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IMPERIAL SYNCHRONICITY IN EURASIA: 300 BCE TO 1500 CE

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Abstract

Chinese history shows cycles of unification and fracture. In western Eurasia, some empires would also temporarily gain hegemony. Were the occurrences of large polities in these two halves of Eurasia related? This paper examines whether the size of the largest empire in western Eurasia is correlated with the size of the contemporary Chinese dynasty. This paper finds a positive association between these two. This suggests that what happened in China could have influenced western Eurasian polities. Further analysis suggests that economic integration could have partly explained this synchronicity.

Keywords: Empires, Synchronicity, Integration

JEL Classifications: N50, N70

1. Introduction

Countless examples arise today of events in one part of the world having global implications. Historical examples are also numerous. During the Seven Years War from 1856 to 1763, French and British forces clashed in Europe, North America, and India. Although the effects from events in one part of the world were not global before 1492, one can still find instances where much of Eurasia felt repercussions from happenings in one part of it. The Mongol conquests of the 13th centuries began in Eastern Asia but spread to the Middle East and even into Central Europe. These two examples both involve military conquest, but such conquests could also be exceptions. For most of human history, the projection of military power did not span across Eurasia. Nevertheless, were other types of interactions across Eurasia still strong enough so that events on one end still mattered for geopolitical outcomes on the other?

Of course, "events" and "outcomes" are vague. To be more specific, this paper considers to what extent the expansion and contraction of the largest existing empire in western Eurasia were synchronous with the expansion and contraction of the predominant Chinese dynasty from 300 BCE to 1500.[1] The former date corresponds to the rise of the Qin Dynasty, the first to unify China, and the latter corresponds to the Age of Discovery when European seafarers traveled the globe. If the timing of imperial ascendency and decline was synchronous, then a second question

[1] My inquiry focuses upon the rise and fall of political entities. One could consider other aspects of similarity. Morris (2010) constructs development indices for east and west and tracks the two over time. These indices are based upon such criteria as energy capture, organization, war-making capacity, and information technology. However, Morris (2010) does not consider to what extent development in one part of Eurasia impacted development at the other.

concerns “why”. Was it because of some degree of nontrivial integration between China and the West or is it because of some other reason such as global climatic shocks, similarly influencing the rise and fall of nonintegrated empires at both ends of Eurasia? Answers to these questions can provide a better sense as to what extent Eurasia was integrated before 1500 and holds implications for how we study these civilizations, separately or as a part of one interlocking system as argued in McNeill (1963, 1967).

This topic overlaps with others examining when different regions of the globe interacted although the type of interaction differs across these studies. O’Rourke and Williamson (2002) view “globalization” as market integration and so ask when markets were first integrated globally. They find that globalization under this definition began in the early part of the 19th century. Their view counters a commonly held one that the voyages of Columbus and da Gama ushered in a new global age. Bentley (1996) is but one example. Abu-Lughod (1989) reaches further back in time, arguing that a *Pax Mongolia* linked East and West into a common system. Frank and Gills (1993) suggest that the move toward a global system began thousands of years ago, linking first Egypt and Mesopotamia before expanding outward. These views, however, are not mutually exclusive. Perhaps markets were not integrated until the last two centuries whereas political or military interaction long preceded this.

The paper most related to this is Chase-Dunn *et al.* (2000) who also consider synchronous movements in imperial rise and decline within Eurasia. They do, indeed, find co-movement between East and West, using data from Taagepera which is also used in this paper. This study, nevertheless, complements theirs in two general ways.

First, my methodological approach differs from theirs and so one can examine to what extent such differences could change results. Such re-examinations are important given the strong implications their results hold for potential interregional integration long before some believe it had existed. For instance, they interpolate data into decadal intervals and one could question whether such interpolations of missing data is warranted. In addition, their sample period goes from 1600 BCE to 1800 CE. Many would consider a global system to have arisen after 1500 – albeit, not necessarily a common market – and so one could be concerned to what extent the latter three centuries drive results, especially since the rise of Spanish and British empires in the West coincided with a unified (and so large) China under the Ming and Qing Dynasties. Going to the beginning of their sample period, China was largely fragmented before the Qin Dynasty in 300 BCE whereas many western Eurasia empires were also small (relative to later empires) before Persia arose in 550 BCE. Therefore, one could likewise be concerned that their results are driven by concurrent large empires in the latter centuries or relative small ones in the first millennium of their sample. Chase-Dunn *et al.* (2000) find no synchronicity for a sample period ending in 250 BCE. A third difference is that it is also considered the potential for lagged associations between east and west Eurasia in addition to contemporaneous ones. If it takes many years or even decades for the full ramifications of some event on one end of Eurasia to impact polities at the other end, then examining lags is also important. Finally, my approach will also estimate the magnitudes of interregional associations. When a Chinese empire expands by x%, by how much does an empire in western Eurasia expand? Finding the magnitude of some potential impact can also provide insight into their importance.

The second general difference is that this paper will also explore possible reasons behind any synchronicity. Chase-Dunn *et al.* (2000) speculate on various causes for synchronicity but they do not formally examine which possibilities are most likely. In this paper, more formal steps are taken to attempt to distinguish across possible explanations although it is certainly acknowledged that this paper’s examinations will not be definitive.

Therefore, this paper will consider to what extent the size (and so, presumably, the power) of empires in western Eurasia were associated with the size of the largest Chinese dynasty. The rest of the paper is organized as follows. Section 2 provides background discussion. Section 3 describes the empirical methodology. Section 4 presents results. Section 5 then re-considers various explanations for co-movement and finds support for economic integration as one possible factor. Section 6 concludes the paper.[2]

2. Background and Context

2.1. Scope and definitions

The analysis in subsequent sections will consider whether a powerful empire in western Eurasia arose and fell at similar time periods as did China on the eastern end of Eurasia; but it does not consider any particular empire in western Eurasia. China long remained the dominant power in the East in that even when China fractured, no rival empire with the exception of the Mongols became as powerful as a unified China; and even the Mongols via the Yuan Dynasty tried to govern within the Chinese system. This is not true in western Eurasia. The Seleucid Empire, Rome, the Umayyad/Abbasid Caliphate, and the Ottoman Empire each had their heyday but not any of these powers or others cycled throughout the entirety of the 1,800-year sample period this paper will consider. In effect, the question is: when China was strong, were conditions more favorable in western Eurasia so that a stronger empire had greater potential to arise? This paper does not try to answer why some particular polity was able to take advantage of such conditions. Obviously, the abilities of individual leaders and the distribution of local shocks (i.e. luck) would have played a role as to what particular empire (or empires) most greatly took advantage of favorable opportunities.

A second important issue concerns distinctions in terms such as “globalization”, “integration”, and “synchronous”. Of these, the most general regards whether empire declines and falls are synchronous since any synchronicity might not be caused by any interaction between the two but by a common third factor such as similar climatic shocks. The term integration presumes that two entities are engaged in a common “world system” with some type of interaction between the two such as economic trade or military conquest. A specific type of interaction is “globalization” involving the back and forth flow of goods and resources. O’Rourke and Williamson (2002) define “globalization” even more specifically as the convergence of commodity prices thereby implying a single market. In this paper, the term “integration” is used loosely and comprises any political, military, or economic interaction (such as trade) linking the two regions. Some level of integration certainly existed since Chinese silk found its way to Rome during the latter’s heyday but was any such integration strong enough to influence the rise and decline of empires?

2.2. Channels

Presuming synchronicity exists, what might drive it? The most direct factor is military incursion from one region into another. However, direct military conflict between East and West was rare before the Mongol invasions of the 13th century. The Abbasid Caliphate defeated the Tang Dynasty at the Battle of Talas in 751 but the Abbasids did not invade China. No analog to the sack of Baghdad by Mongol forces in 1258 occurred. Migration could be a more common factor. Although controversial, some see the Huns as stemming from the Xiongnu, a steppe confederation that periodically clashed with the Han Dynasty. Teggart (1939) argues that the defeat of the Xiongnu by the Han precipitated a westward migration that eventually destabilized Europe and led to Rome’s downfall. As they migrated west, dominos fell causing further migration and eventually destabilizing the Roman Empire through the Hunnic invasions of Europe (Heather, 2005). Such events happening regularly would lead to a negative association between China and the West.

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[2] One could also consider associations between China and India. As in Chase-Dunn *et al.* (2000), no significant association was found. One possible explanation is that India is hemmed in between the Indian Ocean and the Himalayas thereby preventing expansion past a certain point. Poorer quality data regarding the size of Indian polities is another. Finally, the southern empires in India tended to be small. Unification of the subcontinent often proceeded from the Gangetic Plain in the North. However, these northern states with less access to the sea would have been less connected with maritime trade and the Spice Route, possibly also limiting the degree of integration between these states and China.

Another type of integration could occur via trade. The Persian Road linked the Iranian Plateau with the Mediterranean. Following Alexander the Great's conquests, Greeks colonists traveled all the way to India, further strengthening trade from the Mediterranean to South Asia. Teggart (1939) describes trade links between the Roman Empire and Han China. Trade routes included not only the Silk Road but the maritime Spice Route leading to ports along the Persian Gulf and Red Sea although such routes declined after 1498 with European voyages around Africa. A strong, unified China could have projected power and order farther along these routes thereby promoting trade between East and West and so thereby raising incomes in western Eurasia. A western empire that could have most greatly taken advantage of this trade would have grown wealthier and more powerful.

Trade, military conquest, and migration could have also spread disease that had similar effects across Eurasia. During the sample period considered below, three major plagues occurred: the Antonine Plague of 165-180, the Plague of Justinian in 541 and the Black Death in the middle of the 14th Century. The Antonine Plague was brought back to Italy after Roman troops fought in the Near East. Although Rome's population declined, the size of Rome's empire changed little. Conversely, the Han Empire fell during the third century and so this plague would not have caused positive co-movement between the sizes of the Roman Empire and Han China. The Plague of Justinian is most widely known in the Mediterranean and named for the reigning Byzantine emperor although it is likely to have originated in China (Wagner *et al*. 2014). After the plague, the Sui and Tang dynasties arose out of the political fragmentation that had occurred since the fall of the Han. In Western Eurasia, the plague certainly weakened the Byzantine Empire and so, at first glance, seems to result in opposite outcomes between the two. However, to the extent that it weakened the Byzantines as well as Sassanid Persia, it could have contributed to the expansion of the Muslim Caliphate, causing positive co-movement between East and West as this new power was expanding along with the Sui/Tang dynasties in China. The Black Death affected most of Eurasia, drastically reducing population in both China and Europe.

A final possibility could explain a synchronicity even if no political or economic integration occurred. Global climatic shocks could affect distinct regions similarly and so create similarly timed windows when empires expanded and fragmented. Parker (2013) provides an example of the Little Ice Age in the 17th century affecting most of Eurasia. A widespread decrease in agricultural production could promote unrest and destabilize political structures across Eurasia. Wei *et al.* (2015) examine how climate mattered for the rise and fall of Chinese dynasties as well as how climatic shocks affected empires in other regions although it does not consider whether such shocks occurred concurrently across regions. Bai and Kung (2011) report that nomadic incursions into China were more frequent during decades affected by drought. Chen (2014) reports similar findings. Chen (2015) also finds that droughts could cause famines that could trigger peasant uprisings which could destabilize Chinese dynasties. Zhang *et al.* (2006) find that wars and dynastic change were more often caused during cold stretches. Tol and Wagner (2010) report similar findings for Europe (although, not surprisingly, these associations weakened as Europe modernized and moved away from agriculture). Hsiang and Burke (2014) provide a survey of research examining links between climatic change and conflict. However, little work has been done to consider whether such climatic shocks could create political synchronicities – either directly or indirectly due to migration – across regions.

2.3. Example

The discussion above alluded to the concurrence of the Roman Empire in the West and the Han Dynasty in East. Can one also find an example of concurrent decline? The Song Dynasty arose in 960 and quickly unified China. Nevertheless, it was weaker than the previous Han and Tang Dynasties and was less able to defend itself against the steppe powers to the North. In 1126, the Jurchens defeated the Song and pushed the Song Dynasty to the south. China was now divided in two. The Jurchens ruled in the North as the Jinn Dynasty whereas the Song ruled southern China. In western Eurasia at this time, power was also largely fragmented. The Ghaznavids ruled in Iran but their empire was much smaller than during Persian heydays. The Abbasid Caliphate nominally persisted but its de facto power was confined to Baghdad. Regional Moslem leaders often battled one another. The Seljuks had declined in power and their scope was limited to Anatolia. In fact, the disunity of Moslem polities was probably the most important factor as to why the First Crusade was successful in capturing Jerusalem in 1099 and then retaining it until 1187. Byzantium further waned, especially after losing the Battle of Manzikert in 1071. The largest empire in Western Eurasia in 1150 was the Almohad Empire in the western Mediterranean, farthest away from what was happening in China.

Obviously, these two examples of concurrent unification and fragmentation could be entirely coincidental, but they do at least raise the possibility that such events were systemic in the histories of these regions.

3. Empirical Model

3.1. Sample and Data

Data for empire size comes from Taagepera (1978a, 1978b, 1979, and 1997) and are measured at 50-year increments, the highest frequency available without interpolating data. This paper does not linearly interpolate to gain more observations since it is not clear that a linear interpolation would accurately reflect historic changes in empire size. Empires sometimes expanded or contracted in rapid spurts of success or decline, the Macedonian Empire under Alexander being an example of both. Disadvantages of using such low frequency data include a diminished number of observations as well as a greater potential to miss temporary expansions or contractions. Table 1 lists the largest empire for each region where western Eurasia is further divided into three subregions: the Mediterranean, Mesopotamia, and the Iranian Plateau. When considering the West most broadly, the largest empire in the West will be the largest empire of these three regions. Figure 1 shows the size of the largest empire in China, in all of Western, and in Mediterranean region.

The sample period extends from 300 BCE to 1500 CE. this range is chosen for three reasons. First, as shown above the relevant data series are stationary. Second and related to the first reason is that this window provides for a stronger test of congruence. As Taagepera (1978a) shows, empire size increased over time on average (although he also reports plateaus of long durations similar to what is shown in Figure 1). All of the earliest empires such as the Xiang and Zhou Dynasties in China or those in Egypt or Mesopotamia were smaller than later empires. Conversely, the Spanish and British Empires arising after 1500 were some of the largest the world has seen and were congruent with the Ming and Qing Dynasties in China. Considering the most recent empires or those arising millennia ago would increase the positive association between empire size in these regions even if they had nothing to do with one another due to trade, migration, or military conquest. The third reason concerns the nature of this inquiry. Many see the voyages of Columbus and de Gama as launching an age of integration where only few parts of the world remained isolated from the others.[3] Such contact also created military encounters that certainly held global implications. Looking at periods prior to 300 BCE, political entities – even relatively large ones such as the Zhou Dynasty – in China were much smaller. China was not unified until the Qin Dynasty in 320 BCE. Therefore, it is less clear to what extent these smaller, more fractious polities could have influenced outcomes at the other end of Eurasia. Therefore, the time range from 300 BCE to 1500 is one where political entities were potentially powerful enough to affect other polities thousands of miles away but did not necessarily do so (at least in comparison to later Europeans colonizing and establishing trading posts across much of the globe).

[3] However, as stated O'Rourke and Williamson (2002) do not find strong evidence of globalization until the 1820's when commodity prices converged around the world.

Table 1. Sizes of Eurasian Empires

	China		Western					
			Mediterranean		Middle East		Iran	
Year	Empire	Size	Empire	Size	Empire	Size	Empire	Size
-300	Chu	0.8	Ptolemy	1			Seleucid	4
-250	Qin	1.3	Ptolemy	0.9			Seleucid	2.8
-200	Han	2.5	Ptolemy	0.8			Seleucid	2
-150	Han	2.3	Ptolemy	0.8			Seleucid	0.5
-100	Han	4	Rome	1.2			Parthia	2.3
-50	Han	6.2	Rome	2			Parthia	2.5
0	Han	6.2	Rome	3.5			Parthia	2.8
50	Han	5.5	Rome	4			Parthia	2.5
100	Han	6.5	Rome	4.4			Parthia	2.3
150	Han	5.7	Rome	4.4			Parthia	2.5
200	Han	4.5	Rome	4.4			Parthia	2.5
250	Wu	1.5	Rome	4.4			Sassanid	3
300	Chin	4	Rome	4.4			Sassanid	3.5
350	E. Chin	2.8	Rome	4.4			Sassanid	3.5
400	E. Chin	2.8	Rome	2.2			Sassanid	3.5
450	N. Wei	2.8	Byzantium	2.8			Sassanid	3.5
500	N. Wei	2.5	Byzantium	1.9			Sassanid	3.5
550	N. Wei	2.3	Byzantium	2.7			Sassanid	3.4
600	Sui	3	Byzantium	2.3			Sassanid	2.5
650	Tang	3.6	Byzantium	1.5	Muslim	6.2	Muslim	6.2
700	Tang	5.2	Byzantium	1	Muslim	9	Muslim	9
750	Tang	5.2	Byzantium	1	Muslim	11	Muslim	11
800	Tang	3	Frankish	1.2	Muslim	8.3	Tahirid	1
850	Jin	4	Frankish	0.775	Muslim	4.5	Tahirid	0.5
900	L. Liang	0.8	Frankish	1.8	Muslim	1	Samanid	2
950	L. Liang	0.5	Frankish	1.8	Buyid	1.3	Samanid	2.3
1000	Song	3	Frankish	1.4	Buyid	1	Ghaznavid	1.4
1050	Song	3	Frankish	1.35	Seljuk	3	Ghaznavid	1.75
1100	Song	3	Almoravid	1.2	Seljuk	4	Ghaznavid	1
1150	Jurchen	2.3	Almohad	2.3	Seljuk	0.7	Ghaznavid	0.9
1200	Jurchen	2.3	Ayyubid	1.7			Kwarzehm	3.5
1250	Song	2	Ayyubid	1.65			Il-Khan	1.65
1300	Yuan	14	Mamluk	2.1			Il-Khan	3.75
1350	Yuan	11	Mamluk	1.85			Jalayirids	0.2
1400	Ming	4	Mamluk	1.6			Timurid	4
1450	Ming	6.5	Mamluk	1.4			Timurid	2.3
1500	Ming	4.7	Ottoman	3			Timurid	2

Note: Size is measured in km^2. The variable WESTERN = max(Mediterranean, Middle East, Iran). Many rows for the Middle East are blank because during these times the dominant power in the Middle East emanated from either the Mediterranean region (e.g. Rome) or from Iran (e.g. the Sassanids).

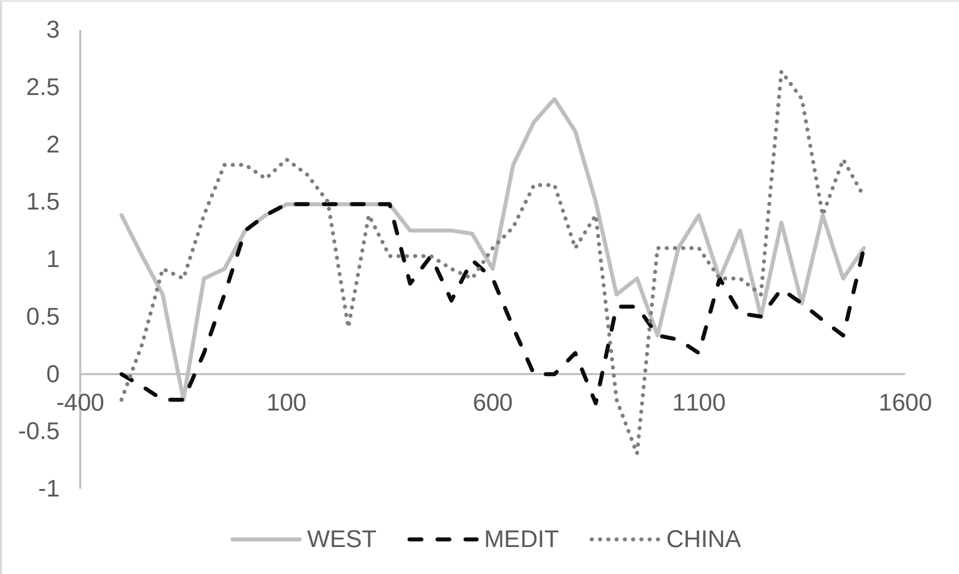

Figure 1. The Natural Logs of the Areas of WEST, MEDIT, and CHINA from 300 BCE to 1500 CE.

Table 2 presents summary statistics in Panel A. The lower panel presents results of unit root tests after taking natural logarithms. In all cases, the null of a unit root is strongly rejected, suggesting that the variables are stationary and ruling out cointegration methodologies.

Table 2. Summary Statistics and Diagnostic Tests

Panel A: Summary Statistics				
	Mean	Standard Deviation	Minimum	Maximum
	in levels (km^2)			
CHINA	3.93	2.66	0.5	14
WEST	3.75	2.06	0.8	11
MEDIT	2.19	1.22	0.78	4.4
	in natural logs ($\ln km^2$)			
CHINA	1.16	0.68	-0.69	2.64
WEST	1.2	0.51	-0.22	2.4
MEDIT	0.64	0.55	-0.22	2.4

Panel B: P-Values of Unit Root Tests		
	Augmented Dickey Fuller	Phillips Perron
CHINA	0.0075	0.0076
WEST	0.0000	0.0015
MEDIT	0.0106	0.0266

Note: For unit root tests, variables are in natural logs and test is conducted with an intercept. The null hypothesis is that a unit root exists.

3.2. Empirical Model

Consider the following specification:

$$WEST_t = \alpha + \beta * CHINA_t + \gamma * YEAR + \epsilon_t \quad (1)$$

where $WEST_t$ denotes the natural log of the land area (in km^2) of the largest western empire at time t. In the empirical work, the term "western" is used loosely. It is not used to refer to a particular culture such as European or Christian but merely to the western part of the Eurasian landmass.

This Western landmass includes Europe, the Mediterranean region (which includes North Africa), Mesopotamia, and the Iranian Plateau. The extension of Rome from the Atlantic to the borders of Parthia and Sassanid Persia shows that these regions were certainly linked throughout the sample period. The spread of the Moslem Caliphate into all of these regions provides another example. Nevertheless, alternative specifications will consider only Europe and the Mediterranean as these were the furthermost regions from China (in which case MEDIT replaces WEST in (1)).

$CHINA_s$ denotes the natural log of the land area of the largest Chinese Empire at time s where s ≤ t. That is, s = t in some specifications so as to examine contemporaneous associations between the two. Such contemporaneous associations could arise if global climate conditions affect agriculture similarly across the world. Since agriculture was the dominant industry until recently in world history, what happened to agricultural output could have had great bearing upon the sizes of polities? Setting s = t could also be appropriate if trade links between China and the West are strong enough such that events in China impact trade outcomes in the West in only a matter of years. In other specifications, s = t-1 so as to allow time for events in China to impact the other end of Eurasia. This specification is more appropriate, for example, if what happens in China matters to western Eurasia via trade but only after decades.[4]

The variable YEAR is included to allow for technological changes to influence the size of empires. Although findings in previous sections rejected the null hypothesis of a unit root, it is still possible that various technological changes in agriculture or in military technology affected how large empires could become. Inclusion of YEAR could also be important to somewhat control for measurement error. Presumably, greater measurement error would arise for less recent empires. If so, then omission of YEAR could cause a nonzero correlation between the residual and CHINA.

The residual ε is assumed to be mean zero but is allowed to have heteroskedastic variance. Given the idiosyncrasies of an empire's rise and falls including the abilities of its leaders and local climatic events, such shocks need not have constant variance over time. An advantage of the specification in (1) is that use of natural logs allows β to have the interpretation as an elasticity, predicting how a 1% rise in the land area of a Chinese empire is associated with what percentage increase in area in the largest western Eurasian empire.

3.3. Weaknesses

Size is used as an implicit proxy for success. Did a large empire in China contribute to some state in western Eurasia also becoming large, at least relative to its neighbors? Obviously, problems with using size are manifold. For one, territory could contain deserts or other uninhabited, unproductive land. Second, actual control could be questionable. Consider an army that conquers some region but then continues onward, never establishing a strong, sustained political control of the area even though the region is nominally part of the empire. Control could also be questionable in cases where an outlying region is largely autonomous. Finally, given these concerns as well as gaps in the historical record measurement error is likely to be nontrivial. To the extent that measurement error is random then the coefficient β should be biased towards zero and so should work against finding a strong association between CHINA and WEST. Admittedly, one could also measure size by population size. However, population estimates for ancient empires are often not available and widely differ when more than one estimate arises. Take Achaemenid Persia as an example (although it is outside my sample period). McEvedy and Jones (1978) provide an estimate of 17.5 million. Yarshater (1996) gives a figure of 50 million, almost three times larger. Therefore, I consider area to be a better measure of size, albeit not a perfect one.

Another problem is the lack of observations. Using the window from 300 BCE to 1500 CE allows for 37 observations. Such a small sample size makes it more difficult to uncover associations. Small sample sizes also increase the potential for outliers to drive results. For

[4] Given that China was the most populous region of the world, I find it more probable that events in China could have impacted other regions than vice versa. Nevertheless, I did conduct robustness checks regressing CHINA upon WEST and YEAR. Coefficient estimates were small and never significant.

example, perhaps any strong association between China and the West is driven by similarities in the dynamics of Rome and the Han Dynasty. Both became regional powers at the same time although Rome survived somewhat longer. Robustness checks will attempt to ensure that results are not entirely driven by a lone congruence of imperial decline and fall. Nevertheless, the potential for outliers or historical coincidences to drive results cannot be ruled out.

4. Results

Table 3 presents baseline results. The dependent variable alternates between WEST and MEDIT. The table then denotes whether CHINA or the lag of CHINA (but not both simultaneously) is included followed by the time window of the sample. Results are then presented in the proceeding columns.

Table 3. Coefficient Estimates of (1) under Different Specifications

Panel A: Regression Results

Row	Dep. Var	Lag of CHINA?	Time Period	CHINA	YEAR	constant	R^2	# obs.
(1)	WEST	No	-300 to 1500	0.176*	0.050	1.171*	0.05	37
				(0.092)	(0.151)	(0.590)		
(2)	MEDIT	No	-300 to 1500	0.191*	0.129	0.880	0.06	37
				(0.110)	(0.166)	(0.657)		
(3)	WEST	Yes	-300 to 1500	0.211**	0.083	1.263**	0.09	37
				(0.102)	(0.151)	(0.579)		
(4)	MEDIT	Yes	-300 to 1500	0.316***	-0.194	0.987	0.18	37
				(0.105)	(0.150)	(0.571)		
(5)	WEST	No	250 to 1500	0.293**	-0.677***	3.546***	0.30	26
				(0.112)	(0.180)	(0.675)		
(6)	MEDIT	No	250 to 1500	-0.032	-0.459*	2.437**	0.16	26
				(0.096)	(0.250)	(0.965)		
(7)	WEST	Yes	250 to 1500	0.300**	-0.639***	3.389***	0.44	26
				(0.138)	(0.177)	(0.683)		
(8)	MEDIT	Yes	250 to 1500	0.042	-0.493**	2.485**	0.16	26
				(0.090)	(0.237)	(0.929)		
(9)	WEST	No	-300 to 1200	0.320**	0.240	0.079	0.17	31
				(0.137)	(0.241)	(0.942)		
(10)	MEDIT	No	-300 to 1200	0.229	-0.107	0.769	0.07	31
				(0.165)	(0.236)	(0.929)		
(11)	WEST	Yes	-300 to 1200	0.322**	0.164	0.356	0.21	31
				(0.121)	(0.217)	(0.836)		
(12)	MEDIT	Yes	-300 to 1200	0.388**	-0.170	0.840	0.22	31
				(0.127)	(0.197)	(0.713)		

Panel B: Robustness Checks

Dependent Var.	Lag of China	Range of Coefficient Estimates	Years Not Significant
WEST	No	0.14 to 0.24	700, 750, 900, 950, 1250, 1300
WEST	Yes	0.15 to 0.28	1000
MEDIT	No	0.15 to 0.25	-300 to -150, 0 to 200, 1100, 1250 to 1350, 1500
MEDIT	Yes	0.28 to 0.36	None

Note: Robust Standard Errors in Parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. A "no" for Lag of China denotes that the CHINA variable is not lagged. A "yes" denotes that a one-period lag is used instead of the contemporaneous value. Panel B reports outcomes when 37 year dummies are individually included. The "range of coefficient estimates" refers to the coefficient upon CHINA (or its lag) and the "years not significant" refers to the instances when the coefficient upon CHINA is not statistically significant at the 10% level when the listed year dummies are also included.

Rows 1 and 2 consider the baseline specification. The first row considers WEST. The coefficient upon CHINA is 0.18 although only significant at the 10% level. A ten-percent increase in the size of the largest Chinese dynasty is associated with a 1.8% increase in the size of the largest western Eurasian empire. Results considering MEDIT are similar. For both, associations are stronger in rows 3 and 4 after taking the lag of CHINA. The coefficient upon the trend term is not significant.

Teggart (1939) discusses links between Imperial Rome and Han China. To better ensure that this one particular instance is not driving findings, the above four specifications are repeated but begin the sample in year 250 following the disintegration of the Han Dynasty. The association between CHINA and WEST increases in magnitude whereas the association between CHINA and MEDIT falls to almost zero. The association between MEDIT and CHINA now appears to be entirely driven by the congruence of Rome and the Han Dynasty.

The final four rows end the sample in 1200 and so exclude the Mongol conquests and their aftermath. Results are now strongest for WEST. The coefficient upon CHINA is 0.32. Results with MEDIT are more mixed with the greater coefficient coming from use of the lag of CHINA.

With so few observations, outliers and single observations have great potential to drive findings. Panel B of Table 3 reports the range of coefficient estimates upon CHINA (or its lag) when 37 year dummies (300 BCE to 1500 CE) are individually included in the specification. The inclusion of dummy t controls for events at time t that could influence the association between CHINA and the dependent variable and considers to what extent events particular to year t are driving results. Coefficients upon CHINA always exceed 0.14 and are generally significant at the 10% level although results for MEDIT and the concurrent value of CHINA are most sensitive to the inclusion of these period dummies. The results with MEDIT and the lag value of CHINA remain the strongest although it should again be noted that the Rome-Han period drives findings with MEDIT. With 37 regressions for each row but with only 37 observations, some occurrence of a Type II error (failing to reject a false null hypothesis) should not be surprising.

What do these results suggest? First, any synchronous movements between the Mediterranean/European and Chinese empires are driven by the Rome-Han comovement. However, this is not the case when one includes the Middle East and Persia as part of Western Eurasia. In fact, associations grow stronger for the shorter period. Second, the statistical association remains similar regardless whether one regresses WEST upon CHINA or its lag. Finally, results do not appear to be driven by a single outlier or a single occurrence of similarity between China and western Eurasia.

5. Explanations

Section 2 presented various explanations for why co-movement between these Eurasian regions could occur. This section explores these possibilities further in light of the empirical results.

One explanation concerns the potential for warfare to span over distant regions. However, interregional warfare is unlikely to be driving results. As stated, only one instance arises of large Chinese forces battling those from the Middle East before 1200, namely at the Battle of Talas in 751. After the encounter, neither side attempted to further extend territory at the expense of the other. After 1200, Mongol expansion into the Middle East and across Russia certainly had important implications for the political entities of these regions and could have certainly affected the size of empires throughout Eurasia. Nevertheless, associations remain strong in Table 3 when ending the sample period in 1200 and so before the Mongol conquests. Another possibility discussed above is that a strong China pushed steppe confederations westward thereby destabilizing polities in western Eurasia. However, such events should then cause a negative association between the size of a powerful China and that of an empire in a destabilized, weakened West and so does not receive support from the empirical results.

A second explanation considered in section 2 concerned the possibility of plague or of other diseases spreading across Eurasia and having similar effects upon political entities. Nevertheless, such instances are less likely to be driving results. The Antonine Plague weakened Rome but it did not cause Rome’s collapse and, in fact, Rome maintained much of its territory for another two centuries. The Black Death caused population declines throughout Eurasia. But regressions 9-12 in Table 3 end in 1200 and so remove its occurrence from the sample. The remaining large-scale instance of disease was the Plague of Justinian during the 6th century which certainly diminished the Byzantine Empire and possibly Sassanid Persia as well. The weakening of these two empires could then have allowed for the Islamic Caliphate to spread more easily. To the extent that this same plague weakened existing political entities thereby allowing for the ascensions of the Sui and Tang dynasty then this plague would have contributed to co-movement between China and the West.

Table 4 controls for these three instances. Rows 1-4 add the dummy PLAGUE to the specification where PLAGUE equals one for the years 200, 550, and 1350. These are the three years during or after one of these three aforementioned epidemics. The coefficient upon PLAGUE is never significant whereas those upon CHINA (or its lag) are largely unaffected. Columns 5-8 add the dummy JUSTINIAN which equals one only during the Justinian Plague of 550. Again, the coefficients upon CHINA remain roughly the same. These results suggest that the major plagues of the period do not explain the positive co-movement found above. Of course, one cannot rule out the possibility that smaller-scale epidemics contributed to co-movement although such epidemics (should they exist) do not seem to have been large enough to be included within the more common historiographies of these regions.

A third explanation for the positive association between eastern and western empires is that similar climatic episodes arose. To examine this possibility, data from Tan *et al.* (2003) and Büntgen *et al.* (2011) is used. The former estimates temperature anomalies from May to August at an annual frequency from 665 B.C.E. to 1994 using stalagmite layer thickness from Shihua Cave near Beijing. Chen (2014, 2015) uses this same source when examining how climate affected peasant uprisings and nomadic incursions into China. Büntgen *et al.* (2011) use tree rings form various locations to measure temperature anomalies during the summer months in Central Europe from 500 BCE to present day, also at an annual frequency. Such data is limited, both because of the inherent measurement error arising when estimating temperatures from millennia ago and because temperatures within a region can also vary. Nevertheless, these series given their utilization in other studies are used because they span the sample period of this paper.

Table 4. Explanations – Disease/Plague

Row	Dep. Var	Lag of CHINA?	CHINA	YEAR	constant	PLAGUE	JUSTINIAN
(1)	WEST	No	0.189**	-0.000	1.020***	-0.178	
			(0.086)	(0.000)	(0.070)	(0.275)	
(2)	MEDIT	No	0.164	-0.000	0.497**	0.367	
			(0.116)	(0.000)	(0.207)	(0.233)	
(3)	WEST	Yes	0.238**	-0.000	1.007***	-0.260	
			(0.094)	(0.000)	(0.164)	(0.287)	
(4)	MEDIT	Yes	0.292**	-0.000	0.412**	0.237	
			(0.111)	(0.000)	(0.177)	(0.256)	
(5)	WEST	No	0.177*	-0.000	1.167*		0.085
			(0.094)	(0.000)	(0.600)		(0.089)
(6)	MEDIT	No	0.199*	-0.000	0.858		0.426***
			(0.114)	(0.000)	(0.663)		(0.104)
(7)	WEST	Yes	0.212**	-0.000	1.260**		0.064
			(0.103)	(0.000)	(0.588)		(0.085)
(8)	MEDIT	Yes	0.319***	-0.000	0.969		0.417***
			(0.107)	(0.000)	(0.577)		(0.091)

Note: Robust Standard Errors in Parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. A "no" for Lag of China denotes that the CHINA variable is not lagged. A "yes" denotes that a one-period lag is used. PLAGUE is a dummy that equals one for the Antonine, Justinian, and Bubonic Plagues. JUSTINIAN is a dummy that equals one only for the Justinian Plague.

Because 50-year windows are used in the above analysis, this paper averages the annual temperature data for both series into 50-year periods. Another reason to average is that, presumably, longer run climatic changes are more relevant for the rise and fall of empires than are annual fluctuations. After averaging both series into 37 observations, the correlation between the two is 0.13, producing a p-value of 0.45 for the null hypothesis of no correlation between them. Obviously, this is not strong evidence that similar climatic episodes drove the synchronization between the regions although the aforementioned weaknesses temper any strong conclusions.[5]

The last explanation is economic integration. Unfortunately, quantitative data on trade flows across Eurasia is not available. So what evidence would support such an explanation? The first type of evidence is negative in that little support arose for the other three. The next type of evidence considers extensions of the empirical work in sections 3 and 4. If economic integration is the explanation, then results should be strongest for empires that were located along a crucial part of a trade route. The first is the Iranian Plateau, the eastern most part of Western Eurasia along the Silk Road (although an alternative route went through the Steppe north of the Aral and Caspian Seas). A second is the Persian Gulf and the maritime route leading into Mesopotamia. The third is the Red Sea route where after a short overhaul across land goods could be resent from Alexandria across the Mediterranean. Both were branches of the Spice Route (See Franck and Brownstone (1986) and Keay (2006) for descriptions of the Silk Road and the Spice Route).

Table 5 shows specifications analogous to those above but where the three dependent variables correspond to these three important regions along the trade routes: IRAN (Silk Road), MESOPOTAMIA (Persian Gulf), and EGYPT (Red Sea). For each of the three regions, we include specifications both with CHINA and with the lag of CHINA. Moreover, we consider three periods: 300 BCE to 1500 CE (the full sample), 250 CE to 1500 CE (so that the Rome-Han synchronicity is not driving results) and 300 BCE to 1200 CE (to remove the Mongol conquests).

Table 5. Trade Routes

	Dependent Variable					
	IRAN		MESOPOTAMIA		EGYPT	
Period	CHINA	Lag of CHINA	CHINA	Lag of CHINA	CHINA	Lag of CHINA
300 BCE to 1500 CE	-0.024		0.240		0.280*	
	(0.184)		(0.196)		(0.154)	
		0.082		0.042		0.402***
		(0.274)		(0.206)		(0.124)
250 CE to 1500 CE	0.096		0.572**		0.370**	
	(0.163)		(0.267)		(0.139)	
		-0.091		0.144		0.305***
		(0.184)		(0.340)		(0.107)
300 BCE to 1200 CE	-0.078		0.455**		0.500**	
	(0.312)		(0.190)		(0.191)	
		0.060		0.368*		0.595***
		(0.115)		(0.183)		(0.130)

Note: Robust Standard Errors in Parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. A linear time trend is included in all regressions.

Results are strongest for EGYPT with coefficients always significant (at least at the 10% level) and all above 0.28 with most above 0.30. Removing the period of the Mongol conquests where Mongol armies neared Egypt before being defeated by the Mamluks gives coefficients of 0.5 and above. The weakest findings are for IRAN where coefficients are never significant and sometimes even negative. Results for MESOPOTAMIA are more mixed. Coefficients are sometimes large but not always significant. Therefore, some support does arise that empires along these trade routes were larger when China was unified. The contrasting results for Iran

[5] Including the Buntgen *et al.* (2011) temperature anomaly into the regression as an additional control variable did not change the results. Its coefficient estimation was generally insignificant whereas the coefficient estimates on the CHINA variable was not meaningfully affected.

along the Silk Road could simply reflect the difficulties of trade overland for much of history, thereby diminishing the swings in fortune for polities along this route when trade waxed and waned. Also, some land routes traveled north of the Caspian Sea thereby avoiding Iran which could also weaken associations between the two.

6. Conclusion

This study finds positive co-movement between the largest empires in western Eurasia and China. Admittedly, the small sample size raises concerns that any such co-movement is spurious, driven by one or two episodes and so not generally holding across the 1,800 years considered here. On the other hand, small sample sizes cause larger standard errors making it more difficult to claim associations. Moreover, this paper also explored to what extent particular periods could be driving results and mostly found that the positive associations are robust. At the very least, such associations are taken to warrant further study. The generally stronger results when western Eurasia is extended to include Persia also supports claims that findings are not spurious. Given that Persia is closer to China than are Mediterranean polities, the stronger association should be expected.

In some specifications, the coefficient on CHINA (or its lag) exceed 0.3 suggesting that a 10% increase in the size of the Chinese empire coincided with a 3% increase in the size the largest empire in western Eurasia. Given the vagaries of isolated events including the capabilities of individual leaders, local environmental shocks, and the fog of battle, a one-to-one correspondence between empires at either ends of Eurasia should not be expected. Finding a coefficient of less than 0.5 is not surprising. Nevertheless, estimates of above 0.3 suggest that the measured associations are not merely statistically significant but are of historical significance as well.

Therefore, the second part of the paper considered possible explanations for the positive co-movement. Although other explanations such as continental shocks to the environment or continental pandemics are possible, the explanation receiving the most support is economic integration. A unified China could have been better able to project power abroad which promoted trade. Although not always the same polity, some western empire was most able to take advantage of the increase in income and so was able to expand. Given the difficulty of moving bulk goods across long distances for much of history, much of this trade would have consisted in luxury goods such as silks and spices.

Of course, small sample size, measurement error, and an absence of data for many controls and characteristics again temper any stronger conclusions. Nevertheless, the findings of this study argue against separate historical examinations of these regions and so influence how we understand the history of Eurasian civilizations. Even in the absence of military conquest, evidence arises that interactions across Eurasia appear to have been more than trivial. Moreover, such economic interactions could have been of greater importance as they allowed for territorial expansion of some polity that was best able to take advantage of these trading opportunities, either because the polity was favorably situated or because it was fortunate enough to possess a leader more capable than those of its rivals. A unified China that was able to promote trade could have disproportionately benefitted polities in western Eurasia and led to the primacy of one over the others.

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