Ancient Colonialism and the Economic Geography of the Mediterranean

Dimitris K. Chronopoulos, Sotiris Kampanelis, Daniel Oto-Peralías* & John O.S. Wilson

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Keywords: Economic Geography, Economic Development, Ancient Colonialism, History, Mediterranean, Cities

JEL Classification: C21, N93, O1

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This paper investigates the legacy of ancient colonialism (by the Phoenicians, Greeks and Etruscans) in shaping the modern-day population concentration and economic activity of the Mediterranean region. By combining historical data on ancient colonies and current data on population density and night light emission, we find that geographic areas colonised by these civilisations tend to have higher population concentration and economic activity in the present day. We also show that ancient colonialism affected the origin and evolution of the urban system of the Mediterranean.

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1. Introduction

This paper examines the long-term legacy of ancient colonialism in shaping the economic geography of the Mediterranean. During the period spanning the 11th to the 6th centuries before the common era (BCE), the Phoenician, Greek and Etruscan civilisations spread around the Mediterranean. These ancient civilisations, which had more participatory and open political institutions than their neighbours, achieved remarkable prosperity by pre-modern standards.[1] Through a process of colonisation characterised by the foundation of urban settlements, they transferred their respective institutions, culture, technology and human capital to new locations.

Our main hypothesis is that ancient colonialism, by geographically spreading urban settlements and more advanced civilisations, had a positive legacy on the long-term concentration of population and economic activity. Colonisers brought human capital, culture, technologies and institutions to the cities they founded. This was a positive shock for the locations affected directly by the foundation of the colonies as well as the immediate surrounding geographic areas. As this shock could generate dynamics with the potential to persist over time (in terms, for instance, of agglomeration economics and institutional persistence), it would appear plausible ex ante that there is a link between ancient colonialism and modern population concentration and economic activity.[2]

To investigate whether such a link exists, we divide the territory surrounding the Mediterranean and Black Sea with a 50×50 kilometres grid, and compare geographic areas with and without ancient colonies. We collect data on the location of Phoenician, Greek, and Etruscan colonies as well as data on the geographic and climatic characteristics for all Mediterranean and Black sea countries. As a proxy for the concentration of economic activity at the sub-national level, we use fine spatial resolution light density data. We use this on the basis that prior literature shows a high correlation between light density and GDP per capita (Henderson et al., 2011, 2012; Pinkovskiy, 2016).[3] We complement the light density indicator with a measure of population density at a very high (one-square kilometre) spatial resolution. The main independent variable in our empirical analysis is a binary indicator capturing whether there is at least one ancient colony in a grid cell. Our baseline regression model includes country

[1] Morris (2004) estimates an annual rate of aggregate consumption growth of 0.6% to 0.9% over the period 800 to 300 BCE. This growth rate is certainly smaller than that of Britain after the Industrial Revolution, but higher than a very successful pre-industrial economy such as Holland between 1580 and 1820 (which grew at 0.5%).

[2] Recent research indeed emphasises the tendency of prosperity to perpetuate over time (Comin et al., 2010; Chanda, et al., 2014; Maloney and Caicedo, 2016).

[3] Chen and Nordhaus (2014), Donaldson and Storeyguard (2016) and Michalopoulos and Papaioannou (2018) provide extensive reviews of the use of light data in economic analyses.

fixed effects to capture systematic differences in the economic activity across countries. In order to compare a relatively homogeneous geographical coastal area, we restrict the sample to grid cells located within 50 kilometres of the Mediterranean coast.

The results of our empirical analysis indicate that geographic areas with ancient colonies have higher levels of light density and concentration of population. This finding is robust to a large battery of checks which include: i) the use of alternative indicators and sources of ancient colonisation; ii) the analysis of the heterogeneity of the effect across continents (to test whether the results are consistent across Europe, Asia and Africa); iii) the restriction of the sample to coastal grid cells and to coastal areas considered excellent shelters; vi) the differentiation of the effect by coloniser identity; and v) the exclusion of grid cells with a zero value in luminosity or population density.

There are two complementary explanations for the positive effect of ancient colonialism. Our first hypothesis is couched in terms of institutions and culture. Ancient colonialism was a major positive shock in terms of institutions, culture, human capital and technology. The Phoenicians, Greeks, and Etruscans enjoyed a much higher standard of living and had more inclusive institutions than the rest of their Mediterranean neighbours. All these elements were transferred to the new locations, with positive consequences for development. Another related explanation is "urban persistence", that is, once a town or settlement is founded, the forces of agglomeration economies can reinforce the dynamics of the concentration of economic activity and promote economic development over the long-run. In this sense, there is evidence that cities are very persistent, even after major shocks (Davis and Weinstein, 2002; Bleakley and Lin, 2012). We test these arguments by comparing ancient colonies with settlements of other cultures from the same era. Our findings suggest that both of these aforementioned channels play an important role.

We further analyse the role of ancient colonialism in the origin and development of the urban system in the Mediterranean. By doing so, we focus on the idea that ancient colonisers distributed around the Mediterranean a major innovation in the form of urban settlements or cities. This is an important part of the explanation (related to the mechanism "urban persistence") for the positive effect we find. Our results indicate that areas colonised by Phoenicians, Greek and Etruscans were more likely to have ancient settlements, Roman roads and later on cities. For instance, the percentage of grid cells which have had a city at some point in time from 800 to 1800 is almost 10 percentage points larger for those with ancient colonies, being the sample average of only 19%. Therefore, the positive effect of ancient colonialism on the spatial concentration of the population and economic activity can be traced back more than two millennia and has persisted since then.

The current study is framed within the vibrant literature on the historical origins of comparative development, and more specifically, within the body of research that evaluates the economic consequences of colonialism.[4] While research on modern European colonialism is extensive, this study is to our knowledge the first to assess the economic and geographic impact of ancient colonialism. Our work also contributes to the literature on the economic and social legacy of the classical world, which has recently attracted interest among economists and other social scientists (Scheidel et al., 2008; Ober, 2015; Dalgaard et al. 2015; Wahl, 2017; Bakker et al., 2018; Michaels and Rauch, 2018). While it is widely acknowledged that the influence of classical Greece is pervasive in Western culture, we document a direct and local impact of the Phoenician, Greek and Etruscan civilisations on economic outcomes. The positive effect found for ancient colonialism suggests that the benefit of having contact with these advanced cultures was in the long-run greater than any short-term costs (associated with armed conflict).

The rest of the paper is structured as follows. Section 2 provides a brief historical background. Section 3 discusses the empirical strategy and provides a preliminary discussion of the data. Section 4 presents our main results, a battery of robustness checks, and sheds some light on the mechanisms. Section 5 analyses the effect of ancient colonialism on the development of the urban system. Finally, Section 6 concludes.

2. Historical background

Etruscans, Greeks and Phoenicians developed and settled around the Mediterranean and the Black sea coasts from the 11th to the 6th century BCE. These civilisations exhibited outstanding economic and cultural progress, which has often been attributed to developed institutions, high levels of social capital and technological innovation. Focusing on the Greeks (but largely applicable also to Etruscans and Phoenicians as well), Ober (2015) argues that "citizen-centred" institutions and competitiveness were the drivers of this classical prosperity. In this section, we discuss the main characteristics of each of these civilisations and their respective expansion overseas. Figure 1 represents the geographical distribution of ancient colonies along the Mediterranean area.

[4] For literature investigating the economic consequences of colonialism, see among others: Engerman and Sokoloff (2000), Acemoglu et al. (2001), Banerjee and Iyer (2005), Angeles (2007), Feyrer and Sacerdote (2009), Dell (2010), Iyer (2010), Bruhn and Gallego (2012), Spolaore and Wacziarg (2013), Nunn (2014), Easterly and Levine (2016), Oto-Peralías and Romero-Ávila (2014a, 2014b, 2016), Michalopoulos and Papaioannou (2016) and Droller (2018).

2.1 The Greek Colonisation

The Greek colonisation took place between the 11th and the 5th century BCE. During this period, the Greeks were the most active colonisers, establishing settlements around the southern European coastline and the Black sea. In part this colonisation was prompted by domestic instability. At the beginning of the archaic period (8th century BCE), aristocracies based their socioeconomic power on the prestige of birth and wealth. However, the lack of primogeniture rights resulted in a wide division of land among siblings, undermining their previous predominant power and generating political instability (White, 1961). Higher life expectancy at birth, overpopulation, limited arable land, finite natural resources, climatic disasters in the Greek plains, and political instability were factors that led to the search for new territories to settle, mitigating at the same time emerging risks for civil-war (White, 1961; Austin and Vidal-Naquet, 1980; Cawkwell, 1992).[5]

The first wave of Greek colonisation spanned the period from the 11th until the 8th century BCE, and the second wave from the 8th to the end of the 6th century BCE. By the end of the second wave, approximately 400,000 Greeks (a third of the total population) lived outside the Aegean Sea (Morris, 2005). Religious beliefs of the ancient poleis (city-states) as well as their institutional arrangements had a significant influence on the way that new colonies were founded. New areas for colonisation were chosen via a specific ritual related to religious customs, taking guidance from several oracles within the Greek territory. Evidence from the locations of Greek poleis reflect a preference for the coast, which is well reflected in Plato's analogy "[Greeks live] like ants or frogs around a pond" (Plato's dialogue *Phaedo*, in Ober, 2015, p. 21). The colonial enterprise was organised by the mother city or metropolis, which maintained strong cultural ties with the new colonised area.

The Greeks spread the idea of urbanism as a settlement form throughout the Mediterranean basin. This was a novel concept in the newly colonised areas, and particularly so in the western Mediterranean (Pounds, 1969). They also disseminated the Greek culture to neighbouring indigenous communities (White, 1961) as colonies, in line with established standards of the mother city, developed their own laws, cults, foreign relations and arts. Progressively, an increasing number of towns and small settlements, which were embedded within larger regions, adopted social norms and formal rules influenced by the Greeks becoming similar to poleis (Ober, 2015). The Greek alphabet (a conversion of Phoenician primitive symbols) and Greek

[5] Naval technology played an important role in the foundation of new colonies. The design and construction of a new type of ship, the trireme, permitted safer and more efficient transportation along the Mediterranean coast (Davison, 1947).

coins had great influence along the Mediterranean (Culican, 1992; Schoenberger and Walker, 2016).

2.2 The Phoenician Colonisation

The Phoenicians played a major role in establishing settlements on the Mediterranean coast from the end of the second millennium until the 7th century BCE. Among the most important Phoenician cities were Byblos, Sidon, Tyrus, Citium, Utica, Gades and Lixus (Bryce, 2012). The overall expansion around the Mediterranean took place mainly in North Africa and Western Europe. Phoenicians were also a prosperous civilisation of small-states, with a salient commercial orientation and relatively open political institutions (Ober, 2015). The Phoenician colonisation was similar to the Greek counterpart, but the colonisation process was organised in a different way. Apart from Carthage (founded as a colony in 814/813 BCE by Tyrians), every other Phoenician settlement was initially a trading post (Whittaker, 1974). Promontories and small islands close to the mainland were preferred.

The Phoenician’s expansion and economic development was based on their large trade network. Luxurious and prestigious goods enhanced their reputation as good traders. The search for purple shells (whose surface was rich in an expensive colour, and a key input in their cloth dyeing trade) led the Phoenicians to expand in many places such as Cyprus, Rhodes and Crete. Since dye factories were a significant source of their wealth, Phoenicians established treatment plants and settlements not only in places with profitable trading with the natives, but also in regions with rich coral deposits (Jensen, 1963). In doing so, the Phoenicians contributed to the creation of cities in the newly colonised areas and in some instances played an important role in the evolution of the indigenous societies (Bierling, 2002; Osborne and Cunliffe, 2005).[6]

There is evidence that significant (and bi-directional) relationships existed with their neighbouring civilisations. Phoenician temples devoted to Asherah goddess indicate religious influence on the indigenous population in modern day Israel. Egyptian talismans, medallions and scarabs were found in the surrounding area of Phoenicia suggesting an exchange of cults and norms between the two civilisations. Black-on-red vessels which are related predominantly to the Phoenician style of pottery appear at Tarsus in Cecilia around 1000 BCE (Culican, 1992). In summary, the Phoenicians had a pervasive influence and close relationships with indigenous populations in North Africa and Western Europe. The colonies they established soon became vibrant trading posts. Given the importance of trading by that time, Phoenicians as a naval

[6] In the case of Iberia, interactions of the indigenous societies with the Phoenicians helped locals transition from a proto-urban state to an urbanized era and also ushered the emergence of centralised states in the peninsula (Scott, 2018).

nation were able to disseminate their civilisation to coastal regions around the Mediterranean Sea.

2.3 The Etruscan Colonisation

In common with the Greeks and Phoenicians, the Etruscans were a prosperous commercially oriented city-state civilisation with a citizen-centred political regime. In contrast to them, the Etruscans settled in a limited geographic area confined to modern-day northern Italy, which had an abundance of natural and agricultural resources. The fertile land combined with large forests provided them with a wide range of agricultural products and wood which was important for the construction of ships (Haynes, 2005). Mineral deposits including iron, copper, zinc, tin and lead were plentiful, and enabled the Etruscans to form profitable trading relationships with the Greeks and Phoenicians. Moreover, salt mines in Volterra, salt works along the Tyrrhenian, and wool processing stations boosted their economy (Wittke, 2011).

In the first half of the sixth century, the Etruscan trading network extended to northern Europe, Phoenicia, Sardinia and Euboea, exchanging not only goods but also foreign institutions and culture. Trade relationships with Euboeans inspired Etruscans to adopt new drinking practices, new ceremonies and the Greek alphabet. Imports of amber from northern Europe, perfume and ornamental objects and other luxurious products from Corinth indicate a high standard of living among the Etruscans (Bernardini and Camporeale, 2004). Despite their relatively limited territorial expansion, by the end of the 6th century, Etruscans had established a distinguished cultural stamp in many places around the Mediterranean Sea.

3. Data and empirical strategy

3.1 Data

To investigate whether there is a link between ancient colonialism and modern-day economic activity and population concentration, we compare geographic areas with and without ancient colonies. For that purpose, we divide the territory surrounding the Mediterranean and Black Sea with a 50×50 kilometres grid. For brevity we refer to this area as Mediterranean Sea or simply Mediterranean. The main analysis is conducted restricting the sample to grid cells located within 50 kilometres of the coast (a total of 896 cells).[7]

Main independent variables

[7] The intersection of the countries shapefile with the 50×50 kilometres grid renders 922 observations. We then delete polygons with a very small surface area (lower than 10 square kilometres).

We collect data on the locations of ancient Etruscan, Greek and Phoenician colonies from the *Historical Atlas of the Ancient World* (Brill's New Pauly Supplements I - Volume 3 –Wittke, 2011). Figure 1 illustrates the colonies of these three ancient civilisations circa 11th to 6th centuries BCE. There are 145 colonies in coastal areas around the Mediterranean along with 32 metropolis.[8] From these 177 settlements, 14 were Etruscan (8 colonies and 6 metropolis), 133 were Greek (111 colonies and 22 metropolis), and 30 were Phoenician (26 colonies and 4 metropolis). Our main independent variable is a binary indicator which takes the value of 1 if there is at least one ancient colony in the grid cell and 0 otherwise. For the sake of robustness, we also use different historical sources regarding the location of ancient colonies. First, we take the location of Greek colonies from Osborn (1996), whereas for Etruscans and Phoenicians we exploit a number of electronic sources (see Table A1 for more details). Second, we use the extensive dataset on Greek poleis provided by Ober (2015), which has the advantage of being very rich and comprehensive (although with the downside of only covering Greek colonies).

Main outcome variables

In order to construct our main outcome variable, we use an indicator of night light density derived satellite data produced by the National Oceanic and Atmostpheric Association (NOAA) National Centers for Environmental Information.[9] This satellite data reports images from the earth between 20:30 and 22:00 local time. The satellite detects lights from any human and natural activity including ephemeral lights, sunlight, glares, moonlight, aurora, blooming areas (areas that reflect light due to snow) and cloud observations. Light density is then purged from all the non-permanent luminosity sources and translated into an index that takes values ranging between 0 and 63 for approximately each square kilometre of surface. We use this index to calculate the average light density for each grid cell over six years (from 2000 to 2005).

We complement the night light density indicator with a measure of population density using data from the Global Human Settlement (GHS) population grid (European Commission and Columbia University, 2015). This is a dataset that provides population data at a very high (one square kilometre) spatial resolution. Our year of measurement is 2000 although the results would be virtually the same using the most recent available year (2015) as correlation between

[8] Metropolis refer to settlements in the homeland of these civilisations. Grid cells containing metropolis are excluded from the analysis.

[9] Night light emission has been widely used as an indicator of economic development (Michalopoulos and Papaioannou, 2013; Alesina, Michalopoulos and Papaioannou, 2016; Fafchamps, Koelle and Shilpi, 2017). Moreover, Chen and Nordhaus (2011, 2014) argue that light density is likely to add value as a proxy for economic activity in cases where data is not available at sub-national level.

both (in logarithm) is 0.9954. Our indicator of population density is strongly associated with night light density, being the correlation (in logarithm) 0.74.

Other variables

We also collect data on a wide array of historic, geographic and climatic variables, including ancient settlements, ancient ports, Roman roads, temperature, rainfall, altitude, ruggedness, agricultural suitability and marine wealth. Some of these variables will be described later as we introduce them in the analysis while we refer the reader to Table A1 in the Supplementary Material for the more standard ones. Descriptive statistics are provided in Table A2.

3.2 Preliminary data analysis and methodological issues

Panel A of Table 1 compares the level of luminosity of grid cells with and without ancient colonies. Column 1 restricts the sample to grid cells located within 200 kilometres of the coast. Places with ancient colonies have a much higher value of light density. The difference (of 1.66 in logs) is large and statistically significant. Naturally, it can be argued that this comparison is not valid as colonisers founded their colonies in areas close to the sea, which tend to be more economically dynamic than inland regions. Consequently, (in columns 2 and 3) we restrict the sample to the territory located within 100 and 50 kilometres of the coast, respectively. The difference remains large and highly statistically significant. According to column 3, light density is 118% higher ($e^{0.778}$–1) in grid cells with ancient colonies. Note that when restricting the sample to areas within 50 kilometres of the coast we are comparing territories that are relatively similar, particularly in terms of access to the sea, with almost 75% of the observations being coastal. Panel B also shows that areas with ancient colonies are much more populated.

Even if a 50 kilometre bandwidth renders a relatively homogeneous coastal sample, observations may differ along other geographic and climatic dimensions. Greeks, Phoenicians, and Etruscan might have selected places to establish colonies with some specific (attractive) features. If so, then the positive mean differences reported in Table 1 could be due to differences in geographic endowments. However, prior evidence suggests that the selection of locations to found colonies was not driven solely by economic considerations. Religious and political factors very often played a major role (Rutter, 1986).[10] Second, and more crucially, there were many

[10] The religious ritual undertaken to decide the location of colonies introduces an element of randomness. According to Greek beliefs, the god Apollo gave instructions for the new exploration via Pythia, a priestess who was in contact with him while she was inhaling emitted vapours from a chasm in the ground (Crouch, 2004). This process would suggest that Pythia selected the place for the new colony randomly. Regarding the role of political factors, an example is the colony of Himera founded in current Cecilia by a group of exiles from Syracuse (a Greek Dorian metropolis) along with Chalcidinians. Note that for Greeks, the causes and the effects of exiles had always political character (Forsdyke, 2008).

equally attractive areas available along the Mediterranean and ancient colonisers only occupied a few of them. That is, even assuming that colonisers had good information and selected attractive areas, we can still compare them with many other equally good areas that were not colonised.

In Table 2 we examine the relationship between our colony dummy indicator and several relevant geographic and climatic variables. This is a helpful exercise to check whether ancient colonisers selected places with specific geographic and climatic features. Some of the variables such as temperature, rainfall, elevation, ruggedness, soil quality, being an island, being coastal, latitude and longitude are standard in the relevant literature. Others are less common and deserve a brief description. W*ater quality* captures the mean chlorophyll of the sea water around the grid cell using a buffer of 50 kilometres. *Port excellent shelter* is a dummy variable indicating whether the grid cell contains an ancient port classified as excellent shelter by modern nautical guides.[11] *Access to mainland* captures how accessible the mainland is from each point on the coast taking into account the slope of the surface.[12] *Coast connectedness* is a measure of how many coastal grid cells are within a distance of 500 km from each point on the coast moving only through water, following the methodology developed by Bakker et al. (2018). Finally, *river* is a dummy variable indicating whether a river at least 50-metre width passes through the grid cell.

Columns 1 to 14 of Table 2 show that grid cells with and without colonies are very similar in terms of temperature, rainfall, elevation, ruggedness, soil quality, water quality and being an island or not. Columns 17 to 20 and 23 to 28 also show that they are comparable in latitude, longitude, access to mainland, coast connectedness and the presence of rivers. There are only differences regarding the variables coast dummy and port excellent shelter (columns 15-16 and 21-22, respectively), the positive coefficients suggesting that ancient colonisers tended to select coastal places with good shelter conditions. Arguably, these significant correlations do not create a major problem for the analysis. First, both variables are included in the control set of

[11] de Graauw (2017) provides a list of ancient harbours and ports based on documents from 79 ancient and many modern authors, incorporating information from the Barrington Atlas (Bagnall and Talbert, 2000). They provide a list of around 4,400 ancient ports. de Graauw (2017) identifies as a port or harbour "a place where ships can seek shelter. In the concept of 'shelter' must be included anchorages, landing places on beaches and ports". Shelters of interest in de Graauw's (2017) catalogue include "all places which may have been used by seafarers sailing over long distances". Figure A1 in the Supplementary Material shows the geographic distribution of ancient ports.

[12] More specifically, it measures the number (in hundreds) of 10x10 kilometre grid cells located in the mainland that are within a distance of 250 kilometres from the coast moving only through land and taking into account the slope of the surface (for instance, passing through a cell with a slope of 5% is twice as costly as passing through a flat cell). Figure A2 in the Supplementary Material illustrates the construction of this indicator for one observation.

the baseline model. Second, most of the 50 kilometre bandwidth sample is coastal (about 75% of the observations) and only 23% of grid cells with excellent shelter ports also contain ancient colonies (there are many suitable grid cells in the comparison group).[13] Third, we show below that restricting the sample to coastal observations or to observations with excellent shelter ports does not overturn the main results (see Section 4.2).

Another concern with the empirical strategy might be the presence of survivorship bias in our measure of ancient colonies. There exists the possibility that we only observe (or are more likely to observe) colonies that have historically succeeded and have survived over time to become cities. This would inflate the observed impact of ancient colonialism on economic outcomes. We address this concern through several avenues. First, we argue that there are several sources of information from which historians can reliably collect evidence on former colonies. The available data is not only based on archaeological evidence *in situ* (the source arguably most affected by the survivorship bias), but also on historical writings and testimonies left in the metropolis and other places, which help identify and locate ancient colonies. Second, we include country fixed effects to control for the fact that some (richer) countries may afford more archaeological exploration than others, which could also bias our coefficient of interest upwards. Third, we use several alternative data sources to measure ancient colonialism. In particular, we use a very rich dataset that contains a comprehensive list of Greek poleis for which survivorship bias should not be a concern (Ober, 2015).

4. Main results: The effect of ancient colonialism on modern-day economic outcomes

4.1 Baseline results

To investigate the possible link between ancient colonialism and modern-day concentration of the population and economic activity, we estimate the following equation via Ordinary Least Squares (OLS), with standard errors clustered at the country level.

$$Y_{ic} = \alpha * Colony\ dummy_{ic} + \beta * X_{ic} + \eta_c + \varepsilon_{ic}, \quad (1)$$

where i denotes grid cells and c denotes countries. Y_{ic} represents either the logarithm of night light density or the logarithm of population density. $Colony\ dummy_{ic}$ is a binary variable taking the value 1 if there is at least one ancient colony in grid cell i of country c established by

[13] There is arguably a selection bias in the construction of this variable that inflates the number of ports that are excellent shelters in ancient colonies. Areas on the coast where ancient colonisers settled and created ports are more likely to be classified as excellent shelters than analogous points on the coast where they did not settle and for this reason are not so well known. Moreover, Figure A1 shows that the Mediterranean is full of natural harbours, with many of them classified as excellent shelters, being their correlation with ancient colonies far from perfect.

either Etruscans, Greeks or Phoenicians, and 0 otherwise. X_{ic} is a vector of geographic, topographic and climatic characteristics that includes the fourteen variables used in Table 2 plus the grid-cell area.[14] The model also includes country fixed effects, η_c, to capture any unobserved country-wide characteristics (such as national institutions or common historical shocks). ε_{ic} is a stochastic error term. The coefficient of interest α, represents the effect of ancient colonies on current economic outcomes.

Tables 3 and 4 present the baseline results of the paper for night light density and population density respectively. Column 1 in Table 3 shows the effect of ancient colonies on light density conditional on country fixed effects. The coefficient on the colony dummy is positive and highly statistically significant, confirming the previous evidence reported in Table 1 of the positive legacy of ancient colonialism on the concentration of economic activity. Columns 2 through 12 add various geographic and climatic control variables, which do not affect the coefficient of interest. Column 13 reports the results of estimating a saturated model, which includes a full set of control variables along with country fixed effects. The coefficient on the colony dummy is both statistically and economically significant. Grid cells with ancient colonies have a level of light density that is 60% higher than counterparts without colonies ($e^{0.469}-1$). Regarding the effect on population, column 13 in Table 4 indicates that areas where ancient colonisers settled are 85% more populated today.

4.2. Robustness checks

Distinguishing among colonisers

Historians observe several differences in culture and institutions among the Etruscans, Greeks and Phoenicians. In order to investigate whether the effect of ancient colonialism depends on the identity of the coloniser, we create three dummy variables to distinguish colonies based on coloniser identity. There are 82 grid cells with Greek colonies, 25 with Phoenician colonies, 3 with Etruscan colonies, and 3 containing colonies from two colonisers. The last two categories have been grouped together due to their low number of observations. Table 5 shows that the positive relationship between ancient colonies and light density holds across the three categories, albeit the Phoenician dummy is no longer statistically significant for our population concentration outcome variable. Columns 1 and 2 also indicate that the coefficient on Greek colonies is larger, which may suggest that the influence of the classical Greek civilisation was more pervasive, or that some elements of this civilisation such as the strong civic capital and

[14] Although we use a standard grid-cell size of 50x50 kilometre, cell areas may differ because our grid layer is intersected with the coastline.

inclusive political institutions have been more decisive for the local economy than other features more salient in the other civilisations. However, this evidence must be treated cautiously given the lower number of observations for the Phoenician and Etruscan colonies.

Examining the heterogeneity across continents

Our analysis is based on data drawn from countries located in three continents, namely, Africa, Asia and Europe. It could be possible that one of these continents is driving our results. To alleviate this concern, we create three dummy variables, one for each continent, and interact these with our ancient colony dummy, so we can differentiate the effect of ancient colonialism across continents. The results, reported in Table 6, show that the effect is the strongest for Africa, followed by Asia and Europe. In all cases our coefficient of interest remains economically and statistically significant. The lower coefficient for Europe is arguably due to the fact that the European coastline has experienced a relatively widespread development, affecting a large fraction of the territory, so the imprint of ancient colonialism is slightly less visible than for areas (for instance northern Africa) which have not witnessed similar development.

Alternative indicators and sources for ancient colonialism

Table 7 uses alternative indicators and sources to measure the presence of ancient colonies. Columns 1 and 2 employ a variable similar to the baseline indicator, but now the grid cell is considered “treated” (colony dummy equal to 1) if it is within a distance of 5 km from a colony’s centroid. In this way, we take into account potential measurement errors in the exact location of ancient colonies. Columns 3 and 4 employ distance from the nearest colony as an alternative indicator to measure the influence of ancient colonialism. Both alternative indicators carry the expected sign, although the variable distance to the nearest colony is not statistically significant when the dependent variable is night light density.

In addressing concerns that our results hinge on a singular source of information regarding the location of ancient colonies, we repeat the analysis in columns 5 and 6 using an indicator of ancient colonies based on alternative sources. In both specifications, the alternative colony dummy variable enters into the regression with a statistically significant positive coefficient, indicating that our findings are robust to alternative data sources regarding the location of ancient colonies. As an additional exercise, we use Ober’s (2015) dataset on Greek poleis. This source contains a comprehensive list of all Greek poleis known to have existed in the Antiquity, from 800 BCE up to 323 BCE, covering the archaic as well as the classical period of ancient Greece. We consider as colonies all those Greek poleis outside the Greek homeland. While this source has the obvious disadvantage of covering Greek colonies only, it has the important advantage of being very comprehensive, and thus mitigates the possible survivorship bias discussed in Section 3.2.[15] The results, reported in columns 7 and 8, show a positive and statistically significant effect of Greek colonies on the concentration of economic activity and population density. The magnitude of the effect is roughly similar to that reported in the baseline specifications, suggesting that the survivorship bias is not driving our results.

Further robustness checks

This subsection conducts further robustness checks. First, we restrict the sample to only coastal grid cells. These are the majority in our 50 kilometre sample, but in doing so we assure that we are comparing only observations with access to the sea. Second, we restrict the sample to grid cells containing excellent shelter ports to rule out the possibility that our results are driven by the fact that ancient colonisers tend to choose coastal areas with good shelter conditions. Third, we exclude dark grid cells, that is, with an average value of light density equal to zero, and grid cells unpopulated. Fourth, we run our baseline specification deleting countries one by one. This allows us to check whether some country is exerting an undue influence on the coefficient of interest. Finally, we check whether the statistical significance of the results remains unchanged when using Conley's (1999) standard errors to correct for spatial dependence of unknown form. The positive coefficient on the colony dummy remains robust and statistically significant in all cases.

4.3. More economic activity or just more population density?

The previous results indicate that ancient colonialism is positively related to current economic activity –as reflected by night light emission- and population density. Given the high correlation between population density and night light emission, one could wonder whether there is any effect beyond that on population density. That is, it would be possible that ancient colonialism is just affecting population density and that, as a consequence of this, is also related to night light density. To check whether ancient colonialism affects economic activity beyond its effect on population density, we add the latter variable as a control when the dependent variable is night light density. This is done Table 8. Interestingly, the effect of ancient colonies remains economically and statistically significant despite the large coefficient on population density.

4.4. Mechanisms: Institutional-cultural transfer or urban persistence?

[15] Ober's (2015) dataset is based largely on the *Inventory of Archaic and Classical Poleis* (Hansen and Nielsen, 2004). The *Inventory* is a monumental work by the Copenhagen Polis Centre that contains information on more than 1,000 Greek city-states known to have existed during the period c. 800-323 BCE.

There are two complementary explanations for the positive effect of ancient colonialism. Our first hypothesis is couched in terms of institutions and culture. Ancient colonialism was a major positive shock in terms of institutions, culture, human capital and technology. The Phoenicians, Greeks, and Etruscans enjoyed a much higher standard of living than the rest of their Mediterranean neighbours. They had more inclusive institutions, a high level of civic capital and more diversified and sophisticated economies. All these elements were transferred to the new locations, with positive consequences for economic development.[16] Another related explanation is "urban persistence", that is, once a town or settlement is founded, the forces of agglomeration economies can reinforce the dynamics of the concentration of economic activity and promote economic development over the long-run. In this sense, there is evidence that cities are very persistent, even after major negative shocks (Davis and Weinstein, 2002; Bleakley and Lin, 2012).[17]

We investigate the relative importance of each mechanism by comparing settlements of Phoenician-Greek-Etruscan origins to settlements of other cultures of similar age. We use the gazetteer of ancient places to collect information on settlements existing in 750-250 BCE (Pleiades, 2017). A dummy variable "other ancient settlements" is created which takes the value of 1 if the grid cell contains at least one ancient place classified as settlement, city, urban, town or village, and 0 otherwise. The variable also equals 0 if the grid cell contains an ancient colony (i.e., the colony dummy is equal to 1). If the coefficient on the colony dummy is larger than the coefficient on "other ancient settlements", this would imply that the mechanism explaining our result is not only city persistence but also the transfer of institutions and culture.

Columns 1, 3 and 5 in Table 9 include the variable "other ancient settlements" measured in 750, 500 and 250 BCE. The coefficients on these variables are positive, thereby indicating that there is a very long-term persistence in the settlement structure of the territory, but interestingly the size of the coefficients on ancient colonies is larger. This result suggests that both the "urban persistence" and the "institutions-culture" mechanisms help explain the positive effect of ancient colonies on current economic outcomes.

It could be argued, however, that the coefficient on ancient colonies is larger because measurement errors are probably more pervasive in "other ancient settlements". We

[16] Despite recent evidence of little association between institutions and long-term development (Rodrigez-Pose and von Berlepsch, 2015), there is a long-standing literature showing a positive link between the two (Acemoglu et al. 2001; Banerjee and Iyer 2005).

[17] A somewhat related explanation is the "early start" hypothesis, which contends that geographic areas where politically organised societies were established earlier have shaped a more homogenous economic and social environment with higher linguistic unity, social cohesion, political stability and better public management (Bockstette et al., 2002).

acknowledge this potential criticism and only those places with a precise location (according to Pleiades, 2017) are used to create our "other ancient settlements" variable.[18] Moreover, we also construct a more restricted measure of settlements that exclusively focuses on places classified as city, town or urban. Arguably, this indicator captures important and well-studied ancient places. The results reported in columns 2, 4 and 6 are largely consistent with the previous ones, although the coefficient on urban settlements is not statistically significant in columns 2 and 4 of Panel B (which reinforces the importance of the institutions-culture mechanism). In light of this evidence we consider that both mechanisms play a role in explaining the positive legacy of ancient colonialism.

5. The effect of ancient colonialism on the development of the urban system

In this section we focus on the idea that ancient colonisers distributed around the Mediterranean a major innovation: urban settlements or cities. This is an important part of the explanation (related to the mechanism "urban persistence") for the positive effect we find. Ancient colonists exported an urban lifestyle that went hand in hand with their institutional and cultural influence. By founding cities, they were offering a model which natives could copy. Therefore, both directly, by establishing urban settlements themselves, and indirectly, by offering a model that others could follow, ancient colonialism has potentially played a relevant role in the origin and evolution of the urban system in the Mediterranean (Osborne and Cunliffe, 2005; Scott, 2018).

Table 10 tackles this question by analysing the relationship between ancient colonies and the urbanisation process of the Mediterranean coast from 1000BCE until today. For the period before 800 CE, there is no systematic urban data available. Therefore, we use the aforementioned gazetteer of ancient places to collect information on settlements existing at different points in time (Pleiades, 2017). We create dummy variables indicating whether the grid cell contains at least one ancient place classified as settlement, city, urban, town or village. We also create a binary indicator capturing the presence of Roman roads under the assumption that Roman roads and ancient urban development are correlated.[19] For the period 800-1800, we use the urban dataset collected by Bosker et al. (2013) from Bairoch et al. (1988) and several other sources.

[18] Pleiades (2017) classifies the precision of a location as either unlocated, rough, related or precise.

[19] Indeed, there is a strong correlation between the presence of Roman roads and these settlements indicators. Thus, the percentage of grid cells with ancient settlements (in year 0) is 28 percentage points higher for those cells with Roman roads –conditional on country fixed-effects and the full control set of geographic and climatic variables.

Columns 1 to 7 use the presence of settlements from 1000 BCE to 500 CE as dependent variables. The coefficient on ancient colonies is always positive and statistically significant from 750 BCE onwards.[20] These results suggest that ancient colonialism created a persistent pattern of settlement (urbanisation) from the very beginning of the Mediterranean urban system. For instance, the coefficients in columns 2 and 3 indicate that the percentage of grid cells with settlements is about 30 percentage points higher for those cells with ancient colonies. This is a very large effect taking into account that the percentage of observations with settlements in 750 and 500 BCE is 34% and 47%, respectively. For latter periods the coefficient declines but remains large and significant. Column 8 further shows that the percentage of grid cells with Roman roads is 10 percentage points higher for those with ancient colonies.

Columns 9 to 14 use dummy variables capturing the presence of urban settlements larger than 10,000 inhabitants. Interestingly, we can also observe that the probability of having a city is significantly larger in those areas which had ancient colonies. Column 15 shows that the percentage of grid cells which have had a city at some point in time from 800 to 1800 is 10 percentage points larger for those with ancient colonies. Figure 1 depicts the effect of ancient colonialism on the presence of settlements and cities at different points in time, as in Table 1. In addition, the third (bottom) graph shows the effect on the evolution of urban population. The results are fully consistent with the previous one indicating a positive contribution of ancient colonialism to the development of the urban system in the Mediterranean.

To sum up, this section provides evidence suggesting that ancient colonialism played a relevant role in the origin and development of the Mediterranean urban system. Areas colonised by Phoenicians, Greek and Etruscans were more likely to have settlements, Roman roads and later on cities. This analysis of the development of the urban system also helps explain the very long-term effect of ancient colonialism on current economic outcomes reported in Section 4. Its positive effect on the spatial concentration of the population and economic activity is not something that happens circumstantially at the turn of the twenty-first century. The effect of ancient colonialism on the modern-day concentration of the population and economic activity of the Mediterranean region can be traced back more than two millennia and has persisted since then.

[20] The lower and insignificant coefficient in column 1 is consistent with our hypothesis since by that time ancient colonialism had hardly began, with the exception of the Phoenicians. Another complementary explanation is that for this early period, measurement errors are more pervasive, creating a downward bias in the coefficient.

6. Conclusion

This paper investigates the long-term effect of ancient colonialism on the modern-day concentration of the population and economic activity of the Mediterranean region. Using data on the location of Phoenician, Greek and Etruscan colonies and using light density at night as a proxy for economic activity at the sub-national level, we present evidence that geographic areas that were Phoenician, Greek or Etruscan colonies concentrate today more economic activity than areas not subject to such colonisation.

We argue that two complementary mechanisms explain the long-run impact of ancient colonialism on the modern-day concentration of the population and economic activity. On the one hand, the colonisers transferred to the new locations their more advanced institutions, culture, human capital and technologies. On the other hand, they also founded cities, which implies an early urban start, with the advantages of agglomeration economies reinforcing the concentration of economic activity in existing places.

The results of our study contribute to the literature on the economic legacy of colonialism by focusing, for the first time, on the very early experience of colonialism undertaken by the Phoenicians, Greeks and Etruscans. In doing so, we also contribute to improving our understanding of the causes of the spatial distribution of economic activity in the large region of the Mediterranean. In contrast to its modern counterpart, ancient colonialism was much more local in nature, confined merely to the territory surrounding a city, and as a consequence did not lead to vast overseas dominions (with the exception of Carthage). Regions in which ancient colonisers established their colonies have belonged to different empires and countries, and have been subjected to very different historical paths during the ensuing period exceeding two millennia. It is remarkable that we consistently observe even across continents (Europe, Asia, and Africa) that areas with ancient colonies feature more economic activity and are more densely populated today. Given that we control for country fixed effects, the positive legacy of ancient colonialism documented here has been working at the local level.

We further show that the effect of ancient colonialism can be traced back more than two millennia since the origin of the Mediterranean urban system. Areas colonised by Phoenicians, Greek and Etruscans were more likely to have ancient settlements, Roman roads and later on cities. For instance, the percentage of grid cells which have had a city at some point in time from 800 to 1800 is almost 10 percentage points larger for those with ancient colonies, being the sample average of only 19%. This evidence emphasises the idea that ancient colonisers distributed around the Mediterranean a major innovation by that time: urban settlements or cities.

The evidence presented in this paper is appealing, as the effect of ancient colonialism appears remarkably robust. However, our analysis has limitations. There are inherent measurement errors when measuring phenomena, which took place in the remote past. Another possible limitation relates to a potential problem of endogeneity in the location of ancient colonies. Although we conduct a large battery of robustness checks to address this concern, and we interpret our coefficient as *causal*, we acknowledge that it is impossible to completely dispel all doubts.

To conclude, our paper reinforces the idea that historical shocks play a significant role in the structure of regional and local economies. Ancient colonialism, by geographically spreading urban settlements and their more advanced civilisations, had a positive legacy on the concentration of the population and economic activity in the Mediterranean. The Greeks, Phoenicians and Etruscans have not only influenced modern Western culture in general, these civilisations have also left an economic legacy at the local level. This paper has thus shed additional light on the legacy of the classical world and revealed that the contact and interaction between civilisations has long-term positive implications for population concentration and economic activity.

References

Acemoglu, D., Johnson, S. and Robinson, J.A. (2001). “The Colonial Origins of Comparative Development: An Empirical Investigation.” *American Economic Review*, 91(5): 1369-1401.

Angeles, L. (2007). “Income Inequality and Colonialism.” *European Economic Review* 51(5): 1155–1176.

Alesina, A., Michalopoulos, S., and Papaioannou, E. (2016). “Ethnic Inequality.” *Journal of Political Economy* 124 (2): 428-488.

Austin, M. and Vidal-Naquet, P. (1980). *Economic and Social History of Ancient Greece*. 1st ed. Berkeley: Univ. of California Press.

Bagnall, R.S. and Talbert, R.J.A. (2000). *Barrington Atlas of the Greek And Roman World*. Princeton: Princeton Univ. Press.

Bakker, J.D., Bockstette, S., Pischke, J. and Rauch, F. (2018). "Of Mice and Merchants: Trade and Growth in the Iron Age." *Centre for Economic Policy Research Discussion Paper* Number 13060.

Bairoch, P., Batou, J. and Chèvre, P. (1988). *La population des villes Européennes de 800 a` 1850* (Genève, Switzerland: Librairie Droz).

Banerjee, A. and Iyer, L. (2005). “History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India,” *American Economic Review*, 95: 1190–1213.

Bernardini, P. and Camporeale, G. (2004). *The Etruscans Outside Etruria*. 1st ed. Los Angeles, Calif.: J. Paul Getty Museum.

Bierling, M.R.G.S. (2002). *The Phoenicians in Spain: An Archaeological Review of the Eight-Sixth Centuries BCE*. Winona Lake: Eisenbrauns.

Bleakley, H. and Lin, J. (2012). “Portage and path dependence.” *The Quarterly Journal of Economics* 127(2): 587-644.

Bockstette, V., Chanda, A. and Putterman, L. (2002). “States and Markets: The Advantage of an Early Start.” *Journal of Economic Growth*, 7(4): 347–369.

Bosker, M., Buringh, E. and van Zanden, J.L. (2013). “From baghdad to london: Unraveling urban development in europe, the middle east, and north africa, 800–1800." *Review of Economics and Statistics* 95.4: 1418-1437.

Bruhn, M. and Gallego, F.A. (2012). “Good, Bad, and Ugly Colonial Activities: Do They Matter for Economic Development?” *Review of Economics and Statistics*, 94(2): 433-461.

Bryce, T. (2012). *The Routledge Handbook of the Peoples and Places of Ancient Western Asia*. 1st ed. London: Routledge.

Cawkwell, G. (1992). “Early Colonisation.” *The Classical Quarterly*, 42(02): 289-303.

Chanda, A., Cook, C.J. and Putterman, L. (2014). “Persistence of Fortune: Accounting for Population Movements, There Was No Post-Columbian Reversal.” *American Economic Journal: Macroeconomics*, 6(3): 1-28.

Chen, X. and Nordhaus, W.D. (2011). “Using luminosity data as a proxy for economic statistics.” *Proceedings of the National Academy of Sciences*, 108(21): 8589-8594.

Chen, X. and Nordhaus, W.D. (2014). “A sharper image? Estimates of the precision of nighttime lights as a proxy for economic statistics.” *Journal of Economic Geography*, 15(1): 217–46

Comin, D., Easterly, W. and Gong, E. (2010). "Was the Wealth of Nations Determined in 1000 BC?" *American Economic Journal: Macroeconomics*, 2(3): 65-97.

Conley, T.G. (1999). "GMM Estimation with Cross Sectional Dependence." *Journal of Econometrics*, 92(1): 1-45.

Crouch, D.P. (2004). *Geology and Settlement: Greco-Roman Patterns*. New York: Oxford University Press.

Culican, W. (1992). "Phoenicia and Phoenician Colonization." In: Boardman, J., Edwards, I., Sollberger, E. and Hammond, N. ed., *The Cambridge Ancient History*, 2nd ed. Cambridge: Cambridge University Press: 461-546.

Dalgaard, C, Kaarsen, N., Olsson, O. and Selaya, P. (2015). "Roman Roads to Prosperity: The Long-Run Impact of Transport Infrastructure." Presentation slides, University of Gothenburg.

Davis, D.R. and Weinstein, D.E.. (2002). "Bones, Bombs, and Break Points: The Geography of Economic Activity." *American Economic Review*, 92(5): 1269-1289.

Davison, J.A. (1947). "The First Greek Triremes." *Classical Quarterly* 41: 18-24.

de Graauw, A. (2017). *Ancient Ports and Harbours*. Available at: http://www.ancientportsantiques.com

Dell, M. (2010). "The Persistent Effects of Peru's Mining Mita." *Econometrica* 78(6): 1863-1903.

Donaldson, D. and Storeygard, A. (2016). "The view from above: Applications of satellite data in economics" *Journal of Economic Perspectives* 30 (4): 171-198.

Droller, F. (2018). "Migration, Population Composition, and Long Run Economic Development: Evidence from Settlements in the Pampas." *Economic Journal*, 128(614):2321-2352.

Easterly, W. and Levine, R. (2016). "The European Origins of Economic Development." *Journal of Economic Growth* 21 (3):225–257

Engerman S. and Sokoloff, K. (2000). "Institutions, Factor Endowments, and Paths of Development in the New World." *Journal of Economic Perspectives* 14(3):217–232.

European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015): GHS population grid, derived from GPW4, multi-temporal (1975, 1990, 2000, 2015). European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/jrc-ghsl-ghs_pop_gpw4_globe_r2015a.

Fafchamps, M., Koelle, M. and Shilpi, F. (2017). "Gold mining and proto-urbanization: recent evidence from Ghana." *Journal of Economic Geography* 17(5): 975-1008.

Feyrer, J. and Sacerdote, B. (2009). "Colonialism and Modern Income: Islands as Natural Experiments." *Review of Economics and Statistics*, 91(2): 245-262.

Forsdyke, S. (2008). *Exile, Ostracism, and Democracy*. Princeton: Princeton University Press.

Hansen, M.H. and Nielsen, T.H. (2004). *An Inventory of Archaic and Classical Poleis*. Oxford University Press.

Haynes, S. (2005). *Etruscan Civilization: A Cultural History*. 1st ed. Getty Publications, p. 432.

Henderson, V., Storeygard, A. and Weil, D.N. (2011). "A Bright Idea for Measuring Economic Growth." *American Economic Review*, 101(3): 194-199.

Henderson, V., Storeygard, A. and Weil, D.N. (2012). "Measuring Economic Growth from Outer Space." *American Economic Review*, 102(2): 994-1028.

Iyer, L. (2010). "Direct Versus Indirect Colonial Rule in India: Long-term consequences." *Review of Economics and Statistics*, 92(4), 693-713.

Jensen, L.B. (1963). "Royal Purple of Tyre." *Journal of Near Eastern Studies*, 22(2): 104-118.

Maloney, W.F. and Caicedo, F.V. (2016). "The Persistence of (Subnational) Fortune." *Economic Journal*, 126(598): 2363-2401.

Michaels, G. and Rauch, F. (2018). "Resetting the Urban Network." *Economic Journal*, 128(628): 378-412.

Michalopoulos, S. and Papaioannou, E. (2013). "Pre-Colonial Ethnic Institutions and Contemporary African Development." *Econometrica*, 81(1): 113-152.

Michalopoulos, S. and Papaioannou, E. (2016). "The long-run effects of the scramble for Africa." *The American Economic Review* 106(7): 1802-1848.

Michalopoulos, S. and Papaioannou, E. (2018). "Spatial patterns of development: A meso approach." *Annual Review of Economics* 10 (1): 383{410.

Morris, I.P. (2004). "Economic growth in Ancient Greece." *Journal of Institutional and Theoretical Economics*, 160(4): 709-742.

Morris, I.P. (2005). The Growth of Greek Cities in the First Millennium BC. [online] Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1426835 [Accessed 12 May 2017].

Nunn, N. (2014). "Historical development." In: Aghion P, Durlauf P (eds) *Handbook of Economic Growth, vol 2*. Elsevier, North-Holland, pp 347–402

Ober, J. (2015). *The Rise and Fall of Classical Greece*. 1st ed. Princeton University Press.

Osborne, R. (1996). *Greece in the making 1200-479 BC*. London: Routledge.

Osborne, R. and Cunliffe, B. (2005). *Mediterranean urbanization 800-600 BC.* Oxford: Oxford University Press.

Oto-Peralías, D. and Romero-Ávila, D. (2014a) "Legal traditions and initial endowments in shaping the path of financial development." *Journal of Money, Credit and Banking*, 46(1):43–77

Oto-Peralías, D. and Romero-Ávila, D. (2014b). "The distribution of legal traditions around the world: a contribution to the Legal Origins Theory." *The Journal of Law and Economics*, 57(3):561–628

Oto-Peralías, D. and Romero-Ávila, D. (2016). "The economic consequences of the Spanish Reconquest: the long-term effects of Medieval conquest and colonization." *Journal of Economic Growth*, 21(4): 409-464.

Pinkovskiy, M.L. (2017). "Growth Discontinuities at Borders." *Journal of Economic Growth* 22(2): 145-192.

Pleiades. (2017). *Pleiades: A Gazetteer of Past Places*. http://pleiades.stoa.org/

Pounds, N. (1969). "The urbanization of the Classical world." *Annals of the Association of American Geographers*, 59(1):135-157.

Rodriguez-Pose, A. and von Berlepsch, V. (2015). "European migration, national origin and long-term economic development in the United States", *Economic Geography* 91(4): 393-424.

Rutter, K. (1986). "Sicily and South Italy: The Background to Thucydides Books 6 and 7". *Greece and Rome* 33(2): 142-155.

Scheidel, W., Morris, I. and Saller, R.P. (2008). *The Cambridge Economic history of the Greco-Roman World*. 1st ed. Cambridge: Cambridge University Press.

Schoenberger, E. and Walker, R.A. (2017). Beyond exchange and agglomeration: resource flows and city environments as wellsprings of urban growth. *Journal of Economic Geography* 17, 935-958.

Scott, J.C. (2018). “The Phoenicians and the Formation of the Western World.” *Comparative Civilizations Review*, 78, 25-40.

Spolaore, E. and Wacziarg, R. (2013). “How Deep Are the Roots of Economic Development?” *Journal of Economic Literature* 51 (2): 325-369.

Wahl, F. (2017). “Does European development have Roman roots? Evidence from the German Limes.” *Journal of Economic Growth*, 22(3): 313-349.

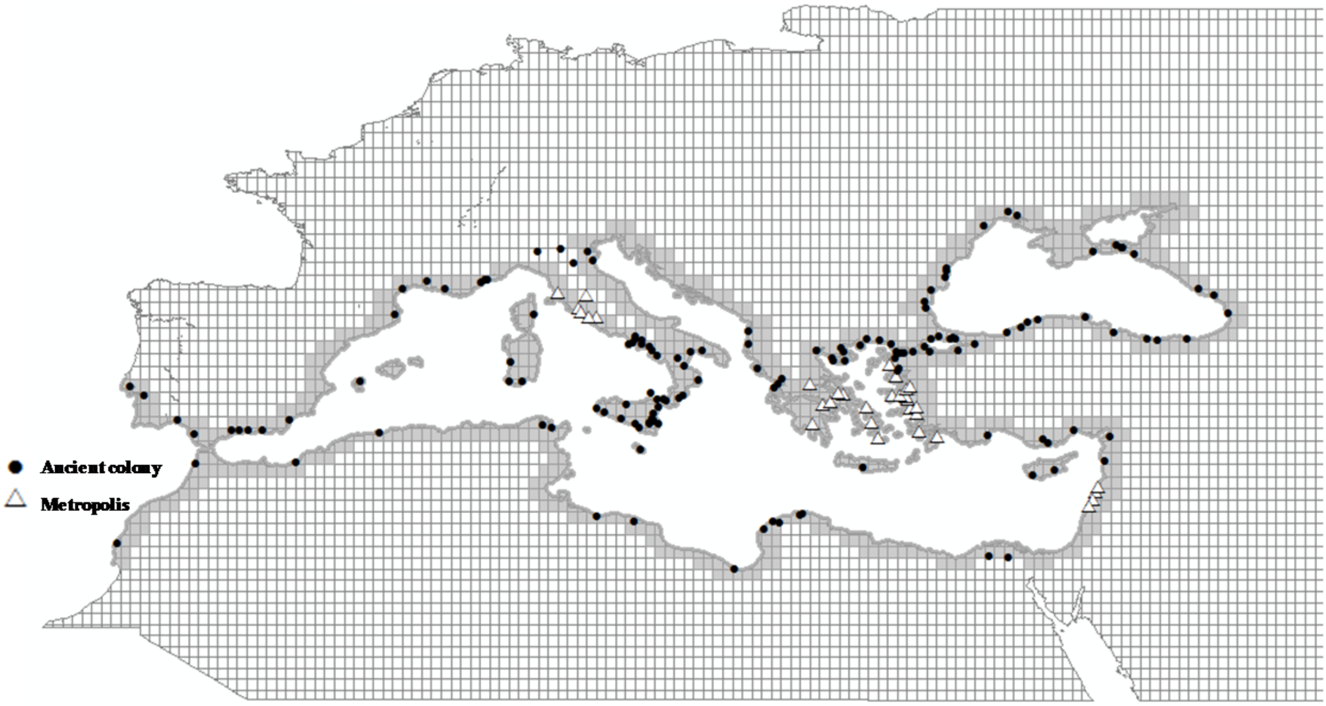
White, M.E. (1961). “Greek Colonization.” *The Journal of Economic History*, 21(4): 443-454

Whittaker, C.R. (1974). “The Western Phoenicians: Colonisation and Assimilation.” *Proceedings of the Cambridge Philological Society*, 20: 58-79.

Wittke, A. (2011). “Colonization: Phoenicians, Greeks and Etruscans in the Mediterranean Area (c. 11th–6th Cents. BC)”, in: *Brill’s New Pauly Supplements I - Volume 3: Historical Atlas of the Ancient World*, Edited by: Wittke, A., Olshausen, E. and Szydlak, R. in collaboration with: Sauer, V. and other specialists.

FIGURES AND TABLES

FIGURE 1. MAP OF ANCIENT COLONIES IN THE MEDITERRANEAN AREA



Notes: This map shows the geographic distribution of ancient colonies along with their metropolis (c. 11th-6th cents. BCE). The underlying layer is a 50x50 km grid. Cells within 50 km from the coast are in dark grey. Source: Wittke (2011).

FIGURE 2. THE EFFECT OF ANCIENT COLONIALISM ON THE EVOLUTION OF THE URBAN SYSTEM

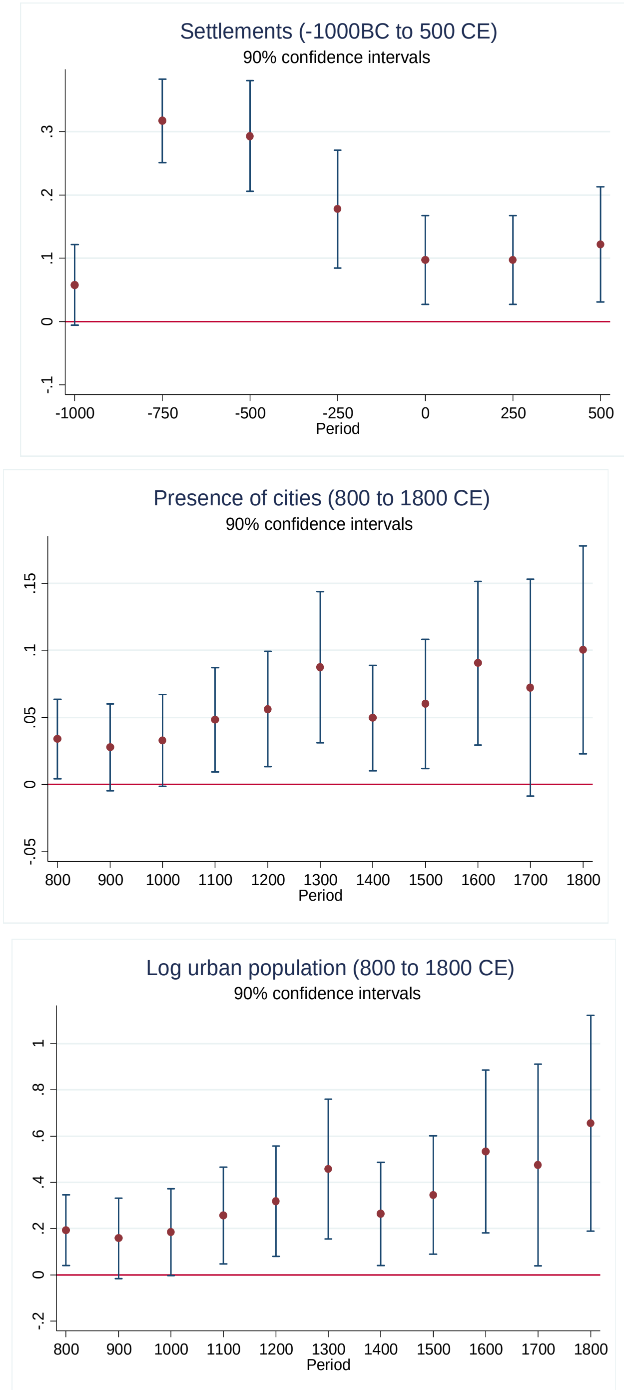


Table 1

Ancient colonialism and the spatial concentration of economic activity: A first look at the data

	Within 200 km of the Mediterranean coast	Within 100 km of the Mediterranean coast	Within 50 km of the Mediterranean coast
	(1)	(2)	(3)
Panel A: Log night light density			
Ancient colonies	2.066	2.066	2.031
	117	*117*	*113*
No ancient colonies	0.405	0.915	1.253
	1,839	*1,137*	*757*
Difference	1.661***	1.151***	0.778***
	(0.300)	(0.217)	(0.121)
Panel B: Log population density			
Ancient colonies	4.903	4.903	4.868
	117	*117*	*113*
No ancient colonies	2.194	3.174	3.794
	1,839	*1,137*	*757*
Difference	2.709***	1.729***	1.074***
	(0.819)	(0.574)	(0.245)

Notes: The units of analysis are 50x50 km grid-cells. Variables descriptions are provided in Table A1. The number of observations is in italics. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that differences are statistically significant at 10%, 5%, and 1%, respectively.

Table 2

Balancedness table

	The dependent variable is:													
	Temperature		Rainfall		Elevation		Ruggedness		Soil quality		Water quality		Island	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Ancient colonies	-0.293	0.27	46.475	-5.47	-50.695	-95.203*	0.002	-0.409	0.172	0.125*	-2.617	-1.564	0.015	-0.011
	(0.403)	(0.236)	(37)	(16.95)	(35.999)	(54.998)	(0.276)	(0.297)	(0.128)	(0.064)	(2.861)	(1.907)	(0.071)	(0.052)
Country fixed effects		yes		yes		yes		yes		yes		yes		yes
R-sq	0.00	0.70	0.00	0.73	0.00	0.30	0.00	0.42	0.00	0.26	0.0	0.47	0	0.42
Observations	870	870	870	870	870	870	870	870	870	870	869	869	870	870

	Coastal		Longitude		Latitude		Port excellent shelter		Access to mainland		Coast connectedness		River	
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Ancient colonies	0.271***	0.274***	1.017	-0.33	0.719	-0.039	0.153***	0.166***	-61.744	-0.054	50.253	14.317	-0.047	-0.088
	(0.041)	(0.049)	(1.805)	(0.46)	(0.666)	(0.563)	(0.034)	(0.033)	(44.219)	(32.105)	(42.773)	(28.648)	(0.064)	(0.066)
Country fixed effects		yes		yes		yes		yes		yes		yes		yes
R-sq	0.04	0.11	0.00	0.96	0.00	0.87	0.02	0.17	0.00	0.59	0.0	0.73	0	0.17
Observations	870	870	870	870	870	870	870	870	870	870	870	870	870	870

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term, which is omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 3

Ancient colonialism and the spatial concentration of economic activity: Baseline results (I)

	The dependent variable is Log night light density												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Ancient colonies	0.699***	0.673***	0.587***	0.682***	0.707***	0.473***	0.699***	0.604***	0.699***	0.696***	0.725***	0.664***	0.469***
	(0.156)	(0.159)	(0.145)	(0.162)	(0.155)	(0.102)	(0.116)	(0.153)	(0.155)	(0.154)	(0.17)	(0.141)	(0.109)
Temperature		0.116***											0.248
		(0.024)											(0.147)
Rainfall		0.001**											0.001
		(0.001)											(0)
Elevation			-0.001***										0.001
			(0)										(0.001)
Ruggedness			0.025										-0.028
			(0.039)										(0.068)
Soil quality				0.135									0.108
				(0.092)									(0.073)
Water quality					0.006***								0.007*
					(0.001)								(0.004)
Island						-0.641***							-0.497*
						(0.209)							(0.245)
Coastal						0.798***							0.712**
						(0.25)							(0.333)
Latitude							0.105*						0.191
							(0.056)						(0.147)
Longitude							-0.012						0.001
							(0.026)						(0.034)
Port excellent shelter								0.566***					0.396**
								(0.141)					(0.167)
Access to mainland									0.036				-0.021
									(0.048)				(0.055)
Coast connectedness										0.015			0.034
										(0.04)			(0.049)
River											0.305*		0.456**
											(0.158)		(0.189)
Grid-cell area												-0.016	0.001
												(0.01)	(0.009)
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		yes
R-sq	0.3	0.32	0.33	0.3	0.3	0.34	0.31	0.31	0.3	0.3	0.31	0.31	0.4
Observations	870	870	870	870	869	870	870	870	870	870	870	870	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 4

Ancient colonialism and the spatial concentration of economic activity: Baseline results (II)

	The dependent variable is Log population density												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Ancient colonies	0.964***	0.941***	0.835***	0.949***	0.968***	0.514***	0.978***	0.861***	0.964***	0.964***	0.996***	0.87***	0.614***
	(0.206)	(0.202)	(0.212)	(0.218)	(0.205)	(0.113)	(0.183)	(0.213)	(0.205)	(0.199)	(0.225)	(0.163)	(0.157)
Temperature		0.132**											0.303
		(0.051)											(0.209)
Rainfall		0.002**											0.001***
		(0.001)											(0)
Elevation			-0.002***										0.002
			(0.001)										(0.002)
Ruggedness			0.107*										-0.093
			(0.059)										(0.118)
Soil quality				0.122									0.125
				(0.176)									(0.159)
Water quality					0.003								0.012
					(0.003)								(0.008)
Island						-1.026***							-0.936***
						(0.231)							(0.282)
Coastal						1.6**							1.438*
						(0.655)							(0.792)
Latitude							0.157						0.263
							(0.102)						(0.233)
Longitude							0.022						0.001
							(0.05)						(0.058)
Port excellent shelter								0.619***					0.256
								(0.126)					(0.226)
Access to mainland									-0.066				-0.132
									(0.09)				(0.095)
Coast connectedness										0.003			0.026
										(0.078)			(0.073)
River											0.36		0.906**
											(0.245)		(0.436)
Grid-cell area												-0.045**	-0.023
												(0.021)	(0.015)
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		yes
R-sq	0.27	0.29	0.29	0.28	0.28	0.33	0.28	0.28	0.28	0.27	0.28	0.29	0.38
Observations	870	870	870	870	869	870	870	870	870	870	870	870	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 5

Differentiating among colonisers

	The dependent variable:			
	Log night light density		Log population density	
	(1)	(2)	(3)	(4)
Greek colony	0.794***	0.533***	1.138***	0.753***
	(0.185)	(0.144)	(0.315)	(0.242)
Phoenician colony	0.407**	0.273*	0.366	0.099
	(0.171)	(0.15)	(0.289)	(0.295)
Etruscan colony and mixed (more than one coloniser)	0.675***	0.468***	1.213***	0.99***
	(0.027)	(0.107)	(0.041)	(0.162)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	0.3	0.4	0.28	0.38
Observations	870	869	870	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 6

Examining the heterogeneity across continents

	The dependent variable:			
	Log night light density		Log population density	
	(1)	(2)	(3)	(4)
Ancient col. x Africa	1.277***	1.008***	2.153***	1.423***
	(0.266)	(0.163)	(0.644)	(0.371)
Ancient col. x Asia	0.889***	0.568***	0.942***	0.548***
	(0.117)	(0.118)	(0.076)	(0.193)
Ancient col. x Europe	0.48***	0.301**	0.7***	0.455**
	(0.153)	(0.121)	(0.144)	(0.218)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	0.3	0.4	0.28	0.38
Observations	870	869	870	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 7

Alternative indicators and sources for Ancient colonies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Log night light density								
Ancient colonies: 5-km buffer	0.582***	0.428***						
	(0.147)	(0.099)						
Distance to the nearest colony			-0.003	-0.003				
			(0.002)	(0.002)				
Ancient colonies (alternative sources)					0.766***	0.547***		
					(0.202)	(0.182)		
Ober (2015)'s poleis dataset							0.535**	0.357*
							(0.193)	(0.198)
Geographic and climatic controls		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0.3	0.4	0.29	0.4	0.3	0.4	0.31	0.42
Observations	863	862	870	869	871	870	801	800
Panel B: Log population density								
Ancient colonies: 5-km buffer	0.713***	0.445**						
	(0.157)	(0.167)						
Distance to the nearest colony			-0.008*	-0.007*				
			(0.004)	(0.004)				
Ancient colonies (alternative sources)					1.057***	0.757**		
					(0.364)	(0.298)		
Ober (2015)'s poleis dataset							0.731*	0.515
							(0.357)	(0.338)
Geographic and climatic controls		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0.27	0.38	0.29	0.39	0.28	0.38	0.27	0.38
Observations	863	862	870	869	871	870	801	800

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 8

More economic activity or just population density?

	The dependent variable: Log night light density	
	(1)	(2)
Ancient colonies	0.262**	0.199**
	(0.098)	(0.087)
Log night light density		
Log population density	0.453***	0.439***
	(0.064)	(0.062)
Geographic and climatic controls		yes
Country fixed effects	yes	yes
R-sq	0,71	0,73
Observations	870	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 9

Mechanisms: Institutional-cultural transfer vs. urban persistence

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Log night light density						
Ancient colonies	0.677***	0.476***	0.704***	0.48***	0.951***	0.484***
	(0.116)	(0.109)	(0.138)	(0.108)	(0.17)	(0.109)
Other ancient settlements 750BC	0.562***					
	(0.167)					
Other ancient settlements 750BC (only town, city or urban)		0.298**				
		(0.134)				
Other ancient settlements 500BC			0.44**			
			(0.166)			
Other ancient settlements 500BC (only town, city or urban)				0.29*		
				(0.143)		
Other ancient settlements 250BC					0.681***	
					(0.181)	
Other ancient settlements 250BC (only town, city or urban)						0.295***
						(0.091)
Geographic and climatic controls	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
R-sq	0,41	0,4	0,41	0,4	0,42	0,4
Observations	869	869	869	869	869	869
Panel B: Log population density						
Ancient colonies	0.978***	0.621***	1.074***	0.624***	1.283***	0.63***
	(0.198)	(0.155)	(0.23)	(0.152)	(0.232)	(0.155)
Other ancient settlements 750BC	0.983***					
	(0.325)					
Other ancient settlements 750BC (only town, city or urban)		0.294				
		(0.222)				
Other ancient settlements 500BC			0.861**			
			(0.336)			
Other ancient settlements 500BC (only town, city or urban)				0.262		
				(0.224)		
Other ancient settlements 250BC					0.945***	
					(0.271)	
Other ancient settlements 250BC (only town, city or urban)						0.303*
						(0.152)
Geographic and climatic controls	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
R-sq	0,39	0,38	0,39	0,38	0,39	0,38
Observations	869	869	869	869	869	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table 10

Ancient colonialism and the evolution of the urban system

	Ancient settlements							Presence of Roman Roads
	-1000	-750	-500	-250	0	250	500	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ancient colonies	0.058	0.317***	0.293***	0.178***	0.097**	0.097**	0.122**	0.1***
	(0.037)	(0.039)	(0.051)	(0.055)	(0.041)	(0.041)	(0.053)	(0.023)
Geographic and climatic controls	yes	yes	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,21	0,43	0,4	0,3	0,3	0,3	0,32	0,59
Observations	869	869	869	869	869	869	869	869

	Cities						City at some point in time (800-1800)
	800	1000	1200	1400	1600	1800	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Ancient colonies	0.034*	0.033	0.056**	0.05**	0.09**	0.1**	0.091**
	(0.017)	(0.02)	(0.025)	(0.023)	(0.036)	(0.045)	(0.044)
Geographic and climatic controls	yes	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes
R-sq	0,06	0,08	0,1	0,09	0,19	0,28	0,27
Observations	869	869	869	869	869	869	869

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Supplementary Material to

Ancient colonialism and the economic geography of the Mediterranean

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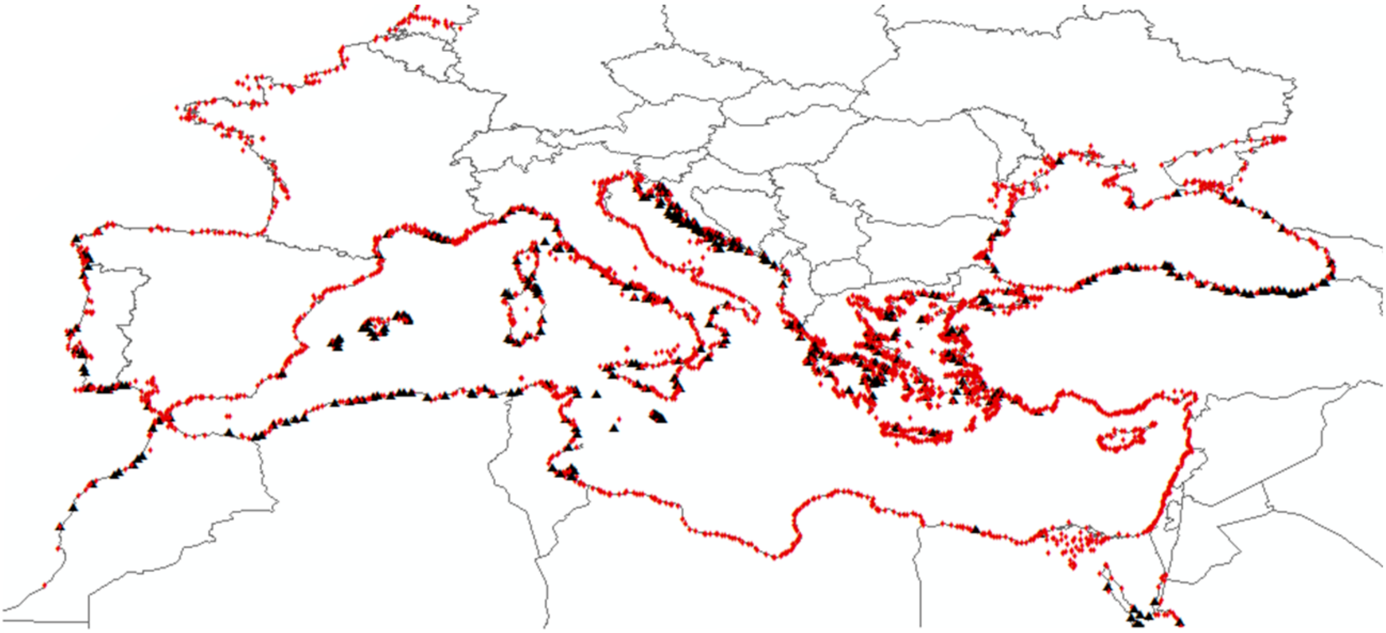
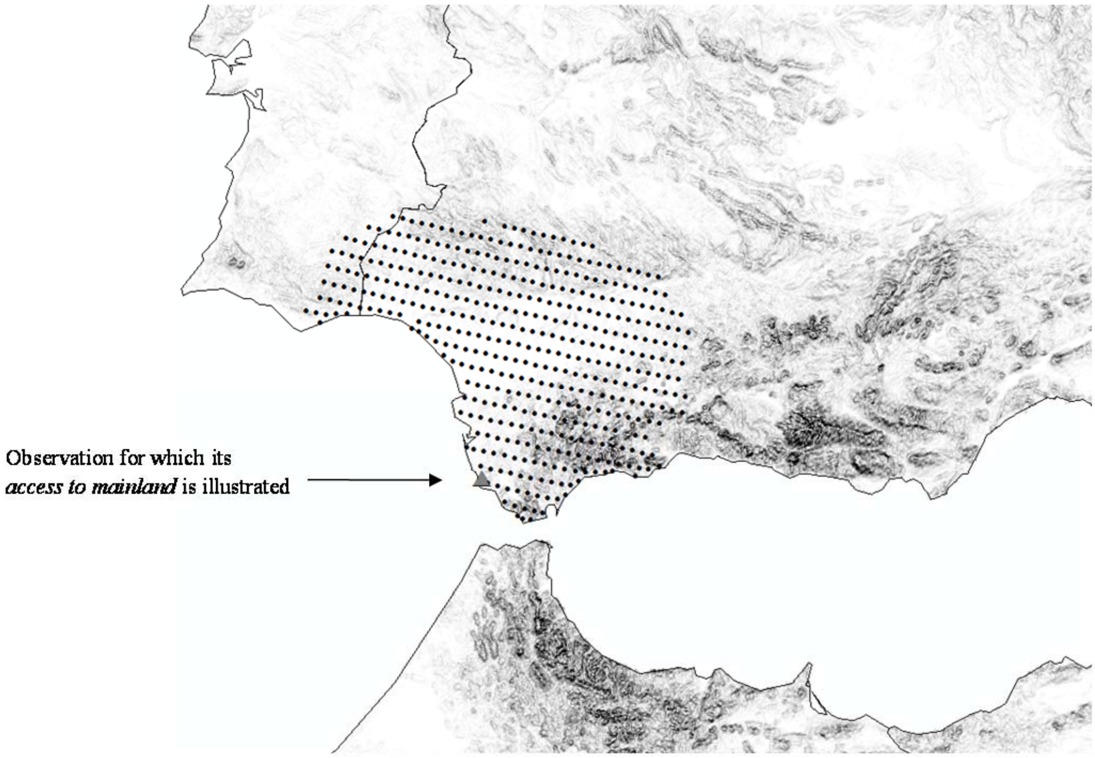
[NOT INTENDED FOR PUBLICATION]

Figure A1. Map of Ancient Harbours and Ports in the Mediterranean area



Notes: This map shows the geographic distribution of ancient harbours and ports. Ancient ports considered excellent shelter by modern nautical guides are in black.Source: de Graauw (2017).

FIGURE A2. ILLUSTRATION OF THE CONSTRUCTION OF THE VARIABLE *ACCESS TO MAINLAND*



Notes: This map illustrates the construction of the variable ***access to mainland*** for one observation. The background layer represents the slope of each sq-km of the surface. The black dots show the centroids of the 10x10 grid cells which are located within a distance of 250 km from the grey triangle -traveling only through land and taking into account the slope of the surface.

Table A1

Description of variables

Variable	Description	Source
Left-hand side variables:		
Log night light density	Natural logarithm of 0.001 plus the average night light density from 2000 until 2005.	NOOA/National Centers for Environmental information, https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html
Log population density	Natural logarithm of 0.000001 plus population density measured in 2000.	European Commission (JRC) and Columbia University(CIESIN), 2015.
Cities 800-1800	Dummy variable capturing whether there was at least one city (settlement with 10,000 or more inhabitants) within the grid cell in the referred year.	Bosker et al. (2013)
Urban population 800-1800	Natural logarithm of 0.1 plus total urban population (living in settlements with 10,000 or more inhabitants) measured in the referred year.	Bosker et al. (2013)
City at some point in time	Dummy variable capturing the presence of a city (settlement with 10,000 or more inhabitants) in any year of the period 800-1800.	Bosker et al. (2013)
Settlements 1000 BC-500CE	Dummy variable measuring the existence of at least one ancient place classified as settlement, city, urban, town or village. Only places with precise location are selected.	Pleiades (2017).
Roman roads	Dummy variable capturing whether a Roman road overlaps with the grid cell.	McCormick et al. (2013)
Right-hand side variables:		
Main independent variables:		
Ancient colonies	Dummy variable indicating whether there is at least one ancient Phoenician, Greek or Etruscan colony in the grid cell. Observations with metropolies (mother cities in the civilisations' homeland) are excluded from the analysis.	Wittke (2011).
Ancient colonies: 5-km buffer	This variable is analogous to the previous one but the presence of a colony is considered if the grid cell is less than 5 km away from the colony's centroid.	Wittke (2011).
Distance to the nearest colony	Linear distance in kilometers between each cell's centroid and the nearest ancient colony.	Wittke (2011).
Ancient colonies (alternative sources)	Dummy variable indicating whether there is at least one ancient Phoenician, Greek or Etruscan colony in the grid cell. Observations with metropolies (mother cities in the civilisations' homeland) are excluded from the analysis.	Etruscan colonies: http://www.historyfiles.co.uk/KingListsEurope/ItalyEtruscans.htm Greek colonies: Greece in the Making, 1200-479 BC, Robin Osborne Phoenician colonies: https://www.lib.utexas.edu/maps/historical/shepherd/greek_phoenician_550.jpg

Table A1

Description of variables (*Continued*)

Variable	Description	Source
Poleis outside the Greek homeland	Dummy variable indicating whether there is at least one ancient Greek polis in the grid cell. Observations with poleis located in modern day Greece are excluded from the analysis.	Ober (2015).
Greek colony	Dummy variable indicating whether there is at least one ancient Greek colony in the grid cell. Observations with metropolies (mother cities in the civilisation's homeland) are excluded from the analysis.	Wittke (2011).
Phoenician colony	Dummy variable indicating whether there is at least one ancient Phoenician colony in the grid cell. Observations with metropolies (mother cities in the civilisation's homeland) are excluded from the analysis.	Wittke (2011).
Etruscan colony	Dummy variable indicating whether there is at least one ancient Etruscan colony in the grid cell. Observations with metropolies (mother cities in the civilisation's homeland) are excluded from the analysis.	Wittke (2011).
Mixed (more than one colonizer)	Dummy variable indicating whether in the same grid cell there are at least two colonies from different colonisers. Observations with metropolies (mother cities in the civilisations' homeland) are excluded from the analysis.	Wittke (2011).
Control variables and others:		
Altitude	Average altitude of the surface area of the grid cell.	GTOPO30 (Data available from the U.S. Geological Survey).
Distance to the Mediterranean coast	Linear distance between the grid cell's centroid and the nearest point of the Mediterranean coast (in km).	Authors' elaboration.
Coastal	Dummy variable indicating whether the grid cell borders the Mediterranean coast.	Authors' elaboration.
Island dummy	Dummy variable indicating whether the grid cell is within an island.	Authors' elaboration.
Latitude/ Longitude	The geographic coordinates of the grid cell centroids, in decimal degrees.	Authors' elaboration.
Precipitation	Annual precipitation, in hundred of mililiters. It corresponds to the average value of the surface area of the grid cell.*	WorldClim (Hijmans et al., 2005).
Ruggedness	Average slope of the grid cell calculated using the *slope* function of ArcGIS.	GTOPO30 (Data available from the U.S. Geological Survey.).
Soil quality	Average of seven key soil dimensions important for crop production: nutrient availability, nutrient retention capacity, rooting conditions, oxygen availability to roots, excess salts, toxicities, and workability. The average value for each component is calculated for the surface area corresponding to the grid cell .*	Fischer et al. (2008).

Table A1

Description of variables (*Continued*)

Variable	Description	Source
Temperature	Annual average temperature. It corresponds to the average value of the surface area of the grid cell.*	WorldClim (Hijmans et al., 2005).
Water quality	Mean chlorophyll of the sea water around the grid cell using a buffer of 50 kilometres.*	http://sedac.ciesin.columbia.edu/data/set/icwq-annual-chlorophyll-a-concentration-1998-2007
Port excellent shelter	Dummy variable indicating whether the grid cell contains an ancient port classified as excellent shelter by modern nautical guides.	de Graauw (2017).
Access to mainland	Number (in hundreds) of 10x10 km grid cells located in the mainland that are within a distance of 250 km from the coast moving only through land and taking into account the slope of the surface (for instance, passing through a grid cell with a slope of 5% is twice as costly as passing through a flat cell).*	Authors' elaboration.
Connectedness of the coast	Number (in hundreds) of 10x10 km coastal grid cells that are within a distance of 500 km moving only through water. We follow the methodology developed by Maurer et al. (2017).*	Authors' elaboration.
River	Dummy variable indicating whether a river at least 50-meter width passes through the grid cell.	Andreadis et al. (2013)
Grid cell area	Grid cell area in hundreds of sq-km.	Authors' elaboration.
Other ancient settlements 750 BC-250BC	Binary indicator measuring whether in the grid cell there is at least one ancient place classified as settlement, city, urban, town or village that existed in the referred period. Only places with precise location that are not Ancient colonies are selected.	Pleiades (2017).
Other ancient settlements (only town, city or urban) 750 BC-250BC	Binary indicator measuring whether in the grid cell there is at least one ancient place classified as city, urban or town that existed in the referred period. Only places with precise location that are not Ancient colonies are selected.	Pleiades (2017).

Notes: The units of analysis are 50x50 km grid cells. The basic layer of countries surrounding the Mediterranean sea comes from EUROSTAT (Countries, 2010 - European Commission, Eurostat/GISCO). The source of the underlying data is cited although -naturally- all variables need to be properly constructed by us. *Values of the (up to 5) nearest neighbour have been imputed to grid cells with missing values in some of these variables.

Table A2

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Log night light density	896	1.38	1.68	-6.91	4.13
Log population density	896	3.96	2.78	-13.82	9.10
Cities 800	896	0.02	0.15	0.00	1.00
Cities 900	896	0.04	0.19	0.00	1.00
Cities 1000	896	0.05	0.22	0.00	1.00
Cities 1100	896	0.05	0.23	0.00	1.00
Cities 1200	896	0.07	0.25	0.00	1.00
Cities 1300	896	0.08	0.27	0.00	1.00
Cities 1400	896	0.06	0.24	0.00	1.00
Cities 1500	896	0.07	0.26	0.00	1.00
Cities 1600	896	0.09	0.29	0.00	1.00
Cities 1700	896	0.09	0.29	0.00	1.00
Cities 1800	896	0.16	0.37	0.00	1.00
Urban population 800	896	0.81	9.52	0.00	250.00
Urban population 900	896	1.24	11.58	0.00	300.00
Urban population 1000	896	1.68	12.45	0.00	300.00
Urban population 1100	896	1.73	10.52	0.00	200.00
Urban population 1200	896	1.77	8.38	0.00	100.00
Urban population 1300	896	2.49	11.68	0.00	150.00
Urban population 1400	896	1.99	10.25	0.00	100.00
Urban population 1500	896	2.24	13.44	0.00	280.00
Urban population 1600	896	3.92	28.26	0.00	700.00
Urban population 1700	896	4.08	29.03	0.00	700.00
Urban population 1800	896	6.19	28.96	0.00	500.00
City at some point in time	896	0.19	0.39	0.00	1.00
Settlements 1000 BC	896	0.08	0.28	0.00	1.00
Settlements 750 BC	896	0.34	0.48	0.00	1.00
Settlements 500 BC	896	0.47	0.50	0.00	1.00
Settlements 250 BC	896	0.65	0.48	0.00	1.00
Settlements 0 CE	896	0.75	0.43	0.00	1.00
Settlements 250 CE	896	0.75	0.43	0.00	1.00
Settlements 500 CE	896	0.65	0.48	0.00	1.00
Roman roads	896	0.71	0.46	0.00	1.00

Table A2

Descriptive statistics (*Continued*)

Variable	Obs	Mean	Std. Dev.	Min	Max
Ancient colonies	870	0.13	0.34	0.00	1.00
Ancient colonies: 5-km buffer	863	0.19	0.39	0.00	1.00
Distance to the nearest colony	870	84.77	67.20	0.53	294.83
Ancient colonies (alternative sources)	871	0.13	0.34	0.00	1.00
Poleis outside Greek homeland	801	0.14	0.35	0.00	1.00
Greek colony	870	0.09	0.29	0.00	1.00
Phoenician colony	870	0.03	0.17	0.00	1.00
Etruscan colony	870	0.003	0.06	0.00	1.00
Mixed (more than one coloniser)	870	0.003	0.06	0.00	1.00
Temperature	896	15.11	3.20	4.53	21.65
Precipitation	896	615.90	291.93	40.10	1872.99
Altitude	896	315.70	316.72	1.83	2051.87
Ruggedness	896	3.17	2.56	0.01	12.79
Soil quality	896	8.83	1.06	0.00	10.00
Water quality	895	9.69	22.00	0.98	197.49
Island dummy	896	0.18	0.38	0.00	1.00
Coastal	896	0.74	0.44	0.00	1.00
Longitude	896	19.03	13.42	-9.70	42.30
Latitude	896	38.74	4.39	30.08	47.52
Port excellent shelter	896	0.18	0.38	0.00	1.00
Access to mainland	896	4.49	3.08	0.01	15.32
Connectedness	896	5.70	3.10	1.90	13.73
River	896	0.43	0.49	0.00	1.00
Grid cell area	896	14.95	9.36	0.10	25.00
Other ancient settlements 750BC	896	0.34	0.48	0.00	1.00
Other ancient settlements 750BC (only town, city or urban)	896	0.02	0.15	0.00	1.00
Other ancient settlements 500BC	896	0.47	0.50	0.00	1.00
Other ancient settlements 500BC (only town, city or urban)	896	0.03	0.18	0.00	1.00
Other ancient settlements 250BC	896	0.65	0.48	0.00	1.00
Other ancient settlements 250BC (only town, city or urban)	896	0.04	0.20	0.00	1.00

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1.

Table A3

Robustness checks: Only coastal observations

	The dependent variable:			
	Log night light density		Log population density	
	(1)	(2)	(3)	(4)
Ancient colonies	0.549***	0.505***	0.681***	0.693***
	(0.141)	(0.128)	(0.149)	(0.172)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	0.29	0.34	0.24	0.31
Observations	634	634	634	634

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to coastal observations. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table A4

Robustness checks: Only observations with ancient ports classified as excellent shelters

	The dependent variable:			
	Log night light density		Log population density	
	(1)	(2)	(3)	(4)
Ancient colonies	0.365**	0.172*	0.7**	0.423*
	(0.135)	(0.099)	(0.3)	(0.225)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	0,39	0,55	0,3	0,46
Observations	146	146	146	146

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to coastal observations. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table A5

Robustness checks: Excluding dark places and places w/o population

	The dependent variable:			
	Log night light density (dark places removed)		Log population density (places w/o population removed)	
	(1)	(2)	(3)	(4)
Ancient colonies	0.593***	0.386***	0.687***	0.486***
	(0.125)	(0.09)	(0.153)	(0.129)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	0,35	0,47	0,31	0,4
Observations	859	858	856	855

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table A6

Robustness checks: Excluding countries one by one (I)

The dependent variable is Log night light density

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	AL		BA		BG		CY		DZ		EG		EL	
	ALBANIA		BOSNIA AND HERZEGOVINA		BULGARIA		CYPRUS		ALGERIA		EGYPT		Greece	
Ancient colonies	0.684***	0.469***	0.699***	0.47***	0.701***	0.482***	0.686***	0.458***	0.707***	0.469***	0.687***	0.47***	0.726***	0.514***
	(0.156)	(0.114)	(0.156)	(0.109)	(0.16)	(0.113)	(0.157)	(0.11)	(0.161)	(0.108)	(0.156)	(0.113)	(0.177)	(0.11)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,3	0,39	0,3	0,4	0,3	0,4	0,31	0,41	0,3	0,41	0,31	0,4	0,32	0,42
Observations	858	857	863	862	860	859	859	858	830	829	832	831	767	766

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	ES		FR		GE		HR		IL		IT		LB	
	SPAIN		FRANCE		GEORGIA		CROATIA		ISRAEL		ITALY		LEBANON	
Ancient colonies	0.733***	0.511***	0.672***	0.451***	0.675***	0.45***	0.699***	0.484***	0.699***	0.47***	0.852***	0.488***	0.699***	0.468***
	(0.172)	(0.111)	(0.157)	(0.113)	(0.155)	(0.114)	(0.156)	(0.107)	(0.156)	(0.11)	(0.123)	(0.114)	(0.156)	(0.109)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,28	0,37	0,31	0,4	0,29	0,39	0,31	0,4	0,29	0,39	0,24	0,35	0,3	0,4
Observations	806	805	844	843	859	858	852	851	865	864	736	735	866	865

	29	30	31	32	33	34	35	36	37	38	39	40	41	42
	LY		MA		ME		MT		PS		PT		RO	
	LIBYAN ARAB JAMAHIRIYA		MOROCCO		REPUBLIC OF MONTENEGRO		MALTA		PALESTINIAN AUTHORITY		PORTUGAL		ROMANIA	
Ancient colonies	0.633***	0.385***	0.703***	0.485***	0.699***	0.468***	0.699***	0.471***	0.699***	0.469***	0.707***	0.487***	0.684***	0.448***
	(0.142)	(0.112)	(0.16)	(0.112)	(0.156)	(0.109)	(0.157)	(0.11)	(0.156)	(0.109)	(0.16)	(0.112)	(0.155)	(0.105)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,31	0,43	0,3	0,4	0,3	0,4	0,3	0,39	0,3	0,39	0,3	0,4	0,3	0,4
Observations	809	808	828	827	866	865	868	867	866	865	855	854	861	860

	43	44	45	46	47	48	49	50	51	52	53	54
	RU		SI		SY		TN		TR		UA	
	RUSSIAN FEDERATION		SLOVENIA		SYRIAN ARAB		TUNISIA		TURKEY		UKRAINE	
Ancient colonies	0.711***	0.473***	0.699***	0.467***	0.703***	0.477***	0.679***	0.468***	0.673***	0.427***	0.682***	0.436***
	(0.161)	(0.11)	(0.156)	(0.109)	(0.158)	(0.111)	(0.155)	(0.121)	(0.193)	(0.111)	(0.161)	(0.107)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,3	0,4	0,3	0,4	0,3	0,4	0,31	0,4	0,3	0,4	0,3	0,4
Observations	840	839	866	865	861	861	835	834	751	750	817	816

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table A6

Robustness checks: Excluding countries one by one (II)

	The dependent variable is Log population density													
	55	56	57	58	59	60	61	62	63	64	65	66	67	68
	AL		BA		BG		CY		DZ		EG		EL	
	ALBANIA		BOSNIA AND HERZEGOVINA		BULGARIA		CYPRUS		ALGERIA		EGYPT		Greece	
Ancient colonies	0.955***	0.626***	0.964***	0.613***	0.965***	0.632***	0.968***	0.612***	0.986***	0.611***	0.92***	0.628***	1.028***	0.713***
	(0.208)	(0.162)	(0.206)	(0.157)	(0.21)	(0.159)	(0.21)	(0.161)	(0.211)	(0.158)	(0.198)	(0.156)	(0.228)	(0.13)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,27	0,38	0,28	0,38	0,27	0,38	0,28	0,38	0,27	0,37	0,33	0,41	0,28	0,38
Observations	858	857	863	862	860	859	859	858	830	829	832	831	767	766

	69	70	71	72	73	74	75	76	77	78	79	80	81	82
	ES		FR		GE		HR		IL		IT		LB	
	SPAIN		FRANCE		GEORGIA		CROATIA		ISRAEL		ITALY		LEBANON	
Ancient colonies	1.006***	0.668***	0.933***	0.592***	0.97***	0.628***	0.964***	0.616***	0.964***	0.616***	1.108***	0.501**	0.964***	0.611***
	(0.225)	(0.145)	(0.209)	(0.162)	(0.211)	(0.163)	(0.206)	(0.158)	(0.206)	(0.157)	(0.222)	(0.184)	(0.206)	(0.158)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,27	0,37	0,27	0,38	0,28	0,38	0,28	0,37	0,27	0,37	0,27	0,38	0,27	0,38
Observations	806	805	844	843	859	858	852	851	865	864	736	735	866	865

	83	84	85	86	87	88	89	90	91	92	93	94	95	96
	LY		MA		ME		MT		PS		PT		RO	
	LIBYAN ARAB JAMAHIRIYA		MOROCCO		REPUBLIC OF MONTENEGRO		MALTA		PALESTINIAN AUTHORITY		PORTUGAL		ROMANIA	
Ancient colonies	0.825***	0.504***	0.979***	0.64***	0.964***	0.611***	0.958***	0.607***	0.964***	0.613***	0.966***	0.627***	0.943***	0.586***
	(0.142)	(0.148)	(0.211)	(0.166)	(0.206)	(0.157)	(0.206)	(0.158)	(0.206)	(0.157)	(0.21)	(0.161)	(0.204)	(0.157)
Geographic and climatic controls		yes		yes		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,19	0,32	0,27	0,37	0,27	0,38	0,27	0,37	0,27	0,37	0,28	0,38	0,27	0,38
Observations	809	808	828	827	866	865	868	867	866	865	855	854	861	860

	97	98	99	100	101	102	103	104	105	106
	RU		SI		SY		TN		TR	
	RUSSIAN FEDERATION		SLOVENIA		SYRIAN ARAB		TUNISIA		TURKEY	
Ancient colonies	0.981***	0.617***	0.964***	0.611***	0.973***	0.628***	0.939***	0.613***	0.949***	0.531***
	(0.211)	(0.159)	(0.206)	(0.157)	(0.208)	(0.156)	(0.206)	(0.169)	(0.26)	(0.164)
Geographic and climatic controls		yes		yes		yes		yes		yes
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-sq	0,28	0,38	0,27	0,38	0,27	0,37	0,28	0,37	0,28	0,39
Observations	840	839	866	865	861	861	835	834	751	750

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors clustered at the country level are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.

Table A7

Robustness checks: Conley (1999)'s SEs.

	The dependent variable:			
	Log night light density		Log population density	
	(1)	(2)	(3)	(4)
Ancient colonies	0.699***	0.469***	0.964***	0.614***
	(0.116)	(0.113)	(0.214)	(0.202)
Geographic and climatic controls		yes		yes
Country fixed effects	yes	yes	yes	yes
R-sq	870	869	870	869
Observations	0,299	0,397	0,275	0,375

Notes: The units of analysis are 50x50 km grid-cells. Sample restricted to observations within 50 km of the Mediterranean coast. Variables descriptions are provided in Table A1. The estimations include a constant term and a full set of country dummies, which are omitted for space considerations. Standard errors corrected for spatial dependence are in parentheses. *, **, and *** mean that the coefficient is statistically significant at 10%, 5%, and 1%, respectively.