Resilience and stability trade-offs in China and Europe as systems of systems

ABSTRACT

This article advances two central claims. The first is a methodological one: that patterns of long-term historical change can be better understood by studying them at the system level rather than by insisting on more traditional equilibrium foundations grounded in models of individual behavior. The second claim is empirical: Different network structures determine the capacity of European and Chinese historical regimes to weather intermittent upheavals and transitions. China's more centralized "hypernetwork" structure made it less resilient (in the ecological sense) than Europe's less centralized structure.

1. INTRODUCTION: THE REMARKABLE LONGEVITY OF DYNASTIC LORDSHIP IN CHINA AND EUROPE

It is axiomatic in comparative history that Europe’s decentralized and competitive state system is the key to its developmental divergence from China.¹ This paper references advances

¹ Marc Bloch argues in *Feudal Society* that political fragmentation constrained centralizing monarchs from exercising personal absolutism; because merchants had options for exit, monarchs were prevented from gaining confiscatory powers over the property rights of their subjects (2014, 431). Avner Greif and Guido Tabellini (2010) write that by 1350, Europe’s political fragmentation enabled cities to gain self-governance, and this facilitated the building of institutions where contractual obligations were enforced via impersonal mechanisms. In “Why Europe and the West? Why not China?” (2006), another economic historian, David Landes,
writes that political fragmentation and national rivalries compelled European rulers to pay heed to their citizens, recognize their rights, and promote economic development. Brandt, Ma and Rawski (2014) point out that institutions of imperial China revolved around a unitary regime and state control. This promoted stability and prevented economic and institutional reforms that could have threatened the socioeconomic status quo. Modern Chinese economic growth resulted from the removal of the institutional barriers.

In *How the West Grew Rich* (1985), Nathan Rosenberg and L. E. Birdzell claim that the West drew its advantage from institutional arrangements that served to diffuse political power and authority, and that these proved to be economically more efficient than the alternatives. “What the West’s feudal system had within itself, in its very diffusion of power and its capacity to create towns and cities outside itself and different in their fundamental framework from feudal institutions,” they write, “laid the foundations for a successor society which accelerated technological change” (59–62). China’s slower growth rate they attribute to the “existence of a central authority strong enough to check the determination of merchants to gain access to profitable trading opportunities” (136–137).

In *The Lever of Riches: Technological Creativity and Economic Progress* (1990), Joel Mokyr agrees that political fragmentation, by fostering political competition between units, created the right incentives for Europe’s technological progress. In contrast, he claims, innovators were viewed as troublemakers by a reactionary bureaucracy in China, which preferred a stable and controllable environment (231). “In Europe, precisely because technological change was private in nature and took place in a decentralized, politically competitive setting, it could be sustained in the long run” (238). That fragmentation enabled European cities to gain self-governance and develop their own charters and civil codes. Competition between cities and states fostered social
in network theory to show why it is not enough to say that Europe’s dynamism stems from its decentralized political competition. Interstate rivalries and war were also critical features of China’s geopolitical landscape. But in China, competition produced severe periods of disruption and collapse that had no parallels in Europe (2016, 4, 10).

A decentralized system is one comprising random connections among a number of nodes whose links to a few highly connected hubs prevent them from falling into isolation. In such networks, even when a hub is destroyed, the remaining nodes diffuse and reconnect to a neighbor. Decentralization merely describes a system comprised of subunits that are modules of a larger whole. It does not address how information travels between the modules via the larger hubs of small-world networks.

One of the mysteries of Europe’s cultural continuity resides in exactly this kind of small-world network connectivity—a hierarchy of many small nodes held together by a few large hubs that are themselves connected to a small number of yet larger hubs. The smaller nodes of the many different subunits are not isolated, and the behavior of the system, even under extreme stress, is not entirely random, lending resilience to the system as a whole.

Europe’s royal families were the hubs of this system and, like the CEOs of large corporations, bridged the various modules to unify the discrete functionalities of the different and economic mobility, allowing individuals to pursue incentives, and aiding institutional development. Self-governance and competition were absent in China.

Other prominent scholars reliant on the “competitive state system vs. unified imperium paradigm” to compare Europe’s dynamism with China’s stasis include Montesquieu (trans. 1900), Karl Marx (1861), Max Weber (1927), Jared Diamond (2005), Geoffrey Parker (1996, 2008), and Immanuel Wallerstein (2004).
subunits. This network structure of decentralized yet interconnected hubs enabled Europe to adapt to a changing environment, survive disruptive events, and accommodate coevolutionary changes across local systems.

The paradox of being both modular and interconnected explains the dynamics of Europe’s resilience relative to China’s, as shall be discussed; differences in structure and resilience affected the long-term change capacity of each and produced what has come to be known as the great divergence.

Only recently have scholars of institutional change and economic development come to recognize that the central questions of how social institutions emerge, adapt, and evolve echo similar debates long occurring in the natural sciences, where it is understood that ecosystems are complex adaptive systems. Social scientists are now starting to apply the connections between a system’s microscopic and macroscopic components.

This paper argues for the view that the historical regimes in both China and Europe (and, in fact, all historical regimes) are multiscale systems in which different levels of hierarchy exist and intermingle, giving rise to change processes across levels. The resilience of regime dynamics resides in the pattern of connectivity among the hubs of the system—the system’s hypernetwork—rather than from a simple aggregation of agent-level equilibria. The different structures of their respective hypernetworks determined the capacity of European and Chinese

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2. S. A. Levin (1992) writes that pattern and scale are the central problems for ecology. “Arguably, the need for a formalism to represent multilevel dynamics is this century’s greatest obstacle to scientific progress,” notes mathematician Jeffrey Johnson (2013, 178).
historical regimes to weather intermittent upheavals and transitions (2013). But there were trade-offs—advantages and disadvantages to the network design of both systems—as illustrated in the evolution of Europe and China.

In the case of Europe, one such trade-off was redundancy, in the replication of communication channels among the multitudes of political jurisdictions, as well as considerable institutional redundancy. Yet Europe’s state resilience lay in the multiple connected dynasties ruling across the continental “fabric.” The aggregate hypernetwork structure they formed kept Europe from transitioning into instability when abrupt shocks disabled a particular royal lineage. Even if a royal house fell, the remaining hubs would self-organize by “rerouting the traffic” on the network. Understanding this ability to reconfigure without system-level breakdown is essential for explaining the dynamics of Europe’s long-term development trajectory.

China’s regime structure, with an emperor at the center of a hub-and-spoke structure of governance, produced a hypernetwork of a different kind; its strength resided in the efficiency with which information circulated from one end of a far-flung empire to another; but the hypernetwork structure also made the state more vulnerable to massive shocks. In times of great disruption, only the links that were connected with other links could hold the empire together, and China had few of these.

In China there was less redundancy; fewer nodes meant optimized information arrived more efficiently at the center; and this contributed to system stability. The dynasties themselves

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3. A hypernetwork then is the shared element among the levels of a system and can form a hub-and-spoke or starlike structure, or be entirely decentralized without any return to scale. As a multiscale system, a social system can have multiple hypernetworks, but this study concentrates on one: dynastic succession among royal houses. The papacy is another parallel hypernetwork.
lasted generations, if not centuries. Yet should the central hub fail, the disrupted communication channels would render the entire polity more susceptible to collapse. Imperial China grew vulnerable to intervals of extreme disorder since subsidiary systems of governance had to be rebuilt and replaced. Each dynasty’s collapse disabled the center, and without it, the remaining nodes, much like isolated islands, were unable to communicate. Nevertheless, the centralized institutions of China’s dynastic system invariably reappeared following disruption, in great part because of its long-established efficiency in transferring information from the top to the bottom.

The speed and efficiency with which communication moved along a centralized grid enabled innovations to diffuse quickly, which may help explain China’s technological superiority over Europe before the eighteenth century. Those gains in the efficiency of communication, however, came at the expense of self-organizing resilience. Once Europe was able to reap the benefits that came with the horizontal movement of communication across hubs, it was able to close the gap, eventually to overtake China by the late eighteenth century. Europe’s individual states influenced one another directly; information did not have to pass through a center that might filter it. Disruptive innovations could more easily survive and spread, which gave the European system an advantage over China. Nevertheless, the properties of the network structure may be maladaptive over the long term.

By making the relational structures within multilevel systems more explicit, hypernetworks enable us to identify and understand long-term institutional stationarity and to better grasp:

(1) why Europe emerged as a system that is more than the sum of its parts, despite its many diverse components evolving separately;
(2) why war was unavoidable in Europe, notwithstanding the degree of intermarriage among the royal houses⁴;

(3) how events in one module can cause a sequencing of clustering transitions, e.g., the Renaissance that began in the Italian city states, the Reformation in a small German principality, and the French Revolution and the subsequent spread of nationalism;

(4) why durable regime transitions occur during periods of intermittent hyperactivity, followed by long periods of stasis, such as the resurgence of conservatism in France after the worker rebellions of 1848 were crushed; and

(5) why there are intervals, frequently lasting generations, of intense and prolonged warfare and extreme disorder between dynastic transitions in China.

2. INSTITUTIONS AND EQUILIBRIUM IN POLITICAL ECONOMY ANALYSIS

The central claim of this paper is that micro-level equilibria, whether institutional transitions or events, rarely approximate the long-term behavior of a social system. In this regard, social systems do not differ from other complex systems. Despite significant turmoil and variability at micro-levels, notes Robert Axtell (2014), complex systems frequently display long-term stationarity, and can exhibit aggregate steady states.⁵ Thus a general theory of the

⁴ Miranda Carter, George, Nicholas and Wilhelm: Three Royal Cousins and the Road to World War I.

⁵ Robert Axtell discusses social processes where “perpetual adaptation, coevolution, and strategic adjustments are observed at the agent-level, while steady states obtain at the macro-
macroevolution of historical regimes cannot be deduced from agent-level equilibria among the system’s constituent parts.

This flies in the face of the current emphasis of agent-level equilibria in mainstream economic analysis. Today the political economy of institutions enjoys a central position in the study of large-scale political, economic, and social change; and with the concept of institutions as equilibria, it joins the mainstream of economic analysis. In more general work in economics, level” (2014,1). Agent computing at full scale of the privately invested US economy, which employs 120 million workers, enables Axtell (2016) to observe stationary distributions at the aggregate level, despite continuous adaptation at agent levels. He finds continuous agent-level fluctuation, as millions of job seekers change employment in every period and new firms continuously enter the market. Yet the distribution of firm size and the scale of labor flows appear to be constant over time. The survival probability of younger firms remains constant as well. Analogues in the natural sciences include, for example, viruses and bacteria, which undergo many types of equilibria during the average human life span of seventy years. Within forest ecosystems, the relationships between foxes and rabbits can undergo a great number of different reproductive cycles in the life span of a forest.

6. In the original proposition of economic historian Douglass North, institutions are “the humanly devised constraints that shape human interaction” and the “rules of the game” (1990, 3). This insight led early work in new institutional economics to focus on exogenous constraints (or exogenously given rational choice “game forms”). But it has become apparent that institutions as rules of the game cannot, by themselves and through decree, constrain behavior. North’s institutions as rules thesis did not apply the concept of equilibrium, although it was implicit in
a “model” usually implies a search for equilibrium, a point of balance, a condition of rest, a state of the system toward which the model depicts convergence over time. An economy is either at equilibrium (or one of its equilibrium positions) or is moving—and probably moving rapidly—toward an equilibrium. That position has three basic properties: the consistent behavior of the agents; stability, which is the outcome of some dynamic process; and the lack of incentives for agents to change their behavior or coalitional structure once an equilibrium is attained.

Pointing to the shifting consensus in favor of the institutions as equilibria approach, institutional economists Avner Greif and Christopher Kingston (2011) remark that “a growing body of recent research on institutions places a theory of motivation at the center of the analysis, and thereby endogenizes the ‘enforcement of the rules.’… This perspective focuses on how interactions among purposeful agents create the structure that gives each of them the motivation to act in a manner perpetuating this structure. …” (2011).

The concept of institutions as equilibria does enable us to see how individuals, acting in self-interested ways and according to their environmental constraints, create, evolve, and enforce his rules of the game. The concept of institutions as equilibria of strategic games, in which rule-based institutions are the mechanisms by which people are incentivized to follow certain behaviors and practices, is a natural correlate to the original proposition. According to the expanded theory, a “regularity of behavior” is the endogenous motivator that creates and sustains an institution (1979; 2005).

7. For example, to understand economic growth, economists seek an equilibrium in which an economy’s capital stock per worker, its level of real GDP per worker, and its efficiency of labor all grow at the same proportional rate. Once the capital-output ratio is equal to its balanced-growth equilibrium value, the economy is on its balanced-growth path.
rules (*institutions as rules*) to transact business and engage productively. Over time, as rules become encoded and formalized, and penalties are prescribed to punish deviations, these interactions lead to an overall social equilibrium in which it becomes in everyone’s self-interest to adhere to the institutional setups (the rules of the game).

The result, according to this approach, is an agent-level equilibrium that translates to an overall systemic equilibrium, which is then formalized as an institutional setup, or pact, such as the laws enacted by Parliament or Congress, contract enforcement mechanisms to conduct trade, and electoral systems. From this overall equilibrium derived from agent-level interactions, we are said to be able to observe a system-level stability.8

Few works on dynastic succession, in fact, employ models that imply a search for equilibrium. A notable example is a 2000 study by Bruce Bueno de Mesquita, “Popes, Kings, and Endogenous Institutions: The Concordat of Worms and the Origins of Sovereignty.” He demonstrates that the resolution of the Investiture Controversy (a power struggle between the papacy and monarchy) created a changed strategic environment with multiple equilibria that, on the one hand, induced kings to promote economic growth to gain control over the papacy, and, on the other, induced the Church to invent new institutions to stymie economic growth in order to maintain its political centrality. As kings won this struggle over time, the papacy’s primacy in

8. Frank Hindriks and Francesco Guala (2015) call for combining both approaches in a single framework, noting that the regularities of behavior to which all members of society agree are difficult to separate from the rules, and that it is unrealistic to say that the rules are redundant and that only actions matter. A rules-in-equilibria account,” they insist, is preferable to either the *institutions as rules* or the *institutions as equilibria* conception because it recognizes that institutions help players reach coordination and economize on cognitive effort.
determining dynastic succession gradually collapsed in favor first of monarchy and then, gradually, in favor of more democratic politics. Thus, macro-level change is explained in a micro-level equilibrium environment.

In Bueno de Mesquita’s account (as well other work with Alastair Smith 2009), endogenous institutional change produced by revolutionary threats and coup threats are the micro-level mechanism yielding macro-level change. This research program is exemplary in the use of the mechanics of equilibrium analysis at the agent level to deal with complex historical phenomena. But this approach does not reveal how policy selection and agent dynamics are related to ongoing processes at the macro level. Were the agent-level strategies actual reflections of system-level constraints that could not be altered by the dint of agent efforts? The analysis that follows attempts to demonstrate the linkages between various or multiple levels.

This paper also argues that revolutionary challenges are unlikely to succeed unless they penetrate the macro environment. Thus efforts in Europe to establish a republic, first by the Dutch in the late sixteenth century and later by revolutionary France in the eighteenth century, were short-lived and suffered numerous reversals after incurring the strong opposition of neighboring monarchs.9 Republics could not survive without changes in the macro structure of power in Europe.

Napoleon grasped this idea, which is why he invaded Russia and risked losing most of his army in 1812. He understood, in the language of his day, that the command structure of Europe had small-world properties in its networks of royal families and that they functioned as hubs, with connections to subordinate members across the entire continent. Napoleon believed that the

9. The Republic of the Seven United Provinces existed from 1581 until 1795, but for much of the time there was an elected Stadholder from the House of Orange.
only way to preserve the fundamental values of the French Revolution was to destroy the hubs of
the old structure, and to create a new structure, establishing himself as the central hub. His fear
was that even if just one hub of the old distributed system remained, it could restore the hubs that
had been deleted, putting the revolution in jeopardy.

He was proved correct by the events that followed his defeat. A reactionary Russia under
Czar Nicholas I became the gendarme of nineteenth-century Europe, eventually helping
Austrians defeat the Hungarian uprising in 1848. The czar’s own empire was predominantly
Slavic, but he identified his interests with the fortunes of a fellow monarch, not with the people
he ruled. The failure of Europe’s 1848 revolutions are illustrations of how revolutionary pacts in
particular states are unlikely to survive unless they alter the network structure of larger ecology
that determines the macro system’s logic.

One of the principal analytical advantages of distinguishing a system’s macro-level
properties is that some of these system properties are neither discernable from the properties of
the system’s agents nor reducible to the behavior of the agents. As we will discuss, resilience is
one such property. Chandler (2014) and Holling (1973) argue that stability is another system-
level property, and illustrate that there are trade-offs between stability and resilience—although
over the time frames discussed, these trade-offs were not even knowable by the agents.

3. IDENTIFYING HYPERNETWORKS IN EUROPE AND CHINA

This paper proposes to correct the idea that agent-level equilibria can aggregate to create
equilibria at the macro level. It argues that disequilibria at agent levels—seen in shifting borders,
revolutionary pacts, the rise and fall of royal houses, and other actions and interactions occurring
within that complex system—do not aggregate into a pattern of interplay at the macro level. Despite fluctuation within a particular nation state or states, the properties of resilience and stability that reside in the hypernetwork——can remain unchanged.

A focus on the nation state as the level of analysis will not reveal the key institutional determinants that account for the longevity of Europe and China relative to other historical regimes. European dynasties rose and fell, borders shifted, any part of Europe could be invaded by any other part. Yet Europe’s hypernetwork, its small world of interconnected families, provided continuity that transcended the nation states, and would break apart only with the removal of all the hubs. In China as well, dynasties rose and fell, and their collapse brought periods of chaos; yet the resilient hyperstructure reappeared time after time, in its familiar hub-and-spoke form.

A hypernetwork, as a class of macroscopic phenomena, has its own complex dynamics. Like the backcloth of an opera, it remains stationary, unaffected by the drama on the center stage. Despite fluctuations in their micro dynamics, the respective hypernetworks of both China and Europe the continuation of political power but played different roles in the state development of each. Both societies established rules-based systems for clear and incontestable lines of hereditary dynastic succession. Unlike other known historical meta-regimes, such as the Roman, Ottoman, or Mughal empires, Europe and China introduced orderly principles for dynastic succession, and from the tenth century onward, their historical regimes were able to exhibit remarkable relative longevity. Dynastic lordship was a key institutional determinant for this constancy, and underlies what historian Vivek Swaroop Sharma calls the “nature of authority in the society as a whole” (2015, 157).
3.1 The Hypernetwork Structure and Resilience:

Europe experienced a catastrophic breakdown after the highly centralized Roman Imperium broke apart in the fifth century. The imperial system was abandoned, and an entirely new form of government evolved across the continent. Based on feudalism, it eventually led to the consolidation of states into disparate sovereign units. No center remained; instead, the continent’s dynamism shifted from one region to another. European regimes came and went, and advantage shifted from one hub to another, without any one hub strong enough to secure a monopoly on victory. A shift of power from one dynastic lineage to another did not entail catastrophic, continent-wide demographic outcomes.

This kind of scale-free structure protects the system from random failure, and because the ecology in which they inhabited survived, Europe’s interconnected monarchies remained intact as a governing class, exhibiting both continuity and change over a millennium. Despite fundamental changes in technology and in local institutions and culture, Europe was governed continuously as a small-world network of princely and royal houses.

The European system of dynastic lordship maintained its stationarity, despite a wide spectrum of observed micro equilibria at agent levels, where profound variations in outlook existed and formal institutions came and went. An innovation by one dynasty was parried by a counterthrust from another. Yet this did not mean that the networks were highly stable, just that the small-world networks of great families outlived these variations. Although intermarried, the Hapsburgs, Bourbons, and Hohenzollerns constantly competed to contain each other’s ambitions and prevent any one family from dominating the others.

Because the Europeans were not under a centrally controlled “command system,” this competition had amplifying effects, accelerating the development and articulation of states
whose own intrinsic capabilities were well matched to their intrinsic conditions. The decentralization of management created the capacity to adapt locally while preserving the strength of the network.\textsuperscript{10}

The resilience of the European state system generally resided in the adaptive capacity of its distributed, network structure that could survive drastic events. Yet in a paradox of its small-world network structure, Europe proved to be both highly unstable and highly resilient.\textsuperscript{11} This is because a decentralized network comprising many dense connections is more difficult to supervise and thus may be more prone to disruptive large events that could eliminate one or more hubs. What this small-world hypernetwork lost in stability, however, it gained in the capacity to accommodate and absorb intermittent stresses. With its distributed mesh-like architecture, enough redundancy existed that even if some hubs were deleted, alternatives connections remained among the remaining hubs for communication to be sustained. The density of connections among the hubs made it hard to control information diffusion from any one central

\textsuperscript{10} Being interconnected did not mean being interchangeable. Over time, legitimacy of a particular lineage called for acceptance within the local culture, obligating royalty to embody the local values of their subjects. Thus, after the Reformation, royal intermarriages across faiths are rare, causing segregation between the royal families based in northern and southern Europe. Despite her German lineage, Queen Victoria would taunt Kaiser Wilhelm that things English were superior to things German. In 1917, when Tsar Nicholas II of Russia was tried in Moscow for treason, his first cousin King George V of Great Britain did not propose safe haven for fear of alienating the British population that viewed Russia’s tsars as tyrants.

\textsuperscript{11} The implications for a system’s aggregate resilience of small-world connectivity are discussed in Newman, Barabasi, and Watts (2006); Barabasi (2003); Strogatz (2003).
place; actions and ideas could spread horizontally. Thus even when intermittent and episodic transformations at agent levels occurred, the macro-stability of the system was not disabled.

The composite and timeless representation of European dynastic marriages from the fourteenth through the twentieth century (see Figure 1 below) suggests why describing Europe as merely being decentralized gives short shrift to the pattern of hub-based communication that enables lateral communication across the network, while imposing barriers to attack.

Figure 1. The European Network of Dynastic Marriages

This Gephi software diagram depicts European dynastic marriages from the twelfth through the twentieth centuries as a scale-free network, in which a few highly connected hubs connect the smaller nodes with one another. With every node linked to every other through a hub, connectivity can expand explosively. For such a system to collapse, all the central hubs
must be destroyed; otherwise the traffic will reroute among the surviving hubs.\textsuperscript{12}

The ease of organizing lateral communication among the parts of the system may have been a long-term contributor to Europe’s economic take-off. Coevolutionary change, such as the Renaissance, the Reformation, the Enlightenment, and the Industrial Revolution, could start in one part of Europe and spread to attain continent-wide significance. Such events altered the traffic flow, eliminating some nodes while adding others; nevertheless, the surviving hubs could redirect the traffic and, through self-organization, reconstruct the system (see “Appendix: Diagrams of Network Structure and Implications for Political Economy”).

4. RESILIENCE AND STABILITY TRADE-OFFS IN CHINA AND EUROPE

The trade-offs between the properties of stability and resilience in the hypernetwork of Europe (its small world of interconnected families) and the hypernetwork in China (that of rule by emperor) were ultimately made according to widely different \textit{adaptive values}: Redundancies

\textsuperscript{12} The timeless, scale-free character of the network, represented with Gephi software, shows 3,972 dynastic marriages beginning in the twelfth century. The data are collected with DBpedia. The dynasties include royalty, as well as nobility, popes, bishops, and electors. Bishops and popes are expected to be celibate, but some had children for the express purpose of establishing alliances, and these are included. Node size is based on connectivity determined by centrality and betweenness. For an overview of these measures a good source is Wikipedia.org/wiki/Centrality. Neither time nor nationality is taken into account. The diagram depicts the underlying graph structure of the network.
in the European system absorbed considerable scarce resources. China utilized a far more
efficient system of communication, but with the attendant risks of a central hub.

In Chinese history, the “transitions” were never peaceful. Rebellion from within and
invasion from without produced cycles of decay of long duration, in which the institutions of
central rule retreated or disappeared entirely. During these transitions, the underlying economic
and social situations of the population suffered on a massive scale. Nearly a century of intense
warfare traversed the transition from the Yuan to Ming dynasties (1350–1450). The fall of the
Ming to the Qing dynasty spanned the period 1550–1683, with warfare continuing into the early
eighteenth century. The rebuilding process was exhaustive. Successive dynasties were forced to
rebuild an entire system; the formal rules and norms, as well as the formal institutions with their
memberships, constituencies, and stakeholders—all had to be re-created.

significant distinction between resilience and stability with applications to the institutional
dynamics of complex systems. They argue that a regime built for stability will enjoy less self-
organization and induced variation, and indeed the Chinese hypernetwork of the eighteenth and
nineteenth centuries exhibited little variation from its starting point.

This stability made it very similar to Europe at macro levels—but even at the micro
levels, China experienced far less variation. What made the European system more resilient was
that, despite considerable adaptive evolution at micro levels, its hypernetwork survived dramatic
local transitions intact. The greater resilience of Europe’s hypernetwork enabled local
institutions of governance, of technology diffusion, and ideological adaptation to evolve far
beyond their points of departure.
The definition of resilience in common use by ecologists applies here. Resilience is the ability of the macrosystem to absorb disturbances occurring within the local subsystems, while retaining its own system of rules and procedures. But resilience here also shapes the capacity of the microsystem, the regime.

“Resilience determines the persistence of relationships within a system,” writes Holling, “and is a measure of the ability of these systems to absorb changes in state variables, driving variables, and parameters, and still persist” (1973, 17). In this sense, the hypernetwork’s resilience is a gauge of the maximum perturbation that a regime can withstand, and its capacity, afterward, to make adaptations that foster the next wave of transition. “Stability, on the other hand,” notes Holling, is the ability of a system to return to an equilibrium state after a temporary disturbance” (1973, 17). Holling et al. refined the definition of resilience further, pointing to (1) the degree of the disturbance that can be absorbed before a state change occurs; and (2) the rate of recovery from a perturbation (1995).13

This remainder of this paper seeks to understand why, within the historical time frame of roughly a thousand years, one property was dominant in Europe, and the other in China. What do the trade-offs between stability and resilience mean in terms of terms of political economy? Why do these properties that reside in the hypernetwork remain essentially unchanged, despite fluctuations at the national state level?

13. Holling’s expanded definition of resilience to “[r]esilience is the buffer capacity or ability to absorb perturbation or the magnitude of the disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behavior” (2016).
5. THE ENDURANCE OF DYNASTIC LORDSHIP IN EUROPE

5.1. Europe as a Small-World Network

The high instability of particular regimes makes Europe seem weak and vulnerable to easy conquest; its intrastate governance seemed far less robust, compared to China’s. However, the small-world network structure of the Europe-wide aristocracy acted as the source of system-wide continuity. In such small-world networks, most of the components (nodes) are not themselves linked; but a small number of high-degree nodes link many of the nodes to any other, and to other high-degree (high-connectivity) nodes that derive their social power from the length of their connectivity to other high-degree nodes rather than extent of their connectivity to a larger number of smaller nodes.

The industrialization of Great Britain exemplifies this remarkable continuity, balancing aristocratic entitlements with the ambitions of the rising industrial elites. Even after systems of production were transformed, no such dramatic events or clearly decisive changes to the social structure of authority occurred (1953, 13). “[T]he aristocracy successfully maintained its power during all the vicissitudes of three-quarters of a millennium, during which almost everything else changed, quite drastically” (1961, 19). The knightly aristocracy, along with the monarchy, surrendered their primacy in Britain’s social ordering only after World War II (1999).

The evolution of royal families fanning out across Europe then, which allowed for multiple connections among various regions and systems, is a prime example of hypernetwork activity. When World War I broke out in 1914, monarchs ruled most European states, and almost all the royals were somehow related to one another in a kind of small-world network; Queen
Victoria’s direct descendants sat on the thrones of Britain, Denmark, Greece, Germany, Norway, Russian, and Spain, earning her the sobriquet “Grandmother of Europe.” The social and economic effects of industrialization did not deter the crowned heads of Europe from consolidating their national powers and alliances.\textsuperscript{14}

Of the major European nations, only France and Switzerland were outliers. Switzerland did not fight in World War I, and France entered the war as a republic. “Except in France the kings remained the divinely ordained ‘centerpieces’ of Europe’s authority systems,” writes historian Arno Mayer in his magisterial study of the end of the old order in Europe (1981, 11). He notes that “[e]ven in France, where the ancient regime was pronounced legally dead between 1789 and 1793, it kept resurfacing violently and lived on in many ways for more than a century” (1981, 6). Four failed efforts to restore monarchical government occurred during the nineteenth century, and royalist sympathizers within France were abetted by their supporters across the continent.

The collection of royal families spread out across Europe as a hypernetwork shaped the territorial evolution of European states and gave order into the whole system. Yet most scholarship of European state building maintains primarily a national level, emphasizing competitive state-level fragmentation rather than a system-level focus.

5.2. Intermarriages among Noble Houses

\textsuperscript{14} Her importance in the network structure of European royalty comes from her ancestors, most notably King George III, being highly connected.
It is remarkable that during the late medieval period, circa 1500, Europe contained more than five hundred distinct dominions—sovereign or quasi-sovereign jurisdictions that were largely independent political units. Yet no matter how fragmented feudal Europe was to become, no town or village could ever legally claim to be the subject of more than one kingdom or owe fealty to more than one king. A testimony to the strength of the monarchical tradition is that although many independent powers arose, only to fall into decay, even at the peak of power, none ever dared to claim a royal title or to deny the bonds of fealty to a king. Marc Bloch comments that “no great feudatory, however powerful he might be, ever dared to demand the most sacred part of the ceremony of being the ‘lords anointed,’ a status found only among kings and priests” (2014, 400).

Despite the intensive selective pressures on European societies to compete by constantly updating their political, economic, and military structures, at no time until Napoleon did a usurper ever claim to the status of royalty. The belief in the hereditary vocation of a dynasty over an individual prevailed, ensuring that when a king dies, the kingdom remains. This belief was indispensable to the eventual re-concentration of power in the state.

The eighth-century Germanic kingdoms laid the basis of Western Europe’s political evolution that would establish the borders of both medieval and modern Europe.\(^\text{15}\) Bloch resolves that “thus the feudal era witnessed the emergence of the first lineaments of a political map of Europe. … [It] also saw debated those problems of frontier zones which were destined till our own day to be responsible for the spilling of both ink and blood. … [T]he most

\(^{15}\) Bloch concludes, “There could be no more eloquent testimony to the continued strength of the monarchic tradition, much older than feudalism and destined to survive it” than the fact that no vassal no matter how powerful ever rose to usurp the title of king (2014, 400).
characteristic feature of this geography of kingdoms was that though their territorial limits were so fluctuating, their number varied remarkably little” (2014, 399).

This phenomenon found among the crowned heads of Europe—in which every royal house was connected in some way, if only remotely, to every other—is not merely a curiosity in the history of the continent. Via their elaborate protocols of intermarriage, the hypernetwork formed a strategic ecology that lent stability to society, enabling state formation (2015, 155).

Over time and in large measure due to the effort of the Church and its support of the combined practice of primogeniture and female inheritance, the various political entities and principalities were concentrated into the hands of a few royal families. The logic of dynastic succession was the primary driver of the territorial consolidation of these fragmented units. War was an instrument used to accelerate or decelerate the progress, but the big gains, such as the unification of France and Spain, were achieved through the logic of dynastic accumulation.16 The Germanic territories of the Holy Roman Empire adopted primogeniture only in the eighteenth century, and this late adaptation was the reason they suffered continual fragmentation.

16 For example, a continuous line through the Capetians (987–1328) and Valois, a cadet (younger son) branch of the Capetian dynasty (1328–1589) to the Bourbons, another cadet branch of the Capetians, that ruled until 1792, enabled French monarchs to unify France.

Dynastic marriage was a principle venue of Habsburg aggrandizement during the period between 1438 and 1740. The Habsburg monarchy of Charles V, of the sixteenth century, the largest political entity of its day, was largely the result of dynastic accumulation. The unification of the Low Countries was an accident of dynastic succession. The logic of dynastic accumulation was also behind the Austro-Hungarian monarchy (1867–1918) of the Habsburg dynasty, a multilingual, multicultural empire of more than fifty million inhabitants (Brenner et al. 2003).
Contrary to the often-repeated remark of sociologist Charles Tilly that “war made states and states made war,” the major states of Europe were born of dynastic accumulation. The map of modern Europe is roughly the product of dynastic marriage (Brenner et al. 2003).\textsuperscript{17}

The papacy itself played a central role in the cultural and ideological cohesion of Europe, and no doubt the integrity of kingship owed much to the role of the papacy. In one sense, it very much like the structure of imperial China, being the central hub of a hub-and-spoke system that controlled much of the political competition in Europe, including control of dynastic marriages. It held the essential power to anoint and therefore legitimize secular power, but it did not exercise that power in its own name. It did not control civil administration. The Chinese emperor played both roles; thus as concentrator of authority, the Chinese throne far exceeded the capacity of the papacy.

The papacy can best be understood as a parallel hypernetwork within the larger European ecology. The Church’s independent stature ensured that the right to justice became part of the value system of Western Europe, for the Church insisted that no king could deny the right to justice of even the humblest servant.

The legal framework of dynastic marriage was established in Europe over the course of the tenth century, with the blending of property rights and political power. In Europe the same laws, norms, and customs that governed the transmission of landed property also held and

\textsuperscript{17} Nathaniel Taylor observes that in Medieval Europe, “Ultimately … in the wake of competition and economic pressure, aristocratic families abandoned co-lordship in favor of a vertical, dynastic structure of succession, restoring the indivisibility of lordship. … The end result … was a reorientation of post-Carolingian society under dynasties identified with regional power bases and led by a single (male) heir” (2005, 130).
transmitted political power. This intertwining of public authority and physical property allowed for the peaceful and orderly transmission of the office of the head of state from one generation to the next. Most important, these laws, behaviors, and customs transcended regional, sectarian, and political boundaries. They were prevalent throughout the European continent, extending from Britain into Russia.

Norbert Elias and Sharma do not use the term *hypernetwork* but nonetheless emphasize how royal marriages were the pivot upon which the European system of international relations rotated, and that “each shift of power directly or indirectly involved every unit, every country” (Elias 1983, 300). The higher-degree linkages and rivalries between royal houses propelled the formation and inter-relations among states—and the “institution of dynastic succession, driven by the contingency of birth, marriage, and death in the leading princely families of Europe, determined the distribution of power in Europe” (2015, 169). Intermarriage was the prevailing means to secure, maintain, and extend power among reigning European families from the medieval era until the outbreak of World War I.


Dynastic succession is not a hypernetwork. It is an instrument by which the hypernetwork of royal families perpetuated itself. The Europe-wide royalty network can be interpreted along three dimensions: (1) a rule-based dimension (or *house rules*), albeit more customary than formal, which describes how dynastic property is to be transferred; (2) an *equilibria dimension*, of strategic games created with self-reinforcing behavior; and (3) a system of symbolic representation in which *status is itself an institution*, regulated by society’s symbolic order.
Stable systems can have unintended long-term consequences -- feedback loops, and path dependencies are often overlooked -- but the resilience of a system can also be maladaptive.

Dynastic succession while facilitating the territorial and administrative consolidation of continental Europe incited continuous warfare.

“Consider the consequences if a system were highly resilient,” note Holling and Gunderson (2002). “Is that entirely a desired condition?” Such a system would not change in any fundamental way. In the face of large disturbances, variables would shift and move, but the system would maintain its control and structures. In the case of Europe, the resilience of the monarchy as the source of political authority on the eve of the Great War jarred with the structure of society changed by a century of increased regional and global industrialization and capitalism. The efforts to preserve dynastic lordship at the opening of the twentieth century exemplify how the resilience of a particular social order can prevail without a welfare-enhancing property.

5.4. The European Ruling Elite and the Status-Bestowing Function of Militarism.

When war broke out between Germany and Britain in 1914, Germany’s Kaiser and Great Britain’s King were not merely cousins, they were first cousins. Considering these shared genealogical connections among the princely dynasties of Europe, why was war unavoidable?

Although not the primary instrument toward territorial consolidation, war perpetuated itself because it defined rank, title, and status, making prowess a foundation of legitimacy and stability. The military role of Europe’s royal elite had a constitutive character, with its own rules and protocol. Prowess in the conduct of warfare assigned status, as well as functionality, to the traditional society of orders, with the monarchy’s symbolic power as the source of justice and
leader of the army. Thus, Josef Schumpeter in *Imperialism and Capitalism* explains that a perennial belligerence was instinctive for the monarchy. Imperialism developed on the continent because its heritage included a “war machine, together with its socio-psychological aura and aggressive bent, and because a class oriented toward war maintained itself in a ruling position” (1951, 129).

In Schumpeter’s contextually rich understanding of European militarism, war and imperialism are embedded in the European state system because the legacy of prowess in warfare was how Europe’s crowned cousins exerted their superiority over lineages of common stock and justified the honors of their office. Even when at war, they followed codes of honor to respect the esteem of their office, avoided taking each other hostage, and did not impose changes or dictate the internal institutional structures of a defeated rival.

Schumpeter’s observations echo those of US President Woodrow Wilson, who posited the same explanation for the Europeans’ perpetual tendency to be at war with each other and who further believed that this propensity would not end until the “pretensions” of the elite genealogies that sustained it were “checked and nullified” (1917).

Mayer, an admirer of Schumpeter, interprets the events leading up to World War I as efforts by European royalty to preempt the loss of their status (1981). A militarist revival was under way, in which the German Kaiser, the Austrian Hapsburgs, and Russia’s Romanovs sought to form alliances to restore the Church and the army as the bastions of social order. The great families of Europe, Mayer speculates, feared class mobilization more than war; the latter, they imagined, would restore the natural hierarchy of society to their favor. At the risk of shedding a
few royal thrones, the crowned heads of Europe envisioned a revival of the primordial values of
the Old Regime and a remobilization, of its civil and political institutions.¹⁸

Mayer puts emphasis on internal pressures; a crisis of legitimacy “which produced the
Great War … started the final act of the dissolution of Europe’s Old Regime” (1981,15). War
might endanger the survival of a particular royal house at the risk of safeguarding the stature
enjoyed by the principle of dynastic lordship.

5.5. Europe’s Old Regime in the Context of the Changed International System

To explain the origin of the Great War, historians weigh the domestic issues of militarism
and nationalism against external pressures, i.e., the system of alliances, war plans, the
accumulation of different crises prior to 1914. But to explain why a small perturbation like the
assassination of Archduke Franz Ferdinand at Sarajevo on June 28, 1914, would have been
enough to push the entire state system into a crisis, we do not need the deep context-rich
knowledge Meyer and Schumpeter bring to the subject.

If one considers only the way the European hypernetwork was interconnected, it is
possible to construct a plausible explanation without a detailed understanding of the history.
Network theory tells us that in a highly interconnected network of interrelated royal families, a
small localized event can trigger a cascade of military responses across national boundaries. In

¹⁸ “[T]he Great War of 1914, was the first phase of a general crisis” (1981, 4). It was
precipitated when “between 1905 and 1914 the old elites proceeded to reaffirm and tighten their
political hold in order to bolster their material, social, and cultural preeminence. In the process
they intensified the domestic and international tensions which produced the Great War that
started the final act of the dissolution of Europe’s Old Regime” (15).
highly connected networks, what happens to some well-selected nodes can set off a wave of interactive responses.

Yet being prone to contagion does not explain why a small perturbation could have caused the sudden demise of the entire system. Another factor becomes paramount. The structure of the network was transformed.

The peace repositioned the United States, making it a hub of central importance. Transformed into a principal hub of the system from having been a peripheral player, the United States sought to redesign the system around a new strategy for global order premised on its preference for democratic universalism. American foreign policy leaders saw an opportunity to end militancy and imperialism by challenging the constitutive and symbolic order of European society that supported it. Thus America’s role in peace transformed the landscape for those surviving royal houses.

President Wilson was not content with merely redistributing the spoils of victory among the surviving lineages; he persuaded the allies to refuse to negotiate with any German government that had ties to the monarchy or the army.\(^{19}\) He insisted that new nations, carved out of the fallen empires of Turkey, Germany, Austria-Hungary, and Russia, were to be

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\(^{19}\) Henry Kissinger explains that Wilson’s attempt to achieve global peace by imposing universalizing democratic principles was contrary to the uniform perceptions that traditionally guided the European balance of power system. “Wilson proclaimed that America had intervened not to restore the European balance of power but to ‘make the world safe for democracy’—in other words, to base world order on the compatibility of domestic institutions reflecting the American example. Though this concept ran counter to their tradition, Europe’s leaders accepted it as the price of America’s entry into the war” (2014, 256).
representative democracies. This demand to reframe the basis of regime legitimacy clashed with established Westphalian ideals that recognized the primacy of sovereignty. The peace redefined the basis of regime legitimacy in terms of universal rights; Wilson would settle for nothing less than a new system of relations among states, based upon the universality of democratic values and aspirations.

The subsequent failure of the United States to join the League of Nations and its retreat into isolationism contributed to the inability to institutionalize the Wilsonian ideal of a liberal world order. Instead of strengthening international law and organization under the auspices of liberal institutions sealing, the victors at the Paris Peace Conference had self-interests that had less to do with Wilsonian ideals than with ensuring their own interests. With the unilateral abdication of Kaiser Wilhelm II, Germany’s central hub of social organization gone, and decapitated German nation descended into lawlessness that spread across Europe. Another world war ensued before Europe’s full integration into the liberal world order.

One might debate the critical role of Wilson, but this essay is not the place. The key insight from the persistence of Europe’s royal Old Regime elites and values before World War I, and their sudden disappearance after the war, is that national institutions and elite social behaviors are embedded in a much larger environment and do not exist in isolation from it.

As noted, when the twentieth century began, only France, Switzerland, and (very briefly) San Marco were republics. Yet within a single generation, in both China and Europe, dynastic succession ceased to be the institution underpinning the orderly transmission of power. By the end of World War II, the surviving royal houses of Belgium, Denmark, Luxembourg, the Netherlands, Spain, Sweden, Norway, and the United Kingdom were vestiges of their former selves. Two world wars sealed the fate of monarchy and the exclusive social orders they
represented. In China the postwar restoration of central power spanned several decades, during which its people experienced warlords, a nationalist revolution, and eight years of Japanese invasion, followed by four years of civil war.

Despite their important respective strengths and vulnerabilities, the demise and reformation of both systems in the early twentieth century resulted not from their own hypernetwork structures at all, but from changes in the structure of the global network and the changing relationships among the principal hubs that created new sets of interconnections within the international system.

6. NETWORK DESIGN AND THE FATE OF CHINESE DYNASTIES

6.1. China as a Hub-and-Spoke Network

The longevity of China’s dynasties is one of the wonders of history. China, like Europe, entered the twentieth century with its ancient protocols of dynastic succession still the pivot of social order; but the administrative continuum that carried China through the centuries was a structural apex, with a single dynasty at the top. To preserve this single apex, an imperial bureaucracy became the mechanism of coordination and national integration. The combination of a meritocratic officialdom and a standing army under civil authority, writes Sidney Finer in *The History of Government*, distinguishes China’s palace-style governance from that of other empires in recorded history (1999, 756).
Whereas the Roman imperial traditions were never to be reconstituted in Europe, in China, the Han dynasty (206 BC–221AD) became the prototype of all subsequent regimes. The Han dynasty introduced an imperial university for official appointees in 124 BC; by 1 AD, official scholars began to administer examinations for entrants to government service, and justice was vested in organs of the central administration rather than in independent local judiciaries. After the 350 years of division and disorder that followed the Han dynasty’s collapse, the Tang dynasty (618–907) reconstituted what the Han had initiated, strengthening many of the characteristic institutions, notably the central officialdom that enabled the subordination of the military to civil leadership. The civil service system attained its pinnacle under the Sung dynasty (979–1279), which perfected the examination system developed during the Tang. As a further refinement of rule by officialdom the Sung prohibited the relatives of officials to conduct business with each other and relatives of the empress or the imperial consorts were barred from becoming high-ranking officials in the government of the empire.

The protocols of dynastic succession also took definitive form during Sung rule and persisted until the downfall of the imperial system in 1912. In earlier periods, usurpation of the

20. The social rank of the emperors’ consorts was less a matter of state policy in China than in Europe, and instances when royal marriage was important for foreign policy, war, or diplomacy were also far less prevalent. When intermarriages with royalty occurred, they were with families from outside China, in sharp contrast with the European tradition, where matches with lines from beyond Europe was a rarity. These interstate marriages, such as between France and Spain, Scotland and France, England might have been considered foreign by the local population, but they were not “beyond Europe.” When stability existed within the Chinese empire, marriages outside the empire were unlikely.
throne by generals, empresses, and even civil officials was common, but never again after 960, when the Sung instituted the system of dynastic succession (1958). Dynasties could be defeated by invasion, and members of the royal family could murder each other in pursuit of the highest office, but a “non-royal” usurper could never again capture the imperial throne.

In China, the hub-and-spoke system, with its reliance on imperial bureaucracy, continued to reappear, even after interludes of conflict between dynasties. Even after prolonged and violent transitions, each successive dynasty rediscovered in the Confucian officialdom a means to integrate the bureaucracy and restore stability, establish the homogeneity of values, and ensure that officialdom, not privately accumulated wealth or military prowess, was the channel for social mobility. Ruling dynasties that failed to adopt it, such as the Mongol-led Yuan (1271–1368), which deviated toward a more explicitly tribal order, were relatively short-lived. The Ming (1368–1662) and the Qing (1662–1911) dynasties reverted to and strengthened officialdom.

6.2. Stability and Replication of Dynastic China

Why was the entire hub-and-spoke system of governance replicated each time it broke down, even when the new dynasty was a led by a foreigner in China? The traditional answer is as follows: One of the most significant drivers of institutional change in Chinese history was the weakening of clan loyalties; officialdom played an essential part by establishing governance via an impersonal institutional form. The exam system for entry into the officialdom inculcated
loyalty to the prince as supreme within the state. A non-feudal meritocracy was more likely be
loyal than were the landed gentry.

A centralized officialdom also enabled the dynastic emperors to maintain, provision, and
conscript a standing professional army. Rather than depend on a nobility with an independent
landed base in the form of fiefs (as was the case in Europe) to lead the army, the Chinese
emperor, through his government, used conscription as the predominate means of recruitment.
This further established the supremacy of the emperor, diverting local loyalty from local clans to
the state.

This paper suggests an additional consideration for the recurrence of the same hub-and-
spoke system of rule featuring a bureaucracy recruited by examination: It was replicated by each
successive dynasty because of its efficiency in maintaining continuity among the government
structures of a far-flung empire. The system did this by reducing the amount of time that
information had to travel from the center to the provinces and back again. Information could
circulate from the bottom to the top with greater constancy and speed than in other empires. This
connectivity gave Chinese forbearance to a wide range of challenges that other pre-modern states
did not possess.

A 1992 study of social networks by Ronald Burt explains how centralized (hub-and-
spoke) networks outperform decentralized networks. They support effective decision making,
Burt argues, by strengthening the leadership’s decision-making capacities. A centralized network
provides greater opportunities for information access, timing, and monitoring and control,
making its management less costly in terms of energy, time, and resources. Fewer redundant
contacts increase the efficient flow of information to the center and require less effort to maintain
clusters of influence. Instead of maintaining relations with the entire network of spoke contacts,
the central decision-maker can preserve resources to reward the primary contacts delegated to the
task of maintaining the total network, and can utilize the conserved resources to expand the
network to include new clusters of influence.

However, this general justification for the effectiveness of hub-and-spoke networks has a
shortcoming that comes into evidence when we consider the history of the Chinese system of
administration.

6.3. China’s Cycles of Decay and Renewal

Chinese history is often told as a sequence of dynastic cycles of decay and renewal. Popular accounts carry a moral lesson and highlight the turpitude of particular leaders. Successive dynasties rose from the ashes of their predecessors to attain peaks of cultural and engineering excellence, followed by corruption, factional quarrels, blind ambition, and moral decay that caused them to lose the Mandate of Heaven. A period of disorder results, and the Mandate of Heaven descended to a new dynasty.

More sophisticated accounts of Chinese history do not reject the idea of dynastic cyclicality, but add an assessment of attendant economic and administrative failings. Edwin Reischauer and John Fairbank explain that at the upper bounds, where affluent central governments engaged in costly projects—palaces, roads, canals, and walls—the nobility and bureaucracy prospered and grew in numbers (Reischauer and Fairbank 1958, 117–118). Defending the larger empire also became costlier. The peasant farmers supported elites who paid few taxes, causing expenditures to increase against declining revenues.
The land tax, for example, was the chief source of government revenue. “One process which seems to have appeared in every dynasty was the progressive withdrawal of land from taxation for the benefit of the ruling official class and to the detriment of the imperial revenue. … Gradually the ruling classes were able to increase their land holdings and to remove them from taxation by various expedients, such as the destruction of tax registers, official connivance, or legal falsification. In this way, a progressively smaller proportion of the land was expected to pay a progressively larger amount of revenue” (Fairbank 1948, 96). Revolt by the overtaxed peasants became endemic, and often led by fanatical religious leadership. Eventually, frontier defenses crumbled, armies defected, and the center weakened and collapsed.

The disorder that resulted from each breakdown set the empire back to a prior level of social complexity. Finer describes how the demise of the Han dynasty in 220 ushered in 350 years of disunion. Order was reconstituted by the Tang dynasty, which itself lasted some 300 years (618–907), only to collapse like the Han dynasty “in blood and rapine” (1999, 744). Like many scholars of Chinese history, he observes that “the collapse of each of the great imperial structures ushered in similar dismal periods of disunion, carnage, warlordism, and court dissension, followed by the predictable barbarian invasion and conquest” (744). The violence of the Ming dynastic transition spanned a century (1350–1450). The chaos caused by the Manchu conquest and defeat of the Ming that erupted in 1610 continued until 1683 and cost an estimated eighty million deaths. The wars associated with dynastic succession were of a length and intensity that had no parallel in the dynastic wars in Europe.

China’s dynastic transitions can be observed in nationwide demographic patterns, which follow political variability. Its population history trails the dynastic cycles in which radical population declines follow violent political transitions. Population numbers blossomed during
the Sung dynasty (979–1279), only to decline dramatically to about half of its peak during the Sung collapse and Mongol conquest. The numbers did not recover during the Yuan (1271–1368), which coincided with the Black Death. Population numbers reached a new peak during the Ming period, increasing threefold over the 1291 level. Again, a drastic decline occurred when the Ming collapsed and the violent Qing conquest overtook it.

Xu, Leeuwen, and Zanden conclude that Western European population patterns are more consistent, that “we see a much more gradual growth, only once interrupted between 1300 and 1400—by the Black Death. … Steep declines in Chinese population levels are linked to transitions from one dynasty to another. … Comparable declines in European populations did occur—during the Thirty Years War (1618–1648), for example, large parts of Germany and Poland were depopulated—but on a much more limited scale, due to the smaller size of European political entities. … In China warfare was … linked to changes in dynasties, but it seems to have had much greater consequences for the demographic development of the region” (2015, 6). While Europe’s population trends exhibit primarily ecological or biological Malthusian dynamics, political dynamics dominate those of China.

7. SOCIAL SYSTEMS AS MULTILEVEL SYSTEMS: POLICY IMPLICATION FOR THE STUDY OF REGIME TRANSITION AND CONCLUDING REMARKS

To assist in understanding how multilevel environments interact and coevolve, this paper has tried to identify a critical property of a system’s multilevel dynamics, its hypernetwork. This approach helps to establish how the system-level dynamical properties of stability or resilience derive from the different organizational structures of dynastic lordship in China and Europe.
Describing the “stable” equilibrium conditions that balance the political and economic variables of historical regimes—enabling it to change in simple and predictable ways—has proved to be less tractable than anticipated. Economist Mary Shirley notes that “macro policies are outcomes, the products of economic systems, political systems, and belief systems. Attempts to change policies without changing the systems that produced them are doomed to failure” (2008). Determining the relevant system components, and how these components interact, is an intrinsically complex undertaking that calls for representing the multilevel dynamics in the evolution of social institutions. This in turns requires a better understanding of how local institutional adaptation is related to, and nested in, system-level variables.

This paper has attempted to identify the organizational hierarchies that furnished institutional longevity to regimes in China and Europe over long time scales. It has considered how the trade-offs among dynamical processes of resilience or stability account for the endurance of those institutional regimes. Differences in their respective hypernetworks can account for important later differences in the evolution of Europe and China, up to and including the collapse of their respective systems in the period surrounding World War I, when both regimes collapsed as a result of the changed global context.

Identifying the effects of emerging hypernetworks on policy outcomes is a critical step toward understanding clustering in the patterns of institutional adaptation among nations. It takes us closer toward finding the integrating logic or structure of multilevel systems.

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**APPENDIX 1: Diagrams of Network Structure and Implications for Political Economy**

**Figure 2.1. Small-World Network Model**


Figure 2.1. In the “Regular” model, the nodes have connections only with neighboring nodes. In this small world, there are no connectors across the system. In the second, “small-world” model, a small number of nodes have connections that span the system, enabling all the nodes to which they are connected to improve communication. In the “Random” model, the communication
across the system reverts to randomness as there is no intrinsic order to the connectivity among nodes.

**Figure 2.2 Small-World Graph Construction**

![Small World Graph Construction - Watts & Strogatz Model](image)

Source: MTAT, n.d.

Figure 2.2 shows how connectivity among all nodes is increased when a few links are added to connect randomly selected nodes. The addition of long-range links to a randomly selected small number of nodes shortens the average separation among all nodes, and this additional clustering among a select number of smaller nodes transforms the overall connectivity within the network.

**Figure 2.3 Creating a Small and Clustered World** in which a few extra links among selected nodes shortens the average separation among all nodes.
In Figure 2.3, connectivity among all nodes increases when a few links are added to connect randomly selected nodes. The addition of long-range links to a randomly selected small number of nodes shortens the average separation among all nodes; this additional clustering among a select number of smaller nodes transforms the overall connectivity within the network.

Figure 3.1 Random and Scale-Free Networks
Figure 3.2 Random and Scale-Free Networks

![Random network](a) Random network ![Scale-free network](b) Scale-free network

Source: Baeza-Yates, Castillo, and Lopez, 2005

Figure 3.1 and Figure 3.2 contrast random with scale-free networks. The network (left) is distributed but random; a random network is similar to a national highway network that connects cities, which are the nodes. Redundancy is present in its mesh-like architecture, so it is not highly vulnerable to attack, but an absence of hierarchy impedes communication among the nodes.

In contrast, a scale-free network in which a few highly connected hubs connect the smaller hubs is similar to an airport system; when one hub is disabled, the traffic reroutes. The network breaks apart only once all the hubs are deleted.

Figure 4. Complex and Simple Hub-and-Spoke Model
Figure 4 illustrates the vulnerability of a hub-and-spoke system in which all traffic is routed through a central hub. If the hub is removed, the smaller nodes become isolated islands and drift apart. This network economizes the number of links that need to be constructed, but its centralized structure makes communication with the smaller nodes vulnerable to attack. If the central hub is deleted, there is insufficient connectivity among the smaller hubs to reroute the traffic among them.