The Imperial Roots of Global Trade *

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October 11, 2017

Abstract

Today's countries emerged from hundreds of years of conquests, alliances and downfalls of empires. Empires facilitated trade within their controlled territories by building and securing trade and migration routes, and by imposing common norms, languages, religions, and legal systems, all of which led to the accumulation of *trading capital*. In this paper, we uncover how the rise and fall of empires over the last 5,000 years still influence world trade. We collect novel data on 5,000 years of imperial history of countries, construct a measure of accumulated *trading capital* between countries, and estimate its effect on trade patterns today. Our measure of *trading capital* has a positive and significant effect on trade that survives controlling for potential historical mechanisms such as sharing a language, a religion, genes, a legal system, and for the ease of natural trade and invasion routes. This suggests a persistent and previously unexplained effect of long-gone empires on trade.

JEL CODES: F14, N70
Key Words: long run, persistence, empires, trading capital, gravity.

*We are grateful to Danila Smirnov for excellent research assistance and to Roberto Bonfatti, Anton Howes, Vania Licio, and seminar participants at the 2016 Canadian Economic Association Annual Meeting in Ottawa, King's College London, and the 2017 FREIT Workshop in Cagliari for their constructive comments.

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1 INTRODUCTION

> Modern life flows on an ever-rising river of trade; if we wish to understand its currents and course, we must travel up its headwaters to commercial centers with names like Dilmun and Cambay, where its origins can be sought, and its future imagined.
>
> William J. Bernstein in A Splendid Exchange (2008)

> The greatest expansions of world trade have tended to come not from the bloodless tâtonnement of some fictional Walrasian auctioneer but from the barrel of a Maxim gun, the edge of a scimitar, or the ferocity of nomadic horsemen.
>
> Findlay and O'Rourke in Power and Plenty (2007)

Today's countries emerged from hundreds of years of conquests, alliances and downfalls of empires. The long-run persistence of such historical episodes has been the focus of a new economic history literature.[1] For example, Oto-Peralías and Romero-Ávila (2016) show how the *Reconquista*, i.e. the series of conquests that led to the fall of the last Islamic state in Spain in the 15th century, explains differences in Spanish regional economic development today. Another example is Wahl (2017) who argues that the persistence of Roman roads explains part of the development advantage of the formerly Roman parts of Germany.[2]

The aim of this paper is to uncover how the rise and fall of empires over the last 5,000 years, from the Afsharid Dynasty (2350BC-2150BC) to the British Empire (1583AD-2000AD),

[1] See Michalopoulos and Papaioannou (2017) for a comprehensive collection of short essays on the long shadow of history.

[2] Other examples include Acemoglu et al. (2001) and Easterly and Levine (2016), who trace the role of colonial institutions in explaining the prosperity of today's countries, Nunn (2008), who shows that the slave trade had long-lasting damaging effects on African development, and Grosfeld and Zhuravskaya (2015) who show that three vanished empires, namely Russia, Austria-Hungary, and Prussia, had different religious practices and ideals that persist in today's Poland. See also Nunn (2009) and Spolaore and Wacziarg (2013) for reviews of this literature.

still influence world trade. To that end, we collect novel data on 5,000 years of imperial history of countries, construct a measure of accumulated *trading capital* between countries, and estimate its effect on trade patterns today.[3]

Trading capital can be thought of as networks and institutions that emerged during empires to facilitate trade and that may outlive empires.[4] Throughout history many empires were essentially about trade facilitation. For example, in its review of Bernstein (2008), The Economist (2008) explains how the Athenian Empire was established to secure food trade:

> The Athenians were driven by the dictates of trade to create, first, a powerful navy, and then, an empire. [...] Low rainfall and a mountainous topography made it impossible for farmers to produce enough grain for a growing and increasingly city-based population. The Spartans and their allies looked west to Sicily, but the Athenians increasingly relied on access to the breadbasket of Pontus (modern Ukraine). This, in turn, meant keeping open those narrowest of choke points: the Dardanelles (to the Greeks, the Hellespont) and the Bosphorus. Other states in the region were just as dependent on the trade with Pontus, and were, therefore, prepared to contribute to the costs of Athenian naval operations. Before long, this "coalition of the willing" evolved into the Athenian Empire.

Findlay and O'Rourke (2009) provide many other examples of how facilitating trade was central to empires. The conquests of the Mongol Empire for example stabilized long-distance trade across Central Asia during a century known as Pax Mongolica. Other examples include

[3]Economists have been trying to understand international trade patterns at least since Adam Smith published The Wealth of Nations in 1776. A series of explanations from comparative advantage to economies of scale and love of variety have been proposed and tested in the last 50 years (see for example Davis, 2000; Davis and Weinstein, 2003; Chor, 2010). A particularly robust empirical finding has been the gravity model of trade, which links trade between two countries to the geographic distance between them and to other bilateral trade costs such as diverging institutions or cultures (Tinbergen, 1962; Head and Mayer, 2014, 2013).

[4]The concept was introduced by Head et al. (2010) who show that despite a gradual deterioration of trade links following independence, colonial empires still explain part of today's trade flows. They suggest that a form of trade-enhancing capital, or trading capital, that depreciates slowly over time could explain this persistence.

the expansion of markets, trade, and specialization that occurred in China during the Song Dynasty, notably thanks to an extensive network of canals and waterways, or the lucrative trade in furs, silver and silk between East and West that was made possible by the Vikings taking control of the Russian river systems. Perhaps even more obvious is the blend of trade, plunder, and settlement associated with colonial empires. The East India Company, initially only about the pursuit of trade opportunities, was key to the creation of the British Empire in India. Mitchener and Weidenmier (2008) suggest that colonial empires doubled trade within their controlled territories between 1870 and 1913 by lowering transactions costs and by establishing preferential trade policies. We can thus think of empires as entities that facilitated trade within their controlled territories by building and securing trade and migration routes, and by spreading common norms, religions, and legal systems. This led to the accumulation of trading capital such as physical capital, e.g. roads, railway lines or pipelines; common institutions, e.g. common legal systems; business networks, e.g. commercial diasporas such as the Gujaratis in the British Empire; or cultural capital, e.g. common language, religion, and trust.

Using novel historical data on the territories controlled by 136 empires over the last 5,000 years worldwide, from the Achaemenid Empire to the Yuan and Zand Dynasties, we first create various trading-capital measures at the country-pair level.[5] Our main measure of trading capital takes into account all bilateral imperial history by considering *years in* and *years since* all joint empires. Assuming that imperial trading capital grows between two countries when they are both controlled by the same empire, but decays otherwise, we estimate trading capital allowing for a range of relative growth and decay rates. We then include these measures of trading capital into a gravity model to estimate its effect on trade today and calibrate its growth and decay rates. Importantly, to isolate the effect of trading capital from other geographic factors, such as mountains, deserts or large water bodies, that

[5]We scrape information on empires and their members from the Wikipedia list of empires. This information was confirmed and complemented with individual countries' "membership" years from Running Reality, an on-line application that maps the history of human civilization from 3,000BC to today. Further sources such as National Geographic were used to complement the list of empires.

may affect both past empire expansions and today's trade patterns, we calculate the number of hours it would take a human to walk an optimal route between two countries (*à la* Özak, 2010, Human Migration Index), and account for it in our regressions.

We find that there is a persistent effect of the trading capital of long-gone empires on trade today. For example, bringing the trading capital of Nigeria-United Arab Emirates to the level of Tunisia-Iraq, i.e. moving from the 25th to the 75th percentile among pairs with non-zero capital, would increase their trade by 12%. Our findings are similar when we test alternative measures of trading capital such as a dummy indicating whether two countries were ever part of the same empire, the number of years the two countries were in joint empires, and the number of joint empires they have been part of. For example, imports from countries that were once in a common empire are on average 70% larger than from other countries. Crucially, we find that trading capital most-likely builds up faster than it depreciates. Our optimization exercise suggests that a reasonable calibration of trading capital involves growth by around 4% a year during times of a joint empire, and depreciation by 2% at other times. A long-lasting effect of defunct empires can hence be thought of as long-run persistence in trade patterns and as a slow decay of trading capital.

Moreover, we investigate potential institutional and cultural mechanisms, such as sharing a legal system, a language, a religion, or genes, that may explain our main findings. We show that part of the effect of trading capital on trade (up to 50%) is mediated by these historical bilateral affinity measures. Thus, a common imperial heritage is part of the reason why countries share institutions and culture, and why this, in turn, has a persistent effect on trade. Lastly, we explore the heterogeneous effects across colonial and non-colonial trading capitals. We verify that colonial empires do not drive our results and that non-colonial empires of the past matter at least as much in explaining today's trade.

Although some researchers highlight the role of colonial history in shaping today's trade patterns (Head et al., 2010), the influence of the entire universe of empires, including non-colonial ones, since 3,000BC has not been studied empirically before. Unlike previous

studies, we build an indicator of trading capital that accounts for both time in and time since a joint empire and that goes beyond colonial empires. Our measure of trading capital suggest that long-gone empires have effects on trade that are even more persistent than that of recent colonial empires. This is likely due to the fact that older, more historical empires have played an important role in shaping institutions and culture.

Our results suggest that trading capital plays a role in reducing trade costs that inhibit international trade. While infrastructure such as roads (Michaels, 2008), railways (Donaldson, 2010), or telegraphs (Steinwender, 2013) do promote trade, Head and Mayer (2013) point out that transport costs (and tariffs) do not account for most of the trade costs associated with borders and distance. Instead, they point to cultural and informational frictions as the main culprits, and this is why cultural similarity (Felbermayr and Toubal, 2010; Gokmen, 2017) and transnational networks (Rauch and Trindade, 2002) are so important to trade. Indeed, the latter facilitate trade by reducing contract enforcement costs and by providing information about trading opportunities (Rauch, 2001). Trading capital accumulated during empires could thus play a similarly important role in making trade happen today.

All kinds of imperial formal and informal institutions as well as infrastructure projects might play a role in the growth of trading capital, and thus, in shaping today's trade patterns. For example, historical Habsburg-Empire regions have higher current trust and lower corruption than neighboring regions, most likely due to the empire's well-respected administration (Becker et al., 2015), and countries of the Habsburg Empire trade significantly more with one another than what is predicted by gravity (Rauch and Beestermoller, 2014). Similarly, Grosjean (2011) shows that Ottoman, Habsburg, Russian, and Prussian empires explain social trust differences across countries. Imperial road networks might also shape today's trade pattern. Volpe Martincus et al. (2017) show that roads from the pre-columbian Inca Empire explain today's roads locations which have a significant impact on Peruvian firms' exports. Pinna and Licio (2017) argues Roman roads have a similar impact on Italy's foreign trade. The formation of trading capital may also come from the act of trading itself.

For example, Jha (2013) showed that local institutions that emerged to support inter-ethnic medieval trade have resulted in a sustained legacy of ethnic tolerance in South Asian port towns. More examples of the emergence of such formal and informal trade-enhancing institutions can be found in Greif (2006). A few studies on the role of history in world trade have also suggested that historical events that allow costs to be sunk can be associated with a persistent level of trade. For example, Eichengreen and Irwin (1998) and Campbell (2010) have showed that current trade flows are a positive function of trade flows 50 or 100 years ago, even after controlling for gravity. While there is no comprehensive data on world trade in ancient times[6] to test for very long-run persistence in this way, the history of empires allows us to find traces of trading capital.

Another way to understand the significance of the empire effect is to view our constructed trading capital as a cross-state index complementing the state history index introduced by Bockstette et al. (2002). Putterman and Weil (2010) derive a time-discounted measure based on this index to explain comparative economic development. Similarly we use a time-discounting strategy to derive our cross-state trading capital index. While the state history index captures the history of individual state institutions in a location (or characteristics of people who used to live there at a certain point in time), ours captures common formal and informal institutions and a common heritage *between* states. Therefore, our trading capital can function as a historically grounded indicator that explains differences in bilateral state relations today. Our index can indeed explain some of the variation in international trade, which we know is a major driver of economic growth (Feyrer, 2009; Pascali, 2017; Donaldson, 2010; Wahl, 2016) without which isolated countries find it much harder to prosper (Ashraf et al., 2010).

The rest of the paper proceeds as follows. In the next section we present our data and empirical strategy. In Section 3 we discuss estimates of the effect of empires and Section 4 concludes.

[6] A recent study did analyze business documents preserved on clay tablets informing us about the caravan trading system connecting Iraq, Syria and Turkey 4,000 years ago (Barjamovic et al., 2016).

2 DATA AND EMPIRICAL STRATEGY

The workhorse model of trade relations between countries is the gravity model, which relates bilateral imports to determinants across country pairs. The model can be summarised as follows

$$(1) \quad \text{asinh}\,(m_{ij}) = \alpha_i + \sigma_j + \beta_E \text{empires}_{ij} + \beta_X(X_{ij}) + \epsilon_{ij},$$

where m_{ij} is the average imports from country j to country i in the 2000s. We take the inverse hyperbolic sine rather than the log of imports to include country pairs with zero bilateral trade.[7] The parameters α_i and σ_j are importer and exporter fixed effects, empires_{ij} is some measure of empire relation for a country pair, and X_{ij} combines the set of baseline bilateral control variables which include distance, walking time, a contiguity dummy, and differences in latitudes and longitudes. These control for the natural tendency of countries to trade and also to become part of the same empire as many empires expanded geographically by pushing their borders further and further. These variables are important to control for the geographic factors that might affect both trade and empire formation and can be considered exogenous.

2.1 Trade data and control variables

All our data that is not related to empires is standard. Trade data comes from UN Comtrade and we use the average of 2000-2010.[8] Other variables such as common legal system, language, religion, and trade agreements, among others, are taken from the CEPII GeoDist

[7] The asinh function is defined at zero and is otherwise similar to the natural logarithm function. We thus interpret our coefficients as proportional effects, i.e. as in log-log models. See Burbidge et al. (1988); MacKinnon and Magee (1990) for details on the asinh function, Kristjánsdóttir (2012) for an application to the gravity equation, and Card and DellaVigna (2017) for another example.

[8] The choice of an average for the 2000s maximises the country coverage compared to picking any year in the 2000s. Doing the latter does not change the results.

database.

2.2 Empire data

We mostly rely on empires data from Running Reality, an online application that allows users to explore the history of human civilization from 3,000BC to today, the list of empires on Wikipedia and if necessary, complement this source with other sources such as National Geographic. This data allows us to match each empire's territory to today's countries, whether covered in whole or partially, and during which years. For example, the Empire of Trebizond covered parts of today's Georgia, Turkey and Ukraine from 1204 to 1461. The Great Moravian Empire was spread over today's Czechia and Slovakia from 833 to 906, while it also covered parts of Poland from 877 to 894. Table 9 in Appendix A gives an overview of this dataset.

Since empire borders expanded and shrank over time two countries that have been part of an empire have not necessarily been part of it at the same time. Based on this information we can create various indicators at the country-pair level, such as a dummy indicating whether two countries were ever contemporaneously part of the same empire, the number of years the two countries were in joint empires, the number of joint empires they have been part of, as well as a more complex index capturing both *time in* and *time since* a joint empire.

We conjecture that spending 100 years in a joint empire 2000 years ago does not matter as much for today's trade relationships as spending 100 years in the Habsburg Empire only 200 years ago. Hence a measure of trading capital would need to discount the number of years spent in an empire by the time that has passed since. We hypothesise that trading capital builds up in times of empire, and depreciates in other times. Algebraically, we represent the

dynamics of trading capital, $E_{ij,t}$, as follows:

$$(2) \quad E_{ij,t} = \begin{cases} E_{ij,t-1}(1+\theta) & \text{if } V_{ij,t-1} = 1 \\ \max(E_{ij,t-1}(1-\delta), 1) & \text{otherwise,} \end{cases},$$

$$E_{ij,0} = 1,$$

where θ and δ are the growth and decay rates, and $V_{ij,t}$ is vector of length T indicating for each year whether a country pair is in an empire in year t or not.[9] If two countries are in a joint empire their trading capital grows at rate θ. It decays at rate δ otherwise. We assume that each country pair starts at a neutral level of 1, and cannot fall below that level. The level of 1 is convenient for taking the log of trading capital in our gravity estimates. Note that the absolute level of this process has no particular meaning and we focus on relative growth and decay rates. Implicitly we assume that each empire contributes identically to trading capital, and therefore, all years that an empire covers (part of) a current day country add onto the trading capital stock. Additionally, as data on the exact boundaries of past empires is sometimes unclear, we are unable to take into account a measure of the size of the current day country's territory that was covered by an empire.

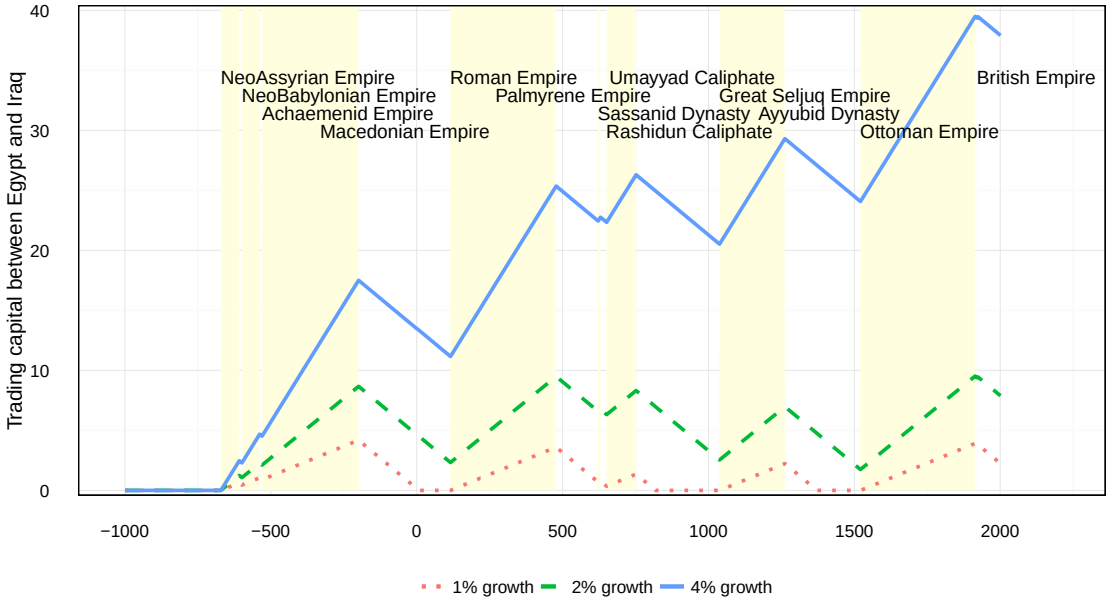
To identify the relative rates of growth and decay, θ and δ, we first turn to the literature for guidance. Head et al. (2010) estimate a 2% annual decline in trade after countries became independent from colonial empires. They were able to estimate this since trade data is available for the post-war period. However, the (average) growth rate of becoming part of an empire has not been estimated to our knowledge.[10] We thus assume a decay rate of 2% and estimate various levels of trading capital based on different relative growth rates.

Figure 1 illustrates fluctuations in trading capital between Egypt and Iraq for three rates of growth and a single rate of decay. The two countries have been part of many joint empires

[9] $T = 4500 - 1$, for the number years from present day to the first empire, 2500BC, such that the $V_{ij,1}$ corresponds to the year 2500BC for country-pair ij, and $V_{ij,T}$ the last year of simulation (2000).

[10] The literature on the effects of free trade agreements may come to mind yet these are not similar enough to empires.

Figure 1: The dynamics of trading capital between Egypt and Iraq

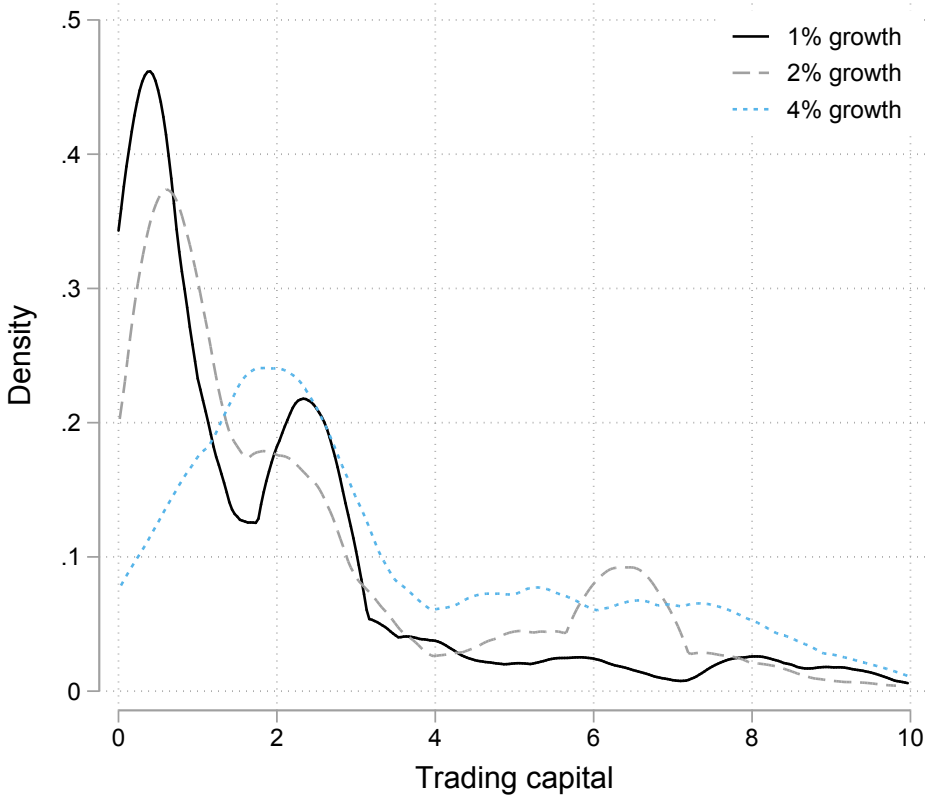


Simulated trading capital (in logs) with varying growth rates θ and a decay rate of $\delta = 2\%$.

over the last 3,000 years including the Neo Babylonian Empire, the Umayyad Caliphate, and the Ottoman Empire. We hypothesise that trading capital grew during those years while it depreciated when their territories were not part of a common empire.

When the growth rate is relatively small trading capital is strongly influenced by the last empire the two countries were connected with. In the case of Iraq and Egypt this would be the Ottoman Empire (Figure 1). Instead, when the growth rate is large relative to the decay rate, the compounding growth from earlier empires become a stronger factor. Trading capital accumulated during past empires does not depreciate completely before the next empire emerges. The distributions of our measures of trading capital across country pairs with a past empire history, based on three different relative growth rates, are given in Figure 2. While the tails of the distributions differ slightly, the figure suggests that the choice of a relative growth rate may not matter greatly for our estimates.

Figure 2: Distribution of trading capital with three different growth rates



To determine which relative growth rate to use to measure trading capital we check if some combinations of growth and decay rates best explain trade today. We thus run hundreds of gravity equations with different values of trading capital based on the different relative growth and decay rates. In these regressions we control for the geographic factors that might affect both trade and empire formation using a Human Migration Index *à la* Ömer Özak (Özak, 2010). We describe this important control variable in the next paragraph before returning to our measure of trading capital.

2.3 Bilateral walking hours

While the literature most often uses bilateral geodesic distance to capture trade costs between countries in gravity equations, here we need to be more precise with regards to the geographic factors that facilitate trade and empire expansion. If two countries are separated by a natural border, such as a mountain range, a stretch of desert or large water bodies, trade costs as well as invasion costs are likely to be high. Such geographic barriers may thus reduce the likelihood that two countries trade and are part of a joint empire. They may explain past empire expansion and still impact trade today. Therefore, we need to control for the ruggedness of land and the difficulty of crossing large bodies of water to identify the effect of trading capital on today's trade. Geodesic distance may not control for such natural barriers to trade and empire expansion as accurately as a measure taking into account the ease of human movement.

To control for these natural barriers to trade and empire expansion we calculate the number of hours it would take a human to walk an optimal route between two points, *à la* Ömer Özak's Human Migration Index (Özak, 2010). Optimal routes are the quickest, where time required is ruled by a version of so-called Naismith's rule of walking time required with sloping paths. The rule takes into account that individuals walk slower the steeper the slope, which holds for both ascent and decent, but is asymmetric at 5 degrees angle (i.e. walking down at 5 degrees slope is faster than zero degrees, but walking up would be slower). A steep slope both up and down will slow down any walker. The limit is reached at 12 degrees, where a walker typically will find a more lengthy route such that the slope does not exceed 12 degrees.[11]

[11] The precise cost function (in hours) is:

$$\text{cost}(\text{angle}) = \text{distance}/\text{speed} = (\text{height}/\sin(\text{angle})) \,/\, \left(1000 * 6 * e^{(-3.5*|\tan(\text{angle})+0.05|)}\right).$$

When a slope exceeds 12 degrees, the distance is extended such that we reach the same height but over a longer path at a 12 degrees angle. So, at a flat surface walking speed is 5km/h, at 5 degrees decent it is 6km/h, and ascent it is 4.2km/h.

To cross small water bodies, such as rivers, we add an additional 3 hours. For sea crossings we use a constant sea sailing speed of 15km per hour, but add a 24 hours (3 days based on 8 hours of walking per day) for boarding and unloading. Seafaring is limited to 200km within coasts (so crossings from Europe over the Atlantic Ocean are not possible).[12]

Figure 3 gives an overview of the optimal route network we estimate. The shades of the routes vary from red (slow) to green (fast). Generally we see that mountainous regions imply a slower walking speed or large detours. In our gravity equation we use both geodesic distance and human migration hours as the former maximises the number of country pairs included. In the appendix we present some statistics on the correlation between walking distance and hours relative to geodesic distance. In general the correlation is high but it varies over distances.[13]

2.4 Trading capital

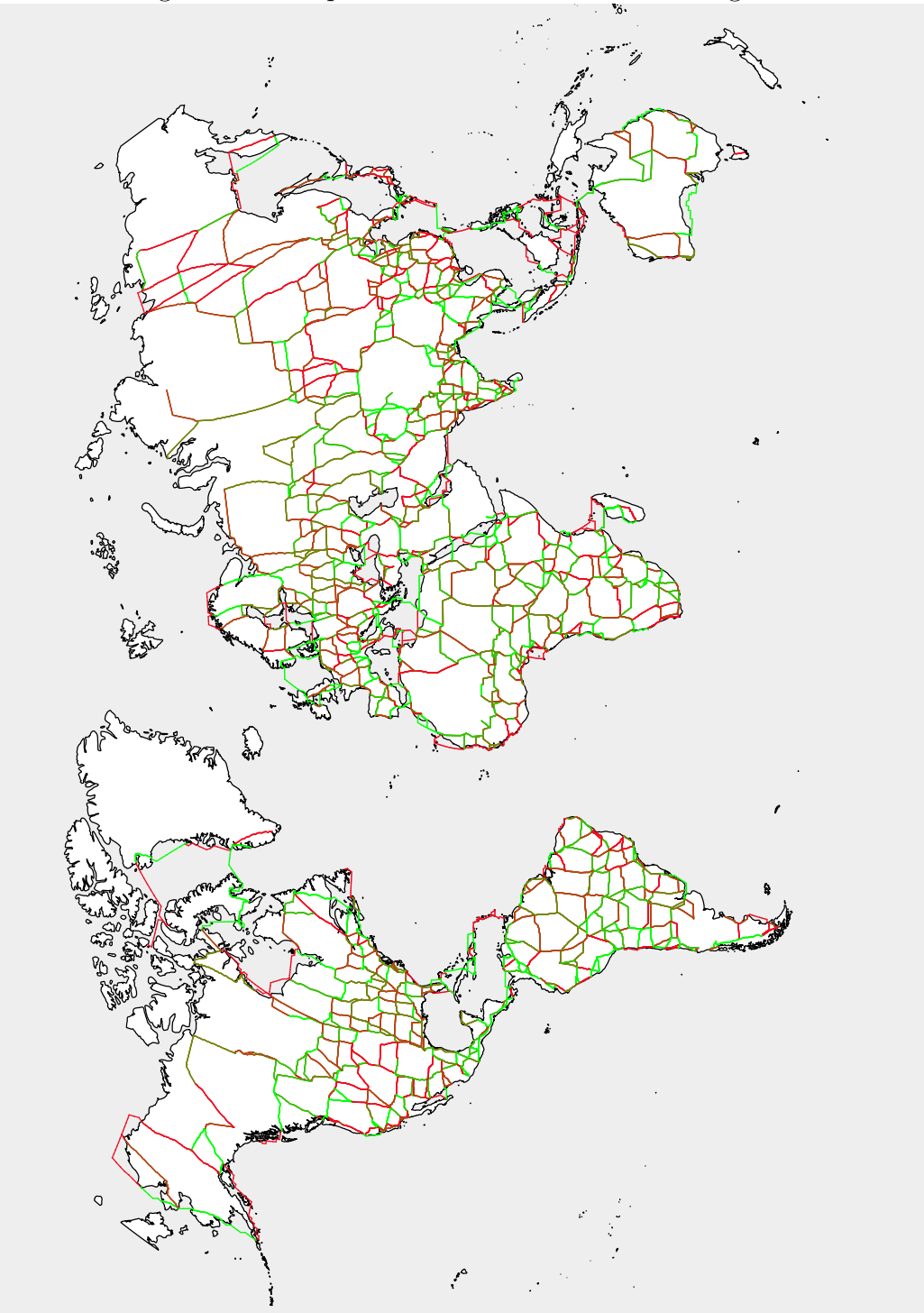
To determine the relative growth and decay rates of trading capital that best explain trade today we run the following gravity equations using various levels of trading capital:

$$\text{(3)} \quad \text{asinh}\left(m_{ij}\right) = \alpha_i + \sigma_j + \beta_E \ln(E(\theta,\delta)_{ij}) + \beta_X(X_{ij}) + \epsilon_{ij},$$

[12]To implement the above we create a grid of nodes at the global level. One for land and one for water. The distance between all nearest nodes are calculated using a projection-free method in order to avoid distance distortion from any particular projection at the global level. Information on elevation, from which we can derive angles between any two points, are obtained from a global digital elevation map. The grid of nodes has an average distance of around 5km. At a global level this results in millions of nodes. In order to reduce the number of potential routes between any two countries we first calculate the optimal route between the nearest (current day) major cities. The distance between two countries is the average distance between all pairs of cities from these two countries. Calculations are executed in PostGIS, code and results will be available on the authors' websites.

[13]Appendix B provides further statistical details regarding the distance measures.

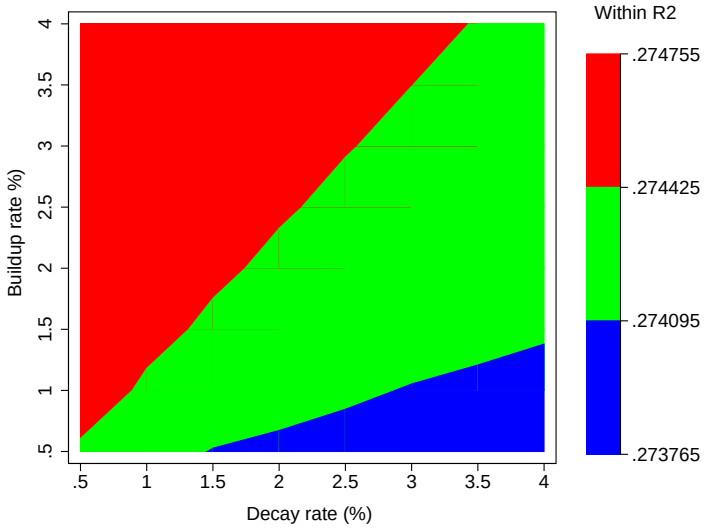
Figure 3: The optimal route network across the globe



A network of walking routes, partly based on current day cities. Color differentiation mark deviation from the baseline walking speed of 5km/h (green).

where everything is as defined before but $E(\theta, \delta)_{ij}$ is the empire trading capital based on two underlying parameters in 2000 (i.e. $E_{i,t,T}$ in terms of (2)). We run this regression for various combinations of θ and δ and capture the R^2 to infer the optimal combination of the growth and decay parameters.[14]

Figure 4: Trading capital explanatory power of growth and decay rates



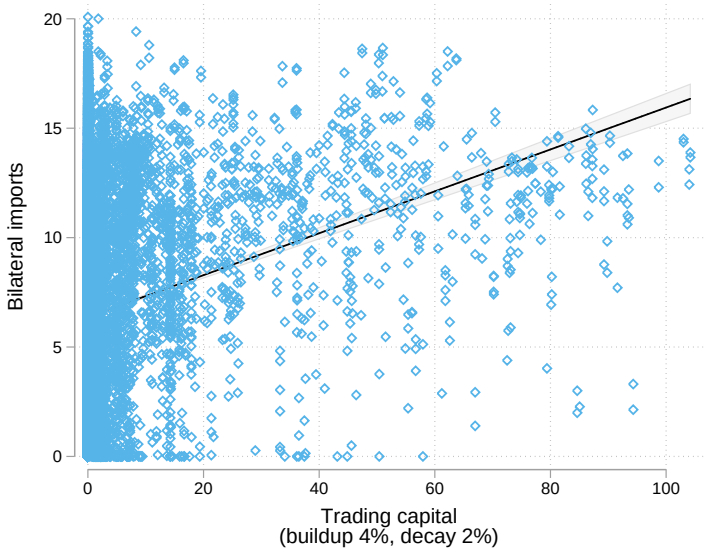
Within R^2 of distance, contiguity, and trading capital in a gravity regression as in equation (3).

Figure 4 summarises the result of this exercise for values of θ and δ ranging between 0.05% and 4%. The level of the R^2 is hardly affected by the different rates. Within our range of parameters the R^2 varies by less than 0.1%, suggesting that the choice of growth and decay rates does not matter much. Nonetheless a higher growth rate explains trade better than a higher decay rate. This makes sense when looking at the time plot of Figure 1. A higher rate of decay relative to the rate of growth will emphasize recent empires over more historic ones, while a great majority of country combinations will have no empire capital as any previous capital would have depreciated back to one. However, the opposite extreme, high growth but low decay, does not strike us as a valid combination. If anything, Head

[14]Looking at the R^2 is equivalent to looking at the partial R^2 associated with trading capital as the other variables in the model do not change across regressions.

et al. (2010) show that a declining trading capital is real and observable. For the remainder of the paper, we thus choose to measure trading capital with a growth rate of 4% and a rate of decay of 2%. While what matters most is the relative growth and decay rates rather than their levels, this scaling pattern is not absolute since trading capital is bounded at 1 (or $\log(1) = 0$, see Figure 1).

Figure 5: Trading capital accumulated since 2500 BC and bilateral trade in the 2000s



Logs of bilateral trading capital, based on a process with a growth rate of 4% and a decay rate of 2% against the arsinh of bilateral imports (in the 2000s). A linear line is fitted, bars indicating a 95% confidence interval.

Figure 5 plots our chosen measure of trading capital against bilateral imports. As indicated in the density plots (Figure 2), many countries have relatively low levels of trading capital and a smaller number have quite large levels. Yet, overall, the level of trading capital is positively correlated with bilateral imports.[15]

The distribution of our chosen measure of trading capital among countries with common empires is illustrated in Figure 2. While more than 75% of country pairs have no trading

[15] Although not reported, the parameter combinations that we looked at above give a positive relation between trading capital and trade, even when conditioning on other covariates. The gravity estimates in the next section will further substantiate this relationship.

Table 1: Trading capital of top, middle, and bottom five country-pairs

Country pair		Nb of empires	Trading capital
Syria	Turkey	25	104.17
Lebanon	Syria	21	104.00
Greece	Bulgaria	9	103.00
Turkey	Lebanon	19	98.71
Israel	Lebanon	19	94.31
Azerbaijan	Kazakhstan	11	20.87
Macedonia	Morocco	3	20.21
Libya	Portugal	6	20.03
Italy	Spain	5	19.55
Algeria	Italy	5	19.32
France	Russia	6	0.00
Cyprus	Saudi Arabia	6	0.00
Vietnam	Cambodia	6	0.00
Jordan	Uzbekistan	6	0.00
Ukraine	Germany	6	0.00

capital, 3,815 country pairs have accumulated some of it since 2,350 BC. Table 1 shows the top, middle, and bottom 5 country pairs among the distribution of trading capital of countries that have shared empires. The pair with the highest trading capital is Syria - Turkey, followed by Syria - Lebanon. In the middle of the distribution we have pairs like Azerbaijan - Kazakhastan and Italy - Spain which have been part of many common empires but these were short-lived and a long time ago. At the bottom we have pairs like Ukraine - Germany and Vietnam - Cambodia, which have been part of the Austrian Empire and the French Colonial empires respectively but have no trading capital left. This table suggests that the Middle East and Central Asia are regions that may be most influenced by the legacies of empires.

3 RESULTS

In this section, we bring our newly collected data on empires and the trading capital measure to the gravity model. In doing so, we can infer the explanatory power of our trading capital measure as well as test for the possible channels through which it may affect trade today.

Table 2 shows our baseline gravity regression results. In these specifications, we include only geographic gravity controls, i.e. geodesic distance or human walking hours, contiguity, and differences in latitudes and longitudes (for these we take the log of the absolute value). We do this as we believe that each of these can be considered as truly exogenous to trade today. We add other determinants of trade, such as common religion, common legal system, and trade agreement, later on when we examine the mechanisms behind the empire effect.

Across the board, we find a positive and significant effect of trading capital on trade, which is robust to various geographic controls. In specifications 5-8 when we control for walking hours, the number of observations is smaller, yet the results are very similar.[16] This suggests that natural obstacles to trade and empire expansion do not drive the explanatory power of an imperial past on trade.

As for the magnitude of the effect, our lower bound estimate of 0.011 suggests that a 10% increase in trading capital increases bilateral trade by around 0.1%. Doubling trading capital means a 0.76% increase in trade ($2^{0.011}$). Alternatively, bringing the trading capital of Nigeria-United Arab Emirates to the level of Tunisia-Iraq, i.e. moving from the 25th to the 75th percentile among pairs with non-zero capital, would increase their trade by 12%. Among countries with at least some non-zero trading capital from a common past empire, moving from a minimal trading capital to a maximum one brings about a 160% increase in trade.

Another way to think about this effect is to understand what happens a year after

[16]The number of observations is smaller because some country pairs are separated by more than 200km of water and this precludes them to be connected by human migration. See Figure 3.

Table 2: Effect of trading capital on modern trade (baseline results)

	(1) Imports	(2) Imports	(3) Imports	(4) Imports	(5) Imports	(6) Imports	(7) Imports	(8) Imports
Trading capital	0.071***	0.015***	0.011***	0.011***	0.063***	0.020***	0.014***	0.012***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Distance		-1.751***	-1.709***	-1.702***				
		(0.021)	(0.021)	(0.036)				
Route (hours)						-1.489***	-1.429***	-1.220***
						(0.021)	(0.022)	(0.033)
Contiguity			0.904***	0.883***			1.127***	1.030***
			(0.137)	(0.137)			(0.149)	(0.149)
Latitude difference				-0.034**				-0.147***
				(0.015)				(0.016)
Longitude difference				0.013				-0.138***
				(0.020)				(0.022)
N	33505	33505	33505	33494	24931	24931	24931	24925
R-sq	0.73	0.80	0.80	0.80	0.74	0.80	0.80	0.80

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

two countries become part of an empire. Since the underlying growth rate of the empire capital is 4%, our coefficient indicates that an additional year of empire increases trade by $4\% \times 0.011\% = 0.044\%$. Similarly trading capital decreases by 2% per year after a breakup. So, 40 years after a breakup, trading capital should decrease by $1 - 0.98^{40}$, i.e. about 55%. This would imply an approximate 1% drop in trade. This is much smaller than what Head et al. (2010) estimate for colonial empires. They find that trade has declined by around 65% after four decades of independence. We thus estimate much stronger persistence than what was found for recent colonial empires. We discuss further the difference between colonial and non-colonial trading capital later in this section.

3.1 Robustness to alternative measures of trading capital

To check the robustness of the long-run persistence of empires, we estimate our gravity model using alternative measures of trading capital. We first use a dummy variable equal to one if the two countries were ever part of the same empire. This dummy captures the existence

of a shared imperial past but not necessarily that of trading capital between two countries, as the latter may have depreciated completely. It lacks the ability to differentiate between long-gone and recent empires but allows for estimating the average effect of a past imperial history. As other indicators of trading capital, we also use the number of common empires countries have been part of as well as the total number of years countries have spent in common empires in the last 5,000 years.

Table 3: Alternative measures of trading capital

	(1) Imports	(2) Imports	(3) Imports	(4) Imports	(5) Imports	(6) Imports
Empire	0.548***			0.533***		
	(0.035)			(0.039)		
Nb of empires		0.080***			0.092***	
		(0.012)			(0.012)	
Empire years			0.093***			0.090***
			(0.006)			(0.007)
Distance	-1.608***	-1.672***	-1.594***			
	(0.036)	(0.036)	(0.037)			
Route (hours)				-1.131***	-1.201***	-1.124***
				(0.034)	(0.033)	(0.034)
Contiguity	0.954***	0.774***	0.899***	1.158***	0.912***	1.103***
	(0.131)	(0.137)	(0.132)	(0.141)	(0.149)	(0.142)
Latitude difference	-0.018	-0.024	-0.012	-0.126***	-0.128***	-0.117***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Longitude difference	0.001	0.011	-0.003	-0.149***	-0.129***	-0.150***
	(0.019)	(0.020)	(0.019)	(0.022)	(0.022)	(0.022)
N	33494	33494	33494	24925	24925	24925
R-sq	0.80	0.80	0.80	0.80	0.80	0.80

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

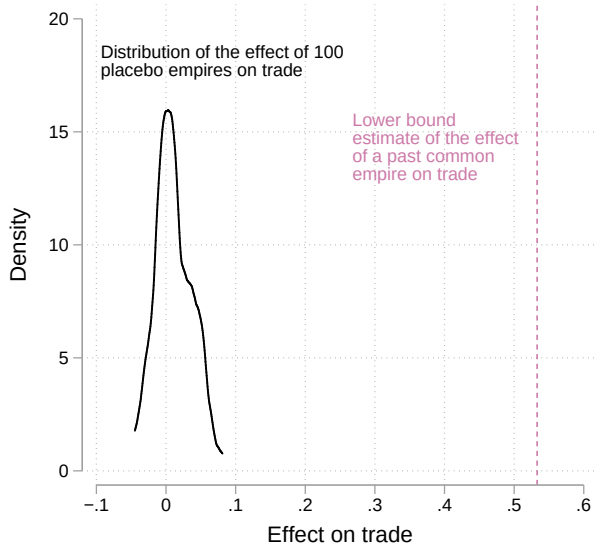
Results using these alternative indicators are in Table 3. Imports from countries that were once in a common empire are on average 70% larger than from other countries ($exp(0.533)-1$). These results confirm the relevance of past empires in shaping today's trade patterns. The results for the other indicators of trading capital indicate that 10% more years of common empire increases trade by 0.9%, while an extra empire increases trade by 8%. It is worth nothing that none of these indicators take into account both *years in* and *years since* past

empires, and hence, our preference for our measure of trading capital.

3.2 Placebo exercise

To additionally check the robustness of our findings, we generate 100 placebo empires. In the placebo treatment, the probability of two countries being in a joint placebo empire is a function of walking hours on natural optimal routes. In Figure 6, we show the distribution of the effect of 100 placebo empires treatment on trade. The mean of the placebo empires effect is centered around zero, and none has a significantly positive effect on trade. Also, the right tail of the distribution is nowhere near our lower bound estimate of the effect of the *Empire* dummy. This exercise assures us about the robustness of our findings.

Figure 6: Placebo estimations



Note: The placebo empires are not completely random but predicted by the ease of human mobility between countries.

Table 4: The effect of past empires on bilateral affinity

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A:	Common legal system	Common language	Common religion	Genetic distance	Linguistic distance	Trade agreement
Trading capital	0.003***	0.004***	0.005***	0.000***	-0.000	-0.002***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance	-0.081***	-0.116***	-0.062***	0.059***	0.104***	-0.168***
	(0.009)	(0.007)	(0.005)	(0.002)	(0.005)	(0.006)
Contiguity	0.138***	0.132***	0.120***	-0.016***	-0.017	0.185***
	(0.035)	(0.028)	(0.024)	(0.005)	(0.018)	(0.028)
Latitude difference	-0.018***	0.009***	0.012***	-0.002***	-0.014***	-0.025***
	(0.004)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Longitude difference	0.021***	0.016***	0.007**	-0.015***	0.004*	0.015***
	(0.005)	(0.004)	(0.003)	(0.001)	(0.002)	(0.003)
N	33459	33494	33494	14338	9666	33494
R-sq	0.19	0.35	0.28	0.42	0.39	0.40
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL B:	Common legal system	Common language	Common religion	Genetic distance	Linguistic distance	Trade agreement
Empire	0.315***	0.265***	0.084***	-0.005***	-0.043***	0.019***
	(0.009)	(0.007)	(0.006)	(0.002)	(0.005)	(0.005)
Distance	-0.021**	-0.068***	-0.055***	0.057***	0.091***	-0.161***
	(0.009)	(0.007)	(0.005)	(0.002)	(0.005)	(0.006)
Contiguity	0.135***	0.145***	0.183***	-0.012**	-0.019	0.153***
	(0.032)	(0.026)	(0.024)	(0.005)	(0.017)	(0.027)
Latitude difference	-0.008**	0.017***	0.013***	-0.003***	-0.015***	-0.023***
	(0.004)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Longitude difference	0.014***	0.011***	0.005*	-0.015***	0.005**	0.014***
	(0.005)	(0.004)	(0.003)	(0.001)	(0.002)	(0.003)
N	33459	33494	33494	14338	9666	33494
R-sq	0.24	0.40	0.28	0.42	0.40	0.40

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

3.3 Mechanisms

In the top panel of Table 4, we look at the effect of trading capital on bilateral measures of affinity to explore further the potential channels through which it affects trade today. Such measures of bilateral affinity are often included in gravity models to capture institutional and cultural barriers to trade. It is worth noting that many of these attributes, e.g. sharing a language, a legal system, or a religion, are a reflection of a shared history that may relate to a shared empire. To look into the relationships between these affinity measures and trading capital, we use gravity-type regressions and include geodesic distance, differences in latitudes and longitudes, and contiguity as controls (omitting these controls or using human walking hours instead of geodesic distance does not change the results). Importantly,

in columns (1) to (3) of Panel A, we find that country pairs which have accumulated a larger amount of trading capital are more likely to share a legal system, a language, and a religion. This is in line with the idea that these measures of affinity capture part of the imperial heritage countries share. On the other hand, the influence of trading capital on trade does not seem to operate through genetic or linguistic similarity as both have near-zero correlations with trading capital (although this may be due to the smaller number of observations). Preferential trade policies are another mechanism through which trading capital may affect trade. The accumulation of trading capital could indeed be related to better political relations today which in turn lead to free trade agreements that boost trade. We find trading capital to be negatively correlated with the probability of a free trade agreement.[17] So, it is unlikely that trading capital's effect is via current trade policies.

In Panel B, we run the same regressions using the *Empire* dummy instead of trading capital as a robustness check. We find similar results, and we also find that a shared imperial past increases the probability of trade agreements by 1.9 percentage points, and it is associated with lower genetic and linguistic distances between countries. The probability of sharing a language increases by 26.5 percentage points and that of sharing a legal system by 31.5 percentage points.[18]

Hence, it is clear that a common imperial heritage is part of the reason why countries share institutions and culture, and why this, in turn, has a persistent effect on trade. Nonetheless, the persistent effect of empires on trade is not entirely captured by these gravity variables. Indeed, results in Panels A and B of Table 5 confirm that the trading capital effect is still positive and significant when we control for these potential mechanisms.[19] The effect

[17] This may be because it is rather country pairs with higher frequency of past wars and the larger potential for trade gains that are more likely to sign FTAs (Martin et al., 2012).

[18] The different results we get when using the *Empire* dummy rather than *trading capital* may be due to the fact that the relative weights of older empires are smaller in the trading capital variable compared to the *Empire* dummy, since the capital of past empires decay over time. Thus, the *Empire* dummy captures the existence of a shared imperial past, but not necessarily that of trading capital between two countries, as the latter may have depreciated completely.

[19] Including genetic and linguistic distances as controls drastically reduces the number of observations and renders the coefficient on trading capital insignificant in one regression (column 3). This is due to a sample

Table 5: Mechanisms

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL: A	Imports	Imports	Imports	Imports	Imports	Imports
Trading capital	0.011***	0.006**	0.004	0.012***	0.008***	0.009**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Distance	-1.702***	-1.475***	-1.426***			
	(0.036)	(0.037)	(0.066)			
Route (hours)				-1.220***	-0.988***	-1.058***
				(0.033)	(0.035)	(0.054)
Contiguity	0.883***	0.597***	0.724***	1.030***	0.781***	0.761***
	(0.137)	(0.135)	(0.170)	(0.149)	(0.144)	(0.175)
Latitude difference	-0.034**	-0.027*	-0.001	-0.147***	-0.122***	-0.105***
	(0.015)	(0.014)	(0.023)	(0.016)	(0.016)	(0.023)
Longitude difference	0.013	-0.016	-0.056*	-0.138***	-0.160***	-0.127***
	(0.020)	(0.019)	(0.030)	(0.022)	(0.021)	(0.030)
Common legal system		0.266***	0.512***		0.354***	0.553***
		(0.031)	(0.048)		(0.035)	(0.050)
Common language		0.869***			0.749***	
		(0.043)			(0.054)	
Common religion		0.292***	0.480***		0.378***	0.478***
		(0.044)	(0.077)		(0.049)	(0.080)
Trade agreement		0.527***	0.321***		0.603***	0.394***
		(0.056)	(0.083)		(0.064)	(0.084)
Genetic distance			-1.505***			-1.607***
			(0.348)			(0.359)
Linguistic distance			-0.908***			-0.665***
			(0.158)			(0.170)
N	33494	33459	9666	24925	24924	9130
R-sq	0.80	0.80	0.82	0.80	0.81	0.82
PANEL: B	(1)	(2)	(3)	(4)	(5)	(6)
Empire	0.548***	0.221***	0.227***	0.533***	0.225***	0.230***
	(0.035)	(0.037)	(0.056)	(0.039)	(0.041)	(0.057)
Distance	-1.608***	-1.452***	-1.382***			
	(0.036)	(0.037)	(0.069)			
Contiguity	0.954***	0.669***	0.793***	1.158***	0.889***	0.896***
	(0.131)	(0.130)	(0.171)	(0.141)	(0.138)	(0.174)
Latitude difference	-0.018	-0.022	0.003	-0.126***	-0.117***	-0.102***
	(0.015)	(0.014)	(0.023)	(0.016)	(0.016)	(0.023)
Longitude difference	0.001	-0.019	-0.061**	-0.149***	-0.166***	-0.135***
	(0.019)	(0.019)	(0.030)	(0.022)	(0.021)	(0.030)
Common legal system		0.237***	0.464***		0.328***	0.508***
		(0.031)	(0.049)		(0.035)	(0.051)
Common language		0.819***			0.699***	
		(0.044)			(0.055)	
Common religion		0.292***	0.471***		0.385***	0.487***
		(0.044)	(0.076)		(0.048)	(0.078)
Trade agreement		0.508***	0.314***		0.589***	0.375***
		(0.057)	(0.084)		(0.064)	(0.085)
Genetic distance			-1.472***			-1.559***
			(0.348)			(0.359)
Linguistic distance			-0.852***			-0.615***
			(0.159)			(0.171)
Route (hours)				-1.131***	-0.962***	-1.025***
				(0.034)	(0.035)	(0.056)
N	33494	33459	9666	24925	24924	9130
R-sq	0.80	0.80	0.82	0.80	0.81	0.82

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

of trading capital is around 50% smaller, suggesting that these mechanisms account for about half of the trading capital effect. The difference in imports between empire pairs and non-empire pairs is reduced to 25%, suggesting that 2/3 of the dummy effect is explained by these mechanisms.

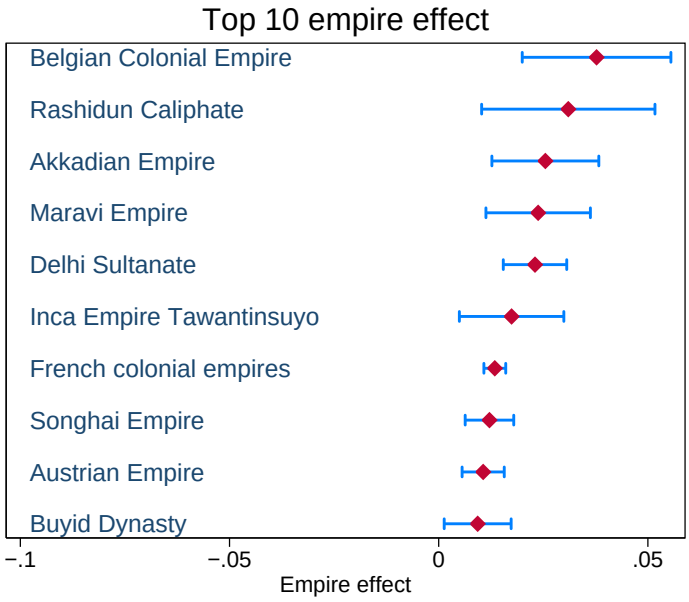
To sum up, the effect of trading capital on trade goes partly through common languages, religions, genes, or legal systems. These measures of affinity may be the result of past common empires, and may, thus, be viewed as components of trading capital. At the same time, although controlling for them does indeed reduce the size of the trading capital effect, part of the effect still remains unexplained. One possible explanation is that the comparative advantage forces that have shaped empire expansion in the past are still at play today in shaping trade patterns. This would imply that the effect of trading capital is partly spurious. While we cannot rule out this possibility completely, it would not explain why longer periods of joint empire have a stronger effect on trade, which is in line with our idea of trading capital as a trade facilitator.

3.4 Heterogeneity across colonial and non-colonial trading capital

In this section, we first investigate whether all empires have a positive effect on trade. Some empires lasted longer than others, some existed a long time ago, and some were better than others at building trading capital. For this additional exercise, we include 140 indicators, one for each empire, to estimate the effect of each empire individually. Figure 7 presents the results for the ten most influential empires. Interestingly, the Belgian Colonial Empire has the biggest effect on current day trade. Other top-10 empires include the Rashidun Caliphate in the Middle East, the Maravi Empire in Southern Africa, and the Inca Empire in South America. We note also that two out of ten empires are colonial empires.

selection issue rather than the inclusion of genetic and linguistic distances as controls. Indeed the coefficient on trading capital is also insignificant if we estimate the specification of column (2) on the restricted sample of column (3) (not shown). Since we find positive effects for the rest of our regressions we conclude that there is indeed a non-explained effect of trading capital on trade.

Figure 7: Which empires matter more?



Next, this exercise also brings us to explore further the differential persistence of colonial and non-colonial empires. Colonial empires have been studied previously by both development and trade economists, and the *colony* dummy is now a staple of gravity equations. It is, therefore, important to check how our measure of trading capital differs between colonial and non-colonial empires.

We start by simply describing the differences between the levels of colonial and non-colonial trading capitals in Table 6. Out of 33,505 country pairs, 8,382 share an imperial past. However, only 3,815 of them share some trading capital. This is because for many pairs empires were so long ago that their capital has depreciated completely. Out of these 3,815 country pairs, 3,221 have colonial trading capital and 1,493 have non-colonial trading capital (some pairs have both). One thing that stands out is that the level of trading capital is, on average, much higher when accumulated during non-colonial empires. Indeed, the mean of colonial trading capital (in asinh) is 3.25, while it is 25.8 for non-colonial capital.

To explore the differential effects the two types of trading capital may have on today's

Table 6: Colonial vs. non-colonial trading capital

	Obs.	Mean	Std. Dev.	Min	Max
	All observations				
Empire	33,505	0.25	0.43	0.00	1.00
Trading capital	33,505	1.37	7.24	0.00	104.17
Non-colonial trading capital	33,505	1.15	7.19	0.00	104.18
Colonial trading capital	33,505	0.31	1.28	0.00	19.67
	Only positive observations				
Empire	8,382	1.00	0.00	1.00	1.00
Trading capital	3,815	12.01	18.22	0.03	104.17
Non-colonial trading capital	1,493	25.80	22.88	0.12	104.18
Colonial trading capital	3,221	3.25	2.75	0.00	19.67

trade, we run our gravity regressions including both variables at the same time on the right hand side. Results are in Table 7. The smaller elasticities associated with non-colonial trading capital suggest that a 10% increase in non-colonial trading capital has a much smaller effect on trade than a similar increase in colonial trading capital. Yet, this comparison may be misleading as the levels of non-colonial trading capital are much larger than that of colonial trading capital. We observe in column (1) that, when we do not control for other factors of trade, bringing the non-colonial trading capital of Moldova-Poland to the level of Bulgaria-Hungary, i.e. moving from the 25th to the 75th percentile among pairs with non-zero capital, would increase their trade about six-fold. On the other hand, bringing the colonial trading capital of South Africa-Sudan to the level of Great Britain-Yemen, i.e. moving from the 25th to the 75th percentile among pairs with non-zero capital, would increase their trade about two-fold. This difference in the size of the effect partly reflects the difference in the size of the colonial trading capital versus the non-colonial one (see Figure 6). If we look at the lower bound estimates of column (3), instead, the same positive changes in non-colonial and colonial capitals would bring about 15% and 16% increases in trade, respectively. In column (6), when we control for optimal walking routes, the effect of colonial trading capital on trade is statistically insignificant. This is probably due to the fact that many colonial country pairs are separated by large water bodies. Whereas, as above,

Table 7: Effect of colonial and non-colonial trading capitals on current trade

	(1)	(2)	(3)	(4)	(5)	(6)
	Imports	Imports	Imports	Imports	Imports	Imports
Colonial trading capital	0.253***	0.141***	0.051***	0.294***	0.104***	0.010
	(0.015)	(0.010)	(0.010)	(0.019)	(0.013)	(0.013)
Non-colonial trading capital	0.066***	0.007***	0.005*	0.058***	0.011***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Distance		-1.687***	-1.477***			
		(0.035)	(0.037)			
Route (hours)					-1.186***	-0.987***
					(0.033)	(0.035)
Contiguity		0.887***	0.610***		1.039***	0.782***
		(0.136)	(0.134)		(0.149)	(0.144)
Latitude difference		-0.039***	-0.029**		-0.154***	-0.123***
		(0.015)	(0.014)		(0.016)	(0.016)
Longitude difference		0.017	-0.014		-0.142***	-0.160***
		(0.019)	(0.019)		(0.022)	(0.021)
Common legal system			0.252***			0.354***
			(0.031)			(0.035)
Common language			0.827***			0.745***
			(0.044)			(0.055)
Common religion			0.285***			0.379***
			(0.044)			(0.049)
Trade agreement			0.521***			0.603***
			(0.056)			(0.064)
N	33505	33494	33459	24931	24925	24924
R-sq	0.74	0.80	0.80	0.74	0.80	0.81

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

bringing the non-colonial trading capital of Moldova-Poland to the level of Bulgaria-Hungary would increase their trade by 25%. This suggests that while colonial empires might matter for today's trade, long-gone non-colonial empires matter at least as much. This also assures us that our results are not driven by merely colonial empires. To additionally confirm that colonial empires do not drive our results, we run further regressions excluding all country pairs with positive colonial trading capital. Results in Table 8 confirm that, among country pairs that were never part of joint colonial empires, trading capital accumulated during long-gone empires still has a positive effect on trade.

Table 8: Omitting pairs with colonial trading capital

	(1) Imports	(2) Imports	(3) Imports	(4) Imports	(5) Imports	(6) Imports	(7) Imports	(8) Imports
Trading capital	0.008***	0.006**	0.011***	0.008***				
	(0.003)	(0.003)	(0.003)	(0.003)				
Empire					0.422***	0.239***	0.444***	0.268***
					(0.045)	(0.045)	(0.048)	(0.048)
Distance	-1.597***	-1.405***			-1.528***	-1.373***		
	(0.038)	(0.039)			(0.039)	(0.040)		
Route (hours)			-1.146***	-0.979***			-1.090***	-0.952***
			(0.036)	(0.037)			(0.037)	(0.038)
Contiguity	0.864***	0.610***	0.997***	0.755***	0.947***	0.681***	1.145***	0.874***
	(0.161)	(0.160)	(0.174)	(0.171)	(0.153)	(0.153)	(0.164)	(0.162)
Latitude difference	-0.065***	-0.051***	-0.161***	-0.131***	-0.051***	-0.045***	-0.142***	-0.121***
	(0.015)	(0.015)	(0.017)	(0.017)	(0.015)	(0.015)	(0.017)	(0.017)
Longitude difference	0.007	-0.020	-0.134***	-0.146***	-0.002	-0.024	-0.138***	-0.149***
	(0.021)	(0.020)	(0.023)	(0.023)	(0.021)	(0.020)	(0.023)	(0.023)
Common legal system		0.274***		0.377***		0.262***		0.364***
		(0.034)		(0.038)		(0.034)		(0.038)
Common language		0.831***		0.694***		0.809***		0.673***
		(0.051)		(0.064)		(0.051)		(0.064)
Common religion		0.299***		0.404***		0.295***		0.404***
		(0.047)		(0.051)		(0.046)		(0.051)
Trade agreement		0.503***		0.528***		0.487***		0.510***
		(0.060)		(0.068)		(0.060)		(0.068)
N	30275	30240	22585	22584	30275	30240	22585	22584
R-sq	0.80	0.80	0.80	0.81	0.80	0.80	0.80	0.81

Importer and Exporter fixed effects included in all regressions. Standard errors in parenthesis clustered by country-pair, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

4 CONCLUSION

In *Power and Plenty*, Findlay and O'Rourke (2009) suggest that "*contemporary globalization, and its economic and political consequences, have not arisen out of a vacuum, but from a worldwide process of uneven economic development that has been centuries, if not millennia, in the making.*" In this paper, we show empirically that there is indeed a persistent effect of long-gone empires on trade. Imports from countries that were once in a common empire are on average 70% larger. Hence, the historical legacy of empires also left its mark on today's trade patterns. We look into the dynamics of persistence by building a measure of trading capital and found that it buildups faster in times of common empire than it depreciates at other times, explaining its slow erosion and long-run persistence. The effect of trading

capital on trade survives controlling for potential mechanisms such as sharing a language, a religion, genes, a legal system, and importantly, for the ease of natural trade and invasion routes. This suggests a persistent and previously unexplained effect of long-gone empires on trade. Our paper, thus, contributes to a wave of papers on long-run persistence by looking at the case of trade patterns and it suggests a basis for a theory of cross-state institutional capital dynamics that makes for promising future research.

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A Empire list

Table 9: Empire territory reach over countries and time

Empire	Countries
Achaemenid Empire	Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Iraq, Turkmenistan, Turkey (550BC–331BC), Egypt, Israel, Jordan, Kuwait, Lebanon, Palestine, Syria (530BC–331BC), Libya (525BC–331BC), Bulgaria, Greece (492BC–479BC), Kazakhstan, Pakistan, Tajikistan, Uzbekistan (479BC–331BC), United Arab Emirates, Moldova, Romania, Russia, Ukraine (410BC–331BC), Oman (410BC–330BC)
Afsharid Dynasty	Afghanistan, United Arab Emirates, Armenia, Azerbaijan, Bahrain, Georgia, India, Iran, Iraq, Kazakhstan, Kuwait, Oman, Pakistan, Russia, Tajikistan, Turkmenistan, Turkey, Uzbekistan (1736–1796)
Akkadian Empire	Iraq (2350BC–2150BC), Kuwait, Saudi Arabia (2271BC–2150BC), Iran, Jordan, Syria, Turkey (2248BC–2150BC)
Aksumite Empire	Yemen (100–480), Djibouti, Eritrea, Ethiopia, Sudan (100–960), Somalia (230–960)
Almohad Dynasty	Algeria, Morocco (1121–1269), Spain, Gibraltar (1145–1269), Portugal (1148–1269), Western Sahara, Libya, Tunisia (1152–1269)
Almoravid Dynasty	Algeria, Western Sahara, Spain, Gibraltar, Morocco, Mauritania, Portugal (1040–1147)
Angevin Empire	France, United Kingdom (1154–1214), Ireland (1166–1214)
Armenian Empire	Armenia (331BC–428), Azerbaijan, Georgia, Iran, Iraq, Syria, Turkey (300BC–428), Israel, Lebanon, Palestine (95BC–428)
Austrian Empire	Austria, Bosnia And Herzegovina, Czech Republic, Germany, Croatia, Hungary, Italy, Poland, Romania, Slovak Republic, Slovenia, Ukraine (1804–1867)
AustroHungarian Empire	Austria, Switzerland, Czech Republic, Germany, France, Croatia, Hungary, Italy, Liechtenstein, Poland, Romania, Yugoslavia, Slovak Republic, Slovenia, Ukraine (1867–1918), Bosnia And Herzegovina (1900–1918)
Ayyubid Dynasty	Egypt, Iraq, Israel, Jordan, Lebanon, Libya, Palestine, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, Yemen (1171–1260)
Balhae	China, North Korea, Russia (698–926)
Belgian Colonial Empire	Guatemala (1843–1854), Democratic Republic Of The Congo (1885–1960), China (1900–1931), Belgium, Rwanda (1916–1960), Burundi (1916–1962), Italy (1919–1920)
Bornu Empire	Cameroon, Niger, Nigeria, Chad (1380–1893)

Table 9: Empire territory reach over countries and time *cont.*

Empire	Countries
British Empire	United Kingdom (1583–1997), United States (1607–1776), Bermuda (1612–2000), Barbados (1624–1966), Antigua And Barbuda (1632–1939), Jamaica (1655–1962), Belize (1665–1981), Bahamas (1666–1962), Cayman Islands (1670–2000), Gibraltar (1704–2000), Pakistan (1748–1947), India (1757–1947), Grenada (1762–1974), Canada (1763–1982), Falkland Islands (1766–2000), Samoa (1768–1962), Turkmenistan (1783–1997), Sierra Leone (1787–1808), Australia (1788–1901), Seychelles (1794–1976), Sri Lanka (1795–1948), Maldives (1796–1965), Namibia (1797–1990), Oman (1798–1971), Malta (1800–1964), Egypt (1801–1922), Argentina (1806–1825), French Guiana, Guyana (1814–1966), South Africa (1815–1961), Malaysia (1819–1963), Ghana (1821–1957), Gambia (1821–1965), Myanmar (1824–1948), Singapore (1824–1965), Afghanistan (1839–1919), Yemen (1839–1967), New Zealand (1841–1907), Nigeria (1861–1960), Lesotho (1868–1966), Fiji (1874–1970), Cyprus (1878–1960), Bahrain (1880–1971), Botswana (1885–1964), Zambia (1888–1923), Kenya (1888–1963), Zimbabwe (1888–1965), Brunei (1888–1984), Solomon Islands (1889–1978), United Arab Emirates (1892–1966), Uganda (1894–1962), Sudan (1899–1956), Kuwait (1899–1961), Tonga (1900–1970), Swaziland (1906–1968), Nauru (1914–1968), Qatar (1916–1971), Kiribati (1916–1979), Tanzania (1919–1947), Iraq (1920–1932), Israel (1920–1948)
British Raj	Bangladesh, India, Myanmar, Pakistan, Yemen (1858–1947)
Bruneian Empire	Brunei (1368–1888), Indonesia, Malaysia, Philippines (1550–1888)
Buyid Dynasty	Iran, Iraq, Kuwait, Turkey (934–1062), Oman (967–1062)
Byzantine Empire	Cyprus (330–1196), Bulgaria (330–1204), Greece (330–1350), Turkey (330–1453), Egypt, Israel, Lebanon, Libya, Macedonia, Syria (476–650), Albania (476–1204), Spain, France, Morocco, Portugal (540–650), Algeria, Tunisia (540–717), Italy (540–1018), Bosnia And Herzegovina, Croatia, Slovenia (540–1204)
Caliphate of Córdoba	Andorra, Spain, Gibraltar, Morocco, Portugal (929–1031)
Carthaginian Empire	France, Italy, Malta (650BC–218BC), Algeria, Spain, Gibraltar, Libya, Morocco, Portugal (650BC–201BC), Tunisia (650BC–146BC)
Chagatai Khanate	Afghanistan, India, Mongolia, Pakistan, Turkmenistan, Uzbekistan (1225–1490), China, Kazakhstan, Kyrgyz Republic, Tajikistan (1225–1687)
Chola Dynasty	India (300BC–1279), Indonesia, Sri Lanka, Maldives, Malaysia, Thailand (925–1279), Bangladesh, Singapore (1016–1279)
Danish Colonial Empire	Estonia (1219–1346), Denmark (1219–1953), Norway (1536–1814), Iceland (1536–1944), India (1620–1869), Ghana (1658–1850), United States (1754–1917)
Delhi Sultanate	Bangladesh (1206–1316), India, Nepal (1206–1526)
Durrani Empire	Afghanistan, Iran, Tajikistan, Turkmenistan, Uzbekistan (1747–1826), Pakistan (1749–1826), India (1757–1826)
Dutch Empire	Netherlands (1602–1975), Brazil (1630–1830), Guyana, Indonesia (1630–1970), Aruba (1636–1973), India (1650–1830), Malaysia (1650–1970), South Africa (1674–1830), Suriname (1674–1970), Chile (1750–1970), Sri Lanka (1920–1830), Macau, Mauritius, Philippines, Singapore (1920–1970)
Eastern Wu	China, Vietnam (220–280)
Egyptian Empire	Egypt, Ethiopia, Israel, Jordan, Lebanon, Libya, Palestine, Saudi Arabia, Sudan, Somalia, Syria, Turkey (1550BC–1077BC)
Empire of Brazil	Brazil, Uruguay (1822–1889)

Table 9: Empire territory reach over countries and time *cont.*

Empire	Countries
Empire of Japan	Russia (1870–1945), Japan (1870–1947), China, South Korea, Mongolia, North Korea (1932–1945), Indonesia, India, Laos, Marshall Islands, Myanmar, Malaysia, Philippines, Palau, Papua New Guinea, Singapore, Solomon Islands, Thailand, United States, Vietnam (1942–1945)
Empire of Trebizond	Georgia, Turkey, Ukraine (1204–1461)
Ethiopian Empire	Eritrea, Ethiopia (1137–1974)
Fatimid Caliphate	Algeria, Libya, Tunisia (909–1100), Egypt (968–1171), Italy, Lebanon, Syria (969–1100), Israel, Jordan, Malta, Saudi Arabia (969–1171)
First Bulgarian Empire	Bulgaria, Moldova, Romania, Turkey, Ukraine (681–1018), Croatia, Hungary (836–1018), Greece, Macedonia (889–1018)
First Mexican Empire	Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, El Salvador, United States (1821–1823)
Frankish Empire	Belgium, France, Luxembourg, Netherlands (481–843), Switzerland, Liechtenstein (531–843), Austria, Germany, Spain, Italy (768–843)
French colonial empires	Canada (1534–1763), France (1550–2000), Saint Kitts And Nevis (1624–1783), Haiti (1627–1804), United States (1660–1733), Senegal (1677–1960), India (1692–1954), Seychelles (1756–1810), Dominican Republic (1795–1809), Italy (1796–1811), Gibraltar (1810–1812), Algeria (1830–1962), Gabon (1839–1960), Cote D'ivoire (1843–1960), China (1849–1949), New Caledonia (1853–1999), Vietnam (1858–1954), Djibouti (1862–1977), Cambodia (1863–1953), Comoros (1866–1975), Congo (1875–1960), Tunisia (1881–1956), Mali (1883–1960), Vanuatu (1887–1980), Guinea (1891–1958), Laos (1893–1954), Central African Republic (1894–1940), Burkina Faso, Madagascar (1896–1960), Chad (1900–1960), Niger (1902–1904), Mauritania, Mauritius (1902–1960), Benin (1904–1958), Morocco (1912–1956), Cameroon, Togo (1918–1960), Lebanon (1920–1943), Syria (1920–1946), Libya (1943–1951)
Gallic Empire	Belgium, Switzerland, Germany, Spain, France, Luxembourg, Netherlands, Portugal (260–274)
German Empire	Belgium, Czech Republic, Germany, Denmark, France, Lithuania, Netherlands, Poland, Russia (1871–1918), Kenya (1885–1890), Namibia (1906–1907), Belarus, Ukraine (1917–1918)
Ghana Empire	Mali, Mauritania (350–1200)
Ghaznavid Dynasty	Afghanistan, India, Iran, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (977–1186)
Ghurid Dynasty	Afghanistan, Bangladesh, India, Iran, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (879–1215)
Goguryeo	China, North Korea (37BC–668), South Korea, Russia (317–668)
Gktrk Khaganate	Afghanistan, China, Kazakhstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan (552–744)
Golden Horde	Azerbaijan, Bulgaria, China, Turkmenistan, Uzbekistan (1240–1456), Belarus, Georgia, Kazakhstan, Moldova, Poland, Romania, Russia, Ukraine (1240–1502)
Gorkha Empire	India, Nepal (1767–1951)
Goryeo	South Korea, North Korea (918–1392)
Great Moravian Empire	Czech Republic, Slovak Republic (833–906), Poland (877–894)
Great Seljuq Empire	Afghanistan, Armenia, Azerbaijan, Egypt, Georgia, Iran, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, Oman, Russia, Saudi Arabia, Syria, Tajikistan, Turkmenistan, Turkey, Uzbekistan, Yemen (1037–1194)

Table 9: Empire territory reach over countries and time *cont.*

Empire	Countries
Han Dynasty	China, South Korea, Mongolia, North Korea, Vietnam (206BC–220)
Hephthalite Empire	Afghanistan, China, India, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (408–670)
Hittite Empire	Lebanon, Syria, Turkey (1600BC–1178BC)
Holy Roman Empire	Croatia (962–963), Austria, Belgium, Switzerland, Czech Republic, Germany, Liechtenstein, Luxembourg, Netherlands, Slovenia (962–1806), Italy (963–1806), France, Monaco (1032–1806), Poland (1500–1806)
Hotaki Dynasty	Afghanistan, Iran, Pakistan, Tajikistan, Turkmenistan (1709–1738)
Hunnic Empire	Kazakhstan, Russia (370–469), Belarus, Ukraine (376–469), Austria, Bulgaria, Czech Republic, Croatia, Lithuania (408–469), Germany, Hungary, Moldova, Poland, Romania (420–469)
Ilkhanate	Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Iraq, Pakistan, Russia, Syria, Tajikistan, Turkmenistan, Turkey (1256–1353)
Inca Empire Tawantinsuyo	Peru (1438–1533), Ecuador (1471–1533), Argentina, Bolivia, Chile (1494–1533), Colombia (1525–1533)
Italian Colonial Empire	Italy (1869–1943), Eritrea (1890–1941), Turkey (1912–1943), Somalia (1936–1941), Ethiopia, Libya (1936–1947), Albania (1942–1947)
Jin Dynasty 265420	China, Mongolia, Vietnam (265–420)
Kanem Empire	Cameroon, Libya, Niger, Nigeria, Chad (700–1387)
KaraKhanid Khanate	Afghanistan, China, Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan (840–1212)
Khazar Khaganate	Ukraine (650–1048), Russia (750–1048), Kazakhstan (850–1048)
Khilji Dynasty	Afghanistan, Bangladesh, India, Pakistan (1290–1320)
Khmer Empire	Cambodia, Laos, Thailand, Vietnam (802–1431)
Khwarezmid Dynasty	Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Turkey, Uzbekistan (1077–1231)
Korean Empire	South Korea, North Korea (1897–1910)
Kushan Empire	China, India, Nepal (30–340), Pakistan, Tajikistan, Turkmenistan, Uzbekistan (30–375)
Later L dynasty	China, Cambodia, Laos, Vietnam (1428–1789)
Latin Empire	Greece, Turkey (1204–1261)
Liao Dynasty	China, Kazakhstan, Mongolia, North Korea, Russia (907–1125)
Macedonian Empire	Bulgaria, Greece, Macedonia (808BC–148BC), Albania (336BC–148BC), Moldova, Romania, Turkey (334BC–200BC), Egypt, Iran, Iraq, Israel, Kuwait, Lebanon, Syria (331BC–200BC), Afghanistan, Turkmenistan (330BC–200BC), Pakistan, Tajikistan, Uzbekistan (325BC–200BC)
Majapahit Empire	Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand (1293–1527)
Mali Empire	Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal (1235–1600)
Mamluk Sultanate	Egypt, Israel, Jordan, Lebanon, Libya, Saudi Arabia, Sudan, Syria, Turkey (1250–1517)
Maratha Empire	Bangladesh, India, Pakistan (1674–1818)
Maravi Empire	Malawi (1600–1750), Mozambique, Zambia (1650–1750)
Mauryan Empire	India, Nepal (326BC–184BC), Afghanistan, Bangladesh, Iran, Pakistan (305BC–184BC)
Median Empire	Armenia, Iran, Iraq, Turkey (678BC–549BC)
Ming Dynasty	China, Laos, Vietnam (1368–1644), North Korea, Russia (1500–1664)

Table 9: Empire territory reach over countries and time *cont.*

Empire	Countries
Mongol Empire	China, Mongolia, Russia (1206–1368), Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (1220–1368), Afghanistan, Armenia, Azerbaijan, Georgia, India, Iran, Iraq, South Korea, Myanmar, North Korea, Vietnam (1234–1368), Bulgaria, Bosnia And Herzegovina, Belarus, Czech Republic, Croatia, Hungary, Laos, Lithuania, Moldova, Poland, Romania, Slovenia, Syria, Thailand, Turkey, Ukraine (1258–1368)
Mughal Empire	Pakistan (1526–1750), India (1526–1858), Afghanistan, Bangladesh (1605–1750)
Nanda Empire	Bangladesh, India, Nepal (345BC–321BC)
NeoAssyrian Empire	Iraq (911BC–609BC), Syria, Turkey (824BC–609BC), Lebanon (737BC–609BC), Armenia, Iran (712BC–609BC), Cyprus, Egypt, Israel, Jordan, Kuwait, Palestine, Saudi Arabia (671BC–609BC)
NeoBabylonian Empire	Iraq (626BC–539BC), Iran, Kuwait (614BC–539BC), Syria, Turkey (612BC–539BC), Lebanon (605BC–539BC), Cyprus, Egypt, Israel, Jordan, Palestine, Saudi Arabia (599BC–539BC)
Nguy n Dynasty	China, Cambodia, Laos, Vietnam (1802–1945)
Northern Yuan Dynasty	China, Kazakhstan, Mongolia, Russia (1368–1635)
Omani Empire	United Arab Emirates, Pakistan (1820–1970)
Ottoman Empire	Turkey (1299–1922), Bulgaria, Greece (1389–1922), Albania, Bosnia And Herzegovina, Croatia, Moldova, Macedonia, Romania (1391–1922), Hungary (1396–1922), Russia (1481–1815), Armenia, Azerbaijan, Georgia, Ukraine (1481–1922), Algeria (1520–1900), Egypt, Sudan (1520–1912), Bahrain, Cyprus, Djibouti, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Yemen (1520–1922), Tunisia (1566–1900), Libya (1566–1912), Austria (1566–1922), Eritrea, Somalia (1683–1912), United Arab Emirates (1683–1922)
Oyo Empire	Benin, Nigeria, Togo (1300–1896)
Pala Empire	Bangladesh, India, Nepal (750–1150)
Palmyrene Empire	Egypt, Iraq, Israel, Jordan, Lebanon, Palestine, Saudi Arabia, Syria, Turkey (270–273)
Pandyan Empire	India, Sri Lanka (550BC–1550)
Parthian Empire	Iran, Turkmenistan (247BC–224), Afghanistan, United Arab Emirates, Armenia, Azerbaijan, Bahrain, Georgia, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, Turkey, Yemen (141BC–224), Syria (118–224)
Pontic Empire	Turkey (281BC–62), Bulgaria, Georgia, Greece, Romania, Russia, Ukraine (129BC–62)
Portuguese Empire	Portugal (1415–2000), Cape Verde (1462–1975), Spain (1474–1778), Mozambique (1498–1975), Morocco (1506–1769), Hong Kong (1514–1661), Macau (1533–1999), Angola (1575–1975), India (1593–1729), Sri Lanka (1597–1658)
Ptolemaic Empire	Egypt, Libya (305BC–30BC), Greece, Jordan, Lebanon, Palestine, Syria, Turkey (275BC–133BC), Cyprus, Israel (275BC–30BC)
Qajar Dynasty	Russia (1789–1813), Georgia (1789–1828), Afghanistan, Armenia, Azerbaijan, Bahrain, Iran, Iraq, Pakistan, Turkmenistan, Turkey (1789–1925)
Qing Dynasty	Afghanistan, Bhutan, China, India, Kazakhstan, Myanmar, Mongolia, Pakistan, North Korea, Russia, Tajikistan (1644–1912)
Rashidun Caliphate	United Arab Emirates, Bahrain, Kuwait, Oman, Saudi Arabia (632–661), Iraq, Jordan (634–661), Syria, Turkey (639–661), Armenia, Iran (643–661), Afghanistan, Azerbaijan, Cyprus, Egypt, Georgia, Israel, Italy, Lebanon, Libya, Pakistan, Palestine, Qatar, Russia, Sudan, Tajikistan, Turkmenistan, Tunisia, Uzbekistan, Yemen (650–661)

Table 9: Empire territory reach over countries and time *cont.*

Empire	Countries
Roman Empire	Italy (800BC–476), Albania (218BC–476), Spain, Greece, Croatia, San Marino, Tunisia, Turkey (133BC–476), Switzerland, Cyprus, Germany, France, Gibraltar, Hungary, Israel, Jordan, Lebanon, Libya, Liechtenstein, Luxembourg, Morocco, Monaco, Moldova, Macedonia, Malta, Netherlands, Portugal, Palestine, Romania, Syria (44BC–476), Andorra, Austria, Bosnia And Herzegovina, Slovenia (14BC–476), Belgium, Bulgaria, Algeria, Egypt (14–476), Armenia, Azerbaijan, United Kingdom, Georgia, Russia, Ukraine (100–476), Iran, Iraq, Kuwait, Saudi Arabia (115–476)
Rouran Khaganate	China, Kazakhstan, Mongolia, Russia (330–555)
Russian Empire Romanov	Armenia, Azerbaijan, Belarus, China, Estonia, Finland, Kazakhstan, Lithuania, Latvia, Moldova, Mongolia, Russia, Sweden, Tajikistan, Turkmenistan, Turkey, Ukraine, Uzbekistan (1721–1917), Poland, Romania (1801–1917), Georgia (1812–1917), Iran (1826–1917)
Safavid Dynasty	Afghanistan, Armenia, Azerbaijan, Bahrain, Georgia, Iran, Iraq, Kuwait, Pakistan, Russia, Syria, Turkmenistan, Turkey, Uzbekistan (1501–1736)
Saffarid Dynasty	Afghanistan, China, India, Iran, Iraq, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (861–1003)
Samanid Dynasty	Afghanistan, Iran, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (819–999)
Sassanid Dynasty	Syria, Turkey (224–639), Armenia, Azerbaijan, Georgia, Iraq (224–643), Afghanistan, Iran, Pakistan, Turkmenistan, Uzbekistan (224–651), Kuwait (480–639), Russia (480–643), India, Kazakhstan (480–651), Bahrain, Oman, Saudi Arabia (531–639), Yemen (570–628), Tajikistan (570–651), Egypt, Israel, Jordan, Lebanon, Libya, Palestine (621–628), Qatar (621–639)
Scandinavian Empire	Denmark, Norway, Sweden (1016–1035)
Second Bulgarian Empire	Bulgaria, Moldova, Romania, Ukraine (1185–1396), Greece, Macedonia, Turkey (1230–1396)
Second French Empire	Algeria, France, Gabon, India, Cambodia, Senegal, Vietnam (1852–1870)
Seleucid Empire	Armenia, Azerbaijan, Georgia (312BC–275BC), Tajikistan, Uzbekistan (312BC–256BC), Afghanistan, India, Iran, Iraq, Kazakhstan, Kuwait, Pakistan, Saudi Arabia, Turkmenistan (312BC–141BC), Syria, Turkey (312BC–63BC), Israel, Jordan, Palestine (301BC–141BC), Lebanon (301BC–63BC)
Serbian Empire	Albania, Bulgaria, Bosnia And Herzegovina, Greece, Croatia, Yugoslavia (1346–1371)
Shunga Empire	Bangladesh, India, Nepal (185BC–75BC)
Siam Empire	Cambodia, Laos, Myanmar, Thailand, Vietnam (1782–1932)
Sikh Empire	China, India, Pakistan (1799–1849)
Song Dynasty	China, Hong Kong (960–1279)
Songhai Empire	Benin, Burkina Faso, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal (1464–1591)
Spanish Empire	Gibraltar (1462–1704), Bahamas (1492–1565), Argentina (1492–1832), Puerto Rico (1492–1898), Spain (1492–1975), Dominican Republic (1493–1865), Venezuela (1498–1830), Aruba (1499–1636), Uruguay (1500–1815), Panama (1501–1821), Costa Rica (1502–1821), United States (1511–1898), Paraguay (1516–1811), Mexico (1518–1823), Philippines (1521–1989), Nicaragua (1522–1820), Palau (1522–1898), Bolivia (1532–1809), Peru (1532–1817), Chile (1541–1810), Colombia (1543–1819), Ecuador (1563–1822), Guam (1565–1815), Cuba (1565–1898), Equatorial Guinea (1778–1968), Western Sahara (1884–1975), Morocco (1912–1956)

Table 9: Empire territory reach over countries and time *cont.*

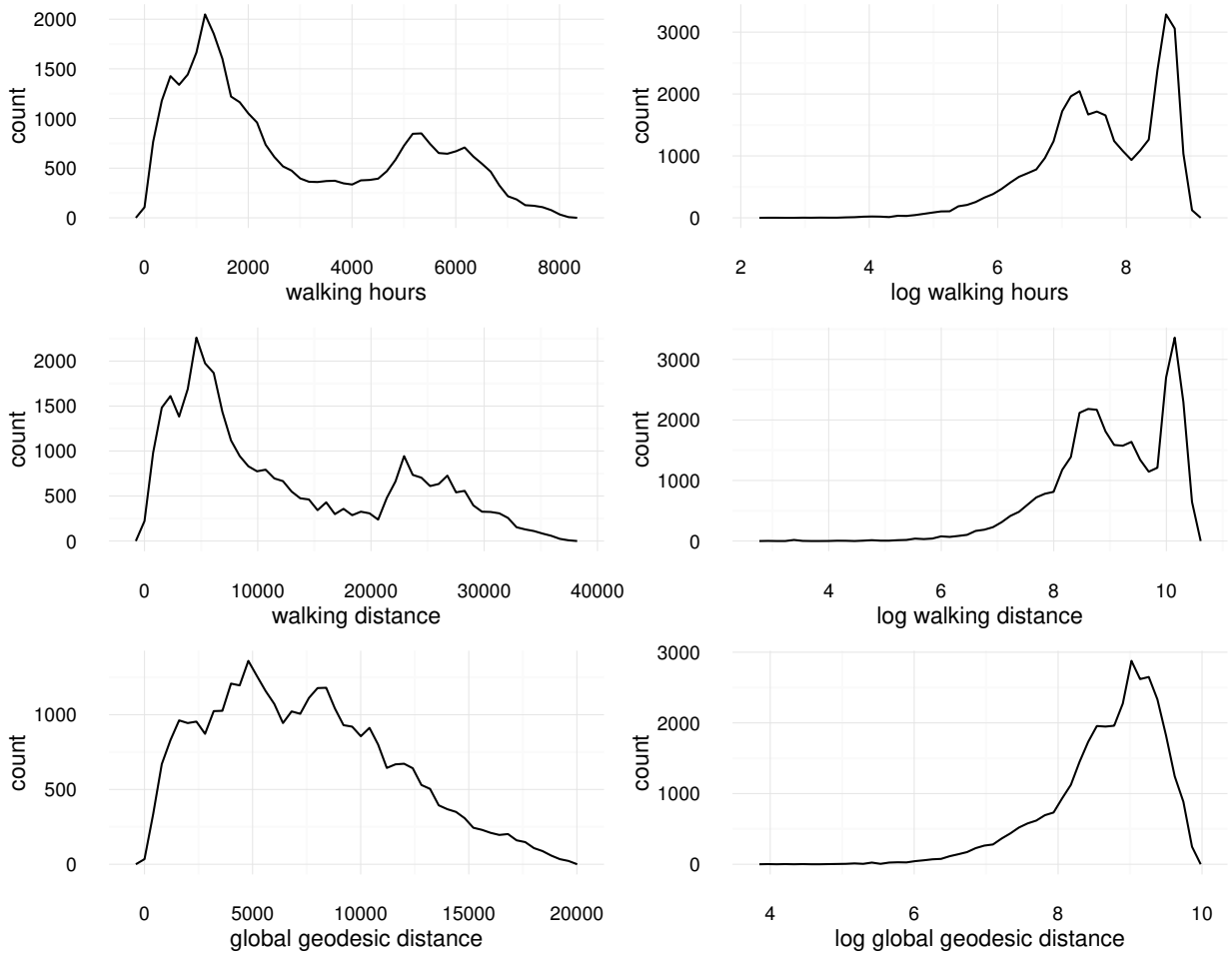
Empire	Countries
Srivijaya Empire	Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand (650–1377)
Sui Dynasty	China, Vietnam (581–618)
Swedish Empire	Estonia, Finland, Russia, Sweden (1611–1721), Latvia (1629–1721), Denmark (1645–1721), Germany, France, United Kingdom, Ghana, Poland, Togo, United States (1648–1721), Norway (1658–1719)
Tahirid Dynasty	Afghanistan, China, India, Iran, Iraq, Pakistan, Tajikistan, Turkmenistan, Uzbekistan (821–873)
Tang Dynasty	Afghanistan, China, Hong Kong, Kazakhstan, Mongolia, Pakistan, North Korea, Russia, Tajikistan, Uzbekistan, Vietnam (618–907)
Third Reich	Germany (1933–1945), Austria (1939–1945), Belgium, Czech Republic, France, Lithuania, Netherlands, Poland, Russia, Slovenia (1943–1945)
Tibetan Empire	Afghanistan, Bangladesh, Bhutan, China, India, Kazakhstan, Nepal, Pakistan, Tajikistan (618–842)
Timurid Empire	Afghanistan, Tajikistan, Turkmenistan, Uzbekistan (1370–1507), Armenia, Azerbaijan, China, Georgia, India, Iran, Iraq, Kazakhstan, Kuwait, Pakistan, Russia, Saudi Arabia, Syria, Turkey (1406–1507)
Tui Tonga Empire	Cook Islands, Fiji, Niue, Nauru, Solomon Islands, Tonga, Tuvalu, Samoa (950–1865)
Umayyad Caliphate	Afghanistan, United Arab Emirates, Armenia, Azerbaijan, Bahrain, Cyprus, Egypt, Eritrea, Western Sahara, Georgia, Gibraltar, Greece, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Mauritania, Niger, Oman, Pakistan, Qatar, Russia, Saudi Arabia, Somalia, Syria, Chad, Turkmenistan, Turkey, Uzbekistan, Yemen (661–750), Algeria, Morocco, Tunisia (683–750), Spain (711–750), Andorra, France, Kazakhstan, Portugal, Tajikistan (713–750)
Uyghur Khaganate	China, Kazakhstan, Mongolia, Russia, Tajikistan, Uzbekistan (744–840)
Uyunid dynasty	Bahrain, Iraq, Kuwait, Saudi Arabia (1076–1253)
Vikings	Denmark, Norway, Sweden (700–1066), Iceland (825–1100), Ireland (840–1171), Germany, Estonia, Lithuania, Latvia, Moldova, Poland (850–1000), Belgium, Russia (859–1000), United Kingdom (865–1263), Ukraine (880–1000), France (911–1100)
Wei Empire	China, North Korea, Vietnam (220–265)
Western Roman Empire	Andorra, Austria, Belgium, Bosnia And Herzegovina, Switzerland, Germany, Algeria, Spain, France, United Kingdom, Gibraltar, Croatia, Hungary, Italy, Libya, Liechtenstein, Luxembourg, Morocco, Monaco, Malta, Netherlands, Portugal, San Marino, Slovenia, Tunisia (285–476)
Western Xia Dynasty	China, Mongolia (1038–1227)
Yuan Dynasty	Bhutan, China, India, South Korea, Laos, Myanmar, Mongolia, North Korea, Russia (1271–1368)
Zand Dynasty	Armenia, Azerbaijan, Iran, Iraq, Kuwait, Russia (1750–1794)

B Further details on bilateral distance measures

Here we provide further statistics on how the measures of walking distance and hours compare against great circle (geodesic) distances that we typically use for bilateral distance measures. We calculate the geodesic distance between all city pairs that are also used for the walking network. Country distances are then calculated as the average of the distances (or hours)

from each city of country A to each city of country B, (resulting in 27415 country pair observations). The distribution of the distance measures are given in Figure 8.

Figure 8: Distance distributions

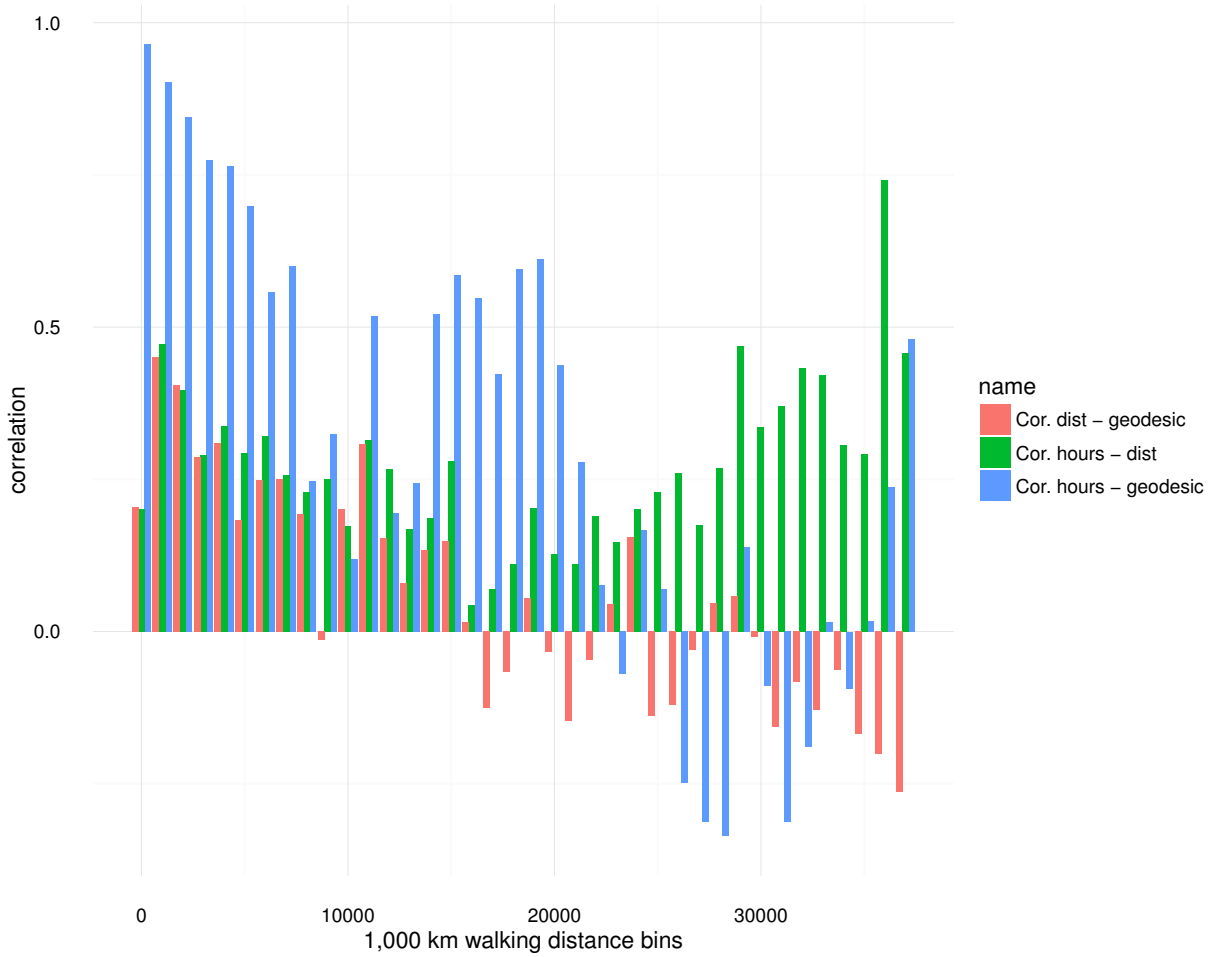


The overall correlation between these measures is

	hours	geodesic
dist	0.98	0.69
hours		0.73

This correlation may vary over distance. On one hand, at a short distance (say within Europe), the walking distance/hours might not be proportional to geodesic distance as rivers and mountains will have a relatively large effect on walking. When looking at much larger distances, such obstacles might be less of an issue in a relative sense, therefore increasing the correlation. On the other hand, since walking distance has a big issue with regards to water,

Figure 9: Correlations with distance bins



over larger distances the probability of having to walk a giant detour around an ocean will create a big discrepancy between walking and 'flying'. Figure 9 provides evidence that this is the case. The correlation between the geodesic distance and the two measures of walking are decreasing with distance. The two measures of walking are relatively constant over all the bins, even though far removed from a perfect correlation.