POLITICAL INSTABILITY AND LONG RUN ECONOMIC GROWTH ACROSS THE OLD WORLD

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POLITICAL INSTABILITY AND LONG RUN ECONOMIC GROWTH ACROSS THE OLD WORLD

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Thesis Abstract

Ezgi Kurt, "Political Instability and Long Run Economic Growth across the Old World"

This study investigates determinants of differences in the long run economic development across the Old World. It provides support for the primary role politics played in driving these differences. In particular, the evidence supports the hypothesis that from the tenth century on, the rise of equestrian warfare favored nomadic groups over settled societies in terms of military power. The military dominance of nomads induced political instability in the semi-arid steppes and surrounding regions they inhabited. Political instability, in turn, reduced economic growth.

The hypothesis is investigated using a Difference in Difference (DD) empirical strategy with a data set of ninety-one countries from the fifth to the seventeenth centuries. The proxy used for economic growth is population and the main dependent variable, measuring the destabilizing impact of semi-arid steppes, is its distance to each country in the sample. Controlling for various geographical, historical and political variables, econometric results identify a significant and substantial negative impact of being proximate to the steppes on population levels after the tenth century.

These findings shed light on one of the key questions in economic history, i.e. the gradual rise of the West, which was protected from the semi-arid steppes at the cost of other economic centers in the Old World, which were not. Rather than a unicausal mechanism, we point out to a complex interaction between geography, military technology and politics in driving the differences.

Tez Özeti

Ezgi Kurt, “Eski Dünya’da Siyasi İstiktarsızlık ve Uzun Dönem Ekonomik Gelişme”

Bu çalışma Eski Dünya’da (Avrasya ve Kuzey Afrika) uzun dönemli ekonomik gelişme farklarını belirleyici faktörleri araştırmaktadır. Çalışmada bahsi geçen ekonomik farklılıkları açıklamada öncül rol siyasi faktörlere verilmiştir. Veriler, onuncu yüzyıl’ın atlı savaş teknolojilerinin gelişmesi ile göçebe toplumların yerleşik toplumlara kıyasla askeri olarak daha avantajlı konuma geçtiğini desteklemektedir. Göçebe toplumların görece askeri üstünlüğü yaşadıkları yarı kurak bozkır bölgeler ve çevresi boyunca siyasi istikrarsızlığa sebep olmuştur. Bu siyasi istikrarsızlık beraberinde ekonomik büyümeyi de azaltmıştır.

Bu tez ampirik olarak farkların farkı (FF) stratejisi ile analiz edilmektedir ve çalışmada beşinci ve onyedinci yüzyıllar arasında doksanbir ülkeyi içeren büyük bir veri seti kullanılmıştır. İncelenen dönemde ekonomik büyümeye ölçüt olarak nüfus verileri, ana değişken olarak ise örneklemdeki her ülkenin yarı kurak bozkıra olan uzaklığı baz alınmıştır. Pek çok farklı coğrafi, tarihsel ve siyasi değişken kontrol edilen analizde sonuçlar onuncu yüzyıl sonrasında bozkır değişkeninin nüfus üzerindeki önemli ve negative etkisini ortaya koymaktadır.

Edindiğimiz sonuçlar iktisat tarihinin en önemli sorularından biri olan Avrupa’nın dereceli yükselişi konusuna ışık tutmaktadır. Olgunun açıklanmasında Avrupa’nın, Eski Dünya’nın pek çok ticaret merkezine kıyasla, yarı kurak bozkır bölgelerine olan uzaklığı ve beraberinde gelen siyasi denge argümanı yer almaktadır. Bu çalışmada bahsi geçen olgunun açıklanmasında tekil nedensel bir mekanizmadan ziyade, coğrafya, askeri teknoloji ve siyasi faktörler arasında geçen daha karmaşık bir etkileşim ve işbirliği olduğuna işaret etmekteyiz.

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Now, I dedicate this thesis to my beautiful parents, Mustafa and Suna, my brother Berkay and my dear co-pilot Ahmet for their love, patience and encouragement in all phases of my life. They were always there cheering me up and stood by me through the good times and bad. None of this would have been possible without their love. For the final line, I will express my deepest gratitude to all for surrounding the fîd inside with their invaluable spirit and making me who I am.

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CHAPTER I

INTRODUCTION

There have been numerous studies on the impact of political instability on economic outcomes, but these studies usually focus on the modern period. This study investigates the impact of the differences in political instability across the Old World (Eurasia and North Africa) on historical and long-term economic performance. In particular, it argues that the balance of power between nomadic cavalry and settled agriculturalists tilted towards the former after the tenth century, which destabilized the regions surrounding the semi-arid zone inhabited by nomads and adversely affected economic development in these regions. In this respect, the study is related to large literature on the impact of political instability on growth, but takes a longer term with historical and geographical perspective.

In the first chapter of the study, I begin by reviewing long term population trends in countries across the Old World. The evidence suggests significant differences in population growth rates over time across the Old World, especially between Europe and the greater Middle East.

In the second chapter, I focus on the main hypothesis of the study reviewing geographical, historical and political characteristics of different regions across the Old World. The section lays out the argument that the semi-arid region, and closely associated equestrian warfare, destabilized steppe surrounding regions after the tenth century. On the other hand, regions that were distant from the Eurasian steppe were protected from the impact of equestrian warfare and the associated political instability. Consequently, the population and economic growth in these regions show diverging patterns.

In the third section, I review the literature and alternative arguments on the causes of variations in the long run growth rates across the regions. In particular, I review various political, geographical and institutional factors that might have driven the patterns.

The fourth and fifth chapters discuss the data set used in this study and the empirical methodology, respectively.

Finally, the last chapter empirically tests different hypotheses about determinants of differences in growth rates. The results identify a negative growth differential for the semi-arid regions after the tenth century. Hence, they are consistent with the conjectured line of causation that runs from the interaction of military technology and geography to political instability and economic underdevelopment.

CHAPTER II

POPULATION PATTERNS ACROSS THE OLD WORLD

This section describes region and country-wide population figures for various zones across the Old World. Via analyzing these population indexes, I historically and geographically elaborate on the extent and the level of population shocks. Towards the end, I comprise all population data and give some insights regarding the impact of geography on the population patterns of different regions across the Old World.

First, I compile a population data set for various states across Eurasia and North Africa between fifth and seventeenth centuries.[1] Figure 1 views population patterns for Europe, the Middle East and Central Asia, East Asia and North Africa, respectively. The population data is mapped on a zone-based division in order geographical factors glimpse at the first sight.

In Figure 1, representative countries are the United Kingdom, France, Austria and Germany for Europe. It shows significant increases in population levels especially from tenth century on. Except for the thirteenth century Black Death shock that caused a sudden joint decrease in population levels, Europe exhibits an increasing population trend.

[1] The data is from the data set of HYDE 3.1 (Goldewijk, Beusen, & Jannsen, 2009) and it is in log million terms.

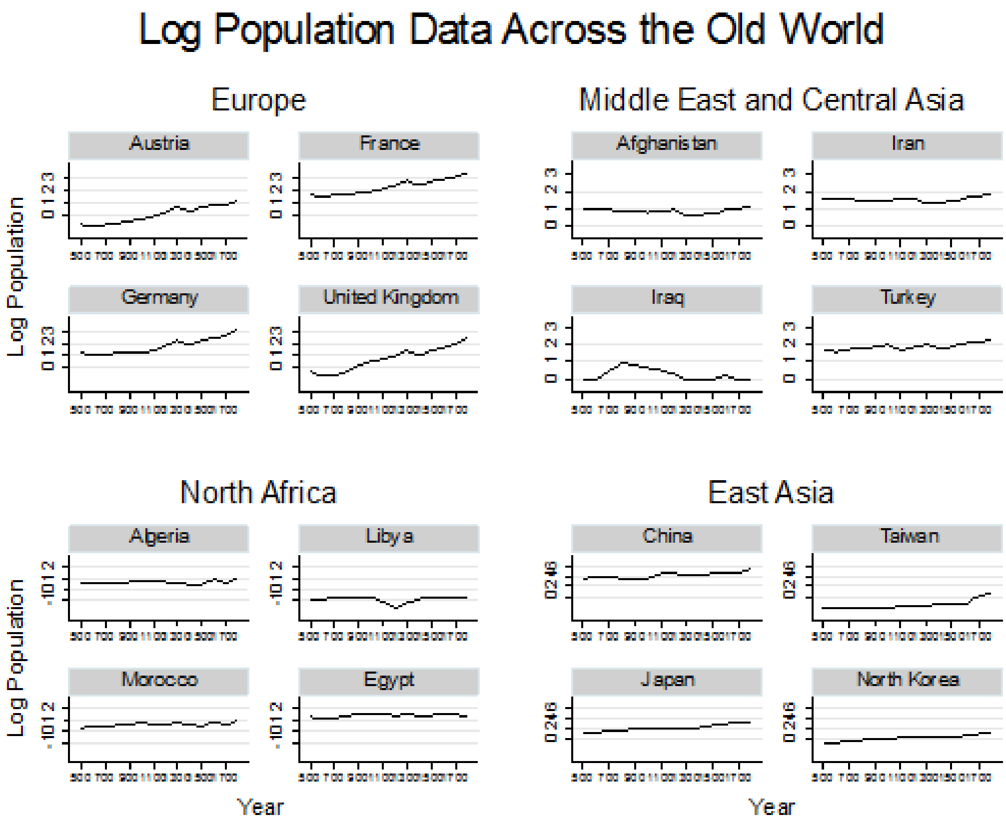

Figure 1. Log population of countries across the Old World

The population pattern for the Middle East and Central Asia is quiet different than sample countries, which are Iran, Iraq, Turkey and Afghanistan. Looking at Figure 1, it is observed that the region is repeatedly exposed to negative population shocks. The evidence signals an external or internal population shock experienced from the tenth century onwards.

The evidence on North Africa also points to a similar pattern. As in Middle East, this region is exposed to population shocks. The trend is mostly decreasing or non-increasing for the North African countries which is of significance as compared to straightforward increases witnessed in Europe and East Asia. Representative countries chosen are Algeria, Egypt, Libya and Morocco.

Finally, East Asia sample is composed of Japan, China, Korea and Taiwan. For this zone, the figure does not reveal repeated population shocks except some specific periods of China. Each country has a relatively mild trend of population increase. There seems to be no zone related shock which can be ascribed to geographical factors.

So, we show that different regions show up diverging population characteristics over time. Now, I also provide a region-wide figure presenting the same population data summed up for all countries of each zone. In Figure 2, the differences between regions become more evident in the total population patterns for the regions.

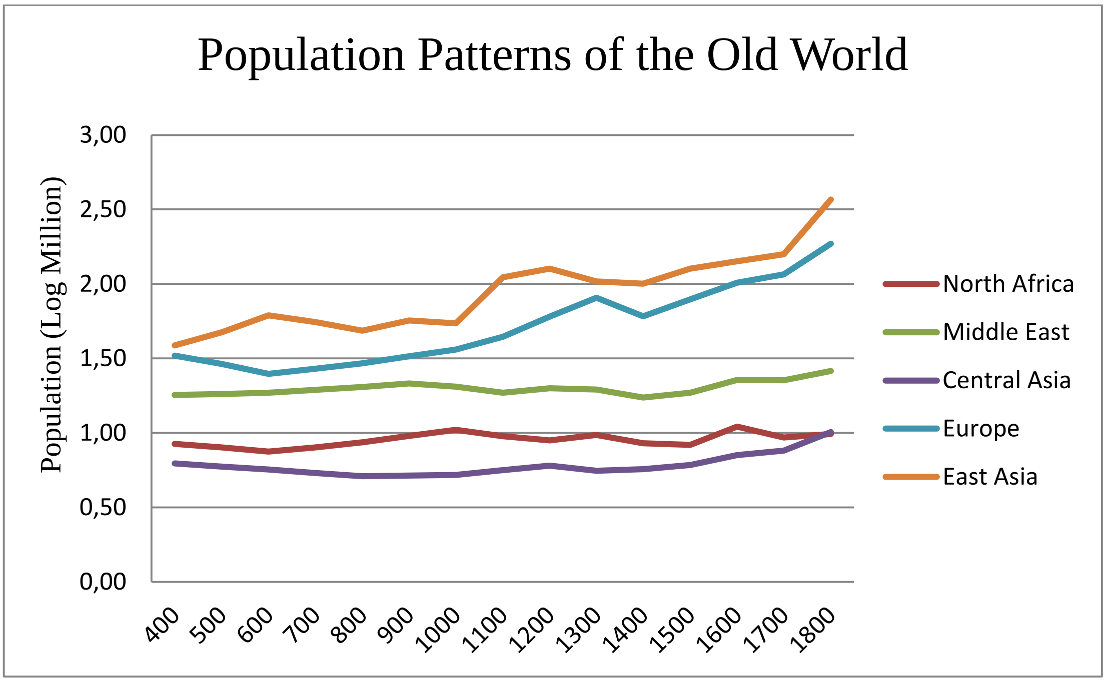

Figure 2. Log population of regions across the Old World

The first observation from Figure 2 is the straightforward increases in the population levels of East Asia and Europe. In Europe, we see an ascending increase in population except for the Black Death drop in thirteen century. Also for East Asia, the trend is modest increases in population with slight volatility. In contrast, the numbers for Central Asia, North Africa and Middle East are stagnant or decreasing. Besides, from the tenth to the fifteenth century, the level of population in Europe even doubles the level in Central Asia, North Africa and the surrounding area.

Overall observation on these figures is population shock differences across various regions in the Old World. There is a myriad of studies questioning the breaking points in this phenomenon in pre-modern ages, all comprising various hypotheses with various explanations such as warfare, politics and geography. In the next chapter, I will propose an explanation for these differences via a political instability hypothesis that builds on geography and military technology interaction.

CHAPTER III

GEOGRAPHY, MILITARY TECHNOLOGY and EQUESTRIAN WARFARE

Recent growth and development studies, especially on the basis of state, society and politics, generate a deep communication with an array of diverse disciplines. Any hypothesis reviewing a long term political and economic phenomena revises all these diverse and multidisciplinary approaches. In that regard, the hypothesis – which is mainly built on political instability – will have three main dimensions: Geography, Military Technology and Institutions.

The following sections will give the insights on the connection between the military technology, geographical factors and institutions. First, I will touch upon the habitation of nomads, evolution of the symbiosis of nomadic societies with horses and analyze the improvements in horse-based warfare. I touch upon the theory of dynamic succession and advert to equestrian warfare in its specific role in forming and destruction of political units. Then I combine it with geography by introducing the semi-arid steppe on a world map and explain the impact of steppe territories on the improvement and spreading of the horse-based warfare. Towards the end, I remark on a few supplementary indexes on dynasty successions and state formation cycles comparatively for different regions across the Old World. I, thus, investigate the decentralizing impact of steppe cavalry in inducing political disequilibrium for certain geographical territories. The end result asserts that geography, military technology and institutions as a trio assure a significant impact on political instability and, in return, growth performance of regions.

Nomads, Horses and Equestrian Warfare

Considering the vast institutional diversity among regions under study, in this work, prior to building a comprehensive hypothesis, I reviewed the historical sociologist Abd al-Rahman ibn Khaldun and his seminal work, Muqaddimah for the institutional insights it embodied. This piece forms a fundamental basis for this hypothesis with the insights it contains on habitation, institutions and state formation cycles in North Africa and Central Asia for quite early centuries.

A detailed analysis of the theorization of Ibn Khaldun, first, suggests the importance of different social organizations between nomadic (*umran badawi*) and sedentary societies. The fundamental difference on nomadic and sedentary societies lies in their ways of living and understandings on ownership. Nomadic societies are mainly tied with kinship relations (*asabiyya*) that are fundamental to their collective living. Openness of their borders forces nomadic societies to have special characteristics such as fortitude, courage and military strength. As their way of living goes along with some kind of extraction of natural resources, the idea of moving and invading is a frequently seen outcome. Their way of interaction results in a potentially greater military strength as compared to the protectionist, property and goods based bordered sedentary societies (Alatas, 1993).

An important phenomenon on tribal nomads underlined by Khaldun is the concept of ‘*asabiyya*. Asabiyya is a completely nomadic phenomenon that refers to group feeling based on kinship ties within a tribe. The crucial point on *‘asabiyya* is its specific role in state formation process. Superior military capacity of nomads in conquests together with the support of *‘asabiyya* ties, plays an empowering role in formation of states and dynasties. However, Khaldun emphasizes that the forces of ‘*asabiyya* behind state formation process eventually comes up as a source of instability for existing political units. Commonly, once a dynasty is established with the aid of tribal military power, the ruler attempts to dispense with '*asabiyya* which now comes as a potential risk of instability (Alatas, 1993). In that regard, the role of tribal '*asabiyya* eventually becomes a factor weakening the state or any existing political power. Khaldun refers to this fashion of the strong tribe invading the weak one as "Dynamic Succession", and according to him this is what forms the basis of political disequilibrium in the region (Andreski, 1969).

Nomadic societies' military capacity is based on horses which has always been a part of their way of living. Horses can adjust to almost any climate, however it was in the Steppe that they were first domesticated around fourth millennium BC. Due to low precipitation, arid climate and open fields of semi-arid Steppe, the opportunities for settled agriculture was quiet restrained. Raising high quality horses in large numbers was also facilitated with the natural ecology of semi-arid steppe. Nomads and the symbiosis they generated with horses formed the cornerstone of the life of the nomadic-pastoralists tribes which has also triggered significant advancement of tribal nomads in horse-based warfare. The outcome was surpassing potential of tribesman on horseback which resulted in equestrian expertise of nomadic people in incursions and consequent political dominance (Fletcher, 1986)

While the causes of this military shift remains to be a matter of debate, it appears to be based on various earlier technologies of horse riding such as the use of stirrups, deeper saddles and new horse tack, which improved both the stability of the rider and the maneuverability of the horse. Drawing upon the work of Michael Chamberlain (1994), R. J. Barendse (2003) proposes that the tenth to twelfth centuries should be seen as the period of the "warhorse revolution," when mounted warriors became militarily and politically dominant (Lieberman, 2009) . In particular, nomads' anarchic energy (Sinor D. , 1990) and increasing effectiveness in equestrian warfare led them became dominant coercive power around Eurasia. Equestrian Warfare, then, became a vital determining factor on the cyclical rise and decline of civilizations in the region.

Equestrian Warfare led nomad's supreme advantage in mobility and invasion and caused dynamic succession among dynasties. It led breakdowns in political formations and impacted significantly on the "state formation" and following political institutions in the territories of semi-arid Steppe. The Middle East, Inner Asia, Eastern Europe and North Africa are the regions exposed to tenth century Steppe cavalry phenomena. Forming up the boundaries of semi-arid Steppe, these regions have shown to exhibit decreasing population patterns and repeated disequilibrium after tenth century. On the other side, Western Europe, South India, Southeast Asia and Japan were protected by the distance and natural barriers which tend to show increasing population trends over this time (Barendse, 2003).

Table 1 (Chaliand, 2003) periodically shows the recurring nomadic waves for certain territories from the fourth to the eighteenth centuries. The table represents nomadic incursions and how it decentralized territories of Western Europe, Byzantium, Russian Steppe, the Middle East, North India, North China and Japan with increasing density after the tenth century.

Table 1. Periods of nomadic waves (Chaliand, 2003)

IV- V century	Flood of high Asia nomads Wei dynasty in Northern China Expansion of Black Huns towards the Near East and Western Europe White Huns towards India and Sassanid Iran.
VI – IX century	Göktürks creating a vast steppe empire which soon disintegrates Annihilation of White Huns Avars attacking the Byzantine Empire, Russia and conquering Hungary Bulgars emerging from Central Asia crossing the Danube (fifth century) and clushing with the Byzantine Empire Khazar Turks (seventh century) in western Asia Uighur Turks in east Asia forming states.
X- XII century	A high level turbulence in the steppe of High Asia, nomad waves pour out in all directions; Khitans forming Liao dynasty in northern China Seljuks entry into the Iranian front up to Indian borders and continuing penetration into Anatolia The Pechenegs clashing with the Byzantine Empire and Kievan Russia Increasing pressure of the Turks, Ghaznavids in eastern Iran (tenth century) and India, Establishment of the Mamluk sultanate of Delhi (1206) Jurchens coming from Manchuria conquering northern China Khitans forming Qara-Khitai in further west.
XIII- XV century	All areas hitherto held by nomads as well as much of the Eurasian continent come under the domination of the Mongols, the largest universal empire in history. Timur Lenk reunites Persia and defeats both the Russians and the Golden Horde, building the Timurid Empire, the death of Timur Lenk (1405), the end of Timurid Empire referred to as the last great nomadic power Persia and the Golder Horde are again without a clear ruler.
XV- XVIII century	Gradual end of Central Asia nomadic warriors in surrounding regions Manchu's in China (1644).

Specific Geographical Zones and Steppe Territories

Conquests of steppe cavalry on surrounding regions created persistent political instability for almost four centuries, and this phenomenon had a geographical dimension. Apparently, advances in the new horse based military technology did not have identical effects in all regions of Old World. Inner Asia was certainly the dominant forerunner region for extensive tribal alliances and equestrian expertise but there is actually a route to trace the impact of equestrian warfare revolution in the surrounding regions. In this regard, the semi-arid steppe will be our roadmap to follow the spread of equestrian warfare and induced political instability.

Figure 3 (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006) depicts semi-arid steppe regions across the Old World, which extends over Mongolia, Kazakhstan, Russia and Ukraine and that played a central role for the steppe cavalry with the open arid lands it provided. The map is shown by Google Earth using Koeppen-Geiger Climate classification (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006). The dark and light brown shows cold and hot arid steppe regions, respectively. This study hereby takes the steppe area as the key geographical factor determining the level of exposure to equestrian warfare and in turn, inducing political instability.

Figure 3. Koeppen Geiger climate classification, illustrating hot and cold steppe. (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006)

I will now present different zones in the world map and investigate their geographical positioning towards a semi-arid steppe and in return, equestrian warfare. The first region is Inner Asia, which has special characteristics with the geographical aspects it generated for horse-based warfare.[2] Inner Asia is known with its feasibility for nomadic ways of living and excellence in horse-based armed forces. Arid and semiarid plains induce geographic determinism which leads to the development of military virtues and horse-based raids for the region (Sinor D. , 1972). The nomadic life style, cavalry mounts and associated horse-based warfare are highly characteristic of this zone. Considering these conditions, I identify Inner Asia as the root zone for equestrian warfare. I will now define close-by regions and their relation to semi-arid Steppe as the specific source of political instability.

The second zone extends over the Middle East, Eastern Europe and North Africa. It is significant that the region clearly fits the boundaries of the Eurasian Steppe above. The zone mainly offers temperate grassland and savannas for Eastern Europe and the Middle East and small scale deserts for North Africa. It is highly open to horse-based nomadic tribes of steppe origin with the arid and semi-arid steppe lands it offers. As an example, in the case of Iran, the population of the tribes is estimated at half of the total Iranian population at the beginning of the nineteenth century and they occupied extensive geographical areas of the Safawi Empire (Alatas, 1993). In addition, the mountainous terrain made it much more difficult to control the inhabiting tribes. Geographical constraints, thus, not only made the terrain open to attacks of nomads but also weakened any exertion of central authority for the region.

The third zone is Western Europe. In contrast to previously-discussed regions, this zone is well shielded from the Steppe by distance, forested landscape and mountain ranges (Lieberman, 2009). The geographical characteristics of the region led nomadic

[2] By Inner Asia we take the zone above the frontier of China. In that sense, Mongolia is counted as part of Inner Asia.

tribes to remain marginal to the region, at least from the tenth century.[3] For this region, the terrain restrained the impact of equestrian warriors in incursions and protected the continent from raids of steppe nomads.

The last zone is East Asia, which includes China, Korea, Japan and Taiwan. For this zone, Korea, Japan and Taiwan have a location that is relatively more protected against nomad invasions. On the other hand, China was consequently exposed to attacks of Inner Asia equestrian warriors from the north. Additionally, the agricultural climate in this zone was also not that feasible for horse breeding. As an example, China always experienced a deficiency in horse-based warfare and was susceptible to attacks by Mongols. One quotation from the Chinese scholar Song Qi (998-1061) will be well explaining the history:

"The reason why our enemies to the north and west are able to withstand China is precisely because they have many horses and their men are adept at riding; this is their strength. China has few horses, and its men are not accustomed to riding; this is China's weakness..." (Creel, 1965)

Chinese historians habitually portrayed north (west)ern people as threats to the stability of the states on the Yellow River plain (Lieberman, 2009). In Chinese history, Inner Asia always stands as a threat to surrounding regions resulting from the political instability they exerted in recurring incursions.[4]

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[3] On the inadequacy of Hungarian and central European pasture for Inner Asian horsemen, see Sinor (1972), "Horse and Pasture," 181–82; Lindner (1981), "Nomadism, Horses." Walter Cf. Pohl (1997), "The Role of Steppe Peoples in Eastern and Central Europe in the First Millennium A.D.," in P. Urbanczyk, ed., Origins of Central Europe, 65–78; and David Morgan (1985), "The Mongols in Syria, 1260–1300," in P. W. Edbury, ed., Crusade and Settlement, 231–35, arguing that inadequate pasture also helped doom Mongol efforts in Syria.

[4] However, it should also be noted that for the case of South East China, incursions were not just recurring conquests. Inner Asian conquests also led territorial expansion and administrative centralization. In that sense, there was institutional and administrative borrowing within China and Inner Asia steppe nomads.

Overall, historians remarks that the tenth to the fifteenth centuries stand as the era of Turko-Mongol and Inner Asian conquests across surrounding areas (Barendse, 2003). Eastern Europe, the Middle East, most of South and South East Asia, China, North India and Central Asia witnessed recurring waves of invasions and were exposed to long-term occupation by nomadic and semi-nomadic people of Inner Asia. On the other side, Western Europe, South India, Southeast Asia and Japan were protected by distance and natural barriers, so these areas show increasing population patterns for the associated era.

Below Table 2 (Chaliand, 2003) also provides reviewing the interval from the fifth to the seventeenth century for four regions (Europe, the Middle East, China and India) experiencing waves of invasions. It is clear that the density of invasions rises in the tenth century, which depicts waves of incursions for all regions. However, the Greater Middle East, including Iran, Afghanistan, Asia Minor and Mesopotamia, is the foremost exposed region with seven different invasions over four centuries.

Table 2. Regions under Waves of Invasions

Region	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700
EUROPE (mainly Russia, central Europe and the Balkans)	Avars	Bulgars		Hungarians		Pechenegs	Kipchaks	Genghiskhanids	Ottomans				
MIDDLE EAST (mainly Iran, Afghanistan, Asia Minor, Mesopotamia)						Ghaznavid			Timurid Turks				
						Selkjuks			Shaybanid Turks				
							Khorezm Turks		Ottomans				
								Genghiskhanids					
CHINA	Juan-juan			Khitans			Jurchens			Oirots		Manchu	
INDIA						Muslim incursions		Mamluks	Timurid Turks		Chagatai Babur		
						Ghaznavid			Kaji		Mughals		

The impact of equestrian warfare can be categorized as direct and indirect. First of all, a warfare shock directly leads to decreases in population levels. It results in the loss of human life and destruction of property. Next, persistent political instability, potentially, leads to immediate destruction in economic returns as well as human power. It leads migrations, which lead to relocation of economic resources and inputs that result in un-sustainability in economic terms. Warfare also creates indirect effects. First of all, each cycle of rise and fall sweeps away any local bottom-up institutions that had built up. It leads to predatory taxation, lower investment and forestalls legal development. It also undermines local governance institutions and civic life.

The assertion is well known that political instability induces interruptions in many areas such as economic growth, institutional formations and in turn, the rules of law. Persistent population shocks, high social mobility, absence of law and above all high political instability inhibits the absence of organized and continuous social institutions which are stressed as the key for cumulative social, economic, scientific and technological development (Katouzian, 1997). Summing up, we argue that chronic political instability is the link behind "lack of continuity" in political and economic settlements, which hinders any means of development.

Supplementary Political Indexes

This section comprises supplementary political indexes concerning political history of associated regions. Figure 4 compares the differences in sizes of major states in the Middle East (Taagepera, Size and Duration of Empires: Growth-Decline Curves, 600 B.C. to 600 A.D., 1979). The state size data allows us to make a comparison based on the longevity of political equilibrium or disequilibrium of respective regions (Taagepera, Expansion and Contraction Patterns of Large Polities: Context for Russia, 1997). It represents how the rapid processes of the political elite turnover take place across Eurasia. According to the figure, by the fifteenth century the Eastern Mediterranean appears to have stabilized under the Ottoman rule; however instability persisted longer in Iran and India. Further to the East, China was destabilized by nomadic invasions from the north and by internal disintegration. The figure also signals the specific interval starting with tenth century, with high political turnover and density.

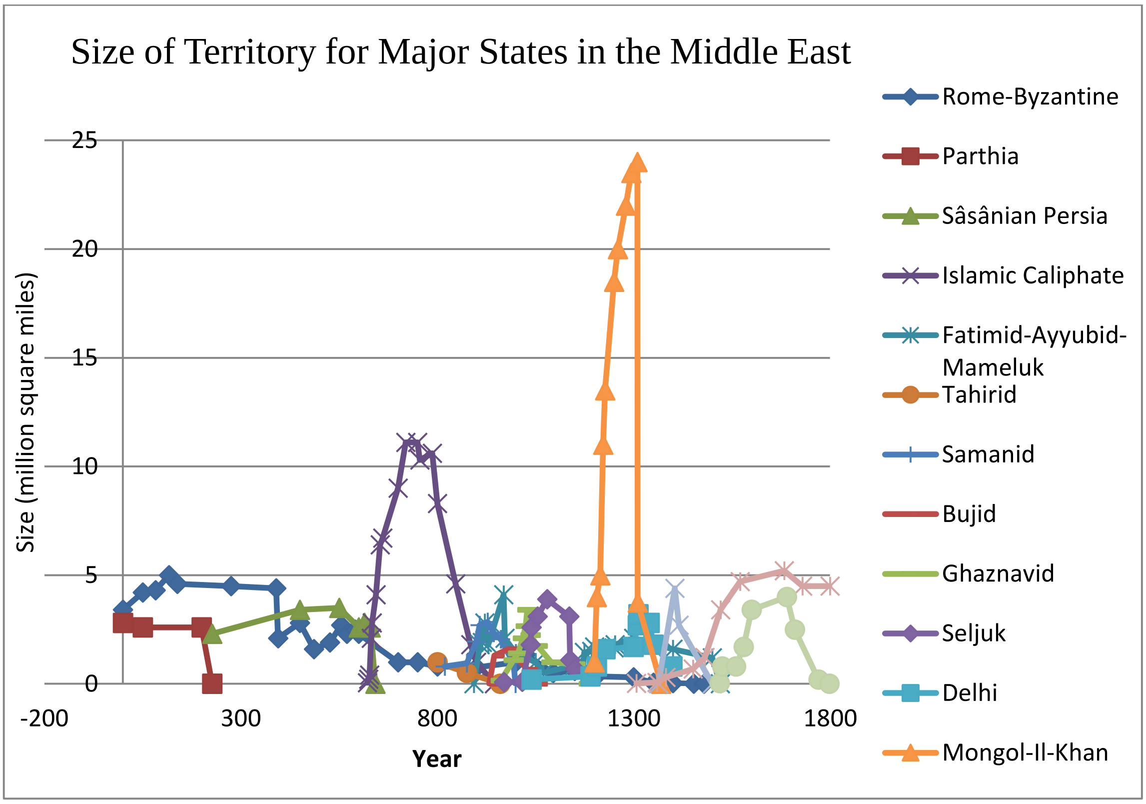

Figure 4. List and size of major states in Middle East between years 0 and 1800 (Taagepera 1979, 1997)

As a matter of fact, the political history of each region also provides us with clues on the roots of political instability. In Middle East, superiority of equestrian warfare leads short and decisive episodes of conflict and rapidly shifting borders. Fatımid, Mamluk, Ayyubid, Samanid, Ghaznavid, Seljuk, Delhi, Mongol, Timurid, Uzbak, Mughal and other smaller states rose and disintegrated in quick succession after the tenth century, which is by itself a natural indicator of the political disequilibrium in the region.

As another example, Blaydes and Chaney (2013) also investigate the political instability across Eurasia. The study touches upon the differences in political instability but ground it on Islam and institutions-related contexts. Their main analysis variable is the “mean ruler duration” level for pre-modern history in Western Europe and the Islamic world.

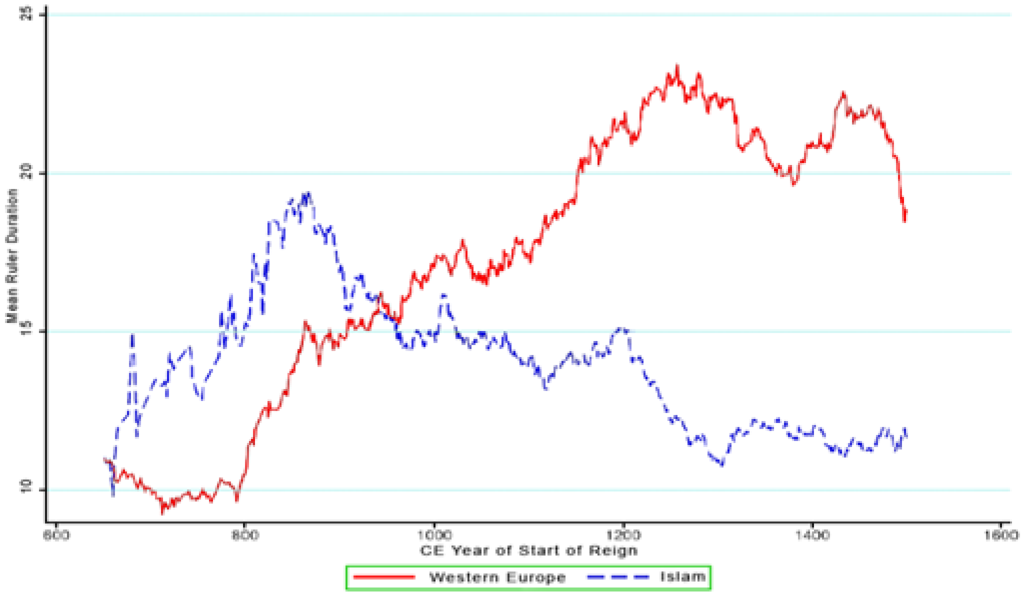

Figure 5. Mean Ruler Duration in Western Europe and Islamic lands (Blaydes & Chaney, 2013)

Like our argumentation, Blaydes and Chaney (2013) assert that Islamic territories ended up with high political disequilibrium after the ninth century, whereas the very same period corresponds to a long term ruling and associated political stability in Western Europe. Until the end of the fifteenth century, European rulers remained in power for longer than their Muslim counterparts which resulted in diverging political fortunes of Islam and Western Europe territories. A more detailed analysis of this study will be given in the last chapter while analyzing the results as it forms an important insight for the political disequilibrium argument it enrolled.

Final index measures comparative political disintegration levels for Islamic territories and Northern Europe (Zlatev, 2011). It gives the number of de facto independent states in both the Islamic lands and Northern Europe and comprises an index of political decentralization. Figures 6 and 7 (Zlatev, 2011) show the associated political disintegration levels for the respective lands. In Islamic lands (the former territories of the Roman Empire and Northern Europe), the number of independent units increase rapidly after the ninth century, stabilized in the eleventh century and began to diminish after the fifteenth century. It asserts that Islam territories have a high level of political disintegration around the tenth century and this process continued up until the fifteenth century. In contrast, for Northern Europe, the number of political units follows an increasing trend up to the eleventh century and starts to decrease after the twelfth century, which is an indication of the relative political stability experienced in the region. A clear comparison of the two figures gives the difference in the extent of political disintegration experienced by the two regions.

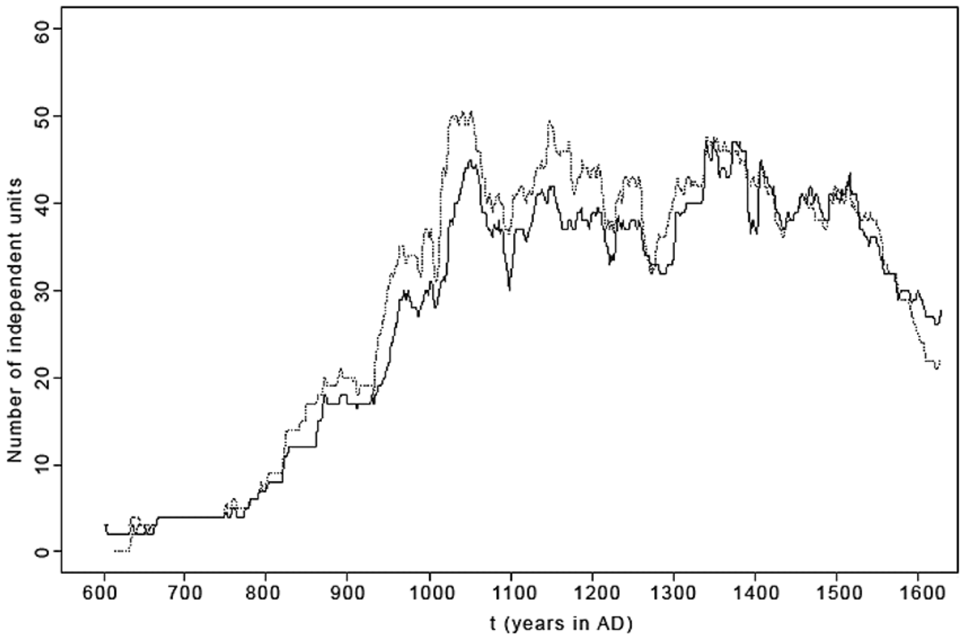

Figure 6. Political disintegration index for Islamic civilization (Zlatev, 2011)

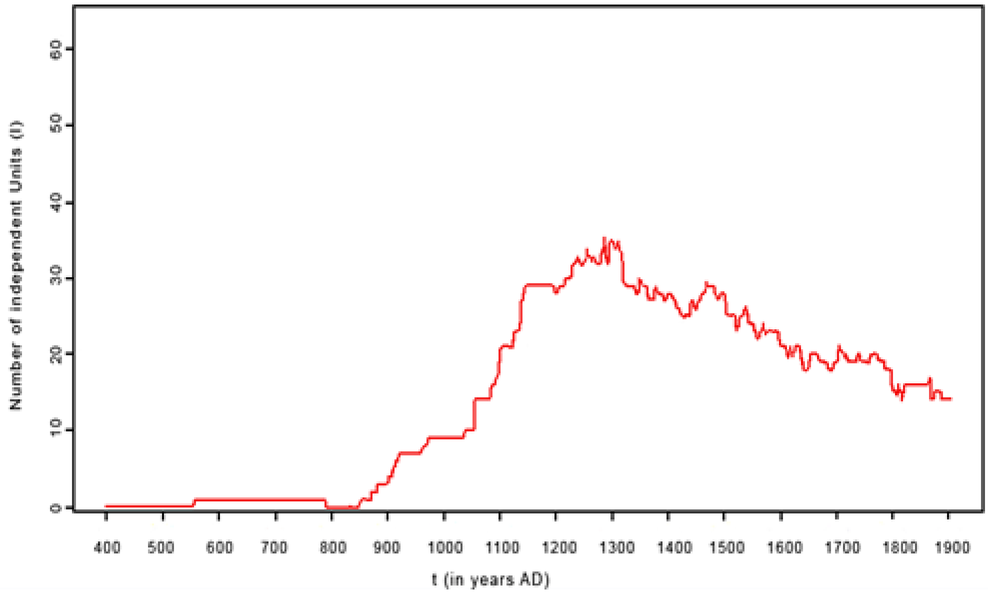

Figure 7. Political disintegration index for Northern Europe (Zlatev, 2011)

Comprising all indicators above, the most significant observation is divergence of political fortunes across the Old World starting with the tenth century. For Western and Northern Europe, the pattern increasingly points to ruler durations, a decreasing level of political disintegration together with prosperous population increases. Contrarily, the Middle East and Central Asia – with a volatile environment of the coercive forces it encounters – show decreasing population patterns, persistent political dynamism (Taagepera 1979, 1997), decreasing ruler durations (Blaydes & Chaney, 2013) and high levels of political disintegration levels (Zlatev, 2011). As a result, this study investigates the role of the steppe cavalry between the tenth and fifteenth centuries in inducing divergent political fortunes across the Old World and offers the semi-arid steppe zone as the road map to track the extent of this natural experiment.

CHAPTER IV

LITERATURE REVIEW

In previous sections, I stated my hypothesis, which argues on the impact of the tenth century "horse-warrior revolution" on political instability and persistent growth. Now I will summarize alternative explanations for determinants of differences in growth rates across Eurasia. This chapter will be reviewed under three headings: geography, institutions and religion. The argumentation will be more complete with the insights of other disciplines.

Geography

The literature analyzing long run economic growth investigates various geographical factors. Among these, agricultural productivity – signaling the production frontier for the pre-modern times – and geographical elements such as topography, climate zone and latitude play significant roles. I now will review a few long run growth studies with geographical dimensions.

The first study with climate zone argumentation is by Jeffrey D. Sachs' "Tropical Underdevelopment" (2001), which brings out one of the strongest empirical relations between ecological zones and per capita income. It re-examines the nature of tropical underdevelopment and explains its roots through combining physical ecology and societal dynamics. It is found that economies in temperate zones are generally rich and productive in many areas such as agriculture, health, energy and military technology, while those in tropical zones are nearly everywhere poor.[5]

[5] Sachs also uses Koeppen-Geiger (KG) climate classification and uses distance measures in integrating climatic and economic data. Koeppen-Geiger (KG) climate classification differentiates regions mainly by temperature and precipitation. The differentiation between "near" and "far" (more that 100km away from sea navigability) zones is made based on KG classifications.

There are other studies reviewing climate arguments together with the agricultural revolution in Medieval Europe. The temperate drift argument of Mokyr (1990) posits that from the middle ages on, northwest Europe surged ahead because agricultural technology evolved in ways that favored temperate areas over the subtropics. In addition, Andersen et al. (2013) investigate the impact of heavy plough usage and suggest that the invention and widespread adoption of the heavy plough increased the advantage of the regions with fertile clay soils like northern Europe. After the invention of the heavy plough, access to the fertile, heavy clay soils provided these regions advantages in terms of productivity and access to new and fertile land. The end result accounts for more than 10% of the increase in population density and urbanization during high middle ages.

Institutions

Institutional economics is quite a rich arena for building history based growth and development hypotheses. This part involves well-known arguments such as Atlantic trade, ruler duration, limited government, and state antiquity in explaining the diverging fortune of Europe.

Acemoglu, Johnson and Robinson (2005) point to the Atlantic trade argument in explaining diverging growth performances. The hypothesis is that Atlantic trade – the opening of the sea routes to the New World, Africa and Asia and the building of colonial empires – contributed to the process of West European growth between 1500 and 1850. This effect is carried not only through direct economic effects, but also indirectly by inducing fundamental institutional change. The link they suggest is that, the growth of Atlantic trade strengthened merchant groups through constraints on the power of the monarchy and helped merchants obtain changes in institutions to protect property rights. These changes are suggested as central to the subsequent economic growth of Europe.

Another study is from Blaydes and Chaney (2013), focusing on medieval divergence in political fortunes of Islamic and Western European rulers. Blaydes and Chaney emphasized growth-friendly and sovereign constraining institutions in Europe, which led to increasing respect for property rights and the rule of law. This study makes an important assessment by bringing the analyses of the Middle East in direct dialogue with contemporary research on long-term economic trajectories. We will be making a more detailed analysis of this study in the last chapter while analyzing the results.

There are also other studies such as North and Weingast (1989) and Van Zanden et al. (2012) that posit that establishment of limited government in parts of Europe curtailed predatory policies by rulers, fostered property rights for broad segments of the society and created incentives for innovation and investment. Last, there is the study of Bockstette et al. (2002), which focuses on the advantage of an early start considering the depth of experience with state-level institutions, or state antiquity. They show that state antiquity significantly contributes to the explanation of differences in growth rates.

Religion

There is a long line of literature studying the impact of religion on economic and political performance. One study to point out is that of Kuran (2011) making a combination of religion and its institutional dimensions. Kuran analyses Islamic law and argues that the Islamic legal system had a negative impact on growth. He argues that the *waqf* system hindered the development of civil society and their traditional rigid structure disallowed organizational autonomy, which in return yielded weakness in the backbone of stable democracy.

Another study by Michalopoulos et al. (2012) examines the economic origins of Islamic institutions. The points underlined are unequal distribution of land endowments and larger Muslim adherence in terms of income redistribution. He argues that institutional formations such as *zakat* for poverty alleviation, anti-*riba* (interest) laws as restrictions on capital accumulation and high investments in public goods provision through donations to religious endowments bounded wealth inequality in Muslim world.

Lastly, Lewis (2002) and Huntington (1991) argue that the separation of church and state in Christianity and the close association between them in Islam explains the divergence in economic and political development. Huntington also argues that Chinese Confucianism and its derivatives in Southeast Asia lacked a tradition of rights against the state, put the emphasis on stability and stalled growth.

Unfortunately, we are unable to control for all religion- and institution-based arguments due to empirical strategy restrictions. But we will be reviewing some of these arguments in the last chapter while analyzing the results.

CHAPTER V

DATA

Main Variables

On the empirical front, this study explains the long-term population dynamics of the Old World, covering Europe, Asia and North Africa. Our data set includes data for 91 countries from the fifth to the seventeenth centuries (See Appendix A). Following the Malthusian framework, we use population as the most reliable index for explaining pre-modern age growth performances, as it is used extensively in the growth and development literature as a representation of per capita income.[6] The resource for historical urban and country-wide population numbers is HYDE 3.1.[7] The data is used in a logarithmic scale in order to catch the exponential growth of population linearly[8] (See Appendix B).

For the political instability and corresponding equestrian warfare argumentation, we created a dependent variable named Distance to Steppe for measuring a country's distance to steppe[9] and in turn determining its vulnerability to continuous equestrian warfare shocks. The distance variable is in thousands of miles and it is calculated by measuring the distance from each country's centroid to the closest steppe region for

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[6] (Galor & Weil, 2000), (Jones, 2003) and (Voigtlander & Voth, 2006) are examples of studies in the growth literature that have focused on the link between population dynamics and factors such as per capita incomes.

[7] The data is combined with satellite information and specific allocation algorithms to create spatially explicit maps, which are fully consistent on a 5* longitude/latitude grid resolution (Goldewijk, Beusen, & Jannsen, 2009).

[8] Population data often rises exponentially rather than arithmetically. We, hereby, use logaritmic scale as it changes an exponential growth curve into a linear one, making the analysis more accurate. Another example from economic history literature using log population data is (Nunn & Qian, 2011).

[9] BSK and BSH are used as the semi-arid steppe region from Koppen Geiger Climate Zone Index. For complete reference; (Peel, Finlayson, & McMahon, 2007)

each respective country. Centroid data is taken from the Google Earth KML extension, which can be downloaded[10] (See Appendix C).

To review long term institutional impacts, we also carried a cross sectional analysis; checking the impact of distance to steppe on 2010 real GDP per capita. The logarithmic real GDP per capita data (Laspeyres) is from Penn World Table 7.1 (Heston, Summers, & Aten, 2012). Real GDP per capita data[11] is converted to logarithmic scale in order to catch the exponential growth of GDP linearly. Otherwise, the impact of countries with greater real GDP per capita would determine the results more than that of small countries.

Control Variables

In the literature and theory part, we touched upon a wide range of geography arguments for explaining growth performances. Among these, agricultural suitability level is the most critical, given the pre-modern time period under study since it signals a lot in terms of the prosperity of nations under the Malthusian framework. We encounter two different data sets for agricultural suitability, namely Michalopoulos (2012) and the Global Agro-Ecological Zones (GAEZ) 2010 database. Michalopoulos (2012) is based on climatic and soil characteristics such as monthly temperature, precipitation and potential sunshine hours12 and Global Agro-Ecological Zones (GAEZ) is based on

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[10] http://www.rcc.uq.edu.au/education/uni-courses/math4205/2010/gkelly/ (Google Earth, 7.1.1.1888).

[11] RGDPL is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. The given year components are obtained by extrapolating the 1996 values in international dollars from the Geary aggregation using national growth rates. It is a fixed base index where the reference year is 1996, hence the designation "L" for Laspeyres.

[12] The raw data set is available at the Atlas of the Biosphere. It may be dowloaded from http://www.sage.wisc.edu/iamdata/grid_data_sel.php.

basic crop productivity analysis[13]. Both data are critical in signaling the agricultural advantage of specific historical zones (See Appendix C).

Following the studies of Sachs (2001) and Mokyr (1990) referring to temperate drift arguments, we construct a measure on the share of agricultural potential of each country that falls into each of the following four climate zones: temperate, tropical, polar and subtropical. The agricultural potential data is based on FAO (2010) and climate zones are based on the Koeppen-Geiger classification.

As an addition, we utilized well-known literature control variables. We control for the ruggedness level of each country (Nunn & Puga, 2012). A country's level of ruggedness determines the openness of its lands, indefensibility towards steppe cavalry and associated political instability. In that regard, it may act as a shelter against steppe cavalry or it may lead to perfect exposition to nomadic warfare. We also control for general distance to coast levels and the specific share of the Atlantic Ocean coast (Acemoglu, Johnson, & Robinson, 2005) to account for the positive (advances in sea trade) or negative (through raiders, pirates etc.) impacts of seas.

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[13] FAO's Global Agro-Ecological Zones (GAEZ) 2010 database is calculated as follows. First, for each region in each country, we calculate potential annual energy value (in billions of calories) of the output from cultivation of rice and wheat under minimal technological input conditions. Then, we take the maximum amount for the two crops, and add across different regions to find the total agricultural potential of each country. Figure 10 (See in Appendix C) provides summary on the data.

CHAPTER VI

ECONOMETRIC MODEL AND EMPIRICAL STRATEGY

Estimation is based on the standard differences-in-differences (DD) strategy, which allows us to observe outcomes for different groups exposed to a treatment for different periods. In this setting, we compare the relative change in population in century-based periods between countries that are all found at different distances to the steppe region. The inference of the DD strategy allows the analysis to be robust to different groups and time period variations in the framework. The estimation strategy will be examined under three separate parts; flexible estimates, baseline estimates and cross section analysis.

Flexible Estimates

The flexible econometric specification is OLS with country- and century-fixed effects. Standard errors are clustered at country level. The estimated equation is as follows:

$$\mathrm{Y_{it}} = \alpha_{\mathrm{i}} + \gamma_{\mathrm{t}} + \sum_{j=5}^{j=17} \beta_{\mathrm{t}} I_t^j DistSteppe_i + \mathrm{X}_{\mathrm{it}}^{'}\theta + \varepsilon_{\mathrm{it}} \qquad (1)$$

where Y_{it} denotes log population of country i in period t which is 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600 and 1700. The variable Dist steppe is the geodesic distance of a country's centroid to the closest Eurasian Steppe region. It is interacted with period dummies for each country. I_t^j is the indicator variable for the centuries that take value 1 when j=t and zero otherwise.

Additionally, α_i and γ_t are country and period fixed effects. Country-fixed effects control for all time invariant factors that differ between countries. The time period fixed effects control for any patterns of population growth that affect all regions similarly.

Any systematic measurement error that varies by time-period or by country is captured by the country and year fixed effects, which are included in all specifications.

X_{it} represents control variables which include the Atlantic coast, crop and rain based agricultural suitability, ruggedness, climate-zone based agricultural potential, and distance from the coast.

The coefficient of interest in the econometric equation is β_t, which gives the estimated impact of distance to steppe on the population level for different states. For concreteness, $\hat{\beta}$ measures the additional growth in population levels experienced by countries that are close to or distant from the steppe region before and after equestrian warfare era. A positive coefficient indicates that countries that are in a distant position from the steppe witness a greater increase in population for the associated era.

The estimation strategy has all the advantages and disadvantages of the standard DD estimation. In sum, we test the hypothesis that, during the period of dominance of equestrian warfare, the parts of Eurasia protected from the Steppe were more stable and grew faster. If the conjecture is correct, between the tenth and fifteenth centuries, growth rates increased in proportion to the distances from the steppe.

Baseline Estimates

The baseline econometric specification has exactly the same properties in Flexible Estimates, except for the option of changing the associate base year. In this estimate, other than investigating the whole time interval (500-1700) relative to year 500, we picked the year 1000 as the baseline year and replicated the same empirical strategy.

In this case, our independent variable interacted with a post indicator which equals zero for the periods 500–1000 and one for the periods 1000–1700. Therefore, the estimated equation takes the following form:

$$Y_{it} = \alpha_i + \gamma_t + \sum_{Post=10}^{Post=17} \beta_t I_t^{Post} DistSteppe_i + X_{it}'\theta + \varepsilon_{it} \qquad (2)$$

It is important to note that in difference and difference empirical strategy, we are not particularly interested in the individual magnitudes of the point estimates. Because the Distance to steppe variable is time invariant and equation (2) includes country and time-period fixed effects, the estimated β must be measured relative to a baseline time-period, which here we take to be 1000. (It was year 500 in flexible estimates.) It is important to note that the absolute level simply tells us the difference in the relationship relative to an arbitrarily chosen baseline.

Cross Sectional Analysis

The cross sectional analysis mainly reviews the impact of steppe distance. In this analysis, we test whether steppe territories and associated warfare have indirect effects that are even valid on today's GDP per capita. Main estimated equation is given below.

$$Y_i = \alpha_i + \beta\, DistSteppe_i + X_i'\theta + \varepsilon_i \qquad (3)$$

The dependent variable is 2010 real GDP per capita in log terms (Heston, Summers, & Aten, 2012) and independent variables are distance to steppe, agricultural potential, Atlantic coast, climate zone, distance to sea and ruggedness. The standard errors for the coefficients are based on White's (1980) heteroskedasticity-consistent covariance matrix since heteroskedasticity could be important across countries.

CHAPTER VII

EMPIRICAL RESULTS

Flexible Estimates

The strategy compares population and urbanization levels between Old World countries that are close to semi-arid steppe to those far away, before and after equestrian warfare shock. The tables report results from six different specifications for each outcome of interest. All specifications include country and time period fixed effects together with control variables.

Table 3 suggests that being close to the steppe region becomes significant on determining population level after the 1000s. The estimated coefficient β measures the additional growth in population level experienced by countries that are distant to the steppe (relative to those that are close) after the equestrian warfare shock of the tenth century (relative to before). The positive coefficient here indicates that countries with a distant geographic location to Steppe region witness a greater increase in population level after the tenth century.

The clear pattern that emerges from the table is that the relationship between a country's distance to steppe and population increases steadily from the ninth century onwards and its effect turns significant from the tenth century onwards. After 1000, the population of steppe distant regions significantly begins to increase relative to regions that are close and this effect is valid for all further specifications.

Table 3. Flexible regression results for country population levels

IMPACT OF DISTANCE TO STEPPE ON POPULATION ACROSS THE OLD WORLD						
	OLS with Difference in Difference					
	Dependent Variable Log Population					
	(1)	(2)	(3)	(4)	(5)	(6)
ds*600	-0.013	-0.013	-0.014	-0.017	-0.027	-0.027
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
ds*700	0.002	0.002	-0.001	-0.004	-0.001	-0.001
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ds*800	0.024	0.024	0.018	0.014	0.027	0.027
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
ds*900	0.040	0.040	0.031	0.026	0.038	0.038
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
ds*1000	0.077***	0.078***	0.071**	0.064**	0.067*	0.067*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.030)
ds*1100	0.109***	0.112***	0.110***	0.096***	0.086**	0.086**
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.030)
ds*1200	0.155***	0.158***	0.162***	0.144***	0.117**	0.117**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.037)
ds*1300	0.212***	0.216***	0.222***	0.206***	0.183***	0.183***
	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.038)
ds*1400	0.201***	0.205***	0.214***	0.187***	0.168***	0.168***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.044)
ds*1500	0.240***	0.244***	0.255***	0.229***	0.197***	0.196***
	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	(0.044)
ds*1600	0.262***	0.267***	0.275***	0.248***	0.223***	0.223***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.048)
ds*1700	0.334***	0.340***	0.361***	0.321***	0.302***	0.303***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)	(0.068)
Control Variables (x Century Fixed Effects)						
Rain Suit.	N	Y	Y	N	N	N
Ruggedness	N	N	Y	Y	Y	Y
Crop Suit.	N	N	N	Y	Y	Y
Climate	N	N	N	N	Y	Y
Atlantic T.	N	N	N	N	N	N
Observations	975	975	975	975	975	975
df_m	24	36	48	48	74	74
R2	0.98	0.98	0.98	0.98	0.99	0.99
r2_a	0.98	0.98	0.98	0.98	0.98	0.98
F - stat	16.41	37.03	52.45	74.40	.	.
ar2	0.98	0.98	0.98	0.983	0.98	0.98
Clustered Standard errors in parentheses		T statistics	* p<0.05, ** p<0.01, *** p<0.001			
Estimated using Stata areg procedure with century and country fixed effects and clustered std. errors						
Dropped from Sample; Indonesia, Brunei and Malaysia						

The patterns in the data can be seen most clearly by plotting the coefficients of the interaction terms over time. Figure 8 plots the point estimates and their 95% confidence intervals from column (6) of Table 3. The interaction term showing distance to steppe*year is small in magnitude between the sixth and ninth centuries and steadily increases in magnitude from the tenth century up until the fourteenth century. After the fifteenth century, we still observe an increase in coefficient but this time small in pace.

Figure 8 illustrates the significant impact of steppe distance in explaining the patterns in the level of population for the mentioned era. The figure up to the fourteenth century significantly remarks the growing importance of distance to steppe. On the other side, for the post 1700 era, the argument should not be taken for granted since the modern era, starting with the 1700s, enrolls another story with its new factors such as the industrial revolution, changing institutional structures and new state formations.

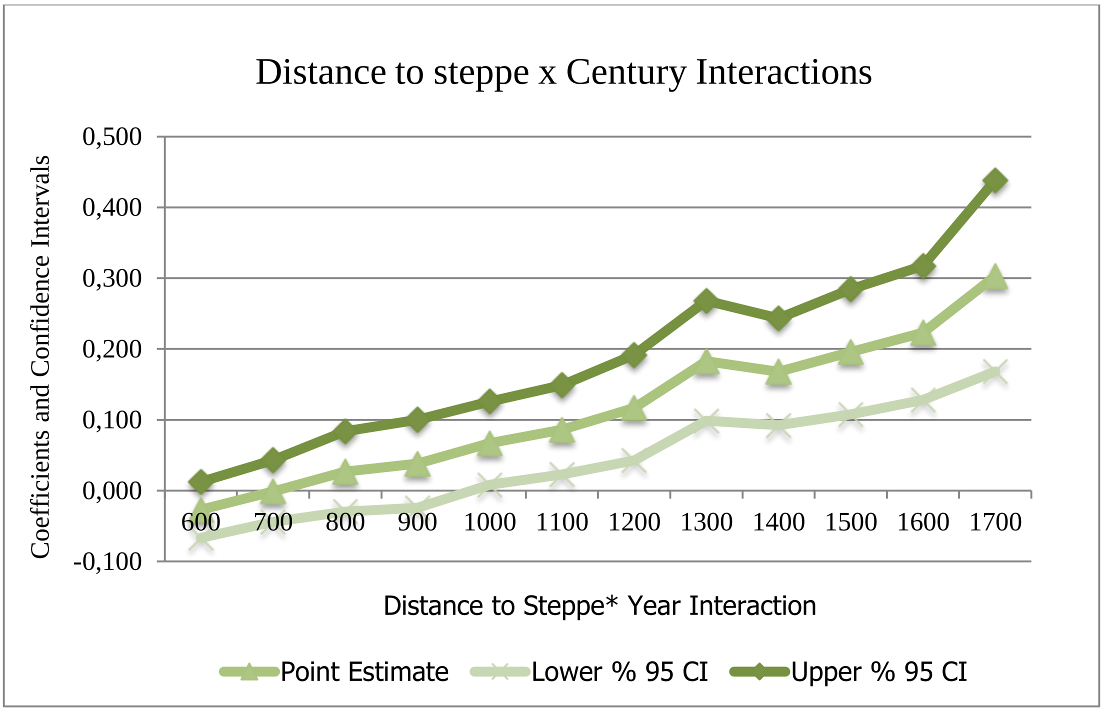


Figure 8. Point estimates and % 95 upper and lower confidence intervals

There are a number of channel equestrian warfare impacts on population growth. First, a warfare shock directly decreases population levels and causes destruction of property, resulting in an immediate decrease in economic returns. It further causes an increase in migration, which leads to the relocation of economic resources, which results in economic unsustainability. Indirectly, each cycle of rise and fall sweeps away any local bottom-up institutions that had built up. Plus, it leads to predatory taxation, lower investment, forestalls legal development and undermines local governance institutions and civic life.

As an alternative to examining variation across country populations, we also examine variation in city populations. In the literature, urbanization level is usually interpreted as a proxy for income (Nunn & Qian, 2011). Here, the estimates in Table 4 examine the impact of distance to semi-arid steppe before and after the introduction of equestrian warfare on city population share. A positive coefficient indicates that cities that are in distant location to semi-arid steppe witness a greater increase in population growth.

Table 4. Flexible regression results for urban population levels

IMPACT OF DISTANCE TO STEPPE ON URBAN POPULATION ACROSS THE OLD WORLD							
	OLS with Difference in Difference						
	Dependent Variable Log Population						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ds*600	-0.090	-0.082	0.011	0.028	0.028	0.032	0.020
	(0.11)	(0.11)	(0.06)	(0.06)	(0.06)	(0.09)	(0.06)
ds*700	-0.027	-0.023	-0.007	0.027	0.027	0.035	0.019
	(0.11)	(0.11)	(0.11)	(0.13)	(0.13)	(0.15)	(0.12)
ds*800	0.176	0.176	0.109	0.158	0.158	0.166	0.150
	(0.09)	(0.09)	(0.10)	(0.10)	(0.10)	(0.12)	(0.10)
ds*900	0.287**	0.284**	0.221	0.314**	0.314**	0.325*	0.306***
	(0.10)	(0.10)	(0.13)	(0.11)	(0.11)	(0.15)	(0.09)
ds*1000	0.367*	0.367*	0.413**	0.454**	0.454**	0.460*	0.439***
	(0.14)	(0.14)	(0.15)	(0.15)	(0.15)	(0.20)	(0.12)
ds*1100	0.493***	0.491***	0.499**	0.673***	0.674***	0.665**	0.596***
	(0.12)	(0.12)	(0.16)	(0.16)	(0.17)	(0.20)	(0.12)
ds*1200	0.437**	0.438**	0.483**	0.611**	0.612**	0.623**	0.569***
	(0.15)	(0.15)	(0.16)	(0.18)	(0.19)	(0.21)	(0.11)
ds*1300	0.696***	0.690***	0.725**	0.869**	0.870**	0.880**	0.772***
	(0.15)	(0.15)	(0.22)	(0.26)	(0.26)	(0.29)	(0.17)
ds*1400	0.723***	0.721***	0.512*	0.712***	0.713***	0.721**	0.664***
	(0.14)	(0.14)	(0.19)	(0.19)	(0.20)	(0.22)	(0.13)
ds*1500	0.763***	0.758***	0.468**	0.552**	0.553**	0.556*	0.592***
	(0.15)	(0.15)	(0.16)	(0.17)	(0.18)	(0.21)	(0.12)
ds*1600	0.828***	0.841***	0.561***	0.625***	0.627**	0.634**	0.710***
	(0.16)	(0.16)	(0.16)	(0.18)	(0.19)	(0.22)	(0.12)
ds*1700	0.918***	0.914***	0.539**	0.550**	0.554**	0.562*	0.662***
	(0.15)	(0.16)	(0.17)	(0.19)	(0.20)	(0.22)	(0.13)
Control Variables (x Century Fixed Effects)							
Crop Suit.	N	Y	Y	Y	Y	Y	N
Climate	N	N	Y	Y	Y	Y	Y
Dist. Sea	N	N	N	Y	Y	Y	Y
Atlantic C.	N	N	N	N	Y	Y	Y
Ruggedness	N	N	N	N	N	Y	Y
Rain Suit.	N	N	N	N	N	N	Y
Observations	300	300	300	300	300	300	300
df_m	24	28	35	37	38	39	39
R2	0.945	0.946	0.969	0.973	0.973	0.974	0.972
r2_a	0.926	0.924	0.947	0.950	0.949	0.947	0.944
F - stat	28.38	.	.	.	.	.	
ar2	0.93	0.92	0.95	0.95	0.95	0.95	0.94
Clustered Standard errors in parentheses			T statistics * p<0.05, ** p<0.01, *** p<0.001				
Estimated using Stata areg procedure with century and country fixed effects and clustered std. errors							
Dropped from Sample; Indonesia, Brunei and Malaysia							

All specifications of city-level estimates control for time-period and city fixed effects. The standard errors are clustered at the country level and reported in square brackets. All regressions control for baseline controls – rain suitability (Michalopoulos, Naghavi, & Prarolo, 2012) , level of ruggedness (Nunn & Puga, 2012), associated climate zone based agricultural productivity, crop based agricultural suitability (rice and wheat), the distance to sea and impact of Atlantic trade (Acemoglu, Johnson, & Robinson, 2005) – each interacted with time-period fixed effects.

The impact of equestrian warfare on urbanization rate is straightforward; a city being in close location to insistent invasions tends to show decreasing population patterns, causing decreasing living standards, decreasing fertility and life expectancy. Moreover, two main economic agents in the economy, namely the merchant class and agriculturalists witnessing persistent destructions in cities, lose their economic means of living. Besides, there are indirect effects of persistent political instability carried through institutional channels. Being exposed to persistent political disequilibrium leads lacking political and governmental institutions which hinder any means of development in the region.

Table 4 suggests that being close to semi-arid steppe becomes significant in determining urbanization level after 900s. The estimated coefficient β assesses the additional growth in urbanization levels experienced by countries that are distant to steppe (relative to those that are close) after the equestrian warfare shock (relative to before). The positive and ascending coefficient here indicates that countries with distant geographical location to semi-arid steppe witness a greater increase in urbanization levels after ninth century.

Baseline Estimates

We now turn to the estimates of equation (2), which are reported in Table 5. The table reports results from seven specifications for each outcome of interest. The first specification reports country and time-period fixed effects only; the following specifications include additional controls interacted with time-period fixed effects. The specifications have the same control variables of the specifications for the flexible estimates.

Table 5. Baseline regression results (Equation 2)

The impact of distance to steppe: Baseline estimates							
OLS with Difference in Difference							
	Dependent Variable Log Population						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DSteppe*Post	0.195***	0.199***	0.211***	0.165***	0.165***	0.149***	0.126**
	(0.035)	(0.033)	(0.034)	(0.036)	(0.036)	(0.038)	(0.038)
Baseline Controls (x Century FE)							
Rain Suit.	N	Y	Y	Y	Y	Y	Y
Ruggedness	N	N	Y	Y	Y	Y	Y
Climate	N	N	N	Y	Y	Y	Y
Atlantic C.	N	N	N	N	Y	Y	Y
Crop Suit.	N	N	N	N	N	Y	Y
Dist. Sea	N	N	N	N	N	N	Y
Observations	975	975	975	975	975	975	975
R2	0.978	0.982	0.982	0.984	0.985	0.985	0.986
Dropped from sample	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei	Indonesia Malaysia Brunei
Clustered standard errors in parentheses Estimated using Stata areg procedure, with century and country fixed effects and clustered std. err.							

The estimates of equation (2) confirm the earlier findings that distance to steppe impacted positively on total population levels. The estimated coefficient of the distance to steppe interaction term, $DistanceToSteppe_i * I^{Post}_t$, reveals the average increase in our outcomes of interest arising from increased distance to Eurasian steppe after 1000.

According to the estimate in column (7), increasing distance to steppe by 1 percent increases population by 0.12 % on average.

Cross-Section Estimates

The cross sectional analysis shows the long term effect of steppe distance and associated warfare shock. We hereby test whether the impact of steppe territories have indirect effects that are even valid on today's GDP per capita.

The dependent variable is 2010 real GDP per capita (Heston, Summers, & Aten, 2012) in logarithmic terms and independent variables are distance to steppe, crop and rain based agricultural potential, Atlantic coast, climate zone, distance to sea and ruggedness. The results shows that impact of steppe distance – as well as distance to sea and climate zone —have impact on 2010's real log GDP per capita. All specifications signal that the indirect effects of Eurasian steppe military shock persist even in the very long-term impacting through indirect channels such as local governance institutions and legal development institutions.

Table 6. Cross-sectional results (Equation 3)

IMPACT OF DISTANCE TO STEPPE ON LOG REAL GDP PER CAPITA							
	Dependent Variable Log Real GDP Per Capita						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
lnkp	0.368*** (0.092)	0.374*** (0.089)	0.339*** (0.095)	0.408*** (0.086)	0.366*** (0.079)	0.287* (0.111)	0.287* (0.112)
lnrain		-0.116** (0.039)	-0.123** (0.038)	-0.092* (0.038)	-0.039 (0.053)	-0.079 (0.057)	-0.079 (0.057)
rugged			-0.099 (0.085)	-0.034 (0.071)	0.007 (0.067)	-0.005 (0.064)	-0.004 (0.064)
crrice				0.015*** (0.003)	0.016*** (0.003)	-0.006 (0.005)	-0.006 (0.005)
lndsea					-0.367* (0.144)	-0.426* (0.165)	-0.426* (0.167)
clpolar						0.008* (0.003)	0.008* (0.004)
cltemp						0.003 (0.003)	0.003 (0.003)
cltrop						-0.007 (0.005)	-0.007 (0.005)
Atlantic c.							0.798 (6.341)
Observation	71	71	71	71	71	71	71
df_m	1.000	2.000	3.000	4.000	5.000	8.000	9.000
R2	0.224	0.285	0.301	0.515	0.578	0.616	0.616
r2_a	0.212	0.264	0.270	0.485	0.546	0.560	0.559
F - stat	15.857	15.026	11.365	17.013	21.464	20.526	18.117
T statistics * p<0.05, ** p<0.01, *** p<0.001							
Heteroskedasticity robust std errors in parentheses							
Dropped from Sample; Indonesia, Brunei and Malaysia							

Robustness Analysis

The results thus far show that after the start of equestrian warfare, locations with distant position to semi-arid steppe experienced faster increases in population and urbanization. Following the literature section, we now review a host of additional factors (each interacted with time period fixed effects) that may have affected historic population. This section will lead the robustness analysis of the results and explain the impact of certain control variables.

The choice of controls is guided by the determinants of long-term economic development that have been emphasized in the literature. The first set of controls captures differences in geography. The first specification involves agricultural potential level based on crop suitability for each country. It assesses agricultural potential level based on two basic crop yield; rice and wheat. Adding crop based agricultural potential ensures that its impact does not blend with our estimates.

Next, we include an important geo-climatic control variable. Following the study of Sachs (2001) pointing to the impact of climate zone in economic performance, we control for associated climate zones and their agricultural gains for all countries. The results do not fluctuate with climate zone adding. Although the study (2001) puts forward that temperate zone countries are always advantageous compared to tropical zone countries, it seems that the political instability scenario is more effective in determining population levels.

In order to control for sea based arguments, we have also checked for the distance to sea and Atlantic trade variables. These factors have been rigorously cited as causing the rise of Western Europe over the past centuries (Acemoglu, Johnson, & Robinson, 2005). Whether a country is an Atlantic trader or not or the extent of its Atlantic trade coast has been argued as a key determinant of the rise of Europe by Acemoglu et al. (2005). Here, we control for the indicator variables, and the outcome shows that the effect of Atlantic trade or sea distance does not significantly alter the results.

We include a topographical element into our system, the level of ruggedness. The smoothness or ruggedness level of a region acts as the key variable as it leads regions to be sheltered or non-sheltered towards equestrian warfare. In that sense, its inclusion into the system is a must control variable that ensures robustness in all phases. The results again are not affected by ruggedness levels.

In column (7) of Table 3 we engaged in an alternative agricultural potential index. The first index is based on crop suitability, whereas the second one controls for rain based agricultural suitability levels (Michalopoulos, Naghavi, & Prarolo, 2012). Given the pre-modern, non-industrial times in analysis, rain based agricultural potential level significantly reflects on the existing economic potential of countries. Our findings provide evidence that high agricultural productivity fosters economic growth and distance to steppe estimates are not affected by controlling the effect of rain based agricultural potential.

In sum, the estimates presented in Tables 3, 4, 5 and 6 provide reassurance that the estimates for the destabilizing impact of steppe are not biased by other historical or geographical factors responsible for the diverging growth performance of regions. We control for almost all of the arguments mentioned in the literature review and the results shows that none of them significantly change the destabilizing impact of steppe on population. In almost all specifications the point estimates for distance to steppe*year remain positive, stable and highly significant in magnitudes suggesting that estimated impact of steppe is robust to controlling for determinants of long-term growth and development.

Reviewing Alternative Explanations

As we had reviewed in literature part, there is religion and institutions related arguments which we could not test in this study due to empirical restrictions. Now I intend to review these hypotheses in the light of our empirical results.

The study of Kuran (2011) stresses the impact of Islam and its institutions in the backwardness of Islam territories. The main claim of this research is that Islamic legal arrangements prevented capital accumulation, inhibited the development of corporations and led to organizational deficiencies that delayed modernization. Although it is impossible to dismiss the impact of Islamic institutions on development, any empirical test aiming to assert evidence for this impact turns out to be limited. First of all, there is an underlying assumption that Islamic law is applied the same everywhere. Actually, Islam territories have all shown different densities in applying the religious law. The interpretation and the exercise of Islamic law in economic issues had certain diversity in terms of application in everyday life.

Additionally, we propose politics as a factor always more determining than religion and argue that referring to a uni-causal mechanism is not convincing. It is important to stress that the phenomenon contains both the rise of Europe and fall of the Middle East. In the light of findings of this study, we refer to diverging political fortunes of the greater Middle East and Western Europe and argue that the Islamic legal system and its institutions (or better not to use the term Islam and call Middle East institutions) come out as endogenous entities that are away from being push factors but rather serve as useful setups of this phenomenon. In that regard, referring to differences in political atmosphere, we count Islam as one of the drivers of this mechanism but clearly not a complementary one.

An alternative and more complementary explanation is that of Blaydes and Chaney (2013), which encounters a political instability argumentation. This study focuses on the medieval divergence in the political fortunes of Islamic and Western European rulers and asserts the impact of institutions on growth performance over time. Their main explanation is based on the impact of differences in “warrior class”. In the Muslim world, Mamlukism as a military – the political institution enabled rulers to bypass local elites, and increased the power and independence of Muslim sovereigns. It is argued that interdependent military, political and economic relationships that developed in Europe under feudalism laid the basis for more impersonal forms of political organizations compared to the institutional formations of the Muslim world. These constraints bringing regular checks and balances prepared the way for the emergence of parliaments and medieval Europe's unique institutional framework, compared to the long history of autocratic rule observed in the Muslim world.

Like Kuran (2011, 2012), Blaydes and Chaney (2013) make an important contribution by bringing research on the Middle East in direct dialogue with contemporary research on long-term economic trajectories (Cammett, Lancaster, & Walle, 2013). We also recognize that medieval military organizations provide significant links for this phenomenon. However, in the case of our results we point to the tenth century because it fits the Equestrian Warfare Revolution era[14] (Barendse, 2003). In this study, we cannot point to a specific argument on why the impact of Mamlukism started to show up in the tenth century. If the Mamlukism argumentation as an Islamic institution holds, we would expect the implication to come up earlier than the tenth century, namely around the seventh or eighth century. Moreover, there are also findings indicating that, through wealth accumulation, the imported slaves settled and also acquired the potential to challenge the sultan (Cammett, Lancaster, & Walle, 2013) . In fact, the historical experiences of the Mamluks in the twelfth century and, much later, the Janissaries in the Ottoman Empire, suggest that foreign military slaves were not always loyal but rather posed a serious threat by rising up periodically against their rulers (Karpat 2010, 32-33; Murphy 1999, 30-32). In that regard, the experience of social relations neither remained stable nor operated uniformly in Islam territories that spanned over vast territories and long centuries.

[14] About the Mongol warfare impact, Blaydes takes the date of thirteenth century for granted -the date for the settled Empire i.e. 1206- . However, there were Turk tribal nomads before Mongols which takes the date for the instability shock as early as tenth century.

To sum up, the recorded findings of these studies shed light on the same phenomenon with differing explanations. Unfortunately, the social dynamics and institutions across the Muslim world call into question the empirical validity of all these claims. Seen from this aspect, our hypothesis asserts a stronger point in questioning the empirical validity of its claim with strong geographical and historical aspects it enrolled.

CHAPTER VIII

CONCLUSION

This thesis identifies and empirically investigates determinants of diverging long-term economic performance across the Old World. The explanation entails a political instability hypothesis consisting of geography and military technology interaction.

Within this study, politically destabilizing impact of equestrian warfare is given as the source of variation in instability and it is asserted that parts of Eurasia protected from the Steppe cavalry were politically more stable and grew faster. Through a distance variable, the study empirically tests whether regions around steppe area were actually susceptible to invasions and persistent political instability which triggered population shocks.

The results of our research show that being distant to the Steppe region has a positive impact on population dynamics. The less the state's distance to steppe, the more susceptible they are to political instability and population shocks. It is found that regions that are exposed to equestrian warfare tend to show low population patterns after the tenth century onwards, whereas protected regions with extensive distance to steppe have advantages in population levels via experienced political and economic stability.

Bringing these observations together, we assert that political instability and geography collaborate and determine major inputs of economic performance across the Old World. In the end, the source of variation in population patterns is explained via politically destabilizing impact of Eurasian Steppe for the tenth and fifteenth centuries, leading political instability in the Greater Middle East and stability in Western Europe.

APPENDIX A

LIST OF COUNTRIES

Below is a table showing list of 91 countries included in this analysis.

Table 7. List of countries

Order	Nr.	Isocode	Country	Order	Nr.	Isocode	Country
1	4	AFG	Afghanistan	47	414	KWT	Kuwait
2	8	ALB	Albania	48	418	LAO	Laos
3	20	AND	Andorra	49	422	LBN	Lebanon
4	784	ARE	UAE	50	434	LBY	Libya
5	51	ARM	Armenia	51	438	LIE	Liechtenstein
6	40	AUT	Austria	52	144	LKA	Sri Lanka
7	31	AZE	Azerbaijan	53	440	LTU	Lithuania
8	56	BEL	Belgium	54	442	LUX	Luxembourg
9	50	BGD	Bangladesh	55	428	LVA	Latvia
10	100	BGR	Bulgaria	56	504	MAR	Morocco
11	48	BHR	Bahrain	57	498	MDA	Moldova
12	70	BIH	Bosnia	58	807	MKD	Macedonia
13	112	BLR	Belarus	59	470	MLT	Malta
14	96	BRN	Brunei	60	104	MMR	Myanmar
15	64	BTN	Bhutan	61	496	MNG	Mongolia
16	756	CHE	Switzerland	62	458	MYS	Malaysia
17	156	CHN	China	63	528	NLD	Netherlands
18	196	CYP	Cyprus	64	578	NOR	Norway
19	203	CZE	Czech	65	524	NPL	Nepal
20	276	DEU	Germany	66	512	OMN	Oman
21	208	DNK	Denmark	67	586	PAK	Pakistan
22	12	DZA	Algeria	68	608	PHL	Philippines
23	818	EGY	Egypt	69	616	POL	Poland
24	724	ESP	Spain	70	408	PRK	Korea-n
25	233	EST	Estonia	71	620	PRT	Portugal
26	246	FIN	Finland	72	634	QAT	Qatar
27	250	FRA	France	73	642	ROU	Romania
28	826	GBR	UK	74	643	RUS	Russian-fed
29	268	GEO	Georgia	75	682	SAU	Saudi Arabia
30	300	GRC	Greece	76	736	SDN	Sudan
31	191	HRV	Croatia	77	703	SVK	Slovakia
32	348	HUN	Hungary	78	705	SVN	Slovenia
33	360	IDN	Indonesia	79	752	SWE	Sweden
34	356	IND	India	80	760	SYR	Syria
35	372	IRL	Ireland	81	764	THA	Thailand
36	364	IRN	Iran	82	762	TJK	Tajikistan
37	368	IRQ	Iraq	83	795	TKM	Turkmenistan
38	352	ISL	Iceland	84	788	TUN	Tunisia
39	376	ISR	Israel	85	792	TUR	Turkey
40	380	ITA	Italy	86	158	TWN	Taiwan
41	400	JOR	Jordan	87	804	UKR	Ukraine
42	392	JPN	Japan	88	860	UZB	Uzbekistan
43	398	KAZ	Kazakhstan	89	704	VNM	Vietnam
44	417	KGZ	Kyrgyzstan	90	887	YEM	Yemen
45	116	KHM	Cambodia	91	891	YUG	Serbia
46	410	KOR	Korea-s				

APPENDIX B

POPULATION, URBANIZATION AND REAL GDP PER CAPITA

Historical urban and country-wide population numbers are in million terms and are taken from HYDE 3.1.[15] Descriptive and summary statistics are supplied below respectively.

Table 8. Descriptive statistics of population level (in millions) and population growth (Goldewijk, Beusen, & Jannsen, 2009)

	LEVEL					GROWTH				
Years	Whole Sample	Europe	Middle East	Asia	North Africa	Whole Sample	Europe	Middle East	Asia	North Africa
Pop400	151.3	28.5	19.7	88.5	7.5					
Pop500	158.5	24.7	19.8	100.0	7.1	0.05	-0.13	0.01	0.13	-0.06
Pop600	171.6	20.8	20.0	117.4	6.7	0.08	-0.16	0.01	0.17	-0.06
Pop700	174.1	22.6	20.8	116.5	7.2	0.01	0.09	0.04	-0.01	0.07
Pop800	176.4	24.7	21.5	114.9	7.7	0.01	0.09	0.04	-0.01	0.07
Pop900	198.0	27.7	22.7	130.9	8.6	0.12	0.12	0.05	0.14	0.12
Pop1000	206.5	30.8	21.8	135.9	9.5	0.04	0.11	-0.04	0.04	0.11
Pop1100	271.4	36.7	19.9	195.1	8.6	0.31	0.19	-0.08	0.44	-0.10
Pop1200	307.6	47.8	21.2	213.9	7.9	0.13	0.30	0.07	0.10	-0.08
Pop1300	305.9	68.5	20.8	190.7	8.7	-0.01	0.43	-0.02	-0.11	0.10
Pop1400	289.9	48.6	18.7	197.7	7.7	-0.05	-0.29	-0.10	0.04	-0.11
Pop1500	342.1	63.7	20.1	230.0	7.5	0.18	0.31	0.07	0.16	-0.03
Pop1600	418.8	82.9	24.3	275.9	10.0	0.22	0.30	0.21	0.20	0.33
Pop1700	478.4	93.5	24.2	321.6	8.5	0.14	0.13	0.00	0.17	-0.15

[15] Historical population numbers from McEvedy & Jones (1978), Livi-Bacci (2007) and Maddison (2001) form the basis of HYDE (Goldewijk, Beusen, & Jannsen, 2009) national historical population estimates. The data is supplemented with the subnational population numbers of Populstat (Lahmeyer, 2004) and many other sources, constructing time series for each province or state of every country of the world.

Table 9.Summary statistics on main dependent and independent variables[16]

Summary Statistics				
Population				
	Percentiles	Smallest		
1%	0.002	0.001		
5%	0.060	0.001		
10%	0.094	0.001		
25%	0.223	0.001	Obs	1040
50%	0.7		Sum of Wgt.	1040
		Largest	Mean	3.268
75%	1.92	99.93	Std. Dev.	11.471
90%	5.29	103.57	Variance	131.593
95%	8.75	106.60	Skewness	6.880
99%	71.60	131.20	Kurtosis	55.317
Log Population				
	Percentiles	Smallest		
1%	-6.41	-6.61		
5%	-2.82	-6.59		
10%	-2.36	-6.57		
25%	-1.50	-6.55	Obs	1040
50%	-0.36		Sum of Wgt.	1040
		Largest	Mean	-0.40
75%	0.65	4.60	Std. Dev.	1.72
90%	1.66	4.64	Variance	2.95
95%	2.17	4.67	Skewness	-0.18
99%	4.27	4.88	Kurtosis	4.54
Urban Population				
	Percentiles	Smallest		
1%	0.00	0.00		
5%	0.00	0.00		
10%	0.00	0.00		
25%	0.00	0.00	Obs	1040
50%	0		Sum of Wgt.	1040
		Largest	Mean	0.201894
75%	0.01	9.72	Std. Dev.	1.147221
90%	0.12	10.72	Variance	1.316117

[16] Table 9 provides summary statistics, presenting the variance, skewness, and kurtosis; the four smallest and four largest values; and the 1st, 5th, 10th,25th, 50th (median), 75th, 90th, 95th, and 99th percentiles as an addition to mean and standard deviation. Population level varies greatly across countries, with a standard deviation of 11.471 which is almost third times of the mean. The median is 0.7 which is smaller than the mean of 3.268, reflecting the skewness of the data. The skewness level of 6.88 indicates considerable right skewness and high kurtosis level leads thick tails. A standard solution for high kurtosis is taking natural logarithm which leads very low kurtosis. Here with log population data, we see that the skewness becomes -0.18 and kurtosis becomes 4.54 which is quiet close to a normal distribution. (A normal distribution would have a skewness of 0 and a kurtosis of 3.)

95%	0.66	15.99	Skewness	9.634445
99%	5.96	18.37	Kurtosis	117.7139
Distance to Steppe				
	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0.025	0		
25%	0.103	0	Obs	1040
50%	0.6015		Sum of Wgt.	1040
		Largest	Mean	0.714763
75%	1.165	2.28	Std. Dev.	0.59968
90%	1.49	2.28	Variance	0.359616
95%	1.79	2.28	Skewness	0.548073
99%	2.28	2.28	Kurtosis	2.365043

APPENDIX C

DEPENDENT AND CONTROL VARIABLES

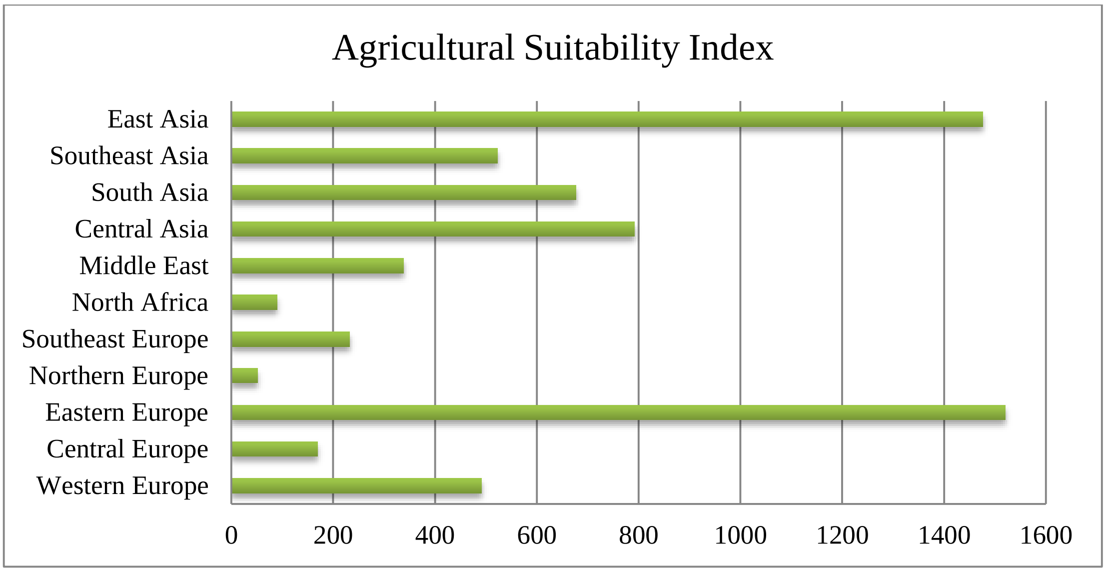


Figure 9. Agricultural suitability levels of various regions across the Old World (Michalopoulos, Naghavi, & Prarolo, 2012)

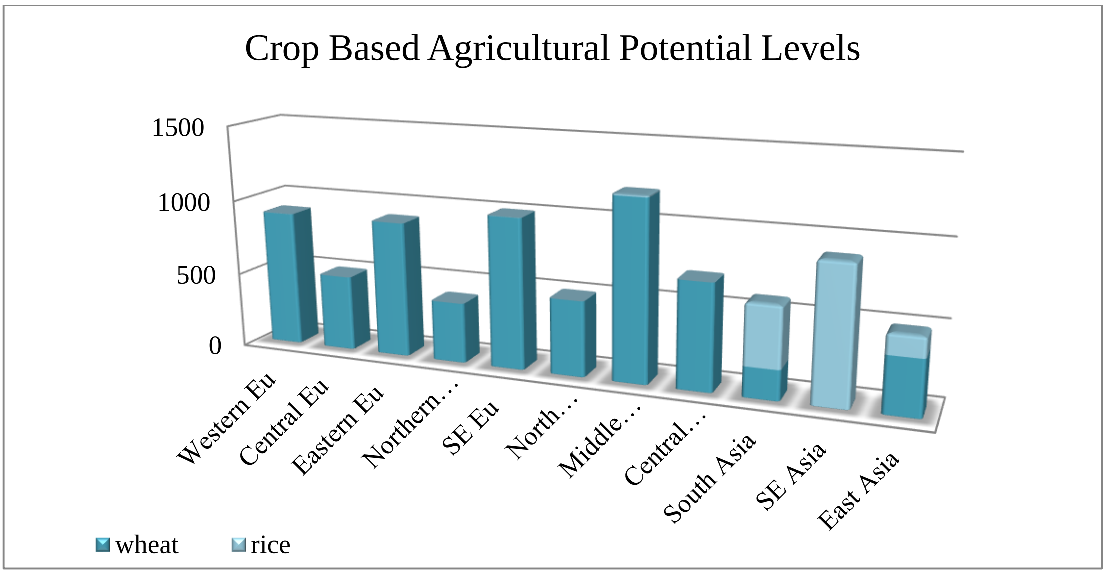
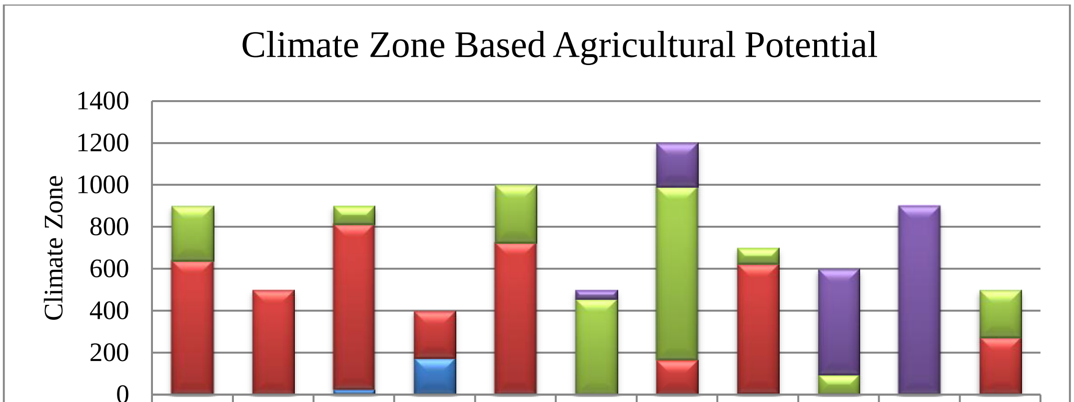


Figure10. Crop based agricultural potential levels of different zones across the Old World. (FAO/IIASA. 2010)



	Western Eu	Central Eu	Eastern Eu	Northern Eu	SE Eu	North Africa	Middle East	Central Asia	South Asia	SE Asia	East Asia
trop	0	0	0	0	0	42	210	0	503	899	1
sub	261	0	87	0	275	458	825	76	97	1	224
temp	638	500	788	225	725	0	165	619	0	0	273
polar	1	0	26	175	0	0	0	5	0	0	1

Figure11. Climate zone based agricultural potential across the Old World. (FAO/IIASA, 2010)

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