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

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WP Nº 18-004

1st Quarter 2018

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Keywords: Economic Development, Ancient Colonialism, History, Mediterranean

JEL Classification: C21, N93, O1

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1. Introduction

This paper investigates the long-term economic legacy of ancient colonialism (c. 11^{th}–6^{th} centuries BCE). As the advanced Phoenician, Greek and Etruscan civilisations spread around the Mediterranean, they transferred their respective institutions, culture, technology and human capital to new locations. This early form of colonialism which occurred more than two millennia ago was confined to the territory surrounding a city, and as such did not lead to vast overseas dominions. We find robust evidence indicating that areas that had Phoenician, Greek or Etruscan colonies are today more developed in terms of higher light density at night. This suggests that having an early exposure to a more advanced civilisation has a positive long term influence on economic development.

This 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 (Spolaore and Wacziarg, 2013; Nunn, 2014; Michalopoulos and Papaioannou, 2017).[1] While research on modern European colonialism is extensive, this is to our knowledge the first study to assess the economic impact of ancient colonialism. This early form of colonialism has several attractive features that differentiate it from its modern counterpart. First, ancient colonialism took place more than two millennia ago and the metropolitan political dominion over the colonies was brief or non-existent. These two characteristics are consistent with the fact that former ancient colonies have been part of several empires and kingdoms during the past two and a half thousand years. If despite all this historical turbulence there is still an economic legacy, it would imply a remarkable persistence of the influence of ancient civilisations. Second, this form of colonialism was concentrated geographically along the Mediterranean (which is a relatively homogeneous territory) thereby facilitating its empirical study. Third, ancient colonialism was local in nature, generally confined to the area surrounding a town, which implies that, if there has been persistence, it has been working at the local level. All these features make ancient colonialism a particularly interesting historical setting to analyse the influence of more advanced civilisations on economic development.

Our work also contributes to the literature on the economic and social legacy of the classical world, which has attracted a renewed interest among economists and other social scientists (e.g.,

[1] For literature investigating the economic consequences of colonialism, see among others: Engerman and Sokoloff (2000), Acemoglu et al. (2001, 2002), Banerjee and Iyer (2005), Angeles (2007), Feyrer and Sacerdote (2009), Dell (2010), Iyer (2010), Bruhn and Gallego (2012), Easterly and Levine (2016), Oto-Peralías and Romero-Ávila (2014a, b, 2016), Michalopoulos and Papaioannou (2016), Dell and Olken (2017), and Droller (2017).

Scheidel et al., 2008; Ober, 2015; Dalgaard et al. 2015; Michaels and Rauch, 2017; Maurer et al., 2017; Wahl, 2017). 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 development. 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 the potential short-term costs (for instance, due to conflicts).[2] In addition, this paper improves our understanding of the historical causes of regional economic development along the Mediterranean. Remarkably, despite the very divergent historical paths of countries within this broad region, the legacy of ancient colonies survives at the local level.

To test whether areas with ancient colonies are more developed today, we collect data on the location of Phoenician, Greek, and Etruscan colonies as well as on geographic and climatic characteristics for all Mediterranean and Black sea countries. Our main unit of analysis are 50×50 kilometres grid cells. We use fine spatial resolution light density data as a proxy for economic development at the sub-national level, which prior literature shows has a high correlation with GDP per capita (Henderson et al., 2011, 2012; Pinkovskiy, 2016). The main independent variable in our empirical analysis is a binary indicator capturing whether there is at least one ancient colony in a 50x50 grid cell. Our baseline regression model includes country fixed effects and restricts the sample to grid cells located within 50 kilometres of the Mediterranean coast, thus allowing us to compare a relatively homogeneous geographical coastal area.

The results of our empirical analysis indicate that places with ancient colonies have higher levels of light density. This finding is robust to a large battery of robustness checks which include: i) the use of an alternative indicator of ancient colonies (distance from the colony); ii) the division of the sample by continents to test whether the results are consistent across Europe, Asia and Africa; iii) the use of alternative data sources for the indicators of ancient colonies; iv) the exclusion of grid cells with a zero value in luminosity; v) the restriction of the sample to coastal grid cells; vi) the differentiation of the effect by coloniser identity; and vi) the use of a bigger cell size of 100×100 kilometres. Reassuringly, the results from these robustness checks provide support to our baseline finding that ancient colonialism has a positive and persistent impact on long-term economic development.

[2] An interesting feature of ancient colonialism is that even if civilisations were very different across the Mediterranean, the natural environment was relatively similar, including the disease environment. Therefore, the native population was not decimated as a consequence of diseases brought by colonisers.

Two complementary mechanisms can explain our results. On the one hand, the institutional-cultural view, typical in the colonialism literature (Acemoglu et al. 2001, Easterly and Levine, 2016), whereby our results reflect the persistent effect of the exposure to a more advanced civilisation, including culture, human capital, institutions and technology. On the other hand, according to the "early start" view (Putterman et al., 2002) the results may also reflect the advantages of an early start (such as an early establishment of a settlement) and be partially the consequence of agglomeration economies accruing over the long-run. To analyse the relative importance of each mechanism we compare ancient colonies with settlements of other cultures from the same era. Our findings suggest that both channels play an important role.

The rest of the paper is organised as follows. Section 2 outlines the historical period concerning ancient colonialism and the main characteristics of the Greek, Phoenician and Etruscan civilisations. Section 3 discusses the empirical strategy and provides a preliminary discussion of the data. Section 4 presents our main results and a battery of robustness checks. Section 5 discusses the results and sheds some light on the mechanisms. 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 common characteristics such as advanced institutions, high levels of social capital and technological innovation (including naval engineering). 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.[3] 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.

[*Insert Figure 1 about here*]

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 mainly in the southern

[3] More specifically, to explain the classical Greek prosperity, Ober (2015, p.103) argues that "[f]air rules and competition within a marketlike ecology of states promoted capital investment, innovation, and rational cooperation in a context of low transaction costs."

European coastline and around the Black sea. 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). Moreover, early evidence from ancient grave sites around Attica and Argolid illustrates a shift in the adult to child ratio from approximately 9:1 before 750 BCE to 1:1 afterwards (Scheidel et al., 2008). 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).[4]

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, it is estimated that about 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. The new area to be colonised was chosen following a specific ritual related to religious customs, taking a 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). Most areas along the Mediterranean coast shared similar characteristics such as natural harbours, mild climate and fertile soil. The colonial enterprise was organised by the mother city or metropolis, which maintained strong cultural ties with the new colonised area.

The Greek colonies, in line with established standards of the mother city, developed their own laws, cults, foreign relations and arts. In doing so, they disseminated the Greek culture to neighbouring indigenous communities (White, 1961). 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 coins (the primary means of transacting at least in Western colonies until the end of 5th century) had great influence along the Mediterranean (Culican, 1992). More often than not neighbouring indigenous societies adopted

[4] 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).

elements of the Greek civilisation which, according to our hypothesis, could stimulate their subsequent economic development.

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 (but not identical) to the Greek one. However, the colonisation process was organised in a different way. Apart from Carthage (which was founded as a colony in 814/3 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 their dye factories were a significant source of their wealth, they had to establish treatment plants and settlements not only in places with profitable trading with the natives, but also in regions with rich coral deposits (Jensen, 1963).

There is evidence that significant (and bidirectional) 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 founded 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 nation were able to disseminate their civilisation in 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 the Greeks and Phoenicians, 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, 2011b). 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).

Economic development led to political and cultural development for Etruscan regions. The improvement in living standards and the formation of a new class of specialised artisans and small business owners contributed to the creation of more inclusive institutions. This economic and cultural change was reflected in the physical infrastructure of Etruscan cities. Straight-running roads, squares, sewerage system, paved sites and walls resembled the Greek polis (Wittke, 2011a). Iconographic, thematic and stylistic proximity with the Greek painting style in graves and vases suggest a high cultural influence from Greeks (Spivey, 2006). 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.

2.4 Ancient colonialism and long-term development

The Greeks, Phoenicians and Etruscans achieved remarkable prosperity by the pre-modern standards. Focusing on the Greeks, the most active coloniser, 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%). These advanced civilisations had more participatory and open political institutions than their neighbours. Moreover, they were more commercially oriented and used money as a medium of exchange. All these factors contributed to prosperity. Our main

hypothesis is that ancient colonialism, by geographically spreading these more advanced civilisations has had a positive legacy on long-term economic development. Colonisers brought human capital, culture, technologies and institutions to the settlements that they founded. This was a positive shock for the territory affected directly by the foundation of the colonies, but also for the surrounding area, given the influence exerted on the indigenous population. As culture and institutions become very persistent over time, the existence of a link between ancient colonialism and modern economic development is plausible. Recent research has indeed emphasised the tendency of prosperity to perpetuate over time (Comin et al., 2010; Chanda, et al., 2014; Maloney and Calcedo, 2016). We thus expect that places with ancient colonies to be relatively more developed today.

3. Data and empirical strategy

3.1 Data

To investigate whether there is a link between ancient colonialism and current economic development, 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. The geographic sample covers the areas affected by ancient colonialism, as shown in Figure 1. 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 864 cells).[5]

Regarding our measure of ancient colonies, we collect data on the locations of ancient Etruscan, Greek and Phoenician colonies. To this end, we use the *Historical Atlas of the Ancient World* (Brill's New Pauly Supplements I - Volume 3 –Wittke, 2011b). 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.[6] 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

[5] The intersection of the countries shapefile with the 50×50 kilometres grid renders 922 observations. We delete polygons with a very small surface area (lower than 10 km^2) and those with missing values in our dependent variable.

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

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).

For our measure of economic development, we follow Michalopoulos and Papaioannou (2013) and Alesina, Michalopoulos and Papaioannou (2016) in using luminosity at night from satellite data. It has been found that a high correlation exists between light density at night and GDP per capita, access to electricity and the provision of public goods (Pinkovskiy, 2016). Moreover, Chen and Nordhaus (2011) argue that light density is likely to add value as a proxy for output for national sub-divisions with low-quality data collection systems. For these reasons, given the lack of available data at the sub-national level in some countries included in our sample (particularly in Africa and Asia), light density is a suitable measure of economic development for the purposes of our study. Data are obtained from the Defense Meteorological Satellite Program's Operational Linescan System (NOAA) that reports images from the earth at night 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 (e.g., 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 also collect data on a wide array of geographic and climatic variables, including temperature, rainfall, altitude, ruggedness, agricultural suitability and marine wealth. In order to conserve space, we refer to Table A1 in Appendix 1 for the definitions and sources of the variables employed in the analysis. Descriptive statistics are provided in Table A2 in the Supplementary Material.

3.2 Preliminary data analysis and methodological issues

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 are much more developed in terms of light density. The difference of 1.71 (in logs) is large and highly 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 developed than inland regions. Consequently columns 2 and 3 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 180% higher ($e^{1.032}$–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. For instance, for this sample almost 75% of the observations are coastal (72.69%).

[*Insert Table 1 about here*]

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 with some specific (attractive) features to establish their colonies. If so, then the higher development of ancient colonies reported in Table 1 could be due to superior geographic endowments. To address this concern, first, we point out that the process of colony foundation was not purely driven by economic considerations. Religious and political factors played very often a major role (Rutter, 1986).[7] Second, and more crucially, there were many 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. One interesting case in point is the presence of natural harbours, which can be thought of as a major determinant for the location of colonies. This fact does not actually create major problems for the analysis because the Mediterranean is full of natural harbours.[8]

[7] The religious ritual undertaken to decide the location of colonies introduces an element of randomness in the process. 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).

[8] 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. It is apparent that these are widespread along the Mediterranean, which mitigates any concern about the potential heterogeneity of our sample in this regard. In other words, even assuming that colonies were established in places with natural harbours, the latter were so widespread that this is unlikely to bias the results of our analysis.

Notwithstanding the previous comments, we control in our baseline model for a large set of geographic and climatic variables. Moreover, in order to evaluate empirically whether ancient colonisers selected places with specific geographic and climatic features, we next present a balancedness table showing the relationship between our colony dummy indicator and several geographic and climatic variables. Columns 1 to 7 of Table 2 show that there are no statistically significant differences between grid cells with and without colonies in terms of temperature, rainfall, elevation, ruggedness, soil quality, water quality and being an island or not. Columns 9 and 10 also reveal the absence of significant differences in latitude and longitude. There are only differences regarding the coastal dummy variable (column 8), with the positive coefficient suggesting that ancient colonisers tended to select coastal places. Arguably, this significant correlation does not create a major problem for the analysis. First, the coastal dummy variable is included in the control set of the baseline model. Second, most of the 50 kilometre bandwidth sample is coastal (about 75% of the observations), and omitting observations that are landlocked does not change the main results (see Section 4.2).

[*Insert Table 2 about here*]

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. In contrast, information about failed colonies is perhaps more scarce and has often not reached us. This would inflate the effect of ancient colonialism on economic development. 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 the very rich dataset provided by Ober (2015) that contains a comprehensive list of Greek poleis for which survivorship bias should not be a concern.

4. Regression results

To investigate the possible link between ancient colonialism and current economic development we estimate the following equation via Ordinary Least Squares (OLS), with standard errors clustered at the country level.

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

where i denotes grid cells and c denotes countries. Y_{ic} represents the logarithm of mean light 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 either Etruscans, Greeks or Phoenicians, and 0 otherwise. X_{ic} is a vector of geographic, topographic and climatic characteristics that includes temperature, precipitation, elevation, ruggedness, agricultural suitability, water quality, island dummy, coast dummy, latitude and longitude. 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 here is α, which represents the effect of ancient colonies on current economic development.

4.1 Baseline results

Table 3 presents the baseline results of the paper. Column 1 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 about the positive legacy of ancient colonialism on development. Columns 2 to 7 add the geographic and climatic control variables, which do not affect the coefficient of interest. Column 8 reports a more 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 140% higher than counterparts without colonies (i.e., $e^{0.882}$–1).

[*Insert Table 3 about here*]

Table 4 uses an alternative indicator to measure the influence of ancient colonialism, namely, distance from the nearest colony. While the variable *ancient colonies* assumes a discrete and discontinuous effect of ancient colonialism, the variable *distance to the nearest colony* assumes a linear relationship between the geographic distance to an ancient colony and economic development. We expect that the positive influence of ancient colonies diminishes as distance from the colony increases. In other words, the closer an area is to a colony, the higher its luminosity should be. In order to test this hypothesis, we replace the binary colony indicator used in Table 3 with a variable measuring the distance between the centroid of each grid cell

and its nearest ancient colony. This variable enters in all regressions with a negative and statistically significant coefficient. According to the coefficient reported in column 8, each kilometre of distance from an ancient colony decreases light density on average by 0.6% ($e^{-0.006}$–1).

[*Insert Table 4 about here*]

The evidence presented thus far suggests that ancient colonies have a positive impact on regional economic development in the long-run. The culture, institutions, technologies and human capital that the more advanced Greek, Phoenician and Etruscan civilisations distributed around the Mediterranean via the establishment of colonies influenced the economic development of the areas where they settled. This effect appears to have persisted over more than two millennia. Given that the models include country fixed effects, the legacy of ancient colonialism documented here is working at the regional (local) level. The rest of this section shows that this result is robust to a large battery of robustness checks.

4.2 Robustness checks

4.2.1. Splitting the sample by continents

Our analysis is based on data drawn from countries located in three continents. It could be possible that one of these continents is driving our results. To alleviate this concern, we create three different subsamples by classifying observations on the basis of the continent they belong to, and then regress light density on ancient colonies for Europe, Asia, and Africa separately. Columns 1 and 2 in Table 5 focus on the European subsample, and present the results for the most parsimonious and most saturated models. Columns 3 and 4, and 5 and 6 repeat this for the Asian and African subsamples respectively. In all cases the coefficient on ancient colonies is positive and statistically significant (albeit the coefficient in the European subsample is slightly smaller).

[*Insert Table 5 about here*]

4.2.2. Alternative data sources

In addressing concerns that our results hinge on a singular source of information regarding the location of ancient colonies, we repeat the analysis using an indicator of ancient colonies based on alternative sources. The results are reported in columns 1 and 2 of Table 6. 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.[9] The results, reported in columns 3 and 4, show a positive and statistically significant effect of Greek colonies on regional economic development. The magnitude of the effect is roughly similar to that reported in the baseline specification, suggesting that the survivorship bias is not driving our results.

[*Insert Table 6 about here*]

4.2.3. Distinguishing among colonisers

Historians observe several differences in culture and institutions among the Etruscans, Greeks and Phoenicians. In this section we 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 81 grid cells with Greek colonies, 25 with Phoenician colonies, and only 5 with Etruscan colonies. In addition, there are 3 observations containing colonies from two colonisers, which have been grouped into a residual category called "mixed". Table 7 shows that the positive relationship between ancient colonies and light density holds across the three colonisers. It indicates that our findings are not driven by a subgroup of colonisers, although it seems that the coefficient for Greek colonies is larger, while the coefficient for the Phoenician colonies is only marginally significant. The larger size of the coefficient on Greek colonies 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 inclusive political institutions have been more decisive for local economic development than other features more salient in the other civilisations. However, this evidence has to be interpreted carefully given the lower number of observations for the Phoenician and Etruscan colonies. Overall, the findings provide support to our hypothesis of the positive legacy of ancient colonialism by which more advanced civilisations transferred their institutions, culture and technologies to distant places in the Mediterranean.

[9] 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.

[*Insert Table 7 about here*]

4.2.4. Other 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 exclude dark grid cells, that is, with an average value of light density equal to zero. Third, we check whether the results survive the inclusion of a variable measuring the connectedness of the coast (Maurer et al., 2017). Fourth, we run our baseline specification deleting countries one by one, which allows us to check whether some country is exerting an undue influence on the coefficient of interest. Fifth, we replicate the main analysis using a 100×100 kilometre grid (rather than the 50×50 kilometre grid used so far), which renders grid cells of 10,000 km^2. 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. Reassuringly, the positive coefficient on the colony dummy remains robust and statistically significant in all cases.[10]

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

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. Another 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 (Putterman et al., 2002). Relatedly, 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).

[10] Detailed results from these robustness checks are presented in the Supplementary Material.

We investigate on the relative importance of each mechanism by comparing settlements of Phoenician-Greek-Etruscan origins to settlements of other cultures but of similar age. We use the gazetteer of ancient places Pleiades (2017) to collect information on settlements existing before 500 BCE. 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 and 2 in Table 8 include these two indicators together with and without additional control variables. Both indicators have positive and statistically significant coefficients, but importantly the magnitude of the colony dummy is larger, with the difference between them being statistically significant at the 5% level. This result suggests that both the "early start-urban persistence" and the "institutions-culture" mechanisms help explain the positive effect of ancient colonies on economic development.

[*Insert Table 8 about here*]

It could be argued, however, that the coefficient on ancient colonies is larger because measurement errors are probably more pervasive in "other ancient settlements". To address this concern, we create another indicator of ancient settlements that only takes into account those places with a precise location (according to Pleiades, 2017), thereby reducing measurement errors.[11] 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 3 through 6 are largely consistent, although the coefficient on urban settlements is not statistically significant in column 6 (which reinforces the importance of the institutions-culture mechanism).[12] In light of this evidence we

[11] Pleiades (2017) classifies the precision of a location as either unlocated, rough, related or precise. We always remove unlocated places from our analysis.

[12] The evidence shown in Table 7 is also consistent with the importance of the institutions-culture channel. If the "early start" hypothesis predominates, the Phoenician colonies, which predate the Greek and Etruscan counterparts, should be the most developed today. We find the opposite. Relatedly, the differences in the magnitude of the coefficients when disaggregating the colony dummy by the identity of the coloniser suggest that there is something else than the mere fact of establishing a settlement to account for our results. The specific elements of each civilisation that were exported are likely to matter. Moreover, urban persistence arguably cannot explain *per se* the legacy of ancient colonialism. Cities to persist over time require a certain level of economic development to exchange manufactured goods and services for agricultural products. In the absence of any institutional-cultural transfer, it is very difficult to explain how places with ancient colonies managed to maintain a higher level of urbanisation. Indeed,

consider that both mechanisms play a role in explaining the positive legacy of ancient colonialism.

6. Conclusion

This paper investigates the long-term effect of ancient colonialism on economic development. By collecting data on the location of Phoenician, Greek and Etruscan colonies and using light density at night as a proxy for economic development at the sub-national level, we find that areas colonised by these civilisations are today more developed. The results hold across continents (Africa, Asia, and Europe), when controlling for country fixed effects, and are robust to using alternative measures and historical sources of ancient colonies. Our findings suggest that the more advanced civilisations that ancient colonialism spread along the Mediterranean have left a positive economic legacy, which persists today despite two millennia of historical turbulence.

This study contributes 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 economic development 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 are relatively more developed 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 argue that two complementary mechanisms are behind our paper results. 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 towns, which implies an early urban start in a context of rural predominance, with the advantages of agglomeration economies

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there is no guarantee that the urban system survives a major shock, as witnessed by Britain after the collapse of the Roman Empire (Michaels and Rauch, 2017).

reinforcing the concentration of economic activity in existing places. We attempt to evaluate the relative importance of each channel by comparing ancient colonies with settlements of other cultures but of similar age. The results suggest that both mechanisms are relevant in explaining the positive effect of ancient colonialism.

The evidence presented in this paper is appealing, but our analysis has some limitations. One is the use of light density at night as a proxy for economic development. While it is the best alternative at hand to measure economic development at the subnational level for the wide and diverse Mediterranean area, there has been some criticism on this measure. Importantly, it is correlated not just with income, but also with the level of urbanisation and the concentration of economic activity on particular locations (Henderson et al., 2012; Mellander et al., 2015). Even accounting for this criticism, the results of this paper are nevertheless valuable since we document that ancient colonialism has been a major factor in shaping the economic geography of Mediterranean countries. Another limitation of our analysis has to do with 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 emphasises the idea that historical shocks play a significant role for regional and local economies. The impact of a change in institutions, culture, technology and human capital appears to influence the long-term economic path of societies, even after thousands of years. 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 positive implications for economic development.

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FIGURES AND TABLES

Table 1

Ancient colonialism and economic development: A first look at the data

	Log night light density		
	Within 200 km of the Mediterranean coast	Within 100 km of the Mediterranean coast	Within 50 km of the Mediterranean coast
	(1)	(2)	(3)
Ancient colonies	1.865074	1.865074	1.823839
	116	*116*	*112*
No ancient colonies	0.1544367	0.5837332	0.7920832
	1,808	*1,106*	*726*
Difference	1.711***	1.281***	1.032***
	(0.318)	(0.226)	(0.153)

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	Coastal	Latitude	Longitude
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ancient colonies	-0.337	43.567	-59.128	1.938	0.218	-2.765	0.029	0.284***	0.699	0.934
	(0.384)	(36.138)	(36.487)	(20.549)	(0.131)	(2.996)	(0.069)	(0.04)	(0.668)	(1.729)
R-sq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Observations	838	838	838	838	838	837	838	838	838	838

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 economic development: Baseline results

	The dependent variable is Log night light density							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ancient colonies	0.959***	0.981***	0.855***	0.929***	0.976***	0.886***	0.974***	0.882***
	(0.196)	(0.178)	(0.23)	(0.195)	(0.195)	(0.157)	(0.123)	(0.149)
Temperature		-0.021						0.142
		(0.07)						(0.155)
Rainfall		0.002***						0.001
		(0.001)						(0.001)
Elevation			-0.002***					-0.001
			(0.00)					(0.001)
Ruggedness			0.005***					0.004***
			(0.002)					(0.001)
Soil quality				0.18				0.159
				(0.167)				(0.14)
Water quality					0.011***			0.012***
					(0.003)			(0.003)
Island						-1.455***		-1.031***
						(0.249)		(0.24)
Coastal						0.253		0.157
						(0.255)		(0.299)
Latitude							0.214***	0.178
							(0.047)	(0.15)
Longitude							-0.003	-0.001
							(0.053)	(0.052)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.21	0.23	0.23	0.22	0.22	0.24	0.23	0.29
Observations	838	838	838	838	837	838	838	837

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 economic development: Distance to the nearest colony

	The dependent variable is Log night light density							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance to the nearest colony	-0.006***	-0.005***	-0.005**	-0.006***	-0.007***	-0.005***	-0.006***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Temperature		-0.019						0.121
		(0.061)						(0.142)
Rainfall		0.002***						0.001
		(0.001)						(0.001)
Elevation			-0.002***					-0.001
			(0.00)					(0.001)
Ruggedness			0.005***					0.004***
			(0.001)					(0.001)
Soil quality				0.206				0.173
				(0.159)				(0.127)
Water quality					0.017***			0.016***
					(0.003)			(0.004)
Island						-1.399***		-0.929***
						(0.215)		(0.236)
Coastal						0.311		0.205
						(0.232)		(0.289)
Latitude							0.227***	0.18
							(0.045)	(0.145)
Longitude							-0.002	0.005
							(0.048)	(0.046)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.21	0.23	0.23	0.22	0.23	0.24	0.24	0.29
Observations	864	864	864	864	863	864	864	863

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

Robustness checks (I): Splitting the sample by continents

	The dependent variable is Log night light density					
	Europe		Asia		Africa	
	(1)	(2)	(3)	(4)	(5)	(6)
Ancient colonies	0.776**	0.64***	1.09***	0.906***	1.505***	0.977*
	(0.269)	(0.199)	(0.139)	(0.203)	(0.256)	(0.42)
Temperature		-0.004		0.236		0.299**
		(0.16)		(0.206)		(0.095)
Rainfall		0.003***		0.00		-0.002
		(0.00)		(0.001)		(0.002)
Elevation		-0.003**		0.00		-0.001
		(0.001)		(0.001)		(0.002)
Ruggedness		0.005**		0.003		0.008
		(0.002)		(0.002)		(0.006)
Soil quality		0.563***		0.06		-0.022
		(0.175)		(0.416)		(0.039)
Water quality		0.009**		0.032***		0.037
		(0.003)		(0.005)		(0.026)
Island		-0.844***		-7.243***		-2.776***
		(0.257)		(0.678)		(0.396)
Coastal		-0.1		-0.435*		0.885
		(0.202)		(0.185)		(0.601)
Latitude		-0.004		0.262		0.759
		(0.122)		(0.211)		(0.358)
Longitude		0.016		0.009		-0.077
		(0.076)		(0.029)		(0.078)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.24	0.38	0.26	0.45	0.07	0.19
Observations	470	470	159	158	209	209

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

Robustness checks (II): Alternative sources for Ancient colonies

	The dependent variable is Log night light density			
	Alternative sources for Greek, Phoenicians and Etruscan colonies		Ober (2015)'s poleis dataset	
	(1)	(2)	(3)	(4)
Ancient colonies (alternative sources)	0.92***	0.774***	0.492**	0.543**
	(0.197)	(0.192)	(0.183)	(0.228)
Temperature		0.128		0.29**
		(0.162)		(0.114)
Rainfall		0.001		0.001
		(0.001)		(0.001)
Elevation		-0.001		0.000
		(0.001)		(0.001)
Ruggedness		0.004***		0.003**
		(0.001)		(0.001)
Soil quality		0.151		0.088
		(0.131)		(0.092)
Water quality		0.012***		0.011***
		(0.004)		(0.004)
Island		-1.043***		-0.978***
		(0.257)		(0.323)
Coastal		0.19		0.255
		(0.286)		(0.304)
Latitude		0.164		0.282*
		(0.156)		(0.137)
Longitude		-0.003		0.006
		(0.052)		(0.045)
Country fixed effects	Yes	Yes	Yes	Yes
R-sq	0.21	0.29	0.23	0.31
Observations	839	838	770	769

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

Differentiating among colonisers

	The dependent variable is Log night light density							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Greek colony	1.041***	1.056***	0.975***	0.998***	1.059***	0.933***	0.998***	0.929***
	(0.196)	(0.162)	(0.224)	(0.201)	(0.196)	(0.118)	(0.123)	(0.137)
Phoenician colony	0.64	0.688*	0.498	0.639	0.644	0.708	0.797**	0.718*
	(0.385)	(0.352)	(0.417)	(0.391)	(0.389)	(0.428)	(0.313)	(0.378)
Etruscan colony	1.439***	1.204***	0.824***	1.522***	1.467***	1.04***	1.453***	0.553***
	(0.033)	(0.079)	(0.204)	(0.081)	(0.033)	(0.098)	(0.08)	(0.171)
Mixed (more than one	0.947***	0.953***	0.64***	0.934***	0.977***	0.912***	1.198***	0.813***
coloniser)	(0.033)	(0.072)	(0.074)	(0.035)	(0.033)	(0.058)	(0.095)	(0.127)
Temperature		-0.029						0.107
		(0.067)						(0.148)
Rainfall		0.002***						0.001
		(0.001)						(0.001)
Elevation			-0.002***					-0.001
			(0)					(0.001)
Ruggedness			0.005***					0.004***
			(0.002)					(0.001)
Soil quality				0.181				0.155
				(0.167)				(0.138)
Water quality					0.011***			0.011***
					(0.003)			(0.003)
Island						-1.478***		-1.032***
						(0.259)		(0.234)
Coastal						0.258		0.164
						(0.254)		(0.302)
Latitude							0.222***	0.166
							(0.047)	(0.145)
Longitude							-0.008	-0.002
							(0.053)	(0.053)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.21	0.23	0.23	0.21	0.22	0.24	0.23	0.29
Observations	864	864	864	864	863	864	864	863

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.

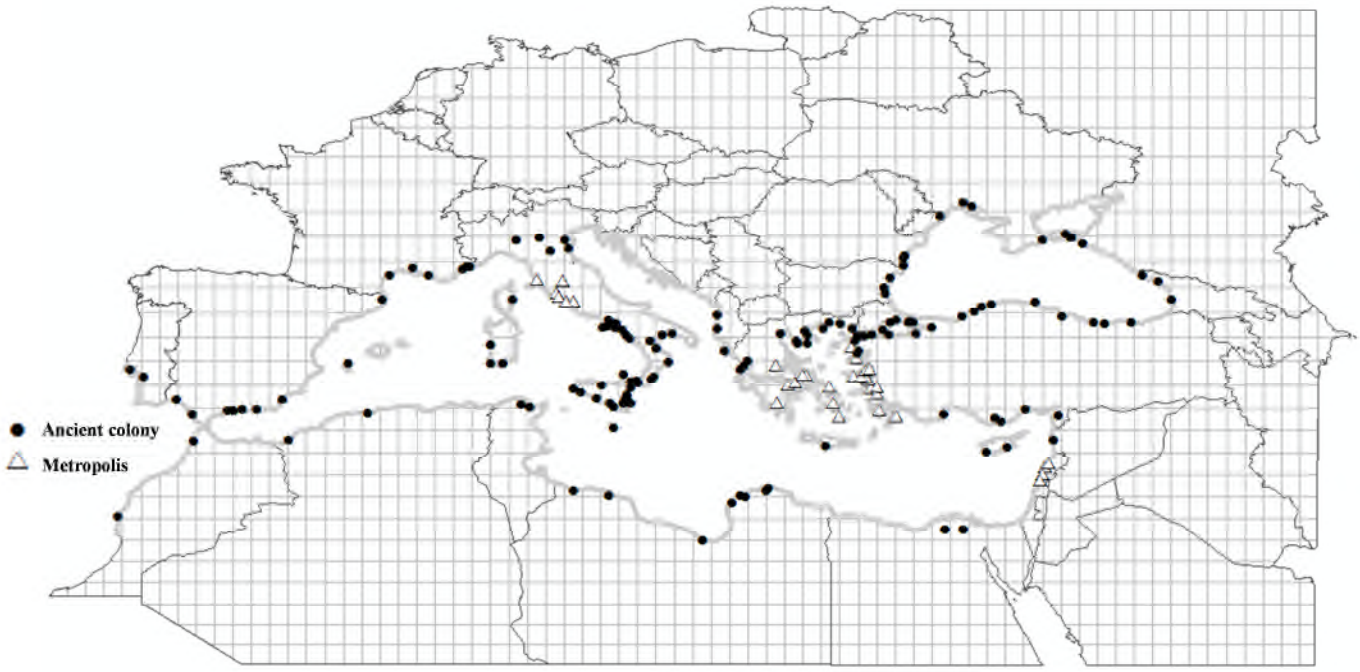
Table 8

Mechanisms: Institutional-cultural transfer vs. urban persistence

	The dependent variable is Log night light density					
	(1)	(2)	(3)	(4)	(5)	(6)
Ancient colonies	1.387***	1.309***	1.383***	1.306***	0.989***	0.902***
	(0.29)	(0.237)	(0.289)	(0.236)	(0.197)	(0.148)
Other ancient settlements	0.854**	0.792**				
	(0.355)	(0.355)				
Other ancient settlements (only precise location)			0.846**	0.787**		
			(0.353)	(0.354)		
Other ancient settlements (only town, city or urban)					0.83**	0.505
					(0.3)	(0.299)
Temperature		0.113		0.115		0.141
		(0.162)		(0.162)		(0.155)
Rainfall		0.001		0.001		0.001
		(0.001)		(0.001)		(0.001)
Elevation		-0.001		-0.001		-0.001
		(0.001)		(0.001)		(0.001)
Ruggedness		0.004***		0.004***		0.004***
		(0.001)		(0.001)		(0.001)
Soil quality		0.159		0.162		0.159
		(0.142)		(0.141)		(0.139)
Water quality		0.012***		0.012***		0.012***
		(0.004)		(0.004)		(0.003)
Island		-0.9***		-0.9***		-1.014***
		(0.272)		(0.272)		(0.238)
Coastal		0.089		0.092		0.154
		(0.286)		(0.287)		(0.301)
Latitude		0.178		0.179		0.179
		(0.146)		(0.146)		(0.15)
Longitude		0.004		0.004		-0.001
		(0.049)		(0.049)		(0.052)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.23	0.31	0.23	0.31	0.21	0.29
Observations	838	837	838	837	838	837

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.

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 countries in the figure are overlapped with a 50x50 km grid. Source: Wittke (2011b).

Table A1

Description of variables

Variable	Description	Source
Dependent and main independent 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
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.	Authors' elaboration using data from Wittke (2011b).
Distance to the nearest colony	Linear distance in kilometers between each cell's centroid and the nearest ancient colony.	Authors' elaboration using data from Wittke (2011b).
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
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.	Authors' elaboration using data from 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.	Authors' elaboration using data from Wittke (2011b).
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.	Authors' elaboration using data from Wittke (2011b).
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.	Authors' elaboration using data from Wittke (2011b).
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.	Authors' elaboration using data from Wittke (2011b).
Other ancient settlements	Binary indicator measuring whether in the grid cell there is at least one ancient place classified as settlement, city, urban, town or village. Only places with attested time period before 500 BCE are selected.	Authors' elaboration using data from Pleiades (2017).

Table A1

Description of variables (*Continued*)

Variable	Description	Source
Other ancient settlements (only precise location)	Binary indicator measuring whether in the grid cell there is at least one ancient place classified as settlement, city, urban, town or village. Only places with precise location and attested time period before 500 BCE are selected.	Authors' elaboration using data from Pleiades (2017).
Other ancient settlements (only town, city or urban)	Binary indicator measuring whether in the grid cell there is at least one ancient place classified as city, urban or town. Only places with attested time period before 500 BCE are selected.	Authors' elaboration using data from Pleiades (2017).
Geographic and climatic controls:		
Altitude	Average altitude of the surface area of the grid cell.	Author's elaboration using data from 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).	Author's elaboration.
Coastal	Dummy variable indicating whether the grid cell borders the Mediterranean coast.	Author's elaboration.
Connectedness of the coast	Number 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).*	Author's elaboration.
Island dummy	Dummy variable indicating whether the grid cell is within an island.	Author's elaboration.
Latitude/ Longitude	The geographic coordinates of the grid cell centroids, in decimal degrees.	Author's elaboration.
Precipitation	Annual precipitation, in hundred of mililiters. It corresponds to the average value of the surface area of the grid cell.*	Author's elaboration using data from WorldClim (Hijmans et al., 2005).
Ruggedness	Standard deviation of the altitude of the territory corresponding to the grid cell.	Author's elaboration using data from 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 .*	Author's elaboration using data from Fischer et al. (2008).
Temperature	Annual average temperature. It corresponds to the average value of the surface area of the grid cell.*	Author's elaboration using data from 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

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). * Values of the (up to 5) nearest neighbour have been imputed to grid cells with missing values in some of these variables. This imputation is relevant to the variable water quality and connectedness, since all grid cells farther than 50 kilometres from the coast have missing values given the way the variable is constructed. For the other three variables, the imputation only affects about 5% of the observations.

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