The Historical State and Economic Development: Evidence from Ottoman Syria's Nomadic Frontier

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Abstract

This paper investigates the long-term impacts of statelessness in Ottoman Syria, focusing on the regions demarcated by the 'desert line' - a boundary that separated areas under Ottoman state control from those subject to tribal raids until the middle of the 19th century. Using geocoded census data alongside historical data on Ottoman state control in the 19th century, I estimate the effect of historical statelessness on economic outcomes using a spatial regression discontinuity design. The results indicate that a history of statelessness is associated with lower incomes in the present, less developed infrastructure, a higher share of workers in the primary sector, as well as lower levels of human capital. The effect is partly driven by higher population density and urbanization rates in areas of historical state control. The effect is not driven by ethnic or religious differences and is robust to geographic controls.

1. Introduction

A line of research focuses on the role of historical institutions in explaining gaps in economic development observed in the present (Acemoglu et al. 2001, Nunn 2020). Recent literature in this tradition has focused on the role of the historical state in shaping economic conditions in the present, which may explain persistent regional inequalities within countries today (Michalopoulos and Papaioannou 2013, Dell et al. 2018). This paper examines the long-term economic impact of historical state boundaries, focusing on the 'desert line' in Syria — a border that historically divided areas governed by the Ottoman state from those outside state control until the 19th century. To estimate the causal effect of statelessness on economic development today, a regression discontinuity design is used by comparing Syrian towns and villages on two sides of the desert line using contemporary census data. Areas that were historically outside of state control are today less developed economically, having lower incomes and lower levels of human and physical capital. The effect is driven in part by the low population density in areas that were historically outside of state control, with a legacy of land abandonment in the past which shapes the human geography of the region today.

Evaluating the impact of historical statelessness on present day development is challenging as stateless regions may differ from areas under state control along multiple dimensions: stateless areas are typically distant from coasts, further away from urban centers, and occupy mountainous areas or regions abutting arid steppes and deserts. Stateless regions may also be inhabited by peoples with distinct cultures from those in state held regions, including peoples with a recent history of nomadism. Identifying the causal effect of the legacy of statelessness requires that any confounding factors are continuous at the border line (Dell 2010, Dell et al. 2018). This motivates the choice of study region, which spans the area between the coastal mountain range and the Syrian desert. Climatic conditions change across this area, most notably in terms of precipitation which declines gradually as we move east. However, climatic conditions change continuously, with no discontinuities around the historical border. The desert line which separated Ottoman Syria from the stateless areas to the east did not denote the actual extent of the desert, but rather the area where land was largely abandoned due to Bedouin raids and lack of security and rule of law. The term was used by European explorers and cartographers who travelled across Syria in the 18th and 19th centuries.

Using a spatial regression discontinuity design, the analysis finds that contemporary living standards are higher in areas north and west of the desert line, with lower incomes found in areas to the south and east, as well as a less skilled labor force, overall lower education and literacy levels, and less developed infrastructure. The outcomes are measured using data from the population and housing census of 2004 prior to the onset of the civil war in 2011. The results are not driven by differences in ethnic majorities across the desert line or to belonging to tribal communities, and similar results yield when excluding areas with tribal majorities and excluding other ethnic and religious minorities.

Syria is characterized by large regional inequalities. The north-east of the country has particularly lagged behind in terms of economic development as compared to the economically central regions in the west of the country (Abu-Ismail et al. 2016). Unlike the north-east, the regions of western Syria benefitted from the stability and rule of law provided by the Ottoman state. This region was historically split by a border line which denoted the limits of Ottoman state authority and control (Lewis 1987). Ottoman efforts at consolidating control of the rest of Syria took place in the middle of the 19th century, leaving parts of the country east of the border line with a long legacy of statelessness.

In the middle of the 19th century, the Ottoman state expanded its control over the Syrian regions in the east. This policy came as part of a larger shift towards the east precipitated by the loss of Ottoman territories in the 18th and 19th centuries in Eastern Europe, the Balkans, the Caucasus, and North Africa (and the brief occupation of Syria by Muhammad Ali of

Egypt), and as part of a broader set of administrative reforms that sought to modernize the Ottoman state (the *Tanzimat*) and to expand taxation and consolidate Ottoman control of eastern border regions. Towns and villages east of the desert line were brought under state control in this period, while Ottoman policy towards tribes in Syria shifted towards a policy of sedenterization with the aim of expand agricultural production and settlements in the east of Syria.

A large discontinuity in population density is found across the border line, suggesting that the lack of state presence east of the border line shaped the human geography of the region, leading people to migrate away from stateless areas and towards state-controlled ones. Controlling for population density accounts for around half of the observed effects on income. The evidence here is in line with previous literature that emphasizes the role of population density for economic growth (Boserup 1965, Kremer 1993, Klasen and Nestmann 2006), and the literature on the role of path dependence in explaining regional economic disparities (Krugman 1991, Bleakley and Lin 2012). This represents an important and often overlooked mechanism in the study of contemporary effects of historical state centralization, whereas previous studies have focused on the role of institutional factors. The availability of data on ethnic composition of villages also allows for testing the hypothesis that ethnic social norms drive the results, and the hypothesis is rejected with the causal effect of state legacy on economic development found to be robust to this factor.

The literature on economic development in the MENA region typically focuses on factors like religion, social and cultural norms, as well as natural resources. No studies to date have explored how state history shapes economic development in this region. The study shows that historical state centralization plays an important role in contemporary development in the MENA. Statelessness mostly vanished in the region in the course of the 19th century. Independent states like Syria emerged following the dissolution of empires and periods of colonial rule, but the long pre-colonial history of the region has persistent effect that are not fully appreciated. The findings contribute to earlier work on the role of historical political centralization in contemporary development outcomes (Michalopoulos and Papaioannou 2013, Dell et al. 2018), the literature on the role of path dependence in explaining regional economic disparities (Krugman 1991, Bleakley and Lin 2012), and the literature on agricultural-pastoral frontier zones (Bai and Kung 2011, McGuirk and Nunn 2024) and adds a novel case study to the literature in the often-overlooked MENA region. The paper also contributes to understanding the factors behind regional inequalities in Syria, which have not been systematically analyzed even though they represent an important challenge for economic development and the process of nation building.

2. Historical background

The region of present-day Syria came to be part of the Ottoman Empire in 1516, having been previously ruled by the Mamluk Empire centered in Egypt. As Ma'oz (2013) describes, Syria under the Ottomans was not a unified political entity, but rather subdivided into provinces that were loosely governed by the central authority in Istanbul, with local autonomous forces developing within these provinces such as mountain chiefs, tribal sheikhs, and feudal overlords. The region extending from Aleppo to Damascus was the center of Ottoman political power in Syria, whilst outlying regions like the Syria desert were inhabited by religious and ethnic minorities and formed centers of centrifugal political forces that resisted centralization. The Syrian desert, also known as the Syrian steppe or Badia, is primarily an arid steppe characterized by rocky and gravelly terrain with sparse vegetation including shrubs and grasses. The region receives some rain during the winter season making it suitable for grazing and was used for this purpose by nomadic tribes. Figure 1 shows the desert line as mapped by Lewis (1987). Areas south and east of the line were outside of state control until the middle of the 19th century. The Syrian desert is located further east of the line and formed the heartland of the nomadic tribes in Syria. Figure 1 also shows the cities, towns, and villages in the north-west of Syria. The desert line closely aligns with the location of the major urban centers of Aleppo, Hama, and Homs. These cities, with Damascus further south, form the political and demographic center of Syria. Cities in this region were highly fortified to defend against raids and invasions, including those from the nearby desert.

Figure 1 here

Throughout Ottoman rule, the state faced the problem of de-population of its provinces. Population numbers had reached their peak under the early Islamic empires, and despite growing during Ottoman rule, vast regions of the empire remained well below the population peaks reached in prior eras. Contributing factors included the black death and other plague epidemics and natural disasters, the declining role of Mediterranean trade in favor of the Atlantic trade, as well as the Bedouin raids and rural insecurity. According to Williams (1981), rural depopulation was a chronic problem from the turn of the 17th century until the middle of the 19th century, and it figured prominently in Ottoman government reports, as well as in the writings of European travelers and foreign consuls (Lewis 1987, Williams 1981). Walker (2012) refers to a 'nomadization' of the rural hinterland and the disappearance of villages in the southern Levant from the start of the Ottoman era. One of the measures taken by the government to alleviate the depopulation problem was through replacing tax farming tenancies with life leases in order to give tax farmers a long-term interest in the wellbeing of peasants, as well as through settlement projects.

The Ottoman state also carried out settlement projects across Anatolia and Syria with the aim of bringing more land into cultivation and in order to expand the tax base. These projects took on various form and included land grants to incoming refugees from former Ottoman territories in the Balkans and the Caucasus or involved forcible displacement of populations from within the Ottoman domain including nomadic populations such as those in the east of Syria and their sedenterization. Ma'oz (1968, Chapter 9) describes the settlement activity as sporadic, though it did move forward in the region around Aleppo where authorities encouraged settlement by granting land, seeds, and tools and tax exemptions. Though these efforts likely faced difficulties as the government did not protect the newly sedentary tribes against attacks from nomads.

Archeological evidence from the region east of the desert line suggests a degree of relative prosperity in the pre-modern era. The cities and towns on the Syrian Euphrates, which were largely ruined and abandoned by the time of Ottoman rule, had prospered from Antiquity well into the Middle Ages. The frontier of settlement in the study area moved significantly across time, reaching its furthest extent towards the east under Byzantine rule in the 5th and 6th centuries (Geyer 2011), a part of a cycle of intensification and abatement common to agricultural-pastoral frontier regions in the MENA (Wickham 2006, p. 19). The Romans and Byzantines relied on sedentarized nomads to rule inland Syria, with the city of Palmyra emerging as an important seat of power in late Antiquity (Liebeschuetz 2015). The east of Syria continued to play a significant role under the Islamic Caliphates in the following centuries. However, the entire area of present-day Syria was devastated by the Mongol invasions in the middle of the 13th century. In the present day, the only cities east of the desert line are Manbij and Salamiyah, both minor cities re-established by migrant groups in the 19th century (Circassians and Ismailis respectively) with support from the Ottoman state.

On the eastern fringes of the Syrian provinces, The Ottoman state allowed the Bedouin tribes considerable autonomy in managing their affairs. The relationship between the Bedouins and the Ottoman state was a complex one, with the Ottomans attempting to co-opt the Bedouins by appointing a Bedouin governor (Emir of Badia) who was at the head of a tribal confederation and was tasked with keeping order in the desert and neighboring areas and was responsible for protecting trade routes. Still, regions close to the desert were subject to constant tribal raiding. Ma'oz (1968, Chapter 9) suggests that the Ottoman co-optation policy was ineffective, with Bedouin tribes in government employment frequently attacking villages and trade caravans. The populations of stateless regions paid protection tax to the tribes (Khuwah), yet the tribes did not ensure order and rule of law. According to Ma'oz (1968), the protection duty paid out to a dominant tribe rarely secured a village from extortion or attack from other tribes, or even from the 'protector' tribe. Villages outside of state control were also required to pay tax to Ottoman officials, representing a double burden of taxation with little security in exchange. The Ottoman state did not maintain any presence deep in the Syrian desert, which formed the center of power for the largest tribes. Migration of tribes from the Arabian Peninsula also led to conflict over grazing rights and may have pushed some tribes towards raiding.

Travelers in the region south-east of the desert line in the 18^{th} and 19^{th} centuries report that many villages were abandoned to the nomads, while the remains of medieval towns and cities were deserted and in ruins (Lewis 1987). Comparatively few villages remained inhabited on the south and east side of the desert line as compared to those lying on the western side, despite the abundance of cultivable land and their proximity to the urban centers of Aleppo, Hama, and Homs.

The first significant steps undertaken by the Ottoman state to extend its control over the north-east of Syria came in the late 1850's and early 1860's with the creation of new administrative districts and the building of military outposts in the Euphrates valley east of Aleppo, followed by the establishment of a garrison at Deir ez-Zor. Arab tribes occupying these areas were subdued in the process and agreed to pay tax to the Ottoman government, while the protection tax paid by peasants to the tribes was abolished. By the 1870's the Euphrates valley tribes were 'completely under control' and paid taxes regularly (Lewis 1987). The nomadic tribes settled new villages and expanded existing villages, towns, and cities throughout the rest of the 19th century and into the 20th century.

The Provincial Reform (*Vilayet*) law of 1864 was a crucial part of the *Tanzimat* reforms for re-defining the central government's authority over the provinces, with Syria one of the first regions to be re-organized (Rogan 1995). The aim of the law was to centralize and modernize the administrative system, enhancing the state's control over its territory. The regions controlled by Bedouin tribes were not the only ones affected by this development, with the Alawi coastal region and the Druze areas in the south experiencing similar centralizations. Certain social classes such as urban elites and merchants played a role in extending state authority in this period according to Rogan (1995), with the state providing favorable conditions for trade and economic activity. Barakat (2015) shows that tribal leaders as well as middling groups of nomads obtained positions as low-level bureaucrats by assisting in the Ottoman modernization of land administration during the Hamidian period (1876-1909).

Several factors led to the Ottoman state modernization and reforms of the 19th century, and they mostly had to do with outside pressures on the empire. The loss of Ottoman territory in Europe, the modernization efforts of Muhammad Ali of Egypt and his occupation of Syria in the 1830's, as well as western pressures for governmental reform and the strong pull of the western modernization. State centralization in the Syrian provinces also came with reforms that promoted legal equality for religious minorities, and sought to reduce the power of local elites as well as the influence of European powers within Ottoman lands. The reforms were not particular to the study area, and were largely exogenous to its internal dynamics, even if their implementation had profound implications for the region.

Parallels to the Ottoman state centralization in Syria can be found across the MENA region. Several studies of the late Ottoman empire focus on frontier regions including Trans-Jordan, Kurdistan, the Persian Gulf, Eastern Arabia, and Yemen (Reinkowski 2001). Recent historical work highlights the history of governance in the Ottoman peripheries, as in the case of the Kurdish principalities (Özok-Gündoğan 2014) and the inter-imperial borderlands of the Balkans (Esmer 2014). While most countries in the region came under colonial control by the early 20th century, the pre-colonial era was characterized by diversity in terms of state centralization. In many cases, the pre-colonial empires, kingdoms, and sheikhdoms exercised weak control over their holdings, especially in marginal areas and frontier regions. The Kingdom of Morocco has been ruled by the Alaouite dynasty since the 17th century, but Morocco's regions were split in the pre-colonial era into what was termed *Bled Al-Makhzan* (land of the treasury[1]) and *Bled Al-Siba* (land of anarchy) where the former region fell firmly under state control while the latter was largely dominated by traditional tribal authorities (Hoffman 1967). Geography clearly shapes the *Makhzan* and the *Siba*, with the coastal areas and cities situated in the north of western North-Africa usually being the centers of state control, while mountainous and desert regions further south were the centers of tribal presence and control. An earlier parallel is that of the border region between Byzantines and Seljuks in Anatolia which was occupied by Turkic tribes, and which experienced depopulation due to tribal raiding on peasant communities according to Lindner (2017).

The economic consequences of statelessness in the Middle East and North Africa (MENA) region remain understudied. Until the 19th century, centralized states in the region co-existed with stateless areas typically ruled by tribes. Even though examples of these conditions exist across the MENA in the modern era, with stateless regions occupying the interior of the Arabian Peninsula and southern Jordan, eastern Syria and western Iraq, and the southern regions of Morocco, Algeria, and Tunisia, alongside parts of eastern Anatolia. In some cases, tribal rule led to the emergence of modern state structures as in the Arabian Peninsula, but in

[1] The Arabic word 'Makhzan' translates to 'warehouse' but came to be denote the state in western North-Africa. The origin of this use may relate to the word's association with the treasury and the presence of state tax collectors in areas under state control.

most cases the existing states expanded their reach over stateless regions in the course of the 19th and 20th centuries (Khoury and Kostiner 1990).

A pattern of state formation in the Middle East region involves tribes on the margins of imperial states. This is most clearly seen in the case of Saudi Arabia and other GCC countries, as well as some historical examples like the tribal Kurdish confederacies in eastern Anatolia and the tribal confederacies of North Africa (Khoury and Kostiner 1990), and even the Ottoman state itself which originated in a tribal setting (Lindner 2017). In the Syrian case, the Kurdish and Arab tribes that settled the north-east of Syria were initially operating outside the bounds of the state but were eventually integrated into Ottoman state structures in the mid-19th century, with the aim of safeguarding the frontier region and creating sources of tax revenue. The Ottoman state supported the settlement and sedenterization of tribes in the north-east, and even assigned a tribal leader as governor of Raqqa (Winter 2006), a pattern that followed in south-eastern Anatolia as well. Early on, the relationship between the tribes and the state was marked by conflict, with tribal authorities often undermining the Ottoman rule of law. But the tribes in the Syrian north-east did not create alternative state structures as was the case in the Arabian Peninsula. Proximity to the well-established Ottoman state in the west of Syria may have played a role, with little opportunity for the tribes to control urban areas and establish stable governance.

3. Theory and Previous Research

A line of research focuses on the role of pre-colonial state history and institutions in explaining the economic inequalities observed in the present. Studies of this kind measure state centralization in the past and find that it correlates with present day economic outcomes both across and within countries. Gennaioli and Rainer (2007) find that pre-colonial state centralization in Africa at the country level is associated with better provision of public goods in the present. Their evidence suggests that the presence of more hierarchical chiefdom structures in the past causes local chiefs today to be more accountable to state authorities, leading to better implementation of state policies. Michalopoulos and Papaioannou (2013) extend this work using more granular data at the ethnic group level and find strong association between historical state centralization and economic development as proxied by nightlight density. More recently, Dell et al. (2018) tests the effect of historical state centralization in Vietnam across a historical border line that separated the centralized Dai Viet kingdom from the less centralized south, which was a peripheral tributary of the Khmer empire, finding that state centralization is associated with better economic outcomes, with village governance institutions playing a key role in explaining this persistent legacy.

Overall, these studies treat historical borders as natural experiments to test the effectiveness of state centralization in the past on economic development today. The mechanism suggested for this persistent relationship is mainly institutional, represented by local governance institutions such as chiefly hierarchy or village governance. Lowes et al (2017) uses a similar design to argue that past state centralization in Central Africa is related to cultural norms in the present, leading to weaker norms of rule following and a greater propensity to cheat as measured using behavioral experiments. While the study does not deal directly with economic development outcomes, it suggests another mechanism for persistence through cultural transmission.

A factor that has not been addressed in previous studies is that of economic and human geography. Historical evidence suggests that areas east of the desert line experienced very high emigration rates, with the abandonment of towns and villages becoming a common response to insecurity (Lewis 1987, Williams 1981). If differences in state centralization persisted for a long period, we would expect the emergence of large differences in population density between state-controlled and stateless regions in favor of state-controlled regions. This is evident in Figure 1 which plots all villages, towns, and cities in the region of study colored according to population size. Areas north and west of the desert line show a higher number of larger towns (shown as red dots) as well as cities.

Differences in settlement patterns can persist long after differences in state centralization have disappeared. Path dependence can play an important role, and a large literature explores how initial conditions and historical accidents can shape economic geography in the long run. Krugman (1991) illustrates the effect of path dependence using the fact that one third of the US population today lives within the original thirteen colonies established by the British. Bleakley and Lin (2012) show that historical portage sites on rivers in the eastern US still determine the population distribution in that region, even though portage sites became obsolete long ago.

The effect of historical state centralization is not limited to shaping population. Population density is an important factor in economic development. Densely settled areas may experience urbanization at a higher rate and benefit from opportunities for specialization and investment. Boserup (1965) theorized that agricultural productivity is shaped by population density, with areas of higher density shifting to more intensive systems of land use. According to Kremer (1993), societies with larger initial populations have faster technological growth as well as faster population growth, all else being equal. Klasen and Nestmann (2006) incorporate both population size and population density in their analysis of the relationship between population and technological growth. According to their model, population density spurs technological change, particularly for countries with low levels of technology. Higher density also increases the returns to investment in public goods such as infrastructure, which in turn may affect technological change.

The link between population and economic development is a natural complement to the study of the legacy of state centralization, and that of the historical roots of economic development more broadly (see Nunn (2020) for a review). The analysis in this paper also relates to the study of state capacity and the consequences of weak rule of law and a lack of monopoly on violence for long term economic development (e.g. North et al. 2009).

4. Data and Methods

The data used in this study comes from the Syrian population and housing census of 2004. The census data records a rich array of information on the population, labor force, and infrastructure and housing. The data is aggregated at the level of the city, town, and village. Information on the historical boundary of the desert line comes from the work of Lewis (1987) which uses traveler accounts to pinpoint the boundaries of state control prior to the mid-19th century.

The study exploits the discontinuous change in exposure to historical state control, comparing towns and villages in areas outside the control of the Ottoman state in the period before the middle of the 19th century with those that were incorporated previously when the Ottomans invaded Syria in 1516. I use the methods employed in Dell (2010) and Dell et al. (2018) and treat the desert line as a two-dimensional discontinuity in longitude-latitude space. The regression model takes the form:

$$outcome_i = \alpha + \gamma\ South\_east_i + f(geographic\ location_i) + \beta\ to\_Aleppo_i + \epsilon_i$$

Where $outcome_i$ is the outcome variable in village i, and $South\_east_i$ is an indicator equal to 1 if village i was on the south-east side of the desert line (i.e. outside of Ottoman state control before the middle of the 19th century) and equal to zero otherwise. $f(geographic\ location_i)$ is the RD polynomial which controls for smooth functions of the geographic location. to_Aleppo_i is the log distance to the center of Aleppo city, which is the largest city in the region and an important trading center. The analytical sample is limited to towns and villages within 50 kilometers of the desert line and excludes towns or cities with populations over 10,000. The reason for excluding major urban centers is that the location of the line itself is likely endogenous to the location of these centers, but towns and villages can be treated as if randomly distributed across the line, with towns and villages on either side of the border being in close proximity to the major cities and having similar geography as will be shown in the results section.

The estimation framework relies on the assumption that all relevant factors besides treatment vary smoothly at the boundary. Geographic characteristics may vary across the two sides of the desert line, such as precipitation, soil quality, or ruggedness of the terrain. The variation in outcomes that is due to these factors will be captured by the geographic functions f().

The estimation framework is also sensitive to selective sorting across the boundary. For this reason, the regression model additionally controls for ethnic composition based on the ethnic majority of each village or town. The ethnicity data comes from the work of Khaddour and Mazur (2018), where the ethnicity variable captures ethnic identity, religious and sectarian identity, as well as belonging to an Arab tribe. Figure 2 shows a map of the study area according to ethnic group. Controlling for tribal belonging is particularly relevant, as areas east of the desert line were settled by Arab tribes whose culture may differ from that of the population west of the desert line and the analysis accounts for this fact.

Figure 2 here

Another threat to the estimation framework is due to spatial correlation in the error terms, which can lead to inflated t-values as detailed in Kelly (2019). To address this issue, I estimate spatial autoregressive lag models that relax the assumption of no correlation in the error terms.

To estimate gaps in incomes across areas, an income index is created using data on the local composition of the labor force in each village and town. Incomes are imputed based on the national-level average wages are used which are conditional on occupation, along with the local mix of sectors. The wage data comes from Syrian Labor Force Survey of 2007. The sectoral income variable reflects within-country differences in the composition of the economy but does not account for other sources of income inequality such as differentials in payoff to the same work across areas. The imputation formula takes the form:

$$Income_i = \sum_{j=1}^{7} Sector\ wage_j\ .\ Sector\ share_{ij}$$

Where i refers to the city, town, or village and j to the sector. Sector wage refers to the national-level average wage of sector j, and Sector share is the share of workers in the city/town/village employed in that sector. The set of sectors used to construct the sectoral income measure are: agriculture, industry, construction, hotels and restaurants, transportation, finance and real estate, and other services.

An alternative specification of the income measure is used in addition. Income is imputed in this case using educational attainment measures and corresponding average wages conditional on educational attainment using the following formula:

$$Income_i = \sum_{j=1}^{7} Mean\ wage_j\ .\ Educational\ attainment\ share_{ij}$$

Where the educational attainment share refers to the share of the adult population in attainment categories: illiterate, literate, elementary school, middle school, high school, middle academy, and university educated. Mean wage refers to the national-level average wage conditional on the educational attainment category. Both imputed incomes are normalized as z-scores using population-weighted mean and standard deviation across all cities, towns, and villages in Syria. The resulting measures represent deviations from population-weighted mean income.

In addition to imputed income, the analysis makes use of other data that proxy local economic development. Measures of the share of households connected to each of the electricity network, sanitation network, and water network are used, as well as measures that directly capture different development in the local labor force, including the share of white-collar workers (managers) and the share of workers in regular employment (as opposed to seasonal or intermittent work). Finally, direct measures of human capital are included which are the share of adults with a university education and the illiteracy rate in the adult population.

5. Results

5.1. Descriptive statistics

Table 1 shows descriptive statistics for the main variables used in the analysis. The area of study is split into two, with towns and villages categorized into those that are located on the south-east side of the desert line and which were stateless until the middle of the 19^{th} century, and those in the north-west which were under Ottoman state control. The income indices measure at -1.04 and -0.63 standard deviations for the south-east and north-west respectively. That is, villages and towns in both areas are below the Syria national average in terms of income, though areas with a history of statelessness especially stand out. The alternative measure of income imputed using education levels gives slightly lower values at -1.20 and -0.72 respectively.

Table 1 here

The historically stateless region has worse infrastructure overall. Fewer households are connected to the sanitation network (17.8%) as compared to those in the Ottoman state areas (35.3%). A similar gap is found in the share of households connected to the freshwater network (39.7% and 65.8% respectively). The only exception is the proportion of households connected to the electricity network, with both sides of the border line reaching over 90% and with a small gap of less than 3%.

Areas with a stateless legacy also have worse labor market outcomes and lower levels of education. The proportion of workers in managerial positions is at 3.5% and 7.7% in stateless and Ottoman areas respectively, while the proportion of farmers is at 39.1% and 43.4% respectively. Education levels are also lower in areas with a stateless history, with the proportion of university educated adults at 0.6% and 1.2% in areas with historical state control and areas under Ottoman control respectively, while the illiteracy rates are at 34.2% and 25% respectively.

Areas with a stateless legacy are less urbanized, with lower mean population in the towns and villages as compared to areas with a legacy of Ottoman state control, and a lower number of towns and villages. The overall gap is best captured by the measures of population within 5km and 10km radius, as these measures include the population size of the village or town itself, as well as any villages or towns centered within the radius. According to this measure, the population density is much higher in areas with a legacy of Ottoman state control, reaching 75,512 within a 10 km radius as compared with 30,797 for towns and villages with a stateless legacy.

Table 2 presents balance checks for the two sides of the border line using a set of geographic variables. Differences in slope, elevation, average yearly temperature, precipitation, and flow accumulation are presented alongside their mean values for the entire study region. The slope, presented as a percentage, is low overall which corresponds to a flat terrain on both sides of the border line, even though the slope value is slightly higher in areas with a legacy of statelessness. The region sits on an elevation, with a relatively small difference in elevation between the two sides of the border line. Small differences are also found in terms of temperature and precipitation, while the difference in flow accumulation is not statistically significantly different from zero.

Table 2 here

5.2. Regression results

Table 3 shows the results for the main regression discontinuity models (full model estimates are available in appendix tables A2 to A5). The columns show the RD effect of being located in the region with a stateless legacy, for different outcome measures. The rows represent the different model specifications. The first model is linear in longitude and latitude, and the effects are all negative and statistically significant (with the exception of the illiteracy rate, which is higher in the area with a stateless legacy). For the income index, the gap is at -0.532 while the gap in education-based income is estimated at -0.438. The infrastructure effects vary, with both the sanitation network and the freshwater network being significantly less developed in the south-east (effect sizes of -21.8 and -22.5 respectively), while the effect for the electricity network is much smaller at -3.4 and significant only at the 0.05 level. When looking at the labor force variables, the proportion of managers in the south-east is lower by 0.5, while the proportion employed in agriculture is 7 percentage points lower. The proportion of adults with a university education is 0.53 percentage points lower, and the illiteracy rate is 9.2 percentage points higher. Overall, the estimated effects resemble the unadjusted gaps presented in the descriptive statistics table earlier, which suggests that these gaps are mainly driven by the desert line discontinuity and are not primarily due to geographic trends across the study region.

Table 3 here

The second row of Table 3 provides the effect estimates for the model controlling for cubic polynomial terms in longitude and latitude on each side of the border line. The effects sizes are similar level as in the previous model, with the exception of the gap in the sanitation network which becomes small and statistically insignificant. The robustness of the results to the cubic polynomial controls suggest that they are not driven by geographic trends. In some cases, the effects are even larger in this model, as in the income index, the electricity and freshwater networks, and the share of farmers in the labor force as well as the illiteracy rate. To further ensure that geographic factors are not the drivers behind the results, the third row adds controls for elevation, slope, temperature, precipitation, and flow accumulation. In this model, the effect sizes are also on a similar level to the above model and are equally significant. The results for these two models (linear and cubic polynomial) are replicated using 25km bands around the border line with similar results (see Online Appendix Table A1).

Controlling for ethnic groups in the fourth row in addition to the cubic polynomial model does not shift the picture much either. The income effects appear slightly larger at -0.65 and -0.52 for the income index and education-based income respectively, and the other effects are slightly higher each but remain broadly similar and statistically significant. The role of ethnicity is explored further in the next sub-section.

The regression results are graphed in figure 3, which shows a map of the study area split by the desert line with each town and village plotted on the longitude on the x-axis and the latitude on the y-axis. Predicted values are estimated from the cubic polynomial model for a grid of longitude-latitude values for each outcome (excluding the sanitation network outcome). The background colors are synonymous with the typical two-dimensional curve in RD plots, while the dots show the actual outcomes as measured in the census. The maps show both considerable variation in the outcome variables across space, but also capture the discontinuity in outcomes across the border line.

Figure 3 here

To test the robustness of the results, I estimate spatial autoregressive lag models which address the Kelly critique (Kelly 2019) by relaxing the assumption of uncorrelated error terms. The models included in Table 4 allow each error terms to covary with that of the eight nearest observations in the sample (keeping the cubic polynomial functional form). This ensures that the effect estimates are not due to observations being correlated geographically. In this case, the effects are overall smaller but remain statistically significant, and some remain on a similar level to those reported in the base models. The income effect is measured at -0.21 and that of education-based income at -0.19, while the effect on the electricity network and water network measures at -6.14 and -13.95 respectively (with the sanitation network effect not statistically significantly different from zero). The effect on the proportion of managers in the labor force is at -1.63, while the effect on the share of the labor force in agriculture is not statistically significantly different from zero. Finally, the effects on human capital measures appear to be robust, measuring at -0.28 for the share with a university education, and 8.19 for the illiteracy rate.

Table 4 here

Moran's I statistics are reported to examine correlation in the error terms of the estimated models. Moran's I statistic takes values between -1 and +1, where 0 corresponds to random spatial patterns without spatial autocorrelation, and a value of 1 suggests perfect clustering where locations with similar values are adjacent to each other. Table 5 reports Moran's I statistics for the residual terms in the base cubic polynomial models and the spatial lag models. Overall, Moran's I for the base cubic polynomial models are reported at values between 0.1 and 0.3, which suggests some level of clustering in the residuals. Clustering may not be very pronounced as the values are on the lower end of the scale. In the case of the spatial lag models, all Moran's I statistics are not statistically significantly different from zero.

Several placebo analyses were conducted as shown in Table 6. In Panel A two placebo borders are used with the original border shifted alternatively 25 kms east and west of the original border. The estimated models use a cubic polynomial in longitude and latitude and are therefore comparable to the estimates in Table 3. In almost all outcomes, the effect is either statistically insignificant or greatly reduced as compared with the analogous estimates in Table 3 (with the exception of the illiteracy rate when the border is placed west of the real border).

Table 5 here

Panel B of Table 6 presents placebo outcomes tested using linear models in longitude and latitude. The placebo variables include the unemployment rate, female labor force participation (FLFP), the sex ratio in the local population, characteristics of dwellings in the local area (the proportions of the dwellings in refurbishment, rented dwellings, and empty dwellings), and the gender gap in educational attainment. The causal effects on the placebo outcomes are statistically insignificant (with the exception of the proportion of empty dwellings, where the effect size is very small and statistically significant only at the 0.1 level). Overall, the placebo tests support the validity of the causal estimates found in the prior section, with no effects found for outcomes not directly measuring economic development.

Table 6 here

5.3. The role of ethnicity and religion

The previous section showed that the results are robust to controlling for ethnic and religious identity. We explore this factor further in Table 7, which shows the regression discontinuity effects for different sub-groups. Panel A excludes all area with non-Sunni Muslim majorities. The results remain broadly similar and statistically significant, and in many cases the effects are larger than those found in the full sample. Panel B further excludes areas with tribal majorities. In this case, the effects are larger for the income and education outcomes and are more than doubled for the percentage of farmers in the labor force, though they are statistically insignificant for the infrastructure variables.

Table 7 here

The results are robust to excluding minority groups such as Christians, Alawis, Druzes, and Ismailis whose outcomes may differ from that of the Sunni Muslim majority for factors unrelated to the border line (such as discrimination or differences in social norms). The results also do not simply reflect a penalty held by the tribal population of North-East Syria either, as the effects are larger when this group is excluded (with the exception of the infrastructure outcomes). Panel C of Table 7 shows the effects for the subsample of areas with a Sunni tribal majority. The effects on income and education level are reduced to very low levels and none of the effects are statistically significant at the 0.1 level. Though the mean outcomes for tribal areas are overall closer to those of areas with a stateless legacy (in non-tribal areas). The lack of an effect in tribal areas may be due to the stateless legacy of these communities, with settlement in Ottoman controlled areas occurring in the 19^{th} century precluding a state legacy for the affected communities even if the land itself had been under state control prior to the 19^{th} century.

5.4. The role of population density

Table 8 looks at the role of population density in explaining the gap in outcomes between areas on each side of the border line. The regressions include controls for cubic polynomial terms in longitude and latitude as in Table 3 and adds controls for population size of the town or village itself as well as controls for population sizes within 5 and 10km radiuses (all in log form). We find that the effect of statelessness is reduced when we add these controls, with the income effect measuring at 0.297 and the education-based income at 0.19, with a reduction of 49% and 56% respectively when compared with the unadjusted model in Table 3. The contribution is much larger for infrastructure, where density accounts for 100% of the gap in electricity network infrastructure and 71% of the gap in water network infrastructure, while the previously insignificant effect on the sanitation network infrastructure becomes positive and statistically significant. Population density also plays an important role in accounting for the stateless legacy effects on the proportion of farmers, the university educated, and the illiteracy rate, even though it does not matter for the proportion of managers in the labor force.

Table 8 here

6. Discussion and conclusion

The results confirm the presence of a negative effect of a legacy of statelessness on contemporary economic development in Syria. The finding supports earlier research on the topic and generalizes this fact to the setting of the MENA, where several stateless societies survived into the modern era on the margins of empires before the state centralization efforts starting in the 19th century. The results provide evidence of significant discrepancies in economic development on the two sides of the desert line. Areas exposed for a longer period to Ottoman state control have better economic outcomes in the present era, and the effects are found across different measures including income and physical and human capital. Towns and villages which experienced stable state rule in the western side of the desert line have higher average incomes, more developed physical infrastructure, and higher levels of education and a higher proportion of workers employed in white collar jobs as measured in the census data.

The observed effects on economic development are robust to geographic confounding factors. The similar geography across the two sides of the historical border allows for clean identification of the causal effect of stateless legacy holding geography constant. The results are also robust for controlling for geographic factors and for various geographic robustness tests.

The effect of a legacy of statelessness is not likely to be transmitted through cultural norms. The causal effect is slightly larger when we control for ethnic and religious composition, and largest when we excluding non-Sunni Muslim groups. The observed effect is not driven by the gap between tribal and non-tribal communities in Syria either. The gaps in economic outcomes found across the desert line are unlikely to be a simple function of regional inequality during or before the Ottoman era. Infrastructure measures capture recently-built infrastructure that was created in the mid to late 20th century, and literacy and primary education spread in Syria in the course of the 20th century, well after the gap in state presence had been closed.

The evidence is in line with the previous studies that find a persistent effect of state legacy on economic development in the present (Michalopoulos and Papaioannou 2013, Dell et al. 2018). However, the lack of a role for cultural transmission in this context is a notable one, as it goes against the theory that persistence is transmitted through a cultural mechanism, such as the social norms regarding cheating and following rules (Lowes et al. 2017).

The analysis shows that the gap in population density across the border line is an important correlate of the gap in economic development. Rural insecurity prior to state expansion in the 19th century led to emigration into state-controlled areas west of the border line, with long term implications for the population distribution in the region. Low population density in areas with a legacy of statelessness explains around half the observed effects on income and education levels, and most of the effect on infrastructure variables and on the proportion of farmers in the labor force.

While the study finds evidence for a large negative effect of a legacy of statelessness on economic development today, the size of the effect may be conditional on government policy choices. The infrastructure effects disappears when we exclude tribal areas, which may suggest a tribal-specific penalty in infrastructure development projects or may point to an institutional mechanism even though the lack of data does not allow for analysis of local governance institutions. At the same time, the relatively smaller effects on the electricity network and the more developed status of this network on both sides of the border line reflects the Syrian state's prioritization of rural electrification after 1970 (Hinnebusch 2012).

The conflict between the ways of life of settled agrarian communities and nomadic groups is a recurring theme in the history of the MENA region and continues to influence the politics of many developing countries today, particularly in Sub-Saharan Africa. In a world of climate change, increased conflict is expected in such frontier zones where nomadism survives, with recent research highlighting how worsening climatic conditions contribute to increased conflict by increasing pressures on pastoralist populations (McGuirk and Nunn 2024, Bai and Kung 2011). The analysis here shows that such conflict can have long term consequences for economic development, as well as for human settlement patterns and urbanization more broadly.

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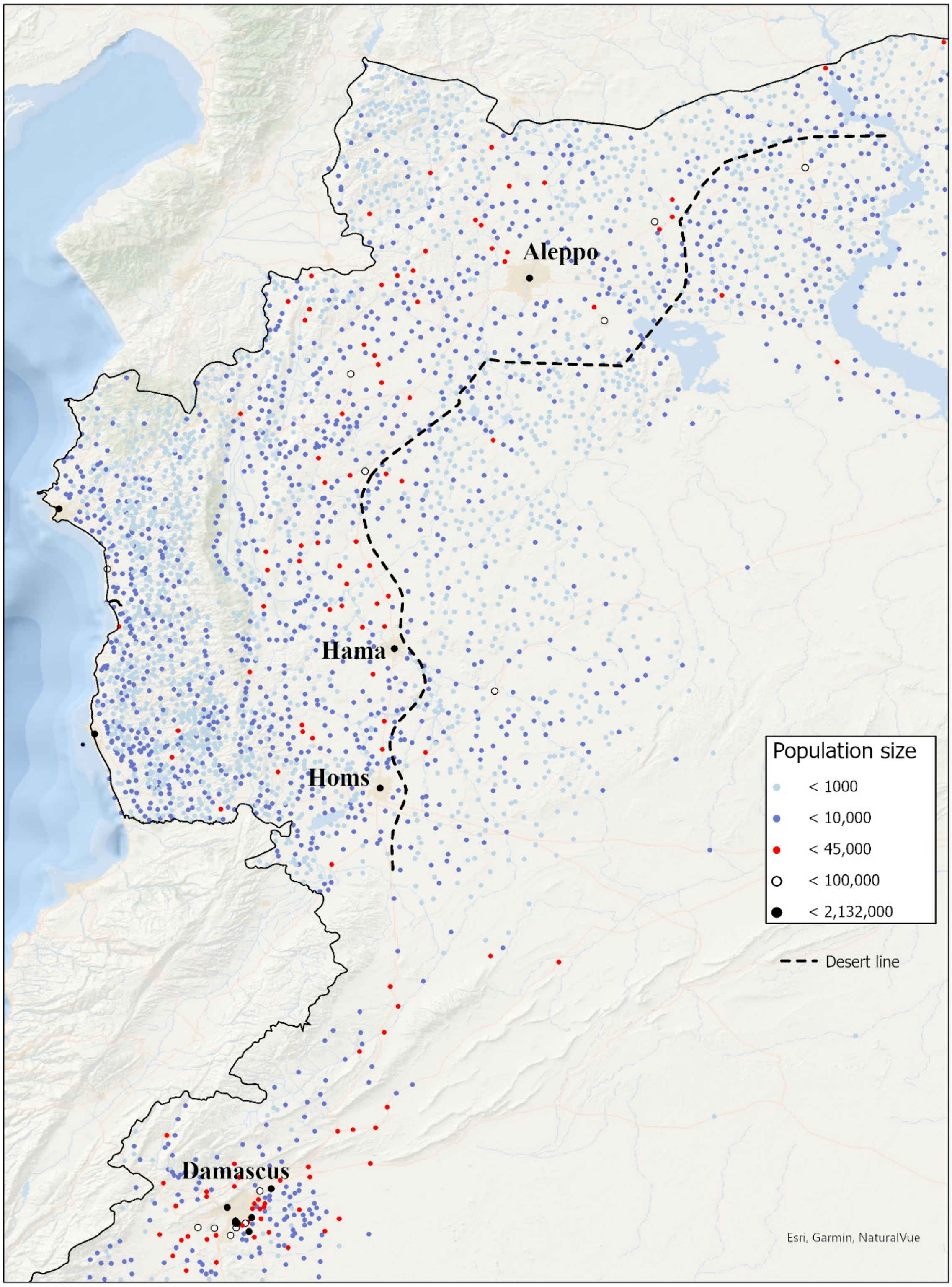
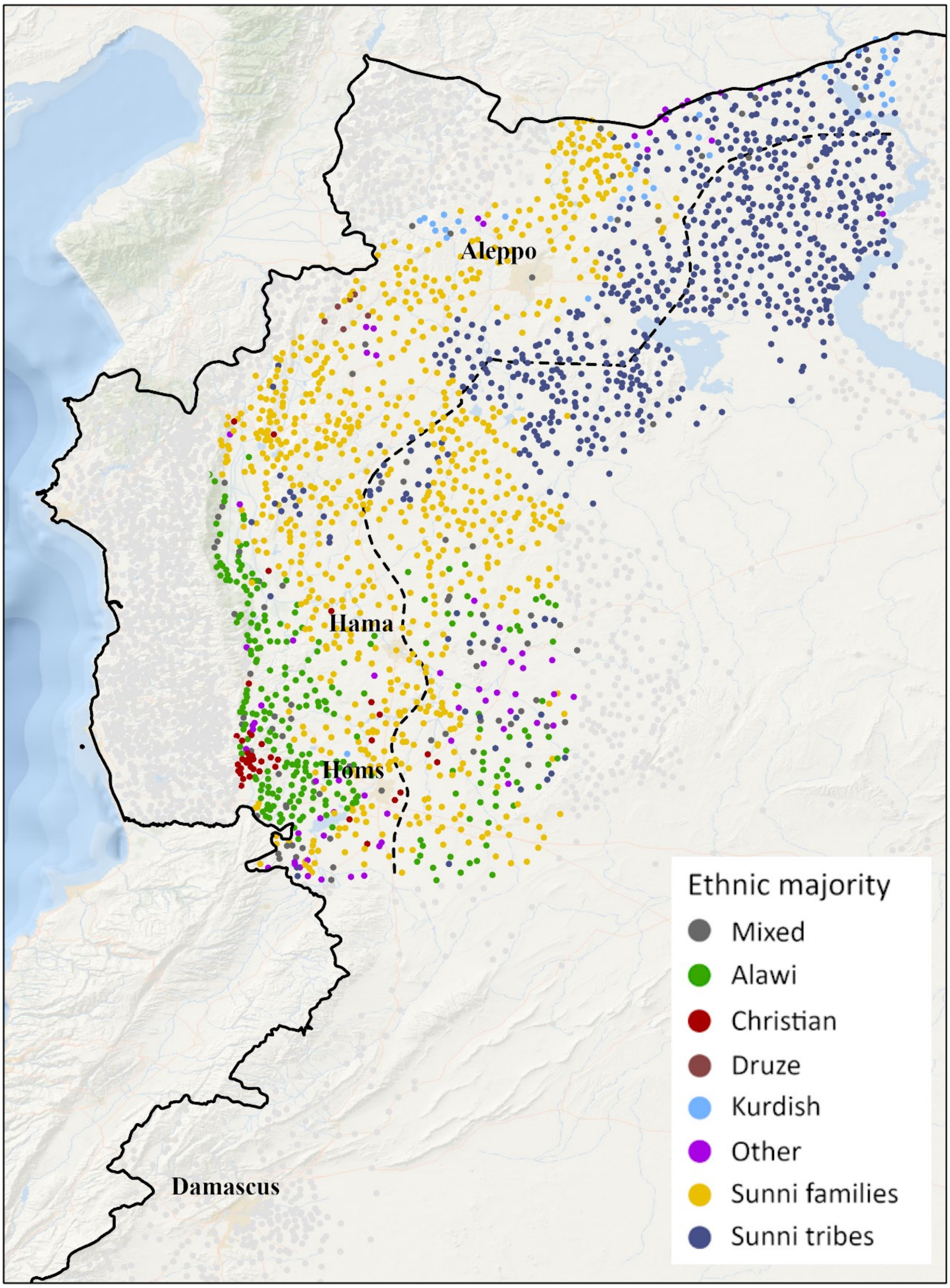
Figures and Tables

Figure 1: Map of the desert line in the west of Syria with surrounding cities, towns, and villages in 2004 according to population size



Source: Author's own map based on Lewis (1987) and the Syrian Population Census of 2004. Background ESRI OpenStreetMap.

Figure 2: Map of the study area with ethnic majorities



Source: Author's own map based on ethnic majority data from Khaddour and Mazur (2018). Background ESRI OpenStreetMap.

Figure 3: Regression discontinuity graphs

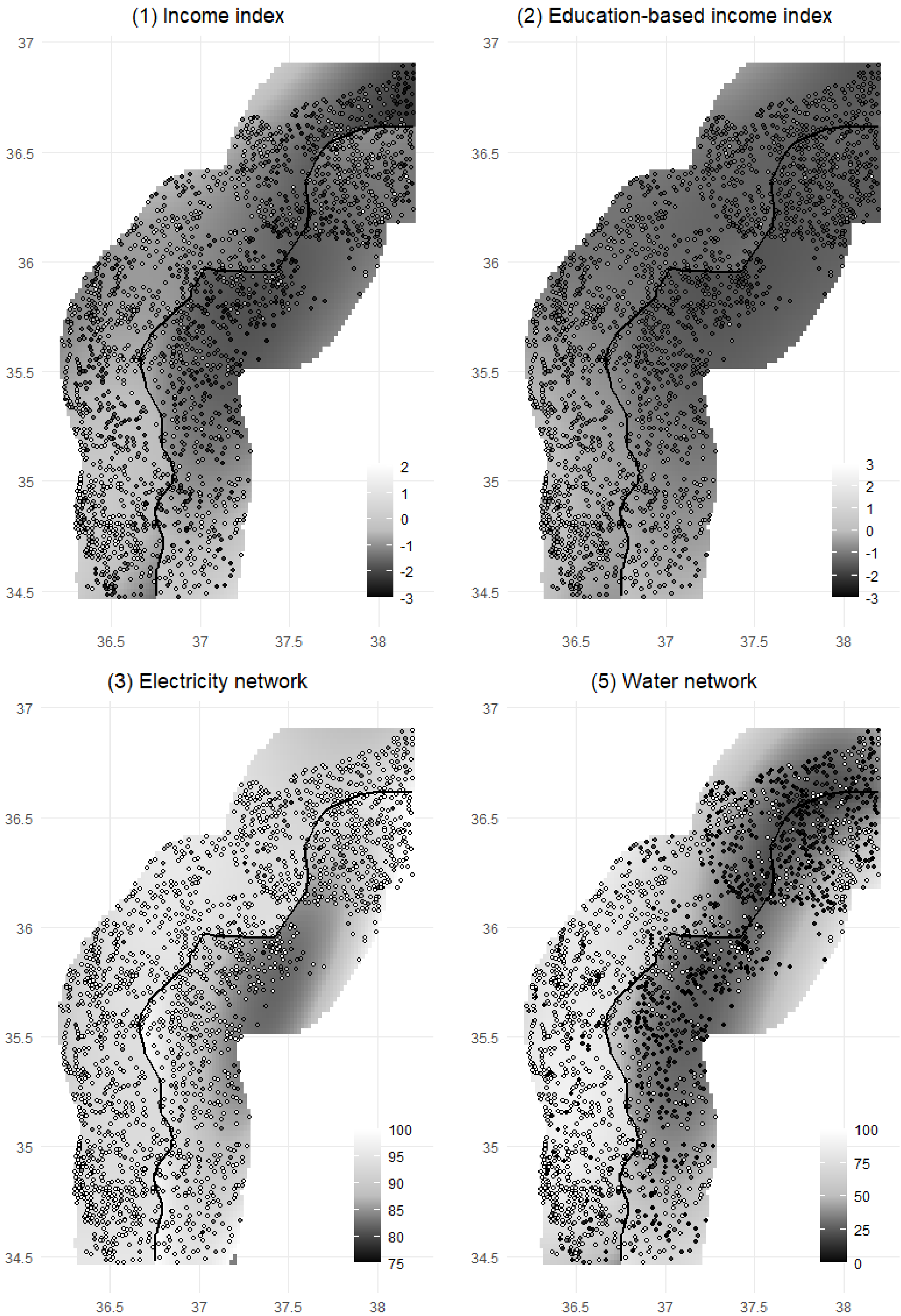


Figure 3 (continued)

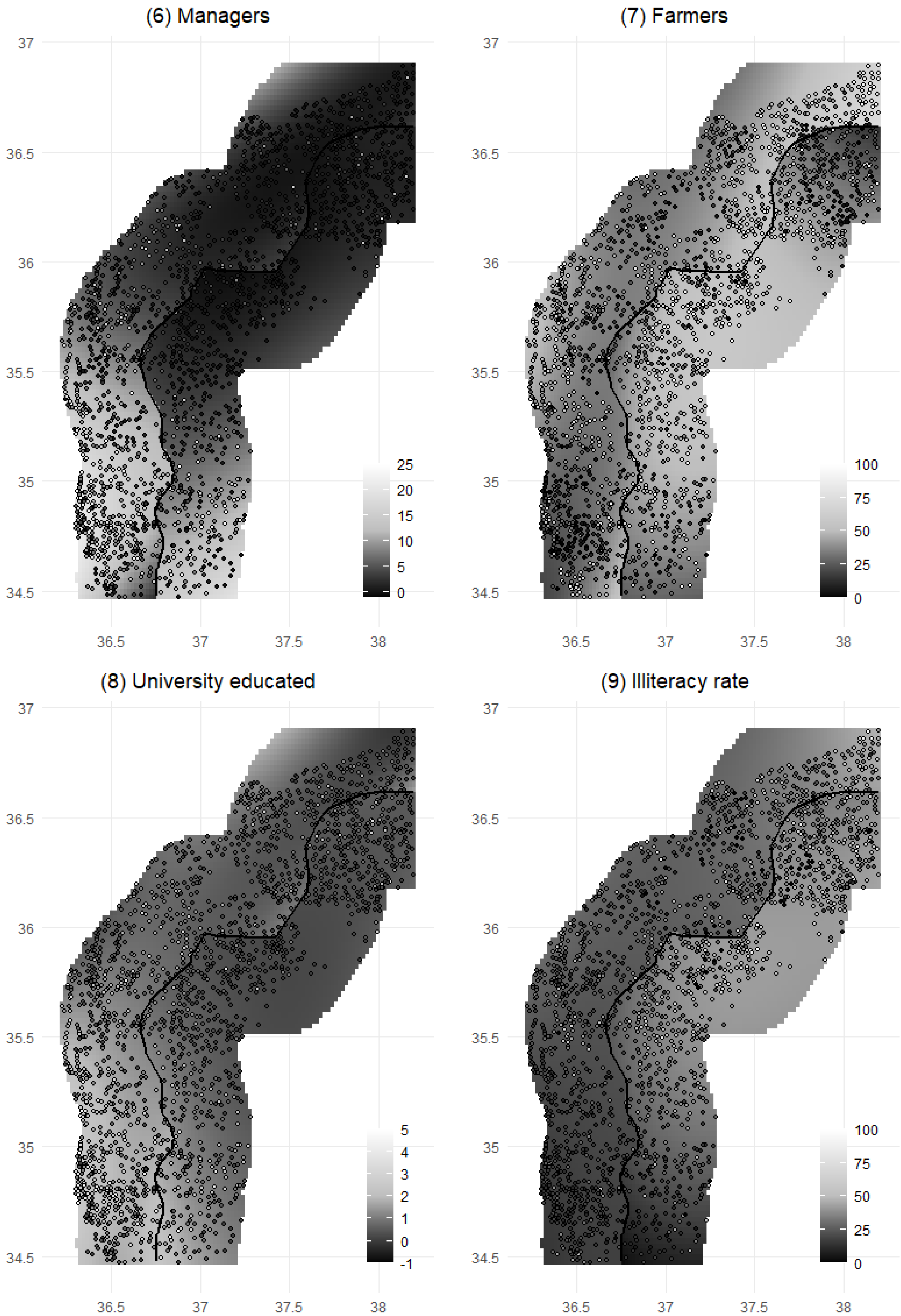


Table 1: Descriptive statistics

	Side of the border line		
	South-east *Stateless*	North-West *Ottoman state*	Difference
Income index	-1.26	-0.80	-0.46
Education-based income index	-1.20	-0.72	-0.48
Electricity network	90.6	93.4	-2.88
Sanitation network	17.8	35.3	-17.43
Water network	39.7	65.8	-26.12
Managers	3.5	7.7	-4.19
Farmers	39.1	43.4	4.28
University educated	0.6	1.2	-0.59
Illiteracy rate	34.2	25.0	9.21
Population	1,030	1,644	-614
Population within 5 km	5,668	13,322	-7,654
Population within 10 km	30,797	75,512	-44,715
Observations	797	1111	

Note: The table shows mean values of outcomes used in the analysis according to the placement of each town or village in relation to the Ottoman state border line. Income indices are standardized z-scores. Other outcomes are in percentages (apart from population sizes).

Table 2: Balance checks

	Dependent variable:				
	Slope	Elevation	Temperature	Precipitation	Flow Accum.
	(1)	(2)	(3)	(4)	(5)
South_East	0.718**	-38.759***	0.125***	4.127**	139.573
	(0.300)	(10.754)	(0.045)	(1.795)	(233.060)
Mean	2.6	434.8	17.5	171.8	190.928

*p<0.1; **p<0.05; ***p<0.01

Note: The table shows the RD cutoff effect using a cubic polynomial in latitude and longitude for each variable, alongside the unadjusted mean value for the entire sample.

Table 3: Regression discontinuity effects

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Linear	-0.532***	-0.438***	-3.410**	-21.942***	-22.491***	-5.010***	7.098***	-0.530***	9.216***
	(0.061)	(0.037)	(1.326)	(2.047)	(2.529)	(0.407)	(1.853)	(0.075)	(1.039)
Cubic polynomial	-0.577***	-0.431***	-7.754***	-2.006	-27.177***	-3.648***	10.098***	-0.471***	13.676***
	(0.113)	(0.066)	(2.659)	(4.073)	(4.289)	(0.797)	(3.446)	(0.154)	(1.956)
Geographic controls	-0.500***	-0.409***	-7.338***	-0.903	-26.805***	-3.589***	7.743**	-0.421***	13.541***
	(0.112)	(0.067)	(2.673)	(4.080)	(4.313)	(0.806)	(3.379)	(0.157)	(1.959)
Ethnicity controls	-0.645***	-0.523***	-8.703***	-3.232	-28.155***	-4.279***	11.210***	-0.653***	14.533***
	(0.111)	(0.062)	(2.729)	(4.122)	(4.289)	(0.735)	(3.448)	(0.145)	(1.977)

*p<0.1; **p<0.05; ***p<0.01

Note: The table shows the RD cutoff effect for different model specifications and outcomes. Standard errors clustered by district are in parentheses (92 clusters). All regressions control for log distance to Aleppo. The basic linear model includes controls for latitude and longitude on each side of the regression discontinuity line. The cubic polynomial model includes controls for latitude and longitude on each side of the discontinuity of the form $x + y + x^2 + y^2 + xy + x^3 + y^3 + x^2y + xy^2$ where x and y denote longitude and latitude. The third and fourth rows include the cubic polynomial model and controls for geographic variables (elevation, slope, temperature, precipitation, and flow accumulation) and for ethnic majority composition respectively. Full regression outputs are included in Appendix tables A2 to A5.

Table 4: Spatial autoregressive lag models

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.211**	-0.191***	-6.144**	-2.441	-13.954***	-1.625*	3.751	-0.283**	8.189***
	(0.103)	(0.066)	(2.460)	(3.885)	(4.032)	(0.895)	(2.819)	(0.143)	(1.767)
Constant	0.338	-0.363	53.353***	50.485***	31.261*	6.576*	2.639	0.593	13.247*
	(0.446)	(0.286)	(11.099)	(17.249)	(17.413)	(3.911)	(12.277)	(0.623)	(7.545)
Observations	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908

*p<0.1; **p<0.05; ***p<0.01

Note: The above table shows the RD cutoff effect for the spatial autoregressive lag models. Full regression outputs are included in Appendix table A6.

Table 5: Moran's I statistics

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Agriculture	University educated	Illiteracy rate
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cubic polynomial	0.280***	0.246***	0.071***	0.177***	0.205***	0.255***	0.295***	0.139***	0.171***
	[25.64]	[22.583]	[6.565]	[16.188]	[18.764]	[23.48]	[26.994]	[12.886]	[15.706]
Spatial lag	-0.011	-0.008	-0.005	-0.008	-0.011	-0.014	-0.015	-0.007	-0.011
	[-0.98]	[-0.676]	[-0.413]	[-0.675]	[-0.916]	[-1.239]	[-1.299]	[-0.590]	[-0.976]

*p<0.1; **p<0.05; ***p<0.01

Note: The above table reports the Moran's I statistics for the cubic polynomial models and the spatial autoregressive lag models based on the 8 nearest neighbors of each point. Z-scores are reported in brackets. The models in question are reported in Appendix tables A3 and A6.

Table 6: RD effects using placebo lines and placebo outcomes

	Panel A: Placebo borders								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
25 Km West	-0.133	-0.052	3.771*	-9.695***	5.094	-1.211	5.179*	-0.009	1.271
	(0.096)	(0.058)	(1.973)	(3.364)	(3.198)	(0.894)	(2.659)	(0.115)	(1.339)
25 Km East	-0.186**	-0.251***	-5.287**	-3.837	-6.225	-3.244***	-2.288	-0.215***	9.380***
	(0.089)	(0.048)	(2.539)	(2.835)	(3.798)	(0.632)	(2.840)	(0.083)	(1.804)

	Panel B: Placebo outcomes						
	Unemployment rate	FLFP	Sex ratio	Dwellings in refurbishment	Rented dwellings	Empty dwellings	Gender gap in schooling
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	0.845	-1.232	-0.014	-0.132	-0.224	1.270*	0.223
	(0.974)	(1.091)	(0.011)	(0.441)	(0.571)	(0.753)	(0.365)

*p<0.1; **p<0.05; ***p<0.01

Note: Panel A shows the regression discontinuity effects using two alternative border lines 25 kilometers west and east of the true line estimated using a cubic polynomial in longitude and latitude. Panel B shows the regression discontinuity effects using the true line and a set of placebo outcomes with a linear function in longitude and latitude.

Table 7: RD effects according to ethnic group

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Sunni Muslims									
South_East	-0.624***	-0.563***	-9.876***	-5.631	-28.045***	-3.885***	10.260***	-0.806***	14.511***
	(0.124)	(0.068)	(3.101)	(4.603)	(4.807)	(0.642)	(3.923)	(0.152)	(2.115)
Mean (Ottoman)	-1.066	-1.006	93.736	30.316	61.615	3.831	42.332	0.849	27.304
Observations	1,438	1,438	1,438	1,438	1,438	1,438	1,438	1,438	1,438
Panel B: Sunni Muslims excluding tribes									
South_East	-1.151***	-0.799***	14.797	-13.331	-5.628	-2.220	23.947**	-1.360***	14.057**
	(0.386)	(0.219)	(9.144)	(14.423)	(15.667)	(2.283)	(11.190)	(0.459)	(6.115)
Mean (Ottoman)	-0.826	-0.867	94.187	36.507	74.914	4.932	37.299	1.004	24.254
Observations	745	745	745	745	745	745	745	745	745
Panel C: Sunni tribes									
South_East	-0.132	-0.128	-7.481	-13.781	1.739	-1.425	3.485	-0.322	4.318
	(0.364)	(0.160)	(7.317)	(13.355)	(17.025)	(1.217)	(11.791)	(0.326)	(8.036)
Mean (Ottoman)	-1.565	-1.296	92.798	17.452	33.981	1.544	52.792	0.528	33.640
Observations	693	693	693	693	693	693	693	693	693

*p<0.1; **p<0.05; ***p<0.01

Note: The table shows the regression discontinuity effect for three subsamples. Panel A includes only locations with majority Sunni Muslim populations. Panel B further excludes locations with majority tribal populations. Panel C includes only locations with majority tribal populations. Mean outcomes are shown for areas with an Ottoman state legacy.

Table 8: RD effects controlling for population density

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.297**	-0.190***	0.592	19.027***	-7.949*	-3.483***	2.837	-0.236	6.398***
	(0.122)	(0.070)	(2.835)	(4.225)	(4.582)	(0.928)	(3.765)	(0.155)	(2.083)
% explained by density	49	56	100	-	71	5	72	50	53
Observations	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908

*p<0.1; **p<0.05; ***p<0.01

Note: The table shows the regression discontinuity effect controlling for the size of the local population and the population of the neighboring area within diameters of 5- and 10-kilometers distance (in log form). The percentage of the RD effect explained by population density is calculated by comparing the RD effects in this table with those yielded in the unadjusted model in Table 3 (second row).

Online Appendix

Table A1: Regression discontinuity effects using 25km bands

	Dependent variable:								
	Income index	Education-based income index	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Linear	-0.321***	-0.333***	-3.706***	-15.950***	-17.691***	-3.984***	2.503	-0.417***	9.216***
	(0.064)	(0.040)	(1.398)	(2.210)	(2.665)	(0.464)	(1.962)	(0.087)	(1.039)
Cubic polynomial	-0.563***	-0.548***	-10.448***	-5.398	-24.111***	-0.794	11.722***	-0.707***	17.231***
	(0.143)	(0.080)	(3.232)	(5.168)	(5.401)	(0.933)	(4.406)	(0.180)	(2.408)

*p<0.1; **p<0.05; ***p<0.01

Note: Standard errors clustered by district are in parentheses (92 clusters). All regressions control for log distance to Aleppo. The basic linear model includes controls for latitude and longitude on each side of the regression discontinuity line. The cubic polynomial model includes controls for latitude and longitude on each side of the discontinuity of the form $x + y + x^2 + y^2 + xy + x^3 + y^3 + x^2y + xy^2$ where x and y denote longitude and latitude.

Table A2: RD regression models with linear longitude and latitude

	Dependent variable:								
	Income index	Education-based income	Electricity network	Sanitation network	Water network	Managers	Agriculture	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.532^{***}	-0.438^{***}	-3.410^{**}	-21.942^{***}	-22.491^{***}	-5.010^{***}	7.098^{***}	-0.530^{***}	9.216^{***}
	(0.061)	(0.037)	(1.326)	(2.047)	(2.529)	(0.407)	(1.853)	(0.075)	(1.039)
log(to_Aleppo)	0.064	0.263^{***}	1.897	-4.460^{**}	4.832^{**}	2.511^{***}	1.820	0.291^{***}	0.559
	(0.051)	(0.025)	(1.153)	(1.963)	(2.105)	(0.237)	(1.658)	(0.044)	(1.005)
South_East:long	0.608^{***}	0.097	2.143	14.725^{***}	19.644^{***}	4.324^{***}	-16.727^{***}	-0.082	-3.884
	(0.146)	(0.089)	(2.506)	(4.333)	(6.004)	(0.960)	(4.240)	(0.133)	(2.430)
South_East:lat	-0.781^{***}	-0.504^{***}	-0.152	-22.324^{***}	-17.730^{***}	-7.478^{***}	6.335^{*}	-0.323^{***}	13.796^{***}
	(0.135)	(0.078)	(2.133)	(3.823)	(4.688)	(1.080)	(3.551)	(0.115)	(1.853)
long:North_West	-0.517^{***}	-0.341^{***}	-0.849	2.815	-45.193^{***}	-2.290^{***}	9.300^{***}	-0.223	4.748^{***}
	(0.097)	(0.062)	(1.837)	(3.456)	(3.145)	(0.837)	(2.633)	(0.148)	(1.304)
lat:North_West	-0.357^{***}	-0.320^{***}	1.638	-21.362^{***}	8.828^{***}	-5.116^{***}	6.159^{**}	-0.579^{***}	6.489^{***}
	(0.094)	(0.062)	(1.791)	(3.303)	(3.069)	(0.888)	(2.453)	(0.156)	(1.234)
Constant	-1.186^{***}	-1.936^{***}	85.048^{***}	55.066^{***}	35.440^{***}	-3.640^{***}	33.210^{***}	-0.100	23.611^{***}
	(0.230)	(0.114)	(5.110)	(8.812)	(9.353)	(1.085)	(7.375)	(0.215)	(4.457)
Observations	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908
R^2	0.200	0.409	0.007	0.124	0.250	0.310	0.062	0.199	0.209
Adjusted R^2	0.197	0.407	0.004	0.121	0.248	0.308	0.059	0.196	0.206
Residual Std. Error	0.999	0.620	20.554	34.832	36.227	8.374	27.628	1.242	15.350
F Statistic	78.981^{***}	219.409^{***}	2.260^{**}	44.746^{***}	105.553^{***}	142.336^{***}	20.765^{***}	78.576^{***}	83.555^{***}

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table A3: RD regression models with cubic polynomial longitude and latitude

	Dependent variable:								
	Income index	Education-based income	Electricity network	Sanitation network	Water network	Managers	Agriculture	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.577***	-0.431***	-7.754***	-2.006	-27.177***	-3.648***	10.098***	-0.471***	13.676***
	(0.113)	(0.066)	(2.659)	(4.073)	(4.289)	(0.797)	(3.446)	(0.154)	(1.956)
log(to_Aleppo)	-0.431***	-0.051	6.645**	-18.919***	-3.179	-2.916***	7.264*	-0.013	0.803
	(0.119)	(0.065)	(2.691)	(4.873)	(4.970)	(0.652)	(3.752)	(0.119)	(2.348)
South_East:long	-1.283***	-0.711***	-26.378***	3.557	-41.342***	0.638	34.690***	-0.870***	19.960***
	(0.257)	(0.160)	(6.125)	(8.990)	(11.380)	(1.319)	(7.998)	(0.223)	(4.888)
South_East:lat	-0.693**	-0.593***	18.348**	-29.362**	10.328	-11.177***	0.627	-0.398	1.206
	(0.335)	(0.198)	(7.438)	(12.329)	(13.887)	(2.094)	(9.890)	(0.329)	(5.550)
South_East:I(long2)	4.244***	2.006***	8.333	-39.324	168.202***	14.447***	-103.296***	0.502	-38.963**
	(0.984)	(0.576)	(23.013)	(31.054)	(40.521)	(4.633)	(30.744)	(0.957)	(17.851)
South_East:I(lat2)	1.146***	0.485**	15.010**	6.574	39.609***	4.392	-23.156**	0.340	-19.748***
	(0.370)	(0.219)	(6.915)	(10.539)	(12.555)	(2.886)	(9.378)	(0.306)	(4.566)
South_East:I(long3)	-1.352	-0.784	44.052	92.287**	-35.050	-7.799	63.843	0.869	20.437
	(1.540)	(0.962)	(32.183)	(46.954)	(60.395)	(8.142)	(45.528)	(1.417)	(28.023)
long:North_West	-1.028***	0.189	-0.364	-8.392	-71.508***	3.428	45.334***	1.264	3.839
	(0.398)	(0.281)	(7.888)	(15.269)	(15.294)	(3.121)	(12.162)	(0.781)	(7.304)
lat:North_West	-1.215***	-1.043***	12.139	-34.183**	-14.549	-19.257***	-4.806	-1.906***	6.528
	(0.400)	(0.265)	(7.509)	(14.863)	(13.643)	(3.080)	(10.787)	(0.618)	(5.222)
I(long2):North_West	-0.100	1.994**	2.685	54.489	-6.858	14.513	52.462*	5.810**	-3.051

	(0.980)	(0.781)	(15.680)	(35.423)	(33.707)	(10.670)	(28.749)	(2.446)	(14.450)
I(lat2):North_West	0.694	0.803*	-3.888	45.299***	7.173	5.527	6.523	2.383*	-4.571
	(0.469)	(0.415)	(7.754)	(17.504)	(16.662)	(5.431)	(12.305)	(1.353)	(6.102)
I(long3):North_West	0.686	1.284*	23.837	45.496	56.780*	0.755	-10.192	4.842**	-11.681
	(0.921)	(0.682)	(16.348)	(34.803)	(31.143)	(8.970)	(26.977)	(2.053)	(13.388)
North_West:I(lat3)	1.862***	0.703*	-7.802	45.668***	39.235***	20.397***	-20.401*	0.409	-0.834
	(0.477)	(0.359)	(8.996)	(17.267)	(14.567)	(4.747)	(11.868)	(1.071)	(5.660)
South_East:long:lat	-0.648	0.256	-4.485	78.115**	-106.757***	-2.458	33.977	1.926*	10.024
	(1.115)	(0.693)	(20.732)	(36.527)	(40.930)	(8.245)	(29.094)	(0.998)	(15.637)
South_East:lat:I(long2)	-2.476	-1.295	-70.232	-156.345*	-7.889	-3.646	-48.651	-2.935	1.445
	(2.890)	(1.880)	(49.050)	(84.778)	(104.594)	(19.450)	(75.564)	(2.451)	(48.397)
South_East:long:I(lat2)	2.321	0.927	22.072	43.891	-41.618	8.830	-6.409	0.738	-0.976
	(1.451)	(0.921)	(23.895)	(42.777)	(51.037)	(11.162)	(36.929)	(1.326)	(22.467)
long:lat:North_West	0.170	-1.821	-8.093	-46.805	-4.616	-6.889	-62.188*	-6.849*	8.908
	(1.310)	(1.122)	(22.552)	(48.078)	(45.988)	(14.862)	(36.884)	(3.612)	(18.924)
lat:I(long2):North_West	0.017	-3.424**	-29.093	-28.718	-4.773	0.033	-34.567	-11.416**	29.946
	(2.126)	(1.736)	(38.033)	(77.756)	(66.692)	(24.159)	(56.631)	(5.527)	(27.615)
long:I(lat2):North_West	-1.759	0.902	4.612	-60.545	-27.705	-20.505	46.328	5.004	-12.402
	(1.508)	(1.309)	(26.844)	(53.739)	(43.422)	(18.363)	(36.137)	(4.313)	(16.195)
Constant	0.569	-0.835***	68.959***	92.621***	68.507***	16.131***	15.063	0.922**	21.981**
	(0.454)	(0.245)	(10.468)	(18.701)	(18.851)	(2.409)	(14.329)	(0.420)	(8.884)
Observations	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908
Adjusted R^2	0.264	0.451	0.021	0.164	0.288	0.346	0.126	0.224	0.246
F Statistic	37.008***	83.303***	3.119***	20.661***	41.500***	54.143***	15.519***	29.898***	33.664***
Note:									*p<0.1; **p<0.05; ***p<0.01

Table A4: RD regression models with cubic polynomial longitude and latitude and controls for ethnic majority

	Dependent variable:								
	Income index	Education-based income	Electricity network	Sanitation network	Water network	Managers	Agriculture	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.645***	-0.523***	-8.703***	-3.232	-28.155***	-4.279***	11.210***	-0.653***	14.533***
	(0.111)	(0.062)	(2.729)	(4.122)	(4.289)	(0.735)	(3.448)	(0.145)	(1.977)
log(to_Aleppo)	-0.318***	0.062	7.177***	-17.825***	-2.463	-1.680***	5.594	0.144	-0.266
	(0.118)	(0.065)	(2.589)	(4.930)	(4.991)	(0.645)	(3.644)	(0.121)	(2.320)
Ethnicity Alawi	0.913***	0.615***	2.342	1.473	7.301**	9.941***	-15.601***	0.575***	-6.887***
	(0.109)	(0.072)	(2.200)	(3.515)	(3.267)	(1.117)	(2.508)	(0.137)	(0.974)
Ethnicity Christian	0.620***	1.320***	4.993	33.353***	18.697***	0.051	-12.192***	3.253***	-8.362***
	(0.188)	(0.142)	(3.275)	(5.305)	(4.191)	(1.721)	(4.480)	(0.389)	(1.336)
Ethnicity Druze	-0.139	0.307*	0.143	-34.472***	13.482***	3.329	15.540*	0.648*	-4.832
	(0.361)	(0.165)	(2.648)	(5.707)	(4.097)	(2.527)	(8.859)	(0.339)	(5.197)
Ethnicity Kurdish	-0.864***	-0.179**	-8.462**	-17.445***	-21.603***	-0.143	26.962***	-0.153	8.061**
	(0.121)	(0.079)	(3.509)	(6.217)	(6.610)	(0.578)	(4.434)	(0.117)	(3.703)
Ethnicity Mixed	0.557***	0.489***	6.035***	3.694	3.765	5.394***	-10.857***	0.651***	-4.311***
	(0.143)	(0.090)	(1.403)	(4.713)	(4.608)	(1.323)	(3.165)	(0.190)	(1.481)
Ethnicity Other minority	0.234	0.341***	-0.621	-1.590	0.866	4.922**	-1.375	0.670*	-1.308
	(0.157)	(0.124)	(3.433)	(5.284)	(5.279)	(1.972)	(3.655)	(0.346)	(1.792)
Ethnicity Sunni tribes	-0.177**	0.008	-5.617***	-3.789	-7.262**	0.782	5.829**	0.048	3.975***
	(0.084)	(0.048)	(2.137)	(2.857)	(3.444)	(0.488)	(2.450)	(0.095)	(1.527)
South_East:long	-1.374***	-0.891***	-23.633***	5.607	-38.304***	-2.326*	34.216***	-1.139***	18.958***
	(0.250)	(0.153)	(6.161)	(9.443)	(11.333)	(1.272)	(7.990)	(0.229)	(4.930)

South_East:lat	-0.007	-0.110	26.177***	-23.109*	20.637	-5.846***	-12.982	0.249	-6.712
	(0.346)	(0.202)	(7.438)	(12.814)	(14.537)	(2.229)	(10.125)	(0.366)	(5.686)
South_East:I(long2)	4.089***	1.785***	12.068	-37.138	172.891***	10.542**	-103.059***	0.298	-40.040**
	(0.993)	(0.550)	(23.437)	(31.591)	(40.980)	(4.690)	(31.119)	(0.885)	(18.322)
South_East:I(lat2)	1.252***	0.558***	18.982***	9.473	43.458***	4.270	-26.260***	0.514	-22.104***
	(0.358)	(0.206)	(7.068)	(10.736)	(12.832)	(2.771)	(9.339)	(0.314)	(4.663)
South_East:I(long3)	-0.943	-0.303	37.241	87.194*	-41.753	1.046	61.276	1.364	21.677
	(1.529)	(0.931)	(32.728)	(47.702)	(61.267)	(8.142)	(46.004)	(1.349)	(28.378)
long:North_West	-1.127***	-0.164	3.941	-11.906	-70.013***	1.432	44.910***	0.511	2.803
	(0.389)	(0.261)	(8.253)	(15.368)	(15.625)	(2.959)	(11.940)	(0.747)	(7.307)
lat:North_West	-0.616	-0.514**	14.839**	-28.179*	-7.312	-13.959***	-15.054	-1.152*	0.712
	(0.382)	(0.246)	(7.537)	(14.733)	(13.724)	(2.904)	(10.422)	(0.600)	(5.119)
I(long2):North_West	-1.097	0.753	-5.134	35.502	-22.775	6.729	68.851**	3.451	8.594
	(0.941)	(0.721)	(16.563)	(35.549)	(34.067)	(10.151)	(27.657)	(2.313)	(14.466)
I(lat2):North_West	0.306	0.401	-10.575	38.115**	-1.785	3.209	13.678	1.603	1.862
	(0.464)	(0.380)	(8.330)	(17.439)	(16.870)	(5.202)	(12.252)	(1.275)	(6.290)
I(long3):North_West	0.458	0.984	15.380	35.523	47.777	0.975	-5.278	4.104**	-5.099
	(0.909)	(0.653)	(17.369)	(34.670)	(31.475)	(8.705)	(26.442)	(2.013)	(13.650)
North_West:I(lat3)	1.273***	0.127	-10.770	42.466**	30.516**	15.028***	-11.666	-0.420	5.748
	(0.467)	(0.348)	(9.403)	(17.262)	(14.813)	(4.492)	(11.741)	(1.019)	(5.471)
South_East:long:lat	-0.723	0.276	-15.534	68.430*	-118.121***	1.651	39.843	1.732*	15.930
	(1.103)	(0.669)	(20.893)	(37.247)	(42.357)	(8.317)	(29.381)	(0.992)	(16.054)
South_East:lat:I(long2)	-2.976	-1.858	-54.139	-143.214*	5.727	-17.365	-48.190	-3.310	-3.323
	(2.843)	(1.827)	(49.207)	(85.862)	(106.240)	(19.563)	(76.424)	(2.413)	(48.582)
South_East:long:I(lat2)	1.846	0.690	6.350	32.165	-57.984	9.405	7.359	0.256	9.169

	(1.461)	(0.907)	(23.698)	(43.558)	(52.394)	(11.631)	(38.144)	(1.344)	(22.534)
long:lat:North_West	0.664	-1.132	2.346	-30.733	11.331	-5.679	-71.460**	-5.265	-1.222
	(1.253)	(1.023)	(23.463)	(47.283)	(45.730)	(14.216)	(35.427)	(3.435)	(18.953)
lat:I(long2):North_West	1.472	-2.130	-11.188	7.709	20.903	7.614	-67.074	-8.931*	12.267
	(2.090)	(1.627)	(39.323)	(77.138)	(67.016)	(23.127)	(55.540)	(5.262)	(27.839)
long:I(lat2):North_West	-1.858	1.136	-2.225	-72.876	-29.311	-18.686	54.948	5.349	-10.814
	(1.493)	(1.228)	(27.845)	(53.133)	(43.632)	(17.604)	(36.024)	(4.103)	(16.162)
Constant	0.233	-1.230***	70.215***	91.168***	69.758***	11.062***	18.491	0.415	23.798***
	(0.448)	(0.244)	(10.468)	(18.862)	(18.999)	(2.334)	(13.895)	(0.424)	(8.931)
Observations	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908	1,908
R^2	0.326	0.515	0.041	0.191	0.304	0.422	0.172	0.314	0.272
Adjusted R^2	0.317	0.508	0.028	0.180	0.295	0.414	0.161	0.305	0.261
Residual Std. Error	0.921	0.565	20.302	33.645	35.074	7.703	26.082	1.155	14.806
F Statistic	34.984***	76.688***	3.129***	17.087***	31.642***	52.889***	15.071***	33.117***	26.965***

Note: *p<0.1; **p<0.05; ***p<0.01

Table A5: RD regression models with cubic polynomial longitude and latitude and controls for geographic variables

	Dependent variable:								
	Income index	Education-based income	Electricity network	Sanitation network	Water network	Managers	Farmers	University educated	Illiteracy rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
South_East	-0.500***	-0.409***	-7.338***	-0.903	-26.805***	-3.589***	7.743**	-0.421***	13.541***
	(0.112)	(0.067)	(2.673)	(4.080)	(4.313)	(0.806)	(3.379)	(0.157)	(1.959)
log(to_Aleppo)	-0.490***	-0.055	4.725*	-23.100***	-3.729	-1.779**	9.849**	-0.136	0.165
	(0.125)	(0.068)	(2.809)	(5.009)	(5.101)	(0.728)	(3.860)	(0.131)	(2.367)
Slope	-0.018***	-0.009***	0.104	-0.688***	-0.375**	-0.078	0.475***	-0.001	0.325***
	(0.005)	(0.003)	(0.087)	(0.178)	(0.172)	(0.052)	(0.128)	(0.008)	(0.093)
Elevation	0.001*	0.0003*	0.004	-0.013	-0.003	0.001	-0.009	0.001***	0.002
	(0.0003)	(0.0002)	(0.006)	(0.009)	(0.009)	(0.003)	(0.007)	(0.0004)	(0.004)
Temperature	-0.354***	-0.052	-0.393	-1.274	-0.192	-1.707**	11.347***	0.017	0.591
	(0.078)	(0.049)	(1.889)	(2.834)	(2.680)	(0.690)	(1.917)	(0.098)	(1.115)
Precipitation	0.001	0.001	-0.073***	-0.218***	-0.035	0.061***	0.044	-0.002	-0.027*
	(0.001)	(0.001)	(0.026)	(0.045)	(0.040)	(0.014)	(0.032)	(0.002)	(0.015)
Flow accumulation	-0.00001**	0.00000	0.00003	-0.00003	0.0001	-0.00005	0.0002**	-0.00000	-0.00002
	(0.00000)	(0.00000)	(0.0001)	(0.0002)	(0.0002)	(0.00004)	(0.0001)	(0.00001)	(0.0001)
South_East:long_d	-0.751***	-0.547***	-31.095***	-10.987	-43.756***	7.412***	22.488***	-0.990***	17.227***
	(0.289)	(0.185)	(6.651)	(10.124)	(12.152)	(1.831)	(8.531)	(0.294)	(5.114)
South_East:lat_d	-0.909***	-0.680***	20.556***	-23.125*	11.294	-14.023***	4.788	-0.398	2.667
	(0.336)	(0.202)	(7.527)	(12.531)	(13.996)	(2.177)	(9.808)	(0.339)	(5.579)
South_East:I(long_d2)	1.921*	1.335**	10.368	-12.633	173.235***	-1.267	-42.243	-0.196	-34.851*
	(1.039)	(0.615)	(23.421)	(34.136)	(42.726)	(5.466)	(31.991)	(1.063)	(18.364)

South_East:I(lat_d2)	0.202	0.222	15.520**	14.597	41.007***	-1.586	2.193	0.072	-17.876***
	(0.388)	(0.235)	(7.655)	(11.714)	(13.527)	(3.037)	(9.824)	(0.349)	(4.923)
South_East:I(long_d3)	0.987	-0.138	47.430	75.874	-39.012	4.029	-0.072	1.900	18.839
	(1.559)	(0.981)	(32.642)	(48.635)	(61.571)	(8.612)	(46.025)	(1.480)	(28.336)
long_d:North_West	-0.427	0.408	-4.559	-23.642	-73.894***	10.151***	32.243***	1.330*	1.093
	(0.411)	(0.295)	(8.055)	(15.817)	(15.539)	(3.427)	(12.219)	(0.804)	(7.472)
lat_d:North_West	-1.814***	-1.250***	12.085	-29.157**	-13.984	-22.635***	10.179	-2.237***	7.832
	(0.398)	(0.276)	(7.785)	(14.873)	(13.923)	(3.309)	(10.553)	(0.645)	(5.436)
I(long_d2):North_West	-1.243	1.449	33.451*	152.109***	10.985	-17.403	63.976*	6.913***	8.188
	(1.193)	(0.891)	(19.601)	(41.577)	(39.731)	(12.167)	(33.986)	(2.638)	(17.231)
I(lat_d2):North_West	-0.015	0.556	5.721	78.501***	13.698	-6.697	20.087	2.693*	-0.600
	(0.528)	(0.445)	(9.151)	(19.496)	(18.878)	(5.822)	(13.825)	(1.401)	(7.127)
I(long_d3):North_West	-0.487	0.810	38.228**	92.847**	64.121*	-17.573*	11.999	5.076**	-4.182
	(0.984)	(0.707)	(17.179)	(36.612)	(33.133)	(9.303)	(29.064)	(2.085)	(14.543)
North_West:I(lat_d3)	2.714***	1.009***	-11.762	36.207**	39.776***	27.821***	-41.251***	0.522	-5.653
	(0.479)	(0.368)	(9.618)	(17.655)	(15.376)	(4.983)	(11.794)	(1.084)	(6.227)
South_East:long_d:lat_d	0.922	0.686	-1.337	73.452*	-107.873***	4.354	-9.536	2.667***	8.469
	(1.120)	(0.700)	(21.574)	(37.493)	(41.795)	(8.321)	(29.451)	(1.026)	(15.911)
South_East:lat_d:I(long_d2)	-4.370	-1.777	-79.273	-158.128*	-6.621	-8.285	6.184	-4.139*	0.232
	(2.869)	(1.879)	(49.795)	(85.222)	(105.066)	(19.548)	(75.038)	(2.465)	(48.470)
South_East:long_d:I(lat_d2)	2.882**	1.019	28.647	57.094	-39.893	6.978	-25.715	1.212	0.519
	(1.438)	(0.919)	(24.360)	(43.019)	(51.325)	(11.194)	(36.469)	(1.338)	(22.506)
long_d:lat_d:North_West	1.375	-1.340	-33.811	-125.850**	-18.904	21.178	-80.308**	-7.892**	-1.483
	(1.449)	(1.193)	(25.392)	(52.107)	(50.663)	(15.684)	(40.550)	(3.731)	(21.340)
lat_d:I(long_d2):North_West	3.655	-1.883	-85.986**	-210.771**	-35.007	66.972**	-95.514	-12.781**	3.120

	(2.490)	(1.903)	(43.866)	(88.714)	(78.429)	(26.396)	(67.055)	(5.791)	(33.675)
long_d:I(lat_d2):North_West	-4.441**	-0.219	44.061	53.082	-11.693	-66.670***	94.641**	6.009	9.388
	(1.738)	(1.416)	(31.061)	(61.185)	(52.032)	(19.828)	(42.741)	(4.489)	(21.026)
Constant	7.009***	-0.135	90.924**	163.611***	79.725	35.155**	-204.279***	0.896	16.027
	(1.592)	(0.992)	(40.893)	(58.041)	(56.421)	(13.712)	(40.404)	(1.893)	(24.634)
Observations	1,907	1,907	1,907	1,907	1,907	1,907	1,907	1,907	1,907
R^2	0.297	0.461	0.036	0.186	0.296	0.369	0.166	0.239	0.258
Adjusted R^2	0.288	0.454	0.023	0.176	0.287	0.361	0.156	0.229	0.249
Residual Std. Error	0.940	0.595	20.357	33.730	35.263	8.044	26.161	1.216	14.932
F Statistic	33.109***	67.075***	2.898***	17.951***	32.933***	45.953***	15.626***	24.627***	27.302***

*p<0.1; **p<0.05; ***p<0.01