A Comparative Evolutionary World-Systems Perspective for Studying Structural Globalization

Introduction

Structural globalization involves the geographical expansion and intensification of global interaction networks relative to local interaction networks. As such, a single, complex and hierarchical, systemically integrated global human interaction network emerged in the 19th century (when the Europe-centered system enveloped the East Asian system). This creates a special challenge for comparative world-systems analysis –with only one "case" the quantitative study of changes in the whole system must use changes over time in variable characteristics or examine subsystems that are not autonomous. But whole autonomous systems can be studied comparatively if we go farther back in time, because there were smaller regional autonomous systemic interaction networks.

Chase-Dunn and Hall (1997) defined world-systems as systemic interaction networks that link settlements[1] and polities[2] in reciprocal interaction networks that conditioned the reproduction and change of local social structures.[3] The word "world" here refers to the world of systemic interactions (exchange, warfare, diplomacy, communication, intermarriage, etc.) that reproduce the social structures and institutions of human groups. In this sense "worlds" were small when transportation and communication technologies imposed a tyranny of distance that constrained the consequences of interaction to extend relatively short distances. These were the small social worlds in which people lived (Chase-Dunn and Lerro 2013; Chase-Dunn and Mann 1998).[4]

This definitional modification to "world-system" is important since it allows us to study the sociocultural evolution of societies over significantly longer time periods, and observe the attributes that engender social complexity and hierarchy. More importantly, we are able to consider egalitarian world-systems (with little to no internal hierarchy) and compare them amongst each other as well as the current single world-system. This also means that we can study small world-systems, making it possible to overcome the question of eurocentrism in our analysis. The goal of this article is to explain the method with which we can objectively measure and understand the evolution of world-systems from small relatively egalitarian world-systems to the structural globalization, which has led to a single complex, and thoroughly hierarchical world-system. We will begin by explaining how sociocultural evolution leads to structural globalization, followed by methods for bounding whole systems for comparative analysis. We then demonstrate how all this can be done using the examples of the SESHAT and Settlement and Polities (SetPol) projects.

Theoretical Underpinnings

Our conception of world-systems as evolving levels of interactions is informed by several theories across disciplines. The first of which is the world-systems perspective, initially formulated in the 1970s by Immanuel Wallerstein, Terence Hopkins, Samir Amin, Andre Gunder Frank and

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[1] The term "settlement" includes camps, hamlets, villages, towns and cities. Settlements are spatially bounded for comparative purposes as the contiguous built-up area.

[2] We use the term "polity" to generally denote a spatially-bounded realm of sovereign authority such as a band, tribe, chiefdom, state or empire."

[3] The important insight is that all human polities have systemic interactions with their neighbors, so it does not make sense to study them one at time.

[4] These changes in scale are being studied by the *Settlements and Polities (SetPol) Research Working Group* at the Institute of Research on World-Systems at the University of California-Riverside. The project web site is at http://irows.ucr.edu/research/citemp/citemp.html We use the populations sizes of settlements and the territorial sizes of polities as quantitative indicators of scale and complexity.

Giovanni Arrighi. Critical, is the work coordinated by Wallerstein and Hopkins (1979) on cyclical and secular trends of the present single world-system which is a capitalist world-economy. Cyclical trends are constitutive of the world-economy, which is driven by perpetual accumulation which in turn creates internal systemic contradictions. Within the capitalist world-economy, the secular, cyclical trends create spatial shifts that do not necessarily reflect changing power dimensions but indicate uneven growth. Growth is seen through five dimensions: mechanization, contractualization (wherein social relations are governed by contracts), commodification, interdependence, and polarization (embodied by uneven development). The cyclical nature of growth and expansion of the present world-system is seen as following a stable systemic logic with very little change in the fundamental nature of the system.

Wallerstein and Hopkins as do many world-systems scholars, point to the work of Nikolai D. Kondratieff (1935) who contended that by examining production levels, volume and values of trade, real wage levels, interest rates, migration trends we find cyclical patterns –what is called a Kondratiev cycle. Typically, a Kondratiev cycle is called a long wave or k-wave and is about 40-60 years and driven by the appearance of new technology. A k-wave is marked by an A-phase of growth and expansion and a B-phase marked by stagnation. Kondratieff's theory of cyclical trends also orients the work of Arrighi for whom the systemic logic of structuration was based on cycles of accumulation whereby each new hegemonic[5] cycle, hegemon (the country at the top of the global hierarchy constituting the core/semiperiphery/periphery) expands and deepens commodification in the whole system. By examining the relationship between finance capital and state power, Arrighi's approach fosters the understanding system-wide change from an evolutionary standpoint.

Another approach to understanding single case world-system change is proposed through the conceptual frame of panarchy (Holling, Gunderson, and Ludwig 2002) in which whole systems are seen as complex, hierarchical and importantly, adaptive and dynamic. It is a nested, multilevel analytical framework to understand cyclical processes that are transformational at the ecological, social and evolutionary level. In the panarchy model smaller, lower level systems are nested within a larger structure. Changes occurring at the lower levels in the form of revolts can have an effect on the larger system; yet, the conditions for these changes at the lower level are set by the larger structure. With such a model, there are four distinct phases of change that structures a system: growth phase (r) which is characterized by rapid accumulation of resources, competition, seizing of opportunities, rising level of diversity and connection and high but decreasing resilience (the capacity to tolerate disturbances); the reorganization phase (a) which is a time of innovation, restructuring and greatest uncertainty with high resilience; the conservation phase (k) where growth slows down as resources are stored and used largely for system maintenance is distinguished by stability, certainty but reduced flexibility and low resilience; and finally the creative destruction phase (Ω) which is marked by chaotic collapse and release of accumulated capital, and low but increasing resilience (Davoudi 2012; Holling et al. 2002; Pendall, Foster, and Cowell 2010).

Jack Goldstone (1991) and later, Peter Turchin along with Sergey Nefedov (2009) proposed a secular cycle or structural demographic cycle of approximately 200 years wherein population growth lead to increasing production and price inflation. It also leads to elite overproduction (too many people wanting and expecting to be part of the small elite) which in turn causes dysfunctional factionalism. Although these earlier structural demographic cycle theory primarily focused on state collapse, Turchin (2016a, 2016b) later demonstrates that state collapse can have a positive effect on equality leading to political stability, economic growth and state recovery and expansion.

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[5] The hegemon is the country at the top of the global hierarchy constituting the core/semiperiphery/periphery. According to the world-system perspective, the current single world-system has experienced three hegemonic cycles led by the Dutch in the 17th century, the British in the 19th century and the United States in the 20th century.

The concept of dynastic cycles put forth by Ibn Khaldûn in 1335 (1958) remarkably demonstrates these demographic cycle theories. He asserted that dynasties frequently endured for three to four generations at which point overpopulation, corruption and overall system weakness triggered collapse. This allowed for the leader of a new barbarian state —non-core marcher state (Inoue et al. 2012)— brilliant and charismatic to emerge and restart a new dynastic cycle. Lasting four generations, these cycles lasted between 75 to 100 years. For Turchin and Nefedov (2009), while Khaldûn's model worked for most of Near and Middle East history, for places like China and Europe, the threat of barbarian invaders was less, causing the dynastic cycles to endure closer to 200-300 years. Furthermore, the dynastic turnovers were more likely to occur due to internal coups.

Victor Lieberman (2003, 2009) also argued that certain nations were more susceptible to invasions by marcher states than others. This was partly due to geography (the existence of "protected rimlands"), but also effective cultural integration (ethno-nation-building). Beyond geography, as a key factor in the state evolutionary process, are hub theories, which take trade as a key factor in binding states and regions, as well as creating network nodes of innovation and energy and wealth accumulation (Christian 2004; Hawley 1986; McNeil and McNeil 2003; Morris 2010, 2013).

The iteration model advanced by Chase-Dunn with Hall (1997:6) and later expounded upon with Lerro (2013), has population growth as the initial driving force in the evolutionary process but also assumes a system of polities that interact with each other that is important for the reproduction and transformation of social structures and institutions leading to a single world-system. Therefore, the structural integration within the modern world-system can be objectively measured by interrelated dimension of the expansion and intensification of the interaction networks within it –this is what we mean by structural globalization.

This conception of structural globalization is closest to Charles Tilly's definition of globalization, which he ideally defines as "an increase in geographic range of locally consequential social interactions, especially when that increase stretches a significant proportion of all interactions across international or intercontinental limits" (1995:1–2). For Tilly (1995), an easier approximation would be to measure the proportion of all interactions across state boundaries by the influence of those interactions on local life. The higher the influence on local life the greater the degree of globalization. Still, as he points out, establishing valid indicators to measure the scope and impact of these interaction processes is not quite feasible.

For us, the challenge of measuring relative degrees of interaction integration at multiple levels is evident, considering our sole unit of analysis is the world-system. Given that the whole system is made up of all the countries in the world, it makes sense to use nation state data for any meaningful determination of structural inequality. This does not mean that nation states are the sole or most important actors in the world-system. Our contention is that different societies have always interacted with one another but the spatial scale of societies and their interactions have deepened. Therefore, in order to determine structural globalization, we must attempt to measure the increase in the intensity of global interaction networks relative to the intensity of local interaction networks.

Measuring Structural Globalization

Structural globalization is qualitatively different from globalization ideology –understood as the neoliberal project of constructing narratives around global integration and competition, while justifying the policies and actions for this integration and competition. Structural globalization then is about the cyclical phenomenon in which the world-system becomes more deeply integrated and interdependent; the density of global interactions relative to local/national networks have increased. In the interest of measuring globalization within the modern world-system, it is necessary to establish variable characteristics of the system as a whole that will allow us to empirically measure change over time. This means that time series analysis can be utilized to test propositions about the relationships among variables within this single case. The characteristics we will examine are investment, trade, and political interaction integration/globalization.

Data and measures for investment globalization

The degree of investment globalization – ideally, the proportion of all invested capital in the world that is owned by non-nationals – is calculated by dividing world international capital inflows, ownership claims, and debt, by the total of all the national gross domestic products (estimates the economic size of the world-economy). Therefore, the denominator is the sum of the GDP of all countries. We have adjusted the total for capital inflows in the numerator: 1) we will not include remittances (transfer payments made by individuals to their families in other countries) in the capital flows calculations, as they are not the type of economic investments we want to study. 2) we do not include payments for imported or exported goods (we use those in our trade globalization measure); and we do not include foreign reserves held by central banks in order to support their currencies in the world money market. 3) however, we include loans and direct equity investment, profits and intrafirm transfers that cross state boundaries. Theoretically, within the data, we should systematically distinguish claims of ownership, control or debt in the international financial transaction variable to determine how similar or different they present in different geographical and temporal distributions. Nonetheless, this distinction is only possible in the post-World-War II period. The data for the pre-World-War II period does not lend itself as easily to this distinction.

In constructing our dataset, we have taken advantage of Brian R. Mitchell's (1992, 1993, 1995) collected data[6] and focused on finding "world totals" as described above and on determining what we call, "investment dependence." Investment dependence is the ratio of foreign debt to gross domestic product (GDP). This is similar to average "degree of openness" as defined by Chase-Dunn, Kawano and Brewer (2000). We maintain that the weighted average of investment dependence, is an excellent indicator of world investment globalization. To refine our dataset, we have expanded as well as disaggregated net figures (balance of credits and debits) from Appendix (f) of Christian Suter's (1992) dataset which covers 1820-1990, as well as the International Monetary Fund's *Balance of Payments Yearbooks* covering the period 1938-1999. Moreover, we added non-British foreign investments flows from 1865 to 1914 along with several additions for the period 1938 to 1999, to the Suter dataset. While most studies on the change in levels of foreign investment over time also use net figures, we will point out that it is completely feasible that when using net figures, a country may have large amounts of capital invested abroad and simultaneously have large amounts investments from abroad which may cancel each other out. Finally, we propose weighting investment ratios for each country by the ratio of the country's population size to the world population.

Data and measures for trade globalization

Trade globalization can be determined by calculating "the extent to which the long-distance and global exchange or commodities has increased or decreased relative to the exchange of commodities within national societies" (Chase-Dunn et al. 2000:78). Typically, the degree of trade integration is calculated by ascertaining the sum of all international exports as a percentage of the sum of all national GDPs. However, these calculations tend to include widely spaced estimates (as we see in the frequently used Angus Maddison (Maddison 1995:227) dataset), hampering our ability to determine a clear understanding of change in trade globalization over long time periods. Furthermore,

[6] Mitchell's dataset keeps the estimates in the local country currency. Therefore, when we calculate the ratio of foreign debt to GDP, there is no need for conversion to a common currency. This makes comparing one country to another infinitely easier and reduces the possibility of introducing and compounding errors in our calculations.

the various transformations of the GDP calculations from national currencies to a common currency can introduce significant errors into the estimates.

We propose using what we call, "degree of openness." This is not a necessarily new concept, but unlike previous trade globalization calculations, for our "degree of openness" we do not use the sum of all the countries' exports and GDPs in US dollars. Like prior studies, we operationalized it at the national level, but we use the local country currency units in the computations for the ratio of external trade to GDP; that is, for each country we calculate a degree of openness which then allows for cross-country comparisons without the problem of converting currency units. Again, this is measured by the ratio of international export to GDP. We also propose weighting the "degree of openness" by the population sizes of each country as we do with investment globalization. A major advantage with determining trade globalization using "degree of openness" calculations, is that we have yearly figures, making it possible to capture much finer temporal changes over time.

In Chase-Dunn et al. (2000), for constructing our dataset for trade globalization we used Mitchell's datasets that spans 1750-1988 (1992, 1993, 1995), and the World Bank (1980, 1998). To build a more current version of that dataset, we will exploit the World Bank's GDP data using local currency (GDP-LCU) available online. However, for most countries, the data starts with the year 1989.

Data and measures for political globalization

Again, our notion of political globalization decenters the neoliberal project and policies around globalization. We conceptualize political globalization much in the same we do investment and trade globalization –the relative strength and density of larger versus smaller interaction networks and organizational structures. Substantively, it is the degree to which the world-system moves toward centralization, integration, and entrenched hierarchy. Specifically, we are measuring the relationship between the power and size of large and small political and military interaction networks and organizations. World-systems scholars contend that all such systems go through cycles of newer and deeper levels of political-military integration. This they call the hegemonic cycle. However, we intend to operationalize the hegemonic cycles separate from the emerging global governance but combined, to measure political globalization.

For determining the hegemonic sequence portion of the equation, we calculate the change in the distribution of economic and political/military power among the core states based on George Modelski and William R. Thompson's (1996) calculations which covers Sung China in the 10th century to the ascendancy of the United States. The basic logic underlying Modelski and Thompson's work is that economic growth is spatially and temporally uneven but that the rise and decline of leading sectors of the global economy are in tandem with the rise and decline of world powers, which reflects global politics. They maintain that sudden bursts of economic innovation are linked to global wars and ultimately leading to global leadership (here, one can consider the rise of the United States). To understand political globalization, we must also understand the rise and demise of interaction networks in world-systems.

Bounding and Comparing World-Systems

A long-term, historical view of measuring structural globalization, is not simply analyzing a single system over the past several thousand years. The modern world-system is one unit of analysis. As stated (Chase-Dunn and Hall 1992; Chase-Dunn and Lerro 2013; Inoue et al. 2015), we contend that whole small world-systems existed prior to the advent of the single world-system as we know it today, enabling us to see the nature and timing of the evolution of hierarchy and complexity. Still, a question of utmost urgency remains: how do we bound world-systems spatially and temporally in order to compare them? We begin with the understanding that all world-systems are defined by interaction networks that are often political-military in nature and they oscillate between growth and decline and that includes interacting polities and settlements. Therefore, any attempt at bounding world-systems would necessarily mean determining the temporal relationship between the growth and decline of cities/settlements and empires/polities and changes in the distribution of power among states and changes in the amount of interstate warfare. This allows comparative analysis between world-systems of varying sizes. However, single prestige goods networks (PGN) exists, and as others (Blanton, Kowalewski, and Feinman 1992; Peregrine 1991, 1996) have argued, are essential to understanding power and structures of authority in small world-systems as well as their growth and decline.

The Wintu, an indigenous people of late pre-historic Northern California, exemplifies a very small world-system (Chase-Dunn and Mann 1998). Their interaction networks linked tribelets (small-scale polities) across major linguistic divisions. These interaction networks were established through warfare, trade, and intermarriage ties. A single prestige goods network existed, which linked Northern and Central California, and was forged based on the exchange of clam-shall disk beads – proto-money that allowed village leaders to accumulate wealth. Within this very small world-system, core-periphery hierarchy, although slight, existed while core-periphery differentiation between the Wintu (who were valley-dwellers with large villages) and the Yana (who were hill-dwellers with much smaller villages) was quite important. Core-periphery hierarchy refers to the exploiting and/or dominating relationship between polities while core-periphery differentiation refers to the systemic interaction between polities with different degrees of population density. Notably, the prestige goods network of the Wintu was organized as gift-giving among village leaders who competed with each other to establish and maintain reputations of generosity.[7] This also served as an alternative to incursions during times of scarcity helping to reduce overall warfare. Still, a reduction in warfare facilitates the conditions for increasing population density, which is often associated with greater political stability and growing economic wealth. As with the Chumash in the Northern Channel Islands and their down-the-trade network with the Yokuts in the San Joaquin Valley and the Gabrieleño (Tongva) people in Los Angeles and Orange counties, what were are observing within this small world-system in pre-historic California, is semi-peripheral development (Chase-Dunn and Grell-Brisk 2016; Chase-Dunn and Mann 1998).

In our comparative method, the type of interaction network observed is crucial to understanding the distinct spatial characteristics and conditions for social reproduction and change within world-systems. Here, we take our cue from Patrick Kirch (1984) and Chase-Dunn and Hall (1997), who saw semi-peripheral development, exemplified by semi-peripheral marcher states, as a key marker for transformations of world-systems. They argued that semi-peripheral regions are ripe for technological, ideological and organizational innovations and that the marcher states are often the root cause of large upsweeps in polity size, changing the spatial boundaries of world-system interaction networks. As such, our bounding mechanism much be locale-centric (or place-centric) since all societies have important interactions with their neighboring societies, as demonstrated with the Wintu and their neighbors.

Given the cyclical nature of changes in all word systems, change is typically based on the rise and fall of large polities, and the oscillations in the spatial extent and intensity of trade networks. Again, this is often driven by semi-peripheral development. Therefore, bounding the world-systems would necessarily involve determining when and where these polity changes occur. We estimate changes in the boundaries and intensity of human interaction networks and then code the power configurations of interstate systems, as well as the world-system positions of settlements and polities within regional interaction networks. For each PMN, we calculate the level of centralization (by conquest or incorporation) and decentralization which may occur.

[7] For extended reading on the role of gift and gift-giving in society, consider the work of Marcel Mauss (1973).

By using the focal-five polities or place-centricity (Chase-Dunn and Hall 1997), and the fall-off rule (Chase-Dunn and Hall 1997; Renfrew 1977), we are able to determine the increasing spatial scale of and intensity of interaction networks and define the boundaries of the evolving international systems. First, we recognize the importance of a particular location based on the settlement/polity size and population density. Plus, the fall-off rule (the further away from the central polity/settlement one gets the weaker the quality of the interaction) allows for a very organic way of bounding systems. As settlements and polities grow, so do their interaction networks but, interaction networks are constrained in terms of how far of a net they can cast and the quality of the information the further from the center it goes, which can be understood as transportation and communication costs. Chase-Dunn and Hall (1997) have argued that in political-military networks, fall-off occurs after two or three indirect links – as polities get larger, and interactions occur over greater distances, each indirect link extends further across space but the point of important fall off will be approximately three indirect links.

Wilkinson argued that starting with the merger of the Mesopotamian and Egyptian regional systems in the Near East around 1500 BCE, the international system expanded as they collide and fused other world regional systems of Asia, Africa, Europe, West Africa, America, South Asia, and East Asia, resulting in the "Central Civilization" (sometimes called the Central State System). The integration of regional systems occurs through incorporation and engulfment as a result of interpolity warfare and alliances; in other words, interpolity political military interactions.

Warfare as an impetus for state/polity formation or even regional integration or disintegration is well established in the literature (Barfield 1989; Herbst 1990; Lattimore 1980; Thompson and Rasler 1999; Tilly 1985; Turchin 2003). Barfield (1989) and Lattimore (1980) demonstrate this dynamic using the relationship between the steppe nomads and farming settlers of China – the steppes grew by raiding resources from large farming settlers but also imposed a selective pressure on farming communities to cooperate with each other in order to survive their raids. Cohesion and interaction was often enhanced between polities on the frontiers. This is in part what Turchin et al. (2015b) labeled as cultural multilevel selection. Interpolity warfare and conflict then, are drivers of hierarchical differentiations between polities and also integral to the evolution of a regionally and globally networked interpolity system. Still, the question of how to bound these polities into world systems remains as important as ever. We demonstrate below, how we go about implementing this.

Bounding a world system: East Asian Interpolity System

According to Wilkinson, from about 1500BCE, the East Asian political-military network developed separately from the Central Civilization as the Far Eastern Civilization until 1850 AD when it was engulfed by the Central State System (Wilkinson 1987:31). However, Wilkinson argues that after the Battle of Baekgang (or the Battle of Hakusukinoe) around 663AD[8], Japan established its own interpolity system –what he calls the Japanese Civilization. Twelve centuries later, the Japanese Civilization falls apart and is absorbed into the Central State system. Wilkinson points to Japan's autonomy relative to the rest of the Far East, its "island" location, and its relative ethnic homogeneity to explain why it should be considered its own civilization as opposed to being part of the Far Eastern civilization (Wilkinson 1987, 1992b:68).

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[8] One could argue for an earlier inter-state military intervention by Japan (Wa) against the Korea (in the state of Goguryeo) in the 5th Century AD, but there is no archaeological evidence to support this. All we have is a mythology in Japanese history written in the Kojiki and Nihon Shoki. The attack on Goguryeo by Wa in 404AD is also included in the record about Goguryeo's conflicts in the Gwanggaeto Stele built in the city of Ji'an in China, which was the capital of Goguryeo. The stele celebrates King Gwanggaeto of Goguryeo's success in defeating Wa and expanding the territory.

We contend that Wilkinson's logic for arguing for the Battle of Baekgang as a turning point for Japan to form its own interpolity system is supported by the internal and external political-military history of Japan. Still, while Wilkinson treats Japan as an autonomous polity and understands that it had formed its own political-military network from the 7th century on, for us, the structural influence of the East Asian network—not only political-military but also trade and information networks—on Japan is clear and is crucial for bounding the Far East world-system.

With a place-centric approach, we reinterpret Wilkinson's Far Eastern Civilization by focusing on Japan. We acknowledge that Japanese state formation started in the 3rd century, during the Kofun era, and was completed in the 7th century with the state's bureaucratization (Ritsuryo system) and centralization programs (Batten 2003). The emperor became the head of the state, institutionalizing and incorporating the local elites' roles into the bureaucratic system. Japan was renamed as "Nihon" –a name that appears in the Kojiki and Nihon Shoki, mythologizing Japan's common ancestry amongst its people and solidifying its ethnic identity.

Furthermore, we maintain that despite establishing its own interpolity system (i.e. the Japanese Civilization as per Wilkinson), Japan was also part of the East Asian political-military network, expanding its interaction network before and after the 7th century. Local elites had historically engaged in interactions with their neighbors across the sea and although the centralization process curtailed these types of interactions, the Yamato polity of Japan, as part of the central government, led more state-to-state interactions with neighboring polities in the 7th century period. Japanese missions were sent to Sui China during this time period and their missions to Tang China continued through to the 9th century AD.

Prior to the 7th century, Japan was politically multipolar. Although it was ruled by imperial government, powerful local elites had relative political independence from the central government. There were contending local powers including Katsuragi (present Nara), Kibi (present Wakayama), and Tsukushi (Present Fukuoka), and they interacted with Kudara, a Korean state (Mori 2010). In fact, from the mid-3rd to the 6th and the 9th to the 10th century AD, there was much interaction between Japan and Korea and this enhance the power and legitimacy of local and state elites. In Japan, Kofun, or mound tombs represent the power of elites and this tomb-building style peaked in the 5th century. Evidence of intensified interactions of Japanese and Korean polities is represented by the Japanese-style burial mounds, built between the 5th and 6th century, found in the area around the Yeongsan River in Southwest Korea.

Some scholars have argued that the chiefs of Yeongsan River area adopted Japanese-style tomb as a signifier of their relationship with Japan, which they believed would help stave off the competing power, Baekje (Habuta 2008; Mori 2010; Tanaka 2002). The contention of other scholars is that the tombs belonged to the Japanese immigrants who worked for Baekje and the tombs served to restrain the chief in the Yeongsan River area (Nishitani 2001; Pak 2007; Yamamoto 2008). Either way, the choice of burial location played a significant diplomatic role between Japan (Wa Kingdom) and Baekje Kingdom (Pak 2010:7). Additionally, local elites took advantage of the symbolic power of tombs to enhance their political power. Local powerful families in Northern Kyusyu benefited from the relationship with Baekje given that it provided the local families more influence in Japan (Pak 2010).

Evidence of Japan's networked interactions with its neighbors is also revealed by the fact that while Japan did not possess the technology of producing iron in this period, there is documentation of their usage of iron weapons. Both state and local-family powers of Japan were dependent on the Southern area of Korea for their supply of iron. To establish military power and authority inside of Japan, where many small states competed with one another, many sought iron from Gaya (or Mimana, confederacy of territorial polities in the Nakdong River in southern Korea, 42-532AD) (Mori 2006). Iron weapons along with other artifacts were found in Kofun tombs.

We must also understand that war-making with Korea and China, particularly the Battle Baekgang forced Japan to reevaluate its internal structure. Defense facilities were built along Kyusyu (southernmost part of the island) and in the Seto inland sea shore (Batten 2001) but centralization became essential to its survival. It promoted and institutionalized the Ritsuryo bureaucratic system which it had imported from China. Local elites continued to retain political importance, with some locations in Kyusyu, such as Dazaifu and Hakata serving important roles in the central government. However, they were essentially under the Yamato government's control.

For the ancient states in Northeastern Asia—Japan, Korea and China–sustaining alliance with one another was more significant than territorial conquests over states, for establishing stability and strengthening internal authority. A place-centric approach allows us to understand the formation and expansion of the interpolity system and the boundaries of these systems are modified.

According to Wilkinson (1987), ethnicity was an important factor for Japan's evolution to its own civilization in the 7th century. However, we would argue that Japan's ethnic identity was subject to the "fall-off" dynamics. The formation of the very idea of uniform ethnicity was impacted by structural and geographical conditions. We point to Batten (2003, 2006), who asserts that "a sense of common identity as "Japanese" was not present until around 7000 AD. He maintains that the diffusion of ethnic identity came from the top down, elites to lower classes and this only begins in the 7th century during and crystalized post centralization. Initially the identity of "Japanese" was limited to the elite classes and for the most part, those in the lower classes had little consciousness of being "ethnically Japanese." Furthermore, it was only at the end of the 19th century that Japanese ethnic identity was common amongst the lower class (Batten 2003:91).

Batten also argues that the diffusion of an ethnic identity in Japan, seemed to have followed the "loss of strength gradient" (to borrow military parlance), as it expanded its national border (2001). To clarify, in the 7th century AD, the whole island was not fully integrated, but the national border expanded as the central polity incorporated the peripheral area, mainly the Tohoku region (North East region of Japan). Other areas were incorporated even later: Hokkaido (the northernmost of Japan) in the end of the 16th century; Okinawa (the southernmost of Japan) in the beginning of the 19th century (Batten 2001:28). The ethnic identity and culture of the core Japanese polity, diffused from the center to geographically distant area as the border of Japan expanded. The expansion followed the fall-off conditions that were formed with network connections of central and local polities.

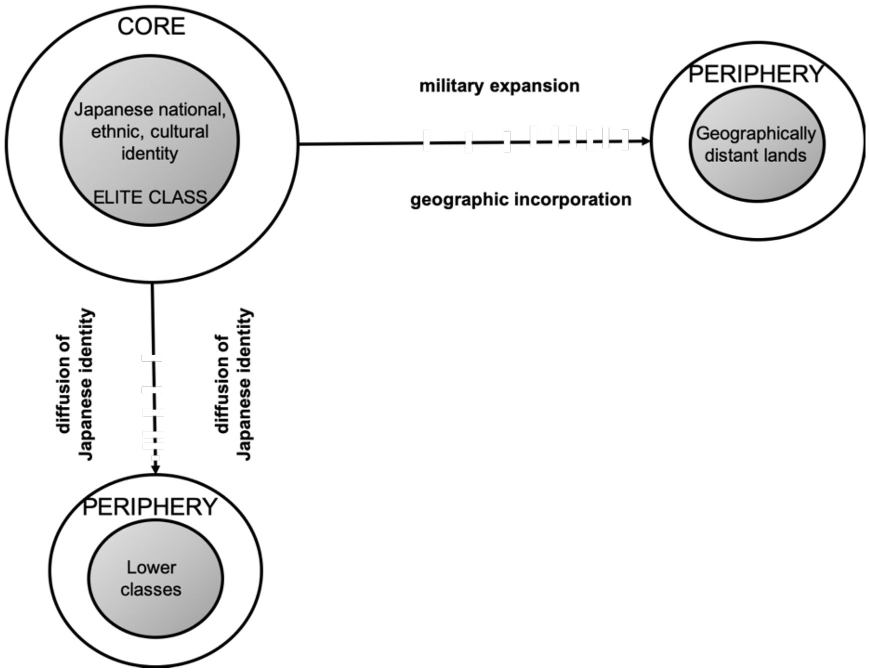

Figure 1. Diffusion and fall-off effect of Japanese national, ethnic, and cultural identity

As we can see in the figure above, integration was achieved through a top (elite class) to the bottom (lower class) method as well as through geographical expansion from the center to periphery. Ruling class in the core was bound up with a dense sense of the ethnicity, but as the social and geographic locations became more distant, this sense of "Japanese" identity became uneven, and sparse. The length of time, a unified Japanese ethnic identity took to form, highly suggests the single ethnic identity began from the center and Japan was still culturally multicentric in the periphery in the 7th century. It is of course, indicative of the fall-off rule for bounding the system. Further, this suggests that until the 7th century, this heterogeneity of national identity and the lack of the sense of unity with core Japan allowed peripheral powers within Japan to seek their independent interactions with the overseas polities.

The Comparative World-System Method Applied

Over the last **10** years**(?)**, the Institute for Research on World Systems' Settlements and Polities (SetPol) Working Group has been quantitatively measuring and identifying major polity size changes since the Bronze Age. Human interaction networks have expanded and intensified over the long run; that is, it has been and is undergoing a globalizing process. Similar work has been done by SESHAT.

SESHAT Global History Databank

Turchin and his colleagues (2015b) test contending theoretical hypotheses on the causes of large-scale polity formation and social complexity using their global historical databank, SESHAT. As a theoretical framework they combine functional and conflict theory to demonstrate cultural multi-level selection as an important external force for the emergence of social complexity. The cultural multilevel selection model used in the SESHAT project essentially factors warfare as the most important form of competition that acts to select for large-scale societies with high degrees of social cohesiveness. Additionally, they utilize the structural dynamic model (see our Theoretical Underpinnings section) to explain the internal mechanism for how societies rise and fall.

In the SESHAT dataset (Turchin et al. 2015a), they have divided the world into ten major regions – Africa, Europe, Central Eurasia, Southwest Asia, South Asia, Southeast Asia, East Asia, North America, South America, Oceania-Australia. They have also selected three "natural geographic areas" (NGAs) for each region. For the SESHAT group, the NGAs represent a variation in the level of complexity –low, intermediate, and high complexity. This is in part based on time/age of the polity as well as the population density. As an example, for the Africa region, the three NGAs are the Ghanian Coast (low complexity), Niger Inland Delta (intermediate complexity), and upper Egypt (high complexity). Therefore, the dataset collects a total of historical data samples from thirty areas around the globe and is claimed to collect as much variation and representativeness among sampled societies as possible.

While we use similar theoretical frameworks, it is important to note that difference between the SESHAT project and ours is the unit of analysis. For the SESHAT group it is the different societies they have included in their database, whereas for our project (SetPol) it is regional and global interpolity systems. We are particularly interested in how the systemic force of the past affects the formation of current inter-polity relationships and the internal state of polities and therefore, regard interaction network (especially political-military ones) as structural constraints for how the integration toward larger systems occur. The SESHAT approach does not factor in system-level constraints.

However, given that the theoretical purpose of their work is to understand how modern societies evolve from ancestral one, using single societies as the unit of analysis is legitimate. Each society is treated as a single independent case and systemic forces are not considered. Random sampling of data from various regions of the world can be important for making inferences regarding that particular population and can allow for cross societal comparative studies. Yet, the information on the impact of structural integration of networked polities and how they are formed is lost in this schema. As previously stated, two-way, regularized interactions are crucial to producing systemic differentiation. And, the interaction networks of consequence, with varying spatial scales, that impinge in any particular locale are the information, prestige good, political-military, and bulk goods networks. Therefore, they must be accounted for.

Interpolity networks and their structured relationship can make it easier or harder for polities to grow. Such systemic constraints are one of the important causal variables for the formation of large-scale complex polities. This impact is not explained by sampling regions with divided space and time based on homogeneous cultural characteristics. Furthermore, it is our contention we need to consider the possibility that some networks, through their interactions, are more important relative to others, in their capacity to reproduce and change local as well as regional structures and institutions. Randomly selected data may or may not include these connections and interactions that have such historically consequential impacts. Still for our purposes, SESHAT data can be incorporated within our framework to aid in our understanding of the historical formation of political-military networks.

Settlements and Polities (SetPol)

The SetPol framework is first and foremost, interdisciplinary. We have constructed a graph database which inventories explanations of systemic change from Sociology, Anthropology, Ecology and Political Science. Our goal is to empirically identify and quantify the specific time points when the scale of sociocultural systems and interaction networks change significantly. Since the Bronze Age, polities and interpolity systems produce iterations of centralization through conquest (as with the semi-peripheral marcher states described by Chase-Dunn and Hall (1997)) or incorporation (see for example, Hall (1998) or Wallerstein (1973)) and decentralization as a result of declining centralized power. We focus on territorial sizes of polities and the population sizes of settlements as these are evidentially quantifiable and permit us to differentiate between small and broad cyclical changes in a world-system.

All world-systems exhibit cyclical processes of change –through the rise and fall of large polities and oscillations in the spatial extent and intensity of interaction networks. This corresponds to the centralization and distribution of power amongst polities involved in the interaction networks. We argue that causal processes of a polity's rise and fall is dependent on the predominant mode of accumulation. Thus, a major difference between the rise and fall of empires (eg. Roman empire) and that of modern hegemonies (eg United Kingdom) is the degree of centralization achieved by the core. If we were to examine tributary systems, they tend to oscillate between multiple and competing cores compared to modern hegemonies that tend to pursue to capitalist form of accumulation. Even still, inter-chiefdom systems work differently as they do not have the institutional foundation to facilitate distant resource extraction.

An illustrative example is the Mississippian chiefdoms in the Savannah River valley (Anderson 1994). Chiefs depended on hierarchical kinship relations, control of ritual hierarchies and control of the import of prestige goods, which hinged on normative integration and ideological consensus. Chiefly polities extended control over adjacent chiefdoms and instituted a two-tiered hierarchy of administration. So, over time, when these regionally centralized polities collapse, they simply reverted back to smaller less hierarchical polities. Rise and fall of polities as well as the alternating spatial extent and intensity of interaction networks can therefore be captured using our bounding mechanisms as well as through spatio-temporal chronographs (see (Chase-Dunn et al. 2015:160) for an example). We propose that the chronographs be modeled on Wilkinson's work (1987) on the emergence of the central political-military network to create a relational database which would link settlements, polities, and regional political-military networks with a particular time period.

Setpol is particularly interested in the changes in the scale of polities and cities and therefore, this is our dependent variable, which we view as characteristics of the region or the interaction network. Our main independent variables are the world-system positions of polities and cities, the power configurations of interstate systems, and changes in the intensity of warfare. Our current SetPol dataset include historical quantitative estimates of demographic characteristics of settlements and polities.

We have identified five world regions – Mesopotamia, Egypt, South Asia, and East Asia – each, with individual cities and polities, and networks of interacting cities and polities building on the work of David Wilkinson (1987, 1992b, 1992a, 1993, 2004) and Philippe Beaujard (2005, 2009, 2012). The spatial boundaries of each of the world regions follow the rules of place-centrality and two indirect interactions from the center of the region's key settlements. We approximate the growth and intensity as well as collapse of interaction networks that have constituted economic and political globalization since the late Bronze Age. With increasing centralization, territorial expansion and population growth, we determine the scale of sociocultural change, identifying them as upswings, downswings, upsweeps and collapses.

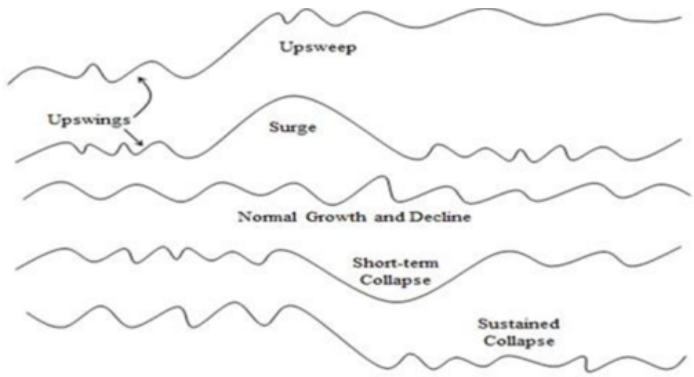

Figure 2. Types of medium-term scale changes in the largest cities and polities

When a polity within a region gains a substantial increase in size from the largest previous polity in size, of that region, we identify this change as an upsweep (Inoue et al. 2012, 2015). We consider this a meaningful change that affects the world-system. Upsweeps typically occur due to:

semiperipheral marcher states – polities inhabiting the semiperipheral power position within a regional system, which then conquers a large portion of the area and produces a territorial upsweep

peripheral marcher states – polities inhabiting the peripheral power position that then conquers the core states as in the case of the Mongol Empire

mirror-empire – wherein core states under pressure from non-core polities engage in territorial expansion

internal revolt – wherein state formation occurs given internal ethnic or class rebellion as in the case of the Addadian Empire

internal dynastic change – when a coup is perpetrated by a rising faction within the ruling class of a polity which in turn leads to territorial expansion

Since the Bronze Age, there has been twenty-one such upsweeps (Inoue et al. 2016). It has been determined that over half of them were due to semiperipheral marcher states (10 such instances) or peripheral marcher states (3 such instances).

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