t} - \tilde{c}$ is net income after consumption.

3.3.2 Spillovers of *Waqf* Investments

Unlike capital bequests that are individual specific, public waqfs by nature had spillovers and provided some benefits across the society as a whole. Kuran (2003, 2010) also points out that waqfs served as means of sheltering wealth from expropriation by the ruler. Therefore, from the perspective of the rich, waqf is an asset-shielding entity engineered to protect one's wealth against confiscation either by the Muslim ruler according to Kuran or by the roving bandits according to our theory. These distinct but complementary arguments highlight the dual benefits of waqf pertaining to different points in the history of Islam.¹⁸

As explained in the historical section, waqfs took different forms over time. As far as the welfare of the recipients is concerned, the basic ideas we would like to convey are related to the dynamic benefits of waqfs and their role in economically integrating different parts of the Islamic society throughout the history of Islam. We therefore resort to a general framework that encompasses the alternative redistributive aspects of waqf investments discussed above.

¹⁷Formally, the initial conditions under which only the rich can invest in waqf are defined in Section 3.3.4.

¹⁸An interesting analogy between Kuran's interpretation and ours is that both arguments view waqf as a means of sheltering private assets by placing them in suboptimal investments. According to Kuran waqf is a static solution to the threat of confiscation by the ruler while ours is a dynamic solution against expropriation by the Bedouins. In other words, Kuran discusses how waqf was used in an already established Muslim society, whereas we offer an interpretation perhaps more pertinent to the early formative centuries of Islam.

Based on narratives, the first evidence of waqf date to the very beginning of the Islamic era and took the form of a *sadaqa* to build mosques as a place of interaction for the Muslim community and to provide free water through public fountains (or wells). As these investments were made in urban areas, they also attracted non-city dwellers into the towns, encouraging interactions between the oasis inhabitants and the surrounding nomads. Hence, one could view these investments as directly increasing $T_{H,t+1}$ in the oases over time. Moreover, the access to improved urban amenities may have also indirectly benefited the next generation nomads by enlarging the future gains from trade which translates into increased zakat transfers for the nomads' offspring.

Another well-known form of waqfs was the construction of accommodation stops for the trading community known as caravanserais. Although concrete evidence for this type of waqf dates to few centuries after the birth of Islam, it is the form directly related to long-distance trade. As caravanserais are built outside urban centers, they are also the type of waqf more transparently associated with cross-regional spillovers. We may interpret the impact of caravanserais as permanently increasing the future profitability of long-distance trade, i.e., increasing p_{t+1} , which may impact the nomads in the periphery in two ways. First, by increasing the future zakat transfers received by the nomads due to the larger gains from trade of the rich and second, by eventually encouraging the Bedouins themselves to be integrated in the activities related to long-distance trade. The latter case is consistent with the idea that the goal of the Islamic institutional complex was to align the interests of the roving bandits (the Bedouins) with those of the oasis dwellers and merchants.

The final form of waqf we consider is the establishment of public goods such as schools or hospitals, which benefited the rich tribe. Such entities were by definition built for use by all in the city and therefore raised labor productivity of the children of the rich through human capital development. A waqf of this type therefore also indirectly benefits the poor by enhancing next period's size of zakat payments to the poor by a factor of γ . In what follows we define waqf spillovers for the poor as $W(T_{H,t+1}, p_{t+1}, h_{H,t+1})$, where $\frac{\partial W(\cdot)}{\partial T_{H,t+1}} > 0$, $\frac{\partial W(\cdot)}{\partial p_{t+1}} > 0$, and $\frac{\partial W(\cdot)}{\partial h_{H,t+1}} > 0$. The idea boils down to waqf investments by the city/oasis dwellers directly increasing their own next period gross and net income, creating a larger pie a fraction of which is indirectly spilled over to the nomads in the periphery.

Alternatively, waqfs can be thought of as a step towards facilitating the sedentarization of the nomads and hence directly increasing the welfare of the poor. Given the location-specific nature of waqf, the newly sedentarized Bedouins could directly gain access to the benefits of such public investments.

3.3.3 Anti-Riba Regulation

Kuran (2008a) argues that anti-riba laws for the Muslims were equivalent to increasing transactions costs, which limited the return on wealth accumulation for Muslim adherents. In the context of the model, what drives the choice between private wealth accumulation and waqf investments are the relative returns of these two assets. Introducing the anti-riba law induces the rich agents to switch from private-only bequests to waqf investments.

Define the net return on capital investments as $r_H^N = \delta r_H$, where $\delta \in [0, 1]$ is an inverse measure of the distortion in the marginal product of capital induced by the limitations on contracts involving capital investments. The comparison between the two forms of investment boils down to evaluating the returns from private capital bequests versus public good investments, i.e., $\delta r_H \leq w_H \gamma$.

Thanks to the linearity of the production function, returns to factors of production are independent of the quantity of factors employed. Hence, individuals from fertile regions prefer public good investments over capital savings as long as:

$$\delta \leq \frac{1 - \alpha}{\alpha} \gamma \equiv \delta_H$$

Below we study the bequest behavior of parents as a function of the riba regime in which they live, i.e., with or without restrictions on capital investments. When there are no distortions on capital accumulation, $\delta = 1$, rich either bequeath only capital:

$$s_{H,t}^*(Y_{H,t}) = \begin{cases} 0 & \text{if } Y_{H,t} \leq \tilde{c} \\ Y_{H,t} - \tilde{c} & \text{if } Y_{H,t} > \tilde{c} \end{cases} . \quad (6)$$

When restrictions are significant, i.e., riba is not allowed, $\delta \leq \delta_H$, the rich invest in public goods. In this case optimal labor enhancing investment becomes:

$$e_{H,t}^*(Y_{H,t}) = \begin{cases} 0 & \text{if } Y_{H,t} \leq \tilde{c} \\ Y_{H,t} - \tilde{c} & \text{if } Y_{H,t} > \tilde{c} \end{cases} . \quad (7)$$

Note that because of (4) the poor benefit from the waqf investment made by the rich.¹⁹

3.3.4 Initial Conditions

Now that we have defined the main building blocks and individuals' optimization structure, it is useful to define the starting point of the economy:

Definition 1 *The initial condition of the model (at time $t = 0$) is one in which $h_0 = 1$ and $s_{H,-1} = 0$, so that $I_{H,0} = 1 - \alpha$ and $I_{L,0} = \frac{1-\alpha}{v}$.*

¹⁹Given our utility function, there are no free riding incentives. Given $\delta < \delta_H$ once $c = \tilde{c}$ is attained, the only way to increase utility is to leave bequests. Moreover, allowing the *waqf* donors to partially internalize the return on *waqfs* would not change the qualitative predictions.

In order for trade to act as a trigger for capital accumulation, we assume that prior to the emergence of long-distance trade opportunities, $p = 1$, no individuals leave bequests:

$$1 - \alpha < \tilde{c}. \quad (\text{C2})$$

It follows that without trade and under (C2) regional incomes remain constant. Moreover, throughout the analysis we assume that the tribe in the agriculturally poor region is initially unable to engage in trade, i.e.,:

$$I_{L,0} < \mu, \quad (\text{C3})$$

and this is always true for large enough values of v . Condition (C3) implies that if $v \rightarrow 1$ the poor region is indistinguishable from the rich one because their natural productivities coincide and they would behave similarly in terms of production, trade, and bequests. Moreover, looking at (1), (2) and (4), $v \rightarrow \infty$ gives $I_{L,0} \rightarrow 0$. Hence, we consider small enough values of land productivity, T_L , such that the emergence of trade opportunities creates conflicting interests between regions.

Finally, let us define a minimum price obtained by trading abroad,

$$\underline{p} \equiv \frac{\tilde{c}}{(1 - \alpha - \mu)\theta}, \quad (\text{C4})$$

which is attainable once commercial trade routes appear. In what follows, we characterize the optimal behavior of agents in the rich region given conditions (C1), (C2), (C3) and (C4). Note that in absence of income transfers agents in the poor region cannot reach satiation point, \tilde{c} , and hence do not leave bequests. Thus, in the rest of this section we only refer to the bequeathing behavior of the rich.

3.4 Trade, Conflict, and Redistribution

The economic value of trade, p , and the level of land quality determine the ability to engage in long-distance trade. Hereafter, we refer to benefits brought about by an increase in p as gains realized from long-distance trade. The argument remains valid if one assumes that instead of actively engaging in long-distance trade, oases only accommodate and provide trading services to the flow of merchants passing by, i.e., fertile pockets of land only act as trade hubs. In the latter scenario the cost of trade μ would now reflect the cost of setting up the urban amenities necessary to accommodate the incoming trade flows. Generally, a region trades if and only if $I_{i,t} < p(I_{i,t} - \mu) \iff I_{i,t} > \frac{p\mu}{p-1}$ when there is no risk of conflict. In this section, we discuss the initial stage of the economy at $t = 0$ as defined above.

3.4.1 Trade and the Threat of a Raid

When trade becomes a viable option only the tribe in the fertile region may participate. Given condition (C3), the tribe in the poor region cannot overcome the fixed trade-related cost, μ . However, it may choose to raid the caravans and obtain part of the goods if profitable. These decisions are considered to be collective actions as tribalism or *asabiyya* (the clan spirit) obliged each tribe to protect its fellow members (Watt, 1961). The outcome of the confrontation depends on the probability that the nomadic tribe intercepts a caravan $f_L(\lambda) \in [0, 1]$ whose argument is the mass of desert, λ , and is continuous and differentiable. Without loss of generality we interpret $f_H(\lambda) = 1 - f_L(\lambda)$ as the probability that a caravan safely retains its goods, where $f_H(1) = 0$, $f_H(0) = 1$, $\frac{\partial f_H(\lambda)}{\partial \lambda} < 0$ and $\frac{\partial f_L(\lambda)}{\partial \lambda} > 0$. Properties of $f_i(\lambda)$ emphasize the fact that overland trade is space intensive, so that the higher is the proportion of arid lands, λ , the larger is the predation threat to any caravan on the way to trading ports. Note that the importance of relative population densities in determining the conflict outcome is less relevant in this context as the encounter takes place out in the desert.²⁰ This observation also suggests that allowing for Malthusian dynamics (which are shut off) would not change the predictions regarding the onset of raids. However, endogenizing fertility decisions would imply that in equilibrium there would be no systematic differences in income per capita but all productivity differences would be manifested in differential population densities across regions, Ashraf and Galor (2013).

We model the trade and raid process as a sequence, where the rich evaluate the profitability of trade conditional on the decision of the poor whether or not to raid. It follows from (3), (6), and (7) that utility is increasing in net income. At any period t and in absence of any institutional arrangements, the rich tribe would trade if her post-conflict net income $Y_{H,t}^c$ exceeds the income under no trade, $I_{H,t}$:

$$I_{H,t} < Y_{H,t}^c \equiv p(I_{H,t} - \mu)f_H(\lambda),$$

which in period 0 can be rewritten as

$$f_H(\lambda) - \frac{1 - \alpha}{p(1 - \alpha - \mu)} > 0. \quad (8)$$

The inequality shows that trade is more likely to occur as the ability of the rich to retain goods during a raid increases (larger $f_H(\lambda)$), and gains from trade are large (a higher gross income $1 - \alpha$, higher prices p , or lower trade costs μ).

²⁰Sustaining large contingents of guards in the desert is economically inefficient or practically impossible. For example, note that the Roman army despite its apparent military superiority did not take over the Arabian peninsula.

Lemma 1 *There exists a unique threshold mass of desert $\bar{\lambda} \in (0, 1)$, giving $f_H(\bar{\lambda}) = \frac{1-\alpha}{p(1-\alpha-\mu)}$, such that trade in the presence of conflict is only profitable for $\lambda < \bar{\lambda}$.*

Proof. Since $f_H(\lambda)$ is continuous, monotonically decreasing in λ , $f_H(0) = 1$ and $f_H(1) = 0$, it follows from the *Intermediate Value Theorem* and (8) that there exists a unique mass of arid land $\bar{\lambda}$ such that $f_H(\bar{\lambda}) = \frac{1-\alpha}{p(1-\alpha-\mu)} \equiv \bar{f}_H$. Hence there exists a $\lambda \equiv \bar{\lambda}$ such that if $\lambda < \bar{\lambda}$ then $f_H(\lambda) > \bar{f}_H$ and the rich trade, whereas if $\lambda \geq \bar{\lambda}$ then $f_H(\lambda) \leq \bar{f}_H$ and they only consume locally. ■

The tribe in the arid region may plunder the goods being traded. In line with the historical evidence, we assume a raid may occur when a caravan is on its way to the trade routes, therefore the potential booty to be gained in a raid is the pre-trade income of the rich tribe.²¹ There is a cost of conflict for the Bedouins that represents resources lost during an ambush. In particular, they sustain a loss equivalent to a fraction θ of caravan's merchandise. Thus, raiding is only a credible threat if what the poor can obtain exceeds the income of remaining passive and consuming own production, i.e.,:

$$I_{L,t} < I_{L,t} + (I_{H,t} - \mu)[f_L(\lambda) - \theta], \quad (9)$$

which can be rewritten as

$$f_L(\lambda) - \theta > 0. \quad (10)$$

The inequality shows that the poor would only raid if probability of obtaining the goods is large enough to overcome the costs of conflict θ .

Lemma 2 *There exists a unique threshold mass of desert $\underline{\lambda} \in (0, \bar{\lambda})$, giving $f_L(\underline{\lambda}) = \theta$, such that a raid is only a credible threat for $\bar{\lambda} > \lambda > \underline{\lambda}$.*

Proof. Note that $f_L(\lambda)$ is continuous and monotonically increasing in λ , $f_L(0) = 0$ and $f_L(\bar{\lambda}) = 1 - \frac{1-\alpha}{p(1-\alpha-\mu)}$. (C2), (C4) and $\theta < 1/2$ imply that $p > \frac{1-\alpha}{(1-\alpha-\mu)(1-\theta)}$, and therefore that $f_L(\bar{\lambda}) > \theta$. It follows from the *Intermediate Value Theorem* that there exists a unique mass of arid land $\underline{\lambda} \in (0, \bar{\lambda})$ such that $f_L(\underline{\lambda}) = \theta \equiv \underline{f}_L$. Hence, there exists a $\lambda \equiv \underline{\lambda}$ such that if $\lambda > \underline{\lambda}$ then $f_L(\lambda) > \underline{f}_L$ and the poor raid, whereas if $\lambda \leq \underline{\lambda}$ then $f_L(\lambda) \leq \underline{f}_L$ and there is no conflict. ■

3.4.2 The Static Redistribution System

We now introduce the possibility of zakat, that is static, same-period income redistribution, and investigate the necessary conditions under which a zakat contract is (i) mutually beneficial

²¹Note that as the poor cannot overcome the costs of setting up a caravan, we assume away the possibility that they subsequently trade goods collected during a raid.

and (ii) an equilibrium outcome. The zakat contract takes the form of a fraction z of the pre-trade income of the rich tribe that is transferred to the poor. The poor would prefer a zakat payment as a form of compensation to refrain from conflict if the transfer is larger than what they would gain from a raid:

$$I_{L,t} + z(I_{H,t} - \mu) \geq I_{L,t} + [(f_L(\lambda) - \theta)(I_{H,t} - \mu)].$$

This gives a minimum acceptable zakat rate, \underline{z} , of

$$\underline{z} \equiv \underline{z}(\lambda) = \max\{0, f_L(\lambda) - \theta\}, \quad (11)$$

which is weakly increasing in $f_L(\lambda)$, thus weakly increasing in λ and weakly decreasing in θ . Note that \underline{z} only becomes positive at \underline{f}_L , which looking at (10) occurs when the mass of arid areas exceeds $\underline{\lambda}$, that is when the poor find it optimal to raid.

The maximum zakat rate the rich would be willing to pay can be found by comparing their post-trade income under conflict with that under a zakat regime:

$$p(1 - z)(I_{H,t} - \mu) \geq f_H(\lambda)p(I_{H,t} - \mu),$$

which gives

$$\bar{z} \equiv \bar{z}(\lambda) = f_L(\lambda) \leq 1. \quad (12)$$

and is increasing in λ . Note that conflict occurs only when $f_L(\lambda) > \underline{f}_L$. Below this threshold there is no conflict so the maximum zakat rate of the rich is 0. It is easy to see from (11) and (12) that $\underline{z} < \bar{z}$ always holds, thus there exists a positive zakat rate that delivers a Pareto preferred outcome as long as $\lambda > \underline{\lambda}$.

Given the structure of trade and assuming that \underline{z} is the rate of redistribution, we can now define the net income of the rich as:

$$Y_{H,t} = \begin{array}{ll} p(I_{H,t} - \mu) & \text{no raid} \\ f_H(\lambda)p(I_{H,t} - \mu) & \text{raid} \\ (1 - \underline{z})p(I_{H,t} - \mu) & \text{zakat} \\ (1 - \underline{z})f_H(\lambda)p(I_{H,t} - \mu) & \text{zakat and raid.} \end{array} \quad (13)$$

The net income of the poor is equal to their gross income, plus zakat earnings, with the latter being equivalent to their potential gains from conflict:

$$Y_{L,t} = I_{L,t} + \underline{z}(I_{H,t} - \mu). \quad (14)$$

		<i>rich</i>	
		<i>no zakat</i>	<i>zakat</i>
<i>poor</i>	<i>raid</i>	$\text{poor: } \frac{1-\alpha}{v} + [f_L(\lambda) - \theta]\Delta$ $\text{rich: } 1-\alpha + \alpha[pf_H(\lambda)\Delta - \tilde{c}]$	$\text{poor: } \frac{1-\alpha}{v} + \{z + (1-z)[f_L(\lambda) - \theta]\Delta$ $\text{rich: } 1-\alpha + \alpha[pf_H(\lambda)(1-z)\Delta - \tilde{c}]$
	<i>no raid</i>	$\text{poor: } \frac{1-\alpha}{v}$ $\text{rich: } 1-\alpha + \alpha(p\Delta - \tilde{c})$	$\text{poor: } \frac{1-\alpha}{v} + z\Delta$ $\text{rich: } 1-\alpha + \alpha[p(1-z)\Delta - \tilde{c}]$

where $\Delta = I_{H,t}^c - \mu$

Figure 1: The Failure of a Static Redistribution System

If the poor deviate by raiding after receiving the transfer payment and before trade takes place, they can achieve a net income of:

$$Y_{L,t} = I_{L,t} + [z + (1-z)(f_L(\lambda) - \theta)](I_{H,t} - \mu). \quad (15)$$

Although adopting a static redistribution system is Pareto efficient, it is not a Nash equilibrium because the poor may deviate and attack the caravan after having received the transfer. This is straightforward to see in Figure 1 that illustrates the outcome of the game between the rich and the poor in terms of their net income. The equilibrium strategy is for the rich to not redistribute and for the poor to raid, giving rise to an inefficient outcome. A static redistribution system hence is not self-enforcing and fails to deliver a sustainable solution that safeguards trade, as the nomadic clan always finds it optimal to raid the caravan after receiving the redistribution. Note that in a repeated game, a static redistribution by itself would have been enforceable and might have delivered a sustainable solution. Failure of the ilaf agreements to eliminate raids prior to Islam, nevertheless, clearly indicate that this was historically not the case.

Lemma 3 Using (11) and (12), a zero zakat rate obtains for $\lambda \leq \underline{\lambda}$, while for $\lambda > \underline{\lambda}$ there

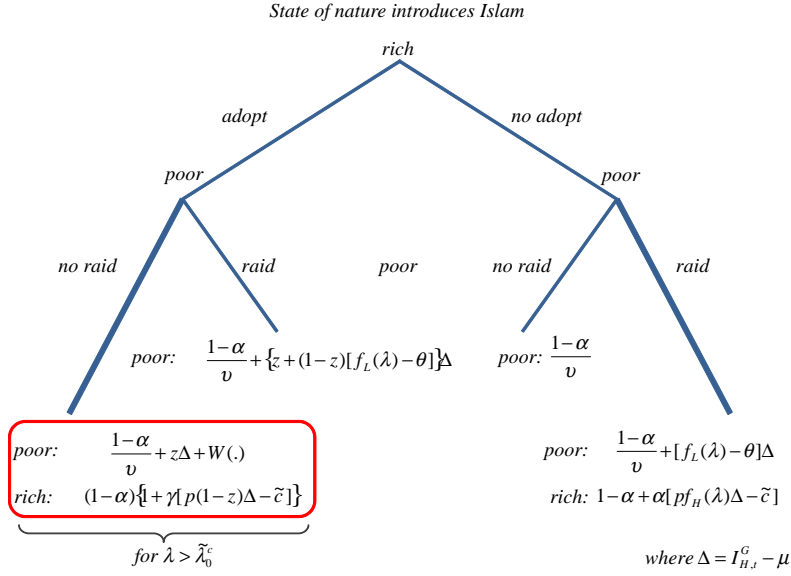


Figure 2: Islam as a System of Dynamic Redistribution

exists a positive zakat rate of z increasing in λ , which is beneficial for both sides. Commitment problems, however, result in the Pareto efficient outcome not being a Nash Equilibrium, rendering a static redistribution system as such ineffective over time.

Proof. Follows by directly comparing (11) to (12), the properties of $f_L(\lambda)$, and the properties of the Nash equilibrium in Figure 1. ■

3.5 Geography and the Emergence of the Islamic Economic Principles

Islam can be viewed as a contract that adds a dynamic layer of redistribution to the static transfer, which alone was shown to be unsustainable. This can be modelled as any force that spreads wealth intergenerationally and avoids its concentration. Historically, such forces included a partible inheritance system and a combination of regulations that limited wealth accumulation and induced public investments by the rich, such as waqfs. In the latter case, benefits to the next generation are enjoyed by both the rich and poor tribes. Specifically, in our model the Islamic contract comprises an anti-riba law together with a zakat transfer from the rich to the poor.

We assume that at $t = 0$ an Islamic pact is offered and is enacted if it is accepted by both sides. Figure 2 displays a redistribution scheme that exhibits both static and dynamic aspects. The introduction of the latter acts as a coordination device by eliminating the commitment problem present in a system of static redistribution only. We model this as a dynamic game,

where first the rich adopt Islam if profitable, and then the poor decide whether to abide by the doctrine or resort to violence and predation.

The nomadic clan uses the threat of conflict to establish Islam, and its bargaining power is increasing in λ . To see whether or not a contract encompassing the set of economic rules present in the Islamic doctrine is adopted, one may compare the utility of the rich clan with and without Islam. The latter calculate their utility under Islam, U_H^ξ , with both zakat and anti-riba in place and compare it to their outside option, U_H^c , which is conflict for all $\lambda > \underline{\lambda}$. At time $t = 0$, the level of net income under conflict Y_H^c that gives $Y_H^c = \tilde{c}$, above which the rich leave capital bequests, solves for:

$$f_H(\lambda) - \frac{\tilde{c}}{p(1-\alpha-\mu)} > 0. \quad (16)$$

With equality, (16) gives $\lambda \equiv \tilde{\lambda}_0^c$ so that capital bequests are positive if $\lambda < \tilde{\lambda}_0^c$ and zero otherwise. In addition, looking at (8) and (16) along with (C2) and (C4) assures that $\underline{\lambda} < \tilde{\lambda}_0^c < \bar{\lambda}$. Bequests are more likely to be positive when $f_H(\lambda)$, $1 - \alpha$, and p are larger, and when trade costs, μ , are smaller.

Lemma 4 *Under conflict there exists a unique threshold mass of desert $\tilde{\lambda}_0^c \in (\underline{\lambda}, \bar{\lambda})$, giving $f_H(\tilde{\lambda}_0^c) = \frac{\tilde{c}}{p(1-\alpha-\mu)}$, such that capital bequests are positive only for $\lambda < \tilde{\lambda}_0^c$.*

Proof. Note that $f_H(\lambda)$ is continuous, $f_H(\underline{\lambda}) = 1 - \theta$ and $f_H(\bar{\lambda}) = \frac{1-\alpha}{p(1-\alpha-\mu)}$. Given (C2), (6), (8), (13) and (16), as long as $p > \frac{\tilde{c}}{(1-\alpha-\mu)(1-\theta)} \implies f_H(\tilde{\lambda}_0^c) > 1 - \theta$, which holds from (C4) and $\theta < 1/2$, it follows from the *Intermediate Value Theorem* that there exists a mass of arid areas $\tilde{\lambda}_0^c \in (\underline{\lambda}, \bar{\lambda})$ such that $f_H(\tilde{\lambda}_0^c) = \frac{\tilde{c}}{p(1-\alpha-\mu)} \equiv \tilde{f}_{H,0}^c$. Also, since $f_H(\lambda)$ is monotonically decreasing in λ , this $\tilde{\lambda}_0^c$ is unique. So, if $\lambda < \tilde{\lambda}_0^c$ then $f_H(\lambda) > \tilde{f}_{H,0}^c$ and capital savings by the rich are positive, whereas if $\lambda \geq \tilde{\lambda}_0^c$ then $f_H(\lambda) \leq \tilde{f}_{H,0}^c$ and savings are zero. ■

Similarly, one may derive the threshold λ below which waqf investments are positive under an Islamic contract, by solving for the net income under Islam, Y_H^ξ , that guarantees consumption equal to \tilde{c} . The only difference from the previous case is the additional gain from avoiding conflict. The following inequality solves for $\tilde{\lambda}_0^\xi$ below which bequests under Islam are positive:

$$f_H(\lambda) - \frac{\tilde{c}}{p(1-\alpha-\mu)} + \theta > 0. \quad (17)$$

Substituting for \underline{p} from (C4), one can show that (17) always holds, hence waqf bequests by the rich are always positive under Islam. Note that while $Y_H^c > \tilde{c}$ no longer holds for $\lambda \geq \tilde{\lambda}_0^c$, $Y_H^\xi > \tilde{c}$ still obtains due to the extra term θ .

The poor in absence of dynamic redistribution always find it optimal to raid as in the static redistribution case. In contrast, under the combination of zakat, an anti-riba regime and

waqf, when waqf gains $W(\cdot)$ are sufficiently large they strictly prefer compliance to raiding. Given the sufficient condition for the rich to adopt Islam, $\lambda \geq \tilde{\lambda}_0^c$, from Lemma 4, should the poor choose to raid after the Islamic contract is offered neither side can enjoy the benefits of waqf as no wealth remains to be bequeathed. Indeed, since the rich get raided and pay zakat in this case, the zero bequest threshold is reached at a lower level of λ than $\tilde{\lambda}_0^c$. Raiding is therefore no longer incentive compatible for the poor under the structure offered by Islam. This leaves a choice between the static benefits of a raid versus the dynamic gains from Islam:

Lemma 5 *When gain from waqf are large, $W(\cdot) > (1 - \underline{z})(1 - \theta)(1 - \alpha - \mu)$, the utility of the poor under Islam is greater than the one-time benefits from a raid obtained upon deviation from the principles, i.e., $U_L^{\xi} > U_L^c$.*

Proof. The utility of the poor in case they accept Islam or forego its benefits and raid are depicted on the left branch of the tree in Figure 2. Islam is strictly preferred by the poor if the dynamic gains outweigh a one-time raid such that $U_L^{\xi} > U_L^c \Rightarrow W(\cdot) > (1 - \underline{z})(1 - \theta)(1 - \alpha - \mu)$ at time $t = 0$, where $\underline{z}(1 - \alpha - \mu)$ and $\frac{1 - \alpha}{v}$ appear on both sides and therefore cancel out, and $f_L(\lambda) = 1$ to depict the maximum value it can take. ■

Lemma 5 reveals that when the gains from waqfs are sufficiently large the poor adopt Islam, i.e., the tribes unify into an Islamic community. Focusing on $t = 0$, it is straightforward to show that Islam is accepted by both sides for all $\lambda \geq \tilde{\lambda}_0^c$, where the alternative is no bequests. In this range, the only option for the rich to leave benefits to the next generation is to switch to Islam and waqf investments, as opposed to bequests strictly benefiting their heirs. Islam also brings static gains by preventing conflict. The difference between what the rich tribe is willing to pay to avoid conflict and what it actually pays, i.e., the difference between \underline{z} and \bar{z} in (11) and (12), is the economic value added by Islam, and is equal to θ . On the dynamic side, the poor also gain by assuring waqf spillovers will be accrued to their offspring, which under large gains from trade outweigh the static gains from a raid. One may thus state:

Proposition 1 *When trade opportunities arise, an Islamic contract is agreed upon by the tribe in the fertile region and respected by the nomadic tribe in the periphery at $t = 0$ when the mass of the arid lands and gains from waqf are such that $\lambda \geq \tilde{\lambda}_0^c$ and $W(\cdot) > (1 - \underline{z})(1 - \theta)(1 - \alpha - \mu)$.*

Proof. Follows directly from Lemmas 4 and 5. For large enough values of $W(\cdot)$ that make dynamic gains from Islam more attractive than a one-time raid for the poor, $\lambda \geq \tilde{\lambda}_0^c$ is a sufficient condition for Islam to be accepted as an institution because (i) the rich will have a static gain by avoiding a raid, (ii) the rich will have dynamic benefits as opposed to no capital bequests, (iii) the poor obtain higher dynamic gains from waqf than raiding since predation leaves no wealth to the rich to be invested socially. ■

Looking back at Figure 2, Islam is proposed for all $\lambda > \tilde{\lambda}_0^c$, where the rich prefer waqf to individual accumulation of wealth under conflict and the poor consequently respect the system and refrain from raiding in exchange for receiving the long-run benefits of Islam.

In summary, when the mass of relatively infertile regions to cross is small, i.e., for $\lambda < \underline{\lambda}$, there is no significant threat of a raid and no redistributive institutions emerge. However, when they account for a moderate part of the landscape, i.e., $\underline{\lambda} < \lambda < \tilde{\lambda}_0^c$, the rich may prefer to trade and privately accumulate and the poor therefore continue to raid. This is an economy where static redistribution schemes collapse due to commitment problems. Finally, as long as the mass of arid land is large enough, the rich accept Islam because the threat of conflict is effective and potential losses are high. Islam is accepted for $\lambda \geq \tilde{\lambda}_0^c$ because the rich will otherwise not be able to leave any bequests under conflict, or even trade for $\lambda \geq \bar{\lambda}$. As a consequence, once trade becomes feasible in period $t = 0$, Islam is founded for $\lambda \geq \tilde{\lambda}_0^c$, the rich pay zakat, and leave bequests in the form of public waqfs.

In what follows we explore some aspects of the dynamics to establish the conditions under which the Islamic economic principles, once adopted, also persist in the long run. In other words, we examine whether there exists a threshold value of poor regions' size, $\tilde{\lambda}_S^c < 1$, above which the Islamic equilibrium survives in the steady state.

3.6 Persistence of the Islamic Doctrine and the Long-term Evolution of the Economy

We now conduct a dynamic analysis to study the persistence of Islam and assess the long-run evolution of the economy. We derive the steady state income under Islam and observe the conditions under which Islam persists.

We know from Proposition 1 that an Islamic institution is initially founded if $\lambda \geq \tilde{\lambda}_0^c$. The anti-riba law sways the rich to divert bequests from private capital accumulation to public good investments that enhance productivity of all agents. Note that due to the public nature of waqf, initial inequality under Islam does not change along the process of development. However, the bequest and the Islam thresholds, referred to as $\tilde{\lambda}_t^c \equiv \tilde{\lambda}_t^c(I_{H,t})$ henceforth, may change due to $I_{H,t}$ increasing over time.

Corollary 1 *At any period t , the expression $f_H(\tilde{\lambda}_0^c)$ derived in Lemma 4 is generalized to $f_H(\tilde{\lambda}_t^c) = \frac{\tilde{c}}{p(I_{H,t}-\mu)}$. Since $\frac{\partial f_H(\tilde{\lambda}_t^c)}{\partial I_{H,t}} < 0$, it follows that the threshold value $\tilde{\lambda}_t^c$ rises over time as $I_{H,t}$ increases. Intuitively, a larger gross income eases the constraint to leave bequests for the wealthy in presence of conflict and discourages the persistence of Islam.*

Proof. Substituting the gross income in period 0, $(1 - \alpha)$, with the gross income in period t , $I_{H,t}$, in the RHS of $f_H(\tilde{\lambda}_0^c)$ in Lemma 4, the expression becomes $f_H(\tilde{\lambda}_t^c) = \frac{\tilde{c}}{p(I_{H,t}-\mu)}$.

Further, $\frac{\partial \tilde{\lambda}_t^c}{\partial I_{H,t}} > 0$ follows by directly inspecting the expression in the Corollary and using the properties of $f_H(\lambda)$. ■

Given Corollary 1, as long as $\lambda \geq \tilde{\lambda}_t^c$, Islamic rules are accepted in every period. Assuming that the gross income of the poor does not surpass that of the rich after acquiring the benefits from waqf, the limits of the economy can be measured by seeing how the income of the rich evolves according to the dynamic equation

$$I_{H,t+1} = (1 - \alpha)(1 + \gamma[(1 - \underline{z})p(I_{H,t} - \mu) - \tilde{c}]), \quad (18)$$

where we have used equations (7), (11), and (13). Gross income increases in every period and eventually monotonically reaches the steady state level:

$$I_{H,S} = (1 - \alpha) \left(1 + \gamma \frac{p(1 - \alpha - \mu)(1 - \underline{z}) - \tilde{c}}{1 - p(1 - \alpha)\gamma(1 - \underline{z})} \right) \quad (19)$$

if $p < 1/[(1 - \alpha)\gamma(1 - \underline{z})]$. It is easy to see that the sufficient condition on p ensures that both the denominator in the parenthesis in (19) is positive guaranteeing a positive steady state income level, and the slope of the linear function $I_{H,t+1}$ is between 0 and 1. A first-order linear dynamic equation with such properties delivers a stable steady state with monotonic convergence. The steady state gross income is the wage rate times the steady state level of investment in waqf. It is positive and larger than the initial gross income $(1 - \alpha)$ from (C4). If the price condition above is not satisfied, growth of income of the rich is unbounded and the importance of implementing the Islamic economic principles declines in the long run.

Corollary 1 shows that the Islamic contract may be abandoned as the gross income of the rich increases. However, using (19) one may show that there exists a threshold mass of the arid lands, $\tilde{\lambda}_S^c$, above which the rich remain loyal to Islam even in the long run.

Proposition 2 *There exists a unique threshold $\tilde{\lambda}_S^c \in (\tilde{\lambda}_0^c, 1)$, where Islam is adopted in the short-run and maintained in the long-run $\forall \lambda \geq \tilde{\lambda}_S^c$.*

Proof. To check for the existence and uniqueness of $\tilde{\lambda}_S^c < 1$, first substitute $\lambda = 1$ into expression $f_H(\tilde{\lambda}_t^c)$ in Lemma 4, yielding $\frac{\tilde{c}}{p(1 - \alpha - \mu)}$. From (C2) and (8) we know that $f_H(1) < \frac{\tilde{c}}{p(1 - \alpha - \mu)}$, therefore in the limit case of $\lambda \rightarrow 1$ the rich would prefer the Islamic contract. Next, Corollary 1 shows that $\tilde{\lambda}_t^c$ is increasing over time. It follows from the *Intermediate Value Theorem* that there exist a unique $\tilde{\lambda}_S^c > \tilde{\lambda}_0^c$ such that if $\lambda > \tilde{\lambda}_S^c$ then Islam persists in the long run, whereas if $\lambda < \tilde{\lambda}_S^c$ then Islamic economic principles may be abandoned or modified despite being adopted in $t = 0$. ■

Proposition 2 establishes the existence of an interval, in which Islam is sustainable in the long run. We may conclude that Islam is initially founded and may be abandoned after

some period $\tilde{t} > 0$ for $\tilde{\lambda}_0^c \leq \lambda < \tilde{\lambda}_S^c$, while it persists in the long-run for $\tilde{\lambda}_S^c \leq \lambda < 1$. If the contract is abandoned, the economy ultimately evolves back into a no-institutions case. Figure 3 presents the main results of the two propositions on the critical values of λ that determine the adoption and persistence of the Islamic institutions paralleling the optimal decisions of the society regarding trade, raid and bequests. It is important to note that in absence of the determinants of the Islamic framework, i.e., unequal geography interacted with trade opportunities, Islamic principles are likely not to be followed in the long-run, see Rubin (2009, 2011) for several examples in which the prohibition of interest rates was no longer enforced among Muslim subjects in the era of the Ottoman empire.

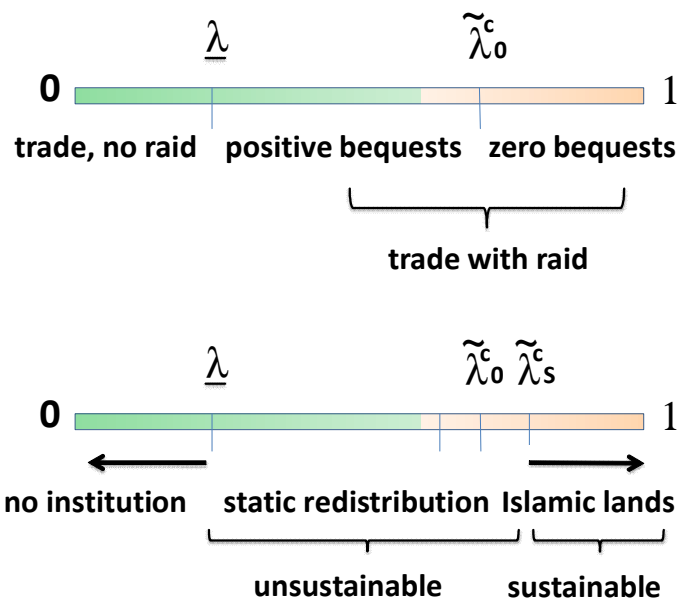


Figure 3: Distribution of Land Quality and Islamic Institutions

The results in this section suggest that the adoption of the Islamic economic doctrine seemingly hampered economic development by limiting private investments and wealth accumulation, thereby constraining long-run growth of income. However, it is crucial to recognize that in absence of Islamic rules territories characterized by a large share of poorly endowed regions would be trapped in a state of eternal feuding. So, while the emergence of Islam allowed these economies to escape a conflict trap and flourish in the pre-industrial world, these very institutions resulted in negligible capital accumulation shaping the economic trajectory of the Islamic lands in the pre-modern era. The long run implications of the model are consistent with the well-developed thesis of Kuran (2010) who argues how public waqfs impeded development due to their inflexibility and the diversion of productive resources away from the relatively more profitable private investments and towards rent-seeking activities. Our findings also complement Galor and Tsiddon (1997), who show that polarization of income in early

stages of development are a necessary ingredient for future economic growth and that prematurely implementing policies designed to reduce inequality leads to stagnation in the long-run. Similarly, Galor and Moav (2004) argue that income inequality in the early stages of development is growth promoting since it leads to wealth being channeled towards those with higher propensity to save, fueling the accumulation of capital.

4 Conclusion

This research sheds new light on the economic origins and consequences of the Islamic economic doctrine. The theory provided links the emergence of trade opportunities across geographically unequal territories to the formation of the Islamic principles and investigates how the adoption of the latter shaped the economic performance of the Muslim world in the pre-industrial era.

We have sketched a simple model that illustrates how geographic inequality when exposed to trade opportunities leads to the emergence of redistributive principles featuring both static and, perhaps more critically, dynamic aspects similar to those prescribed by the Islamic doctrine. In the context of our model two elements are crucial in determining the institutional setup: (i) the existence of substantive gains from trade, and (ii) the relative proportion of regions that cannot directly reap these gains. If poorly-endowed territories constitute a small fraction of the landscape no redistributive institutions arise, while for intermediate values, only static redistribution is feasible, but it is unsustainable due to commitment problems. Nevertheless, once the representation of poorly-endowed regions crosses a critical threshold, the threat of a raid induces the rich to adopt the Islamic contract. The results are consistent with our companion paper, Michalopoulos, Naghavi, and Prarolo (2012), where we find that the interaction between distance to pre-industrial trade routes and geographic inequality is a key predictor of the distribution of Muslim communities in the Old world.

We argue that geography and trade opportunities forged the Islamic economic doctrine, influencing the process of historical development of the Islamic lands. In particular, the unequal distribution of land endowments conferred differential gains from trade across regions, fostering predatory behavior from tribes residing in the poorly endowed regions. In such an environment, it was mutually beneficial to institute an economic system dictating redistribution. A static income transfer only, however, was unsustainable due to commitment problems undermining the viability of trade. Islam offered principles that in addition to static transfers also provided a dynamic layer of redistribution tailored to limit the accumulation of wealth over time across highly unequal regions. Examples of dynamic transfers that kept wealth inequality within limits include the partible inheritance rules, the frictions on borrowing and lending and the concomitant emphasis on public goods provision via religious endowments. As a result of these

principles the Muslim lands managed to escape a state of constant feuding and flourish in the pre-industrial world, this however limited the wealth accumulation for the commercial elite and hence the potential for growth in the era of large-scale shipping trade and industrialization.

Finally, it is worth noting that Christianity emerged in current day Israel and Palestine which also feature a prominently unequal distribution of land endowments. Despite these common geographical origins, which may explain the similarities in the economic doctrine between Christianity and Islam, the former eventually spread in Europe modifying its economic doctrine over time. For example, although Christianity did initially rigorously implement the prohibition on interest, gradually, and particularly following the Protestant Reformation, enforcement of laws against usury were relaxed (Rubin, 2011).²² We view this study as a first step towards a broader effort to shed light on the origins of religious beliefs and their impact on comparative development. Natural questions come to mind, such as why other Abrahamic religions over time toned down or significantly modified their initial economic doctrine and why Muslim jurists did not, and how these differences shaped the process of development.²³ Other inquiries may engage with why non-Muslims performed differently within the Islamic lands, as the limited evidence on Greeks, Armenians and Jews in the Ottoman empire suggests. We hope to tackle some of these questions in the near future.

²²In fact, by the beginning of the 17th century usury was downgraded from an offence against public morality to a private conscience issue, Visser and Macintosh (1998). Also, during the Amoraic period in Babylonia (200AD to 500AD) charging interest started being accepted by the Jewish community.

²³For example, the different paths of development experienced by the Christian world have been associated with the inheritance laws, which in several instances preserved economic inequality and encouraged the accumulation of capital (Bertocchi, 2006).

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