WAVES OF CONFLICT AND CHANGES IN THE POWER CONFIGURATION IN THE EAST ASIAN WORLD-SYSTEM, 1800 BCE-1830 CE

16 BCE wars in China from the zhongguojunshishi(Fu 1985)

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Abstract: This study is part of a larger project that studies sociocultural evolution by comparing small, medium-sized, and large world-systems since the Paleolithic era. This study starts with early state formation in Bronze Age East Asia, but there were smaller whole systems of interpolity networks long before the emergence of cities and states. But here we are focusing on the temporal relationships between the growth and decline of cities and empires and changes in the distribution of power among states, the amount of interstate warfare and internal rebellions in five whole interstate systems (world-systems) since 2700 BCE. World historians have long recognized that the population sizes of settlements and the territorial sizes of polities have both increased over time and have gone through cyclical growth and decline phases. This larger study uses whole interpolity systems (world-systems) as the unit of analysis to address these questions: what are the causal relationships between changes in the sizes of largest cities and empires? Does empire growth cause city growth? Does city growth cause empire growth? And what are the other causes of these size changes? Our earlier studies have found that urban and polity **upsweeps** (large increases in scale) are correlated over time. In this paper the focus is on the expanding East Asian world-system from the Bronze Age until it merged with the Central system in the 19th century CE to form the global world-system of today. Our main unit of analysis is the political/military interaction network – whole systems of interacting polities that were making war and military alliances with one another. This is what international relations scholars call an "international system." We examine the relationships between urban and polity swings and changes in the power configuration of these same systems. Interstate power configurations vary from decentralized to centralized based on the relative sizes and power of the interacting states in each system. This paper presents our decisions about the timing of the series of systemic expansions that began with the emergence of early states in the Huang He (Yellow River) valley Bronze Age China. We review the earlier research that has been done on cycles of conflict and their relationships with climate change, epidemics, famines, and floods. We also introduce the study of East Asian "world revolutions." Our first purpose is to develop a complete data set on interpolity and within-polity conflict by merging those found in other studies in ways that make comparable on and intelligible comparisons possible from the Bronze Age to the 19th Century CE for the East Asian World-System.

Our earlier studies (Inoue *et al* 2012, 2015) have identified big changes in the sizes of the largest settlements and polities in interstate systems and world regions, which we call sweeps. An upsweep is an increase in size that is at least 1/3 larger than the size of the three earlier size peaks. We found a total of eighteen urban upsweeps in the five PMNs (interstate systems) studied (Inoue 2015: Table 7). And we found only five urban downsweeps.[1] (Inoue 2015: Table 8). Regarding polity size changes, we found twenty-two upsweeps (Inoue 2012: Table 1) and nineteen downsweeps (Inoue 2012: Table 2). Our work identifies and focusses on sweeps because it is these large change events that constitute the instances that account for the long-term trends toward larger settlements and larger polities.

We deploy the comparative evolutionary world-systems perspective (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2014) to study and compare relatively small regional world-systems[2] with larger continental and global systems to study sociocultural evolution. [3] The concepts of the world-system perspective as developed by Immanuel Wallerstein and others have been broadened to be useful for the

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[1] A down sweep is a low point (trough) that is at least 1/3 lower than the average of the three previous troughs.

[2] World-systems are defined as being composed of those human settlements and polities within a region that are importantly interacting with one another (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2014). When communication and transportation technologies were less developed world-systems were small.

[3] Scientific studies of patterned social change do not need to make any assumptions about progress (or regress). Sociocultural evolution involves long-term changes in the degree of complexity and hierarchy displayed by human polities and networks of interacting polities. Whether this is seen as progress is a normative judgement that is up to the observer and social scientists differ on this with some hailing the advantages of small-scale egalitarian polities while others emphasize the functional advantages of complexity and hierarchy. As citizens we cannot dodge these issues, but as scientists we can.

analysis of pre-capitalist systems. Thus, we must be able to abstract from scale in order to examine changes in the structural patterns of small, medium and large whole human interaction networks. But, in this article, we focus on **medium-term change in the scale of settlements and polities**.[4]

In the long run human settlements have tended to get larger, but our research focuses on medium-term sequences of growth and decline in order to identify those upward sweeps (upsweeps) in which the scale significantly increased. Accurate identification of these events facilitates our understanding of sociocultural evolution because these were the events that constituted an important part of the long-term trend toward larger, more complex and more hierarchical human social institutions.[5]

World-systems are interacting sets of polities[6] and settlements. Many, but not all, world-systems have been organized as core/periphery hierarchies in which some polities exploited and dominated the populations of other polities. Semiperipherality is an intermediate position within such a core/periphery hierarchy. When we study whole interpolity systems we see that they all oscillate in what we call **a normal cycle of growth and decline** (see Figure 1). The largest settlement or polity in each region reaches a peak size and then declines and then this, or another, settlement or polity returns to the peak size again. These cycles are usually not observed by looking at single settlements or polities in isolation, but rather by looking at the **largest settlement or polity** within each region of interaction.[7]

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[4] Settlement is a general term that includes camps, hamlets, villages, towns, cities and the great megacity urban regions that compose the contemporary global urban system.

[5] This article reports results from a research project on the growth of settlements and polities in regional world-systems since the Stone Age. The project is the *Settlements and Polities (SetPol) Research Working Group* at the Institute for Research on World-Systems at the University of California-Riverside. The project uses both quantitative estimates of the population sizes of the largest settlements in world regions as well as estimates of the territorial sizes of largest polities to study the location and timing of changes in the scale of human institutions. The project web site is at http://irows.ucr.edu/research/citemp/citemp.html. IROWS collaborates with SESHAT: The Global History Data Bank and with the Big Data in Human History initiative (https://github.com/IISH/human-history).

[6] We use the term "polity" to generally denote a spatially bounded realm of sovereign authority such as a band, tribe, chiefdom, state or empire (see also Cioffi-Revilla 2001: 4). Our study of polity size upsweeps is presented in Inoue *et al* (2012).

[7] The normal cycle roughly approximates a sine wave, although few cycles that involve the behavior of humans display the perfect regularity of amplitude and period found in the pure sine wave.
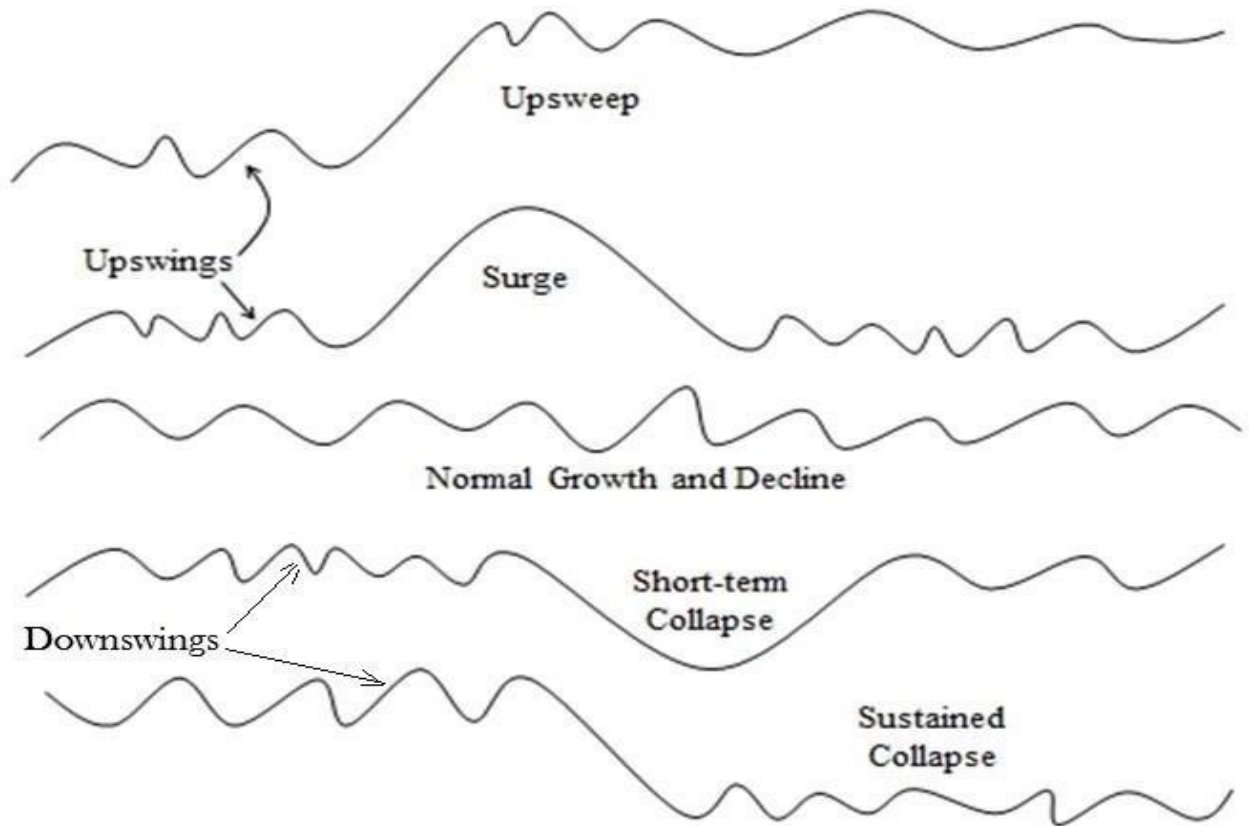
Figure 1. Types of Medium-term Scale Change in the Largest Settlements or Polities

In Figure 1 the normal cycle of growth and decline is halfway down the figure and is labeled "normal growth and decline." At the top of Figure 1 is a depiction of an upward sweep (upsweep) in which the size of the largest settlement or polity increases significantly. When an upward movement is sustained, and a higher level of scale becomes the new normal, we call this an "upward sweep" or an "**upsweep**." We define an upsweep as a peak that is **more than 1/3 higher than the average of the three immediately earlier peaks**.[8] We distinguish between an "**upswing**," which is any upturn in a growth/decline sequence, and an upsweep, which goes to a level that is more than 1/3 higher than the average of three prior peaks.

We want to explain the emergence and expansion of complexity and hierarchy in social change. We note that there is a rough association between the scale of settlements and polities and the degree of complexity and hierarchy. They are not the same thing, but they tend to be associated over many different systems and periods of time. There can be big settlements without much complexity or hierarchy. There can be small polities that have high levels of complexity and hierarchy. These are only rough proxies. We use them because their availability across time and space and make it possible to compare cultures that are rather different from one another.

Hierarchy and complexity tend to go together because an increase in complexity works better if institutions of coordination emerge to regulate and integrate the more specialized parts. But there are non-hierarchical or less hierarchical ways to do this, like the emergence of larger identities that encourage people to cooperate with one another and the emergence of markets that motivate people to coordinate their activities with one another.

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[8] This cutting point specifies what we mean by "significant" in a way that can be used to systematically compare widely different times and places.

Units of Analysis

Our approach to the spatial bounding of the unit of analysis focusses on systemically integrated human interaction networks that were small when transportation and communications technologies did not allow people to importantly interact with distant others (Chase-Dunn and Inoue 2023). This is very different from those who try to comprehend a single global system that has existed for thousands of years.

Gerhard Lenski (2005); Andre Gunder Frank and Barry Gills (1994) and George Modelski (2002; Modelski, Devezas and Thompson 2008) and Sing Chew (2001;2007) all analyze the entire globe as a single system over the past several thousand years. We contend that this approach misses very important differences in the nature and timing of the development of complexity and hierarchy in different world regions that stem from the fact that they were unconnected or only very weakly connected, with one another. Combining apples and oranges into a single global bowl of fruit is a major mistake that makes it more difficult to both describe and explain social change. The claim that there has always been a single global world-system before the rise of a connected intercontinental network is profoundly misleading.

Efforts to study small regional world-systems have noticed that different kinds of important interaction have different spatial scales. Chase-Dunn and Hall (1997) distinguished between relatively local interaction networks in which everyday foods and raw materials were procured and distributed from larger networks in which polities engaged in conflict and alliances with one another and even larger trade networks in which prestige goods were exchanged. In this paper we primarily use Political-Military Networks (PMNs) as the main unit of analysis for bounding world-systems (see Chase-Dunn and Jorgenson 2003).[9] These are composed of polities that are making wars and military alliances with one another. David Wilkinson has carefully studied the spatial boundaries of these interstate systems and we follow his lead in delineating them (Wilkinson 2017; Chase-Dunn, Inoue, and Neal 2018). Following Wilkinson's (1987) specifications, the timings of the incorporation of smaller PMNs into the central PMN are as follows: Egyptian and Mesopotamian PMNs merged to form the central PMN in 1500 BCE; Europe was engulfed by the central PMN in 500 BCE[10]; South Asia was engulfed into the central PMN in 1750 ce[11]; and East Asia was engulfed into the central PMN in 1830 CE.[12] But we also estimate the spatio-temporal boundaries of the other networks in Table 2 below.

Modeling the causes of polity and settlement scale changes

Our earlier research has shown that about half of the upsweeps of polity and settlement sizes were associated with the conquest actions of non-core (peripheral or semiperipheral) marcher states (Inoue, *et al* 2016). This partly confirms the hypothesis that core/periphery relations and uneven development are

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[9] The idea of the central Political/Military Network (PMN) is derived from David Wilkinson's (1987) definition of "Central Civilization." It spatially bounds systemic networks as sets of allying and fighting polities. The central Political-Military Network is the interstate system that was created when the Mesopotamian and Egyptian PMNs became directly connected with one another in about 1500 BCE. The central PMN expanded in waves until it came to encompass the whole Earth in the 19th century CE. Because it was an expanding system its spatial boundaries changed over time. We mainly follow Wilkinson's decisions about when and where the central System expanded, and the temporal bounding of the regions we are studying also follows Wilkinson's dating of when these regions became incorporated into the expanding central PMN. The contemporary global PMN is the international system of states.
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[10] Europe was never a whole interstate system separate from the one in the Near East, though Wilkinson (1987) specifies a short-lived separate Aegean state system in the early Iron Age (1600 to 600 BCE). We wanted to use this Aegean PMN as one of our cases, but we do not have enough data points to do this.

[11] David Wilkinson (2018) has reconsidered the extent to which earlier connections between the Indic and the central System constituted systemic political-military interaction. In earlier work he contended that the engulfment of the Indic PMN occurred with the incursion of Mahmud of Ghazni in the 11th century CE. Wilkinson now contends that the permanent systemic connection occurred in the period from 1750 to 1858 ce. We will use 1750 as the cutoff.

[12] In a later version of this research, we will also use world regions as the unit of analysis (see Chase-Dunn *et al* 2017).

important for explaining the emergence of complexity and hierarchy in world-systems, but it also shows that a significant portion of the upsweeps were not associated with the actions of non-core marcher states. We are developing a multilevel model (Inoue and Chase-Dunn 2019) that combines interpolity dynamics with the "secular cycle" model developed by Turchin and Nefadov (2009). Our iteration model of the causes of the rise of complexity and hierarchy also hypothesizes that these are both more likely to increase in periods in which there has been greater interpolity conflict (warfare). Interpolity conflict is an important selection mechanism that causes sociocultural evolution. Polities that cannot mount a successful defense are likely to get selected out along with their institutions and their people. And high levels of within and between-polity conflict also reduce peoples' resistance to hierarchy-formation. They are more likely to assent to more centralized leadership and governmental institutions that provide order and peace after they have been exposed to a long period of high conflict. Within-polity competition and conflict among individuals, organizations, classes and leadership groups also operate as a selection mechanism, but high levels of intrapolity conflict are detrimental to the success of the polity in competition with other polities. We want to empirically test these hypotheses by using data on warfare and within-polity conflict intensity for the cases in which it is available.

To what extent are urban and polity swings correlated with one another across time? Since both go up over the long run, we seek to determine their medium run relationships by calculating partial correlations that take out the long-term trends by controlling for year as an independent variable or by using percentage change scores that do not display long-term trends. We also examine graphs that show the track of largest city and polity sizes together for each PMN. To correlate urban and polity sizes we need to produce time series of the two that have the same time points. We have done this by using the estimates we have to calculate linear interpolations for congruent years for each variable. For East Asia we have used 50-year time steps because are estimates of city sizes are limited to this level of temporal resolution, but a lot of information is lost averaging conflict data over 50-year periods so we will also use 25-year periods and interpolate the city sizes, though this is risky.[13]

Measuring the Intensity of Conflict

We want estimates of the intensity of between-polity conflict and within-polity conflict that are comparable with those from other world-systems and for the East Asian world-system from the Bronze Age until its incorporation into the Central PMN circa 1830 CE. This involves putting together compendia of conflict events that have been done for different time periods in ways that make estimates comparable. Warfare in interpolity systems and conflict within polities are both important causes of sociocultural evolution. Success or failure in warfare operates as a group selection mechanism in the competition among polities, and different levels of internal conflict and cooperation are also important conditions that have consequences for how well polities do in competition with one another. There is a contentious literature by international relations political scientists about the causal relationship between levels of interpolity conflict (warfare) and the distribution of power among polities in sets of interacting polities.[14] Some geopolitical realists contend that the rise of a hegemon stimulates counter-coalitions and warfare, whereas others think that the presence of a strong hegemon reduces the level of warfare. The iteration model developed by Chase-Dunn and Hall (1997: Chapter 6) suggests that upsweeps in complexity and hierarchy are more likely to emerge after periods in which within-polity and between-polity conflicts have been relatively high. We intend to test these

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[13] The methods that we use to estimate the population sizes of cities, the territorial sizes of polities and power configurations (the relative power and distribution of power among sets of states) are presented in Chase-Dunn, Inoue and Welch (2017) https://irows.ucr.edu/papers/irows108/irows108.htm.

[14] William R.Thompson (2020: Chapter 9) reviews the theoretical positions on the relations between power concentration, warfare and trade intensity.

hypotheses about the consequences and causes of different levels of interpolity conflict in the East Asian world-system.

The most systematic effort so far to develop datasets on premodern warfare using primary sources have been carried out by the Long-Range Analysis of War (LORANOW) project led by Claudio Cioffi-Revilla (1991; 2001). We start our data-gathering effort for the East Asian PMN by using the data set assembled by Cioffi and Lai (2001). We will also use the warfare events data coded by Peter Brecke (2001, nd) since 1400 CE for the central and East Asian PMNs.[15] And we also use the coding of East Asian battles assembled by David Kang and his associates (Kang *et al* 2016) and the war and conflict compendium assembled by the Editing Committee of People's Liberation Army (Fu 1985).

Our level of interpolity conflict coding scheme uses the number and length of wars and indicators of war extent (the number of autonomous polities involve in a war) (Cioffi and Lai 2001) to estimate the relative level of conflict for 25 and 50-year time periods. We also want use war severity (the number of fatalities) but these are not available for very many of the early wars and battles we are coding, so we will not be able to use casualties for the earlier period. Our codings of interpolity conflict intensity are intended to be as comparable as possible across different war event data sets and over time. We begin with the dataset on ancient China produced by the LORANOW project and then try to make other data sets comparable with it. **Each time period is assigned an interpolity conflict score that is the sum of the number of interpolity wars and battles[16] during that period, plus the sum of the number of years (durations) that each war occurred, and the sum of the extents (the number of autonomous polities involved in each war).** Once severity estimates become available, we will also add these to produce our estimates of the relative intensity of interpolity conflict for each period. Because our other variables have very low temporal resolution during early time periods (50-year intervals) we also calculate war intensity for these long intervals, but we compare the 50-year scores with shorter (25-year) scores to see how much information is lost.

Claudio Cioffi-Revilla and David Lai's (2001) data for Chinese warfare from 2700 BCE to 722 BCE [17]estimates the onset and termination years for each war and a variable they call "extent" which is an estimate of the total number of autonomous polities involved in each war. Their indicator of extent varies from 2 to 9 in the ancient China data set. For later periods when we have severity measures (battle deaths) we will scale the relative sizes of wars.[18]

Cioffi and Lai also calculated estimates for power configuration for the East Asian interpolity system, but their coding scheme is a bit different from that of David Wilkinson. To use a consistent indicator over time we converted the Cioffi and Lai estimates into Wilkinson's categories. [19]

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[15] In principle, we would like to estimate changes in the level of interpolity conflict by including all the wars among all the polities in each PMN. But some of the data sets include only wars among the Great Powers (core powers). Brecke (2001:5) says "Assembly of the Conflict Catalog began in 1996 by combining the conflicts from existing computerized war datasets such as Correlates of War (Small and Singer, 1982), Militarized Interstate Disputes (Jones, Bremer, and Singer, 1996), Great Power Wars (Levy, 1983) and Major-Minor Power Wars (Midlarsky, 1988). From there I added additional conflicts from Richardson (1960), Wright (1965), Sorokin (1937) Luard (1987), and Holsti (1991)."

[16] Ideally, we would like to code all the battles that compose each war and we do this when we have information on battles. But some of our data sets include only wars, while others have both battles and wars. Our object is to differentiate time periods in terms of how much conflict was occurring, so we do not want to double-count either wars or battles.

[17] Our other measures start in 1900 BCE so we do not use Cioffi and Lai's war data before then.

[18] We will revise the relative levels by century once we have better estimates of war size (battle deaths, total fatalities) because the whole distribution shifts because the total population goes up a lot, especially in the last 200 years. A small war in the 20th century is much bigger than a big war in the 15th century so we increase the values of the 3 categories as we move forward in time. using the total human population of the Earth as a guide in doing this.

[19] East Asian Power Configuration Indices: The Cioffi and Lai power configuration scores were converted to Wilkinson's scale using the following equivalences:
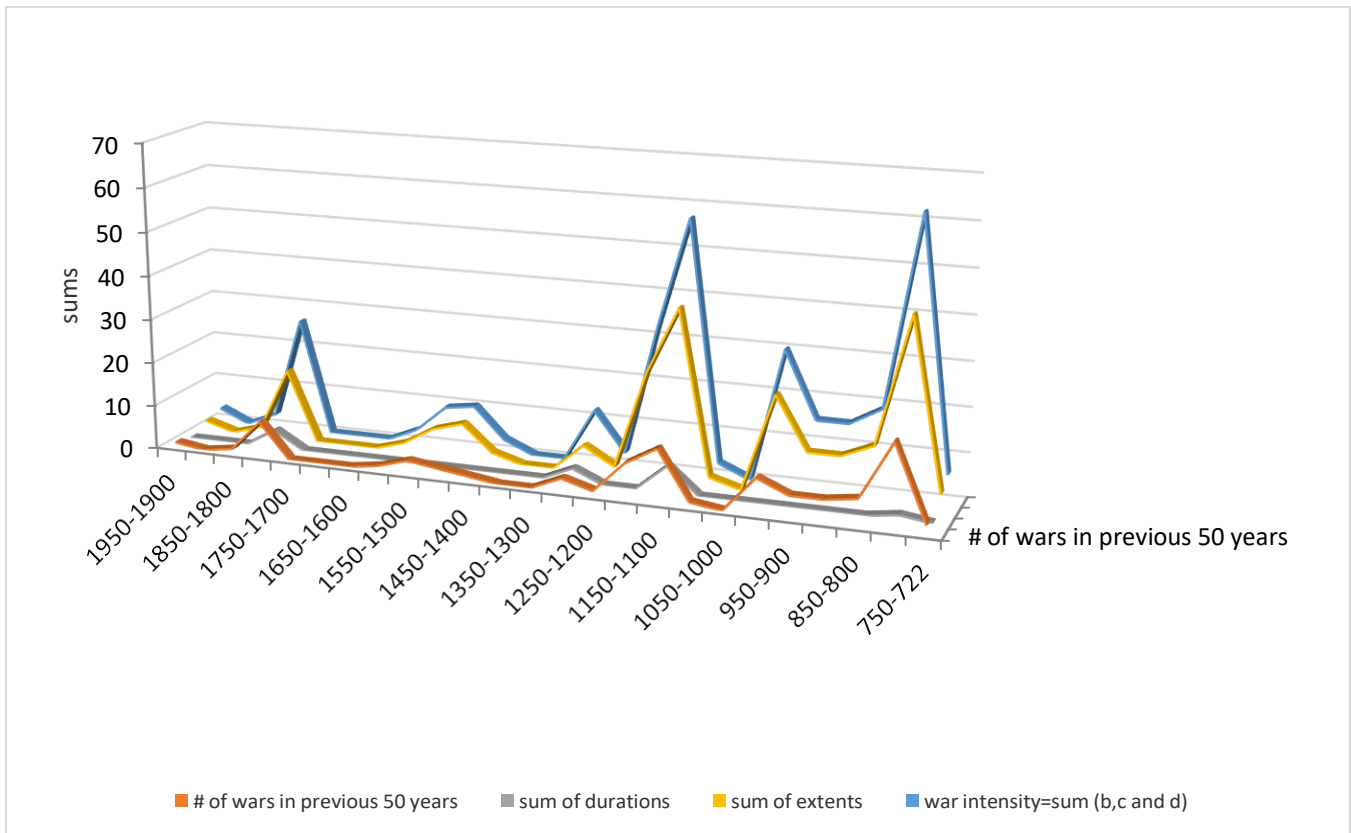
Figure 2: Components of Early East Asian warfare intensity scores (1900 bce-700 bce (50-year intervals) Source: Cioffi and Lai

Figure 2 plots the components of our Chinese interpolity warfare intensity estimates from 1900 BCE to 700 BCE calculated for 50-year intervals. In Cioffi-Revilla and Lai's China data set there are some years that have more than one war (e.g., 987 BCE). In this case we add the two wars together to produce our period estimate of warfare intensity. The Pearson's r correlation coefficients for the components of our index of warfare intensity are: the sum of the number of wars and the sum of durations= .50; the sum of the number of wars and ; the sum of extents (the number of autonomous polities involved in each war) = .97; the sum of the number of wars and the intensity index (which is the sum of number, duration and extent) = .98. In other words, for 50-year time periods the level of ancient East Asian interpolity conflict is mainly correlated with the sum of the number of wars, and so we probably do not need the other components of our intensity indicator. They are not adding much information. Figure A1 in the Appendix shows the warfare intensity components calculated for 25-year intervals for the same time period. The correlation between the 50-year and the 25-year scores is .82.

Wilkinson/Cioffi and Lai
Non-polarity 0 =0
Multipolarity 1 =10-11 and 12
Tripolarity 2=7-8 and 9
Bipolarity 3= 4-5 and 6
Unipolarity 4= 1
Hegemony 5= 2
Empire 6= 3)
For the overlapping years, between 1025 BCE and 722 CE we used Wilkinson's power configuration estimates, rather than Cioffi's.
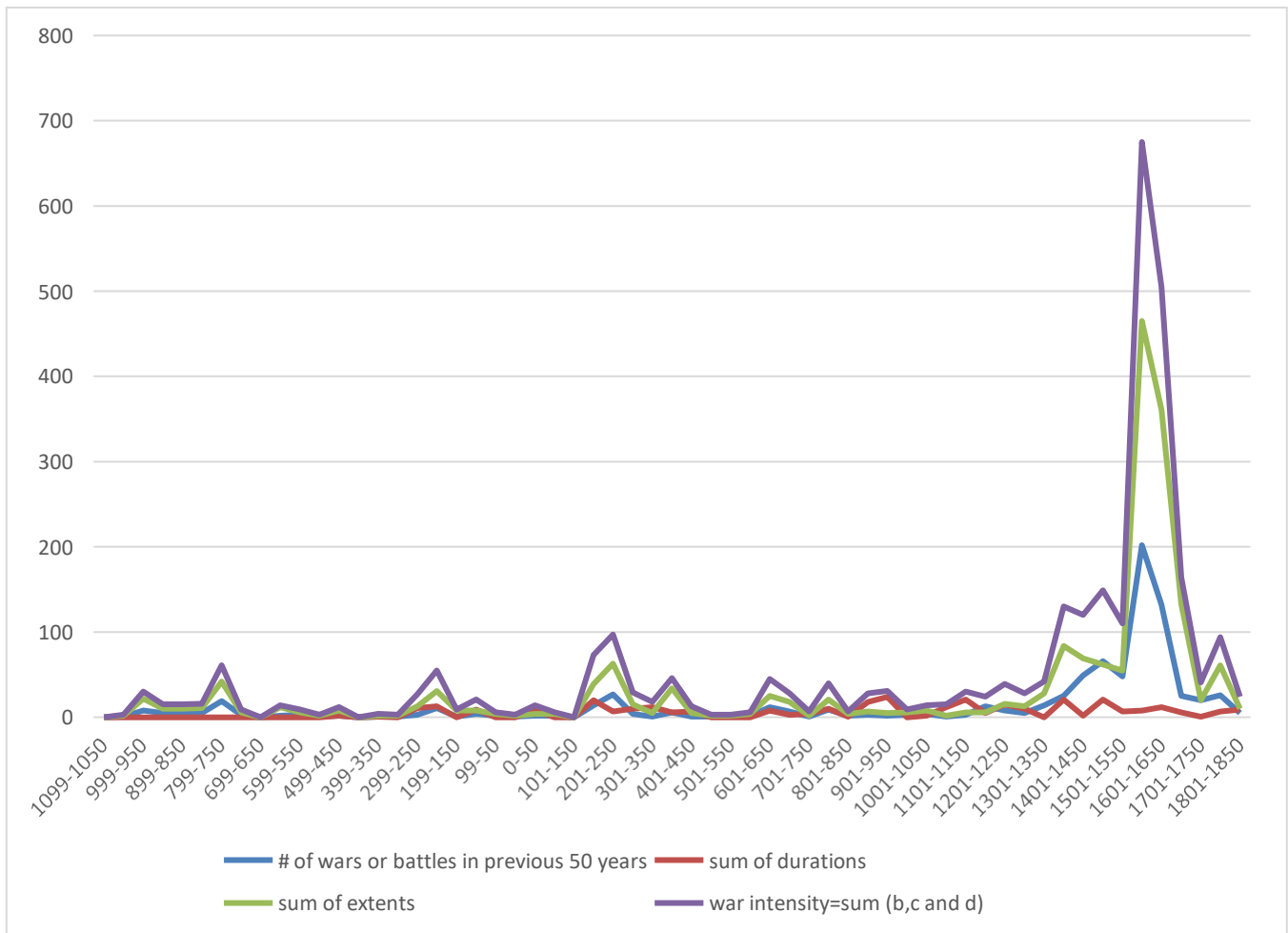
Figure 3: Components East Asian warfare intensity scores (1900 BCE-1850 CE (50-year intervals) Sources: Cioffi and Lai (2001) Kang *et al* (2016) and Wikipedia.

Figure 3 shows the components of our East Asian conflict data set using the items from Cioffi and Lai and extending the period to 1850CE using data from Wikipedia sources for China, Japan and Korea and from Kang *et al* (2016). The correlation between the sum of the number of wars and battles in each period with the composite index that also contains durations and extents of wars is .98, indicating that most of the interpolity conflict information is obtained by just counting the number of wars and battles in each period. The cyclical nature of periods of high and low conflict in the East Asian PMN are visible in Figure 3. We intend to improve this data set using information from Fu (1985) and from the Breck Conflict Catalogue 1500 CE- 1854 CE. We also intend to carefully separate interpolity from within-polity conflict events so that we can analyze them separately. And we will add geographic locations so that we can examine the locational aspects of East Asian warfare.
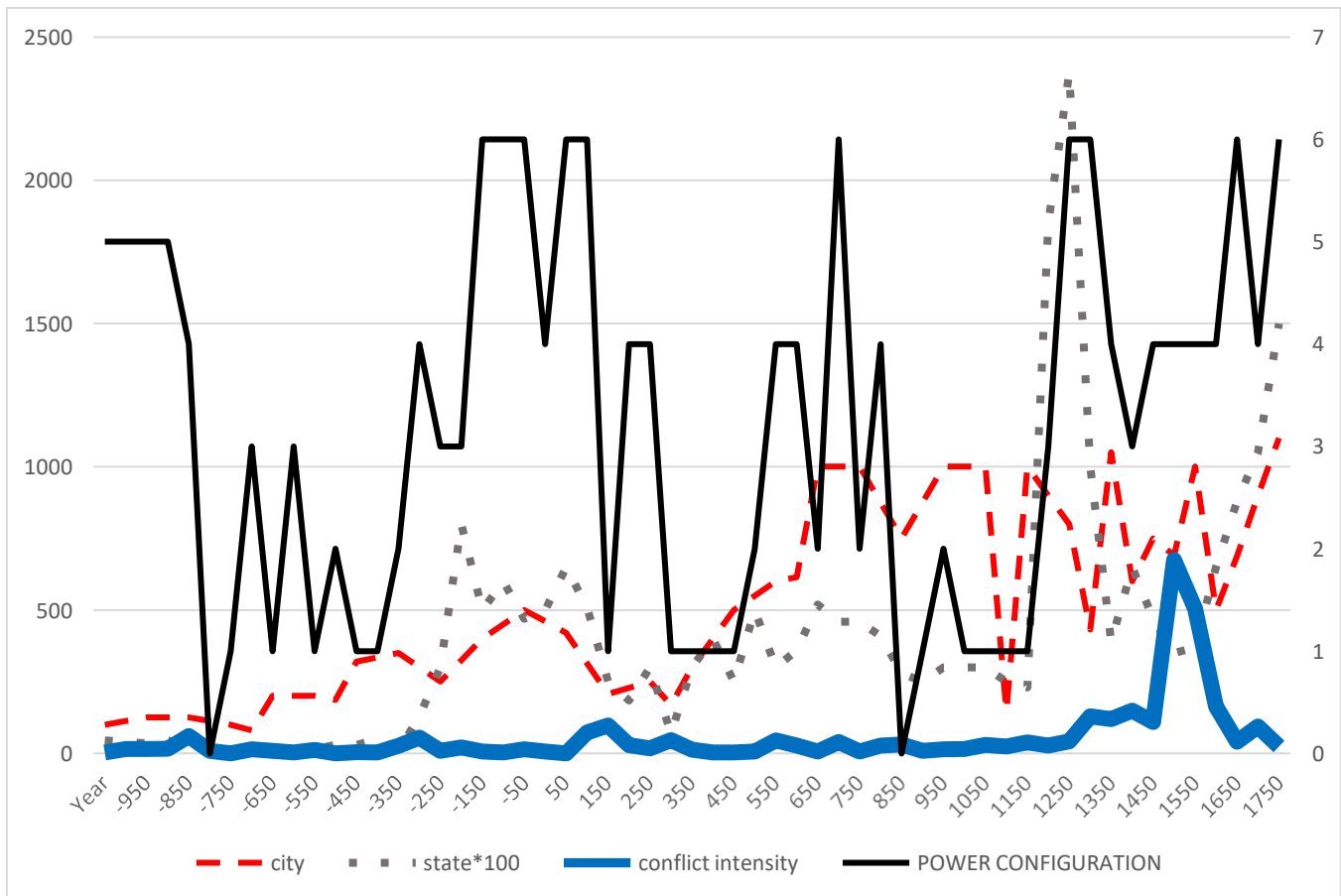
Figure 4: East Asian PMN largest city, largest state, power configuration and conflict intensity (50-year intervals)

We have also used our conflict intensity estimates to have a preliminary look at the relationships between the war intensity variable, power concentration, largest city sizes and the territorial sizes of the largest state or empire in China from 1000 BCE to 1850CE.

	year	city	state	Power configuration	Conflict intensity
City	.80	1			
State	.60	.49	1		
Power configuration	.09	.07	.43	1	
Conflict intensity	.43	.24	.07	.15	1

Table 1: Pearson's r bivariate correlation coefficients among the variables in Figure 4

Year is positively correlated with all the variables except power concentration. The upward trend is bigger for the largest cities and largest states than it is for conflict intensity. Largest cities and largest states are correlated (.49) but this may be partly because they both go up over time. Largest state is correlated with power configuration (.43) but largest city is not. Conflict intensity is somewhat correlated with largest city (.24) but this may partly be due to their upward trends. Largest state and power configuration are not very correlated with conflict. Taking out the long-term trend is easily accomplished by calculating partial correlations in which year is the control variable.

Some geopolitical theories predict that greater power concentration will produce less war because the preponderance of a great power dissuades challengers. In modern times this has been called "hegemonic stability." Others predict the opposite, as mentioned above. The East Asian world-system was different from many other PMNs because of the unusual degree of concentration of power by the Chinese state. The system experienced cycles of power concentration and deconcentration just as other systems did and the magnitude of concentration was greatest during periods of Chinese consolidation. Also, the center did not move far geographically from its point of origin in the Huang He River valley.

Figure 5: A Qing dynasty illustration of Sun Jian's forces (right) attacking Liu Biao's forces (left) (Source:?)

The Spatio-Temperal Boundaries of the East Asian World-System

As we have said above, the unit of analysis for our proposed study is the East Asian world-system. We use the approach developed by David Wilkinson (1987, 1999a, 1999b) for estimating the spatio-temporal boundaries of this systemic interaction network. Wilkinson focusses mainly on what Chase-Dunn and Hall (1997) have called the political-military network (PMN), an international system of allying and fighting states. The geopolitics of security is a systemic feature of all world-systems, but we also wish to consider the possibility that prestige goods exchange (PGN) may have constituted a systemic link between East Asia and the West prior to the time that the two regions became durably linked by political/military interaction during the 19th century (the Opium Wars). Figure 6 is a diagram that portrays what we think happened regarding the waves of expansions and contraction of what Wilkinson called Central Civilization[20] and the East Asian system of states since the emergence of cities and states in each region.

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[20] "Central Civilization" is the political-military network that was formed by the merger of the Mesopotamian and Egyptian state systems around 1500 BCE. We modify Wilkinson's term slightly to call this entity the Central System.
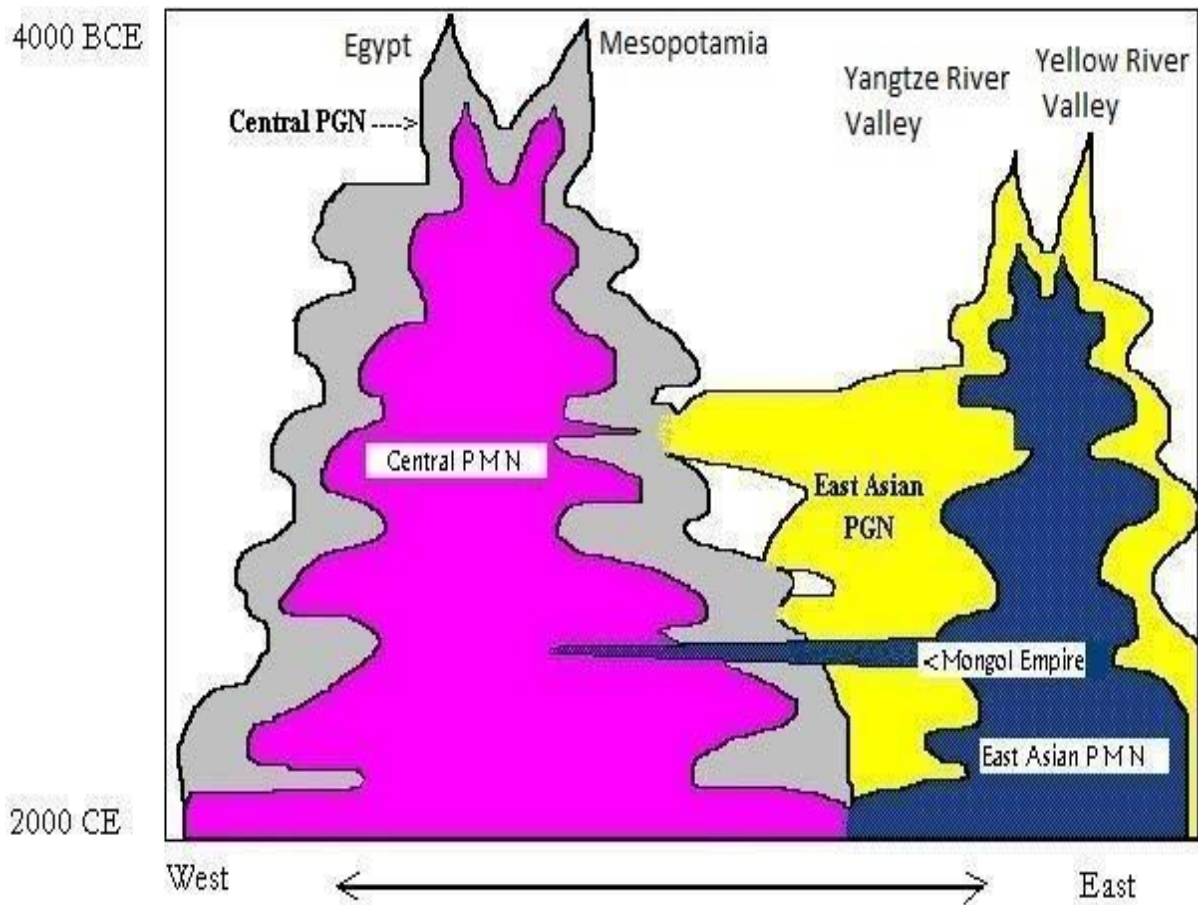
Figure 6: The Expanding East Asian and Central Systems Since the Bronze Age

Figure 6 displays a stylized representation of the expansions and interconnections between the Eastern and Western world-systems. The Central System was formed out of a merger between two relatively autochthonous, but adjacent, state systems that emerged in Mesopotamia and Egypt. And the East Asian system emerged in the valley of the Yellow River (Huang He) and then became connected with and adjacent state system in the Yangtze River Valley. Both systems had two points of origin and a merger between the states and cities of two river valleys. Because the Yellow and Yangtze Rivers are less distant from one another than are Mesopotamia and Egypt the merger occurred more quickly. The East Asian and Central systems are also different regarding what happened subsequently. They both expanded but the center of the East Asian system did not move much from its area of origin while the center of the Central System migrated further and further West from Western Asia/North Africa to Europe to North America. This study focusses mainly on East Asia but eventually we will want to compare what we find with research on the other world-systems.

The expansion of the East Asian political-military network started with the emergence of cities and states in the Yellow River valley. The rise and fall of Chinese dynasties produced larger and larger polities that met and eventually incorporated by trade, migration and conquest formerly autonomous polities in the Yangtze and Pearl River Valleys, Central Asia, North Asia, Korea, Japan, Mainland Southeast Asia and Island Southeast Asia. The core of the system subjected areas in the non-core to exploitation and domination, but parts of the non-core, especially from Central and North Asia, conquered the Han core. So, the system we are studying kept getting larger before it was eventually incorporated into the expanding Europe-centered Central System in the 19th century CE.

The East Asian world-system in which states and cities first emerged in the Yellow River Valley expanded in a series of waves in which prestige goods exchange, political-military interaction and bulk goods exchange expanded. This is the spatio-temporal unit of analysis that we are studying.[21] In Table 1 we propose estimated years in which these different kinds of spatial interactions became systemic in the sense that the linked polities had become dependent on their interactions with one another for social reproduction. These estimates are based on our reading of the histories of trade and geopolitical interaction. Generally, a polity has already been making efforts to manipulate the actions of another polity in the decades prior to a conquest. David Wilkinson's (1999: 502) definition of what we call the political-military network is as follows: " (a historically-autonomous political-military-diplomatic transactional network, not part of a larger such network."

Interaction connections can be non-systemic or systemic. Non-systemic interactions are seen as exogenous impacts (See Chase-Dunn and Inoue 2023). In Table 1 the dates indicate when substantial interaction has emerged, but it may not yet be systemic in the case of prestige goods exchange and communications. On the other hand, Political-Military interaction (the highlighted column in Table 1) is always systemic. The years chosen are meant to indicate what David Wilkinson calls "durable" connections. In most cases there were previous episodic connections, but these are not deemed to have risen to the high bar of systemic connectedness specified in Chapter 2 of Chase-Dunn and Inoue (2023). There were also different kinds of connection. Following Wilkinson, we distinguish between mergers, in which two different systems come together based on interaction at the edges, versus engulfment in which one system conquers all or a large part of another. And there are two kinds of engulfment: getting engulfed by another system or engulfing another system. In Table 1 we use these symbols to distinguish between these different kinds of connection: * = merger; # = engulfed and ^ = engulfed by.

Our estimates in Table 2 (below) allow one degree of separation, If China and Korea were interacting geopolitically, and Korea and Japan were interacting geopolitically we include Japan in the East Asian state system.[22] South Asia and East Asia became connected through Mainland Southeast Asia indirectly at the point at which there were systemic connections between Mainland Southeast Asia, China and South Asia. All the regions in Table 2 were incorporated by either colonialism or clientelism into the modern world-system in the 18th and 19th centuries of the Common Era. We will include the Asian regions, including South Asian in the modern system after 1830 CE.

Regarding core/periphery relations in the early East Asian system (500 BCE) Wilkinson (1999: 517) quotes Eberhard "The Far Eastern system remained polycultural: 'there was a very small area in which only Chinese lived, and a large area surrounding it [but within the "Chinese' states] that was. occupied by non-Chinese," Liao hunters, Yao hunters, Yueh sailors, Tai rice growers, Tibetan sheep breeders, Turkish horse-breeders, Mongol cattle-breeders, Tungus pig-breeders' (Eberhard, 1967, 18-22)."

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[21] David Wilkinson (1999: 505) uses the term "Far Eastern" for this system. He says:

> This system … began when a polyculture in the Yellow River valley produced one and then many cities over 3000 years ago. This expanding civilization, with its polity of states, hegemonies, and empires, probably soon collided and fused with another, begun in the upper Yangtze perhaps even earlier. Continuing to grow outward, it early began to interact regularly trade-wise with other macrosocial systems (Central and Indic) to form a larger oikumene (tradenet). At its greatest extent the Far Eastern system included contemporary China, Korea, Vietnam, Tibet, Mongolia, Burma, Cambodia, Laos, Thailand, and early Japan. The Far Eastern network was absorbed through war and diplomacy into Central civilization in the late 19th and/or early 20th centuries, between the First Opium War and the First World War. Before that time, it went through a long sequence of changes in macropolitical structure.

[22] David Wilkinson's claim that Japan budded off from the East Asian PMN is due to his requiring direct interaction between polities, in this case China and Japan. But he acknowledges that Korea was a shared semiperiphery to both, serving as a locus for occasional collisional interactions. So, allowing one degree of separation in network terms means that Japan was always part of the East Asian PMN from the emergence of the Yamato state until the engulfment of the East Asian system by the Central System.

Connections from the Yellow River (Huang He) to:	Prestige Goods and Communications Network	**Political-Military Network**	Bulk Goods Network
Yangtze River Valley	1100 BCE*	1100 BCE*[23] or 725 BCE[24]	600 CE*
Pearl River Valley (Zhu Jiang)	800 BCE*	300 BCE#	800 CE#
Central and North Asia	1000 BCE*	325 BCE#^[25]	1000 CE*
Korea	1000 BCE*	400 BCE#[26]	1200 CE*
Japan[27]	500 BCE*	650 CE*	1000 CE*
Mainland Southeast Asia	500 CE*	200 BCE#[28]	100 CE*
Island Southeast Asia[29]	400 CE*	600 CE*	1000 CE*[30]
Tibet	100 CE	600 CE *[31]	1900 CE
South Asia	600 CE*	1300 CE*[32]	1900 CE*
Central System	1000 CE*	19th century CE^	20th century CE*

Table 2: Estimated Temporal Connections of the interaction networks of the East Asian World-System

* = merger; # = engulfed and ^ = engulfed by.

Regarding states and interstate systems in Southeast Asia around 550 CE, Wilkinson (1999:551) says:

> In the second half of this century the Funanese vassal kingdom of Chenla, (proto-Cambodia) rebelled and began the conquest of Funan. (Coedes, 61, 65-68.) David Chandler (1996: 26-

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[23] Wilkinson (1999: 507). Re the late Shang dynasty "The system's boundaries were now more likely 500 x 500 miles, with extensions into parts of the Huai and Yangtze basins. But the during the early Zhou dynasty "… the Huai, Han and Yangtze's basins remained outside the system."

[24] Wilkinson (1999:511) says "There probably was a Yangtze civilization/world system simultaneous with and parallel to the Ycllow River system, and only coupling to it at about this time. The Yangtze system was probably hegemonic, its hcgcmon being the state of Ch'u (probably Man "barbarians," Miao-Yaos, Pullcyblank 460) in the upper Yangtze basin, which had had some previous brief collisional interaction with Chou."

[25] Wilkinson (1999: 521) The Chin dynasty gets into it with the Hsiung-Nu in Central Asia.

[26] Wilkinson (1999: 519) says "Beyond Yen there had by now formed a proto-Korean state in southern Manchuria and northwest Korea, a confederated kingdom of walled town-states, Ko-Choson ("Ancient Choson, 11 "Old Choson")."

[27] Wilkinson (1999:505) contends that a separate Japanese PMN "budded off Far Eastern system mid 1st millennium AD." He includes the Yamato state in 350 CE as part of the East Asian system (1999: 542). And of 375 CE he says "In southern Japan, a strong unified state, Wa or Yamato, had by now formed. Packche (on the Korean peninsula) sought Japanese protection and became a vassal in 397" (Wilkinson 1999: 543).

[28] https://en.wikipedia.org/wiki/Southward_expansion_of_the_Han_dynasty Wilkinson (1999:524) says:

> However, by 200 BC, the Far Eastern world-system has grown once again. Partly because of the peripheral effects of the Ch'in empire, the field of inquiry and narrative must now expand far beyond its imperial territory, which can hereafter be treated only as the cultural-political-economic-demographic core of a system at whose semiperiphery significant politics were forming under core pressure. Roughly these may be identified as: NE, (proto-) Korean; N, Steppe (Hun!Hsiung-nu, Sicnbi/Hsicn-pi, Turk/Tu-chiich, Avar/Juan-juan, Mongol, etc); NW, Kashgaria (Tarim basin); SW, mountain (Tibcto-Burman, Tai); SE, coastal (Yiich/Vict). The system's extent is now about 1000 X 1300 miles. (Sec Herrmann 9; Pcnkala 18) Core state claims of hegemony (and universal empire) must be evaluated in some relation to these politics, at least when they are citified. At the same time, the geographic extent of semiperipheral polities often overstates their relative politico-military and economic-demographic weight in the system.

[29] Wilkinson (1999:503) depicts a separate Indonesian PMN that included Malaya and some of coastal Vietnam that may have shared a semiperiphery with what we are calling the East Asian PMN.

[30] Batten (2003:178)

[31] Wilkinson (1999:555) says of 600 CE: "Sui and Tolos/Uighur allies crushed the Togon state 608-609 and drove the Togon out of Kokonor, coming into touch with Tibet, a settled kingdom with towns which had recently undergone a dynastic change; it sent embassies to Sui in the same years. After Sui fell, Togon revived and returned to Kokonor, alternating raiding with tribute; and Tibet expanded to become a major power."

[32] Indirect connections between South Asian and East Asian PMNs started much earlier (225 CE) when relations developed between Funan (an Indianized state in the Mekong Delta) and Chinese states to the north (Wilkinson 1999: 538). Wilkinson (1999:557) says of Yunnan "In the 640's (CE) the T'ang again sought more direct control, moving against walled cities of the Man people, hoping to control a route to India."

27) doubts the might, centralization, extent, and durability of Chenla, which he sees, following Claude Jacques, as a collection of small entities only sometimes led by one leader. This is in a sense old news, since evidently the same could be said of "China" at most moments after its inception, and *a fortiori* of the steppe khaganates and other semi-peripheral formations. But the duration of unity is worth problematizing in principle at the "state" level, as well as at the system level, despite the practical problems that will normally preclude extensive analysis of both problematic levels simultaneously.

Earlier Research on East Asian Conflict

David Zhang and Harry Lee and their colleagues have been pioneers in the long-range study of East Asian conflict and its relationships with climate change (Zhang *et al* 2006, 2007 2015a and b); Lee 2018; Pei *et al* 2019). They built on the earlier research of J.S. Lee (1931, 1933) who studied the relationship between "internal wars" and climate change in China. These researchers do not study the whole East Asian world-system and neither do they study the whole period from the Bronze Age until the 19th century, but their results are extremely germane for our research.
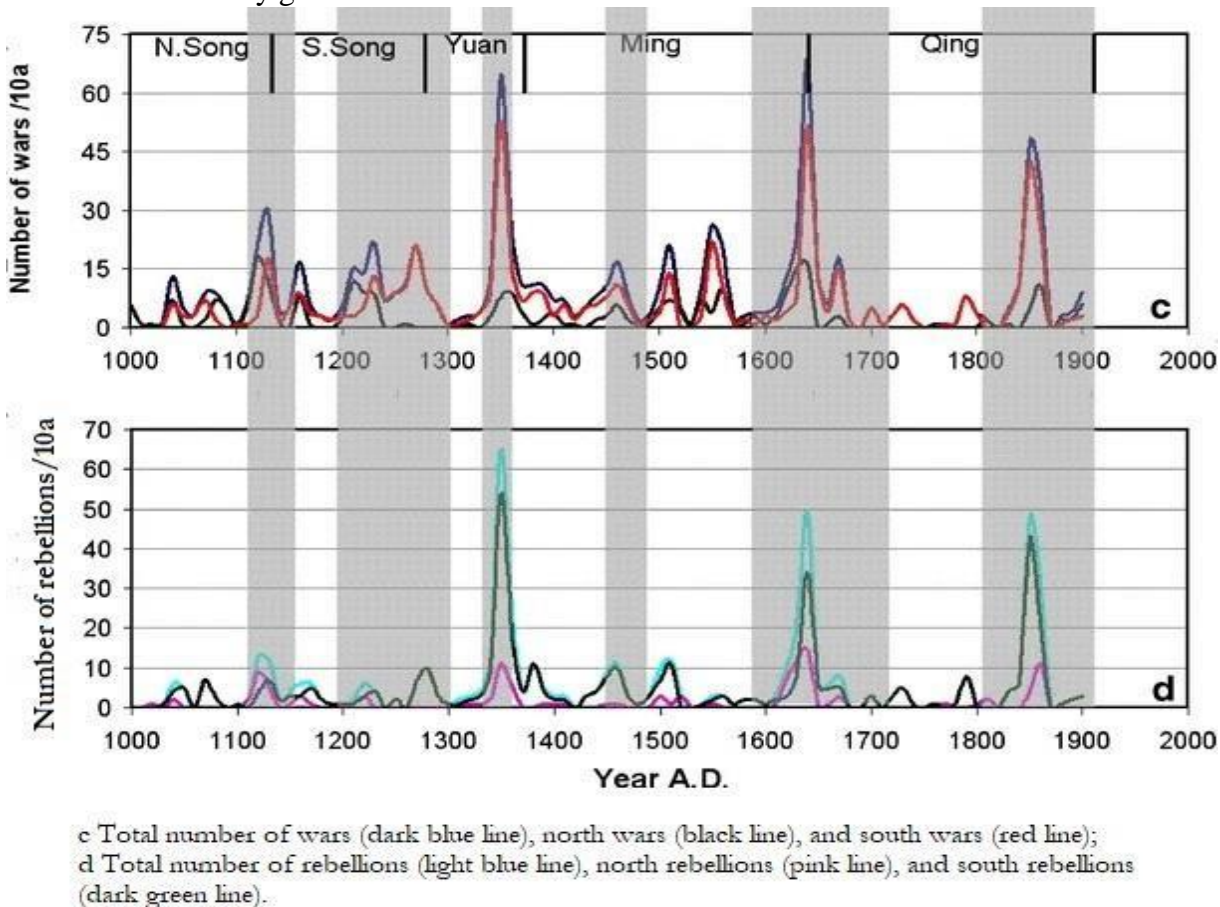

c Total number of wars (dark blue line), north wars (black line), and south wars (red line);
d Total number of rebellions (light blue line), north rebellions (pink line), and south rebellions (dark green line).

Figure 7: Wars and Rebellions in North and South China 1000 CE to 1911 CE: Source Zhang *et al* 2006: 406, Figure 2.

Figure 7 shows the Zhang *et al* (2006) findings for the number of wars and the number of rebellions from 1000 CE to 1911 CE counting events per decade. The same cyclical pattern shown in Figure 3 above shows up in Figure 7 except that the Zhang conflict scores do not exhibit the long-term upward trend that we found in Figure 3. (Why?) Zhang *et al* (2006) say:

We …. categorized wars on the basis of types of participants, particularly the leaders of the two sides in the armed conflicts, as either "rebellion" or "others" (state and tribal wars) (Zhang *et al* 2006: 405).

The rebellions were predominantly peasant uprisings induced by famine and heavy taxation, since farmers were always the first to suffer from declining agricultural production. The three outstanding peaks of warfare were dominated by peasant uprisings. Wherever they occurred rebellions are always significantly correlated with temperature change ….

Warfare frequency in eastern China demonstrates a cyclical pattern …. War frequencies are summed by decades and grouped into three classes: very high (>30 wars/10a), high (15–30 wars/10a), and low (<15 wars/10a). All four very high peaks and eight out of the 11 peaks above the very high and high groups coincide with cold phases. Three high peaks stand well above the others, two of which occur in the coldest phases. All cold phases have high warfare frequency. Warfare generally lags 10–30 years behind the start of a cold phase. The geographic distribution of these wars (Fig. 8c) reveals an interesting and significant pattern. Most warfare occurred in the south. Nevertheless, the high warfare frequencies were generally initiated by wars in the north, except in the fourteenth and nineteenth centuries when China was ruled by northern nomadic tribes (respectively, Mongol and Manchu) and outbreaks of war began in the south. Warfare peaks in the north closely matched cold phases—five out of the six peaks (>10 wars/10a) occurred in cold phases. The frequencies of warfare in the north are relatively constant. At the same time, six of the seven war peaks in the south occurred during cold phases. The maximum war frequencies in the south came 20–50 years after the start of cooling, except in the fourteenth century when the Mongols ruled China. The aberrant peaks in the sixteenth century (Fig. 8c) were mainly caused by northern nomadic invasions led by the Mongol leader Altan Khan and wars with "wokou" (Japanese pirates) along China's eastern seaboard. In general, rebellion was the dominant category of war. The variation in the frequency of rebellion was highly correlated with climate change (Fig. 8d), as all three outstanding peaks were in the cold phases. Eastern China's winter-half-year temperature reconstruction … shows that all four very high war peaks and nine out of the 11 peaks above the very high and high groups also occurred in the coldest times of a cold spell (<−0.3°C). The notable difference between the two temperature reconstructions … was the period during the thirteenth century when eastern China had favorable temperatures while the Northern Hemisphere experienced the opposite. However, the war peaks in this century were generated by the tribal invasions originating from western China (Mongols and Jin), where the climate was rather cold and dry .."(Zhang *et al* 2006: 407)

In the appendix to their 2015 article Zhang *et al* (2015b) say more about the relationship between climate and conflict:

What caused the cycles of nomadic invasion and retreat or the expansion and shrinkage of agriculturist empires? Lee (1933) conjectured that the power of nature was the answer. Some scholars have found strong statistical relationships between climate change, war, population and dynastic cycles in Eurasia and the world by using high-resolution temperature reconstructions and fine-grained historical datasets (Zhang *et al.*, 2006, 2007a, 2008; Tol & Wagner, 2010).

This study decomposed history into different time domains and found that the multicentennial geopolitical changes are associated with climate change, but the short-term

changes (less than 200 years) do not exhibit any rhythmic pattern. This implies that those short-term geopolitical changes might be associated with social and political changes that are non-linear and irregular (no continuous frequency). The results indicate that a complex system may be controlled by different factors at different spatial and temporal scales (O'Neill *et al.*, 1989; Norton & Ulanowicz, 1992). For example, in the complex global climate system, the Earth's orbital oscillation controls the cycles of temperature change at the timespans of 96,000 yr, 41,000 yr and 21,000 yr. The solar output cycles regulate the variations of temperature at the scales ranging from 11 yr to 2200 yr. Other short-term forces, such as large volcanic eruptions, change temperature incidentally at the multiannual scale (Bell & Walker, 2005). When a selected factor has a characteristic timescale which is adequate to the scale of the considered process, while all the other factors have significantly different timescales, we can consider the selected factor as the most evident one that controls the process (Korotayev *et al.*, 2006). In this study, we could infer our ecogeopolitical hypothesis by the fact that the long-term geopolitical and precipitation frequencies were strongly coherent in China at the multicentennial scale, but the short-term geopolitical changes, even if they were of lower magnitude, might have been controlled by other, unknown factors (Zhang *et al* 2015b:15-16)

The question as to why cold spells should cause increased conflict is possibly complicated. Regarding peasant rebellions Zhang *et al* argue that it is declining agricultural production, famine and taxation that stimulate rebellions, and that is plausible. But why are polities more likely to go to war with one another during periods of deprivation? Studies of modern warfare have found a positive correlation between interstate conflict and economic growth (Goldstein 1988). Modern states seem to be more likely to try to conquer one another when they can afford to bear the high costs of war. The studies by Zhang *et al* usually find a two or three-decade lag between cold peaks and the onset of conflict. Harry Lee (2018) suggests that a bad climate and decline in agricultural productivity often sets the stage for natural disasters (floods) or sociocultural catastrophes (famines, epidemics) to serve as the proximate causes of the outbreak of "internal" conflicts.

The World Revolution Hypothesis

The idea of "world revolutions" comes from studies of the Europe-centered ("modern") world-system, referring to periods in which protests, rebellions and revolutions broke out in the same decades in different parts of the system. We propose to evaluate the world revolution hypothesis as it may have operated in the East Asian world-system since the Bronze Age. We will examine the timing of protest and rebellion events to see if they cluster in time and across space. We consider economic and political contexts, synchronies of rebellions, and connections among those that rebelled and among those that sought to repress or ameliorate the rebellions. And we will eventually quantitatively test hypotheses about the interactions among within-state and between state conflicts, the role of rebellions in dynastic cycles and the relationships between rebellions and changes in the scale of polities and cities in the East Asian world-system.

In the modern world-system there has been a spiral of interaction between world revolutions and the evolution of global governance. World revolutions are periods in world history in which many rebellions break out across the world- system, often unconnected with one another, but known, and responded to, by imperial authorities. Since the Protestant Reformation in Europe such constellations of rebellions and social movements have played an important role in the evolution of global governance in the Europe-centered system because the powers that could best handle collective behavior challenges were the ones who succeeded in competition with challenging elites. It is possible that

similar phenomena existed in other prehistorical and historical world-systems, such as East Asia. Oscillations in the expansion of trade networks, the rise and fall of chiefdoms, states and empires, and increasing synchronization of trade and political cycles may have been related to waves of social unrest that occurred in the same time periods among polities that were interacting with one another (world revolutions). Indeed, something of this kind has been suggested by Ravi Palat (2018):

> Asian social movements are an especially interesting topic because the Taiping Rebellion, the first Indian War of Independence (the Sepoy Mutiny), the religious disturbances in the Asian provinces of the Ottoman Empire all occurred roughly around the same time and can be linked to the reversal of the flows of gold and silver between Asia and Europe and its consequences to the regional linkages within Asian empires.

The idea of "world revolution" is a broad notion that encompasses all kinds of acts of resistance to hierarchy, regardless of whether they are coordinated with one another, but that occur relatively close to one another in time. Usually, the idea of revolution is conceptualized on a national scale as an overthrow of a regime and the reorganization of social relations within a national society. Several changes are required to use the revolution concept at the world-system level. In the modern (Europe-centered) world-system there is a global polity, a world order, or what Immanuel Wallerstein[i] calls the "geoculture." World orders are those normative and institutional features that are taken for granted in large-scale cooperation, competition and conflict. The world polity, and its context in the world economy, is the arena of contestation within which world revolutions have occurred and that world revolutions have restructured.

Baidu Peasant Uprising Atlas
https://baike.baidu.com/pic/

Boswell and Chase-Dunn (2000) focused on those constellations of local, regional, national, and transnational rebellions and revolutions that have had long-term consequences for changing the world orders of the modern system. The designation of world revolutions in the Europe-centered system has employed years that symbolize the totemic events that indicate the nature of the complex events that are world revolutions. For the modern world-system the world revolutions after the Protestant Reformation have been symbolized by the years 1789, 1848, 1917, 1968 and 1989.[33] Arrighi, Hopkins, and Wallerstein (1989) analyzed the world revolutions of 1848, 1917, 1968 and 1989. They observed that the demands put forth in a world revolution did not usually become institutionalized until a later consolidating revolt had occurred. The revolutionaries appeared to have lost in the failure of their most radical demands, but enlightened conservatives who were trying to manage subsequent hegemony ended up incorporating some of the reforms that were earlier radical demands into the current world order to cool out resistance

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[33] 1955, the Year of the Bandung Conference of Non-aligned Nations, should be added to this list to represent the great wave of decolonization that emerged after World War II.

from below. It is important to tease out the differences as well as the similarities among the world revolutions. Both the contexts and the actors have changed from one world revolution to the next.[34]

Before local and regional social movements began communicating and aiding one another they were indirectly linked through the hierarchical structures of the world-system – mainly the colonial empires of the core powers. Though local rebels in the far-flung colonies of the British Empire did not usually know about one another, the Home Office knew when local rebellions broke out and prepared plans and policies to accommodate or repress them. Thus, were the rebellions indirectly connected with one another through the hierarchical institutions of the system.

This view of the modern world-system as constituting an arena of economic and political struggle over the past several centuries includes the idea that global civil society has existed all along (Kaldor 2003). Global civil society includes all the actors who consciously participate in world politics. In the past of the Europe-centered system global civil society was mainly composed of statesmen, military leaders, religious leaders, scientists, financiers, international merchants, cosmopolitan literary figures[35] and the owners and top managers of chartered companies such as the Dutch and British East India Companies. This rather small group already saw the global arena of political, economic, military, and ideological struggle as their arena of contestation. Transnational political organizations and elite movements have existed in the Western system at least since the Protestant Reformation. Indeed, these can be thought of as global political parties (Chase-Dunn and Reese 2011). The Society of Jesus (Jesuits) was an explicitly internationalist organization formed to advance the counter-reformation Movements from below have been increasingly transnational since the world revolution of 1789. Politics in the modern system can be analyzed as contention between a left and right, both influencing the center and these all co-evolving (Nagy 2017; Chase-Dunn and Almeida 2020).

World Revolutions in the East Asian System?

East Asia saw periodic eruptions of popular heterodox religious movements and peasant rebellions. (Anderson 2019). Owen Lattimore's (1940:531) description of the Chinese dynastic cycle serves as a stylized depiction that includes these rebellions.

> Although the social outlook of the Chinese is notable for the small honor it pays to war, and although their social system does not give the soldier a high position, every Chinese dynasty has risen out of a period war, and usually a long period. Peasant rebellions have been as recurrent as barbarian invasions. Frequently the two kinds of war have been simultaneous; both have usually been accompanied by famine and devastation, and peace has never been restored without savage repression. The brief chronicle of a Chinese dynasty is very simple: a Chinese general or a barbarian conqueror establishes a peace which is usually a peace of exhaustion. There follows a period of gradually increasing prosperity as land is brought back under cultivation, and this passes into a period of apparently unchanging stability. Gradually, however, weak administration and corrupt government choke the flow of trade and taxes. Discontent and poverty spread. The last emperor of the dynasty is often vicious and always weak -- as weak as the founder of the dynasty was ruthless. The great fight each other for power, and the poor turn against all government. The dynasty ends, and after an interval another begins, exactly as the last began, and runs the same course (Lattimore, 1940:531).

While this model does not apply equally well to all the early and late dynasties, and it contains tropes that the Chinese continue to believe about themselves (that they are relatively peaceful) the description is

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[34] Colin Beck (2011) used Charles Tilly's coding of contentious events in Europe to study the waves of world revolutions in the modern system. What has not yet been done is a quantitative study of world revolutions in the modern system that includes contentious events in Africa, Asia, and the Americas.

[35] The republic of letters was a group of enlightenment scholars from different European countries who corresponded with one another. Whiteneck (1996) studied the transnational "epistemic communities" that promoted the ideology of free trade in the 19th century.

reminiscent of Ibn Khaldun's model of the foxes and wolves in the dynastic cycles he studied and of the Turchin and Nefadov (2009) model of the "secular cycle." What remains is to add world-system level variables including the hypothesis of world revolutions.[36]

It was in a period of high peasant landlessness and poverty during the Han dynasty that large numbers of poor people were drawn to worship the Queen Mother of the West who grew longevity peaches that, once eaten, made people immortal (Hill 2015). The Queen Mother lived in a mythical palace on a mountain somewhere in the West. This idea seems to have been present as early as the Shang Dynasty, but recurrent eruptions of the worship of the Queen Mother corresponded with periods in which there were large numbers of landless peasants. The attraction of stressed masses to "pie in the sky when you die" reoccurs in world history. The White Lotus movement was another heterodox popular movement that first emerged during 11th century CE and became powerful during the Yuan dynasty. Ming dynasty founder Zhu Yuanzhang was an adept. It had ideological elements such as gender equality, vegetarianism and egalitarianism that reappeared in the gigantic Taiping Rebellion in the middle of the 19th century (Michael 1966; Spence 1996). The Taiping rebellion was part of an interesting confluence in which the East Asian dynastic cycle was becoming entwined with the world revolutions of the West. The Taiping founder and leader, **Hong Xiuquan,** read a pamphlet about God and Jesus that a Christian missionary from Tennessee had had translated into Chinese. After failing the imperial examination Hong had a dream in which it was revealed to him that he was Jesus's brother. The movement began peacefully as a ritual and vegetarian

dinner society, but when local authorities were threatened and engaged in repression it mushroomed into a military organization that conquered and held Nanjing for several years. As many as thirty million people died as the Qing dynasty fought for decades to extinguish this movement.

Baidu Peasant Uprising Atlas
https://baike.baidu.com/pic/

Ho-Fung Hung (2011) found that proactive movements that confronted local authorities and engaged with the imperial center, often led by local gentry, emerged in waves during the Qing dynasty. He contends that there was a cycle in which proactive movements and reactive movements oscillated during the mid-Qing dynasty. He argues that the Western emergence of proactive movements focusing on popular sovereignty (rather than filial loyalty) was unidirectional, leading to the establishment of parliamentary democracies in the West. This is somewhat of an oversimplification of the contentious nature of the emergence of "centrist liberalism" in the West (Wallerstein 2011). The world history of the first half of 20th century (two world wars, Bolshevism and Fascism) surely contradicts the idea of a smooth transition to capitalist democracy in which rational proactive movements fine-tuned the ability of human institutions to meet the needs of the people. Identity movements, religious fundamentalism, and renewed populist nationalism in the 21st century strongly suggest that the modern world-system has not risen above reactive

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[36] This is the task taken up, but not yet completed by Inoue and Chase-Dunn (2018).

social movements. But Hung is right that the different ideological constructions (filial piety vs. popular sovereignty) as well as different degrees of importance of millenarianism (present but somewhat less intense in Asia) have been responsible for the somewhat different trajectories of politics and economics in the East and the West.[37]

We plan to use the spatio-temporal chronograph of the expansion of the East Asian system presented in Table 2 to look for the existence of world revolutions in East Asia. This will involve coding social unrest events – rebellions, revolutions, civil wars, coups, riots, protests, and demonstrations – what Charles Tilly and Sydney Tarrow (2015) call contentious events. In principle we would like to include both small and large events. In practice we know that the recording of historical contentious events is incomplete. When a dynasty is strong and organized records are more likely to be systematically kept. When there is chaos or only small-scale polities the occlusions are greater. This introduces measurement error in the record of contentious events that is related to one of the things we are also studying -- the rise and fall of dynasties. This source of error needs to be kept in mind when we are interpreting findings. In principle we would like to know about all the contentious events in all the areas we are studying as shown in Table 2. That is a high bar that we know we cannot attain, especially for the earlier periods. We are also interested in interpolity warfare and interstate conflicts and are coding that separately for East Asia so that we can examine its relationship with contentious events (Cioffi and Lai 1995, 2001; Chase-Dunn *et al* 2018). These forms of conflict often overlap, but for the purposes our study we will try to separate them.

We will code the timing and location of all the contentious events we can find out about from the Shang dynasty until the early 19th century of the Qing dynasty in China, Central and North Asia, Korea, Japan and mainland and island Southeast Asia. Here is our coding scheme for contentious events:

1- Coup A (successful)
2- Coup B (unsuccessful)
3- Secession struggle
4- Rebellion A- internal- against a state of which one is a part
5- Rebellion B- against an external state that has conquered one's region.
6- Succession Struggle
7- Revolution
8- Civil War
9- Bandits
10- Pirates
11- Labor Strikes

Each event may have more than one of these scores.

Regarding chronology, there is much more scholarly consensus regarding calendar years for Bronze Age China than there is for other world regions we have studied but there are still big disputes among scholars regarding calendar years of events in the Bronze Age (Wilkinson 1999:508; Keightley 1978).

After we have compiled this data set, we will be able to see how contentious events are distributed across space and time. The idea of world revolutions suggests clustering of contentious events in time and in different locations. But, as has been the case for the Europe-centered system, the events may not break out in all regions of the system. The spatial distribution of contentious events in the Europe-centered system has varied from world revolution to world revolution, and this may also turn out to be the case in the East

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[37] The "mandate of heaven" concept that originated in the Zhou dynasty both legitimates the ruler and contains an implicit right of rebellion if rumors of incorrect behavior or natural disasters suggest that the current ruler has lost this mandate. This is another difference from European notions of the divine right of monarchs.

Asian system.
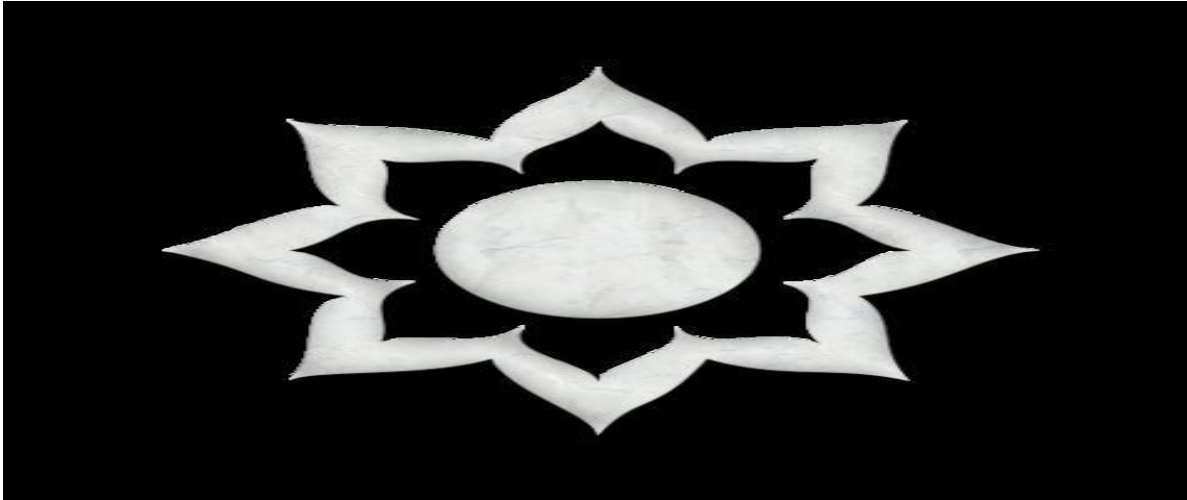
The White Lotus Society

Our first foray into the coding of East Asian contentious events uses lists of rebellions that we find in English and Japanese Wikipedia and the Baidu Peasant Uprising Atlas.[38] We are also searching for studies like that of Ho-Fung Hung's (2011) that have used archival evidence to code protest events. And weplan to code the rebellion and coup events listed in David Wilkinson's (1999a) list of regime changes that occurred in the East Asian PMN. All this is prelude to a new spatial and temporal multiscalar study that examines floods, famines, pandemics, warfare, rebellions, climate change, city population sizes, the territorial sizes of polities, and power configurations of East Asian political/military networks since the Bronze Age. And this study will be designed to facilitate comparisons with other world-systems, especially the Central System.

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[38] The excel data set containing our coding of East Asian contentious events will be available at http://irows.ucr.edu/cd/appendices/eastasia/eastasiaapp.htm

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_____2015a Appendix to Zhang *et al* 2015b **Appendix S3** Further materials and methods. **Appendix S4** References geb12247-sup-0001-si.docx

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