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Dimensions of Global Governance: 1919 – 2016

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Dimensions of Global Governance:
1919 – 2016

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by

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First and foremost, this dissertation is dedicated to all whose labor has sustained my family.

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Special dedications also go to my mother and sister for being my guiding stars in this life. I am the other you.

To my daughter, who makes me want to live long enough to see the world that her generation might bring forth. May our mistakes serve as the lessons from which that world is wrought.

A special dedication goes to the memory of my father and his greatest serenades.

ABSTRACT OF THE DISSERTATION

Dimensions of Global Governance:
1919 – 2016

by

Alexis Antonio Álvarez

Doctor of Philosophy, Graduate Program in Sociology
University of California, Riverside, March 2017
Dr. Christopher Chase-Dunn, Chairperson

The modern system of global governance is comprised of a hegemonic cycle, a network of state-IGO affiliations, and the interstate system that derives its continuity from the Treaty of Westphalia in 1648. To empirically capture multiple dimensions of each of these three elements of global governance, this research examines the emergence and development of three separate networks, these being networks of international trade, foreign aid, and IGO membership since the establishment of the League of Nations. Network analysis was performed on matrices for the period where data are available, rendering the densities, centralities, and hierarchical structures of these networks and their respective hegemons. These values were subsequently incorporated into an attribute dataset of established, non-network measures of global governance—among them, a hegemon's military budget, and the ratio of world imports to world GDP—in an effort to assess measures of autocorrelation, cross-correlation, and conduct other time-series analysis, including Prais-Winsten regressions. Several relationships were identified using bivariate and partial cross-correlation coefficients, though there is little uniformity in them from which to draw a singular narrative.

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Part I: Concepts and Theoretical Framework

Global governance—as distinguished from the more general concept of globalization—refers to those aspects of globalization that constitute its cybernetic, or self-governing, properties. The origins of this phenomenon are nebulous, and subjectively defined, but become significantly more crystallized four centuries ago during the intercore conflicts of the Thirty Years' War and the Eighty-Years' War, both of which ended in 1648. The Treaty of Westphalia, ratified that year, established the modern concept of diplomacy, eventually giving rise to a network of state-IGO affiliations, international trade, and the emergence of foreign aid, all of which have fostered a political climate that has served as an alternative to militarism as a means of global conflict resolution. This dissertation quantifies various aspects or dimensions of global governance from 1919 to present, depending on available data, in an effort to chart the structure and trajectory of each dimension. Part I address the conceptualization of global governance and related theories, while Chapters 2 through 4 in Part II operationalize each measured variable and discuss the whole of the analysis conducted, followed by Part III, which comprises the empirical portion of the study, organized around the distinction between network and non-network variables.

Chapter 1: The Conceptualization of Global Governance

Since the Portuguese/Genoese hegemony of the 15th and 16th centuries, the world-system has become increasingly integrated while its hegemonic cycle has oscillated in the short-term, with a secular trend towards greater centralization with each hegemonic succession (Arrighi, 1994). Figure 1.1.1 qualitatively illustrates the history of the last few centuries (not scaled) with respect to the formative events that have fostered or curtailed the geographic proliferation and institutional intensification of global governance.

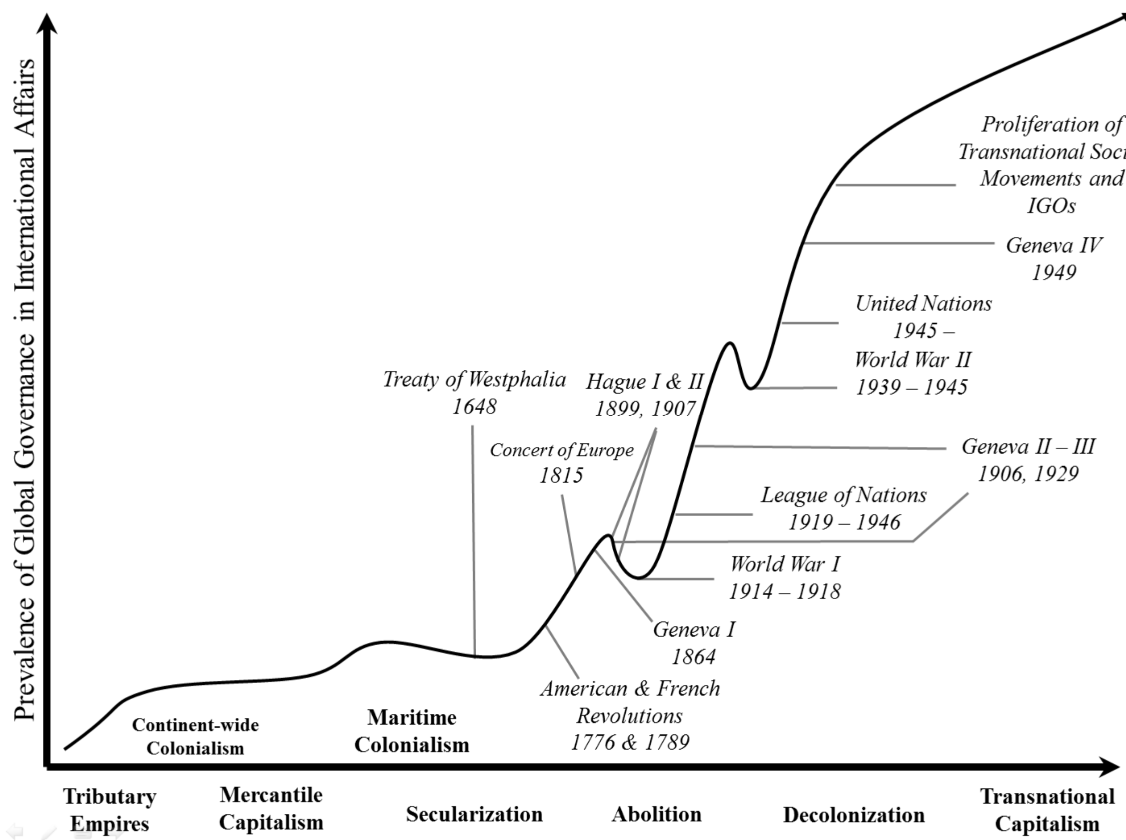

Figure 1.1.1: A Historical Trajectory of the Intensification of Global Governance, Not Scaled

As systemic power now appears to shift towards a period of contested hegemony involving most of the BRICS nations[1] and the established hegemons of the last few centuries, it becomes increasingly important to study the development of (1) the networks of nation-to-nation relationships based on foreign aid and trade, (2) the relationships between intergovernmental organizations (IGOs) and nations, and (3) the relationships among the centralization and integration of these networks, as well as other indicators of integration and centralization of the world-system.

1.1 Research Problem

This research seeks first to quantify the various axes or typologies of global governance, these being: centralization / integration, economic / political, and network / attribute. It also attempts to test for the effects of these dimensions of global governance on global economic inequality. While previous research has extensively examined the trajectory of trade globalization (Kwon, 2011), scant analysis of the centralization of global governance exists, let alone via network analysis, and none at all exists to date that longitudinally examines the network dimensions of global governance while differentiating among institutional dimensions. Bridging these gaps, the incorporation of network analysis in this study introduces various dimensions of trade, foreign aid, and IGO-membership networks, such as their respective densities, centralities, hierarchical properties. The time-series analyses of these network dimensions, alongside a complement of attribute variables, attempt to answer questions about the trajectories and systemic relationships among these dynamics of global governance. Do economic factors

[1] **BRICS:** Brazil, Russia, India, China, and South Africa, a group of rising semiperipheries during the turn of the millennium, most of which are still on the economic rise.

drive political ones, or vice-versa, and how long does causality take to manifest? What similar relationships exist between integration and centralization, and what about hegemonic and democratic forms of global governance? Are network ties important, and if so, what kinds of ties, and during which periods? Conclusively, what do the data and/or historical events, such as World War II or the 2016 US presidential elections, forecast for the future of global governance?

1.2 The Maturation of Global Governance

Political globalization is one aspect of the broader process of globalization, which has been defined in a multitude of ways by many scholars over the last forty years. Generally speaking, the concept of globalization can signify two things (Chase-Dunn and Babones, 2006): (1) integration into interaction networks and the intensity of long-distance interaction (Giddens, 1991; Held and McGrew, 1999), or (2) neoliberalism and other political and religious ideologies which justify it.

Applying this framework to the definition of political globalization one has: (1) political integration at the world-system level, and relative degrees of centralization of this, or (2) ideologies that justify and legitimate political integration and global authority. Although the second of these aspects of globalization is important, the focus of this research is on the first: the emergence of institutions of global governance as part of the process of political globalization and the relative trajectories of its integration and centralization over time. To differentiate between *political globalization* and the more general *global governance*; the former is defined here as *the intensifying transnational networks of political interconnectedness that increasingly supersede local and even* *national sovereignty within the world-system*, while global governance also involves economic, technological, and other activities outside the boundaries of purely political action.

Institutionally (Turner, 1997, 2013), dimensions of global governance can be classified as economic (always a form of soft power) and political, the latter of which can manifest as diplomatic in nature (soft power) or military in nature (hard power). Shifting the analytical lens along the *structural* axis, global governance has integrative features (density of interconnectedness, horizontal in nature), which are contrasted by the centralization of global governance (the intensification of hierarchy, vertical in nature).

Indicators of connectedness that have emerged in previous research examining political globalization include the increase in the average of embassies in countries—referred to by Singer and Small (1966, 1973) as the *saturation* of nations by embassies—and the number of *intergovernmental organizations* (IGOs, also referred to in the literature as *international governmental organizations* or simply *international organizations*) and *international non-governmental organizations* (INGOs) (Murphy, 1994), and the relative density of network ties between IGOs and states (Beckfield, 2010). When examining the economic axis of global governance, trade globalization as measured by Chase-Dunn, et al. (2000) as the ratio of international imports to global GDP constitutes a proxy for one aspect of the connectedness/integration aspect of globalization.

Trade centralization, by contrast, refers to the degree to which the import/export sector of the global economy is in the hands of one or few actors, while the dimensions of political centralization consist of: (1) hegemony (a core nation-state's primacy over its counterparts in both its military and economic expressions); (2) decolonization (the proportion of the world's population that lives in formally autonomous and sovereign polities, technically a measure of *decentralization*); (3) neocolonialism (the centralization of capital ownership in the hegemon or in the core); and (4) the prevalence and prominence of IGOs in the world system.

In more general terms, global governance has been defined rather ambiguously by theorists in different fields, and has often been confused in the popular imagination with the idea of a monolithic world government[2]. The concept has even spawned several political conspiracy theories, religious and cultural backlash as manifested in the Brexit decision and the 2016 US presidential election, and an entire journal dedicated to its study[3].

For the purpose of this research I am defining global governance as *the scope of the institutional/structural control within the political and economic globalization processes that operate formally and informally within the world-system to exert power via both consent and coercion on nation-states and their peoples*. This definition facilitates the measures of global governance at the meso-level (i.e., nation-states and IGOs) in order to understand the world-system as a whole.

Writing from a world-systems perspective, Chase-Dunn and Lerro (2008) identify a tripartite system of global governance which includes (1) the interstate system

[2] A world government is only one possible form of global governance, though some see it as an inevitable outcome of the political globalization process.
[3] *Global Governance: A Review of Multilateralism and International Organizations* http://acuns.org/global-governance-journal/

established with the Treaty of Westphalia in 1648, (2) the hegemonic cycle first identified by Wallerstein (1984), and (3) international organizations, which include both international governmental organizations (IGOs) and international nongovernmental organizations (INGOs). The latter—at least in theory—operate independently of national governments; in fact, Smith, et al. (2007) find that INGOs working in collaboration with global civil society have great potential for a more progressive, less hierarchical global future. The empirical portions of this dissertation—Parts II and III—do not account for INGOs, though it is taken for granted that these organizations are increasingly becoming relevant actors in the world-system.

In order to safeguard a peace threatened by the Thirty Years' War and related inter-core rivalries, the Treaty of Westphalia of 1648 was signed by representatives of the Holy Roman Empire, the House of Hapsburg, Spain, Sweden, the Dutch Republic, France, and several smaller polities, giving rise to a fledging diplomatic world order in Europe, which would eventually slowly mature into the current interstate system constituted of nation-states (Boswell and Chase-Dunn, 2000). This diplomatic world order was dominated by the core powers, which increasingly colonized the world. Although the principles of the interstate system were established in 1648, the system was still developing into the 19th and 20th centuries as the colonial empires and the territorial empires of the Ottomans and Austro-Hungarians fell apart into nation-states.

Waves of decolonization increasingly extended the interstate system to the non-core, unifying the whole system into a single network of formally sovereign states which was only somewhat less hierarchical than the earlier system of colonial empires had been

(Chase-Dunn, 1998). A system of neocolonialism—a comparatively softer method of hegemonic and core control over peripheries that emphasizes unequal exchange, structural adjustment programs, and other capitalist strategies over the coercive colonial methods of reproducing the core-periphery hierarchy—has governed the interstate system in varying degrees in the post-colonial era. This phenomenon has been studied extensively from a dependency perspective by Go (2011), who convincingly demonstrates that this transition to neocolonialism was chiefly caused by: (1) changes in the hegemonic order between the UK and US, and (2) anti-colonial nationalistic fervor in the colonized nations.

According to world-system theorists, the world-system is comprised of a three-tiered core-periphery hierarchy, consisting of the core, semiperiphery, and periphery (Shannon, 1996). This core/periphery hierarchy has historically been conceptualized as a pyramid, with only a few core countries on top, semiperipheral countries in the middle tier, and peripheral countries—the bulk of the nation-states today—on the bottom (Kentor, 2000). As Bornschier (2010) points out, however, this pyramid has come to resemble more of an onion shape than a pyramid due to the increasingly prosperous middle classes in semiperipheral states of the BRICS nations. The hegemonic cycle consists of a distribution of power in the world-system that involves a repeating pattern of relative rise and fall of a single core state (or closely allied financial powers in league with a state, in the case of Portugal and its Genoese financiers) that temporarily assumes the role of hegemon.[4] Hegemons rely on a combination of economic and military forms of power to maintain their dominance, and the extent to which they rely on each type of power has varied historically. Modelski and Thompson (1996) identify the importance of new lead industries in giving a hegemon the innovative edge needed to outcompete other core contenders. The economic advantage presented by new lead industries allows the hegemon to maintain its power through a "soft-power" economic approach, which can be compared to a Gramscian (1999) rule by consent. Conversely, when a hegemon loses its economic power, it resorts more and more to a policy of rule by coercive hard power (Gill, 2003), often coupled with the rise of fascism or other forms of autocratic and/or totalitarian rule. This shift from consent to coercion is illustrated in the 20th and 21st centuries by the decisions made by the United States to embark on a series of military ventures that ultimately led to a bankrupting of the economy by imperial overreach, in what Modelski (2006) terms an "imperial detour." Currently, the United States, which has been hegemonic since the postwar period, is in a state of hegemonic decline (Chase-Dunn, et al., 2005, Chase-Dunn, et al., 2011). Indeed, the rhetoric of reviving a declining hegemony has today spread from academia to the electorate, and arguably resulted in the election of Donald Trump in 2016, and the impending rise of fascism within the hegemon's borders is certain to impact the majority of the world-system. The increasing relative size of the hegemon when compared to the size of the entire system in the sequence from Dutch to British to American hegemony (Arrighi and Silver, 1999) shows

[4] See Arrighi (1994) for a theoretical perspective on the rise of each hegemonic actor since the formation of the modern world-system that is complementary to the quantitative Modelski and Thompson model my research is based upon.

an evolution toward greater centralization, which poses interesting speculations as to the nature of a rising Chinese economic hegemony concurrent with the late stages of US military hegemony.

Lastly, intergovernmental organizations have emerged as the most recent component of global governance (Chase-Dunn, et al., 2013; see also Chase-Dunn and Lerro, 2013). IGOs had their inception in Europe after the Napoleonic wars, with the Concert of Europe, the alliance of core powers that together met quasi-formally to maintain a relative peace in that region. This time period and the dawning of the political and economic realities of the world-system on the public produced an intellectual awareness of the necessity of what Tennyson ([1842] 1891) termed the “Parliament of man,” an international forum capable of mediating conflicts between its member states (Kennedy, 2006). Other, more technologically oriented IGOs also emerged during this period, such as the International Telegraph Union in 1865 (renamed the International Telecommunications Union in 1932)[5].

Later international organizations included the public international unions (Murphy, 1994), the League of Nations, and a multitude of non-governmental organizations, mostly based in the hegemon and the rest of the core. By now, intergovernmental organizations and global civil society are also an integral component of the political globalization process (Smith and Wiest, 2006), and regional IGOs such as the Arab League, the North Atlantic Treaty Organization (NATO), and the European

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[5] http://www.itu.int/en/about/Pages/history.aspx

Union also occupy an important part of the multi-tiered global governance system (Junne, 1999).

1.3 The Trajectory of Global Governance

Political globalization can be thought of as analogous to economic globalization in the sense that both are types of increasing global integration, as measured by the amount of large scale interaction relative to the amount of smaller-scale interaction. In particular, this research examines the extent to which political globalization mirrors the cyclical upward trend of trade globalization since 1800 observed by Chase-Dunn, et al. (2000) and discussed more fully below.

Sachs and Warner (1995), Bairoch (1996), and Bairoch and Kozul-Wright (1998) have presented a strong case for the idea that trade globalization has been taking place since the mid-19th century, and that trends in the global economy at the end of the 19th century mirror some of those present at the end of the 20th century. Unlike Sachs and Warner, however, Bairoch and Kozul-Wright (1998) find that trade, along with foreign direct investment, helped to reinforce a pattern of uneven development in the world economy, as opposed to being a rising tide that lifted all boats. Chase-Dunn, et al. (2000) definitively documented the overall trajectory of trade globalization since 1800, supporting the idea that the long-term trends have been both upward and cyclical, following a typical world-systemic "pulsation" (Chase-Dunn and Hall, 1997) consisting of expansion and contraction of interaction networks. Using a novel measure that eliminates the standardization issues of currency units, which they term "average openness" trade globalization, they estimate the world trajectory of trade globalization based on weighted averages of country ratios of imports to GDP (Chase-Dunn, et al., 2000). Three major waves of trade globalization are documented by their research.

New questions arise upon theorizing about each individual indicator of global governance. Decolonization, for example, can represent a loss of control over the system by the core powers (decentralization), though critics of this conclusion hold that decolonization might also represent a global extension of sovereignty and participation in an emerging world order (an increase in the integration of the network). Strang (1990, 1991) has found empirical support for the world-systems hypothesis that decolonization is more likely when a global hegemon is in power. On one hand, decolonization decentralizes the imperial/hegemonic dimension of global governance because the number of sovereign states goes up and the formal hierarchy composed of colonial empires diminishes in scope. Decolonization, however, also causes structural isomorphism—or homogenization—of the system by extending the interstate system that formerly existed only in the core to the rest of the world (Anderson, 1991). The incorporation of the East Asian PMN (*political-military network*, or interstate system) into the Europe-centered system in the first half of the 19th century, for example, was an expansion and a transition to a singular and truly global system. The system of neocolonialism, which replaced formal colonialism, is expected to have a centralizing effect on global governance. Centralization of the hegemonic cycle—represented in the 19th century by the ascent of the second round of British hegemony (Modelski and Thompson, 1996) and in the 20th century by the hegemony of the US—should also have a centralizing effect on global governance, while hegemonic decline should have a ubiquitously decentralizing effect. The growth of international organizations should also decentralize global governance simply by increasing the total number of actors, and therefore diffusing the power among more nodes in a network.

Kwon's (2011) findings show that hegemony's impact on trade globalization remains relevant despite the proliferation of IGOs in the postwar period (contrary to world polity arguments), and furthermore that IGOs themselves appear to have no measurably significant impact on international trade. This suggests that causality is likely to differ by periodicity, and soft (diplomatic and economic) power is less often effective than coercive (military) means of global conflict resolution.

Having set forth the conceptualization and theoretical precedents related to global governance, Part II does much to operationalize these concepts in the interest of plotting and otherwise analyzing their trajectories across the period (1919 – 2016), as well as to test their relationships, if any, to one another.

Part II: Indicators of Global Governance

The next three chapters discuss the origins and treatment of the data that capture various aspects or dimensions of global governance. Chapter 2 draws upon attribute variables already established by published authors, some of which are only minimally treated for analysis with quotients, standardization, population weighting, and similar transformations, as well as a few count variables created specifically for this dissertation. Chapter 3 only comprises network measures generated internally for the purposes of this and future related analyses, these being the densities, centralities, node centralities, and Krackhardt's measures of the foreign aid, trade, and IGO-related networks.

Regarding both the attribute variables and the network dimensions added to the attribute dataset, the bulk of the preparation of this dataset was performed on Excel, which allows for far more detailed and controlled data management than any statistical software package. In addition, visual and statistical output was generated in Excel, SPSS, and Stata, the latter being the software used to perform the bulk of the statistical analyses discussed in subsequent chapters. The bulk of the results rendered by this analysis can be found in Part III (i.e., Chapters 5 through 9). The various datasets referenced throughout the chapters that follow can be found in the Appendix.

Year	First	Last
Decolonization Data	1919	2016
Population Data	1950	2016
LoN/UN Budget	1920	2016
US% Contrib to UN	1945	2016
IGO Membership Data	1919	2016
Military Data	1919	2016
GDP Data	1919	2016
Aid Data	1960	2012
Trade Data	1919	2009

Table II.1: Data Availability by Year

In anticipation of the discussions of both network and attribute measures of global governance, it should be noted that some of these data are not available for the entire span of the 1919 – 2016 period. Table II.1 details the availability of data by year based on the nature of the variables, which will help to couch the discussion of each variable in the chapters in Part II.

Chapter 2: Operationalization and Computation of Attribute Variables

What do the *non*-network variables—those *not* generated via social network analysis methods—truly measure within the context of this study? Aside from the count of League of Nations and United Nations member states, which are a byproduct of network analysis, the raw figures from which the attribute variables used in this study were computed come from published datasets documented in the Appendix. A description of each of these is complemented by a detailed account of any transformations performed on their constituent, raw figures.

2.1. IGO Attribute Data

Reported in thousands, figures for UN spending since 1946 are adjusted at 2005 USD values based on Kwon (2011). The proportion of this UN budget relative to the world's total annual economic production was then calculated using the UN spending figures as the numerator and global GDP as the denominator.

Though there are over 65,000 IGOs in existence[6], Schraepler (1996) inventories far less, as does the Europa Year Book, which reports an annual list of what it holds to be the most significant IGOs in the world-system. From this latter source, a count variable of these IGOs has been compiled, ignoring any subsidiaries of the United Nations, such as UNESCO and UNHCR, to proxy the proliferation and prevalence of IGOs in international affairs. That is to say, this variable captures only the tip of the IGO iceberg, and might be a less valid indicator of global governance than any other in this dataset.

[6] See http://www.uia.org/faq/intorgs1 for a fairly comprehensive list of IGOs.

2.2. Nation-state Data

Any state not in existence in 2016 (e.g., Czechoslovakia, Yugoslavia, East Germany, United Arab Republic, South Yemen, Austria-Hungary, etc.), while retained in the original data archive derived from external sources for the benefit of posterity, are not included in the working dataset, and are not reflected in any of the statistical or graphic output.

Decolonization/Sovereignty: The acquisition of sovereignty—measured as the most recent year during which a country's independence was recognized by its former (and most recent) colonizer—for each modern nation-state was derived from Wikipedia[7], and incorporated into IF logarithms in Excel to produce dichotomous values of colonial/sovereign status for any given year. These data and formulae can be found via the Appendix, a cross-section of which appears below. Cells highlighted in yellow in this table represent years in the dataset during which a polity had sovereignty that it subsequently lost. These manual changes to the otherwise algorithmic dichotomies are mostly clustered around European nations that abdicated sovereignty to Germany, Russia/U.S.S.R., or a NATO power during the temporal span of the dataset.

[7] https://en.wikipedia.org/wiki/List_of_sovereign_states_by_date_of_formation

Country	Sovereignty	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Fiji	1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	1918	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
France	1944	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1
Gabon	1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gambia	1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Georgia	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Germany	1991	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Ghana	1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greece	1944	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1
Grenada	1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guatemala	1838	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Guinea	1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guinea-Bissau	1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guyana	1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haiti	1934	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Honduras	1925	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hungary	1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iceland	1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
India	1947	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indonesia	1949	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iran	1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iraq	2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	1931	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Israel	1948	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	1945	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1
Jamaica	1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Japan	1952	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Jordan	1958	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kazakhstan	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.1: Decolonization/Sovereignty Dates by Colony/Country, 1919 – 1945

In their raw state, these values produce only sums of colonies relative to sovereign states for every cross-section of time. However, when weighted by each country's population (reported in thousands), each 1 (representing a sovereign state), now multiplied, represents every citizen in that country during that year, thereby yielding a variable that reports the estimate of people living in sovereign territories relative to the global population.

Country	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Afghanistan	7450.738	7547.158	7651.002	7762.538	7882.009	8009.614	8145.52	8289.858	8442.73	8604.222	8774.44
Albania	1214.489	1243.181	1275.597	1311.197	1349.51	1390.137	1432.752	1477.097	1522.982	1570.267	1618.829
Algeria	0	0	0	0	0	0	0	0	0	0	0
Andorra	6.197	6.692	7.25	7.863	8.526	9.235	9.987	10.781	11.616	12.494	13.414
Angola	0	0	0	0	0	0	0	0	0	0	0
Antigua and Barbuda	0	0	0	0	0	0	0	0	0	0	0
Argentina	17150.335	17506.714	17865.9	18224.511	18580.079	18931.045	19276.796	19617.627	19954.635	20289.515	20623.998
Armenia	0	0	0	0	0	0	0	0	0	0	0
Australia	8177.344	8417.64	8627.052	8821.938	9014.508	9212.824	9420.602	9637.408	9859.257	10079.604	10292.328
Austria	0	0	0	0	0	6959.541	6970.153	6983.824	7001.812	7025.57	7056.28
Azerbaijan	0	0	0	0	0	0	0	0	0	0	0
Bahamas	0	0	0	0	0	0	0	0	0	0	0
Bahrain	0	0	0	0	0	0	0	0	0	0	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	0
Barbados	0	0	0	0	0	0	0	0	0	0	0
Belarus	0	0	0	0	0	0	0	0	0	0	0
Belgium	8628.489	8673.691	8721.192	8770.196	8820.161	8870.792	8922.069	8974.221	9027.679	9082.991	9140.563
Belize	0	0	0	0	0	0	0	0	0	0	0
Benin	0	0	0	0	0	0	0	0	0	0	2431.62
Bhutan	176.795	181.494	186.17	190.825	195.47	200.114	204.778	209.483	214.259	219.138	224.155
Bolivia	2713.63	2767.798	2824.184	2882.803	2943.649	3006.701	3071.916	3139.236	3208.589	3279.901	3353.125
Bosnia and Herzegovina	0	0	0	0	0	0	0	0	0	0	0
Botswana	0	0	0	0	0	0	0	0	0	0	0
Brazil	53974.725	55677.354	57437.103	59234.703	61058.213	62903.025	64772.307	66676.558	68632.26	70659.63	72775.883
Brunei	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	7250.999	7303.773	7359.997	7418.765	7479.367	7541.295	7604.251	7668.139	7733.026	7799.095	7866.472

Table 2.2.2: Sample of the Annual Sovereignty Scores, Weighted by Population

Because no reliable national-level population data prior to 1950 exist by which to weight the sovereignty data, only cases from 1950 onward have been used here. Maddison has *some* pre-1950 colony/country population estimates, but leaves substantial gaps in the data, particularly in Africa and other heavily colonized areas. Banks (1971) and Mitchell (2003a, 2003b, 2003c) both have population estimates, but their cases are also comparably sparse, particularly prior to 1945, which renders their data useless for the purposes of this study. The unweighted sovereignty measure has been retained in some portions of the bivariate and multivariate analysis due to: (1) its inclusiveness of data during the League of Nations period (1919 – 1945), and (2) its overwhelming collinearity with its weighted counterpart[8].

Having established the nature of the sovereignty/decolonization measure in the dataset, what follow are a series of economic measures of global governance, derived from Maddison's (2010) annual measures of nation-state GDPs. Though the raw monetary figures used to compute the variables outlined here are reported in millions, the final variables for use in this analysis are all quotients, z-scores, or otherwise transformed measures that do not reflect raw amounts of US dollars.

US GDP Relative to Global GDP: Data on US GDP, as reported by Maddison (2010) (see also Marshall and Jaggers, 2008), were used as a numerator with Global GDP as the denominator in order to produce a measure of the hegemon's GDP proportional to the world at large, proxying the dimension of hegemonic prevalence in the international economic sphere.

[8] Bivariate $r = 0.981$; partial $r = 0.946$, both significant at $p < 0.01$. See Section 8.1.2 for details.

Hegemon's Relative Economic Development: An alternative method of measuring the hegemon's prevalence—or perhaps privilege—in the world system relies on standardizing raw scores of GDP *per capita*. Unlike the proportional method used to render some of the variables above, this method lends itself better to charting the distinctiveness of the farthest outlier in the distribution—that is, the hegemon—and its relative position from the mean for any cross-sectional distribution of the raw score of its economic development and average standard of living. That is, the values that comprise this array represent the cross-sectional z-scores of US GDP per capita relative to those of every other country on a particular year. Hence, the entire array is comprised of positive values, meaning that its GDP per capita is always higher than that of the average nation since at least 1919 (in fact, going as far back as the 19^{th} century).

Hegemonic Military Prevalence: Similarly, two standardized measures of military prevalence in the world-system can be used to proxy dimensions of a hegemon's hard power, these being the cross-sectional z-scores of US military expenditures relative to all other national military budgets (US milex), and those same expenditures divided by the total number of personnel in that nation's military (US milper). The former represents a measure of absolute offensive/defensive capabilities while the latter is a better proxy for a military's efficiency, material capability, and quality of training, much like GDP/capita measures the quality of life of a nation's average citizens.

Next are trade figures, which can measure the degree to which imports and exports are part of the global economy as well as the degree to which the hegemon's imports and exports permeate the trade sector and even the world-economy. Starting with the integrative dimension, the calculated proportion of world imports relative to global GDP captures the degree to which international trade comprises the world's economic activity. The trade matrices covered in Chapter 3 will provide additional network-based equivalents of the integration (i.e., density and connectedness) of trade in the world-economy.

Hegemonic Imports and Exports Relative to Global Trade: A quotient that measures hegemonic centrality in the trade network divides US imports by a denominator of total world imports to calculate proportions of the hegemon's imports to the sum total of imports worldwide. An export quotient is similarly computed with global exports as the denominator.

Tests for autocorrelation are performed on each construct, yielding expectedly significant amounts thereof at the bivariate level, though rarely when controlling for a secular trend. In order to account for this autocorrelation, partial cross-correlations complement their bivariate counterparts, the latter of which are usually confounded by autocorrelation in both relevant measures. Multivariate analysis utilizing most of these measures will require the incorporation of a Prais-Winsten regression model, whose purpose is to eliminate the effects of bivariate serial correlation that might otherwise render a model's coefficients nonsignificant.

2.3. Moving Averages

The calculation of five-period moving averages for the proportion of the LoN/UN budget relative to global GDP was only performed for visual purposes, as no quantitative analysis was done on this moving average. Because Excel automatically graphs moving averages comprised of X-values t, t_{+1}, t_{+2}, t_{+3}... t_{+k}, the automated moving average appears lagged by k years and consequently, moving average line is plotted synchronously with the raw values of t_{+k}. In order to fix this visual lag, rather than being automatically generated by Excel's graphing function, all of the moving averages in this study are calculated as a new variable, averaging the values of t_{-2}, t_{-1}, t, t_{+1}, and t_{+2}, and are therefore centered on t rather than skewed towards t_{+3}.

2.4. Periodization

For the purposes of related research, many of the variables in this study can be easily periodized into four temporal categories based on their values being highly sensitive to historical situations, such as colonialism, inter-core tensions, and economic cycles. A periodization scheme has consequently been incorporated into the dataset reflecting the more profound shifts, particularly from the standpoint of the role of IGOs as primary or alternative vehicles for interstate conflict resolutions as well as more amicable relations, such as trade. This quadripartite periodization scheme will be employed as a categorical (linearly ordinal) variable in multivariate analyses.

The first period (1919 – 1945) spans from the founding of the League of Nations to the end of World War II, the dissolution of the League, and the founding of the United Nations. This is arguably the final period of Colonialism in an overt, historical sense, after which decolonization sweeps every continent, and neoliberalism and other ideologies begin to replace colonial practices and associated systemic processes.

The second period (1946 – 1961) marks perhaps a Golden Age in the flourishing of global governance, ending with the height of tensions between the First and Second

Worlds. The cutoff here is marked by the Turkish/Cuban Missile Crises of 1962, characterizing the periods prior to and following this critical period that nearly led to an unparalleled conflict between the world's two largest superpowers, and most likely their allies and client states.

The theoretical assumption behind the classification of this third period (1962 – 1991) is that the nearly deployed American missiles in Turkey and Soviet missiles in Cuba fostered a new phase of the Cold War based on mounting concerns over successive hegemonic standoffs, thereafter emphasizing a still nascent global diplomacy over the militarist rivalries between the emergent First and Second Worlds, and reframing the United Nations and other IGOs as alternatives to state-centered global governance.

The fourth and final period (1992 – present, or as close to present as reliable data are available) distinguishes the Cold War period from our current historical period characterized by a relative decline in Western prevalence in the world-economy coupled with a continued increase in hegemonic budgetary emphasis on militarism. Seeing as we are living in this period, its classification is based less on predictions of where we might be by the time this stage matures and the next begins, and more on the transformations that have already taken place since the fall of the Soviet-centered Second World.

2.5. Logarithmic Conversions

Based on initial univariate analyses, several variables were subject to the *secular trend*—that is, an exponential surge of growth during the latter portion of the timeline—including most of the import and export figures, both sovereignty proxies, and the LoN/UN member count. This is also the case for many of the network dimensions of global governance detailed in Chapter 3. To account for such exponential growth (as opposed to linear growth), base values were converted to their logarithmic equivalents in the more extremely exponentiated cases.

However, due to the final analysis accounting for autocorrelated values, the removal of any trended growth or diminishment coupled with the use of Prais-Winsten regressions may confound results, diminishing their validity. Therefore, any logarithmic transformations performed herein are used only for univariate and bivariate purposes.

2.6 Currency Inflation, Deflation, Standardization, and Proportioning

Due to the fact that all of the variables reflecting monetary dimensions of global governance for analysis in this dissertation are proportions, standardizations, or otherwise not raw monetary figures, there is no need for deflation of inflated values because each of these numerators is either being divided by an equally inflated denominator, or it is being standardized against the values of every other nation, which are also equally subject to inflation.

In the first case, so long as both the numerator and denominator in a quotient are inflated by the same factor (or deflated, for that matter), the ratio will reflect a valid measure of, for example, the hegemon's imports as a proportion of the world's total imports. This consistency is applied to every quotient or ratio calculated for the purposes of this dissertation.

As regards the second case, the idea of standardizing values cross-sectionally involves calculating each nation's standardized scores of these annual figures. This method was used to compute US military expenditures (both absolute and per soldier) and US GDP per capita, detailed in Section 2.2 above. By contrast, given the wide range of scales of the variables used in this study—some reflecting millions or billions of USD while others reflected only a fraction of a percent—longitudinal standardization had to also be performed on the entire dataset, creating a secondary set of variables standardized across the period of the dataset. This was done for visualization purposes when graphing two arrays plotted along otherwise dissimilar ranges, and to preserve the precision and validity of some of the β-coefficients and other summary statistics in the later stages of the analysis.

2.7 Chapter Summary

The current chapter attempts to organize variables representing three institutions, and two structural dimensions of global governance. Part III is organized around these conceptual distinctions, as well as the various network oriented distinctions discussed in Chapter 3. IGO-related figures and nation-state-level data, such as UN member states and GDP per capita, were gathered from a variety of external sources, and in most cases transformed (standardized, logged, weighted, etc.) in order to capture more valid attributes of global governance.

A periodization scheme sensitive to inter-core tensions such as World War II and the Cuban Missile Crisis was devised and applied to subsequent analysis at the bivariate and multivariate levels. The methodology portion of this dissertation now proceeds to the treatment of the dyadic and matrix data used to analyze the IGO-state, foreign aid, and trade networks.

Chapter 3: Operationalization and Computation of Network Variables

This chapter focuses on the compilation and calculation of dyadic data on foreign aid, international trade, and IGO-memberships, as well as their subsequent conversion to matrix format.

3.1. UCINET and Network Analysis

The five matrices discussed in this section (abbreviated as M_1, M_2, M_3, M_A, and M_T) were generated using UCINET 6.232 (Borgatti, Everett, and Freeman, 2002), using attribute data compiled by Barbieri (2009, 2012), Roodman (2005, 2013), and a variety of external sources detailed below. Though newer versions of UCINET with an Excel-integrated interface are available, version 6.232 has an optimally simple interface, which renders data management a far tedious task, even when transferring data from Excel or other programs, and is the selected version for the purposes of this dissertation.

Matrices 1, 2, and 3 correspond to the binary state-IGO affiliation matrix, the valued IGO-IGO co-affiliation matrix, and the valued state-state co-affiliation matrix, respectively. Matrix A represents the nonmilitary foreign aid networks, and similarly Matrix T represents the international trade networks. Though additional network analyses were performed on these matrices, the only network dimensions used in this analysis are density, Freeman's degree centrality, and Krackhardt's dimensions, namely connectedness, hierarchy, efficiency, and least upper boundedness. Density and connectedness serve as proxies for the integration of global governance, while the rest of the dimensions constitute the measures of its centralization.

More specifically, the density measure is a simple quotient of the actual number of ties over the total possible ties among the available nodes, while network centrality measures the degree to which existing ties are concentrated or dispersed throughout the network. Node centrality, on the other hand, refers to the number of connections that a given node has relative to the rest of the connections. In order to facilitate the comparison of node centrality scores to their counterpart network centrality scores, the normalized values of degree centrality have been used throughout this dissertation. As Everett and Borgatti (2005) put it, a raw centrality score first "needs to be normalized so we can compare different groups on the same set of actors.... We can therefore normalize by dividing the degree of the group by the number of actors outside the group" (2005: 59). In short, it is functionally similar to standardization, but takes the entire sample of nodes into account in order to calculate the total possible connections, dividing all raw centrality values by their maximum possible values. Un-normalized centrality scores are herein ignored, though they have been compiled for future research.

3.2. Matrices 1, 2, and 3: IGO-State Network Data

Before incorporation into the final attribute dataset, the accounting of annual changes in IGO membership by nation-states was done by first establishing the date when countries joined and/or left the IGOs in this study. With a series of algorithmic functions and pivot tables, annual state-to-IGO affiliation matrices were created in Excel before conversion to UCINET formats (*.##h* and *.##d*). These spreadsheets and their formulae can be found in the Appendix. The following are the IGOs used in this analysis, referred to alternately in this study by their respective acronyms.

IGO	Acronym	Years Active
Central Treaty Organization	CENTO	1955 - 1979
General Assembly on Trades and Tariffs	GATT	1948 - present
Group of 8	G8	1975 - present
International Criminal Court	ICC	2002 - present
International Monetary Fund	IMF	1945 - present
League of Nations	LoN	1919 - 1945
North Atlantic Treaty Organization	NATO	1949 - present
Security Council	SC	1945 - present
Southeast Asia Treaty Organization	SEATO	1955 - 1977
United Nations	UN	1945 - present
World Bank	WB	1945 - present
World Trade Organization	WTO	1995 - present

Table 3.2.1: Acronyms of IGOs Detailed in This Study

In order to create the IGO-state affiliation network matrix from which Matrices 2 and 3 were later permuted, an attribute dataset was compiled from UN[9], WB[10], WTO[11] and Wikipedia[12] sources. Aside from the dates of each country's independence/sovereignty (used to calculate the colony/sovereignty dichotomy detailed in the nation-state data section above) this file also reports when every state joined (and in some cases quit) an IGO.

[9] http://www.un.org/en/members/ and http://www.un.org/en/sc/members/
[10] http://www.worldbank.org/en/about/leadership/members
[11] http://wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm
[12] http://en.wikipedia.org/wiki/Rome_Statute_of_the_International_Criminal_Court, http://en.wikipedia.org/wiki/Member_states_of_NATO, http://en.wikipedia.org/wiki/G8, http://en.wikipedia.org/wiki/States_parties_to_the_Rome_Statute_of_the_International_Criminal_Court, and http://en.wikipedia.org/wiki/List_of_sovereign_states_by_date_of_formation#Sortable_list

Nation-State	Sovereignty	UN Admit	UN	WB Admit	WB	IMF Admit	IMF	ICC Year	WTO Admit	WTO	GATT Admit	GATT
Afghanistan	1989	19-11-1946	1946	Jul 14, 1995	1995	July 14, 1955	1955	2003	*not a member*		*not a member*	
Albania	1944	14-12-1955	1955	Oct 15, 1991	1991	October 15, 1991	1991	2003	8 September 2000	2000	*not a member*	
Algeria	1962	08-10-1962	1962	Sep 26, 1963	1963	September 26, 1963	1963		*not a member*		*not a member*	
Andorra	1944	28-07-1993	1993	*not a member*		*not a member*		2002	*not a member*		*not a member*	
Angola	1975	01-12-1976	1976	Sep 19, 1989	1989	September 19, 1989	1989		23 November 1996	1996	8 April 1994	1994
Antigua & Barbuda	1981	11-11-1981	1981	Sep 22, 1983	1983	February 25, 1982	1982	2002	1 January 1995	1995	30 March 1987	1987
Argentina	1816	24-10-1945	1945	Sep 20, 1956	1956	September 20, 1956	1956	2002	1 January 1995	1995	11 October 1967	1967
Armenia	1991	02-03-1992	1992	Sep 16, 1992	1992	May 28, 1992	1992		5 February 2003	2003	*not a member*	
Australia	1942	01-11-1945	1945	Aug 5, 1947	1947	August 5, 1947	1947	2002	1 January 1995	1995	1 January 1948	1948
Austria	1955	14-12-1955	1955	Aug 27, 1948	1948	August 27, 1948	1948	2002	1 January 1995	1995	19 October 1951	1951
Azerbaijan	1991	02-03-1992	1992	Sep 18, 1992	1992	September 18, 1992	1992		*not a member*		*not a member*	
Bahamas	1973	18-09-1973	1973	Aug 21, 1973	1973	August 21, 1973	1973		*not a member*		*not a member*	
Bahrain	1971	21-09-1971	1971	Sep 15, 1972	1972	September 7, 1972	1972		1 January 1995	1995	13 December 1993	1993
Bangladesh	1971	17-09-1974	1974	Aug 17, 1972	1972	August 17, 1972	1972	2010	1 January 1995	1995	16 December 1972	1972
Barbados	1966	09-12-1966	1966	Sep 12, 1974	1974	December 29, 1970	1970	2003	1 January 1995	1995	15 February 1967	1967
Belarus	1991	24-10-1945	1945	Jul 10, 1992	1992	July 10, 1992	1992		*not a member*		*not a member*	
Belgium	1945	27-12-1945	1945	Dec 27, 1945	1945	December 27, 1945	1945	2002	1 January 1995	1995	1 January 1948	1948
Belize	1981	25-09-1981	1981	Mar 19, 1982	1982	March 16, 1982	1982	2002	1 January 1995	1995	7 October 1983	1983
Benin	1960	20-09-1960	1960	Jul 10, 1963	1963	July 10, 1963	1963	2002	22 February 1996	1996	12 September 1963	1963
Bhutan	1907	21-09-1971	1971	Sep 28, 1981	1981	September 28, 1981	1981		*not a member*		*not a member*	
Bolivia	1825	14-11-1945	1945	Dec 27, 1945	1945	December 27, 1945	1945	2002	12 September 1995	1995	8 September 1990	1990
Bosnia & Herzegovina	1992	22-05-1992	1992	Feb 25, 1993	1993	December 14, 1992	1992	2002	*not a member*		*not a member*	
Botswana	1966	17-10-1966	1966	Jul 24, 1968	1968	July 24, 1968	1968	2002	31 May 1995	1995	28 August 1987	1987
Brazil	1822	24-10-1945	1945	Jan 14, 1946	1946	January 14, 1946	1946	2002	1 January 1995	1995	30 July 1948	1948
Brunei Darussalam	1984	21-09-1984	1984	Oct 10, 1995	1995	October 10, 1995	1995		1 January 1995	1995	9 December 1993	1993
Bulgaria	1908	14-12-1955	1955	Sep 25, 1990	1990	September 25, 1990	1990	2002	1 December 1996	1996	*not a member*	
Burkina Faso	1960	20-09-1960	1960	May 2, 1963	1963	May 2, 1963	1963	2004	3 June 1995	1995	3 May 1963	1963
Burundi	1962	18-09-1962	1962	Sep 28, 1963	1963	September 28, 1963	1963	2004	23 July 1995	1995	13 March 1965	1965

Table 3.2.2: Sample of Raw Figures of IGO Membership

From this primary table, each IGO table is derived using an IF formula in Excel. This simple algorithmic procedure generates a separate, binary, state-by-time dataset (that is, one comprised of states as cases, and years as variables) for each of the focal IGOs in this dissertation, such as Table 3.2.3, which represents part of the UN's longitudinal matrix.

Nation-State	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Afghanistan	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Albania	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Algeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Andorra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antigua & Barbuda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Argentina	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Armenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Austria	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Azerbaijan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bahamas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bahrain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barbados	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belarus	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Belgium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Table 3.2.3: UN Membership Data Reorganized along a State-by-Time Grid, 1945 – 1961

These arrays are then pivoted to create annual, cross-sectional matrices of state-IGO affiliation using Excel's LOOKUP function, as the sample portion of 2014 in Table 3.2.4 illustrates.

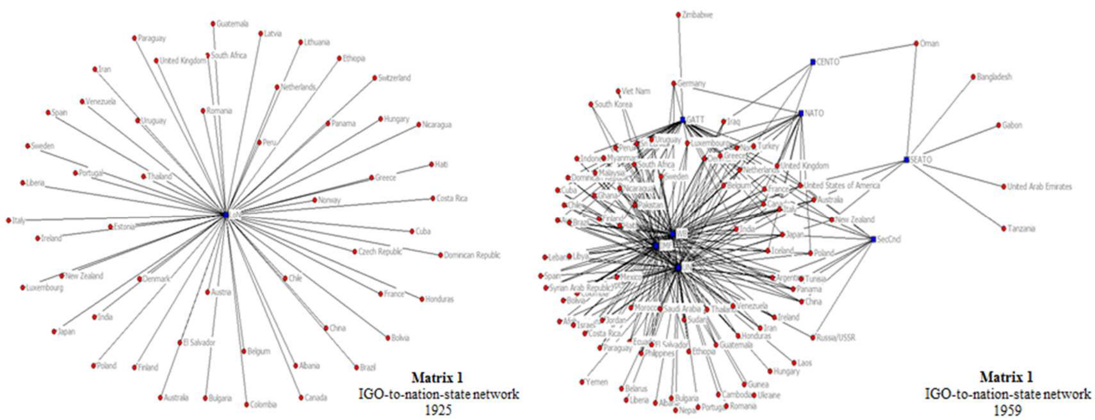
2014	UN	WB	IMF	ICC	WTO	GATT	G8	SecCncl	NATO	CENTO	SEATO	LoN
Afghanistan	1	1	1	1	0	0	0	0	0	0	0	0
Albania	1	1	1	1	1	0	0	0	1	0	0	0
Algeria	1	1	1	0	0	0	0	0	0	0	0	0
Andorra	1	0	0	1	0	0	0	0	0	0	0	0
Angola	1	1	1	0	1	1	0	0	0	0	0	0
Antigua & Barbuda	1	1	1	1	1	1	0	0	0	0	0	0
Argentina	1	1	1	1	1	1	0	1	0	0	0	0
Armenia	1	1	1	0	1	0	0	0	0	0	0	0
Australia	1	1	1	1	1	1	0	1	0	0	0	0
Austria	1	1	1	1	1	1	0	0	0	0	0	0
Azerbaijan	1	1	1	0	0	0	0	0	0	0	0	0
Bahamas	1	1	1	0	0	0	0	0	0	0	0	0
Bahrain	1	1	1	0	1	1	0	0	0	0	0	0
Bangladesh	1	1	1	1	1	1	0	0	0	0	0	0
Barbados	1	1	1	1	1	1	0	0	0	0	0	0
Belarus	1	1	1	0	0	0	0	0	0	0	0	0
Belgium	1	1	1	1	1	1	0	0	1	0	0	0
Belize	1	1	1	1	1	1	0	0	0	0	0	0
Benin	1	1	1	1	1	1	0	0	0	0	0	0
Bhutan	1	1	1	0	0	0	0	0	0	0	0	0
Bolivia	1	1	1	1	1	1	0	0	0	0	0	0
Bosnia & Herzegovina	1	1	1	1	0	0	0	0	0	0	0	0
Botswana	1	1	1	1	1	1	0	0	0	0	0	0
Brazil	1	1	1	1	1	1	0	0	0	0	0	0
Brunei Darussalam	1	1	1	0	1	1	0	0	0	0	0	0
Bulgaria	1	1	1	1	1	0	0	0	1	0	0	0

Table 3.2.4: Sample of IGO-State Affiliation Matrix (M_1), 2014

Cross-sectional matrices for the entire period (1919 – 2016) were generated with the worksheet above, and converted to UCINET files in order to perform the necessary network analyses. Each of these flat files constitutes a cross-section of Matrix 1. IGOs that have 0 members during any given year (such as the League of Nations after 1945 or all the other IGOs before then) are omitted from the UCINET dataset so as to not confound the results of each procedure with inflated denominators.

3.2.1. Matrix 1: IGO-state affiliation network

This raw, directed, asymmetrical matrix simply reports the binary value of every nation's membership in the IGOs of interest to this study (see Table 3.2.1 for the list of IGOs in the dataset). As such, its structure only allows for the analysis of the network's density as a function of its actual ties relative to the total number of possible ties given the number of nodes (all states and IGOs). To illustrate the matrices to be quantified, below are two sample cross-sections of Matrix 1, composed with NetDraw—a graphing program included as part of the UCINET software package—chronicling the proliferation of IGO-membership by nation-states. These and all other network graphs ignore omit disconnected actors (in the case of Matrix 1, nation-states that are not members of any of the IGOs in the dataset).



Figures 3.2.1 – 3.2.2: Sample Cross-sections of Matrix 1

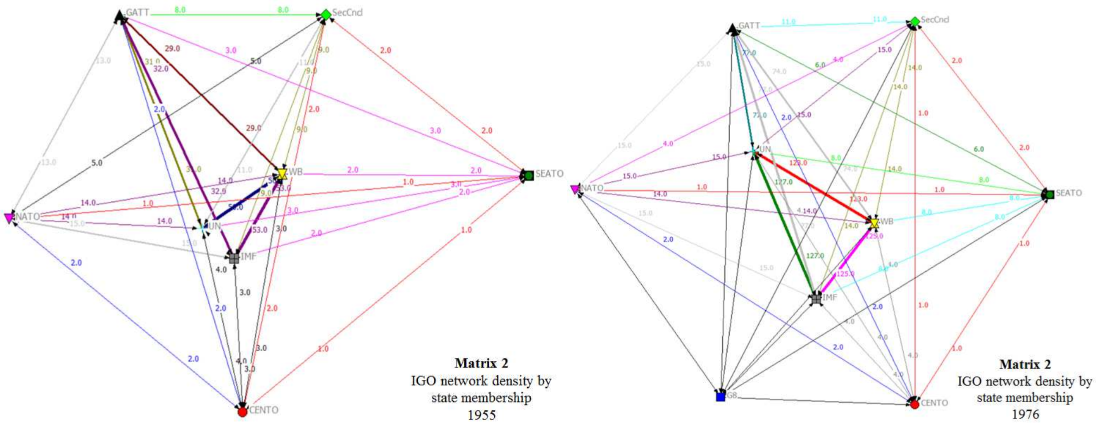
Because Matrix 1 is necessarily asymmetrical (i.e., it has two different types of actors along each axis, and therefore always bears a rectangular shape), only a measure of this affiliation network's density was performed, as the remainder of the network dimensions calculated for this dissertation require square, symmetrical matrices. In order to do more extensive network analysis on IGO-state membership, each cross-section of Matrix 1 was then transformed into two co-affiliation matrices (M_2 and M_3, detailed below) for each year since 1919, when the League of Nations was the only IGO in the study. Co-affiliation matrices are always symmetrical, containing the same actors/nodes along both axes, and thus allowing for the measurement of centrality and hierarchy within the network. These quantifications were then tabulated in the comprehensive, longitudinal, attribute dataset intended for the subsequent statistical analyses detailed in Chapter 5.

3.2.2. Matrix 2: State Co-affiliations among IGOs

UCINET permutes Matrix 1 into the number of member states that any two IGOs have in common during any given year, rendering Matrix 2. Measures of network density, and Freeman's normalized matrix centrality, as well as node centrality for the League of Nations and its successor as the most prominent IGO on Earth, the United Nations, are then computed. In addition, in the case of Matrices 3, A, and T, Krackhardt measures (Krackhardt, 1994: 95-100; Hanneman and Riddle, 2005: 168) are also computed with UCINET, when possible. Some of these computations lead to constant values of 0 or 1, and will be discussed at greater length in Chapter 7, but in short, their invariability renders them unusable in the bivariate and multivariate analyses.

Unlike the other three Krackhardt's measures (hierarchy, efficiency, and least upper boundedness), *connectedness* is more a feature of integration than of centralization in a network. Therefore, the analytical chapters that deal at least in part with network measures will treat Krackhardt's connectedness figures as integration measures, and will group them with density when assessing each institutional (i.e., political-military or economic) or directional (i.e., horizontal or vertical) dimension of global governance.

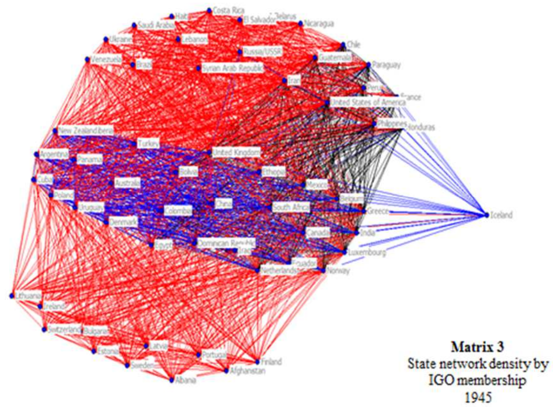
Figures 3.2.3 through 3.2.6 represent cross-sections of Matrix 2 graphed by the NetDraw software. This co-affiliation matrix, given its lower number of nodes, measures the number of states that are members of any two organizations, visually coding the strongest relationships—those among the most central IGOs—with thicker, brighter lines.

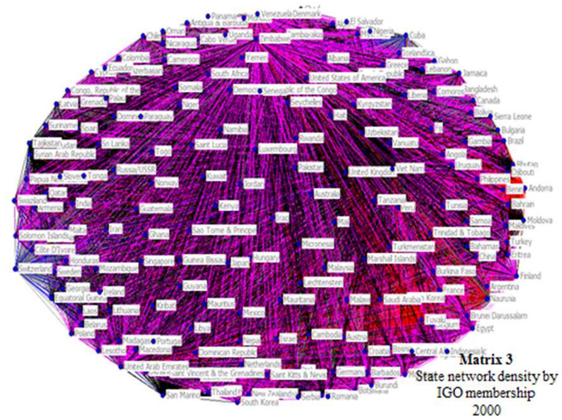


Figures 3.2.3 – 3.2.4: Sample Cross-sections of Matrix 2

3.2.3. Matrix 3: IGO Co-affiliations among States

Much as with Matrix 2, UCINET used the binary data in Matrix 1 to generate Matrix 3, which reports the number of IGOs in which nation-states have common membership. The same measures of density and normalized centrality were calculated with UCINET, quantifying the state-by-state co-affiliation network with the following variables: M_3 Density, M_3 Centrality, and US node centrality in M_3. As detailed in Section 3.1, only *normalized* degree centrality scores are used with all matrices in this dissertation, given the need to account for disconnected nodes in the matrix. In addition, Krackhardt's measures were also computed for Matrix 3, but only its connectedness and efficiency exhibited a nonzero variance. Thus, this matrix's hierarchy (ubiquitously 0.0) and least upper boundedness (ubiquitously 1.0) are discussed as constants in Chapter 7, and are omitted from the bivarite analysis of network dimensions in Chapter 9, and thereafter.





Figures 3.2.5 – 3.2.6: Sample Cross-sections of Matrix 3

Unlike Matrix 2, which has only about ten active nodes during any given year, Matrix 3 is characterized by almost 200 sovereign nodes by the end of the period, as is seen in NetDraw's graphic representations of these cross-sections in which each link represents common membership by two nations in at least one IGO. Color coding is the optimal visual method for distinguishing the intensity of relationships in this densely packed network, as valued labels would be too numerous to make much sense, and even differentially thick lines would blur one another out.

3.3. Matrix A: Nonmilitary Foreign Aid

The raw foreign aid matrices were generated from Roodman's (2005) *Official Development Assistance (ODA*) dataset reported in USD, constant at 1960 values (the first year of Roodman's dataset). As with the IGO-state matrix discussed above and the trade matrix discussed below, these dyadic nonmilitary aid figures, partly shown in Table 3.3.1, were reorganized into cross-sectional foreign aid matrices using a pivot table (see Table 3.3.2) with donors along the top row and recipients of foreign aid listed along the left column.

	A	D	E	H
1	Year	Recipient	Donor	Net ODA
192634	1981	Cyprus	Austria	45.100
192635	1982	Cyprus	Austria	0.560
192636	1983	Cyprus	Austria	-0.940
192637	1984	Cyprus	Austria	-3.920
192638	1985	Cyprus	Austria	-2.010
192639	1986	Cyprus	Austria	-1.950
192640	1987	Cyprus	Austria	-1.920
192641	1988	Cyprus	Austria	-1.920
192642	1989	Cyprus	Austria	-1.780
192643	1990	Cyprus	Austria	-1.650
192644	1991	Cyprus	Austria	-1.540
192645	1992	Cyprus	Austria	-1.650
192646	1993	Cyprus	Austria	-1.670
192647	1994	Cyprus	Austria	-0.300
192648	1995	Cyprus	Austria	0.610
192649	1996	Cyprus	Austria	0.580
192650	1997	Cyprus	Austria	0.000
192651	1998	Cyprus	Austria	0.000
192652	1999	Cyprus	Austria	0.400
192653	2000	Cyprus	Austria	0.000
192654	2001	Cyprus	Austria	0.170
192655	2002	Cyprus	Austria	0.160
192656	2003	Cyprus	Austria	0.140
192657	2004	Cyprus	Austria	0.060

	A	B	C	D
1	Year	2012		
2				
3	Sum of Net ODA	Column Labels		
4	Row Labels	Australia	Austria	Belgium
5	Afghanistan	226.680	1.290	11.790
6	Albania	0.020	8.900	0.010
7	Algeria	0.060	0.250	6.560
8	Angola	0.190	0.040	0.140
9	Anguilla		0.000	0.000
10	Antigua & Barbuda	0.140	0.000	0.000
11	Argentina	1.380	0.240	0.130
12	Armenia	0.000	2.890	0.200
13	Azerbaijan	0.610	0.930	0.000
14	Bangladesh	120.850	0.530	0.820
15	Belarus	0.000	1.140	0.060
16	Belize	0.180	0.000	0.000
17	Benin	0.110	0.030	25.590
18	Bhutan	15.600	1.810	0.000
19	Bolivia	0.550	0.290	16.940
20	Bosnia-Herzegovina	0.010	27.780	-0.250
21	Botswana	1.510	0.000	-0.080
22	Brazil	2.660	1.340	3.730
23	Burkina Faso	0.470	7.320	9.800
24	Burundi	1.170	0.240	56.190
25	Cambodia	100.930	0.710	5.370
26	Cameroon	2.650	0.400	2.360
27	Cape Verde	0.160	0.540	0.250
28	Central African Rep.	0.330	0.000	1.500
29	Chad	2.690	0.000	1.740
30	Chile	2.330	0.290	0.530

Tables 3.3.1 – 3.3.2: Foreign Aid Matrix in Dyadic (left) and Pivoted Matrix (right) Formats

Each cross-section of the pivoted data in Table 3.3.2 was then converted to a corresponding matrix in a separate worksheet, which was then used to convert each year's matrix into UCINET format for further analysis.

1972	Afghanistan	Albania	Algeria	Angola	Argentina	Armenia	Australia	Austria	Azerbaijan	Bahrain	Bangladesh	Belarus	Belgium	Benin	Bolivia
Afghanistan							0.15								
Albania															
Algeria													0.41		
Angola															
Argentina													0.33		
Armenia															
Australia															
Austria															
Azerbaijan															
Bahrain															
Bangladesh							9.84								
Belarus															
Belgium															
Benin													0.18		
Bolivia								0.01					0.16		
Bosnia and Herzegovina															
Botswana							0.03								
Brazil								0.05					0.30		
Bulgaria															
Burkina Faso								0.06					0.05		
Burundi													12.77		
Cambodia							2.00						0.01		
Cameroon													0.41		
Canada															
Cape Verde															
Central African Republic								0.01					0.05		
Chad													0.03		
Chile							0.01						1.08		
China															

Table 3.3.3: Cross-section of Valued Foreign Aid Matrix, 1972

As with the trade and IGO-state affiliation matrices, each cross-section was then converted to UCINET files, generating a corresponding graph of each cross-section. The centrally clustered blue nodes represent donors, while the recipients are graphed as the peripheral, red nodes. As with all other NetDraw graphs in this dissertation Figures 3.3.1 and 3.3.2 omit disconnected actors (in this case, nation-states that are neither donors nor recipients of aid in 1960).

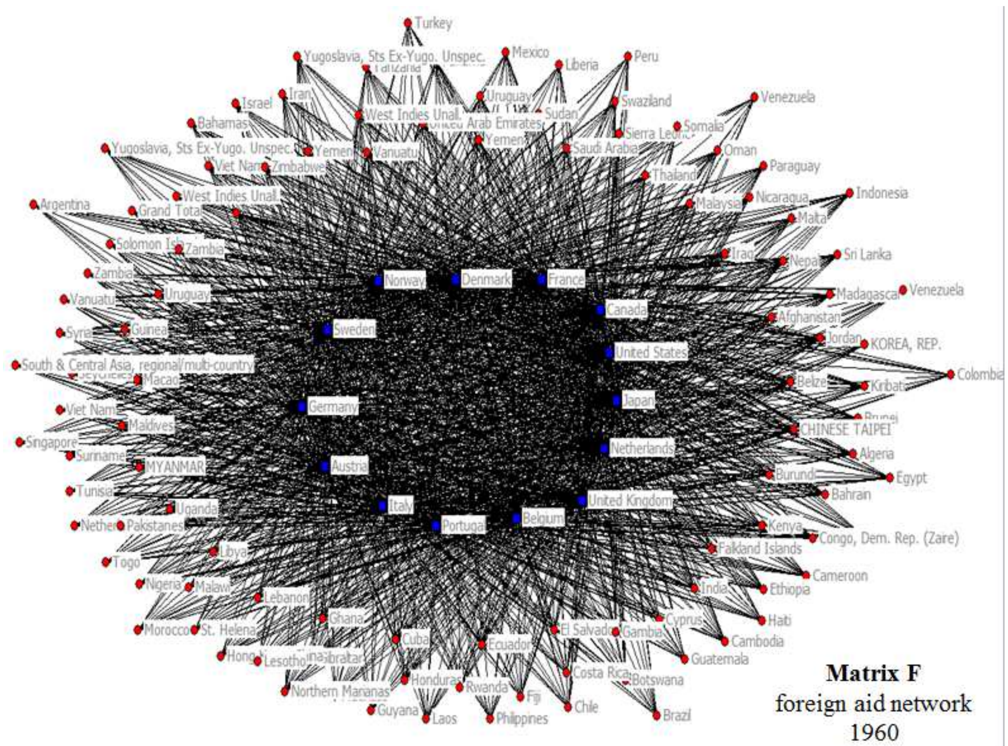


Figure 3.3.1: Sample Cross-section of the Foreign Aid Matrix, 1960

Given the amount of foreign aid activity by 1960 and thereafter (the period for which Roodman's data are available), it is difficult to tell from Figure 3.3.1 who the principal actors are; all that is evident is who the donors and recipients are, based on node coloring and visual centrality in the graph. As a method of adding further detail to the quantitative analysis in this dissertation, removing all donor countries other than the

United States and United Kingdom simplifies the graph, reproduced below, which now graphs the intensity of relationships based on the thickness of the lines joining each pair of nodes. Though no analytical assessment of these graphs is made, and the United Kingdom is not taken into account in the final analysis, these images complement the histograms, normal probability plots, and longitudinal plots featured in Chapters 6 and 7.

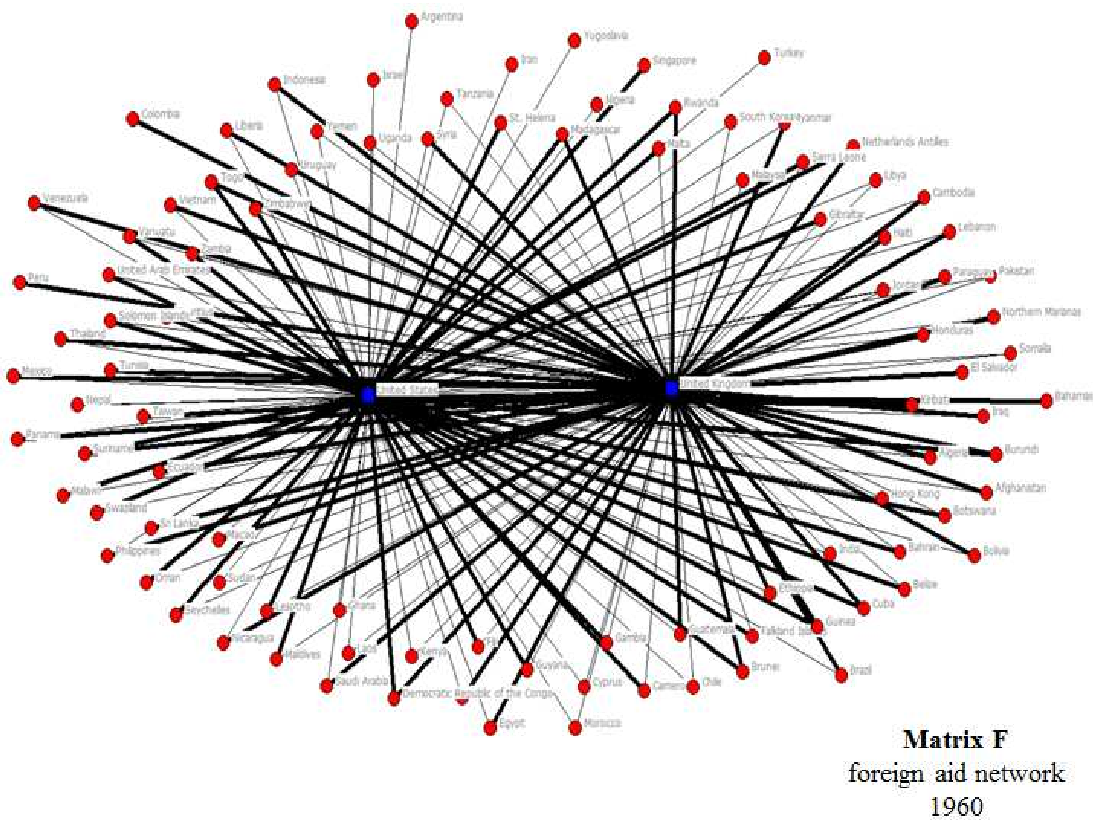


Figure 3.3.2: As Above, Removing Non-hegemonic Donors, 1960

A cautionary note regarding the nature of these matrices is warranted here. While the relative benefits of trade to importers versus exporters—the focus of discussion in Section 3.7—are arbitrary or at best ambiguous, the hierarchical nature of patron-client relationships resulting from foreign aid relationships arguably facilitates a partial surrender of sovereignty by the recipient to the lender, presumably a state with a higher position in the world-system's core-periphery hierarchy. SAPs (*structural adjustment programs*), though empirically exogenous to this research, are only one formal expression of such relationships, but regardless of their introduction into international affairs, the hierarchical quality of the foreign aid matrices is assumed to be ubiquitous throughout the period. That is, there are very few cases wherein a country is only an importer or exporter, but not both, again reflecting a network presumably less hierarchical than the foreign aid network. With foreign aid, the opposite is true: most *donors* of foreign aid are not also *recipients* during the same period, and therefore, the transformations of these matrices into square formats rendered much sparser/emptier matrices with seemingly less density and more complexity than their original counterparts. This is consistent with the above assumption that a country's position in the world-system renders mutually exclusive the roles of *donor* and *recipient* of foreign aid. This is empirically substantiated later in Section 6.3.4's overview of Krackhardt's graph-hierarchy of the foreign aid matrix, which is modally a perfect 1.0, and never smaller than 0.9906.

3.4. Matrix T: International Trade

In order to generate the annual trade matrices, dyadic trade figures were compiled from Barbieri's (2009, 2012) 3.0 dataset (Figure 3.4.1), which comprises interstate trade from as early as the 1870s until 2009.

	A	B	C	D	E	F
1	year	Importer#	Exporter#	Importer	Exporter	Imported (millions)
693000	2004	950	990	Samoa	Fiji	$ 61.46
693001	2005	950	990	Samoa	Fiji	$ 38.71
693002	2006	950	990	Samoa	Fiji	$ 47.84
693003	2007	950	990	Samoa	Fiji	$ 59.37
693004	2008	950	990	Samoa	Fiji	$ 67.78
693005	2009	950	990	Samoa	Fiji	$ 59.30
693006	1999	955	990	Samoa	Tonga	$ 0.13
693007	2000	955	990	Samoa	Tonga	$ 0.15
693008	2001	955	990	Samoa	Tonga	$ 0.17
693009	2002	955	990	Samoa	Tonga	$ 0.18
693010	2003	955	990	Samoa	Tonga	$ 0.23
693011	2004	955	990	Samoa	Tonga	$ 0.30
693012	2005	955	990	Samoa	Tonga	$ 0.65
693013	2006	955	990	Samoa	Tonga	$ 0.80
693014	2007	955	990	Samoa	Tonga	$ 0.99
693015	2008	955	990	Samoa	Tonga	$ 1.13
693016	2009	955	990	Samoa	Tonga	$ 0.99

Tables 3.4.1 – 3.4.2: Dyadic Trade Data in Attribute Format (left), and Criteria for Pivot Table (right)

The attribute dataset was queried with Excel's pivot table functions, using the selection criteria in Figure 3.4.2, which produces annual matrices, such Table 3.4.3. These can be found in the Appendix.

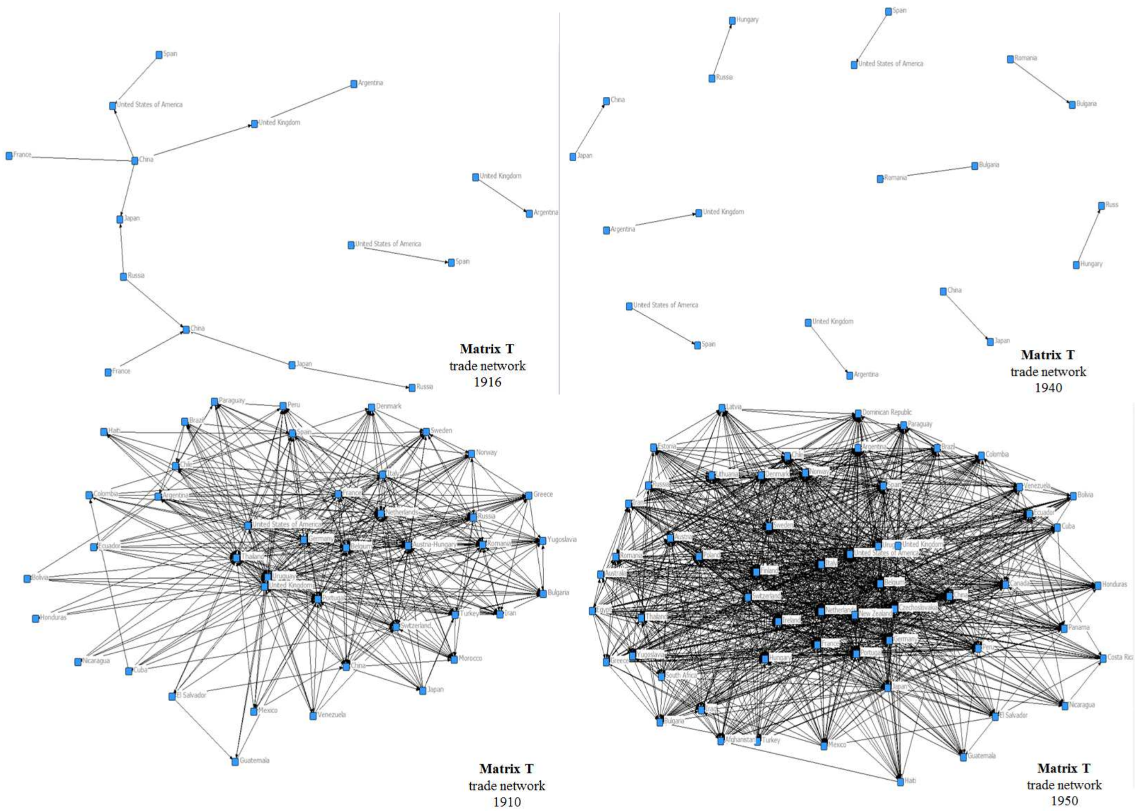
year	1994					
Sum of flow1	**Column Labels**					
Row Labels	**Canada**	**Bahamas**	**Cuba**	**Haiti**	**Dominican Republic**	**Jamaica**
United States of America	101292	607.1		110.7	2452.4	644.4
Canada		45.31	233.48	0.74	29.92	157.09
Bahamas	21.06		0.07	0.18	0.01	0.65
Cuba	103.05	0.02			0.95	
Haiti	6.62	0.2			0.22	0.91
Dominican Republic	55.5	0.05		0.39		1.46
Jamaica	58.02			0.1	4.72	
Trinidad and Tobago	73.73	0.01	0.03		1.93	31.03
Barbados	31.35	0.05	0.24	0.01	1.27	14.62
Dominica	4.23				0.04	1.79
Grenada	2.46				0.19	1.6
St. Lucia	10.74			0.04	0.71	4.23
St. Vincent and the Grenadines	4.05	0.01	0.01	0.01	0.03	2.03
Antigua & Barbuda	7.31			0.03	0.02	2.87
St. Kitts and Nevis	1.85					1.89
Mexico	1156.91	8.06	8.37	4.34	4.3	2.8
Belize	5.45	0.01		0.01	0.04	4.61
Guatemala	23.93	0.02		0.01	0.25	1.14
Honduras	9.7	0.02		0.02	1.7	0.14
El Salvador	14.91				0.38	
Nicaragua	8.8		2.2		0.3	

Table 3.4.3: Pivot Table of Trade Data Based on Criteria in Figure 3.4.2.

110 cross-sectional slices were produced for 1900 – 2009; each was converted to UCINET format in order to calculate each year's density. Though values predating 1919

are available for future analysis, the period before the establishment of the League of Nations is not included in the final working dataset.

Below are four graphic representations of M_T. Figures 3.4.1 and 3.4.2 represent trade networks during World Wars I and II, respectively, while Figures 3.4.3 and 3.4.4 represent peacetime international trade relationships.



Figures 3.4.1 – 3.4.4: Sample Cross-sections of the Trade Matrix

Even slight inconsistencies in node labels yield invalid output based on seemingly missing data. For example, Burma/Myanmar will render a 0 GDP by which to dichotomize a matrix unless the country labels are consistent between Maddison's (2010) GDP dataset and the valued foreign aid and trade matrices, and the same is true for both Koreas, both Congolese nations, etc. UCINET's *Transform/Bipartite* function automatically reshapes each year's matrix as a square matrix, displaying the same actors along both axes, though this study utilizes INDEX/MATCH/MATCH formulae in Excel for greater control over the restructuring of the data (UCINET's *Transform/Bipartite* function tends to duplicate cases in order to achieve a square form), and to better replicate this process in future work. Having rendered each matrix square, the names of some of the country labels were changed to match the country names in Maddison's GDP dataset.

3.5 Chapter Summary

This section explains the computations, transformations, and other reorganization performed on these data before statistical analyses could be conducted. The five matrices rendered by this portion of the methodology are:

Matrix 1 (M_1): the original state-IGO affiliation network

Matrix 2 (M_2): the permuted IGO-IGO co-affiliation network

Matrix 3 (M_3): the permuted state-state co-affiliation network

Matrix A (M_A): the nonmilitary foreign aid network

Matrix T (M_T): the trade network

The need for various measurements of the same relationships lies in the logic inherent in various network analysis computations. Some computations assume symmetry, for example; while other procedures demand matrices with dichotomous values only. Having generated the density of all these matrices, as well as the centrality and hierarchical properties of some of these networks and their primary nodes, preliminary univariate analysis of these network variables begins in Chapter 7, continues in Chapter 9, and concludes in Chapter 10.

Chapter 4: Analytical Methodology

Having operationalized the variables for use in this dissertation, the descriptive analyses contained Chapters 5 and 6 are followed by more inferential discussions in the subsequent chapters. This chapter covers the methods and applications used to undertake this series of analyses.

4.1. Univariate Analyses

The descriptive analysis of the attribute (non-network) variables, detailed in Chapter 5, as well as the subsequent analysis of the network dimensions of global governance, followed up in Chapter 6, are assessed on the basis of their central tendency and overall distribution, as shown in the histograms and normal probability plots included in those chapters. In addition, longitudinal plots tracing the trajectories of each variable provide a visualization to the development and possible erosion or recession of some of these facets of global governance. Figure 4.1.1 illustrates the years for which data is available, by variable or data cluster.

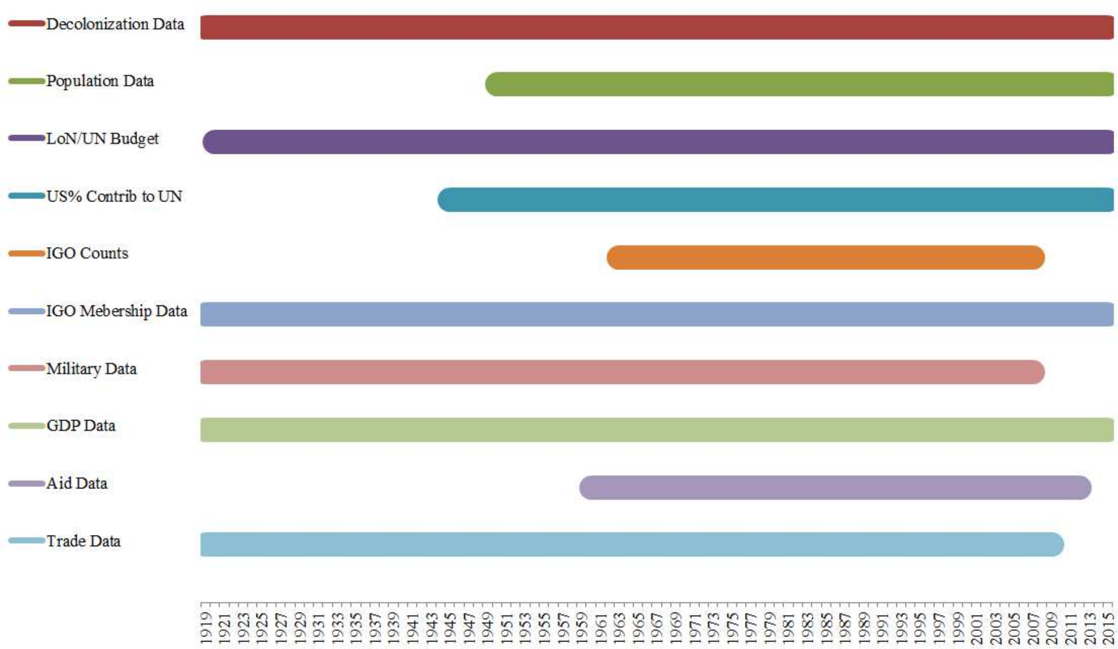


Figure 4.1.1: Availability of Data by Year

Development disparity—treated as the dependent variable in the subsequent sections of the analysis—is discussed with a particular focus of its explanatory power relative to other useful measures of hierarchy in the world-system.

Chapters 5 and 6 describe, respectively, the attribute and network variables to be used, and in some cases, discarded. The discarding of data is done on the basis of internal validity and/or redundancy with a more valid or reliable measure. Collinearity among variables is discussed in the bivariate section of the analysis, and aids in the further reduction of redundant proxies of global governance.

4.1.1. Autocorrelation and Collinearity

Autocorrelation was found throughout most of the raw attribute variables, as well as many of the network dimensions of the valued matrices. Those of the binary matrices were less autocorrelated overall. Logarithmic transformations by their computational definition have greater autocorrelation than their raw values, and even some attempts at replacing raw scores with change scores—though not empirically discussed in this dissertation—did not yield very different results at the bivariate level. Section 4.3 discusses how Prais-Winsten regression accounts for autocorrelation.

In addition, multicollinearity was found throughout the dataset, even among variables that were in no way mathematically rooted in the same raw values, nor in features of the world-system that are theoretically linked in the surveyed literature. Autocorrelation in any variable highly correlated with another autocorrelated variable might be rendered moot in a Prais-Winsten regression, depending on the amount of redundancy in the explainability of a model's factors. In either case, efforts have been made to minimize factor redundancy in multivariate models—particularly among collinear factors.

4.2. Bivariate Analyses

While the original theorizing in this dissertation was highly ambitious in its incorporation of most of the variables in the comprehensive dataset compiled for related studies into a singular model, the bivariate analysis culled many of the less plausible hypotheses from the relatively inclusive model originally premeditated previous research (Álvarez, 2013, 2014, 2015), part of which was driven by the conventions of existing literature and their corresponding paradigms prior to the full operationalization of the variables in this study[13].

[13] Álvarez (2013) compares UK and US hegemony along most of the axes/variables discussed in this dissertation; Álvarez (2014) emphasizes shifts in institutional emphasis with respect to global governance; Álvarez (2015) integrates the structural and institutional typologies in this dissertation in an attempt to isolate specific intra- and interdimensional causal relationships among the dimensions of global governance.

Empirical analyses begin with unlagged Pearson's r-coefficients among the various factors, as well as development disparity, followed by partial correlations controlling for time, and finally by a more incisive causal analysis of cross-correlograms representing lagged correlations among select variable pairs.

This type of output suggests the most likely amount of delay before the onset of causality manifests—if at all—between any two dimensions of global governance. Not only do cross-correlograms optimize the number of years by which variables are lagged in the later analysis, they also highlight variables fit for elimination from the model when those variables have no direct bivariate relationship to development disparity.

All but two cross-correlograms reflect bivariate results, in that they do not control for time or any other variable. Thus, they reflect long-term, lagged effect independent of anything flagged by the unlagged, partial correlations. There are, however, two cases that warranted the calculation of partial cross-correlations; that is, those that accounted for time as a control, *and* as a lagging factor in order to isolate possible short-term causal relationships between US GDP per capita (to be treated as a dependent variable in the Prais-Winsten regressions discussed in Chapter 9) and both the US import and export figures relative to global GDP, as illustrated in Figures 7.1.12 and 7.1.13.

In keeping with the format of the univariate analyses, longitudinal plots allow for a more qualitative and visual interpretation of the results. These will generally consist of two or more variables, thereby facilitating the discussion of possible collinearity or other measurable relationships among conceptually similar variables.

On the basis of spuriousness and other confounding statistical noise likely to emerge after a decade, the standard ceiling for reasonable lags has been capped at 10 years; that is to say, any lags beyond 10 years will either be ignored or in a few cases incorporated into the multivariate analysis as if the optimal lag were actually 10 years.

4.3. Multivariate Analyses: Prais-Winsten Regression

To compensate for the serial autocorrelation so characteristic of much of this dataset, Prais-Winsten regressions were performed with Stata on development disparity. The Prais-Winsten method is useful for controlling for autocorrelation, though it is relatively inefficient at handling collinearity in the model, let alone among multiple collinear relationships.

Factoring the ρ-coefficient—a measure of autocorrelation in a Prais-Winsten regression—into the model's polynomial function, Stata runs a number of iterations of the regression, controlling for the autocorrelation as long as the ρ-coefficient changes with each successive iteration.

Prais-Winsten regression does not compute VIFs (*variance inflation factors*), though OLS models using the same variable structure were also run, and their VIFs were tabulated in Table 9.3.13, found in Section 9.3.6, in order to determine which factors, if any, might be acting on the outcome variable jointly. Values higher than 8 in this case point to such cases, in which it is likely that: (1) collinearity among factors and even with the outcome variable may be confounding the p-values of the β-coefficients in the regressions, or (2) interaction variables among individual dimensions are likely to render statistically significant relationships. As regards the first possibility, this is addressed by taking into account the measured collinearity, and its usually diminishing effects across annual lags, in the detailed discussion of each relationship. With respect to the second possibility, the creation of interaction variables among already related measures is an effort that must be heavily theoretically grounded (as it might be due to properties that characterize many of these variables, such as a secular growth trend) in order to have any substantive face validity, and therefore is better couched in a separate study that utilizes a more limited palette of variables.

4.3.1. The Limitations of ARMA and ARIMA

Other procedures also normally used on highly autocorrelated data, such as ARMA (autoregressive moving average) and ARIMA (autoregressive integrated moving average), are better suited to data subject to seasonal—that is, highly regular—cycles rather than the mostly linear, trended data that this dissertation analyzes. None of the data in this study follow such seasonal cycles or any other form of regular, short-term pattern, and thus this related series of regression variants is not applicable to this dataset.

4.3.2. Periodization in the Multivariate Analysis

Based on the earlier phases of this research—particularly on the bivariate analysis between development disparity and other key variables—the Cold War periodization scheme was incorporated into the analysis, marking 1945/1946, 1961/1962, and 1991/1992 as the three cutoffs that demarcate the four periods. Section 9.2 discusses the application of this temporal typology at greater length.

4.3.3. Typologies of global governance and related regression analyses

By contrast to the temporal typology discussed immediately above, the three conceptual typologies into which the dimensions of global governance in this body of work are classified are:

Network/Non-network: *matrix-based vs. attribute-based dimensions*
Structural: *centralization vs. integration*
Institutional: *economic vs. diplomatic vs. military dimensions*

Hence, each chapter in Part II is organized around the dimensions of each of the three main networks discussed in this dissertation and/or around the structural and institutional classification schemes that facilitate the directional and functional distinctions among these macro-level forces.

The culmination of this empirical analysis, found in Chapter 9, is also organized around clustering these indicators based on these typologies in order to test the merits of each dimension of global governance on one specific measure of the hegemon's level of development relative to the rest of the world, this being its GDP per capita standardized cross-sectionally against all other nations' GDPs per capita. This allows for at least a partial discussion of any dimensions of global governance that determine the standard of living of the hegemon's average citizen compared to the world's average citizen, which is in and of itself a feature of hegemonic global governance, and of the hegemon's determination to reproduce the core-periphery hierarchy.

Part III: Data Analysis and Conclusion

The following six chapters reflect the research conducted for the purposes of completing this dissertation and applying the data to a wider body of work tailored for publication, as well as reflections on the future of global governance. Chapter 5 provides a univariate overview of the non-network attributes of global governance using longitudinal plots, histograms, and normal probability plots to discuss each variable's approximation to Gaussian normalcy, as well as cyclicality, autocorrelation, periodicity, irregularities, nonexistent data, and other univariate features relevant to the analysis. Chapter 6 subsequently replicates these procedures to analyze various dimensions of the IGO-state, foreign aid, and trade networks.

Chapter 7 returns to the attribute measures of global governance assessed in Chapter 5, but focuses on bivariate relationships among them. Cross-correlograms are also used here to assess any lagged relationships among variables, as they are in Chapter 8, which applies these procedures to the network data, reporting on the absence or presence of any intra-network and inter-network relationships.

In addition, in the interest of generating testable causal models using these variables (the purpose of Chapter 9), a qualitative, historical discussion complements the output, description, and relevant inferences made in the next four chapters. Much of Chapter 9, while ambitious, reflects nonsignificant findings, and therefore the conclusive discourse in Chapter 10 tends to refrain from making causal arguments, opting to rely primarily on cross-correlograms and longitudinal plots from the rest of Part III.

Chapter 5: Univariate Analysis of Attribute Variables

Just as a nation cannot govern its people or mediate its geopolitical relations by force alone, so are diplomatic and economic dimensions of power almost invariably reinforced by military capacities, at least in their latent forms. The tacit legitimacy inherent in soft power makes these forms of power integral components of global governance, complementing and perhaps giving legitimacy to more coercive forms of power. Chapter 5 focuses on such features, ignoring network dimensions, and classifying them by their institutional nature: that is, economic, diplomatic, and military.

Before a formal discussion of each measure in this chapter begins, a manifest of the univariate properties provides a brief description of each attribute dimension of global governance. For details on their computation and sources, please refer to the methodology section.

5.1. Inventory and Univariate Analysis of Attribute Variables

In Table 5.1.1, attribute variables are further classified below as time-series (i.e., controls), economic, diplomatic, and military dimensions of global governance. These distinctions later facilitate the analysis of relationships within and across dimensions.

Time-Series Proxies

Year	Serial integer representing the Common Era calendar year.
Period	Four-part, temporal periodization variable [1919 – 1944 / 1945 – 1961 / 1962 – 1991 / 1992 – 201X].

Economic Proxies

US GDP ÷ Global GDP	Prevalence of US in the world-economy.
US GDP ÷ Capita	United States' economic power per citizen, standardized against all other countries.
US Imports ÷ Global GDP	Prevalence of US imports in the world-economy.
US Imports ÷ Global Imports	Prevalence of US imports in the import sector of international trade.
US Exports ÷ Global GDP	Prevalence of US exports in the world-economy.
US Exports ÷ Global Exports	Prevalence of US exports in the export sector of international trade.
Global Imports ÷ Global GDP	Integration of international trade (imports) in the world-economy.
Global Exports ÷ Global GDP	Integration of international trade (exports) in the world-economy.

Diplomatic Proxies

Sovereignty, raw	The proportion of sovereign polities relative to polities and colonies combined.
Sovereignty, weighted by population	The proportion of individuals living in sovereign countries relative to the world's population.
UN Budget ÷ Global GDP	The United Nations budget, adjusted for inflation at 2005 levels, relative to global GDP.
US% Contribution to UN	The percentage of the United Nations budget contributed by the United States.
LoN & UN Member Count	The number of member states in the League of Nations (1919 – 1944), and the UN (1945 – present).
IGOs	The number of major IGOs (excluding subsidiaries of the United Nations) as per the Europa Year Book.

Military Proxies

US milex	United States' military expenditures, standardized against all other countries.
US milper	United States' military expenditures per soldier, standardized against all other countries.

Table 5.1.1: List and Descriptions of Attribute Variables

Following the order of Table 5.1.1 above, Table 5.1.2 reports the univariate properties of each measure. Values smaller than 100 have been rounded to the nearest 10,000th in most cases, depending on the precision needed to report significant information.

Variable	N	μ	σ	Min	Max	CV	1st Year
Year	97	1967	28.1455	1919	2015	0.0143	1919
Period	97	2.320	1.4545	0	4	0.6270	1919
US GDP ÷ Global GDP	97	0.2211	0.0363	0.1475	0.3543	0.3865	1919
*US GDP ÷ Capita**	92	2.4946	0.5567	1.5000	3.7200	0.2232	1919
US Imports ÷ Global GDP	90	0.0009	0.0012	0	0.0041	1.3076	1919
US Imports ÷ Global Imports	90	0.1391	0.0485	0	0.3432	0.3489	1919
US Exports ÷ Global GDP	91	0.0022	0.0029	0	0.0094	1.3143	1919
US Exports ÷ Global Exports	91	0.1441	0.0604	0	0.2765	0.4189	1919
Global Imports ÷ Global GDP	93	0.0066	0.0089	0.000010	0.0505	1.3497	1919
Global Exports ÷ Global GDP	91	0.0183	0.0261	0.000011	0.0983	1.4242	1919
Sovereignty, raw	97	0.5202	0.2429	0.2060	0.8360	0.4669	1919
Sovereignty, weighted by population	66	0.9338	0.0641	0.7608	0.9982	0.0687	1950
LoN & UN Budget ÷ Global GDP	96	0.000013	0.000008	0.0000004	0.000027	0.6672	1920
US% Contribution to UN	71	0.2823	0.0572	0.22	0.40	0.2025	1945
LoN & UN Member Count	97	114.9	56.8618	39	193	0.4949	1919
IGOs	45	63.60	10.3822	49	86	0.1632	1963
*US milex**	89	6.814	3.7341	0	13	0.5480	1919
*US milper**	89	3.3440	1.8674	-0.060	6.190	0.5584	1919

** standardized against all other nations*

Table 5.1.2: Univariates of Attribute Variables

As noted in the methodology section, the three *asterisked* measures above report the standardized equivalents of US values relative to all other countries during any given year in the dataset. Their means are not 0, and their standard deviations are not 1, because they are not standardized longitudinally, but cross-sectionally.

Sections 2.2 and 2.6 contain details on why two of these variables—US military expenditures and the dependent variable, US GDP per capita—have been standardized cross-sectionally; to recap this, the end result of cross-sectional standardization is that this method compares the relative values of the hegemon to those of the rest of the world at any given time, while longitudinal standardization is simply done to unify the scales of each y-axis when using values that have not been cross-sectionally standardized—such as the hegemon's GDP as a proportion of global GDP—for visual and statistical purposes.

Put another way, cross-sectional standardization most validly captures the prevalence of hegemonic variables such as these relative to all other countries during any given year.

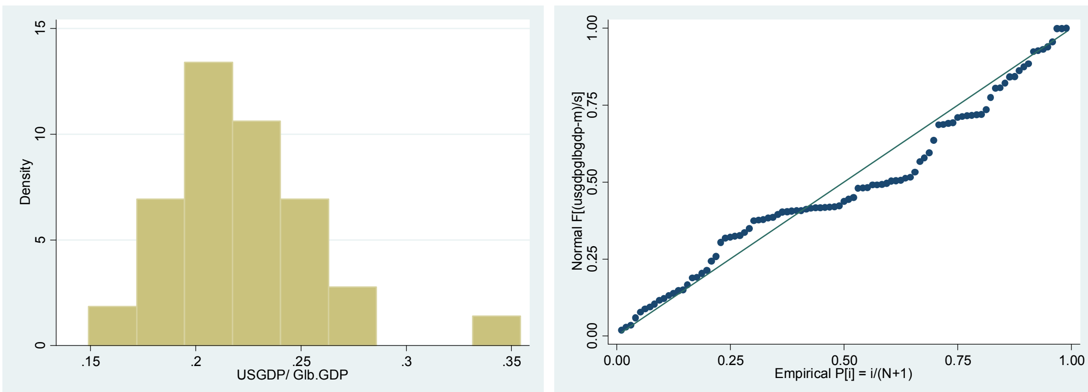
The following discussion describes the univariate distributions of the variables, and poses possible implications for the use of each in the final analysis. The time-series variables will be discussed in the context of periodizing and/or detrending other variables in this and subsequent chapters.

5.2. Economic Indicators of Global Governance

The following indicators represent the various dimensions of economic integration and centralization of global governance. For the purposes of this dissertation, several GDP-based measures have been compiled or computed, including global GDP, the raw values of US GDP, and the standardized values of US GDP per capita relative to all other countries for any given year. Similar quotients were computed using global imports and exports relative to global GDP. Because GNP/GNI data are not as readily available for all countries going back as far as the 1910s, Maddison's (2010) GDP and GDP per capita data have been used instead. The difference between gross national product (GNP) and gross domestic product (GDP) is that GNP includes the value of products made by a country's citizens and companies abroad, while GDP only accounts for products made within a country's borders. However, GNP excludes the value of products made by foreign companies within the reporting country. The comprehensive—that is, global—amounts of GNP and GDP are always numerically synonymous with one another; it is only within individual nations' figures that differences arise.

5.2.1 US GDP ÷ Global GDP

US GDP as a proportion of all GDP provides a measure of the concentration, or centralization, of hegemonic influence over the world's economic output. The following histogram and normal plot scrutinize this variable as a proxy for economic hegemony.



Figures 5.2.1 – 5.2.2: Histogram and Normal Plot of US GDP ÷ Global GDP

The histogram's distribution appears quite normal, save for some positive inflation. The normal plot is only a slight deviation from a Gaussian curve near the median, while its tails return to an approximation of normalcy at both extremes. Figure 5.2.3's evident 1939-to-1940 jump in the values of US GDP relative to all GDP (as well as US GDP per capita) obviates World War II's impact on GDP concentration in the United States. In short, this figure remains relatively constant throughout the period, save for the anomalous 1940s. As will be a trend throughout the remainder of the dissertation, World War II has a significant impact on every dimension global governance, and the GDP of the hegemon relative to those of all other nations (illustrated below) are certainly not exceptions.

5.2.2 US GDP per Capita, Standardized against All Other Nations

The other GDP-based measure of hegemonic global governance is the cross-sectionally standardized GDP per capita of the US, a conceptually similar but empirically different measure, particularly after World War II. An important note is needed here, now that this variable is being empirically scrutinized. When a nation's GDP must be shared by a larger population with more land and infrastructure, that nation's GDP will be distributed among more actors, and will therefore dilute or diminish its per-capita quotient. For the sake of validity, the US GDP measures relative to global GDP are regarded herein as indicative of the hegemon's power in the world-economy, while standardized GDP per capita figures, which measure the economic standing and general quality of life of the average citizen in the US relative to the average citizen of every other country, are held to reflect the level of economic development of the US relative to the rest of the system, a much softer indicator of governance than the former measure.

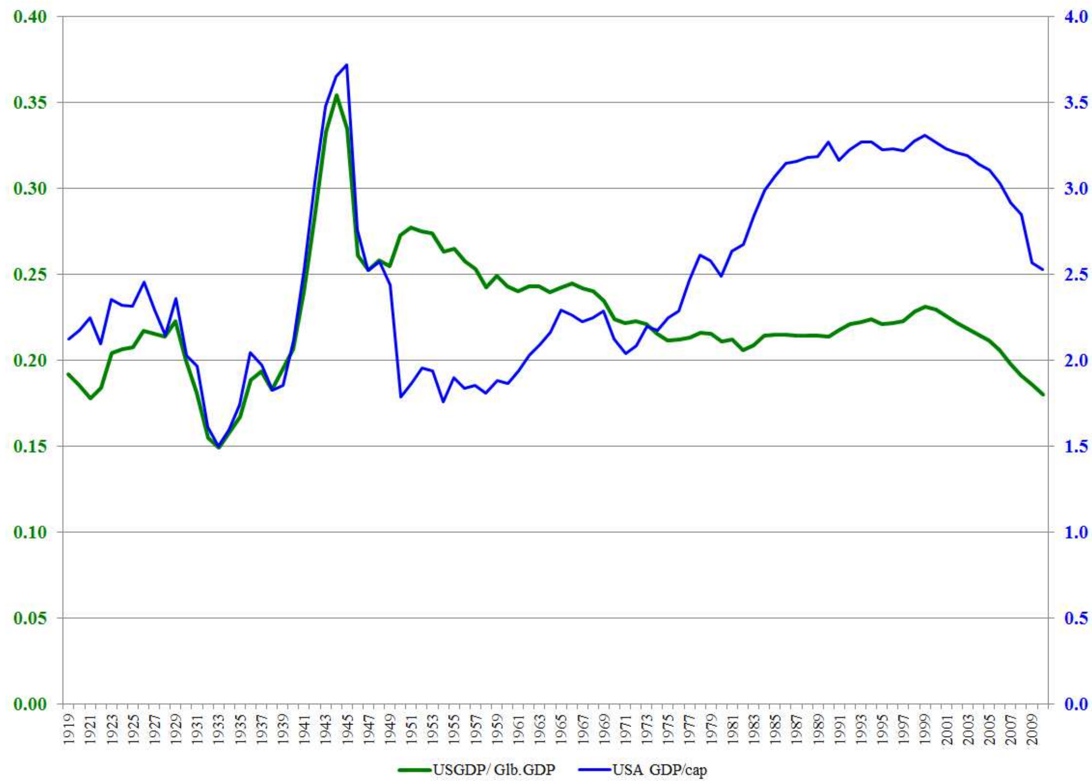
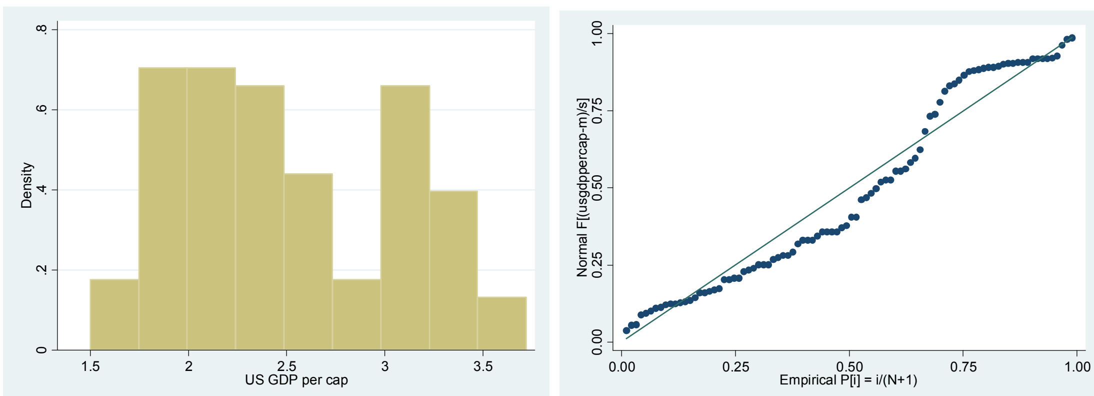


Figure 5.2.3: Longitudinal Plot of US GDP ÷ Capita and US GDP ÷ Global GDP

The spike in both figures evident *during* the Second World War and the subsequent decline of both of these variables—particularly the z-score of US GDP per capita—mark a hegemonic transition between the UK and the US (see Álvarez, 2014, for UK figures), a transition that had been fomenting for decades prior, but was spurred by the Axis/Allies conflict that characterized the first half of the 20th century and left Britain bankrupt and militarily incapable of sustaining its empire and hegemony.

One interpretation of Figure 5.2.3's portrayal of US GDP as a proportion of global GDP suggests that relative to other core countries, hegemonic prevalence in the way of economic development might be flattening, as depicted by the overall decline of the values throughout the period, which suggests—if not a flattening of the entire world-economy—perhaps a flattening of its peak, where cores reside. Another argument to add to this interpretation is that inter-core conflicts have a potential to destabilize this figure, particularly given that it is the hegemon and other cores that are directly engaging is a much more zero-sum competition than during “peacetime”, which is comparatively characterized by core-to-periphery invasions, occupations, liberations, and other engagements.



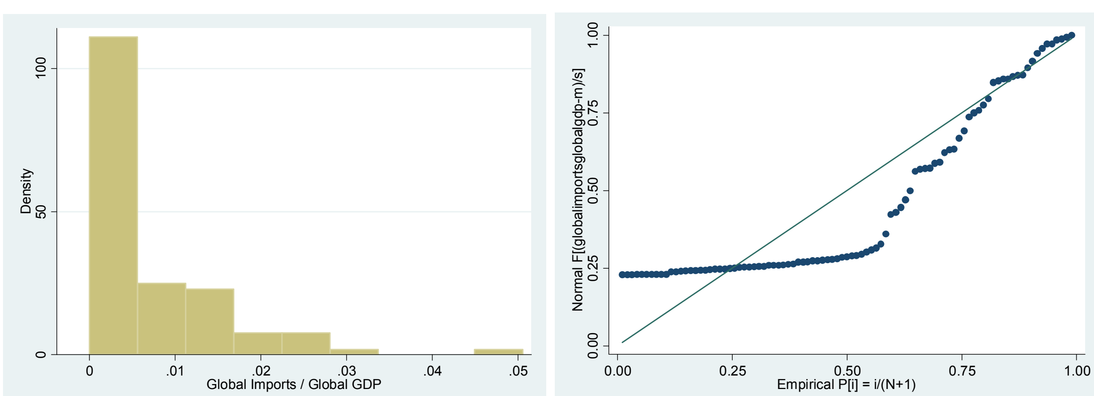
Figures 5.2.4 – 5.2.5: Histogram and Normal Plot of US GDP ÷ Capita

A slightly different interpretation of the US GDP per capita trajectory can be drawn, concluding that the economic development and material standard of living of the United States relative to the rest of the world has actually increased to heights not attained since World War II, and have only recently begun a b-phase towards an equilibrium point. The histogram and normal plot of US GDP per capita standardized against all other nations highlight a significant inflation below the median and a lesser one just above the median. The irregularity of this inverted distribution exhibits is altogether dissimilar from the distribution of the US GDP ÷ global GDP measure exhibited above, a dissimilarity more pronounced during the Cold War, as is evident in Figure 5.2.3.

5.2.3 The Prevalence of International Trade in the World-Economy

The integration of economic global governance is addressed in Section 5.2.3, specifically as measured by the amount of international trade (in the context of both imports and exports) relative to the world's economic productivity. The import and export figures below proxy both the proportion of international trade to total economic production as well as the degree to which international trade is concentrated in a hegemonic "hub".

Figures 5.2.6 and 5.2.7 represent the calculated ratios of global imports to global GDP—that is, the degree to which imports constitute a portion of the world-economy's productivity and wealth. Because the sum totals of imports and exports are theoretically equal, the histogram and normal plot of global exports relative to global GDP are nearly identical to their import equivalents, and are omitted to avoid redundancy. Heavily positively skewed, the normal plot points to the shorter tail at the lower end of the range. The skew in the import figures, as well as in the export figures that follow, is a univariate consequence of the secular trend that leads to the pivot during the early 1970s, as is evident in Figure 5.2.8.



Figures 5.2.6 – 5.2.7: Histogram and Normal Plot of Global Imports ÷ Global GDP

Plotted longitudinally in Figure 5.2.8 are global imports *and* exports divided by global GDP. The angled trajectories are heavily affected by exponential growth forces since the 1970s, seeing as the earlier period has far less variance relative to its range than the later period. What is peculiar about the data is that despite their overwhelming collinearity, the export equivalents are nearly always over-reported relative to the import measures. This patterned inconsistency in Barbieri's (2009, 2012) dyadic data points to potential measurement error based on the differential reliability of countries' trade figures along the core-periphery hierarchy. Nevertheless, their variances are nearly identical across time despite their scalar dissimilarity, which begs for the selection of only one of the two measures in the bivariate analysis in Chapter 7 in an effort to optimize multivariate causal analysis in Chapter 9.

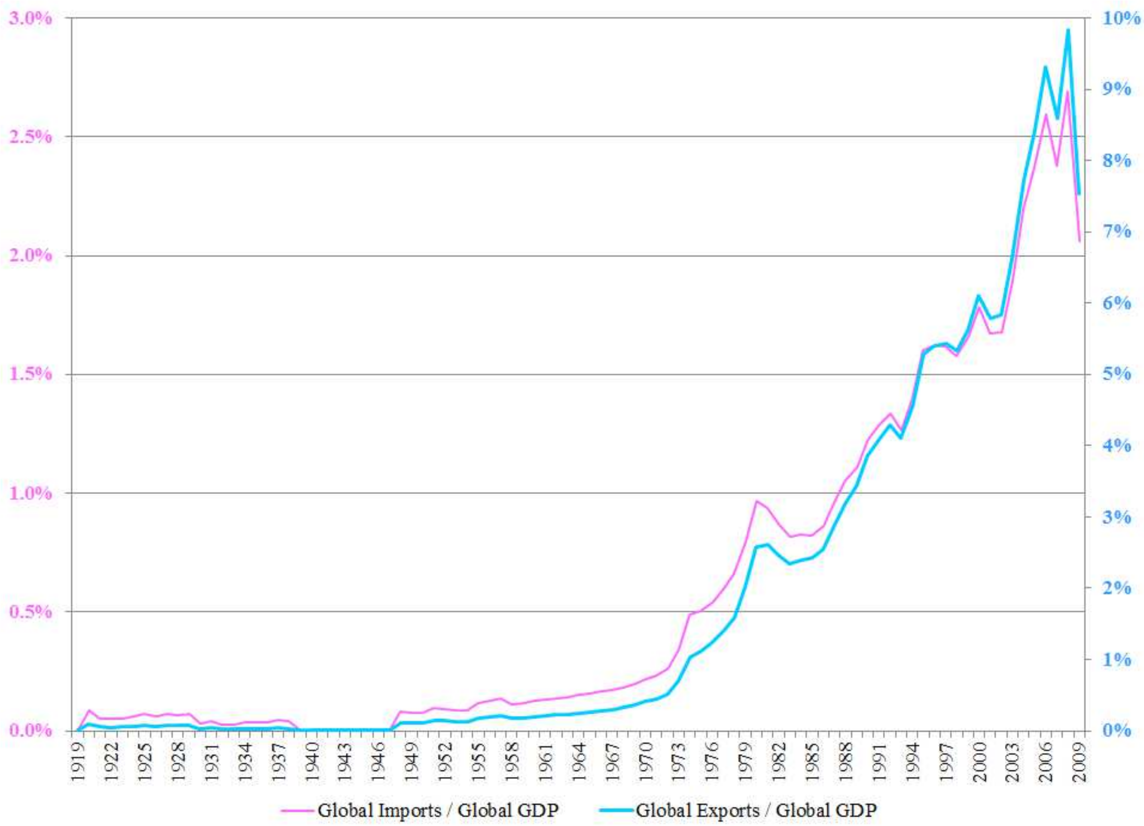
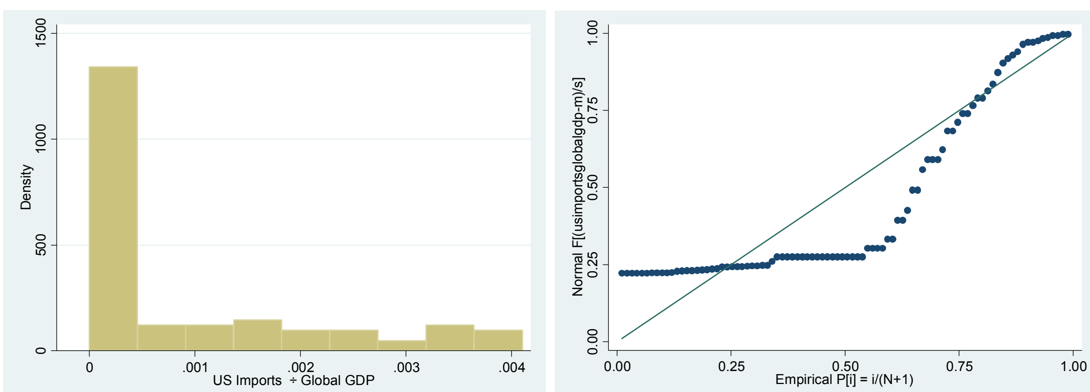


Figure 5.2.8: Longitudinal Plot of Global Imports and Exports, Both as Proportions of Global GDP

Substantively, most of the trajectory of either of these two variables foreshadows a continued upward trend of trade globalization in which the import/export sector increasingly permeates the global market, eventually diminishing its growth and perhaps even plateauing. It is, however, during the last few years of available data that an anomalously sharp drop occurs, coinciding with the Great Recession of 2008. This renders any extrapolated predictions that might have been made in 2005 moot, seeing as an apparent ceiling was hit, and the import/export sector of the world-economy was stunted.

5.2.4 The Prevalence of the Hegemonic Trade Relative to Global Trade and the World-Economy

While the proportion of the hegemon's imports or exports to the entire world-economy's annual productivity are a measure of the degree to which international trade involving the US is relevant in the world's overall productivity, a more direct measure of primacy *within* the interstate economy is the hegemon's imports and exports as proportions to the sum total of all imports and exports). In effect, this measures the centralization of economic global governance as a measure of the hegemonic actor's presence in the import/export sector of the world-economy. The current discussion focuses on imports, followed by an overview of comparable export measures. Figures 5.2.9 and 5.2.10 represent the heavily positively skewed distribution of the collapsed hegemon's imports relative to global GDP.



Figures 5.2.9 – 5.2.10: Histogram and Normal Plot of US Imports ÷ Global GDP

As with the integration measure discussed directly above, this skew is explained in part by the initial dip during World War II, but more so by the relative stagnation before the 1970s, evident in Figure 5.2.11, followed by a sharp rise during the last forty years or so, dropping sharply at the end of the period available, during the economic depression of 2008 and the few years that followed. One descriptive observation to be made here is that the United States is primarily an exporter, not an importer, in the world-economy as can be seen below, even before the exponential proliferation of its international trade relative to all international trade.

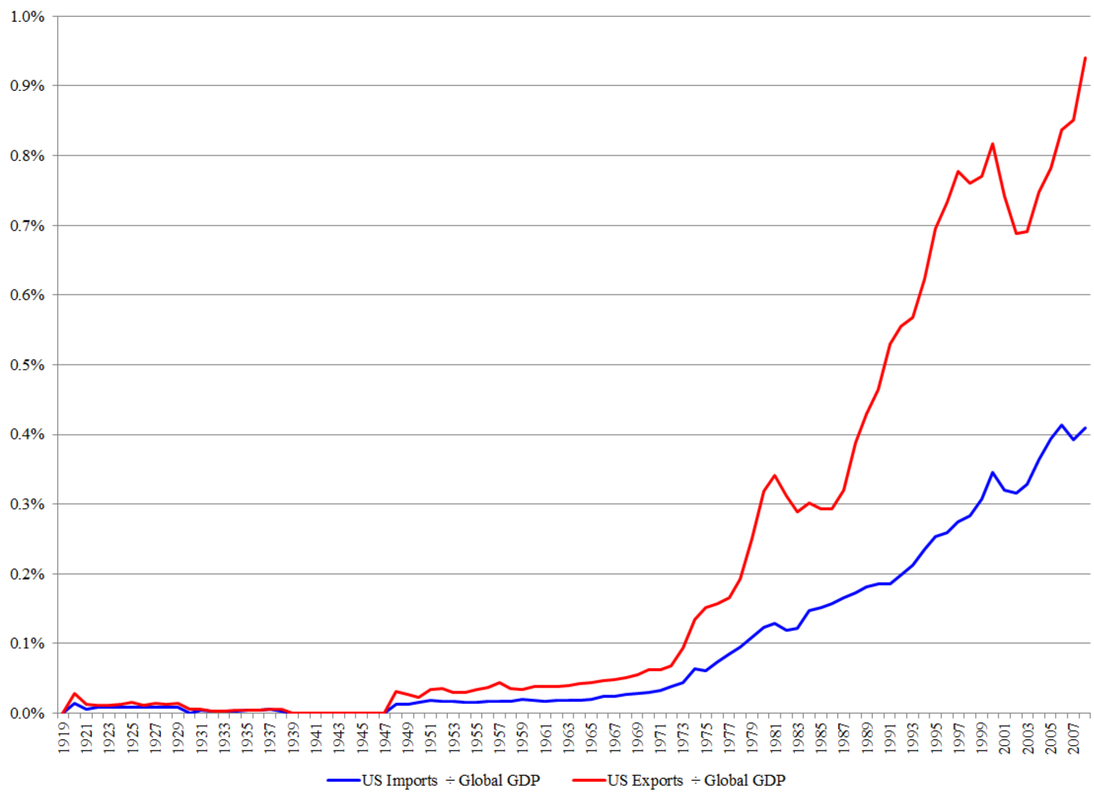


Figure 5.2.11: Longitudinal Plot of US Imports and Exports ÷ Global GDP

In order to control for the exponential growth evident after 1970, it would be reasonable to focus on—as with other variables with similar trajectories—partial correlations over bivariate ones. Logarithms might also deal with this issue, but in this case, such transformations yield a peculiar distribution shown in Figure 5.2.12, which loses much validity during the 1940s when base values approximate 0. Export figures, as seen below, are nearly identical, both having incalculable logarithms based on approximations of base values towards 0 during the beginning of World War II.

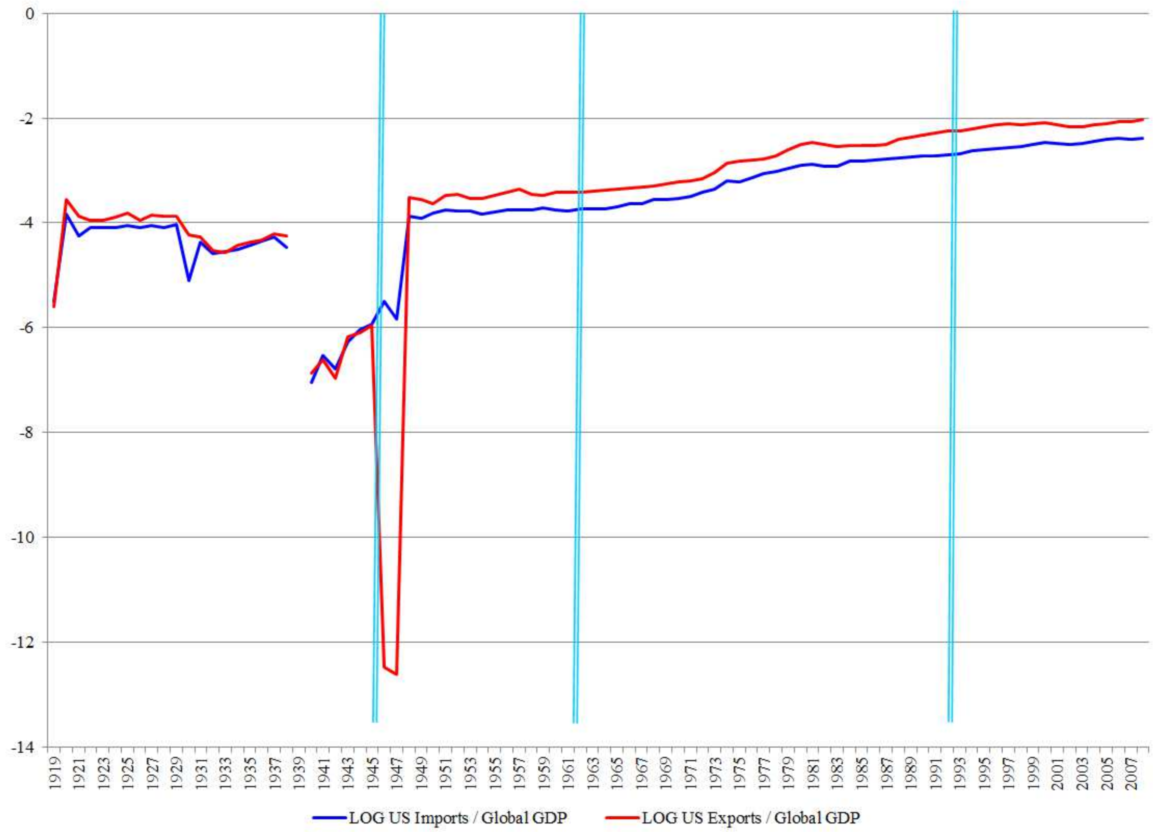
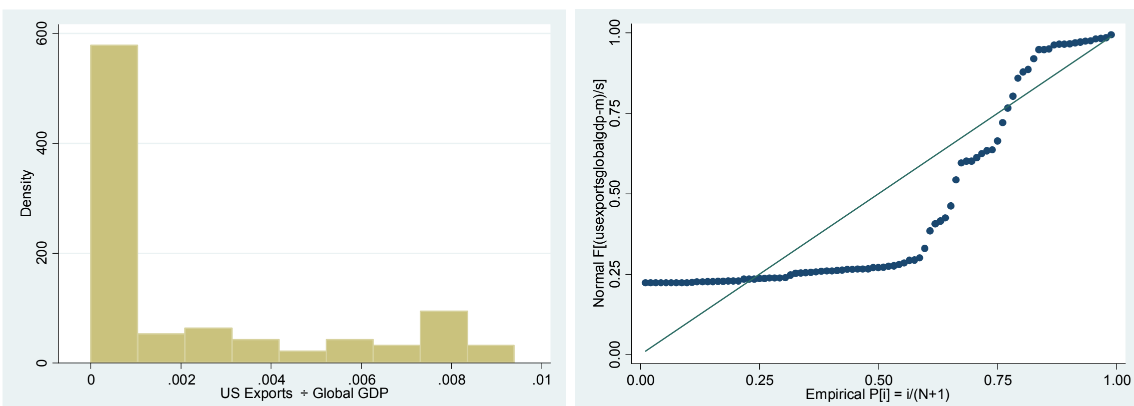


Figure 5.2.12: Longitudinal Plot of Logarithm of US Imports and Exports ÷ Global GDP

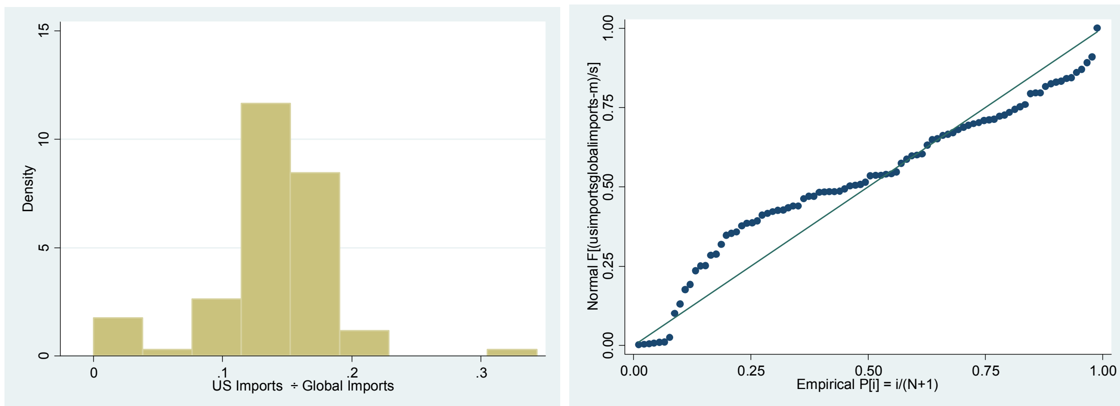
To reduce the effects of the secular trend in the variable, Figure 5.2.12 graphs the logarithmic conversion of the previous graph. This yields nothing conclusive, however, other than the peculiarity of the negative logarithmic values derived from near-zero raw values. As a technical note for bivariate analysis, if using this logarithmic conversion, it might be prudent to remove the values of this variable between 1939 and 1947, as they might confound any possible findings otherwise. In any case, the logged distribution obviates the Second World War's impact on the hegemon's behavior with respect to international trade even more than most of the measures in this dissertation. As a mathematical afterthought, even if one were to multiply the base numbers by a constant figure so that the smallest value of this variable is larger than 1 before logging, the shape of the new logarithmic distribution would look identical to Figure 5.2.12, though the missing figures would have existing, albeit low, values, and the scale of the y-axis would be slightly higher. Given this, partial correlations are a superior alternative to logarithms as a method of dealing with this differential growth trends such as the one characterizing these import (and export) figures. Partial correlations are reported in Chapters 7 and 8, and Chapter 7 in particular deals with the variables currently in question. In addition, periodization—a method complementary to the use of partial correlations—is also discussed in greater detail in Chapter 9.

Regarding US exports, a comparable analysis begins with these figures relative to all of the world's GDP, followed by those same hegemonic export figures as proportions of total exports. Very similar to their import equivalents above, Figures 5.2.13 and 5.2.14 illustrate the histogram and normal plot for US exports.



Figures 5.2.13 – 5.2.14: Histogram and Normal Plot of US Exports ÷ Global GDP

The exponential growth evident in the latter decades of the period, evident in Figure 5.2.12, is largely responsible for the positive skew in the distribution, which deviates from Gaussian normalcy near the median portions of both the timeline and value range.



Figures 5.2.15 – 5.2.16: Histogram and Normal Plot of US Imports ÷ Global Imports

While Figures 5.2.15 and 5.2.16 point to a slightly positively skewed distribution, a possibly cyclical pattern along a longer-term curvilinear trajectory is more evident in Figure 5.2.16, which represents the import figures for the US relative to global GDP. After the collapse and resurgence of hegemonic trade relative to all trade that took place during and after World War II, the postwar period has seen a decentralization of trade; with every emergent nation's inclusion in the market, the amount of trade not involving a hegemonic actor will necessarily bring this figure down.

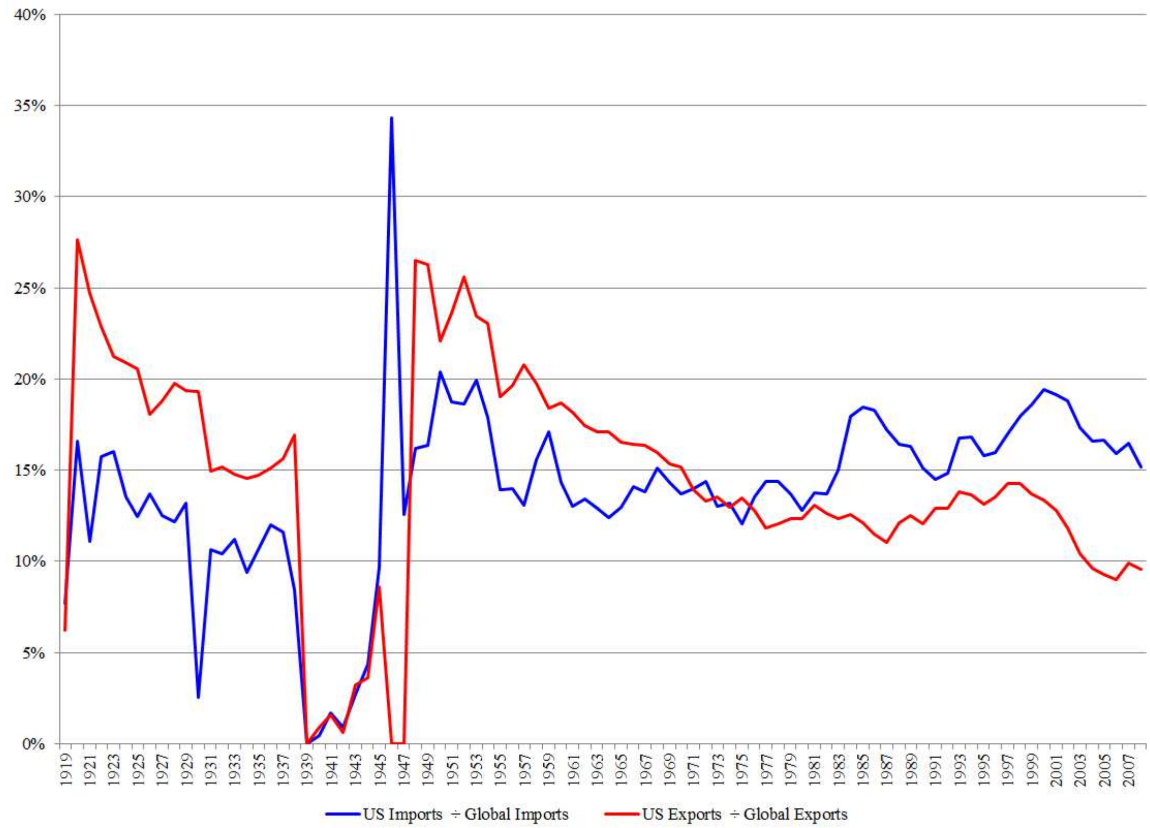
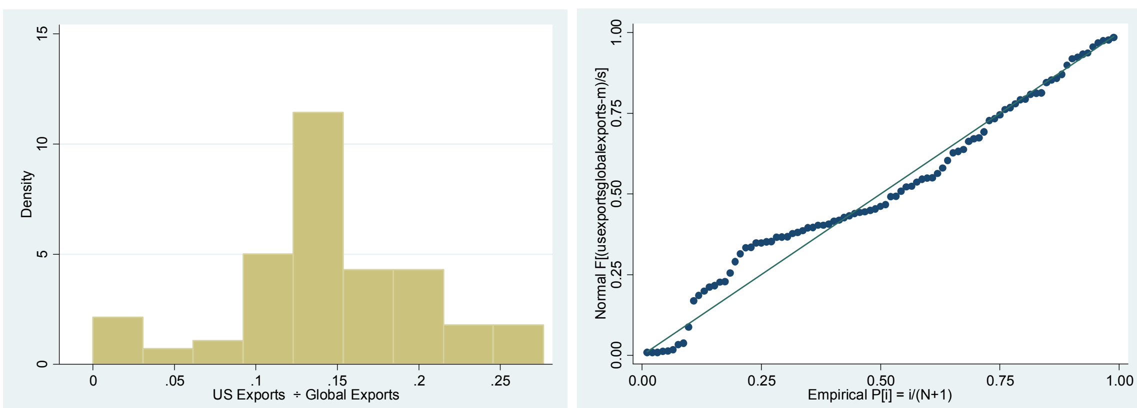


Figure 5.2.17: Longitudinal Plot of US Imports and Exports ÷ Global Imports and Exports

As was the finding with US GDP relative to global GDP, the import and export figures are subject neither to a linear nor an exponential trend of growth but rather retain some equilibrium between values of 10% and 15%. That is to say that just as with the GDP proportion, the import/export activity of the US in the world-economy tends to stabilize—at least during inter-core peacetimes—at about one-tenth of the world-economy's interstate trade.

Unlike the previous measures, which divided US imports and exports by global GDP, these figures represent the degree to which the US specifically dominates the import and export sectors of the world-economy. And unlike the previous figures, the US does not appear to unanimously emphasize its export activities over its imports.

Measured in this manner, and ignoring the anomalous and tumultuous period of the Second World War, US import figures only exceed its exports after the mid-1970s, and continue to do so until at least the end of the available period. While not consistent with any of the periodization cutoffs proposed in this dissertation, the mid-1970s are characterized by other relevant factors that directly affect other variables in this dissertation, such as the dissolution of CEATO and SENTO, the Oil Embargo and consequent recession of the US economy, and the end of the Viet Nam War, which marks a significant turning point in the geopolitical role of the United States. It is consequently important to pay attention to other shifts in global governance during the 1970s.



Figures 5.2.18 – 5.2.19: Histogram and Normal Plot of US Exports ÷ Global Exports

Figures 5.2.18 and 5.2.19 show a more normal distribution than this dataset has produced so far, with less deviance near the median and tails. The Second World War does much to stunt international trade, a reality that at that time affects hegemons and cores contending for hegemony far more, given their comparative preoccupation with the war effort. Therefore, as with the import figures, US exports suffer relative to the rest of the import/export sector of the world-economy.

Aside from the World War II anomaly in the data, it is evident in the longitudinal plot that US prevalence in the export sector has been decreasing since the beginning of the Cold War, with a brief recuperation in the 1990s, followed by a continuation of the recession of this proportion.

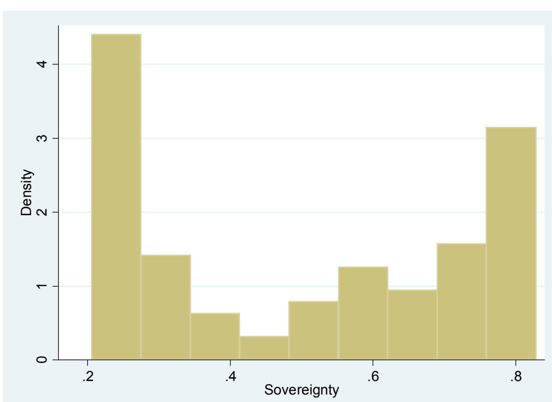
5.3. Diplomatic Indicators of Global Governance

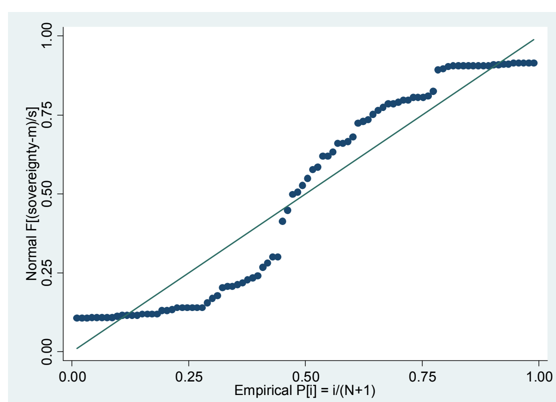
Having analyzed the economic dimensions of both hegemonic and integrative global governance, the current section turns to discuss diplomatic attributes of the world-system, these being decolonization/sovereignty, the United Nations annual budget relative to global GDP, the percentage of the United States' contribution to the United Nations budget, the number of member states of the League of Nations and United Nations, and the Europa Year Book's counts of prevalent IGOs, the last of which is found to be an invalid measure, and consequently unfit for multivariate analysis.

5.3.1 Decolonization/Sovereignty

The sovereignty ratio—weighted by population—reflects the ratio of the citizens of sovereign nations relative to the entire world's population for any given year. As with the development proxy, the population data by which these figures were weighted were derived from Maddison (2010). The unweighted sovereignty ratio is included in the analysis because the population estimates by which this ratio was weighted are not reliably compiled before 1950. The most comprehensive and reliable sources of population estimates that the country level are: Maddison (2010), and Mitchell (2003a, 2003b, 2003c); Mitchell adds pre-1950 estimates, but favors sovereignties to such a degree that anything weighted by this variable will almost completely ignore colonial populations, rendering the measure completely invalid.

To fix sparseness in available time-series data, applications such as interpolation and/or extrapolation are viable when the data have fewer gaps or reflect a less volatile period of history. In Mitchell's pre-1950 estimates, Angola is the only case with a reasonable data gap that would allow for interpolation. The rest of the peripheral and colonial world is characterized by significant gaps in time, and even cases in which interpolation cannot be performed at all because there is no prior estimate. Calculating linear extrapolations during the colonial period of the 20th century is also problematic, as there is no reason to assume that the change between 1950 and 1951 is a linear continuation of the more tumultuous half of the 20th century, when it comes to population figures.





Figures 5.3.1 – 5.3.2: Histogram and Normal Plot of Sovereignty, Unweighted

In addition, the visible gaps in the normal plot in Figure 5.3.1 point to the leaps-and-bounds nature of decolonization during the period in question; that is to say, decolonization in the last few centuries has often been a punctuated, rather than gradual, process, and this becomes even more obvious when the variable is weighted by the population of each colony and sovereign state. Figure 5.3.3 plots both sovereignty measures alongside one another, obviating their similarity. It is only when an inordinately populated country (the few cases skewing the population's distribution positively) acquires independence that a scalar difference is seen between the two trajectories for a single interval.

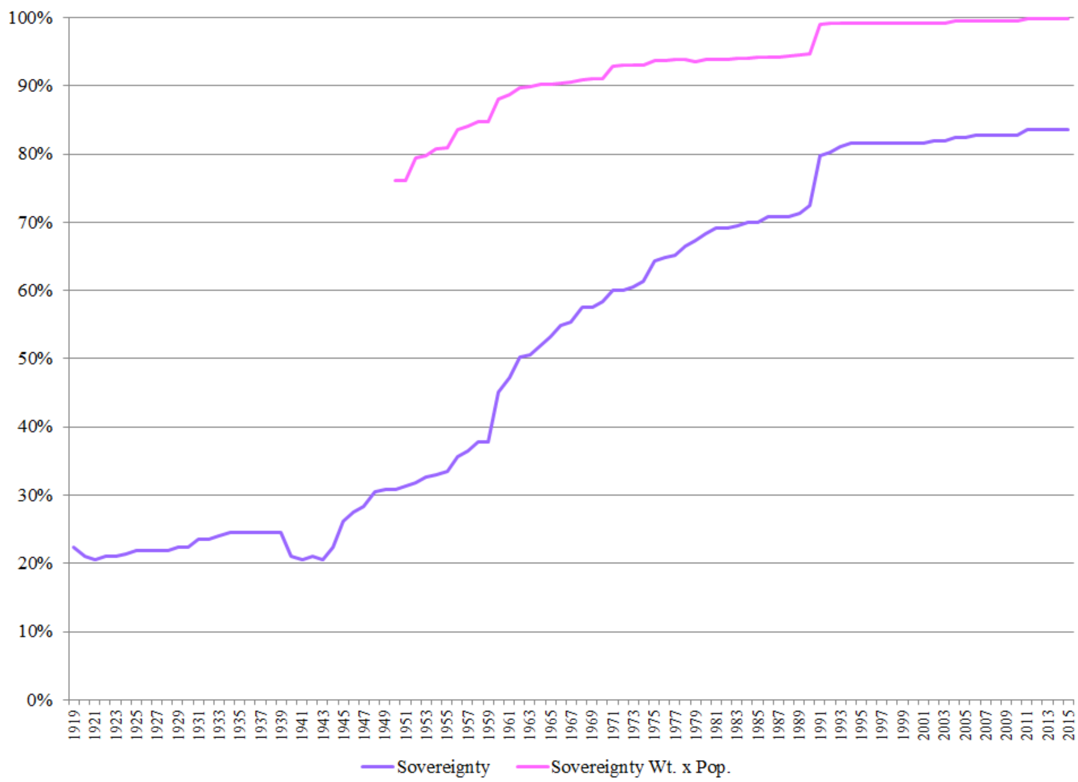
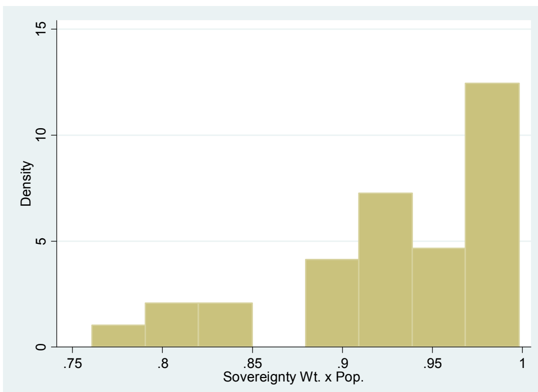
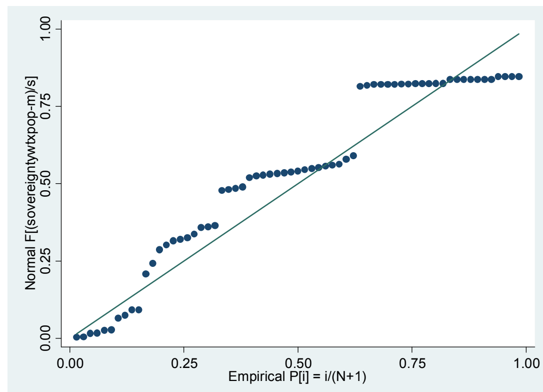


Figure 5.3.3: Longitudinal Plot of Sovereignty (Weighted and Unweighted)

While not much can be done about the lack of reliable population data prior to the Cold War, both the weighted and unweighted versions of the sovereignty proxy will be considered for analysis in the bivariate section. With this being said, the weighted sovereignty figure highlights even more punctuation in the leaps in decolonization made during this period, evident in the gaps in both figures below.

The notable difference in the overall variance of the weighted and unweighted values comes not from dissimilarity between them after 1950, but from the fact that all of the pre-1950 values for the unweighted measure are its lowest values, and account for about a third of its variance.





Figures 5.3.4 – 5.3.5: Histogram and Normal Plot of Sovereignty, Weighted by Population

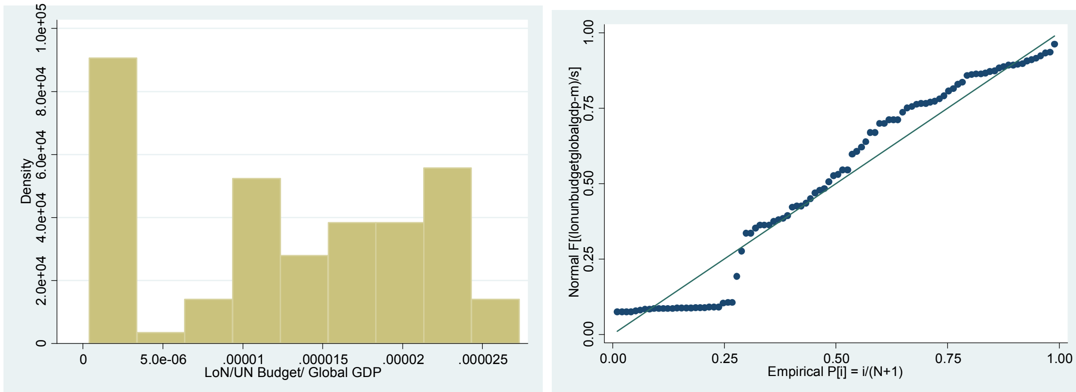
Historically, the bulk of the populations of the territories decolonized during this period—mostly in Africa and Asia—achieved sovereignty during three discrete periods: the late 1940s, the early 1960s, and the early 1990s, which are highlighted by leaps in the distributions of both sovereignty measures in Figure 5.3.3. Subsequent analysis on decolonization will emphasize the unweighted measure, for which available data span the entire dataset, and whose collinearity with its weighted counterpart (see Chapter 7) makes them relatively interchangeable.

5.3.2 International Governmental Organizations

Though empirically related, the following section of this chapter does not reflect the IGO-based network properties discussed in Section 6.1. Instead, it focuses on the IGO-related attribute variables that are not intended for network analysis, some of which overlap with the network-based source variables. Beginning with some of the financial properties of the UN's prevalence, including the US's relative emphasis on funding of the UN, this portion of the analysis ends with more purely diplomatic dimensions, such as the annual League of Nations / United Nations membership counts and the Europa Year Book's inventory of prevalent IGOs. A case-by-case assessment of each IGO's unique membership constitution, found in Section 6.1, also complements this portion of the analysis. Though some of these measures utilize GDP and other economic measures, their diplomatic nature classifies them as distinct from the economic variables analyzed in the previous section.

5.3.2.1 League of Nations/United Nations Budget ÷ Global GDP

The LoN's and UN's budgets proportional to global GDP is a measure of the fiscal emphasis placed on global governance by the bulk of the world's nations, particularly its larger contributors. That is, it proxies the integration of diplomatic global governance, though it is measured via fiscal figures. Because this variable collapses League of Nations values with United Nations values, the heterogeneity of the intergovernmental environment during both periods might be confounding the univariate results. For example, Figure 5.3.6 boasts a near-zero-inflated distribution which would be far more Gaussian were it not for the negative inflation (in this case, values below 0.000005, or 0.0005%), all of which come from the League of Nations period.



Figures 5.3.6 – 5.3.7: Histogram and Normal Plot of LoN/UN Budget ÷ Global GDP

This early period is similarly represented in the normal plot's flat line at the lower tail of the distribution, and further isolated by the periodized graph in Figure 5.3.8. For visual purposes, this longitudinal graph plots a 5-year moving average to smooth some of the oscillations in the budgetary figures; these fluctuations come, in part, from the lack of uniformity in how UN budget data are reported (sometimes annually, sometimes biannually), and their second-order autocorrelation might present possible issues given other variables' first-order autocorrelation.

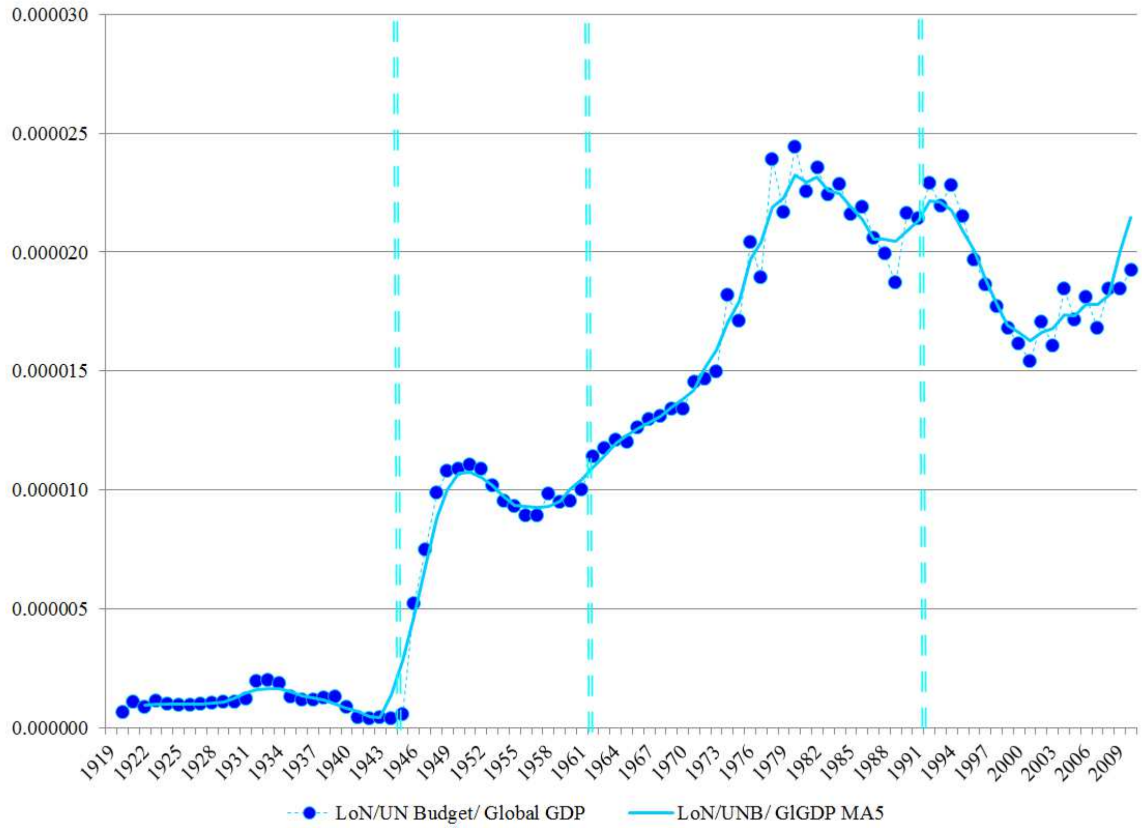
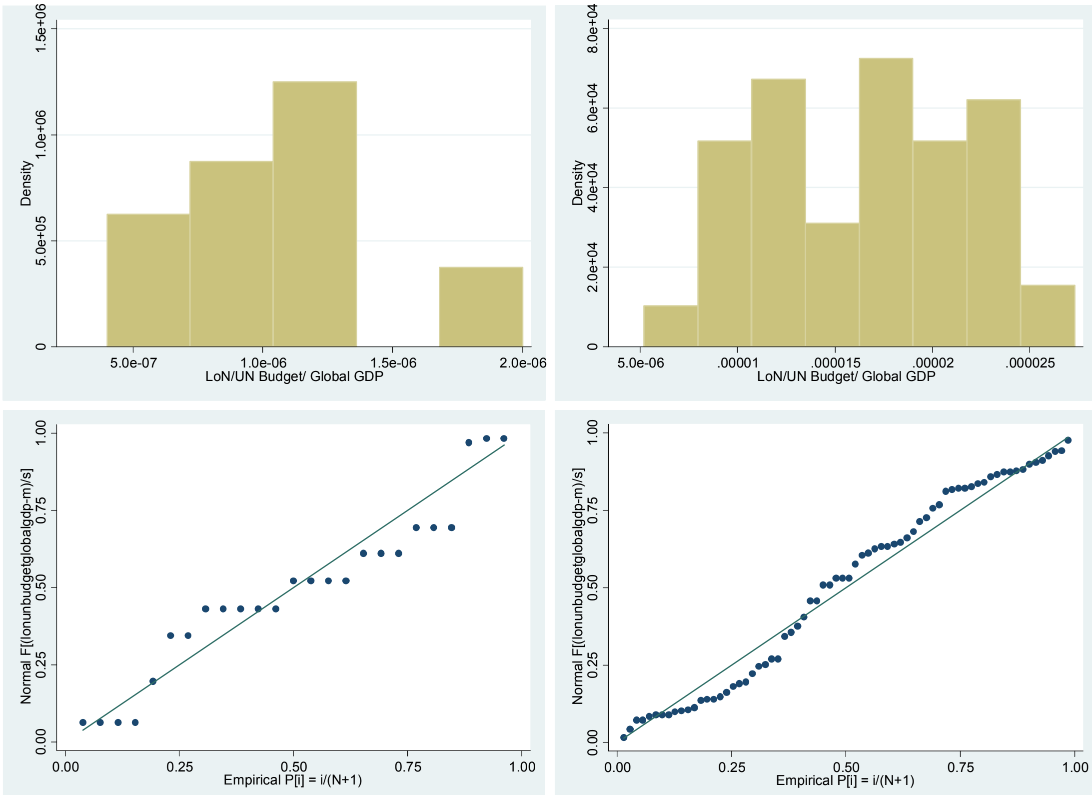


Figure 5.3.8: Longitudinal Plot of UN Budget ÷ Global GDP with 5-Year Moving Average

To return to the problem of differential or heterogeneous validity of the measure, periodizing the variable's distribution, as per the figures below, not only isolates the more Gaussian distribution of the United Nations era, but also highlights some of the variation *within* the previously inflated portion evident in Figure 5.3.8 reflecting the League of Nations period. The core of the periodization work in this analysis is covered in Section 9.1, though the following case foreshadows some of those findings.

The theoretical premise behind this is that the League of Nations and United Nations are themselves dissimilar entities in their respective periods, particularly in reference to the US, who is always a member of the latter IGO, and never of the former. The empirical substantiation behind the necessitation of a periodization scheme here lies in a tenfold increase in the equilibrium ceiling during the 1940s when the League disbands and the UN succeeds it.



Figures 5.3.9 – 5.3.10: Histograms and Normal Plots of UN Budget ÷ Global GDP, Periodized (1919 – 1944 and 1945 – 2015)

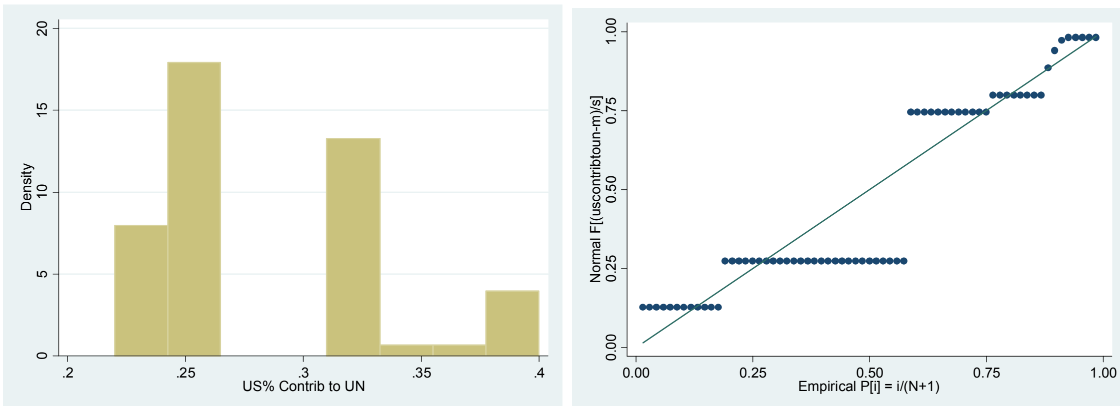
A more discrete variance in this bottom-up measure of the political integration of global governance characterizes the League of Nations period relative to the rest of the timeline. It appears from this output that there are two discrete distributions here, each worth studying separately.

In conclusion of this section, this variable's differential equilibria pre- and post-1945 necessitate for a periodization scheme that classifies the timeline into at least two periods with this year as the cutoff. The usefulness of incorporating additional cutoffs after 1945, further periodizing the UN period based on the Cold War's maturation (1962) and end (1992), is not so clear-cut in the case of this variable, though Section 9.1 provides further reflection on this.

5.3.2.2 Percentage of US Contribution to the United Nations Budget

Turning to a highly irregular, top-down dimension of political global governance, the percentage of the United States' contribution to the United Nations proxies the hegemon's emphasis on soft governance in the global arena. Lacking values for the League of Nations period, since the United States was never a member/funder nation of the League, the large gaps in its central tendency in both the histogram and normal plot represent its lack of median values in the distribution. It is noteworthy that this figure never increases across time; it either remains constant from year to year, or decreases, ranging across the entire period from 40% down to its current 22%, as illustrated Figure 5.3.13. While this figure drops or remains constant, the absolute value of the UN budget generally increases over time, with the only lasting exception being a constant decrease in funding during the 1990s.

Because of the plateauing nature of this distribution, this variable's distribution grossly violates the assumptions of most parametric tests more than most measures in the working dataset; thus, results from bivariate and multivariate analysis involving this, and other irregularly distributed variables will need to account for this in its techniques and/or interpretation. With no cases along the median, it will be moot to discuss this budgetary proportion in the context of central tendency, as cases only discretely change, and always in a decreasing direction across time.



Figures 5.3.11 – 5.3.12: Histogram and Normal Plot of US % Contribution to UN Budget

The longitudinal plot of this variable marks the early 1950s, early 1970s, and the turn of the century as three pivotal periods of dramatic decline in US funding of the UN relative to the rest of the world. These relative drops in funding—in addition to the periods of stagnation and gradual diminishment—will be of particular interest at the bivariate stage when considered as possible predictors of inequality. This drop—exhibiting a steeper decline in the early 1970s than during the rest of the period of interest—creates a discrete handful of deviations from a normal distribution as illustrated in Figure 5.3.13.

Substantively, however, these deliberate drops in relative funding by the US coincide, respectively, with the invasions of Korea, Vietnam, and Iraq. While these are not the United States' only preemptive attacks during the lifespan of the United Nations, they constitute its three grossest violations of the Kellogg-Briand Pact of 1928, as well as precepts of the UN Charter and other statutes mediating international disputes since World War II. An argument could be made here for a direct relationship between the US's decrease in fiscal support of the multilateral structure of the United Nations and its nearly synchronous emphasis on far more pronounced military engagements. This relationship will be empirically explored in Section 7.1.2.

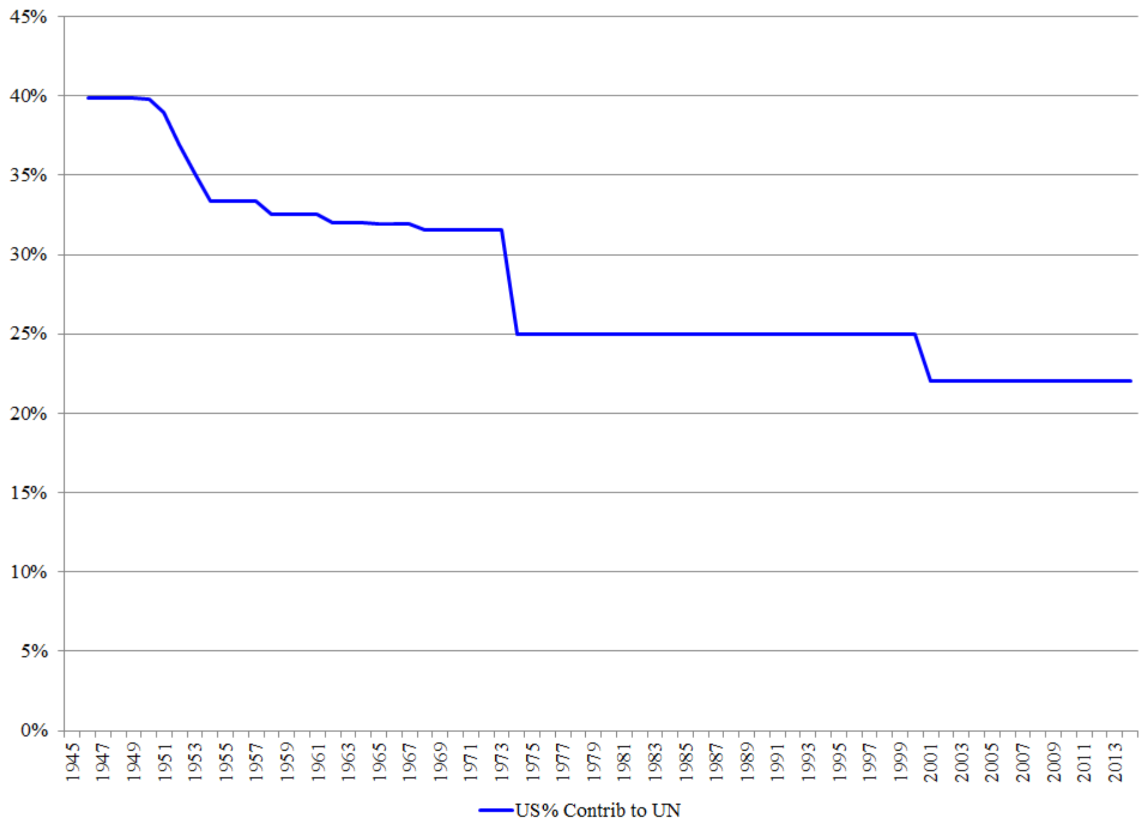


Figure 5.3.13: Longitudinal Plot of US % Contribution to UN Budget

A final observation on this variable merits mention: the proportion of each country's contribution is the result of multiple GNP-based factors, and further limited in range by a minimum of 0.001% and a maximum of 22%[14]. After the UN's initial years of development, and the inclusion of dozens of member states (which usurped a portion of the budgetary responsibilities), the stability of the hegemon's predetermined, proportional contribution to this budget is punctuated by only two major dips, these being in the 1970s (a period already highlighted by earlier peculiarities in the data) and again at

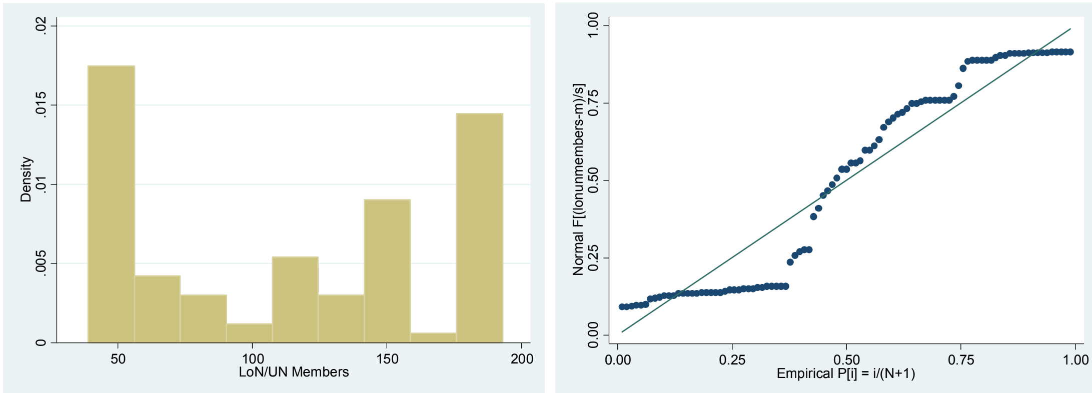
[14] See http://www.un.org/en/ga/contributions/budget.shtml for a detailed account of budgetary assessments spanning more than two decades.

the turn of the millennium, a period characterized by a shift in hegemonic emphasis towards coercive capacities over diplomatic and economic ones.

Research external to this effort on the overall distribution *every* nation-state's proportion of the UN budgetary responsibility would do well to compare these distributions to each country's GDP per capita to determine if there is any correlation between their proportionalities. That is, do cores have a higher proportion of the UN budgetary responsibility relative to their share of all global wealth? By contrast, do peripheries, or could there be a nonlinear relationship, in which semiperipheries pay the most relative to their position in the GDP per capita distribution? This will be briefly revisited in Section 10.3.

5.3.2.3 League of Nations and United Nations Member Counts

With sovereignty and budgetary measures assessed, the attention of the analysis now turns to membership counts in the League of Nations and United Nations. While membership in the former was somewhat exclusive to cores and affluent semiperipheries, and longitudinally curvilinear (several countries quit membership during the League's lifespan), the United Nations has had a more characteristically linear trajectory of state membership. As mentioned earlier, since its inception, countries have joined, but have never left, the UN, and this is the case for most other IGOs in this study. Given its shape—approximating an inverse Gaussian distribution with inflated tails—this variable should be taken as violating the assumptions of normalcy throughout.



Figures 5.3.14 – 5.3.15: Histogram and Normal Plot of LoN/UN Members

Very similar to the case of the LoN/UN budgets relative to global GDP detailed above, periodization is largely responsible for the inflation of values at the lower end of the spectrum. The longitudinal plot below illustrates this relatively flat distribution prior to the mid-1950s, followed by a somewhat linear trend of growth.

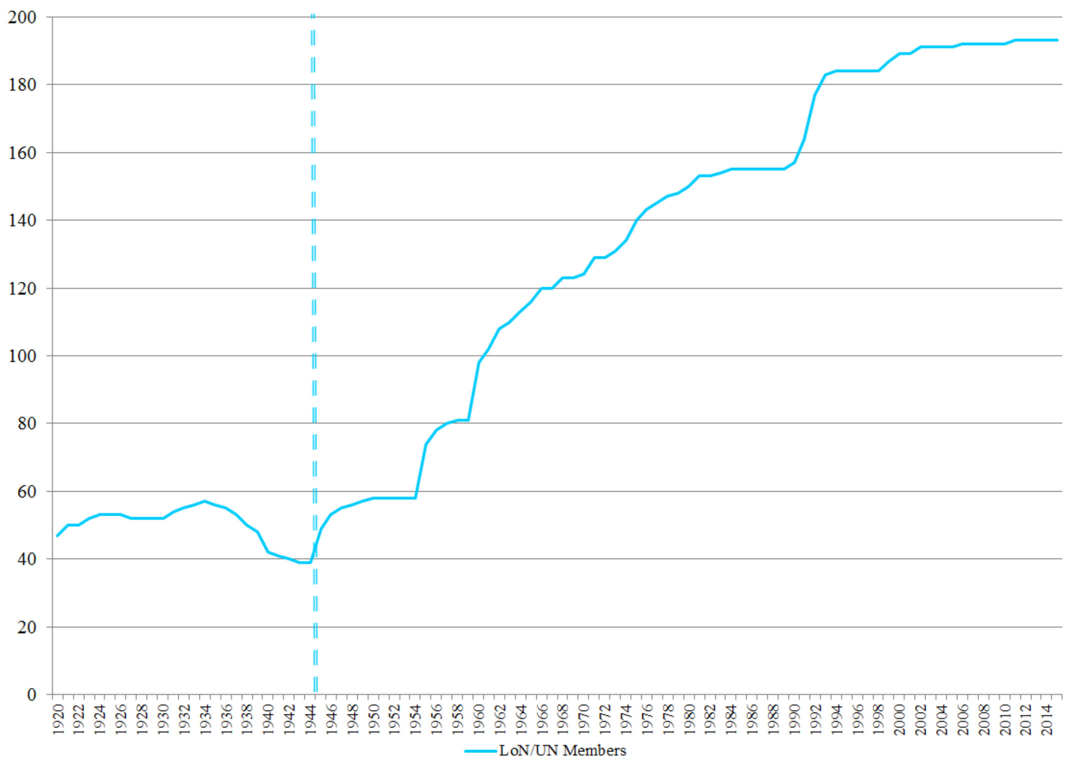
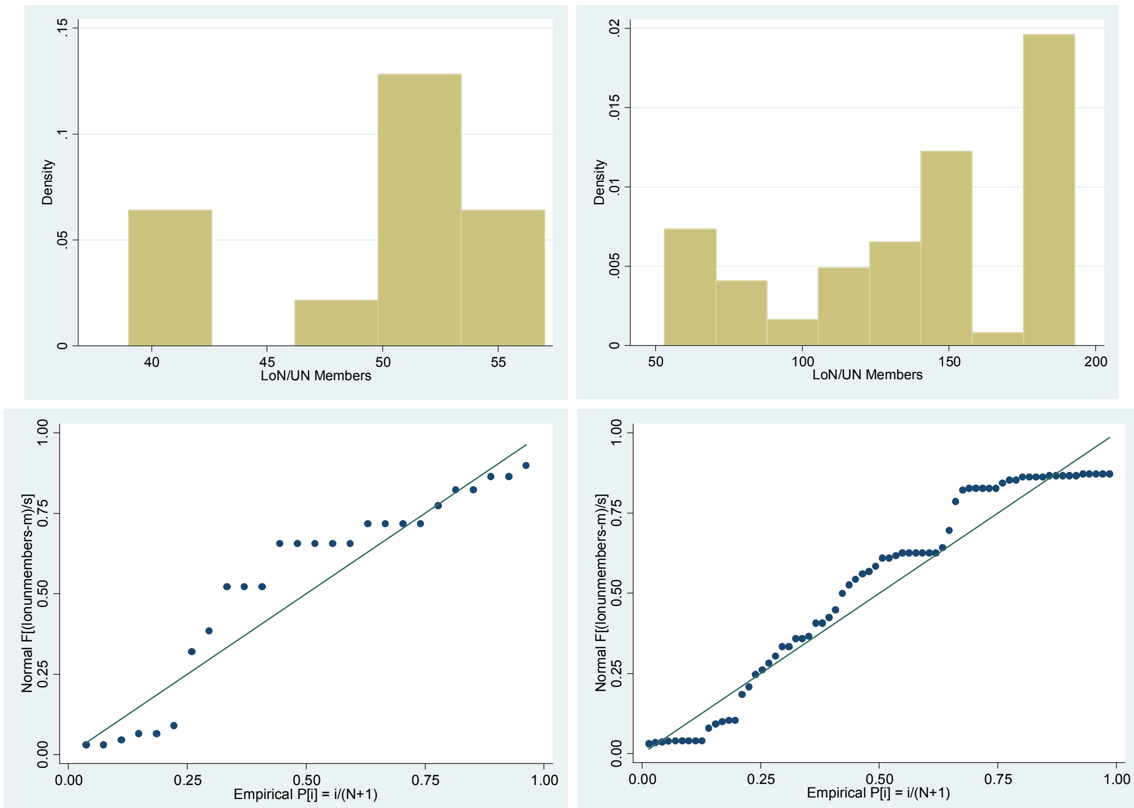


Figure 5.3.16: Longitudinal Plot of LoN/UN Members

Making the cutoff at 1945, as marked in the longitudinal plot, periodized histograms and normal plots are provided below for a clearer picture of the distribution of annual funding for the two prevalent IGOs of their times.

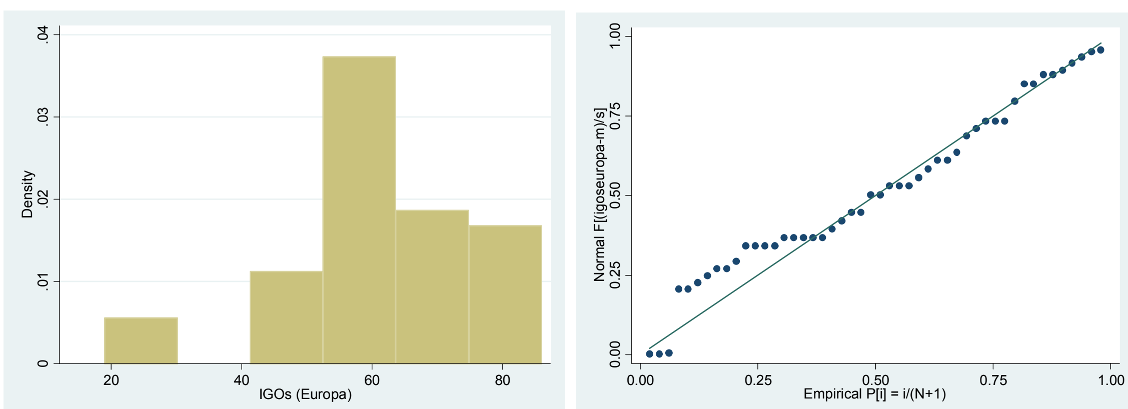


Figures 5.3.17 – 5.3.20: Histogram and Normal Plot of LoN/UN Members, Periodized (1919 – 1944 and 1945 – 2015)

What is most striking here, as was found in the distribution of the UN budget divided by global GDP, is the periods of discrete absence of cases, marked in part by some of the plateauing epochs during this century, such as the early 1950s, the late 1980s, and the majority of the 21st century thus far. This provides strong support for incorporating periodization of the data into a bivariate analysis.

5.3.2.4 Europa Year Book's Prevalent IGO Counts

Though only slightly negatively skewed, the Europa Year Book's list of major IGOs above is a shoddy indicator of IGO prevalence at best. First, it only highlights the more powerful of the global and multiregional IGOs. Though there are actually tens of thousands of IGOs (see Union of International Associations, 2016), Europa reports less than 100 IGOs (not counting subsidiaries of the United Nations) for any given year, and thus, measurement validity here is greatly compromised, even if the variance in the total IGO count might be similar across time to what is reported here. Therefore, the Europa IGO count should be taken—if at all—as an indicator of the proliferation of highly prevalent IGOs in the world-system: the tip of the IGO iceberg.



Figures 5.3.21 – 5.3.22: Histogram and Normal Plot of IGO Count

The narrative that can be gleaned from plotting the IGO count longitudinally in Figure 5.3.23 is that it exhibits a curvilinear trend (possibly cyclical, if the pattern is replicated throughout the rest of the current century); that is, there seems to be a climactic period of IGO prevalence during the earlier part of Cold War that only partly resurges during the 21st century. However, this is again a potential issue of measurement error resulting from the Europa Year Book's selection bias, akin to asserting that there are less

IGOs in existence across time simply because the most powerful ones are disbanding and in some cases being replaced with less prevalent ones. Another way to interpret this is that IGOs may not necessarily be waning in existence, but decentralizing in prominence, with less powerful ones emerging (though the Europa Year Book ignores them), fulfilling the functions of the more central actors of previous decades.

Of all the variables in this study, the IGO count has the least amount of face validity, and its effects on other dimensions of global governance should be deemphasized in light of contradictory findings. That is, when there is doubt in the interpretation of comparable coefficients or other results in the bivariate and multivariate chapters, explanability should be yielded to an alternative measure. To better illustrate its longitudinal trajectory, which is sensitive to the subjective selectivity of the publishers from year to year, a 5-year moving average has been added to the figure below.

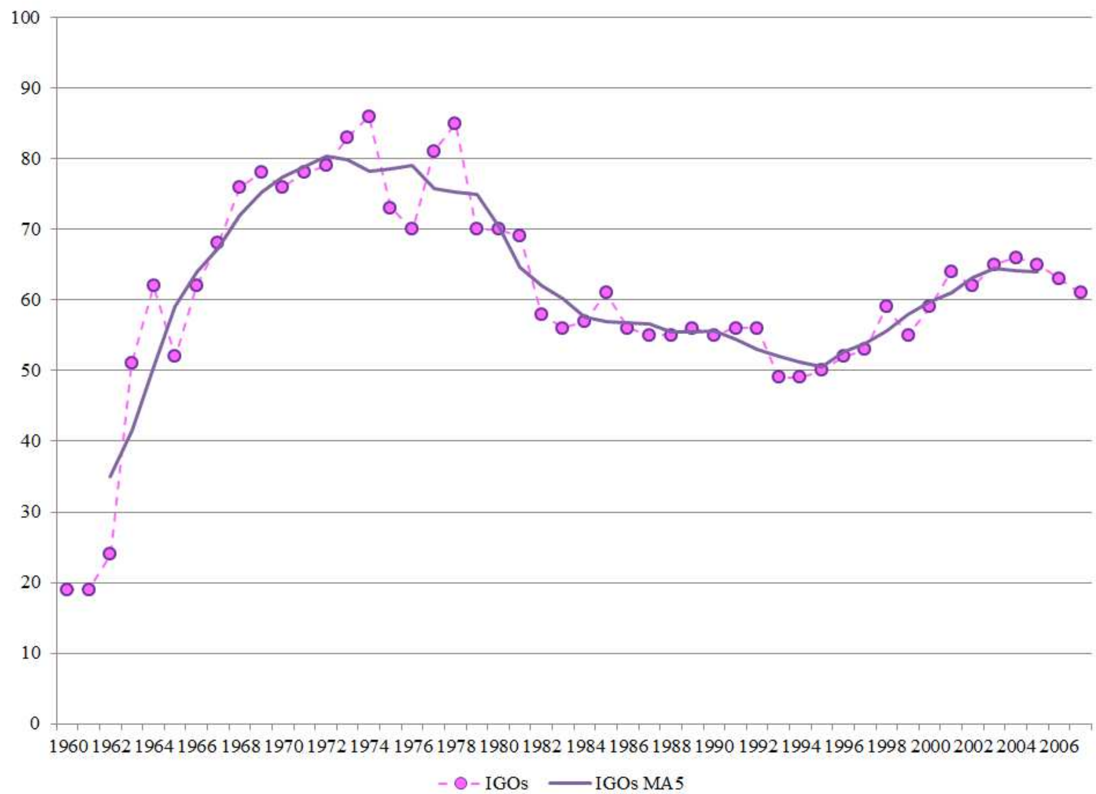


Figure 5.3.23: Longitudinal Plot of IGO Count with 5-Year Moving Average

Given that this measure collapses League of Nations and United Nations budgetary data, the most plausible conclusion from this section is that periodization would be an appropriate component of the relational analysis that is to follow in Chapters 7 through 9. However, this variable will not be considered for multivariate causal analysis for aforementioned reasons, as well as findings discussed in Section 7.2.2.

In conclusion of Section 5.3, while some figures (such as those based on US GDP) exhibit somewhat cyclical behavior throughout the period, others are characterized by discernible trends of linear growth (such as the sovereignty proxies), exponential growth (such as global trade relative to global GDP), or diminishment (such as the US percentage contribution to the UN budget). There is no single narrative to sweep the development of the diplomatic, or IGO-related, indicators of global governance, let alone one that might lend itself to causal implications explored in the bivariate chapters.

5.4. Military Indicators of Global Governance

Transitioning to hard-power dimensions of global governance, Figure 5.4.1 represents the military emphasis on power (in expenditures, as well as in expenditures relative to the number of soldiers at each nation's disposal) for the US *standardized against* the budgets and personnel rosters of every other nation on Earth. Using the same method that rendered the standardized values of US GDP per capita renders the military figures below. These were transformed cross-sectionally into z-scores—are always positive, given that they represent scores standardized against other countries during the same year, not against other years for the same country. A z-score of 0.14 in 1940, for example, does not reflect the near-absence of a military budget, the actual US figure being $1.657 billion (as compared to the UK's $9.948 billion) before its initiation into the Second World War, but rather an approximation to the average nation's military budget for that pivotal year (μ = $1.133 billion, an unexpected though noteworthy finding in itself. As a side note, the US figure rises to over $6.3 million by 1941 and again to over $26 billion by 1942, never again to drop below 10-digit figures, and never again to be overshadowed by any other single polity.

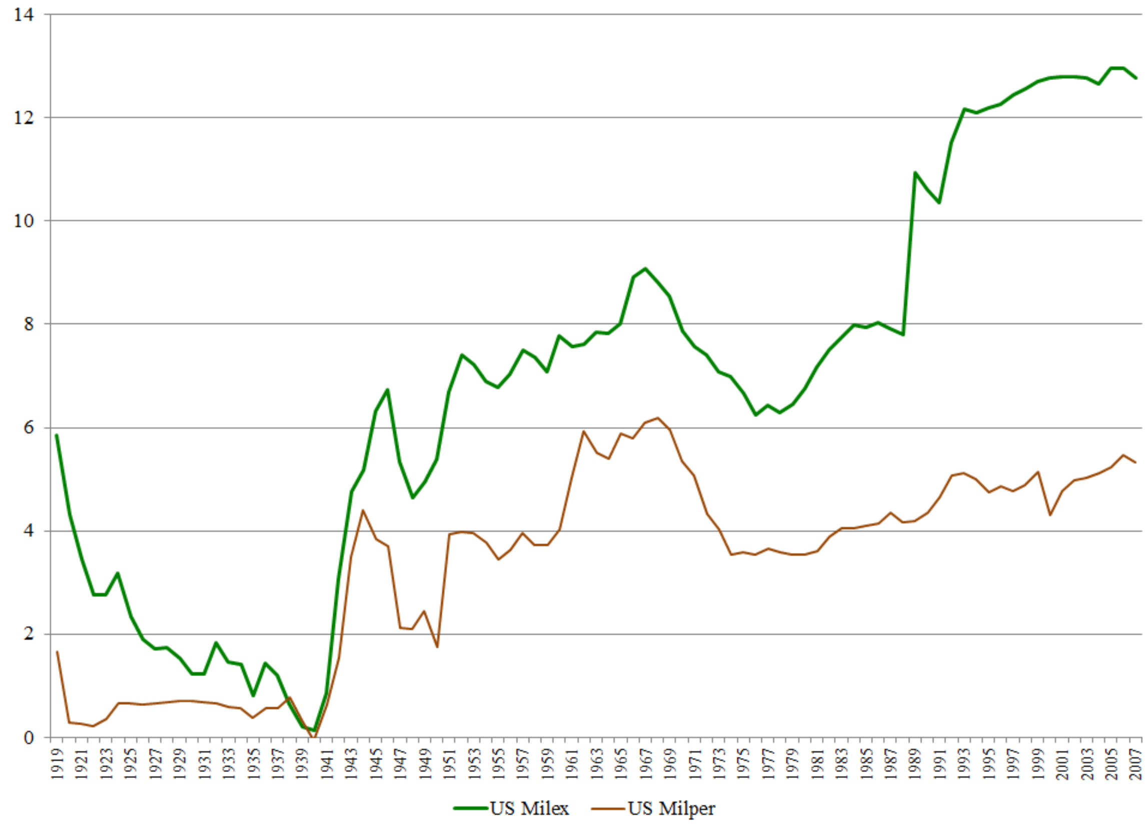
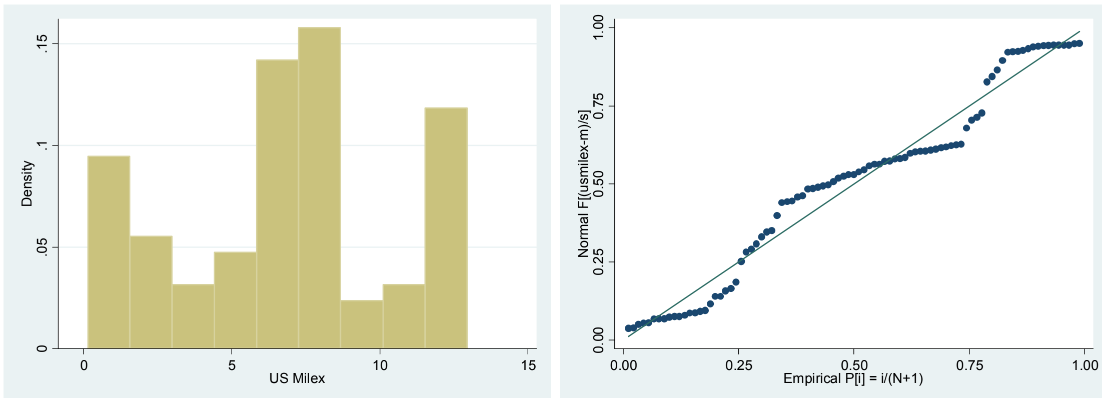
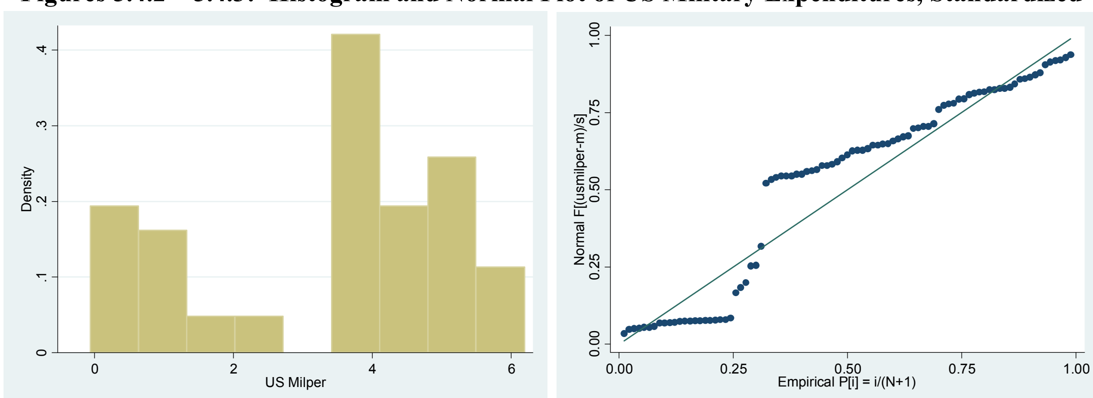


Figure 5.4.1: Longitudinal Plot of Standardized US Military Expenditures (Raw and per Soldier)

Because of the intensification of the scope of the US's war budget relative to all other nations' war budgets, the earlier portion of the graph does little to affect the overall variance. As with variables already discussed in this section, there is substantive support for the use partial correlations and/or periodization here, the latter using 1945 as a reasonable cutoff.



Figures 5.4.2 – 5.4.3: Histogram and Normal Plot of US Military Expenditures, Standardized



Figures 5.4.4 – 5.4.5: Histogram and Normal Plot of US Military Expenditures per Soldier, Standardized

Histograms for both the base military expenditures and their per-soldier quotients appear above, each complemented by its respective normal probability plot. Exhibiting inflated tails, the base expenditure histogram is a far cry from a normal distribution, and its per-soldier equivalent—lacking central cases—is similarly irregular.Though a periodization analysis is not included in this section, it may benefit bivariate analysis to periodize these values into with at least one cutoff at 1945.

5.5. Chapter Summary

As was said of Section 5.3, in a more general sense, no singular description of the development of the attribute dimensions of global governance is provided. It appears that despite the exponential increase in the United States' interstate trade relative to both global GDP, this has not led to a similar process for the economic prevalence of the United States as proxied by its GDP and GDP per capita, both of which exhibit notable equilibria in their relatively cyclical trajectories. This might be to some degree a consequence of an equally sharp, exponential rise in the integration of international trade into the world-economy, as proxied by global imports and exports as proportions of the world's GDP. Some support is also shown for the idea that the US's emphasis on diplomacy—proxied by its contribution to the UN relative to the total budgetary contribution—decreases during periods when the US initiates its more notable invasions, a topic that is assessed empirically in Chapter 7.

Sovereignty and other diplomatic figures are easier to singularly describe. All are appropriate for periodization; some are subject to growth trends and reflect two different entities, such as the LoN/UN budget relative to global GDP, while the US percentage contribution to the UN budget only decreases during discrete periods or remains constant. US military expenditures—both raw and per-soldier—are similarly subject to a growth trend taking place during World War II.

In conclusion, this chapter shows some support for the periodization of the dataset. Contrary to some of the findings network measures explored in the next chapter, however, there do not appear to be many significant differences across the three proposed periods after World War II, suggesting that a simpler, bipartite periodization scheme might be more telling than the Cold War scheme first mentioned in Section 5.3.2. Elaboration on the findings of this chapter is incorporated into the bivariate findings discussed throughout Chapter 7, as well as in the comprehensive analysis contained in Chapter 9.

Chapter 6: Univariate Analysis of Network Variables

To complement the univariate analysis of attribute variables detailed in Chapter 6, the current chapter entails measurements of uniquely soft (i.e., nonmilitary) power, more specifically the integration and centralization of global networks. The three types of networks discussed in this dissertation—IGO-state membership, foreign aid, and trade—reflect relationships that are presumably voluntary rather than coercive, although in the case of foreign aid, the relationships are necessarily imbalanced, representing a patron-client structure rather than a more presumably egalitarian network, such as the state-to-state co-affiliation network (Matrix 3).

Although foreign aid places a recipient country in a debtor's role, subjecting that sovereignty to the complexity that comes from that role (particularly when compounded by debt to multiple donors), the foreign aid networks still reflect a voluntary set of relationships, and are held to be dimensions of soft power, even in the case of hegemonic node centrality, since it is acquired via diplomatic, economic, and/or other non-coercive forms of interaction among polities.

The chapter begins with a brief description of each network's dimensions, these being density, centrality, node centrality, and Krackhardt measures. As mentioned in Section 3.1, the number of actual ties in a network divided by the total number of possible ties among relevant actors renders the network's density measure. Matrix centralities reflect the degree of concentration (i.e., disparity) of ties within the network, while node centralities point to the proportion of any individual node's ties relative to the sum of all actual ties (or possible ties, in the case of normalized centrality) in the network. Lastly, Krackhardt's procedure in UCINET computes a connectedness dimension—which is considered a counterpart to density herein—as well as three vertical measures of a network, including graph-hierarchy, graph-efficiency, and least upper boundedness.

Peculiarities and irregularities in the data are discussed in each measure's univariate overview as they become relevant. As with Chapter 5, histograms, normal probability plots, and longitudinal plots accompany each measure's distribution. In addition, select graphic cross-sections of every network, produced in NetDraw 2.089 (part of the UCINET software package), provide a more comprehensive understanding of the anatomy of each network.

6.1. Inventory of Network Variables

The following manifest lists each variable included for analysis in this chapter. Every network reports a density figure, but given the nature of each matrix (e.g., binary, valued, symmetric, etc.), not every dimension of every network is calculable. For details on their computation, please refer to the methodology section.

IGO Networks

M_1 Density	Density of state-IGO affiliation matrix.
M_2 Density	Density of IGO-IGO co-affiliation matrix.
M_2 Centrality	Normalized centrality of IGO-IGO co-affiliation matrix.
M_2 UN Centrality	Normalized centrality of United Nations in IGO-IGO co-affiliation matrix.
M_3 Density	Density of IGO-IGO co-affiliation matrix.
M_3 Centrality	Normalized centrality of state-state co-affiliation matrix.
M_3 US Centrality	Normalized centrality of United States in state-state co-affiliation matrix.
M_A Connectedness	Krackhardt's connectivity of the foreign aid network.
M_A Efficiency	Krackhardt's efficiency of the foreign aid network.

Foreign Aid Networks

M_A Density	Average density of the foreign aid network.
M_A Centrality (out)	Centrality of donorship in the foreign aid network.
M_A Centrality (in)	Centrality of receivership in the foreign aid network.
M_A US Centrality (out)	Centrality of hegemon's donations in the foreign aid network.
M_A Connectedness	Krackhardt's connectivity of the foreign aid network.
M_A Efficiency	Krackhardt's efficiency of the foreign aid network.
M_A LUB	Krackhardt's least upper bound measure of the foreign aid network.

Trade Networks

M_T Density	Average density of the trade network.
M_T Centrality (in)	Centrality of imports in the trade network.
M_T Centrality (out)	Centrality of exports in the trade network.
M_T US Centrality (in)	Centrality of US imports in the trade network.
M_T US Centrality (out)	Centrality of US exports in the trade network.
M_T Connectedness	Krackhardt's connectivity of the trade network.
M_T Hierarchy	Krackhardt's hierarchy of the trade network.
M_T Efficiency	Krackhardt's efficiency of the trade network.
M_T LUB	Krackhardt's least upper bound measure of the trade network.

Table 6.1.1: List and Descriptions of Attribute Variables

With respect to the IGO-state networks, both intra- and inter-network dimensions are features of the same relationships, but with varying emphases on states or IGOs as the central actors in Matrices 1, 2, and 3. The incorporation of the densities of all three matrices is done for the sake of inclusion, although future work on these matrices will focus more on Matrix 3, which focuses on all existing nation-states as the focal actor rather than a select dozen IGOs that might or might not be indicative of the less prominent IGOs in the world-system. All centrality scores have been normalized for ease of comparison across networks, and, when possible, all Krackhardt measures have been calculated. The univariate overview of each network and its constituent dimensions follows.

6.2. IGO-State Affiliation Networks

This section is devoted to the univariate properties of the IGO-state affiliation matrices (abbreviated as M_1), as well as the permuted IGO-IGO and state-state co-affiliation matrices (abbreviated as M_2 and M_3, respectively). Due to their unique shapes and internal features (such as being valued/unvalued, or directed/undirected), every property of every matrix could not always be calculated. Invariable, incalculable, or irrelevant output has been duly omitted.

Prior to the univariate analysis of the IGO variables, however, a few preliminary facts about each IGO merit mention, given the distinct nature and function of each IGO in the matrices, and its distinct composition of member states.

Variable	N	μ	σ	Min	Max	CV	1st Year
M_1 *Density*	97	0.3192	0.1496	0.0842	0.5836	0.4686	1919
M_2 *Density*	71	31.0934	21.3528	4.3060	65.6670	0.6867	1919
M_2 *Centrality*	71	8.7204	2.8456	4.3400	17.7600	0.3263	1919
M_2 *UN Centrality*	71	41.2313	8.2134	31.2930	54.7870	0.1992	1919
M_3 *Density*	97	1.5080	1.5035	0.0396	4.3358	0.9970	1919
M_3 *Centrality*	97	0.6806	0.6533	0.0200	2.0600	0.9598	1919
M_3 *US Centrality*	97	28.3802	20.3382	0	55.2460	0.7166	1919
M_3 *Connectedness*	97	0.4549	0.3606	0.0396	1	0.7928	1919
M_3 *Efficiency*	97	0.0244	0.0394	0	0.1492	1.6147	1919

Table 6.2.1: Univariate Properties of Each Dimension of Matrices 1, 2, and 3

The League of Nations (1919 – 1946) is comprised of predominantly Western powers, as well as a few key Latin American and Asian states. In practice, membership in the LoN is continuous (that is, countries join only once and leave only once) with the exception of Argentina, which dropped out in 1921, later to rejoin in the 1933. Though membership in the LoN continued until 1946, the League's participation in global affairs all but ceased in 1944, soon to be replaced by the United Nations.

The League of Nations was coexistent with treaties set forth prior to the resolution of World War II, such as the third Geneva Convention of 1929, giving the League little to no power over member nations. Given its lack of coercive apparatus, and the fact that the rising hegemon of the time—the United States—was not a member of the League, its enforcement power in the world-system was hardly a presence in global affairs. It would not be until the onset of the Nuremberg trials that the League of Nations' successor—the United Nations—would come to embody the material and political dimensions of global governance.

The United Nations (UN, 1945 – present), held herein to be the central IGO of its time, boasts continuous membership by all states that have already joined it; that is, no nation has ever ceased to be a member after joining. The same is true of the World Bank (WB, 1945 – present), the International Monetary Fund (IMF, 1945 – present), the International Criminal Court (ICC, 2002 – present), the World Trade Organization (WTO, 1995 – present), the General Agreement on Tariffs and Trade (GATT, 1948 – present), the North Atlantic Treaty Organization (NATO, 1949 – present), and the Southeast Asia Treaty Organization (SEATO, 1955 – 1977), which is ubiquitously characterized by same member states from its inception to its dissolution 22 years later. Some of these have little to no power over nation-states, such as the WTO (Wallerstein, 2015), while others have jurisdictional powers superseding national jurisdictions, such as the ICC.

The Central Treaty Organization (CENTO, 1955 – 1979) is also characterized by continuous membership throughout its existence, with the exception of Iraq, which withdraws in 1978, one year before the dissolution of this IGO.

Similarly, the G8's members (Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States) have continuous participation since their incorporation into the G8 (1975 – present, in most cases), with the exception of Russia, who joined in 1997 and was suspended in 2013. This small but powerful coalition of permanent member states is rivaled in scope only by the UN's Security Council.

The Security Council (1945 – present), arguably the most concretely powerful subset of the United Nations, is by far the most unique actor in the IGO network when it comes to its constituency, as here, a state is elected to membership for only two years at a time, with the exceptions of China (originally Taiwan), France, Russia (originally the Soviet Union), the United Kingdom, and the United States, all of whom are permanent members. In addition, since 1946, when the first non-permanent members were elected, the Council has had anywhere between 5 and 11 non-permanent members.

A key characteristic of IGO membership that distinguishes it from all other measures of global governance in this dissertation is that of its stability and predictability. Because each state's membership for each IGO has been decided at least one year in advance, data available to date extend to 2017 in some cases. This is in part why the League of Nations exists on paper until 1946: memberships for that year had been determined more than 12 months prior.

In contrast to the League of Nations' node-unanimity in this matrix illustrated in Figure 6.2.2, Figure 6.2.3 illustrates Matrix 1 in 2016. NetDraw's default parameters for geodesic distancing plots IGOs clustered as per their centrality in and around the circular formation of member states.

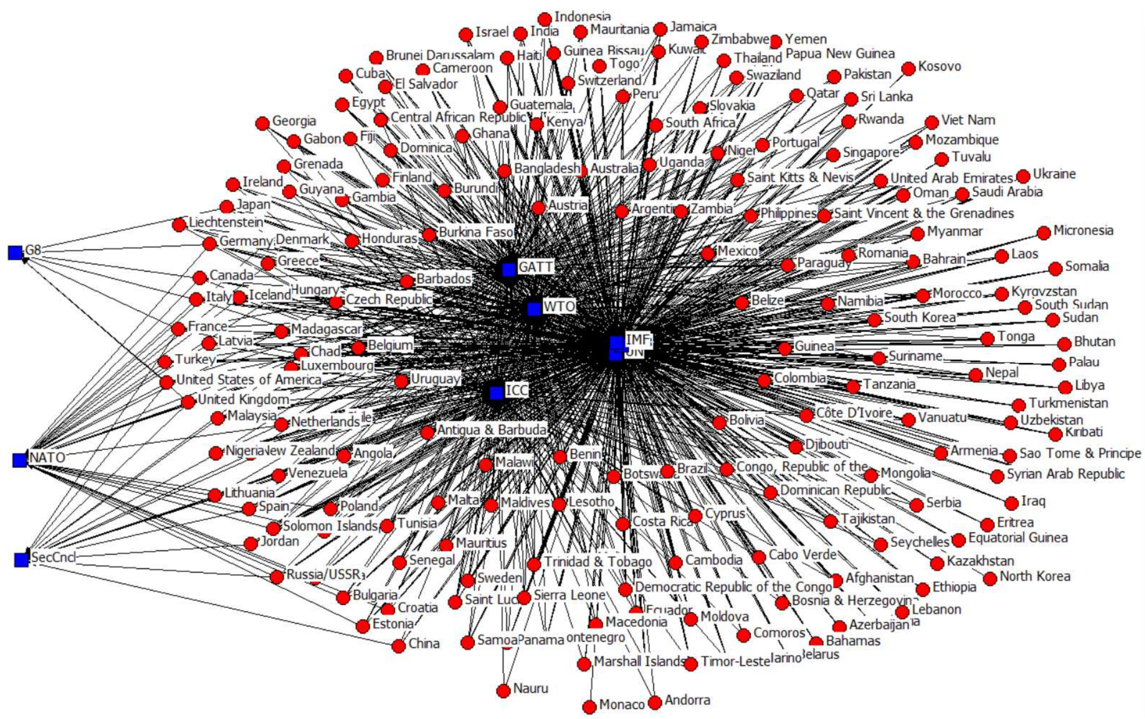


Figure 6.2.1: Sample Cross-section of Matrix 1, 2016

A methodological note on these figures is necessary: though some of NetDraw's capabilities do account for valued differences among relations via spacing, the exact spacing of nodes relative to the League of Nations in the figures above is somewhat arbitrary. They are rough representations of node centrality in each network. As such, the nearly identical node centralities of the UN, IMF, and WB occlude the latter, which is actually underneath the UN and IMF. This trend of close contention among the three primary IGOs is constant throughout the entire postwar period, given that a country must be a member of the IMF before being a member of the WB, and both memberships are contingent upon UN membership[15].

Figure 6.2.2, by contrast, plots Matrix 2 in 1945, the modal inaugural year for the IGOs included in the network. Each relationship is quantified by the number of co-affiliated states in each IGO pair. Because the League of Nations still has nominally active members until the end of 1945, its presence in the matrix is highly linked to other important IGOs, such as the UN, which has 28 member states that transition from the former to the latter that year.

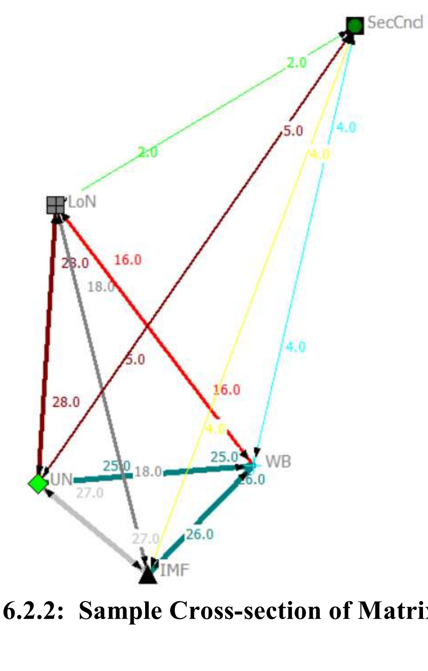


Figure 6.2.2: Sample Cross-section of Matrix 2, 1945

[15] See http://www.worldbank.org/en/about/leadership/members for details on memberships among the Bretton-Woods membership requirements and related governance structure.

The relative peripherality of the Security Council is worth mentioning here. This IGO grants exclusive permanent membership to China, France, Russia, the United Kingdom, and the United States. Aside from this, a more inclusive, but limited (two-year), membership pool—the General Assembly—provides an arguably less powerful body of governance via these rotating memberships that might counter the agendas of the five permanent members of the Council[16]. In further studies using these data, the node centrality of the Security Council—heavily moderated by its members' co-affiliations in other IGOs—might serve as a proxy for its partiality towards central or peripheral temporary members.

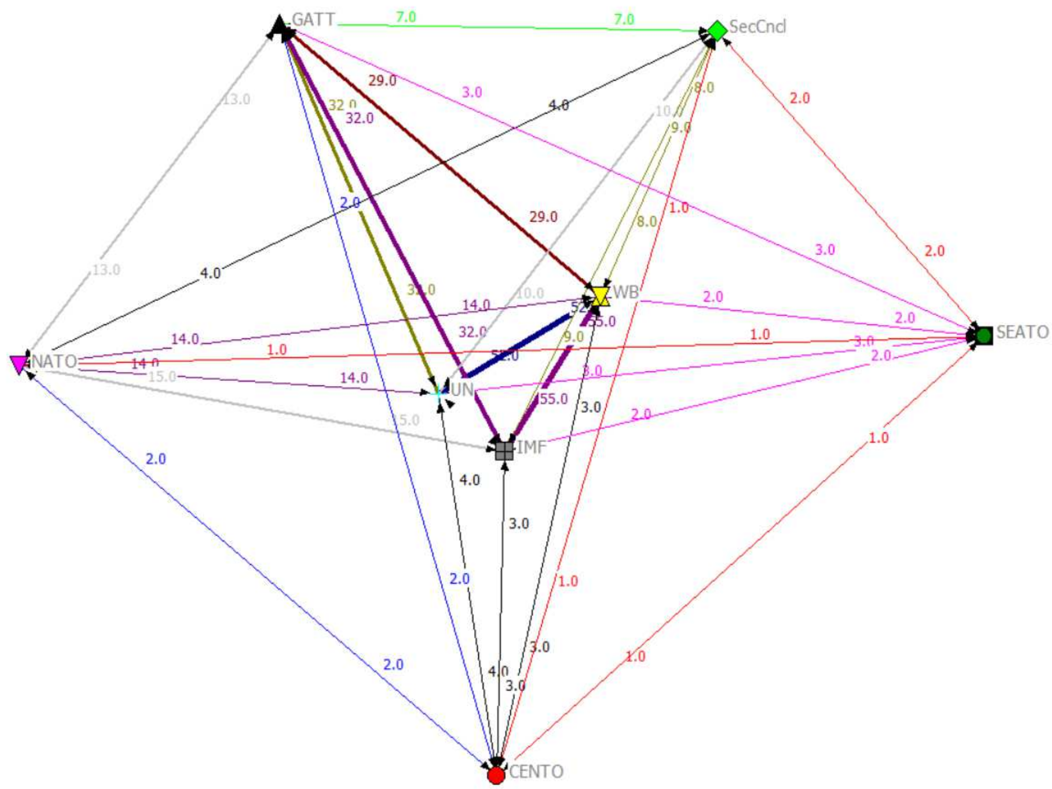


Figure 6.2.3: Sample Cross-section of Matrix 2, 1955

[16] See http://www.un.org/en/sc/members/ for an inventory of Security Council member states from 1945 to 2015.

Only 10 years after the founding of the UN and other major IGOs, new entities such as the GATT, and SEATO had also emerged, and still others like CENTO and the WTO would eventually come to existence. As Matrix 2 gains new nodes, it increases in density, something that only occurs when *most* states quickly become members of these nascent IGOs. In the case of NATO, an exclusive, regional IGO, its inception in 1948/1949 lowers the density, though during this period, the rapid rise in density among other IGO co-memberships cancels out this decrease, creating a brief plateau in the trajectory (see Figure 6.2.8) before continuing upward as more countries acquire sovereignty and participation in the IGO network.

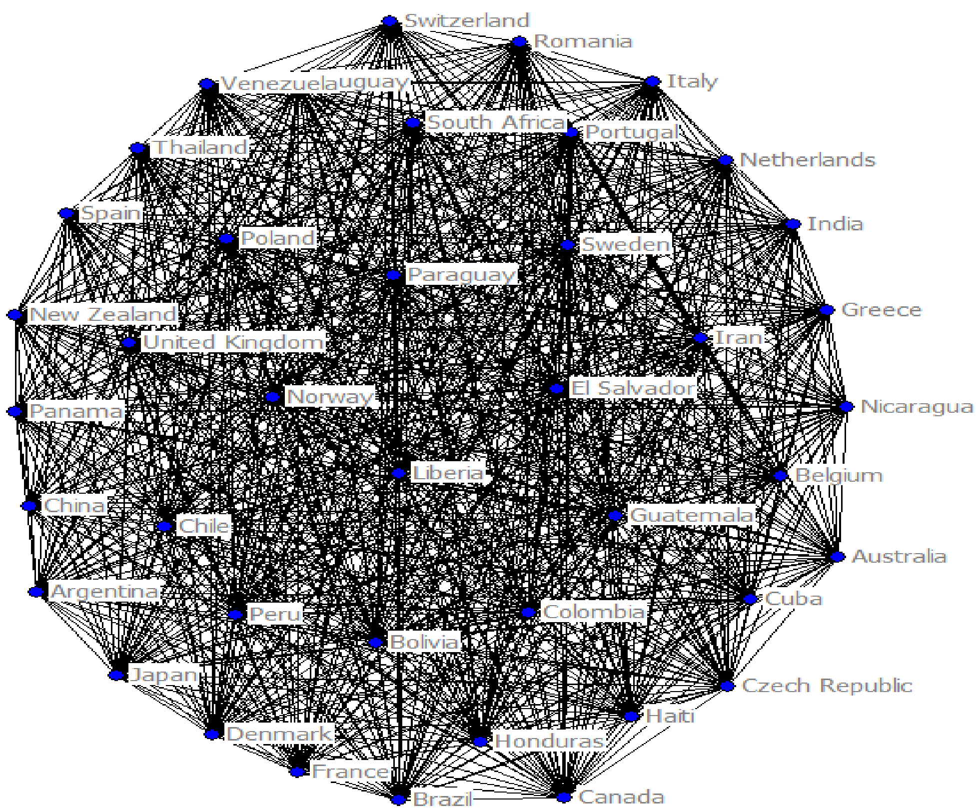


Figure 6.2.4: Sample Cross-section of Matrix 3, 1919

Figure 6.2.4 illustrates Matrix 3 during the first year of the League of Nation's founding. Because of the singularity of the League of Nations, every connection represents a single IGO co-affiliation, and simply serves as a graphic representation of the League's founding members. The complexity of this network comprised of almost 200 nodes is too dense to graph without color coding or excluding nominal levels of co-affiliation. Color coding the same matrix in 2000 is still a bit misleading, as it overlays lines based on the alphabetical order of the nodes, falsely highlighting Zimbabwe as a highly central actor.

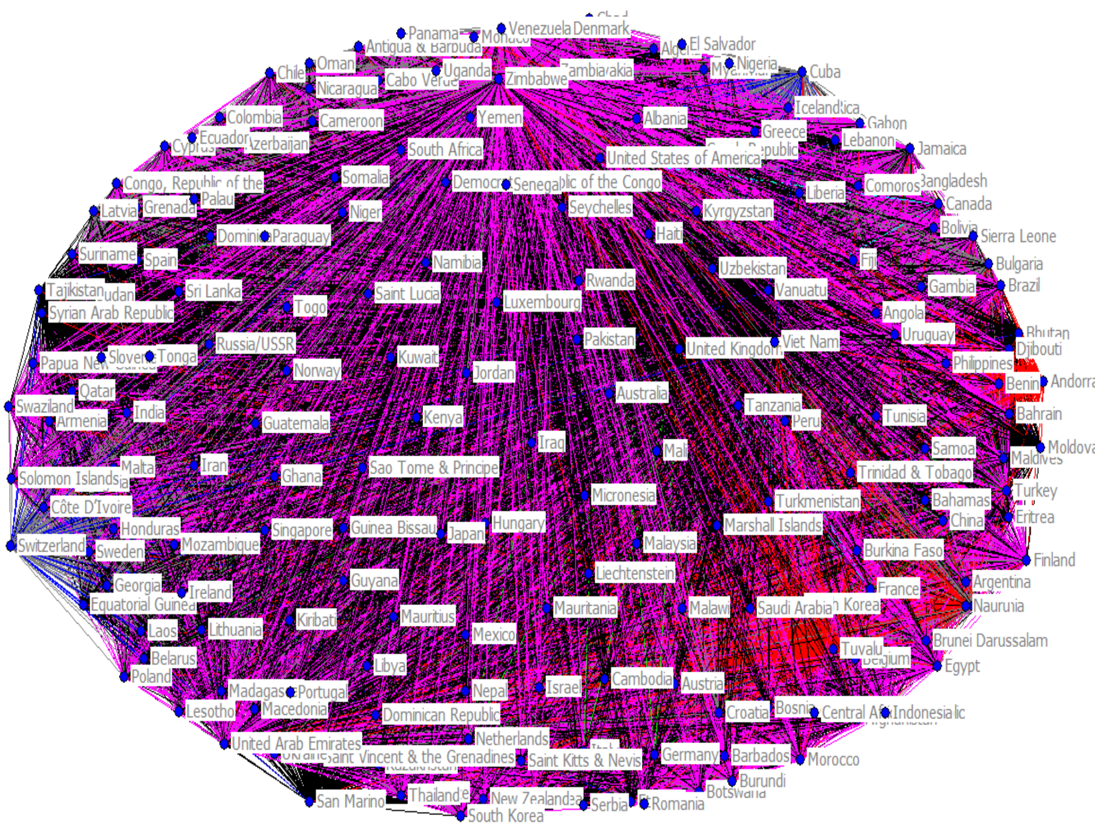
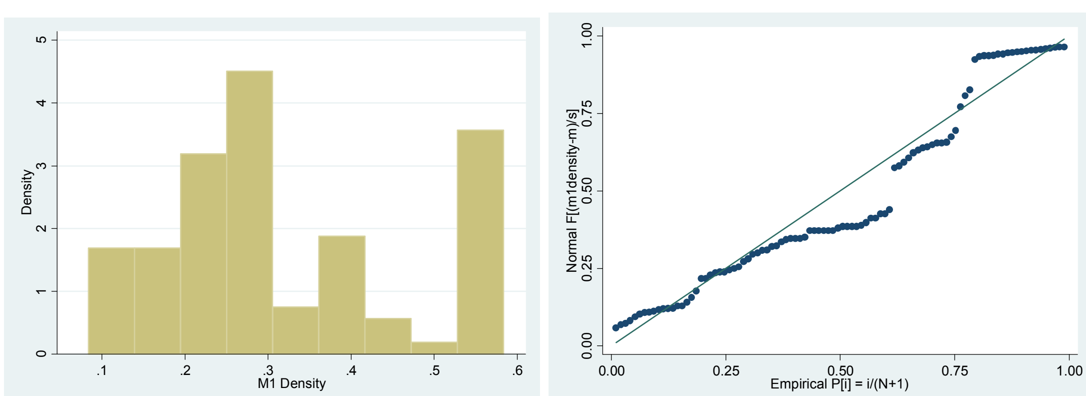


Figure 6.2.5: Sample Cross-section of Matrix 3, 2000

A brief reminder of the composition of Matrices 1, 2, 3 follows for convenience: Matrix 1 reflects the binary membership or affiliation values between IGOs and nation-states. From these, square, valued matrices are permuted, each reflecting the number of state co-affiliations among the selected IGOs in this study (Matrix 2), as well as the number of IGO co-affiliations among nation-states (Matrix 3). Having assessed the anatomical nature of each permutation of the IGO-state matrices, their univariate compositions are assessed below.

6.2.1. Densities of Matrices 1, 2, and 3

The density of a given matrix is its most straightforward measure of its integration, though Krackhardt's connectedness is a close second. The annual IGO matrices reflect a trajectory of soft, or diplomatic, power across the time period. In its simplest form, Matrix 1—the IGO-state affiliation matrix—boasts a maximum-value-inflated distribution, the antithesis of zero-inflated distributions such as those found in Chapter 5, and later in this chapter.



Figures 6.2.6 – 6.2.7: Histogram and Normal Plot of M_1 Density

Because this variable encompasses both the periods during which the League of Nations and the United Nations (along with the other IGOs used in this analysis) exist, this might be confounding the overall shape of its distribution, and it may therefore be fruitful to periodize this variable with a cutoff at 1945 – 1946.

Before performing periodization, however, a preliminary look at the normal plot, though ambiguous, confirms a more populated tail at the high end of the saturation range (0.75 – 1.00) than at its low extreme, consistent with the histogram in Figure 6.2.6. Such a peculiar skew is likely to yield ambiguous results when plotted against other variables.

Because the ranges of the raw figures vary so widely, Figure 6.2.8 plots the z-scores of the densities of Matrices 1 through 3. Longitudinally, it is evident here that the League of Nations boasts a far more exclusive cast of affiliates, and the fact that actors abandon the League during its second decade of existence again points to the usefulness of periodization of this variable. Its curvilinearity is not dependent on the total number of countries on Earth and IGOs in the dataset, since this number does not actually rise during the interwar period, but rather begins to do so after World War II, and this rise *is*, by contrast, responsible for the small dips in density during the 1950s as well as during the turn of the century (2002), when the number of possible ties among all the nodes rises from 1,552 to 1,746.

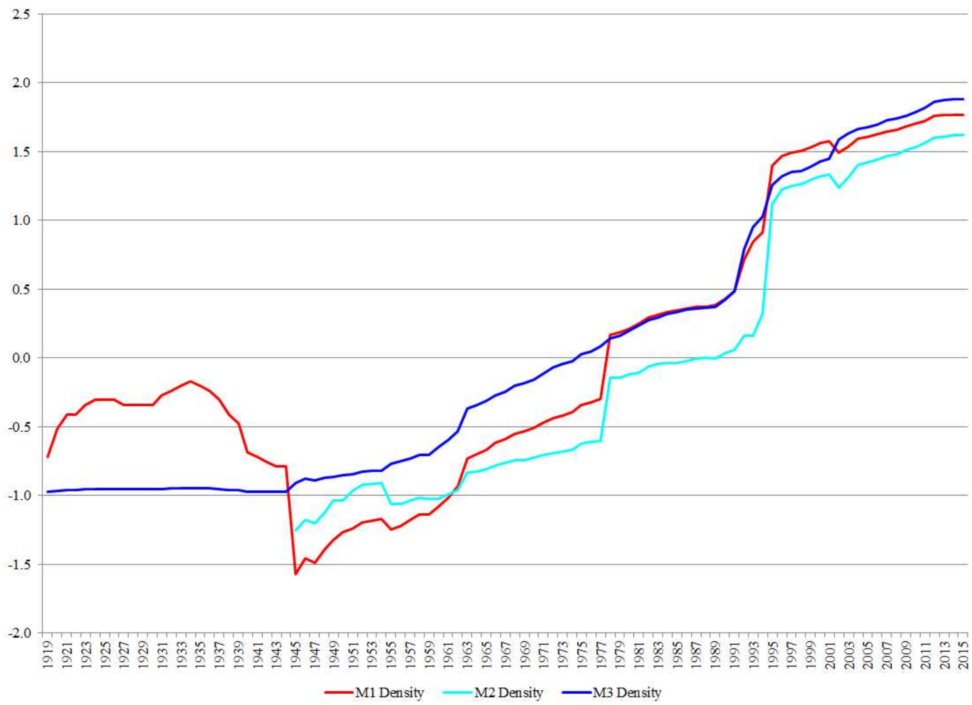
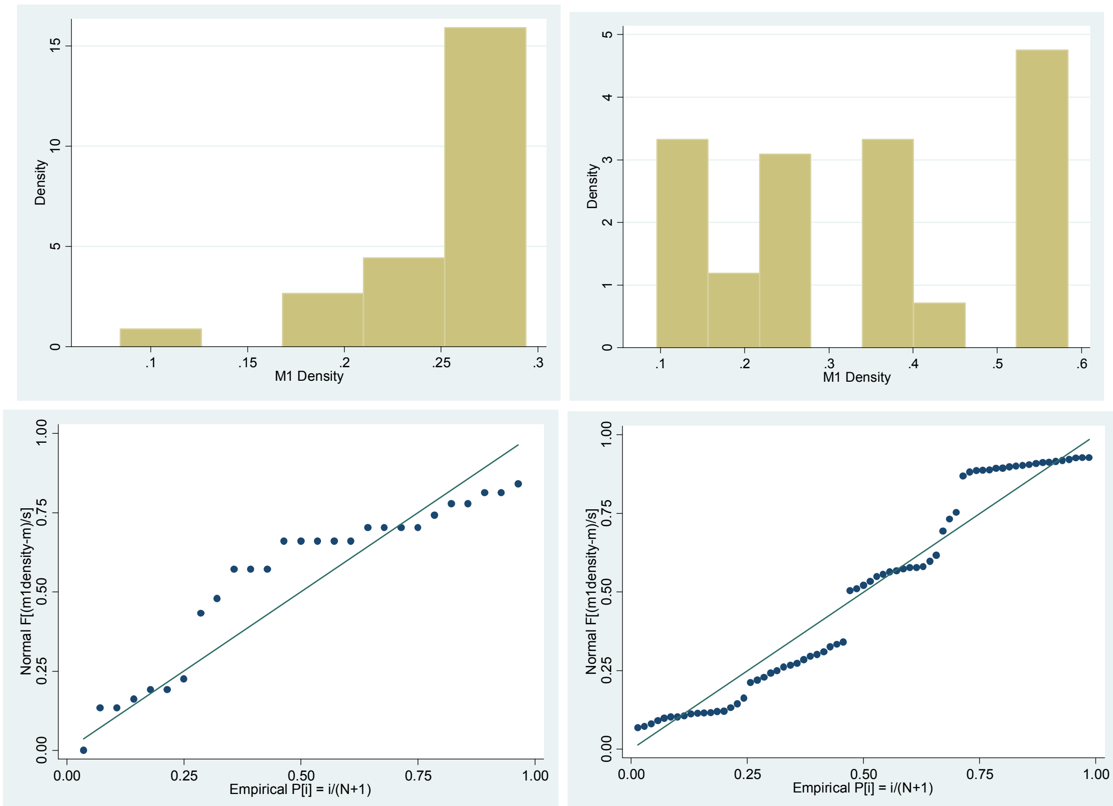


Figure 6.2.8: Longitudinal Plot of M_1, M_2 and M_3 Density, Standardized

These dips in density after World War II are due to: (1) most of Africa becoming decolonized in the 1950s and 60s, though IGO membership is not immediately extended to those emerging sovereignties, (2) SEATO and CENTO emerging, though their regionally exclusive nature excludes most nation-states as potential members, and (3) the International Criminal Court being inaugurated at the turn of the century, though it is also similarly exclusive, extending membership to only 42% of the world's nations in 2002, this figure rising to 62% by the current decade. Indeed, to date, the United States is a non-affiliate of the ICC.

The periodized measure Matrix 1's density—cut off at 1945/1946—is distributed as per the histograms and normal plots in Figures 6.2.9 through 6.2.12.



Figures 6.2.9 – 6.2.12: Histograms and Normal Plots of M_1 Density, Periodized (1919 – 1945 and 1946 – 2016)

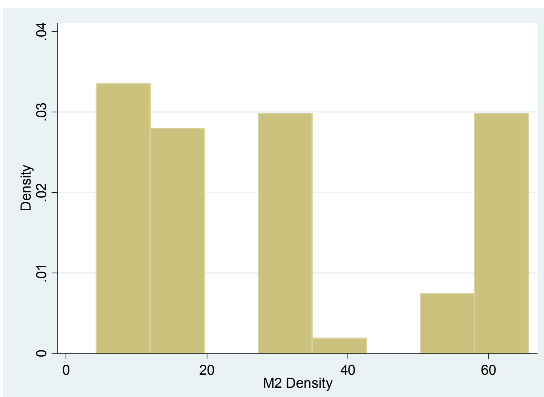
What is evident for the League of Nations period (left histogram and normal plot) is that its density's negatively skewed distribution—comprised of 27 time points—is caused primarily by a sharp decline in membership during wartime.

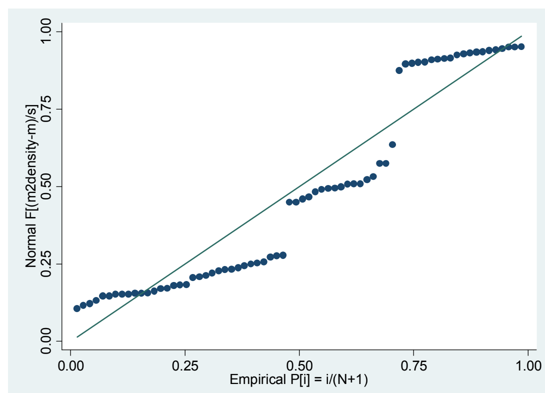
The period after the dissolution of the League of Nations exhibits such irregularity in its distribution that nonparametric or other non-standard methods of multivariate analysis will have to be used to assess the independent effects of other factors on this matrix's density. Mathematically, its irregular clustering of cases (longitudinal plateaus) separated by sharp inclines in density might pose problems of heteroscedasticity at the bivariate level punctuated along these pivotal periods, particularly if plotted against more normally distributed variables subject to a secular trend of growth.

Because Matrix 2—the IGO-IGO co-affiliation matrix—has only one IGO prior to 1945 (the League of Nations), no values can be computed for this perfect star network, and thus, Figure 6.2.13 only displays its density after the founding of the Bretton-Woods and other organizations. As expected, its trajectory is somewhat parallel to Matrix 1, from which it was permuted, though its absolute number of nodes is far smaller along one of its axes, and must therefore be plotted on a much larger scale. In fact, because the density of each IGO-related matrix (IGO-state, IGO-IGO, and state-state) has such varying ranges, all three matrices cannot effectively fit on the same graph; hence, Figure 6.2.14 plots the standardized values of Matrices 1 (raw state-IGO affiliations), 2 (IGO-IGO co-affiliations), and 3 (state-state co-affiliations).

The most obvious difference among the matrices is that Matrix 2 plots no pre-UN values, the reason being that during this time, there is only one IGO (i.e., the League of Nations), and thus IGO-IGO co-affiliations are irrelevant and incalculable. A less noticeable dissimilarity among the trajectories lies in Matrix 3, which exhibits no notable dips after World War II, since it does not take into account the absolute number of IGOs in its computation of density (as do Matrices 1 and 2), but rather computes the count of co-affiliate nation-states per IGOs present.

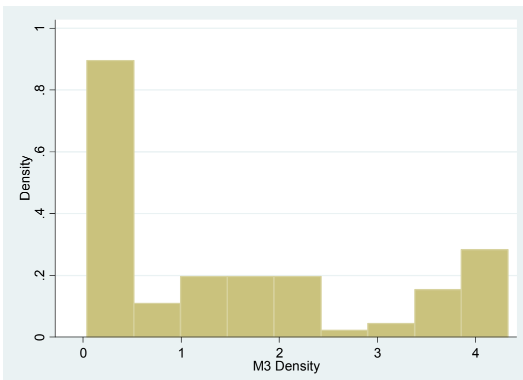
Matrix 2's density yields another abnormal distribution, with notable gaps near the median evident also in its normal plot. This is caused by: (1) the cessation of SEATO and CENTO in 1977 and 1979, respectively (reducing the denominator by which density is calculated), and (2) far more notably, the inauguration of the WTO in 1995, and its immediate incorporation of 109 member nations, followed by the gradual incorporation of 46 others since its inception. Compared to the UN, WB, and IMF, given the exclusive membership constitution of the WTO, and even more so, SEATO and CENTO; it is this exclusivity that most affects the relative values of the numerator and denominator in the density formula in Matrix 2. The incorporation of such an exclusive IGO necessarily increases the denominator (i.e., the total number of possible co-affiliation ties) by a larger factor than the numerator (i.e., the actual number of co-affiliations among IGOs). It is unclear as to why the incorporation of some exclusive IGOs, such as the Security Council (est. 1975), have a less impacting effect on the overall density measure of the matrix.

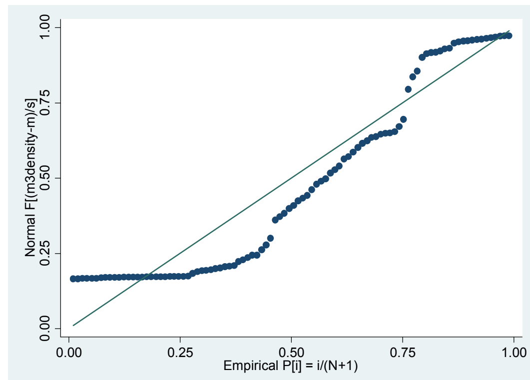




Figures 6.2.13 – 6.2.14: Histogram and Normal Plot of M_2 Density

As stated in Section 6.2.1, Matrix 3 is a state-by-state IGO co-affiliation network, the computational converse of Matrix 2. This state-to-state matrix charts the co-affiliations of IGOs by nation-state (the opposite logic of Matrix 2's permutations of the original data), and therefore its distribution is more sensitive to the proliferation of sovereign states, such as the incorporation of Kyrgyzstan, Turkmenistan, and other emergent Central Asian nations into the IMF during the early 1990s, than it is to the birth and demise of the IGOs in the dataset. That is to say: Matrix 2's density is more irregular than Matrix 3's density because it only has a dozen nodes throughout the entire period (and never that many on any given year), whereas Matrix 3 has anywhere from 52 to 194 sovereign nodes between 1919 and the present. From the perspective of international relations, in which the nation-state is the focal participating actor in global affairs, Matrix 3 measures the degree to which these actors are connected to one another via the *environment of diplomacy* that IGOs engender.





Figures 6.2.15 – 6.2.16: Histogram and Normal Plot of M_3 Density

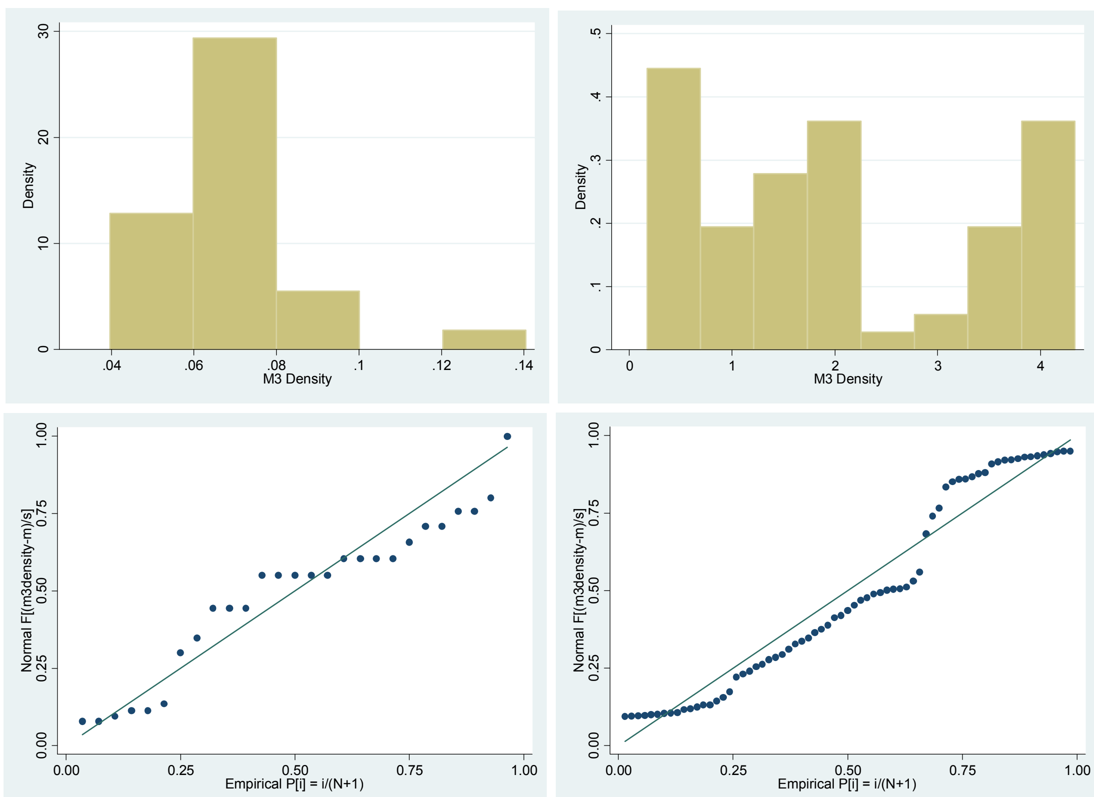
The density of Matrix 3 exhibits a near-zero-inflated distribution similar to that of US centrality in this matrix, discussed in Section 6.2.6. While this is not a true zero-inflation in the density of the network, its negligible values during the League of Nations period are followed by a linear growth trend, skewing the distribution positively. To accompany this output, the years discussed in the paragraphs that follow pertain to when a country joined the United Nations, though once they join the UN, it is the norm that nation-states join the World Bank and the International Monetary Fund on the same or subsequent year.

It is not only in 1945, however, that the density figure exhibits angular changes in its mostly linear trajectory. The period of the Missile Crisis—the height of inter-core tensions during the Cold War—coincides with a short spurt of decolonization between 1960 and 1962, in which 28 colonies (24 in Africa, plus Jamaica, Western Samoa, Trinidad/Tobago, and Cyprus) acquired sovereignty, and within 2 years were members of the UN and other IGOs.

The next pivot in the trajectory occurs during the period between 1990 and 1994, following the wake of the dissolution of the Soviet Union, when former Soviet Republics such as Lithuania (1991) and Kyrgyzstan (1992) join at least some of the major IGOs, as well as non-Soviet entities, including both Koreas (1991), Croatia (1992), Eritrea (1993), and Palau (1994). The early 1990s exhibit a sweep of mostly Eurasian and Pacific Island nations, another lull in the density of the network is achieved, not because the extension of sovereignty or IGO membership is closing, but because the sovereignty ratio is approaching 100%, making it possible for a waning minority of countries to further increase the density by joining at least one IGO, among them Serbia and Switzerland. East Timor, for example, acquires full sovereignty in 2002, contributing to the last upward push in the density figure by joining the UN, IMF, WB, and the new ICC during that same year. South Sudan has a similar effect on the network before density plateaus again during the current decade.

Though it is evident in Figure 6.2.26 that the density of Matrix 3 is increasing over the course of the last century, plotted alongside this trajectory is that of the same network's centrality, discussed below, which is—for the most part—decreasing since the inception of the United Nations and Bretton-Woods institutions.

As with measures already analyzed, the positively skewed distribution of Matrix 3's density, dictated largely by the period when the League of Nations was the sole (and therefore central) IGO actor in the matrix, should be periodized with a cutoff at 1945/1946 to better distinguish this earlier period from its more decentralized, postwar period. When periodized, Matrix 3's distributions for the League of Nations (left) and United Nations (right) periods are as follow.



Figures 6.2.17 – 6.2.20: Histograms and Normal Plots of M_3 Density, Periodized (1919 – 1945 and 1946 – 2016)

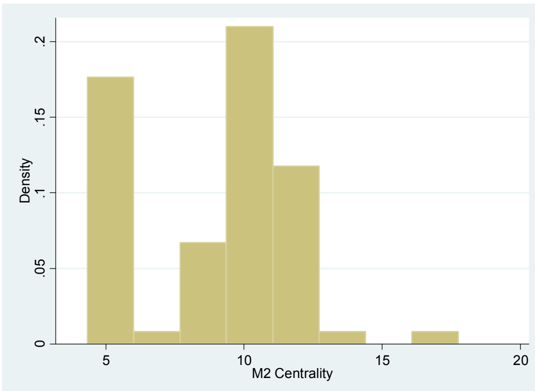
Though the narrative here is largely redundant with that of Matrix 1's density, the distribution has been somewhat normalized in comparison, and in particular, the more notable gaps in density have been narrowed and smoothed out by the pivoting of the raw state-by-IGO affiliation data into a square, valued, state-by-state matrix.

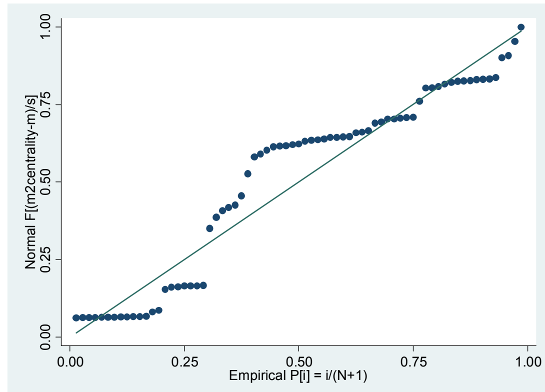
6.2.2. Centrality of Matrix 2

Before the analysis of Matrix 2 begins, a note on centrality in this dissertation must be repeated from Chapters 3 and 4, this being that all centrality scores discussed and analyzed herein have been normalized for the purposes of comparing matrix centrality to node centrality across the same range and variance. While Bonacich centrality was computed, and a dataset of these values exist, only Freeman's degree centrality measures are discussed here, both in the case of networks and nodes. The normalization of these centrality scores matches the scales of hegemonic node and network centralities across the matrices, much as standardized scores have been used throughout the attribute data to account for scalar differences, still yielding relative proportions of the actual centrality of connections relative to the maximum centrality achievable by a network with the available number of actors.

With this disambiguation stated, the computation of the degree centrality of the IGO matrix—which represents how much the IGO-IGO co-affiliation network approximates a star network, with a single actor (in this case, an IGO) in the center and all other actors dependent on that central node for participation in the network—requires a square matrix with the same actors plotted along both axes. Hence, Matrix 1's centrality can only be assessed when it is permuted into its respective co-affiliation Matrices 2 and 3. This section covers the centrality of Matrix 2 and its corresponding central node—the United Nations—followed by an analysis of the same dimension of Matrix 3 and its central nodes—the United Kingdom and United States.

The distribution of the centrality score of the IGO-IGO co-affiliation matrix is graphed in Figures 6.2.21 and 6.2.22, though it is Figure 6.2.23 that better illustrates the sensitivity of this quotient to both numerator and denominator effects.





Figures 6.2.21 – 6.2.22: Histogram and Normal Plot of M_2 Centrality

For example, as seen in Figure 6.2.23, the initial instability in the trajectory of Matrix 2's centrality points to its sensitivity to the number of new IGOs entering the matrix until 1955, when CENTO and SEATO are formed. The subsequent stabilization, plotted alongside the density of this matrix, obviates the fact that while countries are continuously joining more of the IGOs in the matrix, the numerators and denominators that produce the centrality measures remain comparatively constant relative to each other. It is only when SEATO and CENTO cease to exist in 1977 and 1979, respectively, and once again when the WTO is formed, that the centrality measures are affected.

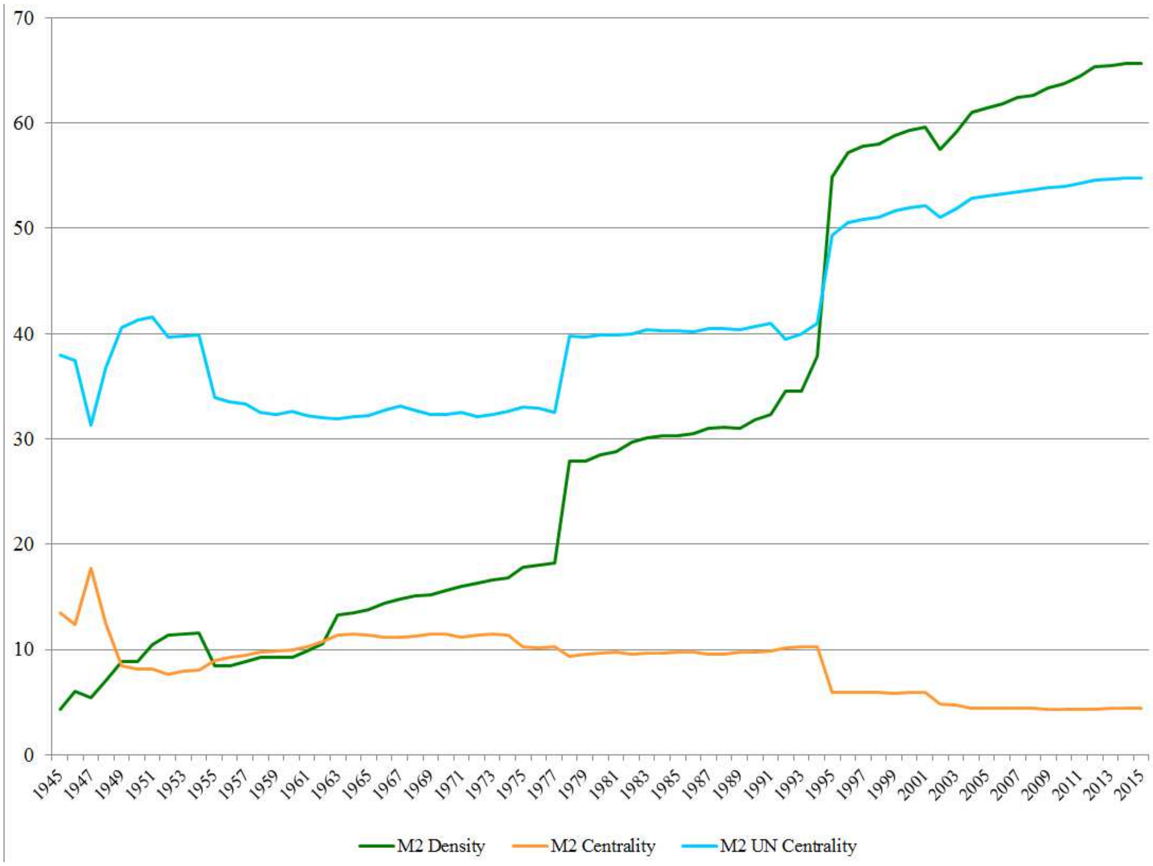


Figure 6.2.23: Longitudinal Plot of M_2 Density and Centrality, and UN Centrality

With the exception of the League of Nations and the Security Council's General Assembly, it is the norm that once membership in an IGO is acquired, it is maintained. Thus, a survival analysis of these data would only have a handful of exceptional cases of nations that lose membership in an IGO, such as Russia's *suspension* from the G8 in 2014, a suspension still pending at the time of this dissertation's defense.

6.2.3. Centrality of the United Nations in Matrix 2

No IGO has been more prevalent since its inception than the United Nations. Its predecessors—each one successively more encompassing—consisted of events, movements or organizations such as the Treaty of Westphalia (1638), the Holy Alliance (1815), the Geneva Conventions (1864 – 1949), the Round Table (1909), and the League of Nations (1919). What sets the United Nations aside from the rest of these—other than its relative geographic scope—is the power bestowed to it by the victors of World War II immediately upon its inception. The Nuremberg Trials—unlike previous attempts to enforce international treaties—benefitted from a tacit legitimacy bestowed upon it by an unprecedented level of postwar devastation. The balance between the coercive capacities of Nuremberg's tribunal and its legitimacy as a functional apparatus of last-resort global governance, had been lacking during the period of the Hague and earlier Geneva Conventions. In part due to the limited coercive capacities of the UN, this IGO has shaped more of the world via diplomatic means than any of its predecessors. This analysis measure the centrality of the UN in Matrix 2 throughout the period, but before doing so, a few technical notes are relevant to the interpretation of node centrality in this dissertation.

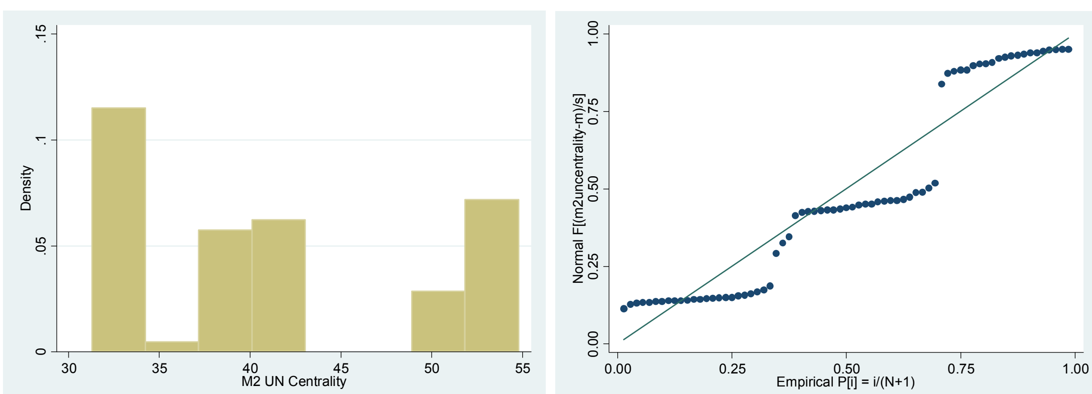
As with network centrality, all measures of node centrality in this chapter are calculated as Freeman's degree centrality. These values do not account for the strength or weakness of an ego's connected alters, and therefore are not attenuated or weighted by the relative coreness or peripherality of adjacent nodes. By contrast, Bonacich's attenuated method of computing *node* centrality (see Hanneman and Riddle, 2005: 203-208) can either capture the degree to which the United Nations (or any other actor) is connected to other strong (i.e., highly connected) actors, or conversely, to weak (i.e., highly marginalized/unconnected) actors in the matrix, who might be solely dependent on the UN for participation in the world polity. While Bonacich centralities of the UN and US in their respective matrices were omitted from this analysis, this dimension will be assessed in related work to be submitted for publication once the more basic features of global governance have been analyzed in this dissertation.

Just as the centrality scores of Matrix 2 capture the degree of approximation of the entire IGO-IGO co-affiliation network to an ideal type star network, the relative degree to which the United Nations is that central actor in that network is proxied by its node centrality—also normalized. Hence, the node centralities of the United Kingdom, United States, and the United Nations will be considered for inclusion in the longitudinal regressions discussed in the multivariate section, and will first be assessed in this chapter. The League of Nations has invariable unanimity in the IGO-IGO matrix during its functional lifespan, and therefore its centrality is not a useful array of data in this analysis.

While the calculation of measures of node centrality might be more suitably applied to Matrix 3 in order to evaluate the *hegemon's* prevalence in the network, it is of interest to this study to note the trajectory of this variable for the United Nations, as future studies building on the matrices used in this dissertation might plot the centrality of the UN against the centrality values of the International Monetary Fund and the World Bank (the other two highly central IGOs during the period of interest) in order to calculate centrality steepness distributions among the prevalent IGOs.

On the note of the UN's centrality, there are a few substantive constraints to the nature of the membership relations in this matrix. First, given the inclusivity of the Bretton-Woods organizations, there are few actors who are ever connected *only* to the UN, and these are relatively negligible actors on the world stage, such as Andorra, Nauru, and Montenegro. Second, a country *must* be a member of the International Monetary Fund before becoming a member of the World Bank, and membership in both of these Bretton-Woods IGOs is contingent upon preexisting UN membership. These legislative and institutional constants of global governance reinforce the relative primacy of the UN in the IGO-IGO matrix.

Figure 6.2.23 above plots the United Nation's centrality, charting that IGO's degree of relevance relative to other IGOs (and their affiliated nation-states) in the world polity. As noted in the previous longitudinal plot, CENTO and SEATO, both founded in the mid-1950s and dissolved in the late 1970s, impose a great leap and drop, respectively, on the centrality of the remaining IGOs, and the United Nations is no exception. This, however, is more a feature of the limited subset of IGOs in this study than of the entire inventory of IGOs in existence.



Figures 6.2.24 – 6.2.25: Histogram and Normal Plot of UN Centrality in M_2

Figures 6.2.24 and 6.2.25, a histogram and normal plot representing the centrality of the UN in M_2, confirm that there are unexpectedly few values for this variable near the median. The gaps in both figures are the result of periodic plateauing of values, separated by punctuated increases in the centrality of the UN, most notably when SEATO and CENTO disappear from the matrix, and two decades later when the WTO extends membership to over 100 nations and other members, nearly all of which are also members of the UN. Regardless of its cause or nature, however, the irregularity of this variable poses concerns at future stages of analysis where central tendency is underrepresented, and the spikes in the otherwise stable data produce heteroscedastic levels of first-order autocorrelation.

6.2.4. Centrality of Matrix 3

Matrix 3's centrality represents the degree to which this network approximates a single star network, with a sole actor at its center and all other actors dependent on that central node for co-affiliation. The role of the League of Nations' role as the sole IGO node between 1919 and 1944 increases the centrality of the network.

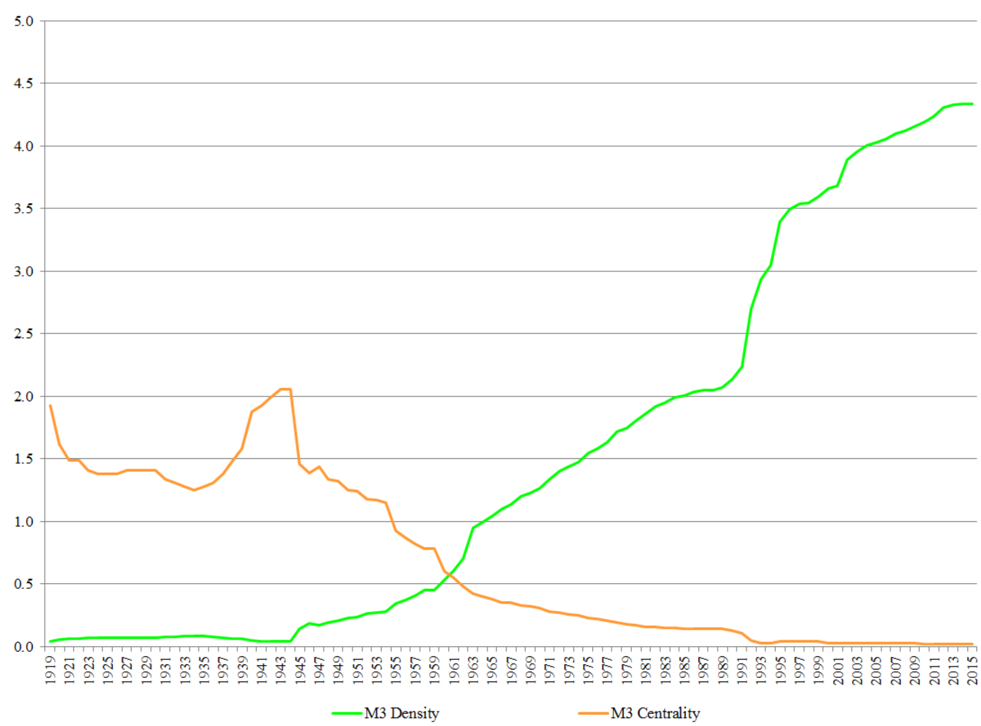
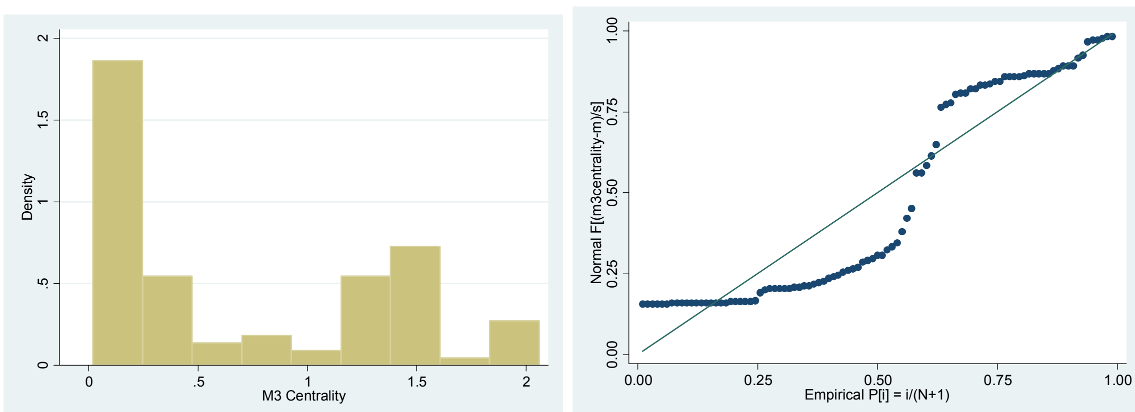


Figure 6.2.26: Longitudinal Plot of M_3 Density and Centrality

Centrality exhibits a peak during World War II followed by a steady, overall decline. With the incorporation of the other prevalent IGOs into the world polity, the centrality of the network gradually decreases thereafter as the incorporation of newly sovereign polities causes the centrality to drop to record lows from which it has yet to recover.



Figures 6.2.27 – 6.2.28: Histogram and Normal Plot of M_3 Centrality

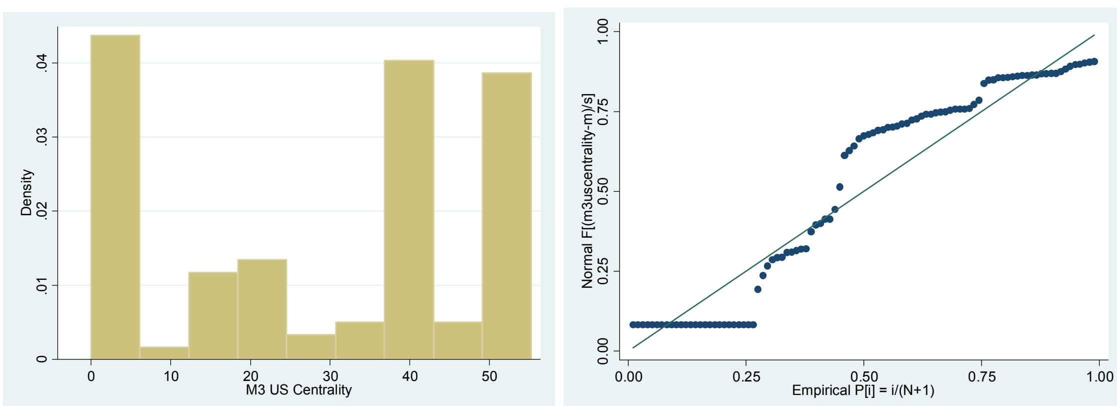
This drop suggests a flattening of this global network, consistent with Meyer's (Krücken and Drori 2009) world polity argument that IGO proliferation is a vehicle of a more inclusive arena of participation in which nation-states—previously the highest-order actors in the world stage—now act as subsets of larger nodes of political efficacy. When viewed from the perspective of state-state relations via IGOs as intermediaries, the centrality of this network decreases with increased participation (i.e., density), strongly advocating the position of the world polity. Bivariate analysis will show just how correlated the centralities of networks and their respective nodes are.

As with previous distributions, the highly positive skew evident in the centrality of the state-to-state co-affiliation network is explained by its relatively large variance before the Missile Crisis, followed by the more highly autocorrelated and less widely dispersed downward slope that characterizes it during the last 6 decades. Considerations for this heteroscedasticity and skew are addressed in the portions covering periodization in Chapter 9.

However, a substantive note relevant to periodization is still warranted here. Because of the League of Nations' central role in the IGO-state network, its role as the sole IGO *in the matrix* during its existence renders the centrality of the network relatively high (it is the number of non-affiliated countries that yields a value smaller than 1), and it is only with its gradual waning during the 1930s and its dissolution in the 1940s that the network's centrality drops, only to be cyclically regained during the first few decades of the postwar period. With the incorporation of the other prevalent IGOs into the world polity, the centrality of the network boasts a second climactic period during the Cold War, particularly following the Missile Crisis, gradually decreasing until the fall of the Soviet Union, after which the incorporation of newly sovereign polities causes the centrality to drop to record lows from which it has yet to recover. This drop suggests a flattening of this global network, consistent with Meyer's (2009) world polity argument that IGO proliferation is a vehicle of a more inclusive arena of participation in which nation-states—previously the highest-order actors in the world stage—now act as subsets of larger nodes of political efficacy.

6.2.5. Centrality of the United States in Matrix 3

As important to global governance as the United Nations' centrality in Matrix 2, if not more so, is the centrality of the United States in Matrix 3. Node centrality in Matrix 3 serves as the prime determinant of a hegemon's diplomatic governance from a social networks perspective. Before addressing the longitudinal distribution of this variable, the histogram of the centrality of the United States (Figure 6.2.29) exhibits gross irregularity, part of which can be explained substantively: because the United States was not a member of the League of Nations, its values prior to 1945 are held constant at 0 until the inception of the United Nations, creating a zero-inflated distribution. To account for this, as was concluded about several other variables in Chapter 5, periodizing US values of centrality at the 1945/1946 cutoff yields a useful distribution.



Figures 6.2.29 – 6.2.30: Histogram and Normal Plot of US Centrality in M_3

The US experiences a sharp rise in centrality during the early 1960s and again during the early 1990s. The acute drop during the mid-1970s does not do much to skew the distribution, since cases before it and after it comprise a more normal distribution.

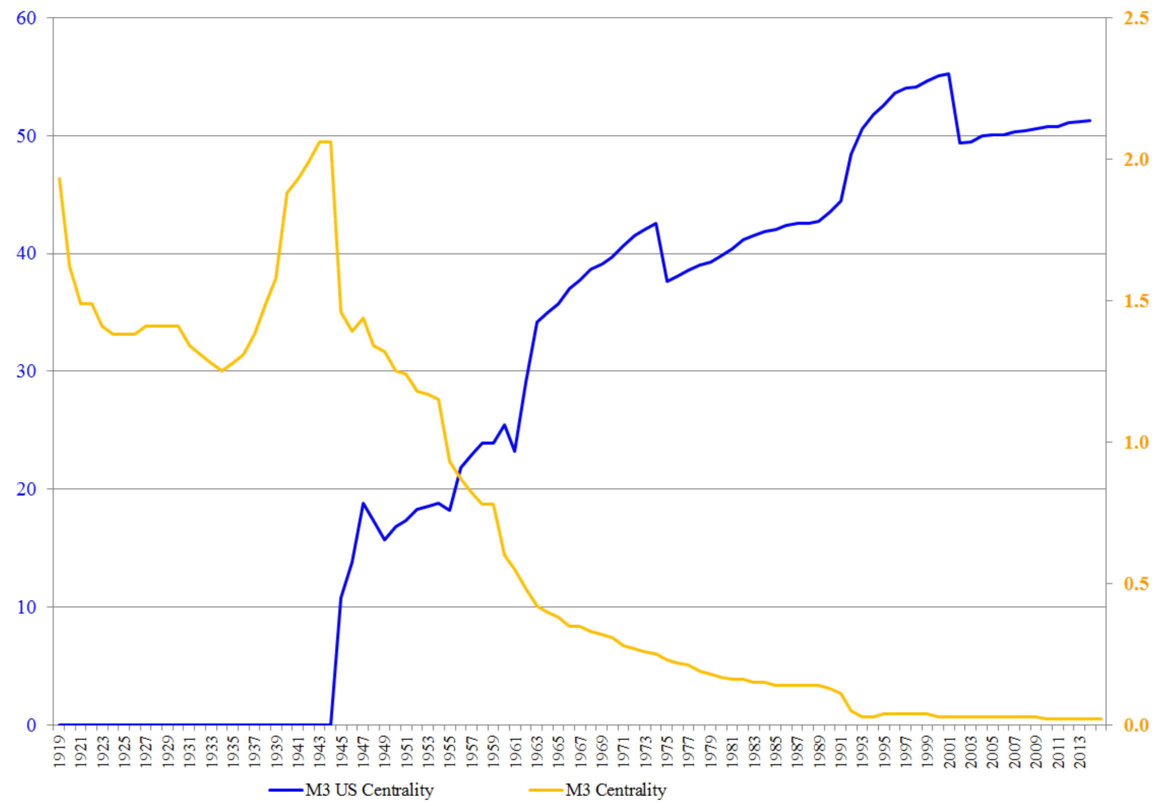


Figure 6.2.31: Longitudinal Plot of M_3 and US Centrality in that Matrix

This node centrality drops again in 2002 when the International Criminal Court is formed, but the US does not join it. It is worthy of noting, however, that network and node centrality are far less direct measures of hierarchy and hegemonic global governance than attribute variables, such as the hegemon's military budget. As is mentioned in Chapter 5, soft-power dimensions of global governance complement, and are complimented by, their hard-power counterparts.

6.2.6. Krackhardt's Measures of Matrix 3

Though the multivariate analysis will exclude these variables due to collinearity found at the bivariate level of analysis, it merits mention here that the two computable, variable Krackhardt dimensions of Matrix 3 exhibit completely distributions longitudinally.

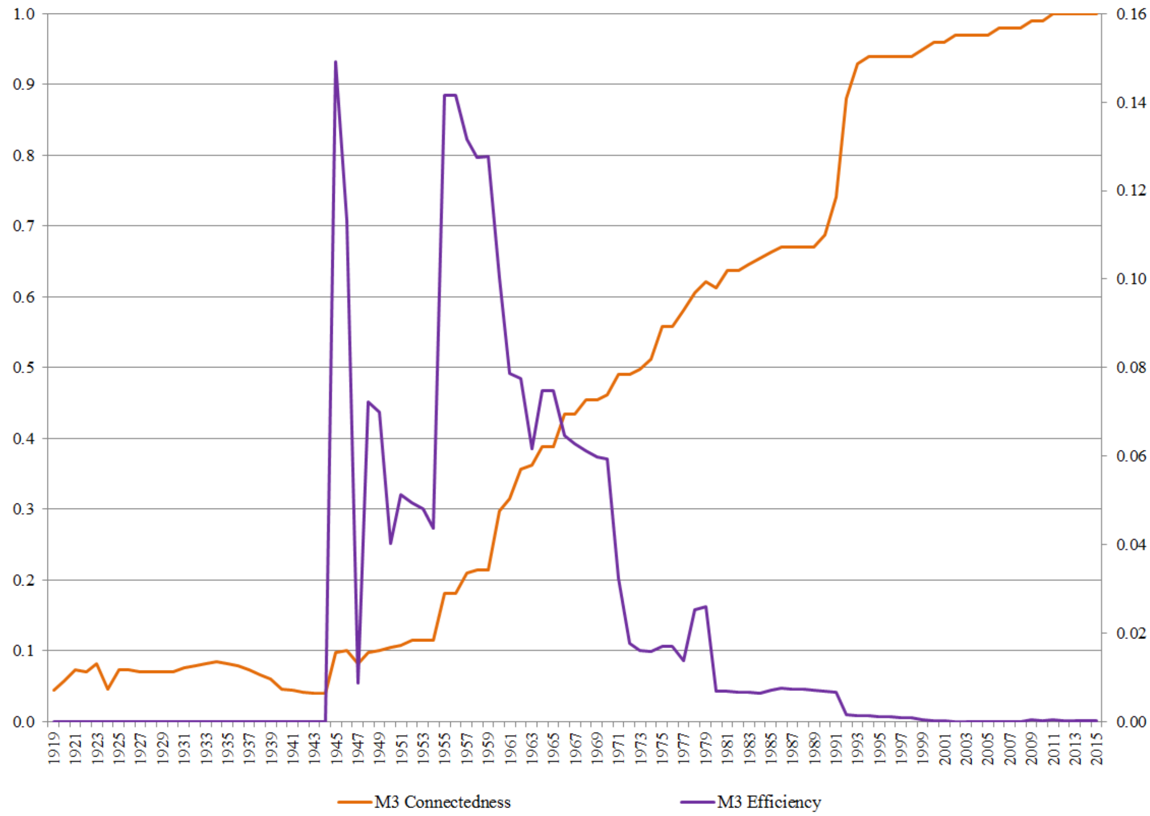


Figure 6.2.32: Longitudinal Plot of Calculable Krackhardt Dimensions of M_3

Given the irregularity of Krackhardt's efficiency, its values prior to 1945 and after 1999 should probably be omitted to eliminate any confounding multivariate effects of near-zero variances during those periods. Furthermore, because of their conceptual overlap with density and centrality, respectively, they will be evaluated against these measures at the bivariate stage of analysis.

6.3. Foreign Aid Networks

Nonmilitary aid represents a more benign form of monies given by one polity to another. The foreign aid matrix is a comprehensive representation of the world's entire nonmilitary aid network, as captured by Roodman (2012) from which density, centrality and Krackhardt's measures are calculated. Figures 6.3.1 and 6.3.2 below illustrate—respectively—unvalued and valued donor-recipient relationships. In this section, the blue nodes in the network graphs represent donors, while red nodes represent aid-recipient nations.

Variable	N	μ	σ	Min	Max	CV	1st Year
M_A *Density*	53	0.9329	0.6987	0.1371	2.5071	0.7489	1960
M_A *Centrality (in)*	53	0.9580	0.3090	0.5690	2.1840	0.3225	1960
M_A *Centrality (out)*	53	2.8432	0.9109	1.0850	5.8970	0.3204	1960
M_A *US Centrality (out)*	53	2.6246	0.9725	0.0768	5.9981	0.3705	1960
M_A *Connectedness*	53	0.6832	0.1717	0.3363	0.9142	0.2514	1960
M_A *Hierarchy*	53	0.9992	0.0021	0.9906	1	0.0021	1960
M_A *Efficiency*	53	0.8406	0.0579	0.7480	0.9730	0.0689	1960
M_A *LUB*	53	0.2137	0.0923	0.0394	0.3950	0.4318	1960

Table 6.3.1: Univariate Properties of Each Dimension of the Foreign Aid Matrix

This section analyzes both the network's centrality as illustrated by Figure 6.3.1, but also the node centralities of the hegemonic power (the US), better illustrated by Figure 6.3.2, in which arrows widths ordinalize the amount of foreign aid given from the US (or UK, in this case) to a client state.

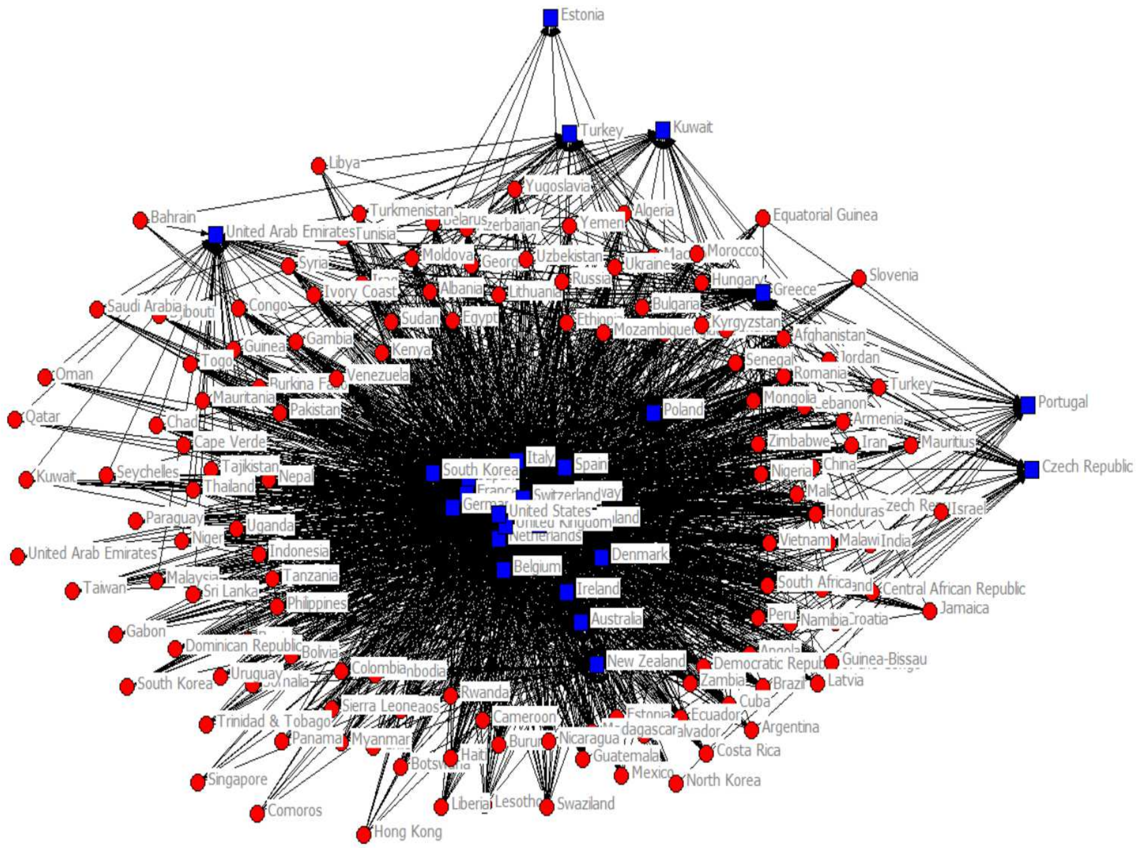


Figure 6.3.1: Sample Cross-section of Foreign Aid Matrix, 2000

Utilizing NetDraw's default parameters for geodesic distancing, Figure 6.3.1 plots the less prominent donor nations at the periphery of the cluster, while the predominant donors that year appear in the middle of the circular diagram. All donors except the UK and the US have been removed from Figure 6.3.2, which now graphs only foreign aid relationships related to the two substantive hegemonic and mathematically most central donor nodes, weighting the width of each line by the relative strength of each relationship's dollar value. Though a quantitative analysis of UK node centralities has been omitted from this dissertation as an effort to not exceed page limits, its centrality is (particularly in Matrix 3) nearly identical to its US equivalent, which (1) refutes any notions of zero-sum rivalries between the two central actors in all of the state-based matrices (i.e., 3, A, and T), and (2) allows for UK and US narratives to be interchangeable with respect to their node centralities herein.

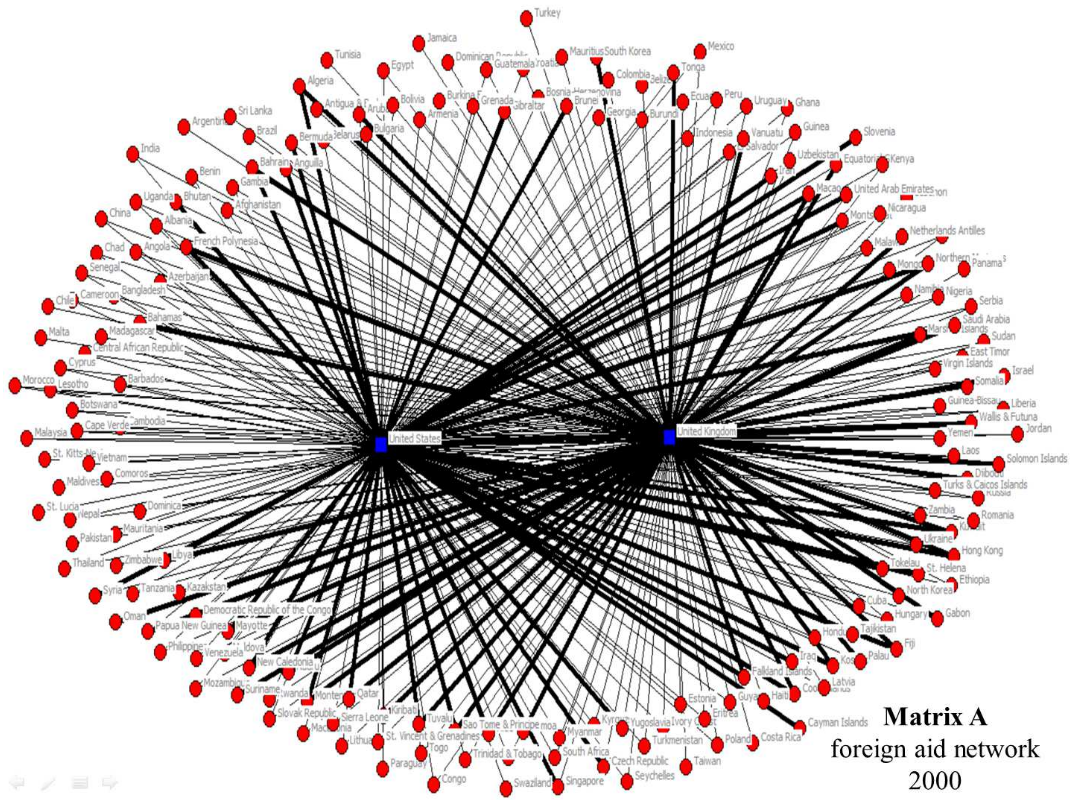
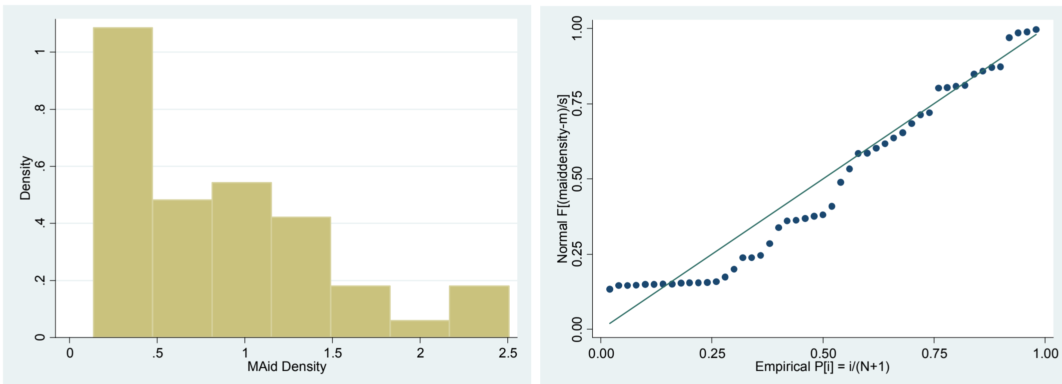


Figure 6.3.2: Sample Cross-section of Foreign Aid Matrix (2000), Including Only the UK and US as Donors

Table 6.3.1 reports the computed univariate properties of each dimension of the foreign aid matrices, while this section provides the individual plots for each variable derived from the foreign aid matrices. Because Roodman's (2012) dyadic nonmilitary aid data only spans as far back as 1960, the trajectory of any of the dimensions of the foreign aid networks cannot be assessed prior to that year.

6.3.1. Density of the Foreign Aid Matrix

The degree to which countries either give or receive nonmilitary foreign aid annually is captured by the density of this network. Positively skewed, the distribution seems to normalize heteroscedastically, approaching a rough bell distribution as values exceed the median.



Figures 6.3.3 – 6.3.4: Histogram and Normal Plot of Foreign Aid Matrix Density

This cyclical trajectory appears to be characterized by a gradual increase in density until the 1990s, followed by what might become the beginning of a cyclical pattern, as seen in Figure 6.3.5 below.

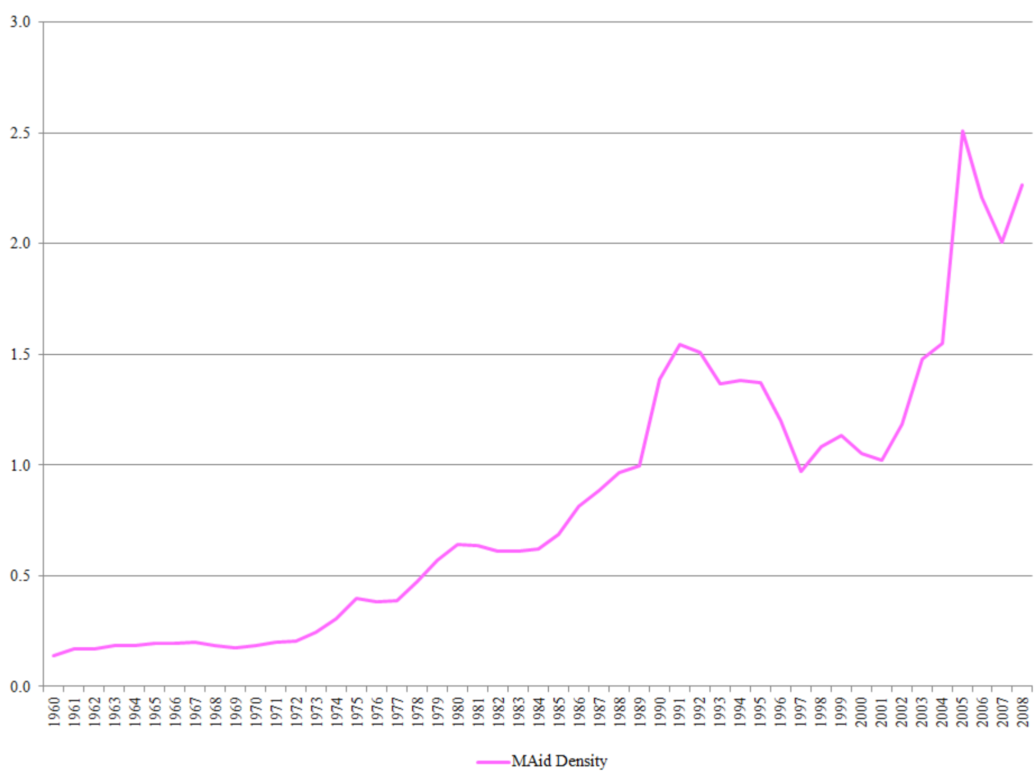
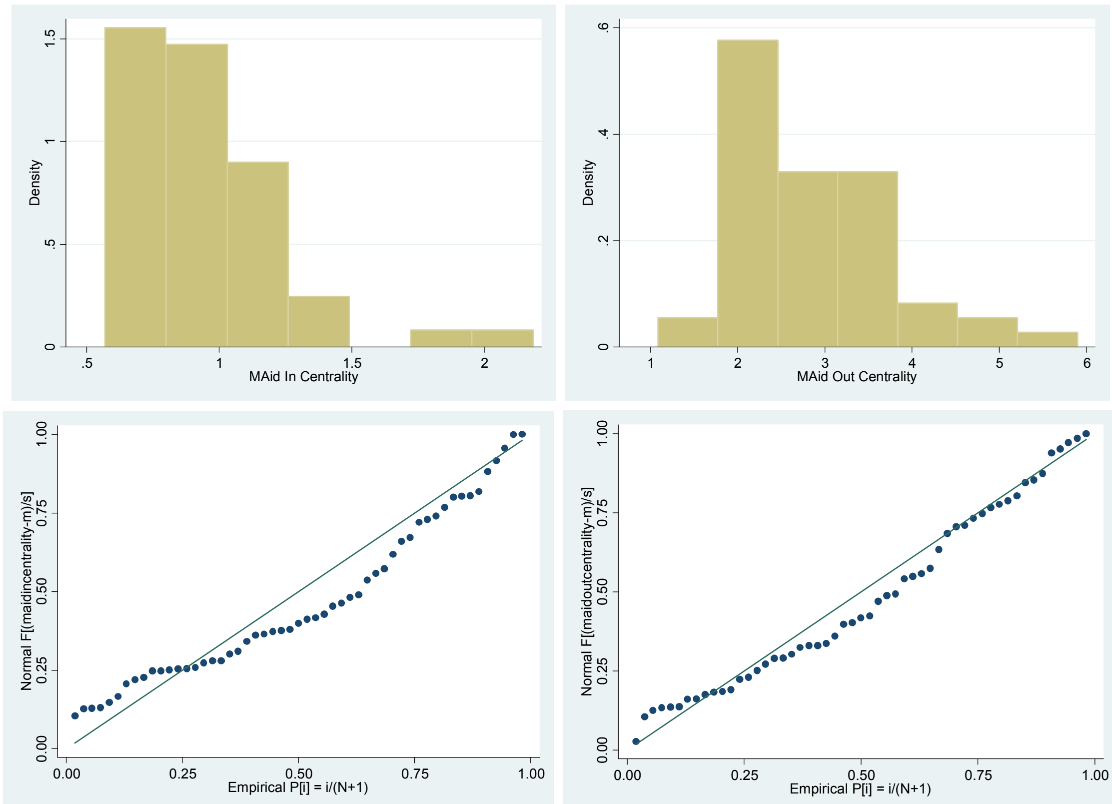


Figure 6.3.5: Longitudinal Plot of Foreign Aid Matrix Density

The integration of global governance in the form of its foreign aid network density is, for the most part, increasing over time, though there might be decadal trends or even recessions affecting the primary donors' economies that dictate the interconnectedness of the foreign aid "market".

6.3.2. In-Centrality and Out-Centrality of the Foreign Aid Matrix

While the density of the foreign aid network provides an insight into how integrated the world-system is via direct donations at least officially designated to nonmilitary national budgets, its in- and out-centralities are instead indicators of how clustered or dispersed the distributions of these aid connections are, either among recipients or donors, respectively. In-centrality measures the centrality of recipients in the network—i.e., those most dependent on more donors—while out-centrality measures the proportion of foreign aid donations that originate from few core powers (particularly the hegemon). Figures 6.3.6 through 6.3.9 illustrate these distributions.



Figures 6.3.6 – 6.3.9: Histogram and Normal Plot of In- and Out-Centralities of Foreign Aid Matrix

It is in both the in- and out-centrality histogram that we see a positive skew, though the out-centrality is more normally distributed. It is unclear to the eye as to what force might be causing the oscillating patterns evident in Figure 6.3.10, but some type of cyclicality appears to be affecting both trajectories. At some points, the fluctuations in both the in- and out-measures appear to be affected in the same direction, while at other times, a negative relationship or none at all is evident. The bivariate analyses of intra-network and inter-network dimensions will reveal any potential causal factors existent in the dataset.

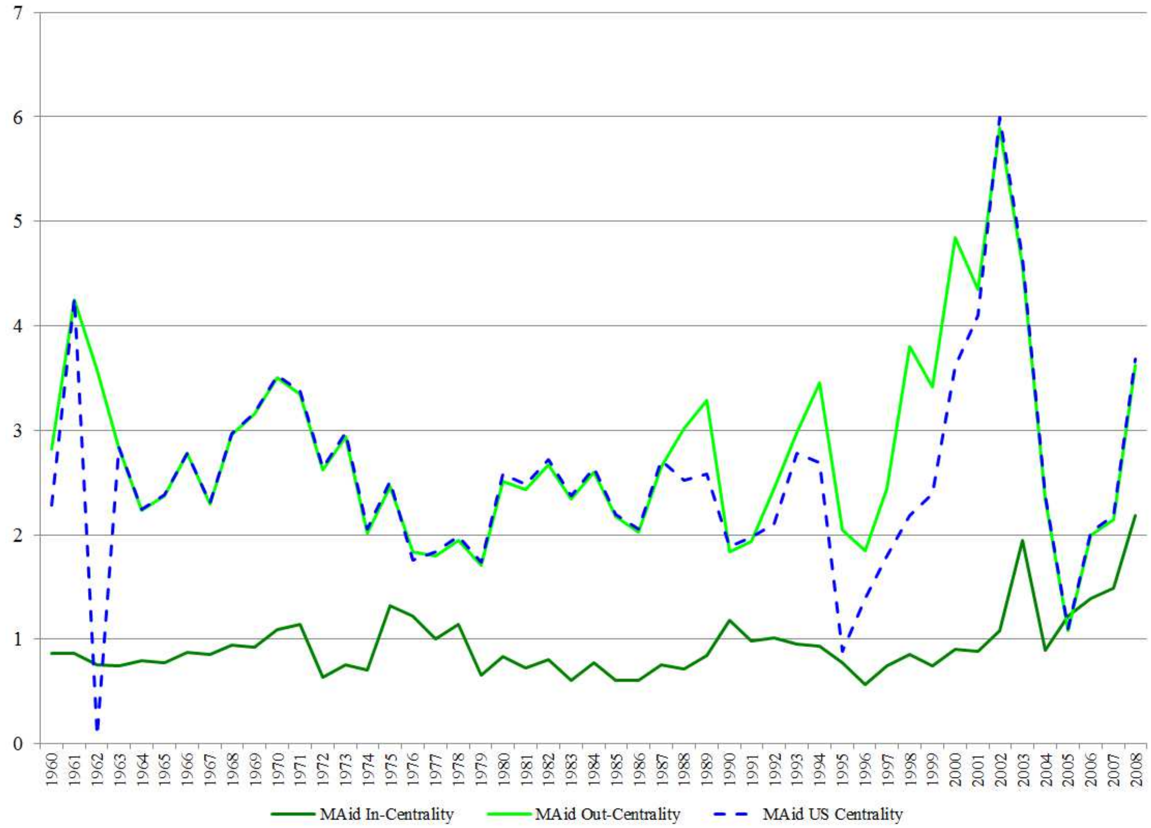
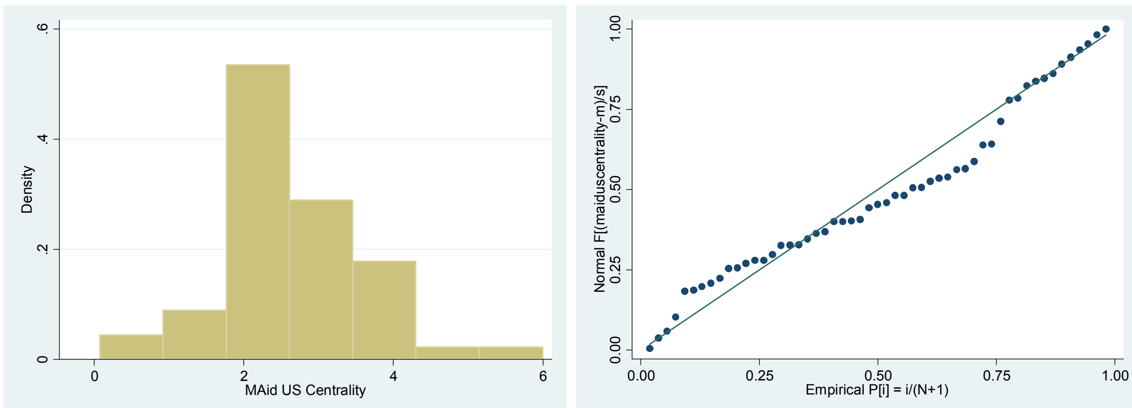


Figure 6.3.10: Longitudinal Plot of In- and Out-Centrality of Foreign Aid Matrix, and of US in Foreign Aid Matrix

Regardless of any causal or spurious relationship between the two, the out-centrality measure almost always exceeds the in-centrality measure, meaning that with a single exception in this timeframe, the ratio of foreign aid *donor* centralization—the concentration of foreign aid relationships into few donor nodes—to the centralization of aid *receivership* is likely to be larger than 1. This is not an axiomatic property of the calculation of the variables, as the exception in 2005 obviates, but a property of the world-system, at least during this period.

6.3.3. Out-Centrality of the US in the Foreign Aid Matrix

The assessment of the foreign aid matrix above is now followed by a similar overview of the hegemonic node in this matrix. Because the hegemon—and most other cores—is never a recipient of foreign aid, Figures 6.3.11 through 6.3.12 consist only of the histogram and normal plot of the out-centrality of the US, being that its in-centrality is held constant at 0.



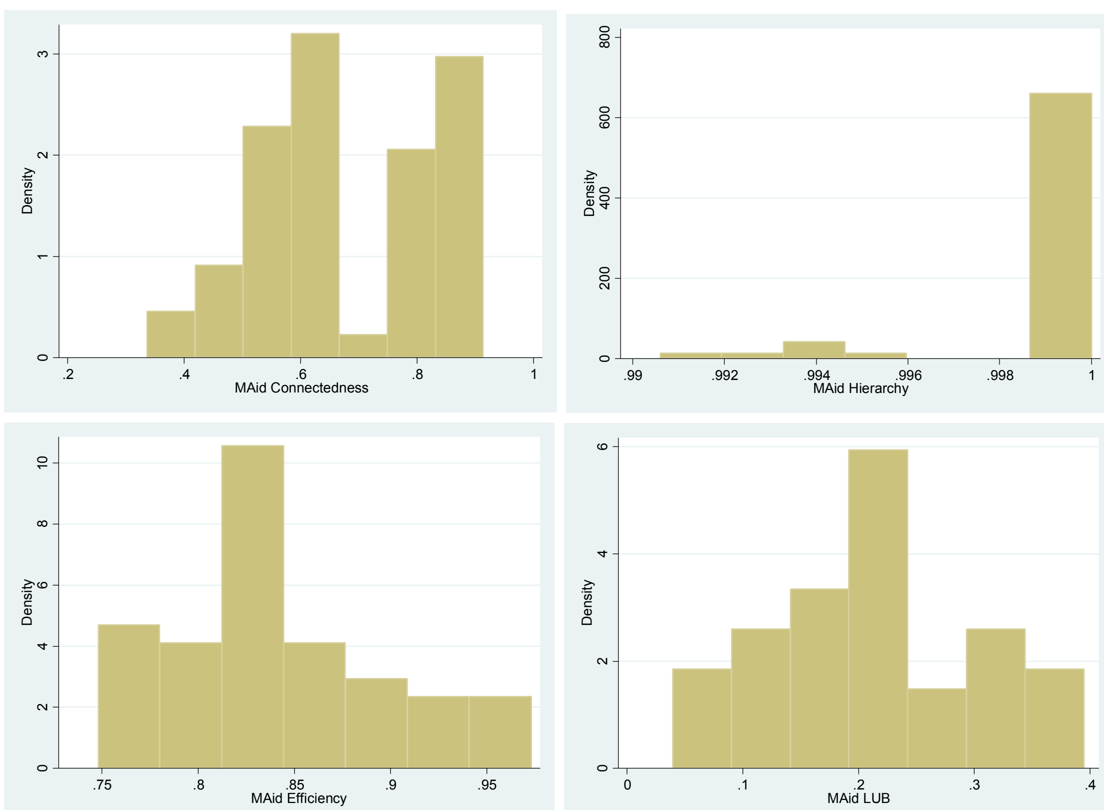
Figures 6.3.11 – 6.3.12: Histogram and Normal Plot of Out-Centrality of US in M_A

The US out-centrality in Figures 6.3.11 and 6.3.12 is far more normally distributed than most other measures in this dataset, deviating only slightly from a bell curve throughout most of the distribution. In the longitudinal plot below, the historical trajectory of the out-centrality of the United States is roughly analogous to the entire matrix's centrality, with the exception of a few years when notable postcolonial donor countries such as the UK and Belgium (not graphed) usurp more of the centrality (i.e. connections) in the matrix than usual.

Though it will not be surprising to find correlations between matrix out-centrality and the United States' node centrality, few other expectations can be forecasted here, seeing as these trajectories do not appear to be affected by the secular and other trends that characterize many other variables in this dataset. Its cyclicality might provide some insight that is independent of a secular trend.

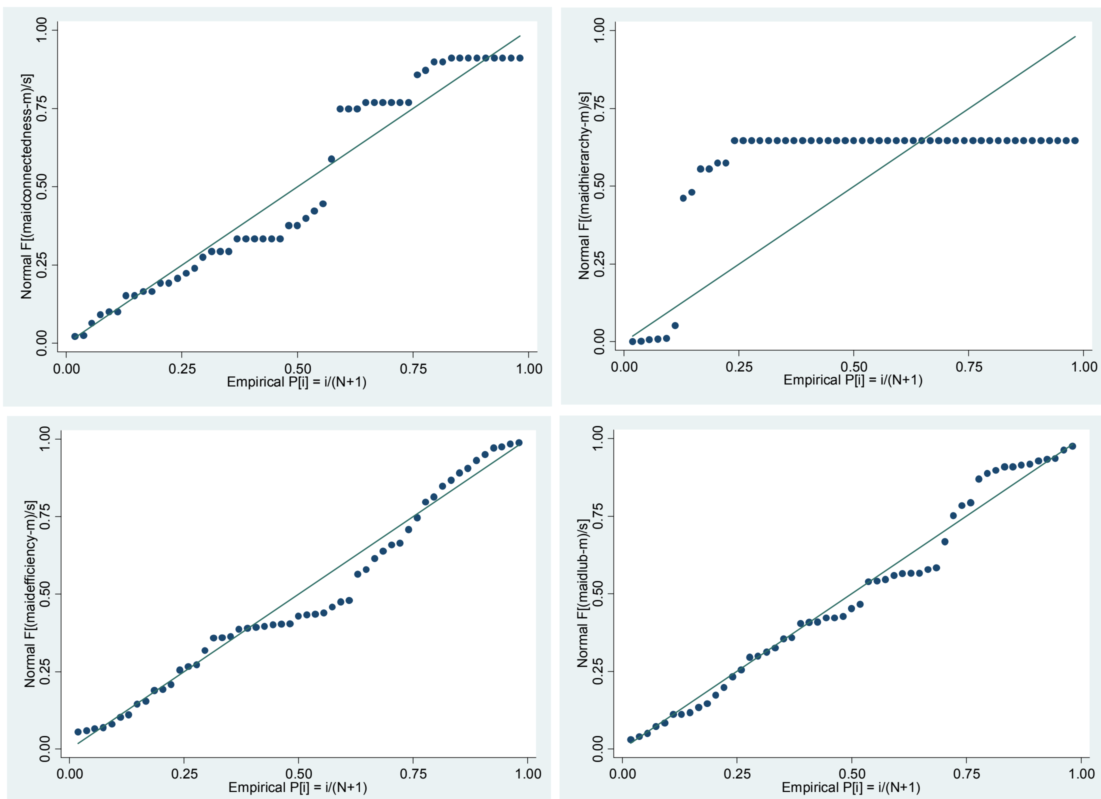
6.3.4. Krackhardt Measures of the Foreign Aid Matrix

As with most of the dataset, the distributions of these measures are mostly deviations from normalcy, the exception being the least upper bounds measure of the foreign aid matrix (Figure 6.3.17). The fact that the least upper boundedness of the foreign aid network is most approximating of a normal distribution here is all the more noteworthy given the complexity of this variable and what it renders. Of Krackhardt's four measures, least upper boundedness is the only one "sensitive to the direction of the arrows in the digraph" (Krackhardt 1994: 100). In short, it captures an approximation to an upward singularity in a network's chain of command (or trade, or aid donations), as opposed to relationships wherein most foreign aid recipients have multiple donors.



Figures 6.3.13 – 6.3.16: Histograms of Krackhardt Measures of the Foreign Aid Matrix

The irregularity of the other three Krackhardt measures is evident, but the most deviation from a Gaussian distribution is its hierarchy, this being due to its relative invariance at and just below maximum values, as is evident in Figure 6.3.21. The substantive reasoning behind this is that a foreign aid network is almost by definition graph-hierarchical. As opposed to the characteristically bidirectional trade network, whose hierarchy is 0.0 most of the time, the foreign aid's mutually exclusive inventories of donors and recipients renders the hierarchy a nearly constant 1.0.



Figures 6.3.17 – 6.3.20: Normal Plots of Krackhardt Measures of the Foreign Aid Matrix

While the connectedness is simply an inverse measure of the fragmentation of the matrix in to separate matrices, and its hierarchy is one in which the donor/recipient relationship is not reciprocal, the efficiency of the matrix captures the absence of redundancies in the presumed hierarchy of the matrix, or the degree to which every node has a single donor node. To paraphrase Hanneman and Riddle (2005)—it is the degree to which all nodes have a single patron node in the network (excepting the central node), and therefore the degree to which redundancy and/or contradictory/counterproductive patron-client relationships are avoided by the singularity of any node's link (direct or indirect) to the central node.

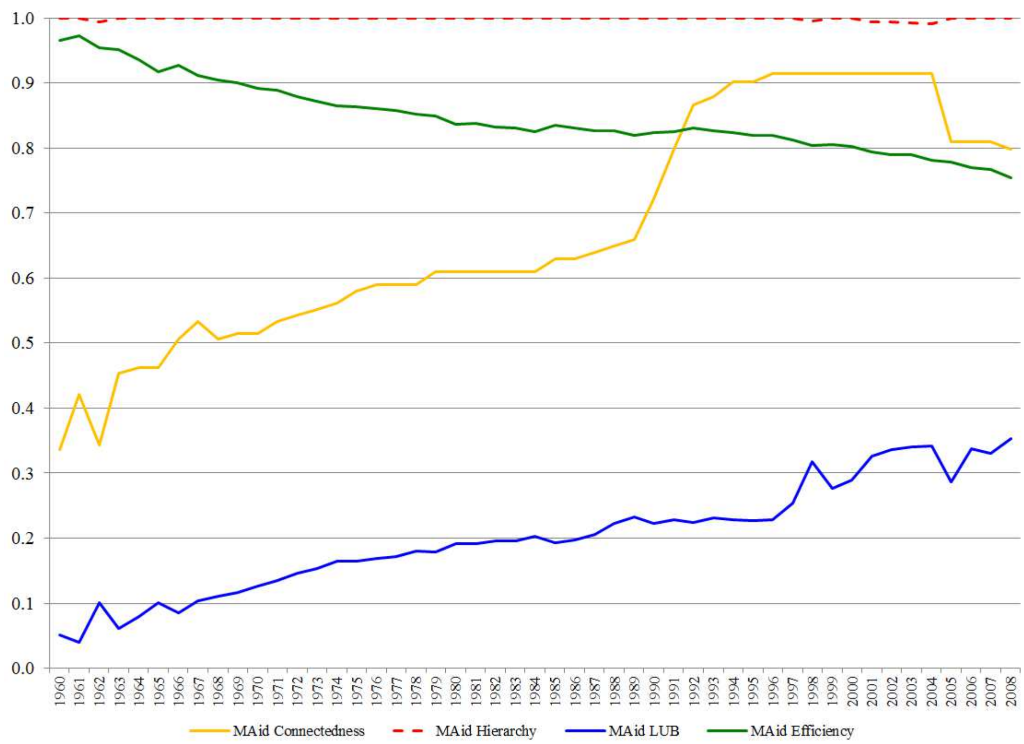


Figure 6.3.21: Longitudinal Plot of Krackhardt Measures of the Foreign Aid Matrix

By contrast, the last attribute of Krackhardt's measures of hierarchy captures the unity versus multiplicity of downward ties, rather than upward ones. The longitudinal graph here suggests that while the connectedness and least upper bound measures are nearly always increasing over the course of this period available, its efficiency is decreasing, meaning that more countries are now receiving aid from a greater number of established or new donors.

While limited in temporal scope, given that they are truncated at 1960, the foreign aid data that are available in dyadic form have been quite comprehensive and instrumental in charting the trajectory of this uniquely oscillating form of global governance. Bivariate analyses will highlight which of these multicollinear measures are optimal for drawing and testing causal inference.

6.4. Trade Networks

The analysis now shifts attention to a much more presumably egalitarian matrix: the trade network. The degree to which nations are voluntarily interacting in an economic context, with or without IGOs as mediators, is a more direct indication of bottom-up global governance than even the nonmilitary aid relationships analyzed above. The trade matrix represents the import/export sector of the world economy, as captured by Barbieri (2009) from which density, centrality and Krackhardt's measures are calculated.

Variable	N	μ	σ	Min	Max	CV	1st Year
M_T *Density*	91	68.9991	121.11	0.0183	524.9634	1.7552	1919
M_T *Centrality (in)*	91	2.3184	0.7454	0.6210	3.7710	0.3215	1919
M_T *Centrality (out)*	91	2.5246	0.9913	0.6180	4.5240	0.3927	1919
M_T *US Centrality (in)*	91	2.3097	0.9054	0	3.9130	0.3920	1919
M_T *US Centrality (out)*	91	2.2535	1.0009	0	3.7780	0.4441	1919
M_T *Connectedness*	85	0.4882	0.3270	0.0005	1	0.6699	1919
M_T *Hierarchy*	91	0.0153	0.0516	0	0.3333	3.3759	1919
M_T *Efficiency*	85	0.4817	0.1676	0.2544	1	0.3479	1919
M_T *LUB*	91	1.0000	0.0001	0.9992	1	0.0001	1919

Table 6.4.1: Univariate Properties of Each Dimension of Trade Matrix

Because these data are readily available going back much further than Roodman's (2012) foreign aid data, a much more thorough analysis can be done here, and a similarly more comprehensive multivariate analysis can be applied later. Unlike with the foreign aid matrices, in which donors are not also recipients of aid, the norm here is that importers are also usually exporters, and under this assumption, one-mode graphic representations of the relationships are rendered below, unless otherwise noted. What would be two unidirectional arrows in the two-mode graph become single lines with two arrowheads each, as evident below, obviating the fact that, at least in 1919, despite that year's limited wartime trade, 100% of the importers were also exporters.

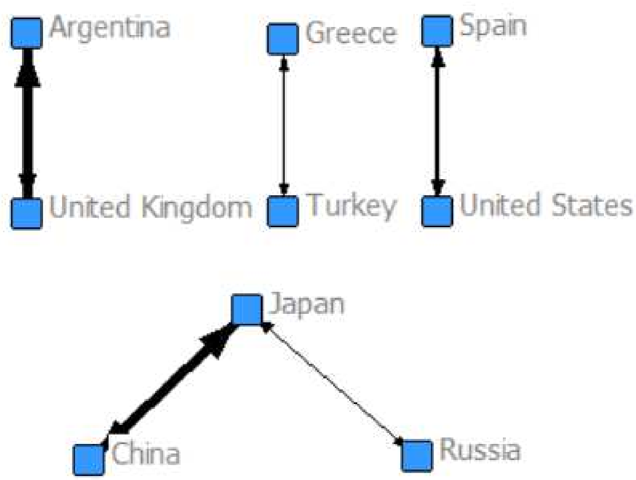


Figure 6.4.1: Sample Cross-section of Trade Matrix, 1919

As with Figure 6.3.2 in the foreign aid section, the arrow widths and arrowhead sizes in Figure 6.4.1 ordinalize the amount of trade among nations. Though World War I is declared over in November of 1918, 1919's trade relationships are still indicative of a period of inter-core war. By the following year, trade relationships return to their usual, peacetime state, which look much as Figure 6.4.2, graphing 1950, which is so dense that the relationships are somewhat muddled by the activity in the network.

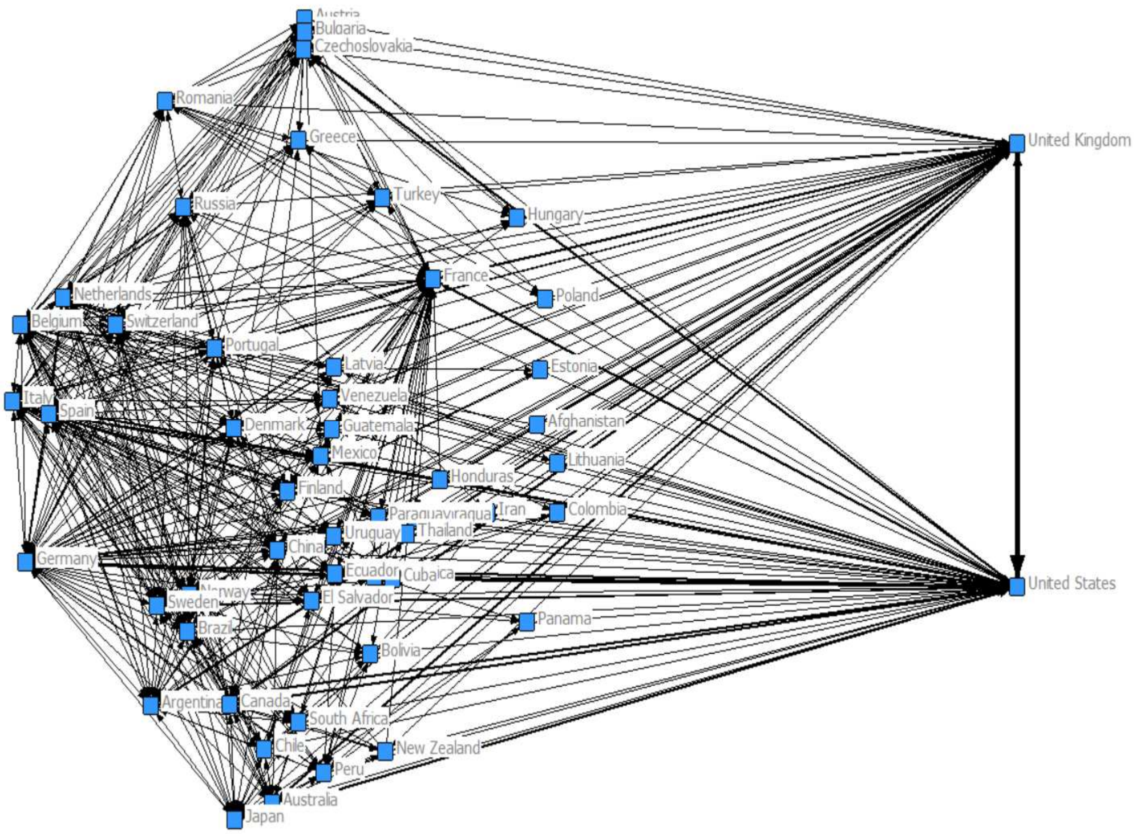


Figure 6.4.2: Sample Cross-section of Trade Matrix, 1920

Graphed below as a *two-mode* network (i.e., one in which importers and exporters appear as two separate nodes), Figure 6.4.3 uses the same matrix as the previous graph, filtering all importers other than the United Kingdom and United States. This highlights the most intense relationships, these involving exporters such as Australia, Belgium, Canada, Mexico, New Zealand, and South Africa, with proportionately thick lines. It is worthy of mentioning that although all of the aforementioned countries are sovereign now, they were colonial entities in 1920, but Barbreri's data still reports pre-sovereignty trade data for these colonies, allowing for a closer look at transfers of wealth across what would eventually become international boundaries.

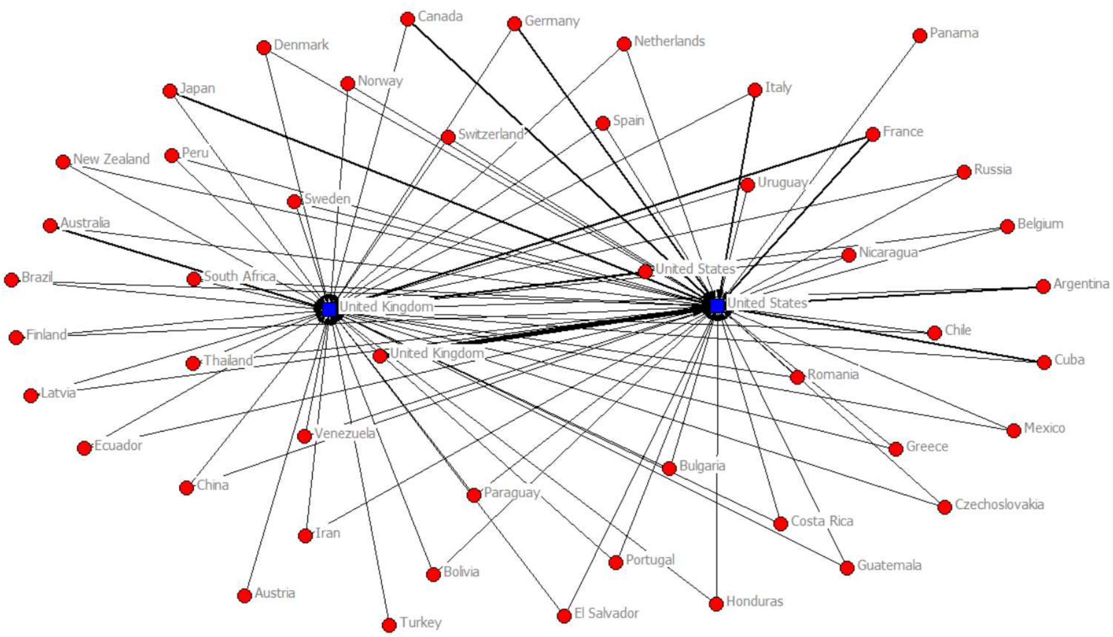


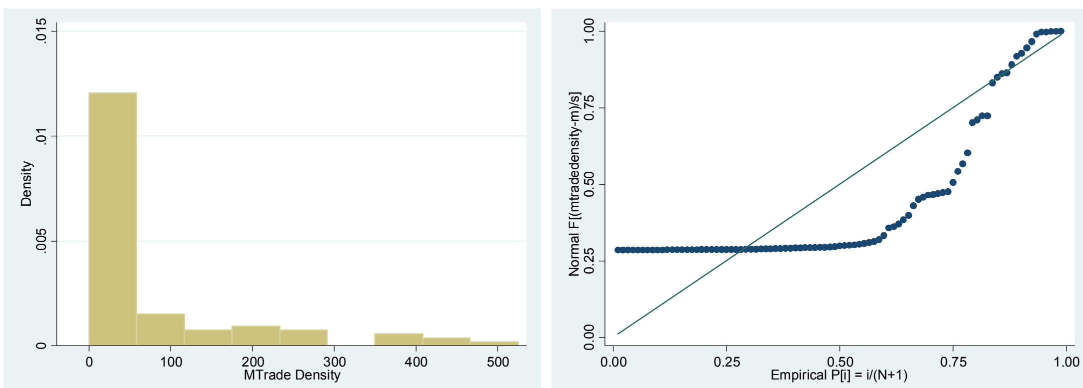
Figure 6.4.3: Sample Cross-section of Hegemonic Trade in Trade Matrix, 1920

Given the anatomical overview of the trade matrix's nature above, the remainder of this section is devoted to assessing the univariate and longitudinal properties of the matrix, and as with the state-IGO and foreign aid matrices, offers some considerations for periodization and bivariate analysis.

6.4.1. Density of the Trade Matrix

The integration of global governance proxied by the trade matrix's density is not only a force of constantly increasing scope, but admittedly exponentially so. This figure reflects the ratio of the actual connections among nodes relative to the total possible links among the importers and exporters in the trade matrix, two categories which are nearly 100% mutually inclusive. Consequently, the square matrices grow somewhat linearly in size as sovereignty is extended (and never retracted) across the period in question. The growth of the matrix mathematically increases the denominator in the density coefficient, consequently lowering the score if the numerator remains equal.

However, nations often enter the international trade market immediately upon achieving sovereignty, and the lack of a protectionist legal structure in emergent peripheries (these comprising the bulk of the nodes) engenders an environment that fosters unfettered trade among polities. Whether or not this is to the advantage of peripheries remains to be seen in the bivariate analysis, in which this variable's trajectory is compared to that of other features of the world-system, such as US GDP per capita relative to all other nations' GDP per capita.



Figures 6.4.4 – 6.4.5: Histogram and Normal Plot of Trade Matrix Density

The density of the trade matrix—much like that of the aid matrix—is strongly positively skewed. The longitudinal plot in Figure 6.4.6 demonstrates that until the early 1970s density values were not yet in the double-digits. In other words, over more than half of the time points (all prior to 1970) correspond with values smaller than 2% of the maximum; the other 98% of the variation in density is represented from 1970 onward, and the skew comes from this exponential sweep that characterizes the last 4 or 5 decades of history.

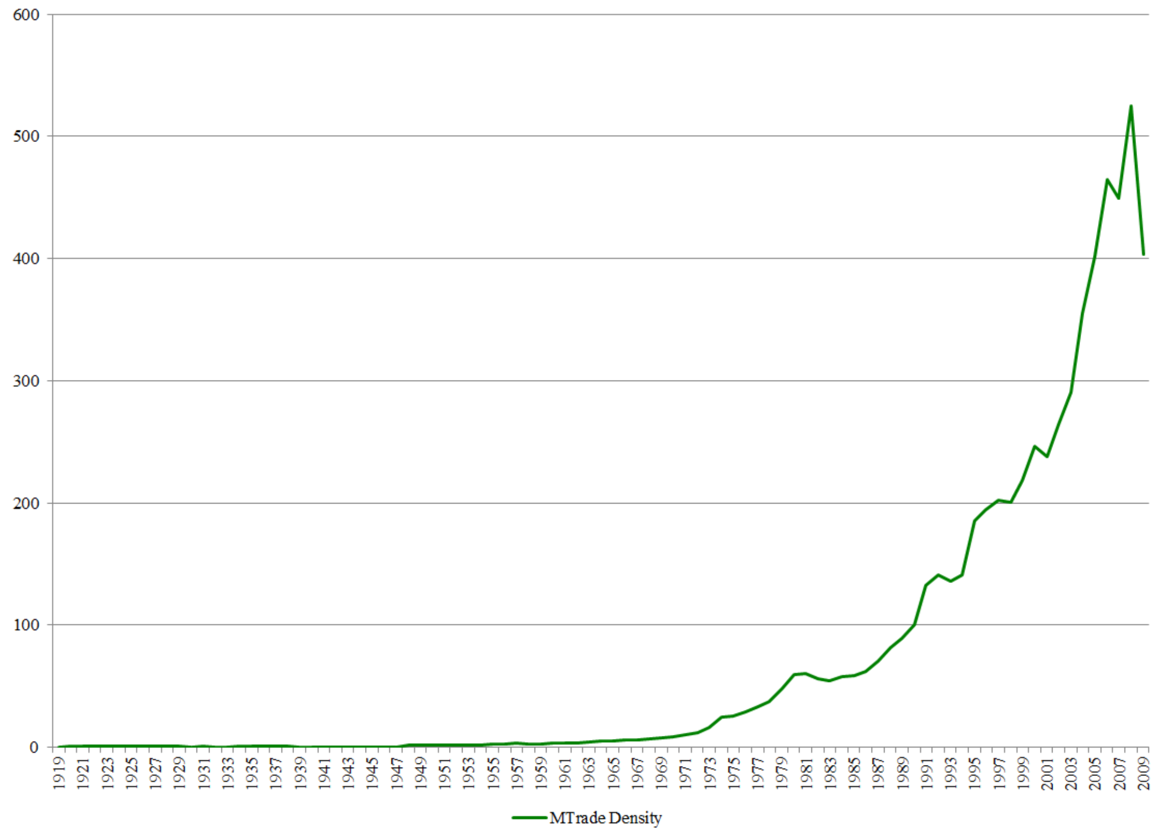


Figure 6.4.6: Longitudinal Plot of Trade Matrix Density

Shown in more detail in Figure 6.4.7, the period between 1919 and 1970 exhibits some of the same fluctuations as previous matrices. These fluctuations are predicated by war/peace cycles, and possibly endogenous causality among the variables in the dataset, which will hopefully be found in the bivariate analysis. It is also notable that in 1958—less than two years since the containerization industry begins to curtail global transportation costs, there is a final drop in global trade, followed by a period of almost continuous growth to present, with only two annual decreases per decade starting in 1981.

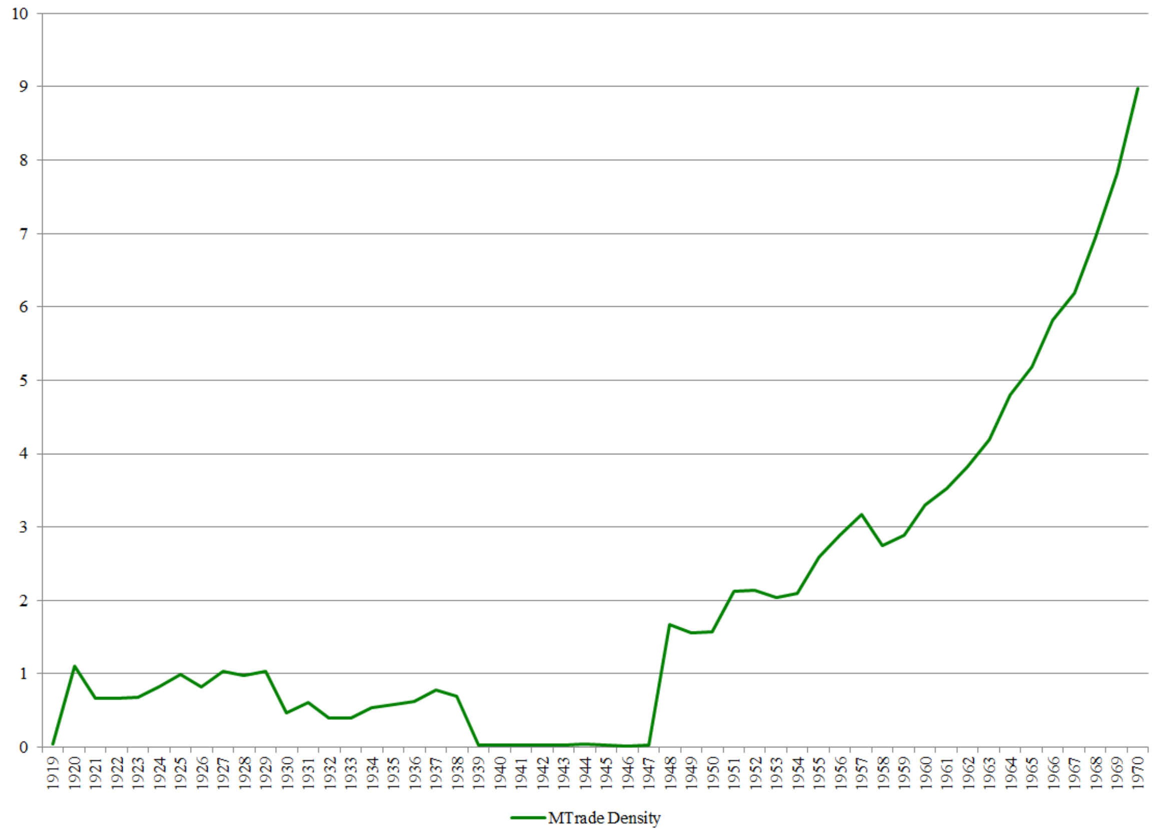
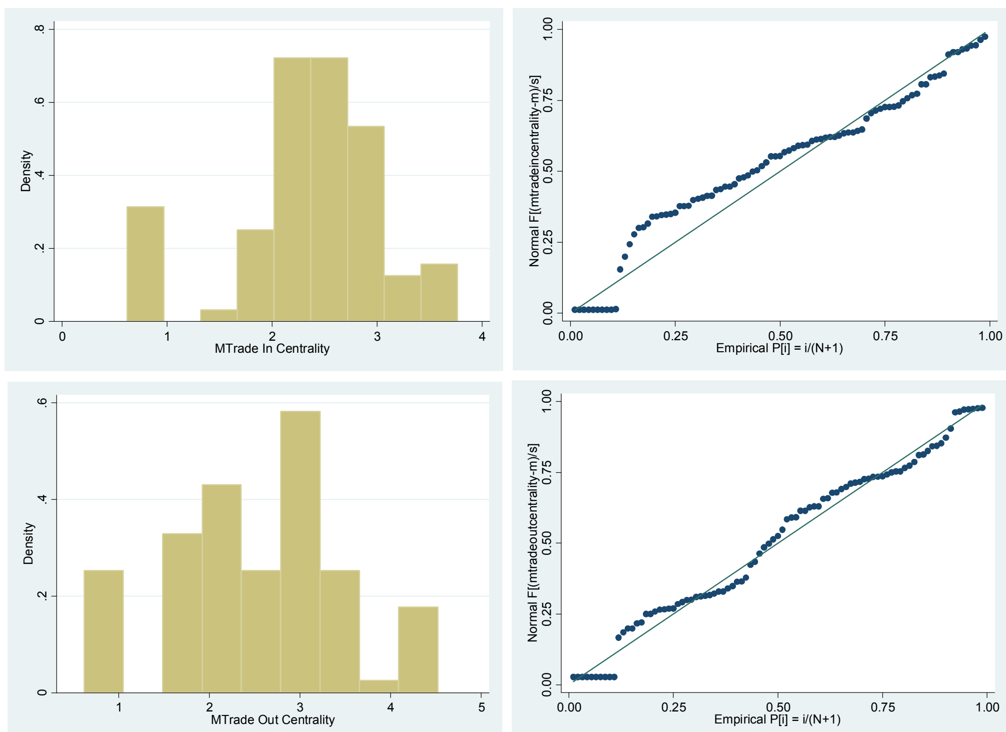


Figure 6.4.7: Longitudinal Plot of Trade Matrix Density, 1919 – 1970

As with other exponentially increasing phenomena, periodization will be considered in the bivariate analysis in order to better assess the role of import/export density in the world-economy. The focus now turns to the centrality of this matrix, followed by the centrality of the United Kingdom and United States in the matrix.

6.4.2. In-Centrality and Out-Centrality of the Trade Matrix

The more centralized that international trade becomes, the more that a presumably bottom-up facet of global governance (i.e., international trade) *has the potential* to become a top-down instrument of the hegemon's economic power, even if that potential is not immediately or entirely capitalized upon. As was the case with the foreign aid network, the degree centralities of the import/export matrix will never reflect a star network with a single hegemonic actor. There are, in fact, always multiple, central importers and exporters in the network, and this cast of countries often involves the same actors recurring across the time period. It is also sometimes the case that countries such as United Kingdom, France, and Japan report higher values than the United States.



Figures 6.4.8 – 6.4.11: Histograms and Normal Plots of In- and Out-Centralities of Trade Matrix

The centralities of both import and export appear quite normally distributed, relative to prior output. Some inflation in the tails of both distributions is accounted for by the 1930s, during which the centrality of trade—particularly exports—was at an all-time high, followed by the collapse of trade during the Second World War. During this war, it is noteworthy that only 10 or 11 countries participated in international trade, these always the same nations, with Greece being the only case that disappears from the matrix by the end of the war.

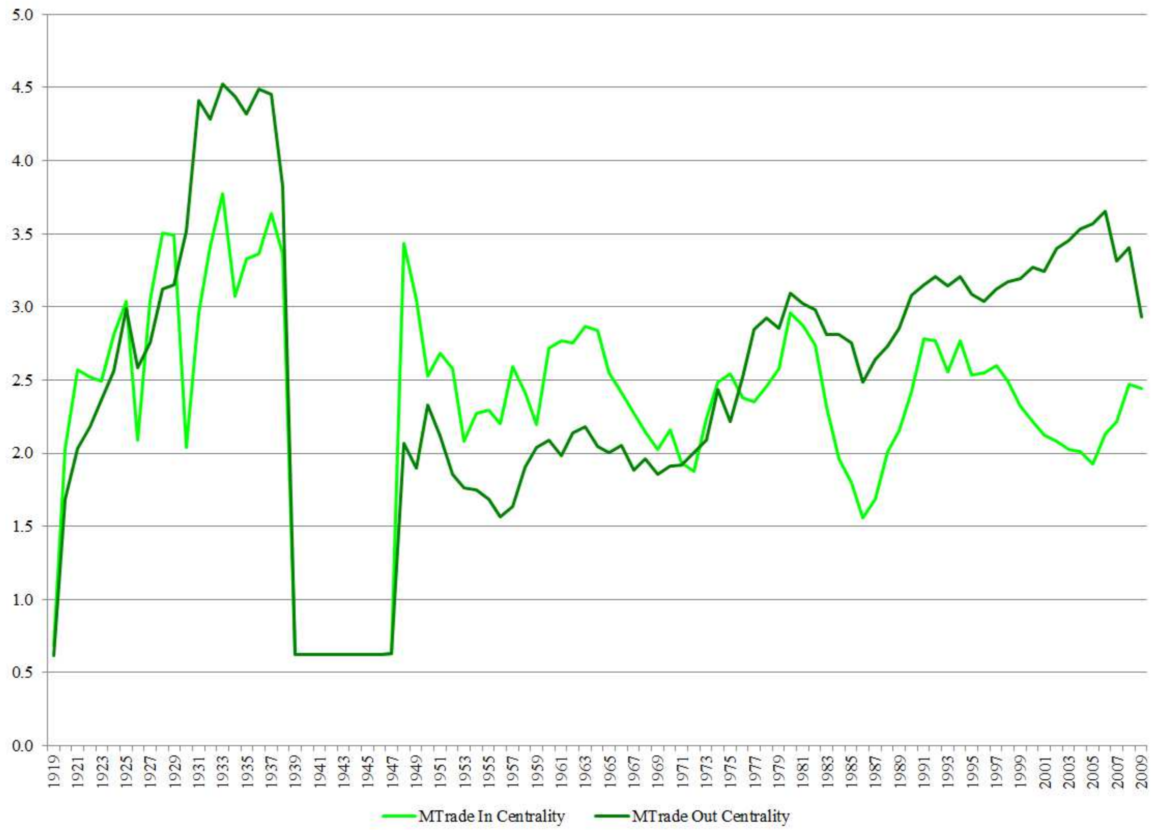
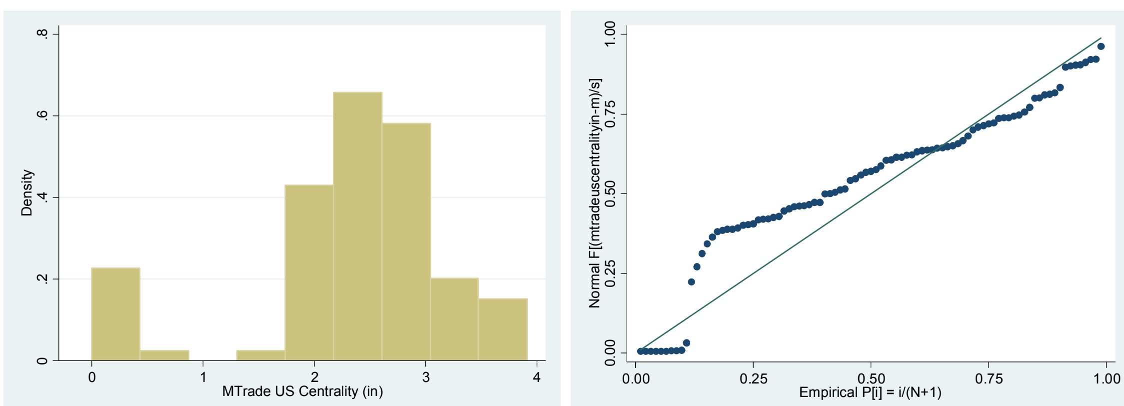


Figure 6.4.12: Longitudinal Plot of In- and Out-Centralities of Trade Matrix

The remainder of the distribution produces cyclical processes that appear to be mutually interdependent, though sometimes inversely so. The inverse relationship seems to characterize the 1950s and the 21st century. Another quality of these figures to note is the handful of years import centrality began to exceed export centrality, and vice-versa. These transitions take place only during the 1920s, 1930s, and 1970s; the rest of the period is fairly consistent with respect to the ratio of import centrality to export centrality being either greater than or less than 1:1. The implication here is that importers and exporters play different roles in any dyadic trade relationship, and the centralization of either half of the trade matrix relative to the other is an indicator of the degree to which *either* component of the trade relationship—import or export—is a more effective predictor of other attributes of global governance.

6.4.3. In-Centrality and Out-Centrality of the US in the Trade Matrix

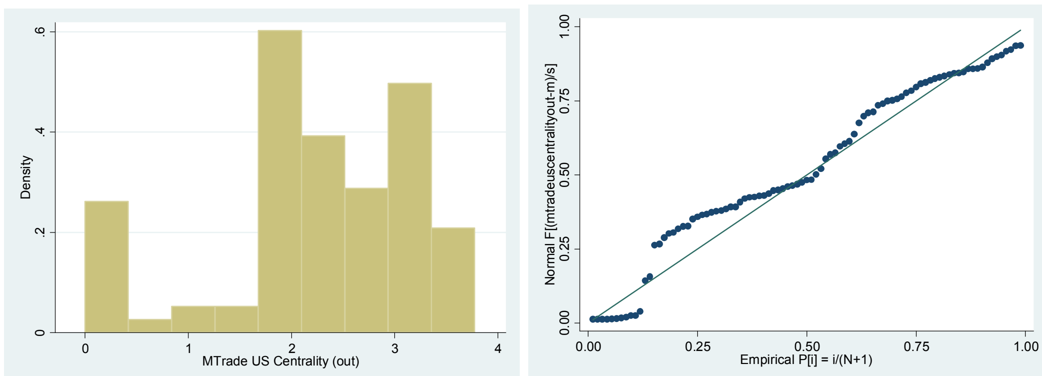
Freeman's node centralities calculate, in this case, the hegemon's connections (weighted by monetary value) relative to the rest of the matrix, regardless of how central or peripheral the hegemon's connections are. The distributions here are Gaussian enough to not confound analysis at the bivariate level, and the low-value inflation in all of the histograms is, as with density, attributed to World War II, during which trade involved countries such as Argentina, Bulgaria, Hungary, Japan, and Romania.



Figures 6.4.13 – 6.4.14: Histogram and Normal Plot of In-Centralities of US in M_T

During the League of Nations period (1919 – 1944), the fluctuations in his node centrality is comparatively erratic. The Great Depression seems to have an impact on the centrality of US imports and exports, suggesting that other nodes may have filled a resource vacuum created by the collapse of the US stock market and other sectors of its national economy.

However, during World War II, the relative equality of the trade values of each of the five or so dyadic relationships in each cross-section during those years necessarily plummets the centrality of the US in the matrix.



Figures 6.4.15 – 6.4.16: Histogram and Normal Plot of Out-Centrality of US in M_T

Postwar optimism, coupled with a nearly global baby boom, initially ushered in a renewed age of global trust in the mid-1940s, increasing participation in international trade by most nations—established and emergent. However, the international markets were again dominated by a dozen or so large actors in the world-economy. The cycles that follow the 1940s are simply a reprise of the prewar core-periphery hierarchy as a nearly identical cast of cores predominates over the import and export sectors of international trade. What is different *after* the War is the relative smoothness of the cycles (which have higher first-order autocorrelation), and in the case of the British figures, their nearly parallel trajectories. Figure 6.4.17 below reproduces the matrix in- and out-centrality values as well as the US's import and export centralities, and doing the same for its *out*-centrality.

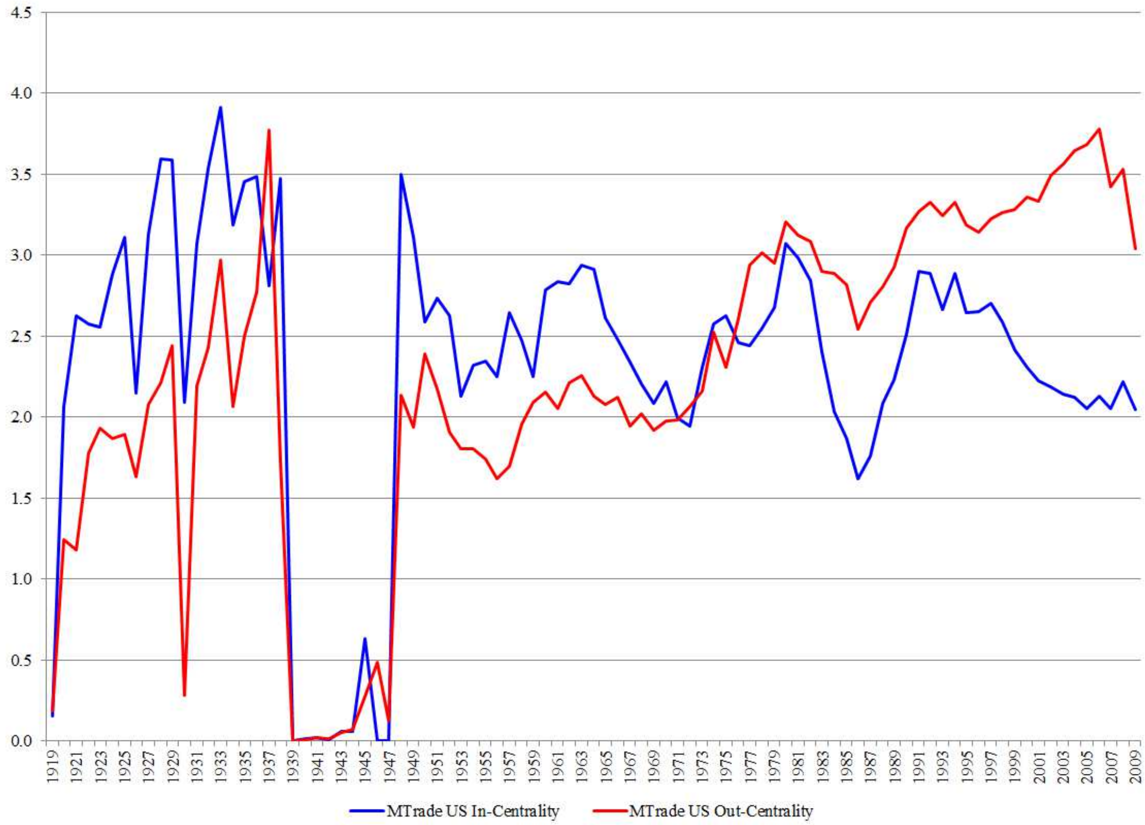


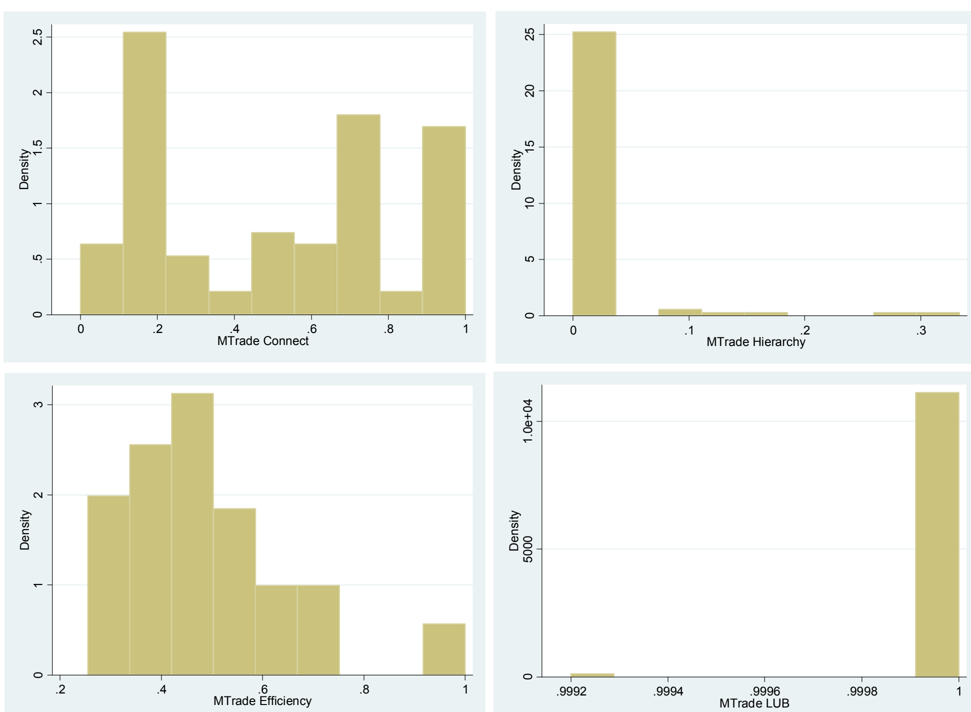
Figure 6.4.17: Longitudinal Plot of In- and Out-Centralities of the US in M_T

As a measure of the centralization of the hegemon as an entity of economic global governance via its trade networks, the narrative here—at least one couched in a univariate context—is one in which the exponential steepening of the hegemon's centrality as either an importer or an exporter seems to have reached a postwar ceiling of 3.5 to 4.0 in the case of exports (about 3.0 in the case of imports). It also appears that the rate of increase in these measures foreshadows the rate of their decentralization. That is, steep upsweeps are succeeded by comparable collapses during the b-phase of the cycle during the 20th century; in the 21st century, the gradual incline was followed by sharp decentralization after the 2006 economic "bubble".

As with other measures so gravely affected by World War II, periodization might prove a useful tool to assess the impact of that conflict on the course of these dimensions of global governance.

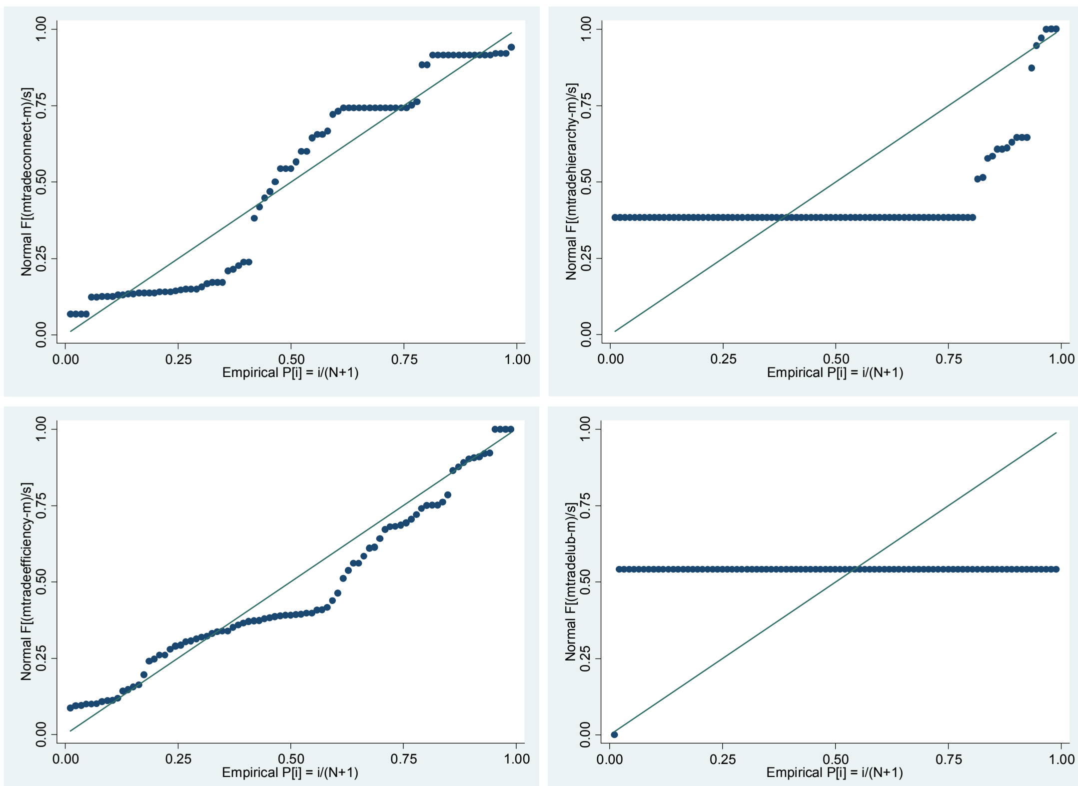
6.4.4. Krackhardt Measures of the Trade Matrix

Comparable to matrix centrality are Krackhard's measures of approximation to a purely hierarchical structure in a network. First, the lack of variance in the least upper bound measure (see Figures 6.4.21, 6.2.22, and 6.24.23) makes its incorporation into any further analysis unfeasible. Suffice to say, this matrix is characteristically saturated with respect to its least upper bound measure due to the fact that importers are also likely to be exporters, an assumption not applicable to the foreign aid network in which donors are almost by definition never recipients.



Figures 6.4.18 – 6.4.21: Histograms of Krackhardt Measures of the Trade Matrix

Having ruled out the least upper bound measure, it is also obvious by Figures 6.4.21, 6.4.25, and 6.4.26 that the hierarchy measure is *nearly* invariant, with a modally zero-inflated distribution. This has a more obvious empirical explanation than least upper boundedness does above.



Figures 6.4.22 – 6.4.25: Normal Plots of Krackhardt Measures of the Trade Matrix

Krackhardt's hierarchy values measure the degree to which relationships are *not* reciprocal, and unlike foreign aid, the roles of importer and exporter are almost always played simultaneously in the matrix; in fact, they are almost as often also reciprocal, meaning that both import *and* export activity is usually taking place between any two given nodes. The spikes in this distribution—graphed longitudinally in Figure 6.4.26—flag the exceptional years during which at least one importer is not also an exporter, a figure more easily achievable during the war, when less than a dozen nodes are active in the matrix.

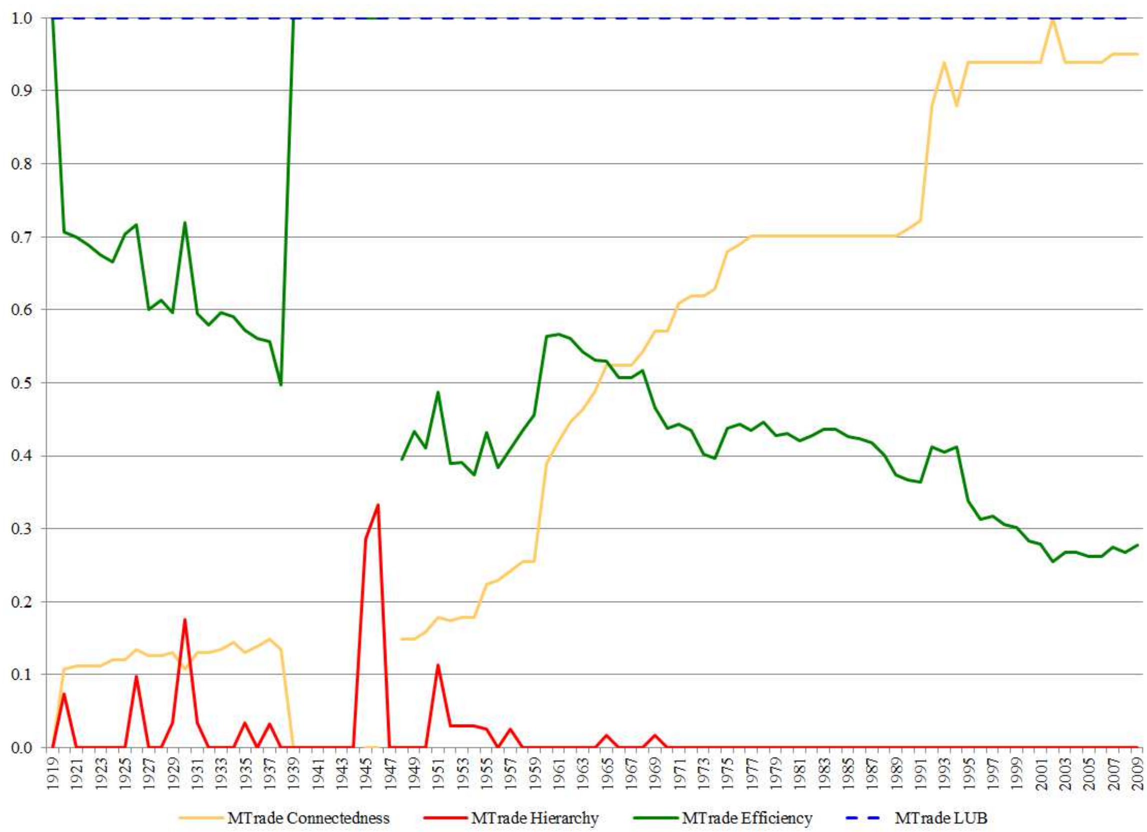


Figure 6.4.26: Longitudinal Plot of Krackhardt Measures of the Trade Matrix

Of the two remaining Krackhardt dimensions—connectedness and efficiency—it is the latter that proxies the degree to which exporters have a single importer, and vice-versa. In the context of international trade, this is a difficult-to-achieve standard that the matrix only exhibits during 1939, 1945, and 1946. Methodologically, the sparseness of active nodes in these three cases renders perfect scores of 1.0, exemplified by Figure 6.4.27, which graphs the trade network in 1940. During this pivotal decade, trade was limited to a handful of pairs of actors who dealt exclusively with one another.

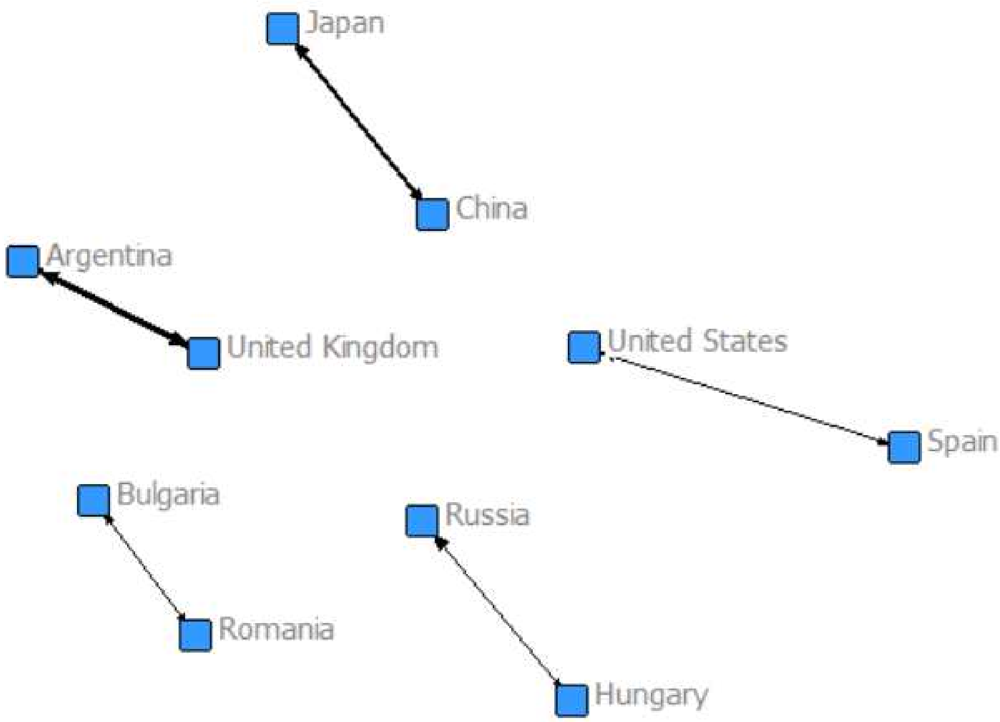


Figure 6.4.27: Sample Cross-section of Trade Matrix, 1940

The sparseness of Barbieri's (2009) recorded trade during 1940 – 1944, and again in 1947, complicates the calculation and meaning of Krackhardt values as active nodes are reduced to a single-digit roster of highly exclusive (and presumably critical) relationships, illustrated above. Nevertheless, assumptions about two of these variables have been made and are represented in the graphs. With respect to the least upper bound measure, it was safely assumed to remain its constant 1.0, and by the same logic, the value of hierarchy was less conservatively assumed to revert to its modal 0.0 during these reformative years.

6.5. Chapter Summary

Though no inference about causality belongs in this section, it is not only by mathematical necessity that some of these figures will correlate with one another—particularly intra-network dimensions, such as the in-centrality and out-centrality of Matrix A. Even inter-network dimensions—such as trade density and foreign aid density—are likely to be boosted or fettered by global-scale historical events such as World War II, the Missile Crisis, economic recessions, the proliferation of containerization, and the formation and dissolution of some of the world's major IGOs. These events are likely to cause spurious effects on the data, but beyond this, it is also possible that these dimensions are directly influencing one another, albeit with lags. Chapter 7 begins to address correlations among attribute dimensions of global governance, but it is Chapter 8 that returns to the variables in this chapter, and charts intra- and inter-network relationships.

Chapter 7: Bivariate Analysis of Non-network Relationships

The purpose of this and the following two chapters is to identify potential relationships among variables intended to be used as factors in time-series regression models, such as the Prais-Winsten regression, which is discussed in Chapter 10.

This chapter utilizes two typologies nested within the context of the non-network dimensions of global governance, while Chapter 9 (focusing on networks of global governance) will instead be thematically subdivided within the context of inter-network and intra-network relationships. Chapter 10 will return to the format presented in this chapter, emphasizing the three typologies in this dissertation. In brief, the typologies for understanding the computational nature, structure, and institutional function of each indicator of global governance are as follow:

Network/Non-network: *matrix- vs. attribute-based* indicators of global governance

Structural: *centralization* vs. *integration* of global governance

Institutional: *economic* vs. *diplomatic* vs. *military* dimensions of global governance

For the sake of consistency with the logic and structure of the methodological chapters (3 through 5) the first of these classification schemata, as aforementioned, is used to separate the analytical content of Chapter 7, while Chapter 8, much like 6, is organized around the network structure of each matrix.

Section 7.1 documents the intra-institutional analysis of global governance, focusing on relationships among purely economic variables, as well as relationships among political (diplomatic and military) dimensions of global governance. Section 7.2, on the other hand, classifies indicators of global governance by their structural nature:

that is, whether they measure horizontal features of the world-system (such as trade globalization) or more hierarchical dimensions (such as the GDP per capita of the United States standardized against all other nations).

All partial correlations throughout this dissertation use year as the control variable, and whether it be in the context of bivariate or partial correlations, cells in all Pearson's matrices highlighted in red represent coefficients with absolute values higher than 0.7, while cells highlighted in light green have absolute values between 0.5 and 0.7, dark green cells have absolute values between 0.3 and 0.499, and gray cells yield r-coefficients between -0.2999 and 0.2999.

The Pearson's matrices presented throughout this chapter[17] reflect correlations exclusively among non-network dimensions of global governance. However, significant, unlagged correlations between possibly causally related variables might be rendered insignificant when cross-correlations introduce the notion annual lags to better account for any processes that—as with most macro-level phenomena—take time to foment. In the same way, some of the negligible unlagged r-coefficients become highly significant when even just a 5-year lag is imposed on one variable or another. That is, unlagged output pointing to nonsignificant findings would not necessarily discount a variable pair as being potentially linked either by direct or spurious causation. It is, however, the unlagged output that will be preliminarily assessed in order to identify clusters of relationships in bivariate matrices among the individual indicators of global governance.

[17] Though too large to include here, the Pearson's bivariate and partial correlation matrices for all the variables in this dissertation can be found in *Appendix III*.

7.1 Institutional Distinctions: Economic, Diplomatic, and Military Attributes of Global Governance

This portion of the chapter emphasizes the institutional distinctions among the individual indicators of global governance. Research focused on long-term evolutionary processes and institutional analysis can make use of the descriptive and inferential discussion of this output, answering questions of possible intra-dimensional causality or spuriousness within each institutional sphere. Though the diplomatic and military dimensions are conceptually different forms of global governance, output for both dimensions has been integrated into a single bivariate matrix and its partial-correlation counterpart.

7.1.1 Economic Attributes of Global Governance: GDP and Trade

Table 7.1.1 presents the first set of correlations among the attribute variables selected for analysis. The non-network economic dimensions of global governance include all variables based on the United States' GDP (raw and per capita), as well as its imports and exports relative to total international trade and total global economic activity.

Bivariate Correlations		Year	USGDP/ Glb.GDP	Global Imports / Global GDP	US Imports / Global Imports	US Imports / Global GDP	US Exports / Global Exports	Global Exports / Global GDP	US Exports / Global GDP	GDP/cap USA
Year	**r**	1	-0.157	0.826	0.000	0.750	-0.043	0.842	0.866	0.609
	Sig. (2-t)		0.124	0.000	0.993	0.000	0.686	0.000	0.000	0.000
	N	97	97	93	91	91	91	91	91	92
USGDP/ Glb.GDP	**r**	-0.157	1	-0.277	-0.402	-0.213	0.092	-0.204	-0.180	0.259
	Sig. (2-t)	0.124		0.007	0.000	0.042	0.387	0.052	0.088	0.013
	N	97	97	93	91	91	91	91	91	92
Global Imports / Global GDP	**r**	0.826	-0.277	1	0.157	0.869	-0.177	0.996	0.985	0.630
	Sig. (2-t)	0.000	0.007		0.137	0.000	0.093	0.000	0.000	0.000
	N	93	93	93	91	91	91	91	91	92
US Imports / Global Imports	**r**	0.000	-0.402	0.157	1	0.446	0.153	0.176	0.157	-0.142
	Sig. (2-t)	0.993	0.000	0.137		0.000	0.149	0.095	0.138	0.178
	N	91	91	91	91	91	91	91	91	91
US Imports / Global GDP	**r**	0.750	-0.213	0.869	0.446	1	-0.168	0.878	0.855	0.523
	Sig. (2-t)	0.000	0.042	0.000	0.000		0.111	0.000	0.000	0.000
	N	91	91	91	91	91	91	91	91	91
US Exports / Global Exports	**r**	-0.043	0.092	-0.177	0.153	-0.168	1	-0.195	-0.155	-0.421
	Sig. (2-t)	0.686	0.387	0.093	0.149	0.111		0.064	0.143	0.000
	N	91	91	91	91	91	91	91	91	91
Global Exports / Global GDP	**r**	0.842	-0.204	0.996	0.176	0.878	-0.195	1	0.980	0.652
	Sig. (2-t)	0.000	0.052	0.000	0.095	0.000	0.064		0.000	0.000
	N	91	91	91	91	91	91	91	91	91
US Exports / Global GDP	**r**	0.866	-0.180	0.985	0.157	0.855	-0.155	0.980	1	0.694
	Sig. (2-t)	0.000	0.088	0.000	0.138	0.000	0.143	0.000		0.000
	N	91	91	91	91	91	91	91	91	91
GDP/cap USA	**r**	0.609	0.259	0.630	-0.142	0.523	-0.421	0.652	0.694	1
	Sig. (2-t)	0.000	0.013	0.000	0.178	0.000	0.000	0.000	0.000	
	N	92	92	92	91	91	91	91	91	92

Table 7.1.1: Bivariate Correlations among Economic Attributes of Global Governance

Some of the more expectedly collinear coefficients include that between the globalization of imports and exports ($r = 0.996$), and the hegemon's imports and exports ($r = 0.878$). Unexpectedly nonsignificant findings, on the other hand, include two variables that use the same raw figure in their formula, these being the US GDP as a proportion of global GDP as well as US GDP per capita standardized against all other countries. The relatively low bivariate correlation between these two ($r = 0.259$, $p < 0.05$), while moderately significant, essentially means that an increase in the hegemon's raw GDP (proxying that nation's economic prevalence) relative to the rest of the world's production only rarely coincides with an increase in US GDP per capita (proxying the level of development and standard of living of the hegemon's citizenry).

Partial Correlations Controlling for Year		USGDP ÷ Glb.GDP	Global Imports ÷ Global GDP	US Imports ÷ Global Imports	US Imports ÷ Global GDP	Global Exports ÷ Global GDP	US Exports ÷ Global Exports	US Exports ÷ Global GDP	US GDP per cap
USGDP ÷ Glb.GDP	r	1	-0.264	0.112	-0.074	-0.134	-0.115	-0.093	0.452
	Sig. (2-t)	.	0.011	0.295	0.493	0.207	0.281	0.384	0.000
	N	0	90	87	87	88	88	88	89
Global Imports ÷ Global GDP	r	-0.264	1	0.027	0.985	0.988	-0.077	0.954	0.285
	Sig. (2-t)	0.011	.	0.800	0.000	0.000	0.471	0.000	0.006
	N	90	0	87	87	88	88	88	89
US Imports ÷ Global Imports	r	0.112	0.027	1	0.042	-0.022	0.501	0.020	-0.100
	Sig. (2-t)	0.295	0.800	.	0.697	0.838	0.000	0.856	0.352
	N	87	87	0	87	87	87	87	87
US Imports ÷ Global GDP	r	-0.074	0.985	0.042	1	0.977	-0.031	0.954	0.405
	Sig. (2-t)	0.493	0.000	0.697	.	0.000	0.774	0.000	0.000
	N	87	87	87	0	87	87	87	87
Global Exports ÷ Global GDP	r	-0.134	0.988	-0.022	0.977	1	-0.090	0.931	0.326
	Sig. (2-t)	0.207	0.000	0.838	0.000	.	0.399	0.000	0.002
	N	88	88	87	87	0	88	88	88
US Exports ÷ Global Exports	r	-0.115	-0.077	0.501	-0.031	-0.090	1	-0.024	-0.379
	Sig. (2-t)	0.281	0.471	0.000	0.774	0.399	.	0.823	0.000
	N	88	88	87	87	88	0	88	88
US Exports ÷ Global GDP	r	-0.093	0.954	0.020	0.954	0.931	-0.024	1	0.421
	Sig. (2-t)	0.384	0.000	0.856	0.000	0.000	0.823	.	0.000
	N	88	88	87	87	88	88	0	88
US GDP per cap	r	0.452	0.285	-0.100	0.405	0.326	-0.379	0.421	1
	Sig. (2-t)	0.000	0.006	0.352	0.000	0.002	0.000	0.000	.
	N	89	89	87	87	88	88	88	0

Table 7.1.2: Partial Correlations among Economic Attributes of Global Governance

Table 7.1.2, however, reports that when controlling for century-long effects, the relationship between US GDP ÷ global GDP and the cross-sectional z-scores of US GDP per capita becomes rather significant ($r = 0.452$, $p < 0.01$), illustrated longitudinally in Figure 5.2.3, found in Section 5.2.2. This period of convergence between these two indicators of the economy of the United States—beginning with its Great Depression in the early 1930s and ending with the Cold War—recedes to a period of divergence as the United States' *comparative* economic power in the world-economy and its *comparative* level of economic development become almost perfectly inversely correlated between 1950 and 1968.

This divergence may be attributed to a distribution of GDP in the postwar years during which the United States initially became wealthier as a nation, usurping a larger fraction of the world's domestic product before the rest of the world began to catch up during the 1950s and 1960s. Interestingly, the level of economic development in the

United States took a bit longer to rise relative to other nations, manifesting mostly during the 1970s and 1980s, after which moderate correlation between the two trajectories becomes evident.

The cross-correlogram below suggests that if there is a relationship between these two variables, it is such that the per-capita figure will be optimally predicted by the US GDP ÷ global GDP figure when lagged by 10 years ($r = -0.448$, $p < 0.01$). The negative coefficient suggests that despite the periods of nearly perfectly positive, unlagged correlation, a decadal lag will actually superimpose one variable's growth over the other's diminishment.

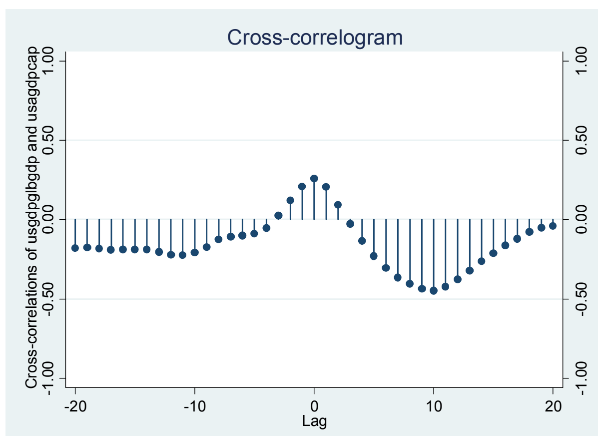


Figure 7.1.1: US GDP ÷ Global GDP ➔ US GDP per Capita, Standardized

Having looked at this in the abstract, however, it is important to note that these variables are largely derived from the same measure—raw GDP—and therefore significant, lagged correlations might reflect a causal relationship while an unlagged relationship may simply be a matter of mathematical necessity. Such phenomena as the negative, lagged effect above can be attributed to (1) the autocorrelation of the United

States' GDP, and (2) decadal cycles, which are visually evident in these trajectories during the 1920s, 30s, 40s, and 50s.

The next series of variables measure (1) the prevalence of global trade in the world-economy, (2) the prevalence of US imports/exports in global trade, and (3) the prevalence of US imports/exports in the world-economy. Graphing the standardized values of these variables longitudinally in Figure 7.1.2, we find that there are nearly perfect trends of growth across the century when looking at both hegemonic and global imports, both as a proportion of global GDP. These bivariate collinearities between global and hegemonic trade relative to global GDP ($r = 0.869$ and 0.980 for imports and exports, respectively, remain even when removing the trend, rendering partial r-values both higher than 0.9. The narrative here is that as trade globalizes, the hegemon participates more intensely, and with more partners, though with zero lags, this is not likely to be a coefficient that explains causation. The cross-correlations displayed in Figures 7.1.5 through 7.1.8 reveal whether there are any lagged coefficients worth taking to the multivariate level.

Another near-parity is also evident below: US import and export figures (divided by its respective global total), identified by the dashed lines below) share a bivariate correlation coefficient of 0.996 ($p < 0.01$), which is reduced to 0.501 ($p < 0.01$) when time is used as a partial control. Suggesting that most of the correlation is not attributed to a secular trend (confirmed by the longitudinal trajectory below), this result suggests that the variance in either US imports or exports explains about 25.1% (partial $r^2 = 0.501^2 = 0.251$) of the variance in the other.

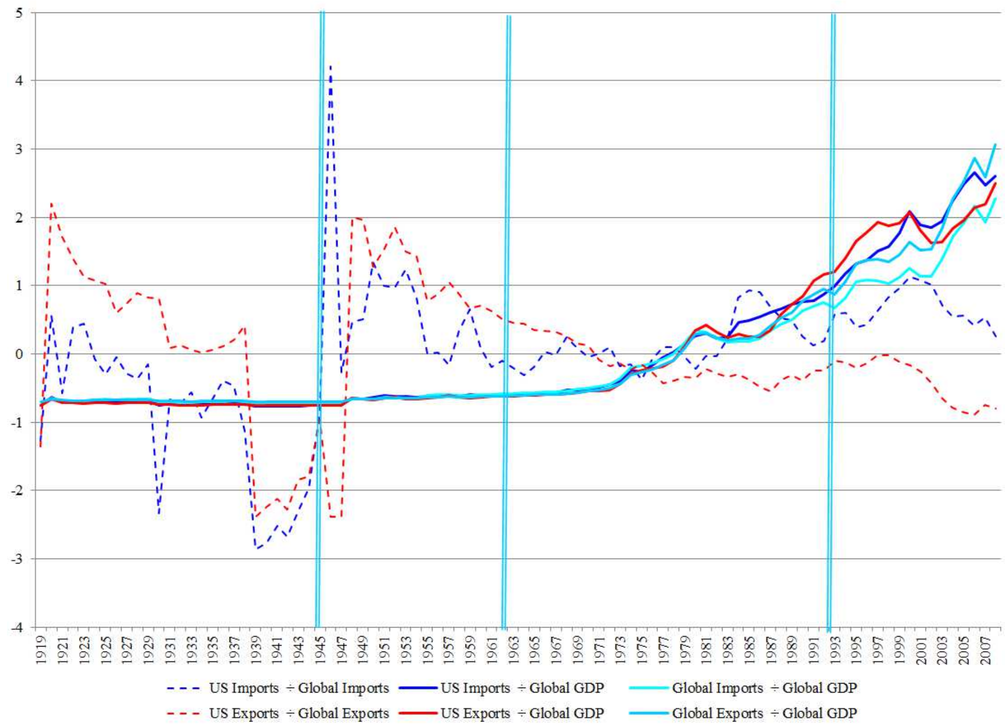


Figure 7.1.2: Attribute Measures of Trade Globalization, Standardized

To illustrate this further, Figure 7.1.3 removes the dashed trajectories above, and replaces the remaining z-scores with actual percentage figures. Here, it is evident that irrespective of scale, a secular trend is present in all of the import and export figures relative to global GDP. The dominant narrative is one of explosive trade globalization after the 1960s, which can be handled either by periodizing the data as per the visual cutoffs below, or by calculating the natural logarithm of these scores.

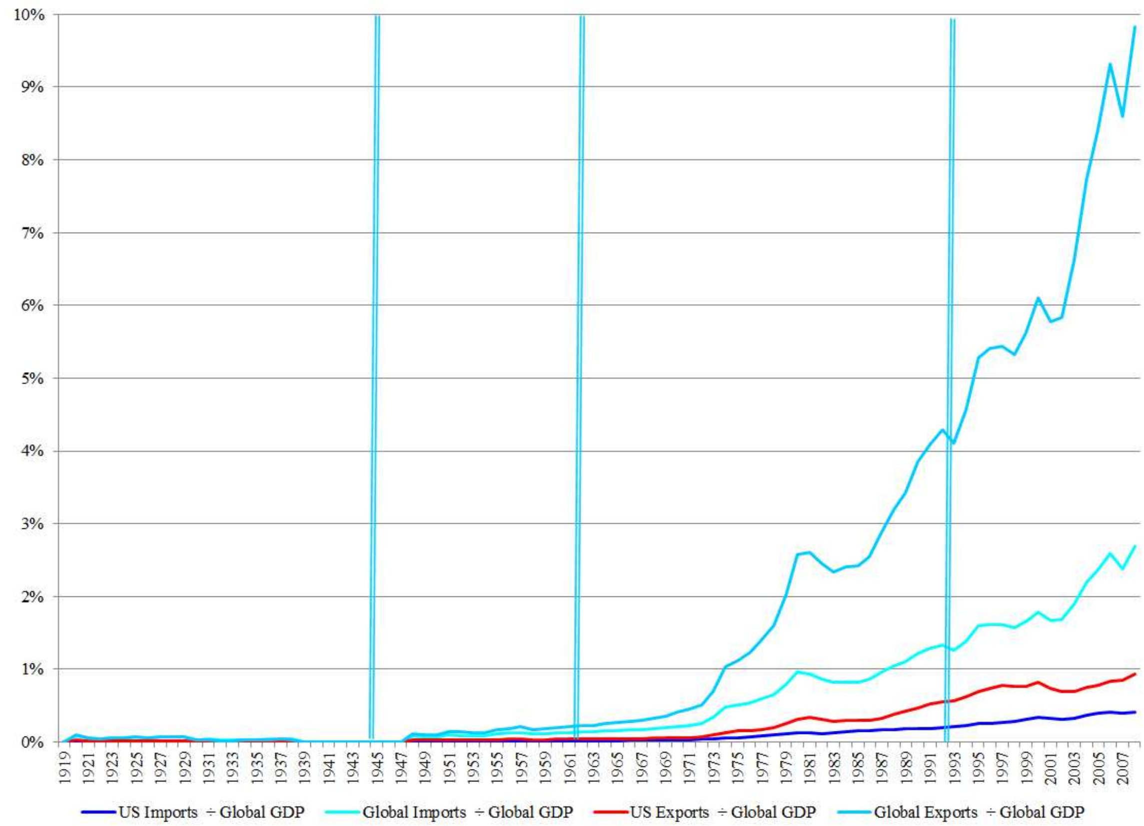


Figure 7.1.3: Hegemonic and Global Trade as a Proportion of Global GDP

For the sake of thoroughness, the logarithmic conversions were performed, though periodization remains the preferred method of dealing with exponential rises in scope or intensity, such as that graphed above. Figure 7.1.4, on the other hand, graphs the logarithmic transformations, yielding negative values due to the raw variables' miniscule value ranges.

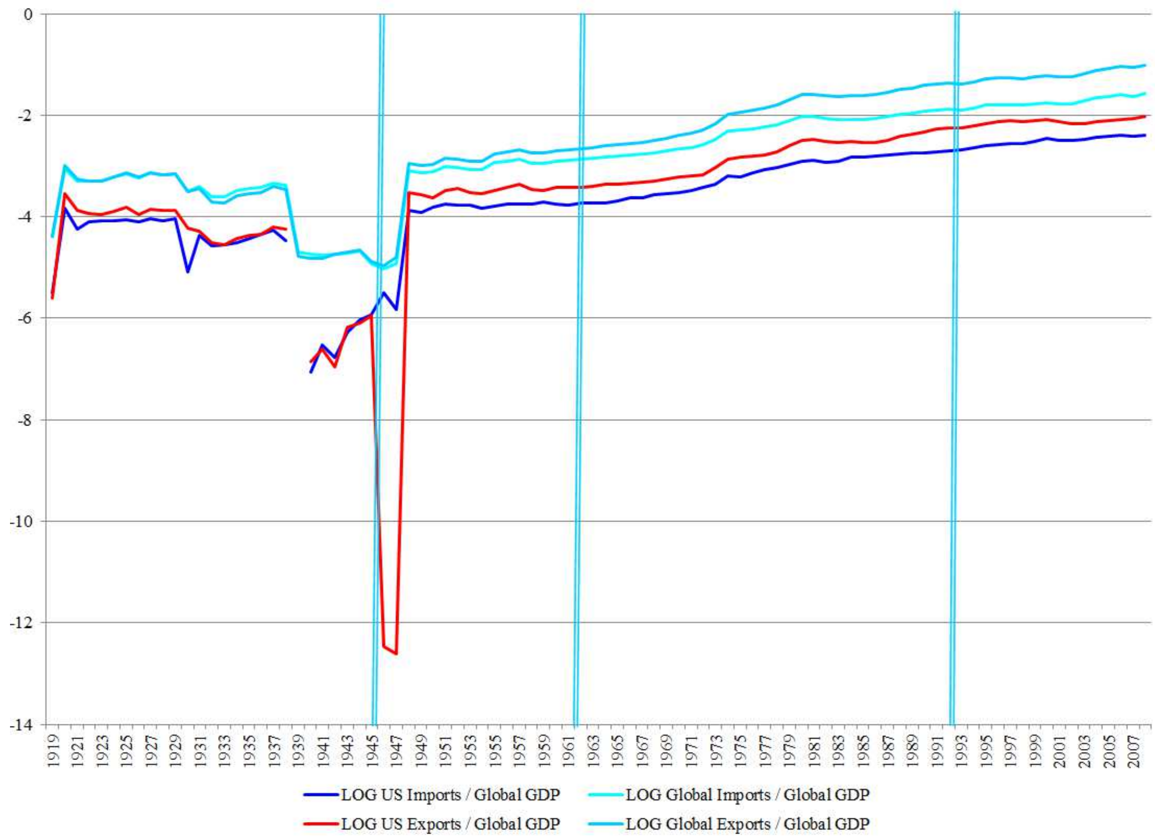
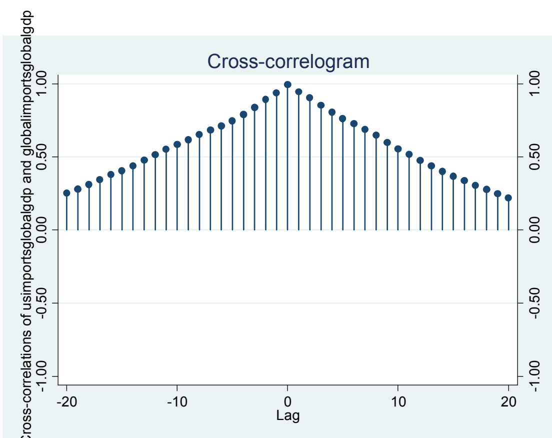


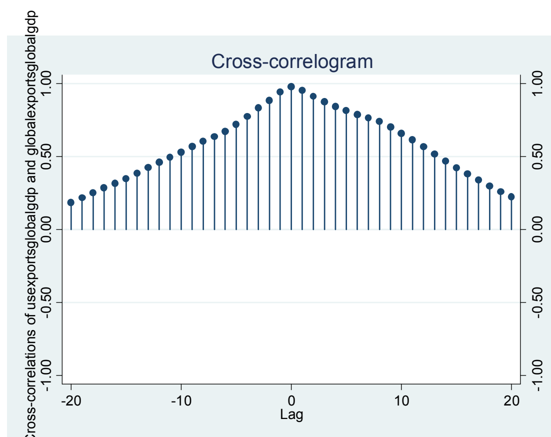
Figure 7.1.4: Logarithms of Hegemonic and Global Trade as a Proportion of Global GDP

The figure above merely reshapes the original distribution, keeping the directional trajectory intact but decreasing larger numbers by a greater factor. Counterintuitively in this case, however, the logarithmic conversion affects the 1940s more (when values were lowest) because those values reflected a drastic drop in global trade encompassing as few as 8 countries. Barbieri's (2009) dyadic trade data do not report any US imports or exports for 1939, yielding an incalculable logarithm for that year. The smallest nonzero raw number in these trajectories—1947's US exports relative to global GDP (0.0000000000247%)—is a significant outlier, so its logarithm will be exaggeratedly close to 0 relative to the rest.

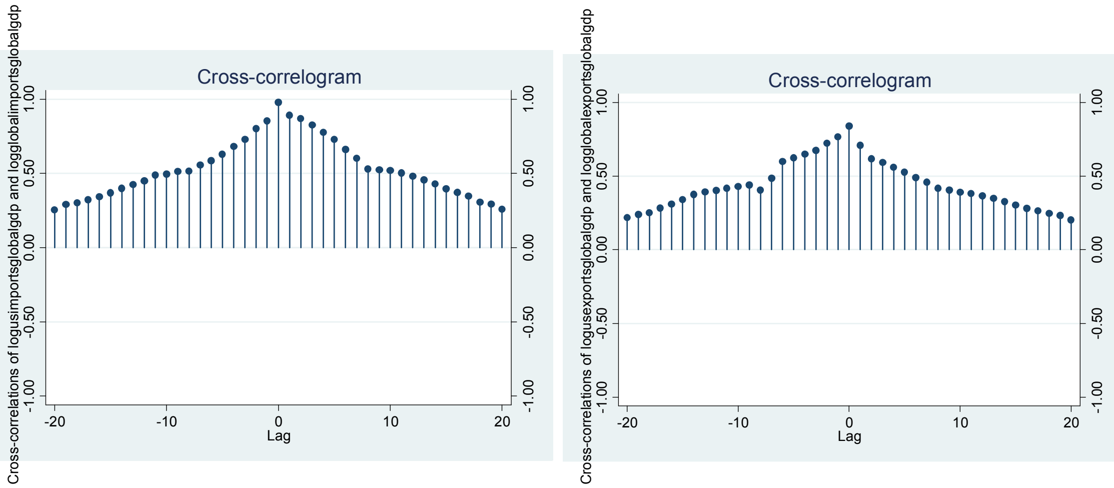
Substantively, the late 1940s usher in a significant explosion of new economies, inflating the denominator in this variable, which consequently decreases the quotient of US exports relative to the world's entire economic product. The US recovers afterwards, and resumes its concordance with the trajectory of global trade in both imports and exports.

Focusing on the relationships between US trade and global trade, both as proportions of all global economic activity, cross-correlograms for both raw and logged values of imports and exports are presented below. All point to unlagged correlations being optimal, with gradual tapering being indicative of the highly autocorrelated and trended values of each of these variables.





Figures 7.1.5 – 7.1.6: US Imports ÷ Global GDP ➔ Global Imports ÷ Global GDP; US Exports ÷ Global GDP ➔ Global Exports ÷ Global GDP



Figures 7.1.7 – 7.1.8: Log US Imports ÷ Global GDP ➔ Log Global Imports ÷ Global GDP; Log US Exports ÷ Global GDP ➔ Log Global Exports ÷ Global GDP

Logging the figures does little to wither the nearly perfect correlations among the raw (i.e., not logarithmic) distributions. Despite a few exceptional cases during and shortly after World War II, hegemonic governance via trade primacy is highly correlated with the integration of international trade into the greater world-economy. Governance by trade primacy may be regarded as a form of soft power, but nevertheless, this phenomenon determines much the legal and financial structure of the trades and tariffs system, much as the demands of dominant corporations such as McDonald's, Tyson, and Monsanto create selection pressures not only for the legal structure of food production, but even the size and shape of an average potato, and the molecular composition of corn. In this scenario, it is apparent that the hegemon benefits linearly from growth in the import/export sector of the world-economy.

On this note of the role of hegemonic primacy in international trade, one final pair of relationships is worthy of further inquiry. To return to Table 7.1.1, the standardized value of the US's GDP per capita is significantly correlated with its own imports (r =

0.523, $p < 0.01$) and exports ($r = 0.694$, $p < 0.01$), both relative to global GDP. Partial correlations for these relationships retain most of this correlation ($r = 0.405$ and 0.421 for imports and exports, respectively, both significant at $p < 0.01$); while long-term trends are partly responsible for the correlation, there is enough short-term correlation to support an argument of causation between the hegemon's participation in global trade and its own level of material development and general standard of living relative to that of every other nation in the world-system.

Figure 7.1.9 below illustrates these trajectories alongside one another. All are subject to a secular trend, but the obvious peak in US GDP per capita during the 1940s, which coincides with a near absence of international trade, marks a distinction from the import and export measures, for which it would be advantageous to convert to logarithms in order to control for linear growth.

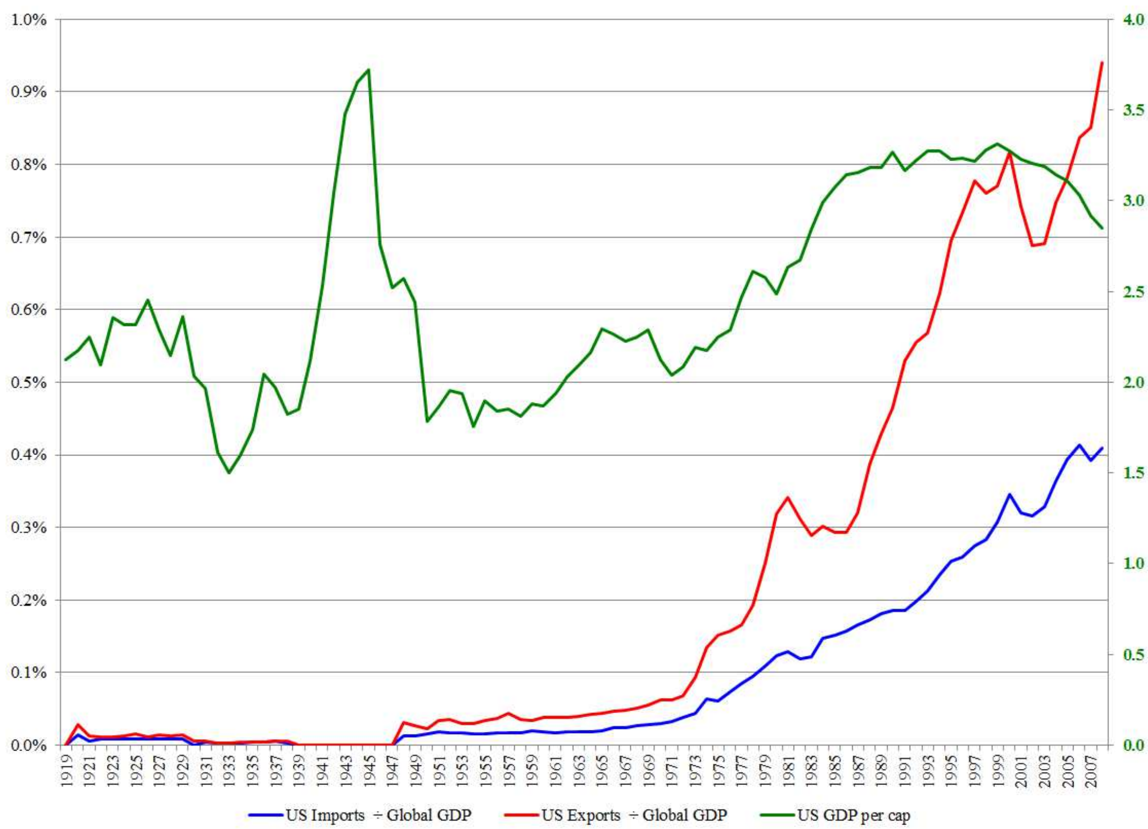
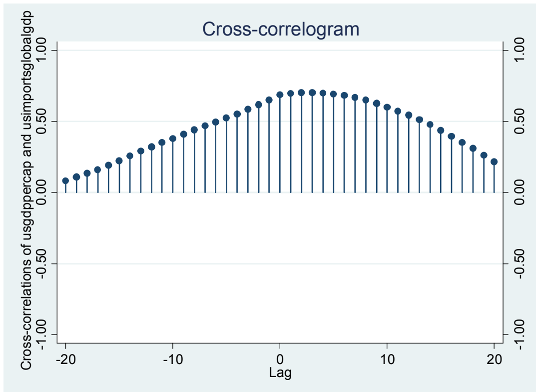
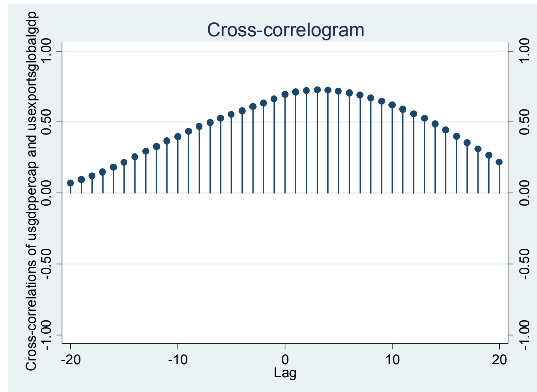


Figure 7.1.9: US GDP per Capita (Standardized) and US Imports and Exports Relative to Global GDP

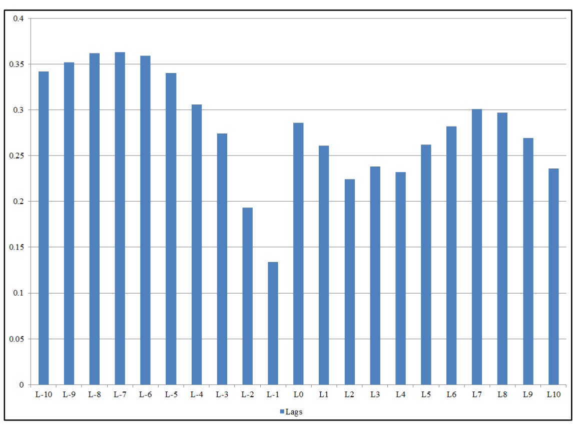
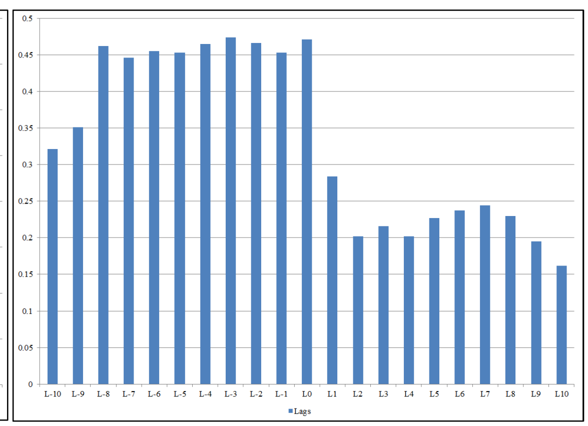
The cross-correlations in Figures 7.1.10 and 7.1.11 point to two similar narratives, emphasized more in the latter diagram. Here, we see that while unlagged correlations are significant, it is at 2 lags in the case of imports ($r = 0.703$, $p < 0.01$) and at 3 lags in the case of exports ($r = 0.726$, $p < 0.01$) that the coefficients peak. In short, US GDP per capita is a fairly reliable predictor of its import and export prevalence relative to the bulk of all global economic productivity 2 or 3 years down the line, respectively.





Figures 7.1.10 – 7.1.11: US GDP per Capita ➔ US Imports and Exports ÷ Global GDP

To add to the bivariate cross-correlograms above, their partial counterparts are provided below for further inquiry into this relationship. Quite a departure from their bivariate counterparts, the partial cross-correlograms in Figures 7.1.12 and 7.1.13 show moderate support for a reversal of the causal argument.

Figures 7.1.12 – 7.1.13: US GDP per Capita ➔ US Imports and Exports ÷ Global GDP (Partial Cross-Correlations)

The argument most supported by these partial cross-correlograms points instead to import and export activity stimulating the hegemon's economy, these cross-correlograms suggest that the more likely scenario is that irrespective of long-term trends, the degree to which the hegemon is active in international trade, both as an importer and an exporter, determines its level of economic development. In the case of imports, a 7-

year lag is likely to be the hegemon's most likely return-on-investment interval, and in the case of exports, the highest *lagged* coefficient places a 3-year lag on its effect on the hegemon's GDP per capita relative to everyone else's.

The implication for global governance in this section is that the hegemon, like most polities, discards protectionist and isolationist trade policies when its economy flourishes, and this constitutes a substantial amount of world trade, given the centrality of this actor in the import/export sector of the world-economy.

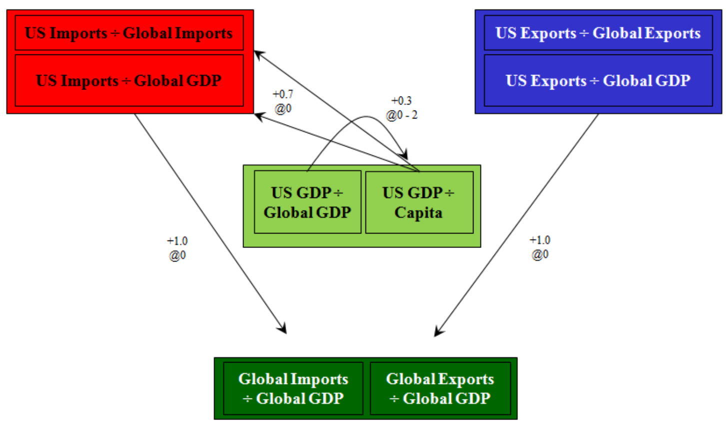


Figure 7.1.14: Optimally Lagged Bivariate Relationships among Economic Attributes of Global Governance

Having begun to address possibly causal relationships among the economic, non-network indicators of global governance, the analysis now turns to the political—that is, the diplomatic and military—attributes in this chapter.

7.1.2. Diplomatic and Military Dimensions of Global Governance: Sovereignty, IGOs, and the US Military Budget

This section is intended to assess any interrelationships among the diplomatic and military attributes of global governance. However, first, a substantive note is needed to frame the analysis of any IGO-related variable. Before a nation-state can attain membership in any IGO in this study, it must first receive recognition as a sovereign polity by the international community, embodied today in the UN. Taking this into account, we can assume that any single nation's sovereignty cannot be caused by its IGO membership status, which is 0 during its colonization. However, because the unit of analysis in this dissertation is the world-system, it is quite possible that an increase of member states in the United Nations during one year would be causally related to the decolonization of other states that might later still become UN members. Such feedback mechanisms will become evident in the cross-correlograms that follow the unlagged output.

Bivariate Correlations		Year	Sovereignty	Sovereignty Wt. x Pop.	LoN/UN Budget/ Global GDP	LoN/UN Members	IGOs	US% Contrib to UN	milex USA	milper USA
Year	r	1	0.975	0.924	0.909	0.968	-0.435	-0.930	0.901	0.806
	Sig. (2-t)		0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000
	N	97	97	65	96	97	45	70	89	89
Sovereignty	r	0.975	1	0.980	0.928	0.996	-0.455	-0.946	0.882	0.771
	Sig. (2-t)	0.000		0.000	0.000	0.000	0.002	0.000	0.000	0.000
	N	97	97	65	96	97	45	70	89	89
Sovereignty Wt. x Pop.	r	0.924	0.980	1	0.733	0.981	-0.413	-0.917	0.729	0.416
	Sig. (2-t)	0.000	0.000		0.000	0.000	0.005	0.000	0.000	0.001
	N	65	65	65	65	65	45	65	58	58
LoN/UN Budget/ Global GDP	r	0.909	0.928	0.733	1	0.905	-0.242	-0.834	0.784	0.734
	Sig. (2-t)	0.000	0.000	0.000		0.000	0.110	0.000	0.000	0.000
	N	96	96	65	96	96	45	70	88	88
LoN/UN Members	r	0.968	0.996	0.981	0.905	1	-0.438	-0.950	0.870	0.736
	Sig. (2-t)	0.000	0.000	0.000	0.000		0.003	0.000	0.000	0.000
	N	97	97	65	96	97	45	70	89	89
IGOs	r	-0.435	-0.455	-0.413	-0.242	-0.438	1	0.270	-0.517	-0.231
	Sig. (2-t)	0.003	0.002	0.005	0.110	0.003		0.073	0.000	0.126
	N	45	45	45	45	45	45	45	45	45
US% Contrib to UN	r	-0.930	-0.946	-0.917	-0.834	-0.950	0.270	1	-0.668	-0.364
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.073		0.000	0.004
	N	70	70	65	70	70	45	70	62	62
milex USA	r	0.901	0.882	0.729	0.784	0.870	-0.517	-0.668	1	0.872
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	N	89	89	58	88	89	45	62	89	89
milper USA	r	0.806	0.771	0.416	0.734	0.736	-0.231	-0.364	0.872	1
	Sig. (2-t)	0.000	0.000	0.001	0.000	0.000	0.126	0.004	0.000	
	N	89	89	58	88	89	45	62	89	89

Table 7.1.3: Bivariate Correlations among Diplomatic and Military Attributes of Global Governance

Partial Correlations Controlling for Year		Sovereignty	Sovereignty Wt. x Pop.	LoN/UN Budget ÷ Global GDP	LoN/UN Members	IGOs	US% Contrib to UN	US Milex	US Milper
Sovereignty	r	1	0.946	0.446	0.931	-0.153	-0.493	0.037	-0.112
	Sig. (2-t)	.	0.000	0.000	0.000	0.322	0.000	0.729	0.298
	N	0	63	93	94	42	68	86	86
Sovereignty Wt. x Pop.	r	0.946	1	-0.634	0.906	-0.032	-0.413	-0.612	-1.000
	Sig. (2-t)	0.000	.	0.000	0.000	0.836	0.001	0.000	0.000
	N	63	0	63	63	42	63	55	55
LoN/UN Budget ÷ Global GDP	r	0.446	-0.634	1	0.241	0.411	0.026	-0.196	0.004
	Sig. (2-t)	0.000	0.000	.	0.019	0.006	0.830	0.069	0.970
	N	93	63	0	93	42	68	85	85
LoN/UN Members	r	0.931	0.906	0.241	1	-0.073	-0.547	-0.021	-0.294
	Sig. (2-t)	0.000	0.000	0.019	.	0.638	0.000	0.848	0.005
	N	94	63	93	0	42	68	86	86
IGOs	r	-0.153	-0.032	0.411	-0.073	1	-0.419	-0.320	0.224
	Sig. (2-t)	0.322	0.836	0.006	0.638	.	0.005	0.034	0.144
	N	42	42	42	42	0	42	42	42
US% Contrib to UN	r	-0.493	-0.413	0.026	-0.547	-0.419	1	1	1
	Sig. (2-t)	0.000	0.001	0.830	0.000	0.005	.	0.000	0.000
	N	68	63	68	68	42	0	60	60
US Milex	r	0.037	-0.612	-0.196	-0.021	-0.320	1	1	0.569
	Sig. (2-t)	0.729	0.000	0.069	0.848	0.034	0.000	.	0.000
	N	86	55	85	86	42	60	0	86
US Milper	r	-0.112	-1.000	0.004	-0.294	0.224	1	0.569	1
	Sig. (2-t)	0.298	0.000	0.970	0.005	0.144	0.000	0.000	.
	N	86	55	85	86	42	60	86	0

Table 7.1.4: Partial Correlations among Diplomatic and Military Attributes of Global Governance

Decolonization is proxied herein via both an unweighted and a weighted measure of sovereignty: either the number of sovereign polities relative to all polities or the number of citizens of sovereign polities relative to the world's population. What follows compares the use of both proxies. As discussed in Section 5.2.3, because Maddison's (2010) and Mitchell's (2003a, 2003b, 2003c) pre-1950 estimates greatly favor sovereignties over colonies, reliable weighting could not be done prior to 1950. The range limitations of this measure, graphed in Figure 5.3.3, found in Section 5.3.1, as well as in Figure 7.1.15 below, make it impossible to compare the ratio of sovereign individuals to all individuals prior to 1950, which should not pose a substantial problem, given that most of the colonization during the century of interest took place after, not before, 1950.

An important point of note here is that while 38 colonies remain today, including Aruba, The Falklands, Tahiti, Guadeloupe, and Saint Helena, the populations of most of these colonies are extremely low compared to the average sovereign polity. Therefore, a somewhat arbitrary count of colonies renders a raw sovereignty ratio of only 84%. The weighted measure, on the other hand, reports a world that is 99.8% decolonized. This being said, the collinearity between the two variables (r = 0.981) allows for a substitution of the weighted variable with the unweighted version, given that their covariance is almost perfect. This means that while specific β-coefficients may vary slightly in a multivariate analysis, the unweighted measure's overall effects on another variable would be nearly the same as those of the weighted measure.

Figure 7.1.15 plots a five-year moving average for the LoN/UN funding variable, given that the UN budget occasionally is assessed/reported every two years (see Europa Year Book, 1964–2007), creating 1st-order autocorrelation within this variable, particularly after the 1970s. The moving average smooths out this curve for a better visualization of the trajectory. The trajectory of this budgetary figure exhibits peculiar, punctuated deviations from parity with the other diplomatic (i.e., non-trade) dimensions in this figure. Once during each of the last three preselected periods in this study, the anomaly occurs: between 1945 and 1960, between 1973 and 1990, and lastly an inverse deviation from parity with sovereignty and the LoN/UN member count between 1995 and 2008, the last year of available trade data. These periods are to varying degrees overlapping the periods in this study, particularly in the first case (1945 – 1960), which coincides almost perfectly with the early Cold War period (1945 – 1961). While these findings are not confirmatory of periodization expressing itself along the integrative dimensions of global governance, periodization does seem to be supported by this and previous output.

The unweighted sovereignty exhibits nearly perfect collinearity with the League of Nations' and United Nations' member counts throughout the period. The reason for this particular collinearity is not mathematical, but political in nature. As previously stated, unlike some IGOs, membership in either the LoN or the UN is predicated on sovereignty, and is usually secured soon after sovereignty is achieved. The Soviet colonization of much of the Asian continent dips the trajectory during the 1940s, but the remainder of the century is one characterized by parity between decolonization and diplomatic intensification via the United Nations and other prevalent IGOs, as Chapter 9 will also discuss. With an unlagged bivariate r-coefficient of 0.928 and a still significant partial r-coefficient of 0.446 ($p < 0.01$), the relationship between these two variables persists beyond the long-term linear trend; that is to say, even short-term oscillations are in synchrony a substantial amount of the time.

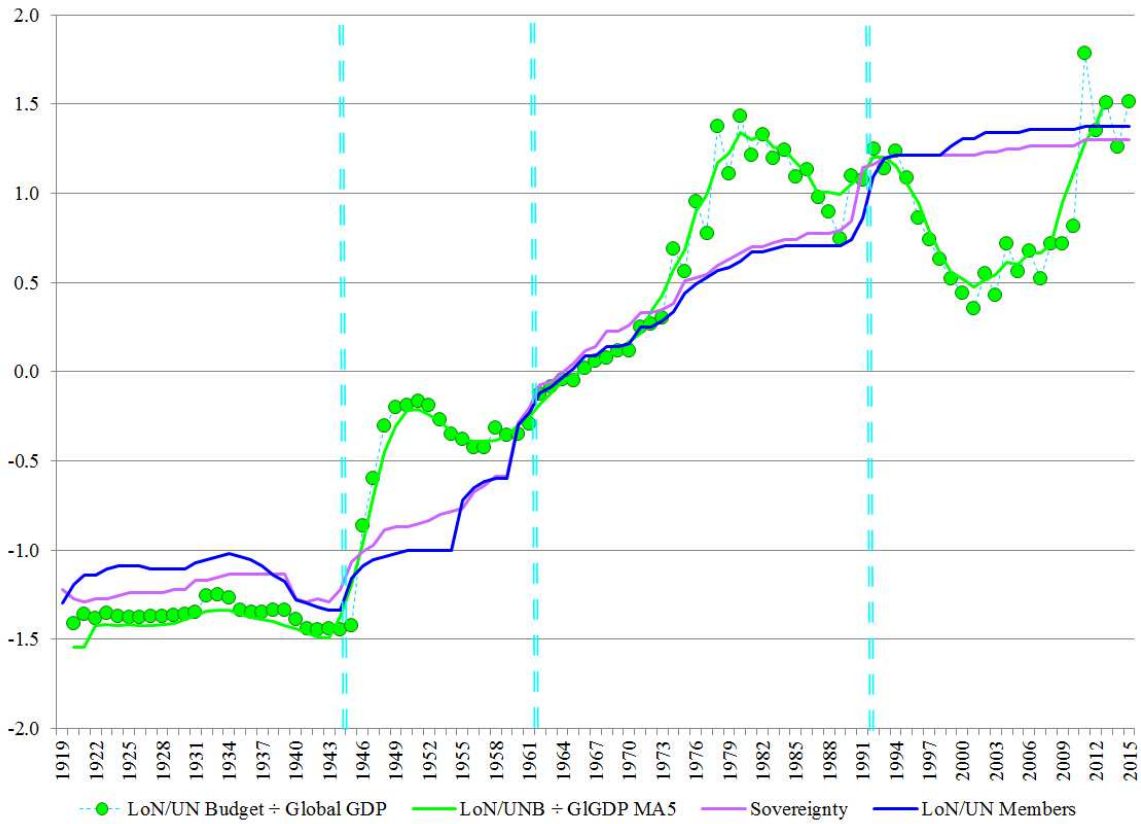
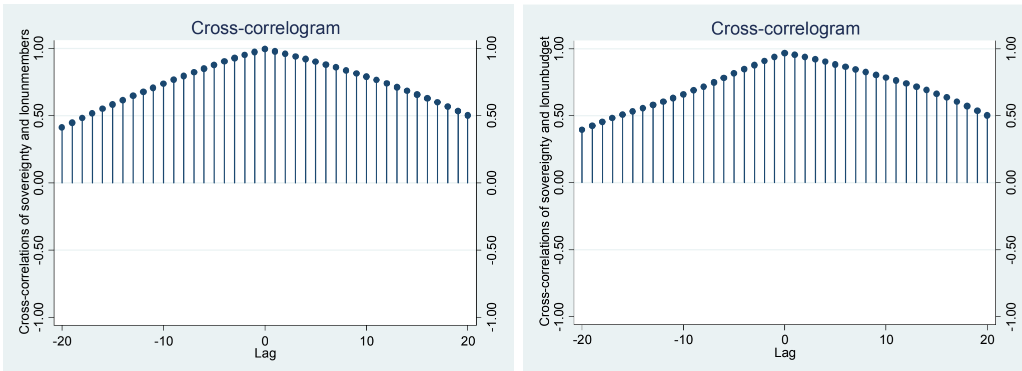


Figure 7.1.15: Sovereignty, LoN/UN Member States, and LoN/UN Budget ÷ Global GDP

The cross-correlations below merely confirm that these two highly autocorrelated arrays are highly collinear in both the short- and long-term senses. The relationships between sovereignty and the League of Nations or United Nations member count, and between sovereignty and the LoN/UN budget relative to global GDP are both typical of positively trended and highly autocorrelated arrays of data, such as sovereignty and the LoN/UN member count.



Figures 7.1.16 – 7.1.17: Sovereignty ➔ League of Nations / United Nations Members; Sovereignty ➔ League of Nations / United Nations Budget ÷ Global GDP

As for the budgetary figures, they are only slightly trended, and exhibit some cyclicality within the slight, secular trend. This pair of variables could constitute a more abstract construct of global governance—such as political integration—given the level of collinearity. However, more intriguing relationships below are devoid of the necessarily high correlations discussed throughout this chapter so far.

Capping this section of the analysis is the discussion of the relationship between the two political-military dimensions of power on the part of the hegemon (military spending and military spending per soldier), as well as the relationships that those military dimensions have to the diplomatic, non-hegemonic dimensions of political global governance that have just been discussed, namely: sovereignty, LoN/UN member counts, and LoN/UN funding relative to global GDP.

First, the fact that one military figure serves as the numerator for the other imposes a great deal of collinearity upon the relationship, which in the case of raw and per-soldier military expenditures is 0.872 at the bivariate level and 0.569 when controlling for time. In other words, both a secular trend and mathematical homogeneity are partly responsible for the bivariate collinearity, while mathematical homogeneity is partly responsible for the detrended relationship.

Though not plotted, both of the military spending figures are highly autocorrelated. Compounding this with their collinearity, the following cross-correlogram merely echoes many previous and subsequent figures charting the nearly symmetrical, gradually decreasing coefficients that suggest that the most likely scenario is not one of lagged causality, but either spuriousness, or more likely in this case, mathematical homogeneity.

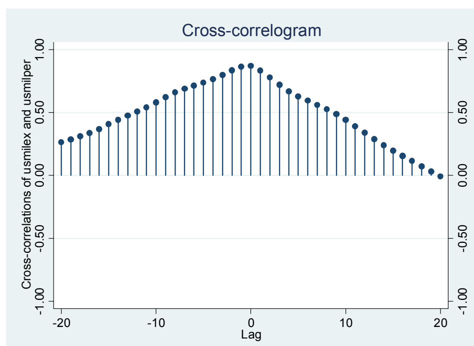


Figure 7.1.18: Military Expenditures → Military Expenditures per Soldier

Figure 7.1.16 graphs non-economic (i.e., diplomatic and military) dimensions of global governance, also capturing structural differences (centralization/verticality vs. integration/horizontality). Their heterogeneity (other than in the case of the military measures detailed above) refutes any case for mathematical collinearity being responsible for the significance of any coefficients, particularly partial/detrended ones.

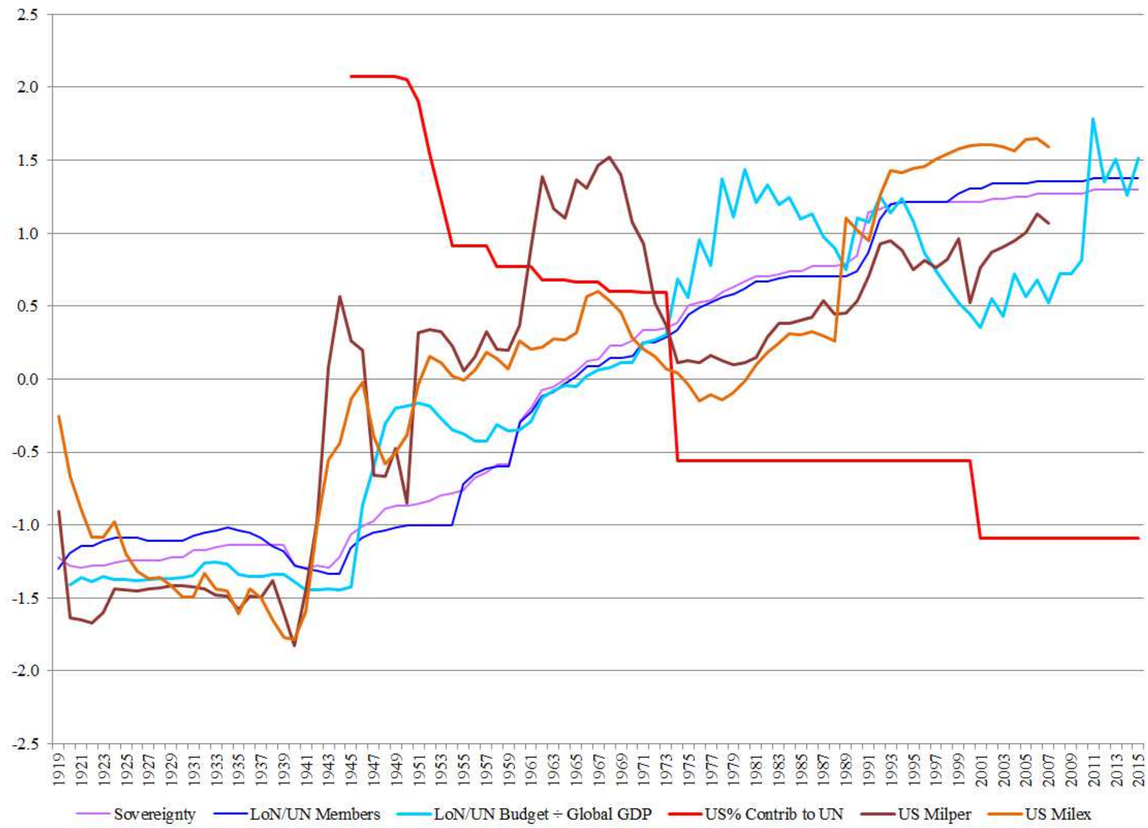


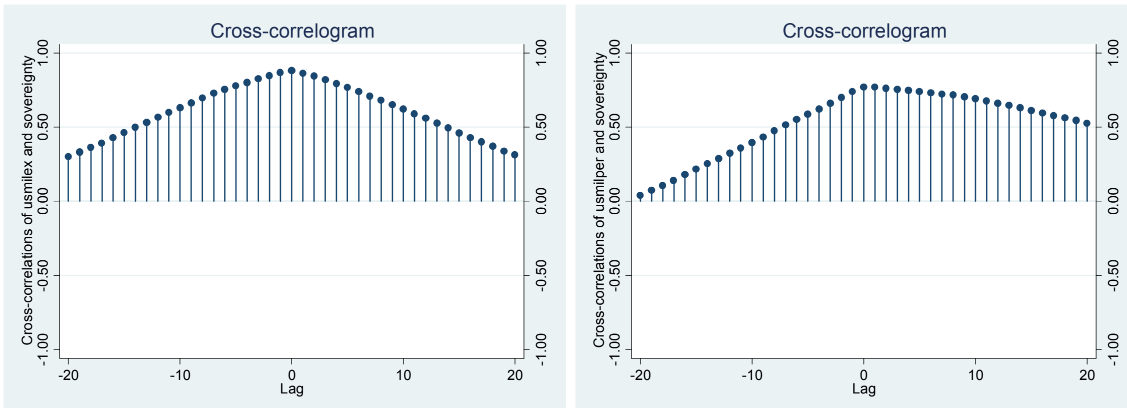
Figure 7.1.19: US Military Expenditures, Sovereignty, LoN/UN Member States, and LoN/UN Budget ÷ Global GDP

Keeping in mind that the IGO count has been omitted from the rest of the analysis, at the bivariate level, any coefficient between raw military expenditures and every diplomatic variable is comparable to the coefficient between per-soldier expenditures and any given diplomatic variable. The only negative correlations that military expenditures exhibit is with the US percentage contribution to the UN budget, but an anomaly with this partial correlation is presented in Section 7.2.1—couching it in the context of the centralization of global governance.

Turning to issues of decolonization, when highly collinear variable pairs become nonsignificantly correlated once time is controlled for, the most likely explanation is that the secular trend places most of the negative z-scores of many of these variables to the left of the temporal median while most of the positive z-scores lie to the right. Such is the case for the relationships between sovereignty/decolonization and both of the military expenditure figures, which exceed 0.7 at the bivariate level but become nonsignificant when the temporal control is applied.

The same happens with the bivariate correlations between military expenditures and the LoN/UN member count when controlling for time. More specifically, the partial correlation for the relationship between the LoN/UN member count and the per-soldier US military expenditures reports an r of -0.294 ($p < 0.01$), while the raw expenditure figures report a nonsignificant r of -0.021. No direct causation can be theoretically inferred about these two measures, though an interpretation of this finding is aided by Figure 7.1.19. The period after 1970 exhibits a counter-cyclical processes *within the secular trend of growth*. This is mostly responsible for the positive bivariate correlation *and* the negative partial correlation, though there could be counter-cyclical processes earlier on that are obfuscated by the scale of the trend.

Cross-correlograms for sovereignty and military expenditures suggest that while the raw US military expenditure figure is highly correlated with sovereignty, it is the per-soldier figure (i.e., the level of economic development of the US military relative to all other nations' militaries) that is a better predictor of sovereignty throughout the world, and positively so, meaning that the more the US spends on raising its level of funding per soldier, the more that the world will decolonize with a lag ranging from 0 to 10 years. As previously stated, lags beyond 10 years lack the theoretical justification endemic of shorter-term effects in this dissertation, and are likely to be the result of compounded 1st-order autocorrelation confounded with collinearity.



Figures 7.1.20 – 7.1.21: Military Expenditures ➔ Sovereignty;
Military Expenditures per Soldier ➔ Sovereignty

As with some the findings above, the positive and highly significant bivariate correlations between military expenditures and the LoN/UN budget relative to global GDP also lose significance when controlling for time (partial r = -0.196 for raw expenditures and -0.004 for per-soldier expenditures, both significant at $p < 0.01$), and the polarity of the coefficients changes from positive to negative. This polarity shift is quite unusual, and points to what can be seen above when only the military spending and relative LoN/UN budget figures are plotted.

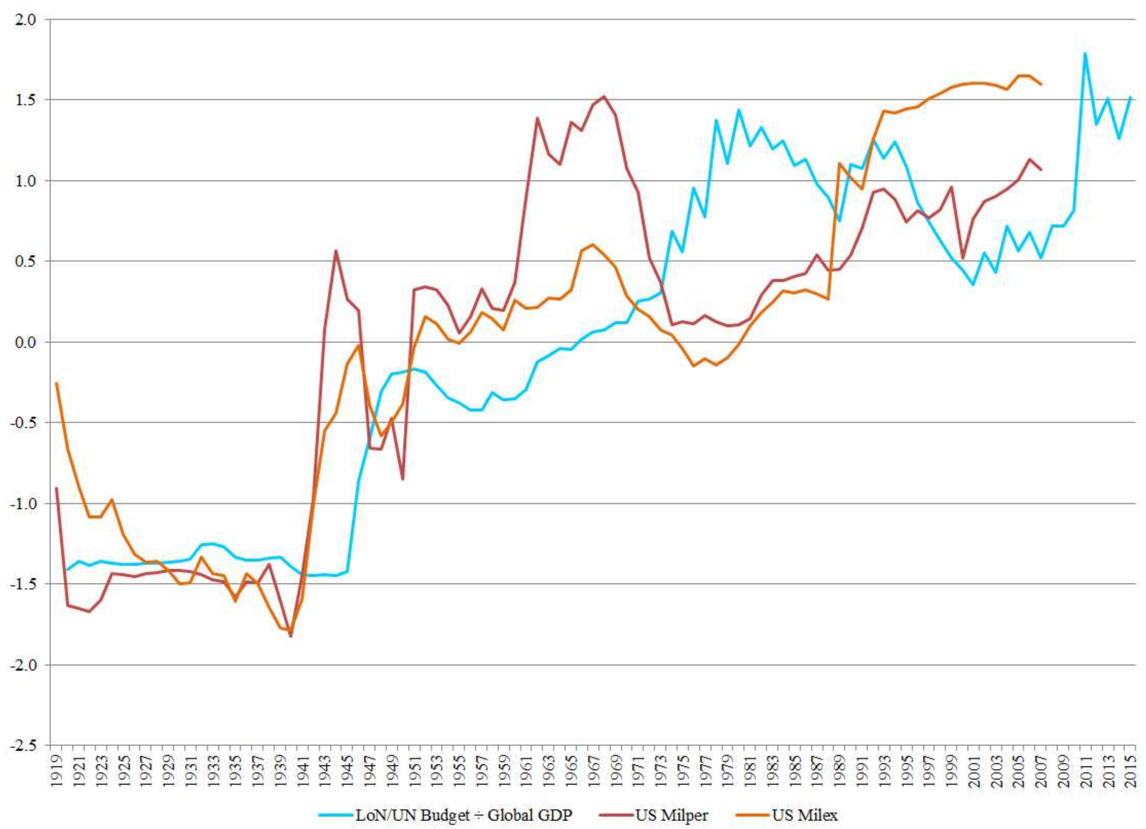
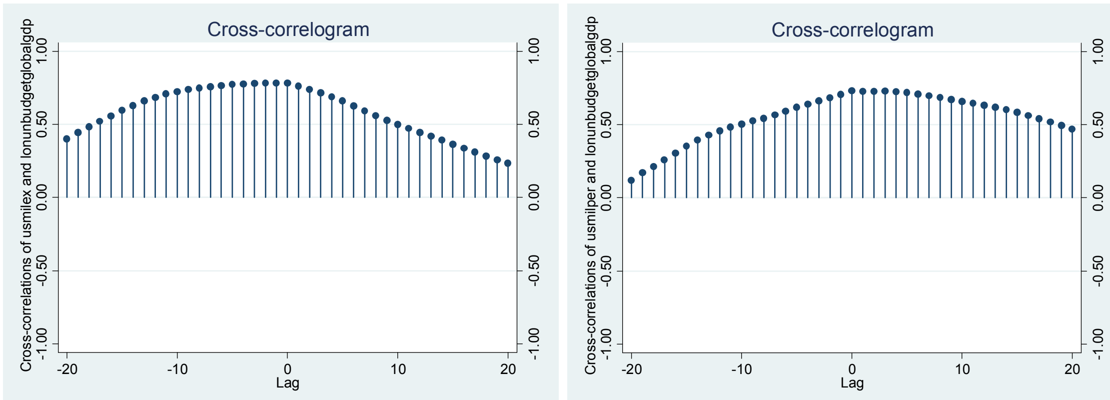


Figure 7.1.22: LoN/UN Budget ÷ Global GDP, and US Military Expenditures

As aforementioned, though most of the negative z-scores like to the left of the temporal midpoint in this graph, and most of the positive ones lie to its right, there are specific periods wherein oscillations in one figure are clearly diverging from the other, most notably between 1975 and 1990, and again between 1995 and the end of the available period. A periodizing, categorical variable in a multivariate analysis will do much to isolate periods like these that, while appearing anomalous, actually account for quite a bit of the short-term covariance between the funding of the League of Nations and United Nations relative to the global economy and the funding of the US military. Lagged bivariate correlations below complement these findings, and suggest that although raw military expenditures are probably better predicted by the funding of the

LoN and UN relative to the world's GDP, the causal relationship is likely to be reversed when military expenditures per soldier replace raw figures.



Figures 7.1.23 – 7.1.24: Military Expenditures ➔ LoN/UN Budget ÷ Global GDP; Military Expenditures per Soldier ➔ LoN/UN Budget ÷ Global GDP

There is no theoretical basis for assuming that the hegemon's military might or sophistication would usher or be ushered by the relative funding of the largest IGO on Earth, and yet, this is what is evident in the long term. However, the partial correlations here are more telling of the process being measured, for it is, as is mentioned above, the secular trend that by the same rate escalates these otherwise negatively correlated variables.

From this portion of the analysis comes the following illustration, reporting the most likely causal relationships that this output forecasts. Unlike the other sections, which find empirical evidence to place the trade figures (particularly imports) as the dependent variable in a causal model, this section does not offer such a singular narrative. Instead, it is just as likely that any of the variables in Figure 7.1.22 might be functions or factors of one another.

At the bivariate level, many of these are best correlated at 0 lags, due either to mathematical collinearity in the case of the military figures or perhaps to more theoretically explainable sociological forces explored in Chapter 10. Those relationships that are cross-correlated in such a way as to favor the causal direction from one measure to the other (such as the relationship between the US military budget per soldier and the LoN/UN member count) will be considered for further analysis in Chapter 10, which will incorporate the analysis of network and non-network variables across all institutional (i.e., military, diplomatic and economic) and structural (i.e., centralization and integration) levels.

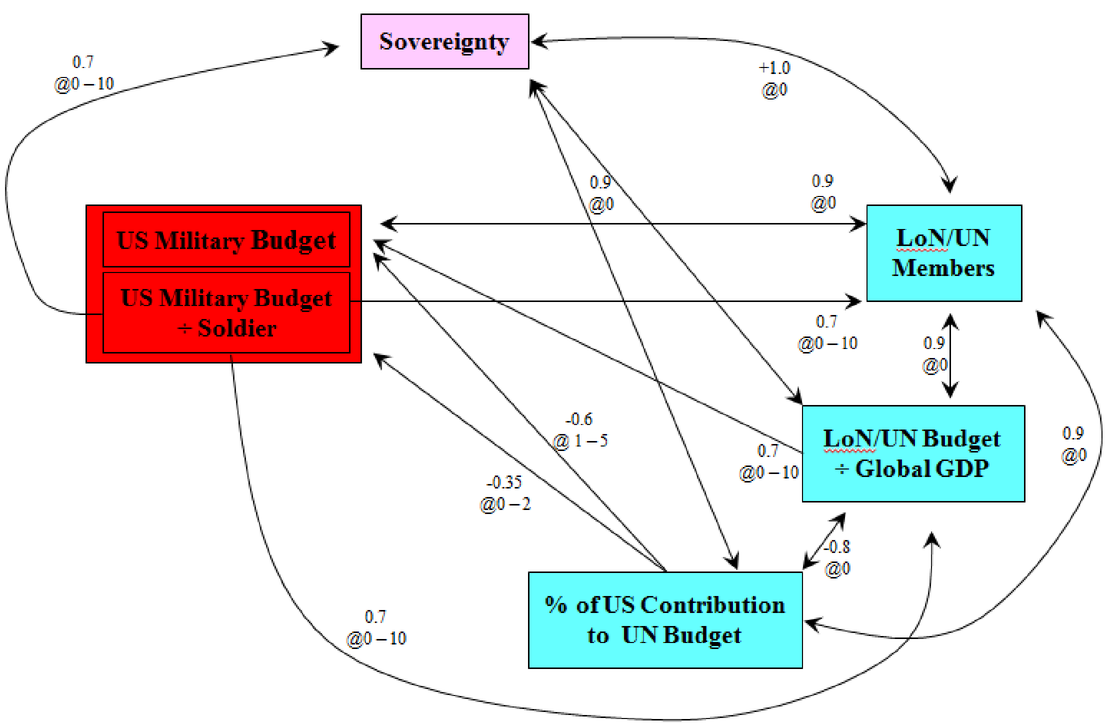


Figure 7.1.25: Optimally Lagged Bivariate Relationships among Political (Diplomatic and Military) Attributes of Global Governance

Section 7.1 analyzes the relationships among institutionally similar variables, answering the question: what are the relationships among indicators of the same dimension (or similar dimensions) of global governance? The dominant narratives here are characterized by collinearity resulting from mathematical homogeneity—as in the case of multiple measures derived from GDP—or from bureaucratic structure—as with measures of sovereignty and UN membership status. To complement this, the following section shifts the analytical lens from an intra-institutional analysis to the verticality and horizontality of the structure of global governance.

7.2 Structural Distinctions: Centralization and Integration of Global Governance

This section classifies all non-network variables into either measures of indicative of the centralization or polarization of the world-system, and of those that proxy integration, or the connectedness or saturation of the system as a whole. Following the format of the previous section, a Pearson's bivariate correlation matrix is followed by its partial equivalent, after which longitudinal plots and cross-correlograms add further detail to any of the relationships addressed in this section.

7.2.1 Indicators of the Centralization of Global Governance

Among the indicators of the centralization of global governance, the only one of a diplomatic nature in this chapter is the United States' percentage contribution to the United Nations' budget, a figure that never increases, and is significantly negatively correlated at the bivariate level with every other variable in this cluster other than US imports divided by global imports.

Bivariate Correlations		Year	US% Contrib to UN	USGDP/ Glb.GDP	US Imports / Global Imports	US Imports / Global GDP	US Exports / Global Exports	US Exports / Global GDP	milex USA	milper USA	GDP/cap USA
Year	r	1	-0.930	-0.157	0.000	0.750	-0.043	0.866	0.901	0.806	0.609
	Sig. (2-t)		0.000	0.124	0.993	0.000	0.686	0.000	0.000	0.000	0.000
	N	97	70	97	91	91	91	91	89	89	92
US% Contrib to UN	r	-0.930	1	0.841	-0.051	-0.676	0.533	-0.795	-0.668	-0.364	-0.697
	Sig. (2-t)	0.000		0.000	0.688	0.000	0.000	0.000	0.000	0.004	0.000
	N	70	70	70	64	64	64	64	62	62	65
USGDP/ Glb.GDP	r	-0.157	0.841	1	-0.402	-0.213	0.092	-0.180	0.198	0.389	0.259
	Sig. (2-t)	0.124	0.000		0.000	0.042	0.387	0.088	0.063	0.000	0.013
	N	97	70	97	91	91	91	91	89	89	92
US Imports / Global Imports	r	0.000	-0.051	-0.402	1	0.446	0.153	0.157	-0.034	-0.214	-0.142
	Sig. (2-t)	0.993	0.688	0.000		0.000	0.149	0.138	0.752	0.044	0.178
	N	91	64	91	91	91	91	91	89	89	91
US Imports / Global GDP	r	0.750	-0.676	-0.213	0.446	1	-0.168	0.855	0.806	0.514	0.523
	Sig. (2-t)	0.000	0.000	0.042	0.000		0.111	0.000	0.000	0.000	0.000
	N	91	64	91	91	91	91	91	89	89	91
US Exports / Global Exports	r	-0.043	0.533	0.092	0.153	-0.168	1	-0.155	0.132	0.178	-0.421
	Sig. (2-t)	0.686	0.000	0.387	0.149	0.111		0.143	0.217	0.095	0.000
	N	91	64	91	91	91	91	91	89	89	91
US Exports / Global GDP	r	0.866	-0.795	-0.180	0.157	0.855	-0.155	1	0.822	0.525	0.694
	Sig. (2-t)	0.000	0.000	0.088	0.138	0.000	0.143		0.000	0.000	0.000
	N	91	64	91	91	91	91	91	89	89	91
milex USA	r	0.901	-0.668	0.198	-0.034	0.806	0.132	0.822	1	0.872	0.610
	Sig. (2-t)	0.000	0.000	0.063	0.752	0.000	0.217	0.000		0.000	0.000
	N	89	62	89	89	89	89	89	89	89	89
milper USA	r	0.806	-0.364	0.389	-0.214	0.514	0.178	0.525	0.872	1	0.436
	Sig. (2-t)	0.000	0.004	0.000	0.044	0.000	0.095	0.000	0.000		0.000
	N	89	62	89	89	89	89	89	89	89	89
GDP/cap USA	r	0.609	-0.697	0.259	-0.142	0.523	-0.421	0.694	0.610	0.436	1
	Sig. (2-t)	0.000	0.000	0.013	0.178	0.000	0.000	0.000	0.000	0.000	
	N	92	65	92	91	91	91	91	89	89	92

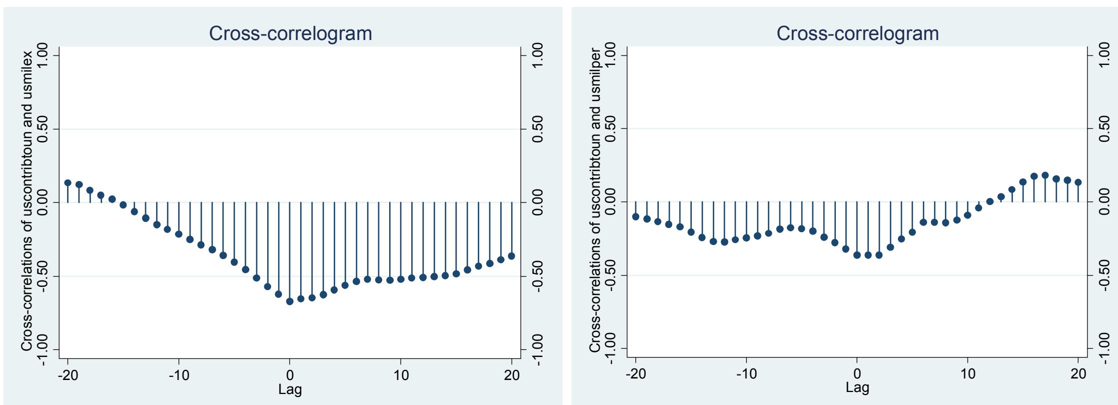
Table 7.2.1: Bivariate Correlations among Centralization Attributes of Global Governance

Illustrated in in Figure 7.2.1, this diplomatic indicator's relationships with other figures—most likely due to its periods of constancy followed by punctuated drops—become either nearly perfectly collinear with other variables, or bear nonsignificant coefficients, the only exception being with US exports relative to global GDP (partial $r = 0.607$, $p < 0.01$). Because some of these relationships are already analyzed in section 7.1.1, such as those involving trade, they are not mentioned in this section.

Partial Correlations Controlling for Year		US% Contrib to UN	USGDP ÷ Glb.GDP	US Imports ÷ Global Imports	US Imports ÷ Global GDP	US Exports ÷ Global Exports	US Exports ÷ Global GDP	US Milex	US Milper	US GDP per cap
US% Contrib to UN	**r**	1	1	1	0.010	0.607	0.057	1	1	-0.065
	Sig. (2-t)	.	0.000	0.000	0.937	0.000	0.653	0.000	0.000	0.606
	N	0	68	61	61	62	62	60	60	63
USGDP ÷ Glb.GDP	**r**	1	1	0.112	-0.074	-0.115	-0.093	0.793	0.881	0.452
	Sig. (2-t)	0.000	.	0.295	0.493	0.281	0.384	0.000	0.000	0.000
	N	68	0	87	87	88	88	86	86	89
US Imports ÷ Global Imports	**r**	1	0.112	1	0.042	0.501	0.020	0.440	0.162	-0.100
	Sig. (2-t)	0.000	0.295	.	0.697	0.000	0.856	0.000	0.131	0.352
	N	61	87	0	87	87	87	86	86	87
US Imports ÷ Global GDP	**r**	0.010	-0.074	0.042	1	-0.031	0.954	0.165	-0.562	0.405
	Sig. (2-t)	0.937	0.493	0.697	.	0.774	0.000	0.124	0.000	0.000
	N	61	87	87	0	87	87	86	86	87
US Exports ÷ Global Exports	**r**	0.607	-0.115	0.501	-0.031	1	-0.024	0.369	0.200	-0.379
	Sig. (2-t)	0.000	0.281	0.000	0.774	.	0.823	0.000	0.062	0.000
	N	62	88	87	87	0	88	86	86	88
US Exports ÷ Global GDP	**r**	0.057	-0.093	0.020	0.954	-0.024	1	0.192	-0.582	0.421
	Sig. (2-t)	0.653	0.384	0.856	0.000	0.823	.	0.072	0.000	0.000
	N	62	88	87	87	88	0	86	86	88
US Milex	**r**	1	0.793	0.440	0.165	0.369	0.192	1	0.569	0.179
	Sig. (2-t)	0.000	0.000	0.000	0.124	0.000	0.072	.	0.000	0.096
	N	60	86	86	86	86	86	0	86	86
US Milper	**r**	1	0.881	0.162	-0.562	0.200	-0.582	0.569	1	-0.116
	Sig. (2-t)	0.000	0.000	0.131	0.000	0.062	0.000	0.000	.	0.283
	N	60	86	86	86	86	86	86	0	86
US GDP per cap	**r**	-0.065	0.452	-0.100	0.405	-0.379	0.421	0.179	-0.116	1
	Sig. (2-t)	0.606	0.000	0.352	0.000	0.000	0.000	0.096	0.283	.
	N	63	89	87	87	88	88	86	86	0

Table 7.2.2: Partial Correlations among Centralization Attributes of Global Governance

One of the most intriguing findings in this chapter so far, foreshadowed in Section 5.3.2.2, involves the long-term, negative correlation coefficients that the relative US funding of the UN imposes on both of its military expenditure figures graphed longitudinally in Figure 7.2.2. The bivariate coefficients between the US's proportion of the contribution to the UN and that country's raw and per-soldier military expenditures ($r = -0.668$ and -0.364, respectively, both significant at $p < 0.01$) produces a peculiar finding when time is controlled for. What begins as a negative bivariate correlation becomes overwhelmingly positive when the secular trend is removed, as partial correlations for the US funding of its military and of the UN actually rounded to 1.0 in the cases of both the raw and per-soldier military expenditures plotted against the US's relative funding of the UN. While these partial coefficients are most likely not exactly 1.0, they are certainly higher than 0.99949. The deviation from previous interpretations here is that there are two counter-trends involved in this correlation. An upward trend affects the US's funding of its own military, while a downward trend affects its relative funding of the UN. Methodologically, removing this trend controls for the portion of each short-term change that accounts for the long-term trends of growth and diminishment, and for this value to be as close to 1.0 as it is raises a red flag that will have to be further analyzed.



Figures 7.2.1 – 7.2.2: US % Contribution to UN Budget ➔ US Military Expenditures; US % Contribution to UN Budget ➔ US Military Expenditures per Soldier

To see if lags can account for any potentially causal mechanisms between US funding of the UN and its military's funding, cross-correlograms appear below. It appears from these figures that unlagged coefficients are, in fact, optimal to test these relationships at least in the long-term. Figure 7.2.1 seems to favor the UN funding variable as a predictor for the funding of the US military, while Figure 7.2.2 yields less significant coefficients that probably would not stand up to more rigorous causal analysis.

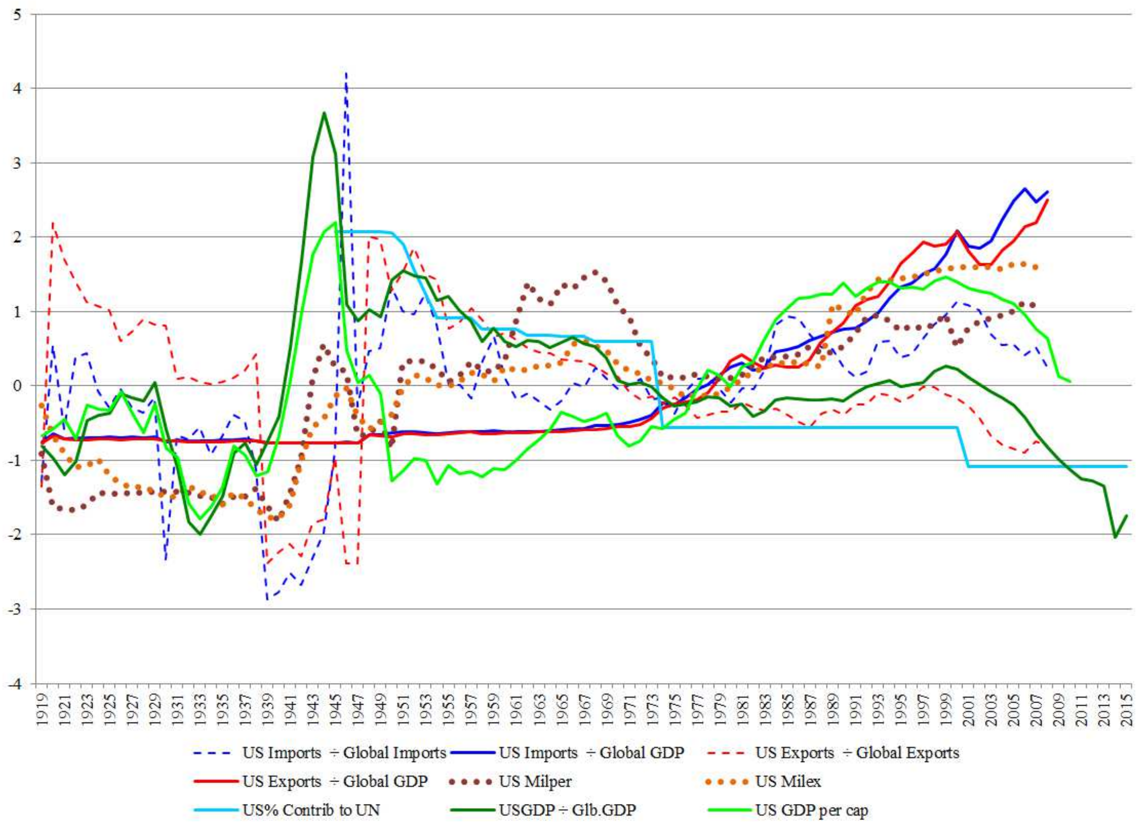


Figure 7.2.3: Centralization Attributes of Global Governance, Standardized

From the cluttered diagram above, we can deduce that there is no singular force driving these indicators, but isolating the non-trade components of this section, the following figure is produced.

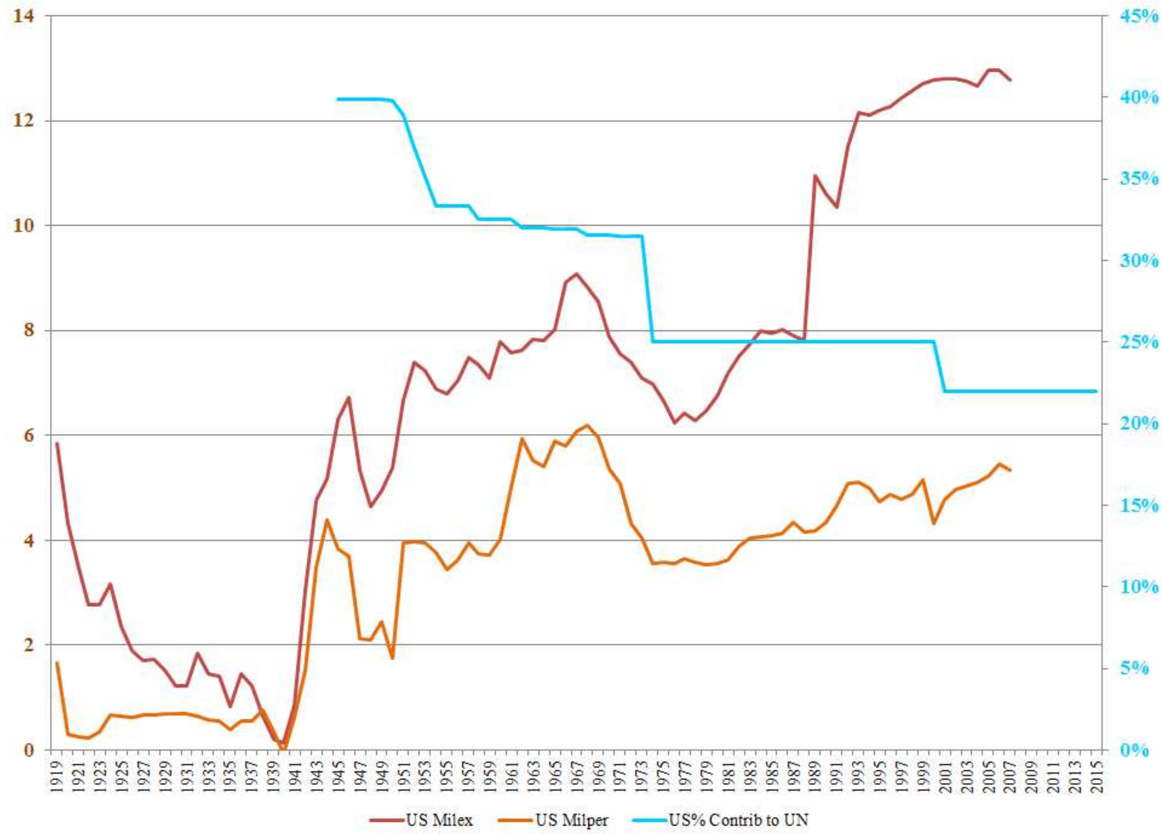


Figure 7.2.4: Military and Diplomatic Measures of the Centralization of Global Governance

Because the US percentage of the UN budget is a decreasing figure across time, its bivariate correlations are negative with those that are positively trended, which renders much of the discussion above relevant to the rest of the relationships involving this UN funding figure. In the case of imports and exports relative to global GDP, the negative r-coefficients of -0.676 and -0.795 (both significant at $p < 0.01$) become nonsignificant (0.010 and 0.057, respectively,) when controlling for time, indicating that much of the significance is usurped by trend effects, furthermore indicating that intra-dimensional relationships involving the US% of funding to the UN are not likely to be the object of a fruitful analytical pursuit.

The United States' GDP relative to global GDP bears very little correlation with either of its military expenditure figures at the bivariate level. However, partial correlations between US GDP ÷ global GDP and the military measures tell an altogether different story, these being 0.793 for raw military expenditures and 0.881 for expenditures per soldier (both significant at $p < 0.01$).

Figure 7.2.5 plots these same military expenditures against the United States' GDP per capita (standardized against all other nations) and its GDP divided by global GDP. Questions of causality between the hegemon's military expenditures and its economic power and level of development are addressed here. First, raw military expenditures yields unlagged, bivariate r-coefficients of 0.198 ($p > 0.05$) with US GDP ÷ global GDP, and 0.610 ($p < 0.01$) with US GDP per capita (standardized against all other countries).

Over the long run, the hegemon's military budget and its relative level of economic development oscillate in fairly consistent tandem. When controlling for time, these r-coefficients unexpectedly become 0.793 ($p < 0.01$) for the relationship between the United States' military expenditures and its GDP, and 0.179 ($p > 0.05$) for US military expenditures and GDP per capita. From this is drawn the conclusion that short-term fluctuations in the raw military budget data and the economic power of the United States (its GDP as a proportion of all GDP) are often in parity with one another, even if a secular growth trend characterizes the former and not the latter. The same cannot be said of the overall level of economic development (standardized GDP per capita) of the

United States, as the coefficient it shares with raw US military expenditures drops below significant levels.

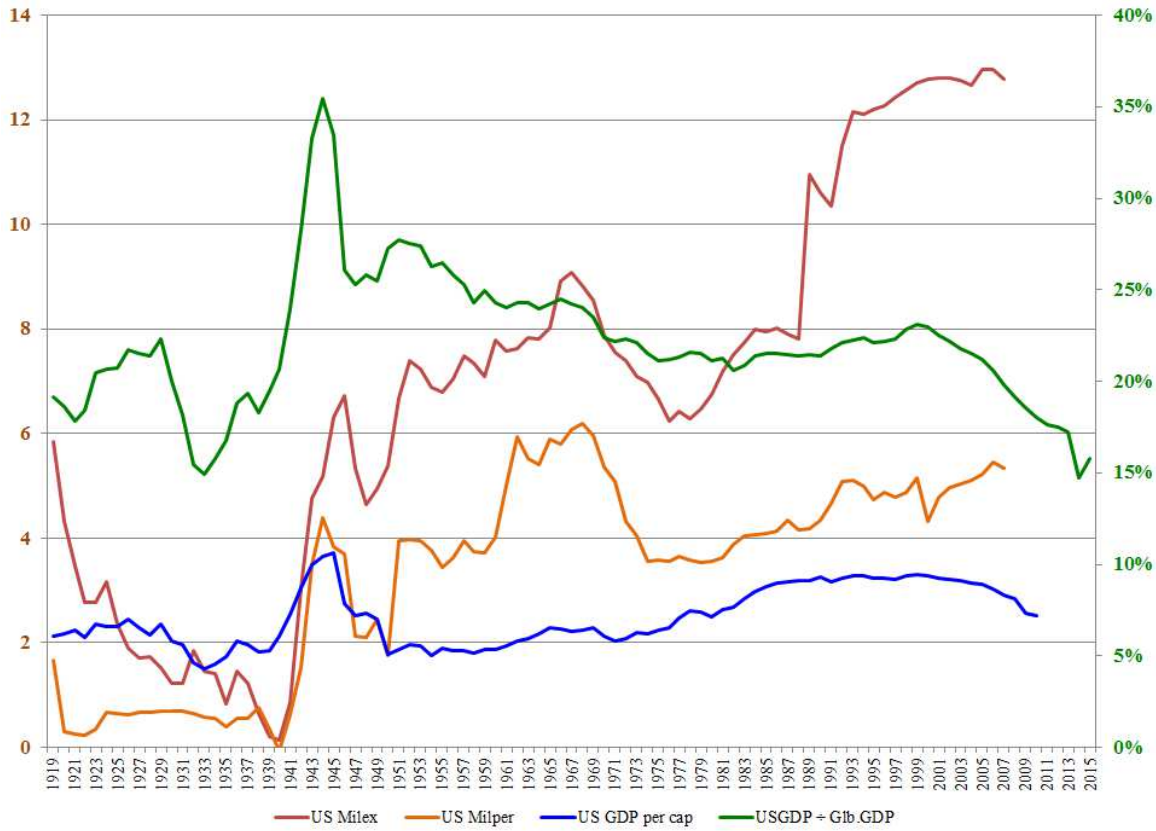
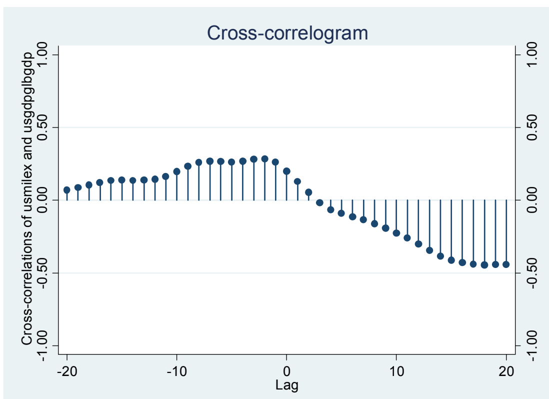
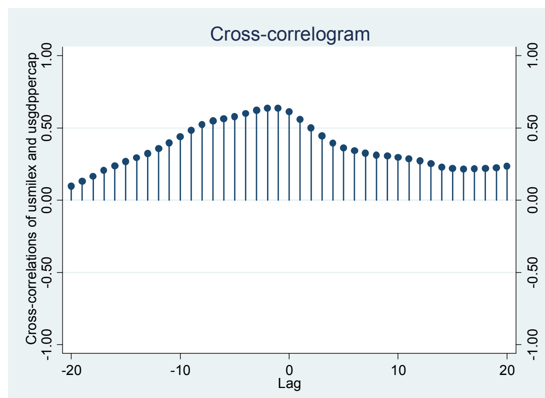


Figure 7.2.5: US Military Expenditures, GDP per Capita, and GDP ÷ Global GDP

With respect to the hegemon's military expenditures *per soldier*, this measure is significantly correlated at the bivariate level with both US GDP ÷ global GDP ($r = 0.389$, $p < 0.01$) and US GDP per capita (0.436, $p < 0.01$). Controlling for time, the first relationship becomes overwhelmingly significant ($r = 0.881$, $p < 0.01$), while the relationship between the United States' military expenditures per soldier and its GDP per citizen is nonsignificant ($r = -0.116$). Here, the conclusion is that despite the trend affecting the military measure and not its GDP-based figures, it is surprisingly the relationship between the economic power of the United States and its average soldier's funding that are most significantly associated here, at least without lagging.

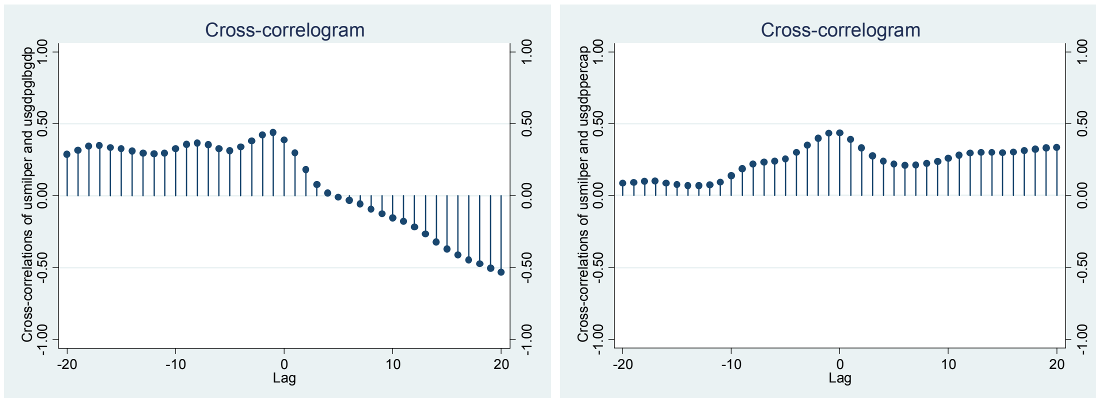
With lagging, the results suggest that the raw military budget measure might be a unique predictor of US GDP ÷ global GDP, but only after a period of more than 10 lags, while in the case of US GDP per capita, it might be the GDP figure that serves as a better predictor of the military budget when lagging by any number of years within a decade, peaking at 2 lags ($r = 0.636$, $p < 0.01$).





Figures 7.2.6 – 7.2.7: US Military Expenditures → US GDP ÷ Global GDP;
US Military Expenditures → US GDP per Capita

As for the per-soldier figures, both US GDP ÷ global GDP and its GDP per capita are likely to predict these military figures, optimally 1 or 2 years in advance, although it is also possible that a feedback effect would also impart causality from the military budget per soldier to its per-capita GDP, but only after a lag of about 10 years or more.



Figures 7.2.8 – 7.2.9: US Military Expenditures per Soldier ➔ US GDP ÷ Global GDP; US Military Expenditures per Soldier ➔ US GDP per Capita

As for the per-soldier figures, both US GDP ÷ global GDP and its GDP per capita are likely to predict these military figures, optimally 1 or 2 years in advance, although it is also possible that a feedback effect would also impart causality from the military budget per soldier to its per-capita GDP, but only after a lag of about 10 years or more.

A final cluster of relationships in this section is now presented, these being the relationships among the US military's emphasis on its military and its emphasis on trade. These relationships elucidate the degree to which methods of hegemony (material or coercive) are emphasized in concert or instead of one another. Rather than using the hegemon's import and export figures relative to the entire world-economy, their values as proportions of the import and export sector of international trade will be the proxies correlated against the hegemon's military expenditures.

First, a nonsignificant coefficient (-0.034) at the bivariate level between raw military expenditures and US imports relative to global imports becomes slightly significant when controlling for time ($r = 0.440$, $p < 0.01$). Similarly, the raw military budget and US exports relative to global exports has a slightly more significant bivariate coefficient than its import counterpart (r = 0.132, p > 0.05) that, when controlling for time, becomes very prominent (r = 0.369, p < 0.01).

The per-soldier equivalent of the narrative above is as follows: US per-soldier military expenditures do not correlate very highly at the bivariate level with US imports relative to global imports (r = -0.214, p < 0.05), nor with US exports relative to total exports (r = 0.178, p > 0.05). When controlling for time, the first relationship remains negligible (r = 0.162, p > 0.05), while the relationship between the hegemon's military spending per soldier and its exports relative to global exports becomes nonsignificant (r = 0.200, p > 0.05). Figure 7.2.10 below illustrates that while not highly convergent at first glance, some pairs do yield short-term correlation, such as the US's per-soldier military budget and its exports relative to global exports.

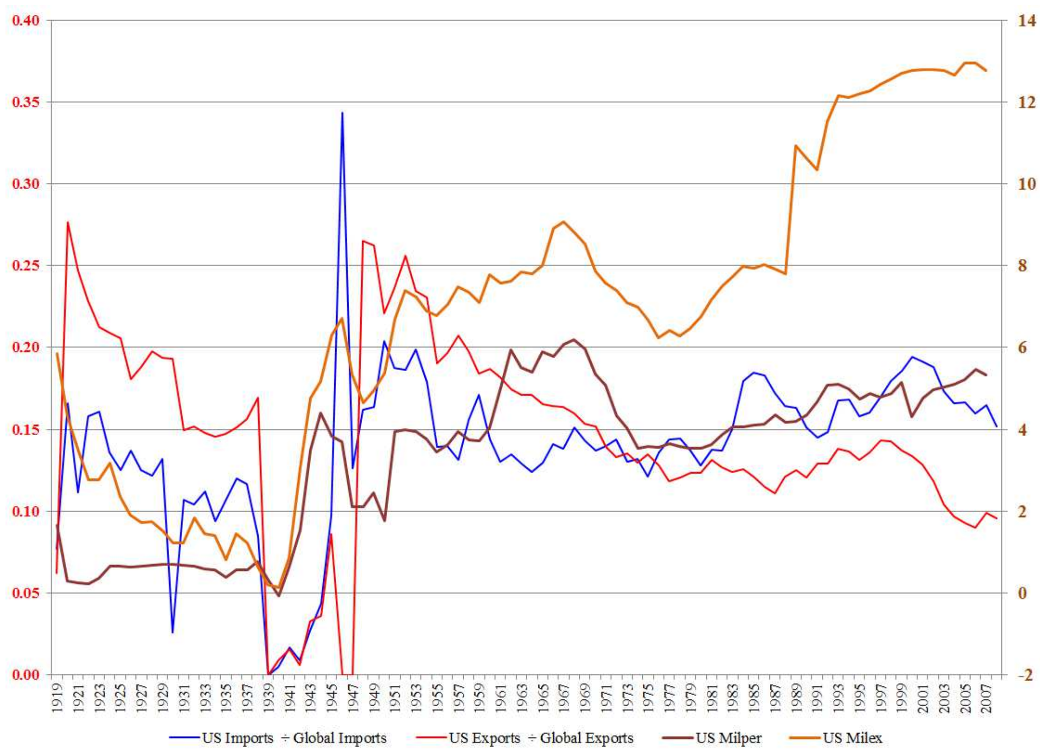
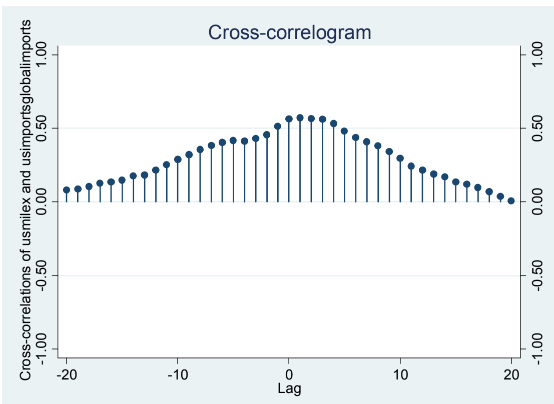
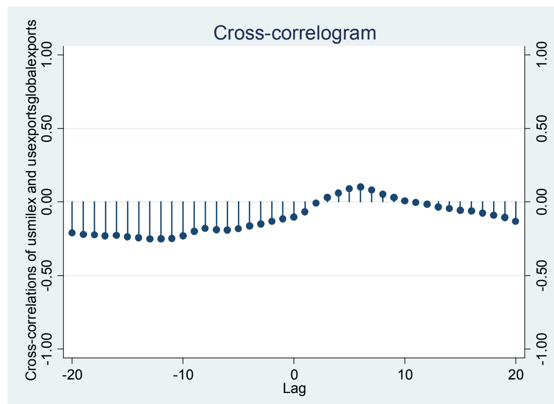


Figure 7.2.10: US Relative Imports and Exports, and Military Expenditures

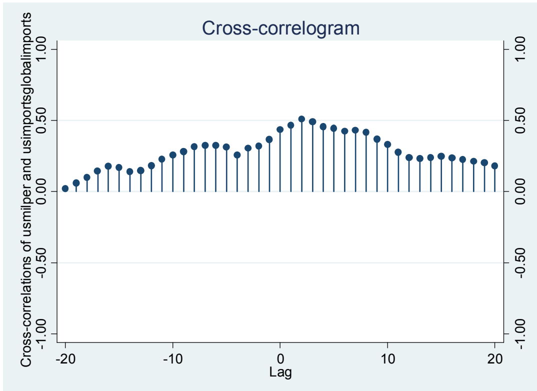
To apply the temporal dimension to these data, cross-correlograms for these relationships appear below. The first figure suggests that the hegemon's raw military expenditures and its imports relative to all imports do not have a clearly defined direction of causality, though their significant correlation persists even when imports are lagged by 1 to 5 years, meaning that US military expenditures might be a short-term predictor of the hegemon's export capacities a few years later.

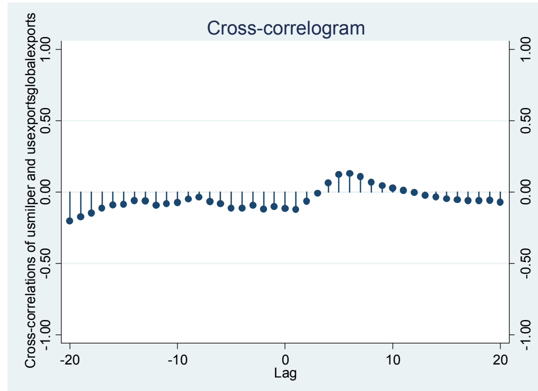




Figures 7.2.11 – 7.2.12: US Military Expenditures ➔ US Imports ÷ Global Imports; US Military Expenditures ➔ US Exports ÷ Global Exports

The second cross-correlogram definitely settles the fact that there is no highly significant bivariate correlation between raw military expenditures and export figures, regardless of lags. Figure 7.2.13 directs the researcher to look closely at a 2-year lag (r = 0.511, $p < 0.01$) when assessing the relationship between the US's military expenditures per soldier and its imports relative to global imports.





Figures 7.2.13 – 7.2.14: US Military Expenditures per Soldier ➔ US Imports ÷ Global Imports; US Military Expenditures per Soldier ➔ US Exports ÷ Global Exports

Lastly, the fourth of these cross-correlograms, much like the second one, suggests that no further research be done with the bivariate correlations between per-soldier military spending and US exports relative to global exports. Conclusions from this portion of the analysis point to mixed, or rather, unpatterned results. Generalizations such as "per-soldier measures are better predictors than raw expenditures" and "imports are more highly predictable than exports" cannot be made when plotted against one another. The rest of Section 7.2.1 surveys the more prominent and theoretically applicable relationships among highly collinear variable pairs—such as the partial correlation between the United States' military spending per soldier and its exports relative to global exports—as well as relationships that are arguably theoretically plausible, though not necessarily as significant at either the bivariate or partial levels, lagged or unlagged.

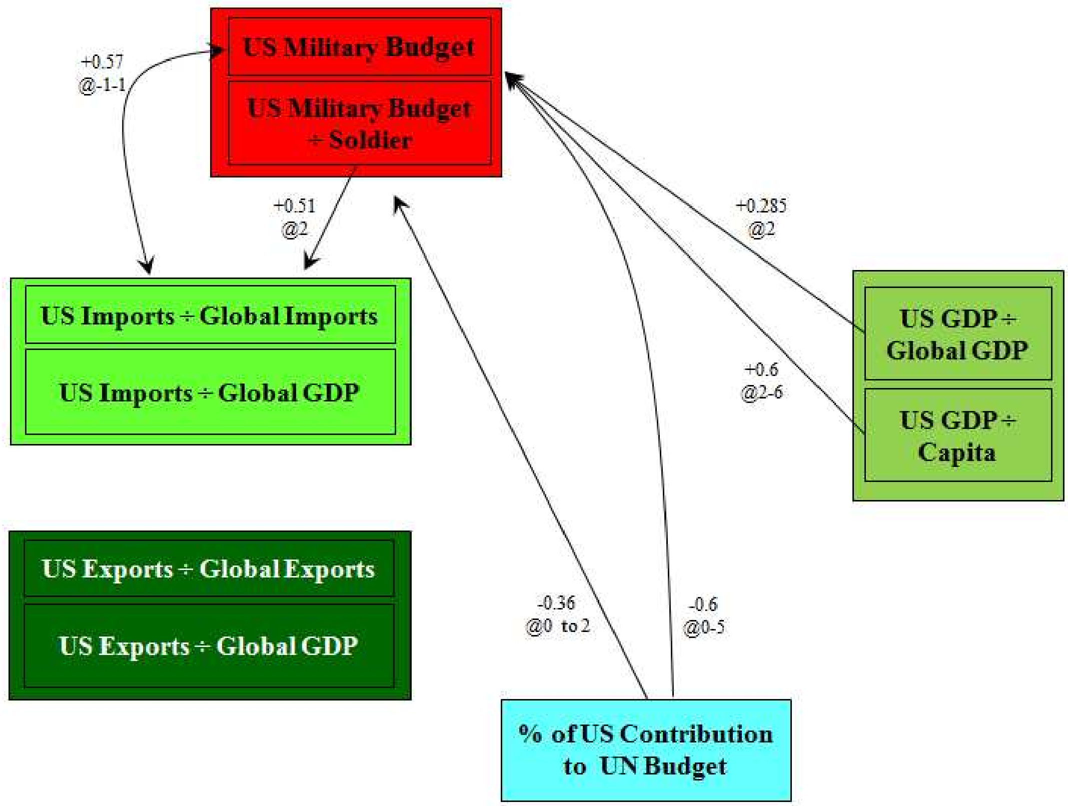


Figure 7.2.15: Optimally Lagged Bivariate Relationships among Indicators of Centralization of Global Governance

In sum, Figure 7.2.15 suggests that in a time-series model, such as a Prais-Winsten regression, involving only non-network indicators of centralization, an optimal theoretical framework would hold US imports relative to all imports and/or all economic productivity as an outcome variable, while the US' military budget figures might work best as an intervening variables, with US GDP ÷ global GDP, US GDP per capita, and the US percentage contribution to the UN budget being exogenous factors. This supports the argument that the economic well-being of the hegemon, coupled with its contribution to the UN budget relative to every other nations' contributions, dictate—one or two years later—the course of its military expenditures, which in turn—after a few more years—increase its prevalence in the import sector of the international market.

Coefficients between indicators of the hegemon's export centralization did not prove to be significantly correlated with the other centralization attributes of global governance, though Chapter 10 provides the medium for the analysis that links the variables below to their network counterparts, such as the node centrality of the United States in the import and/or import sectors of the trade network.

7.2.2 Indicators of the Integration of Global Governance

This section—avoiding redundancy with the institutional analysis in Section 7.1—seeks to direct research regarding sovereignty's effect on international trade, and the prominence of IGOs (most notably, the UN)—and vice-versa—as well the effects of trade globalization on sovereignty, and the prevalence of IGOs—and vice-versa. More generally, how are the factors of integration of global governance—that is, its more voluntary dimensions—impacting one another, and what are the most likely gestation periods or lags between each cause and effect?

To begin this inquiry, the bivariate coefficients below are characterized almost unanimously by collinearity. Already it is evident that either long- and/or short-term parities among the variables are likely to be the norm. Given the secular trend visually evident in only some of the trajectories in Figure 7.2.16 below, it is a wonder that Table 7.2.3 should report so much collinearity.

Bivariate Correlations		Year	Sovereignty	Sovereignty Wt. x Pop.	LoN/UN Budget/ Global GDP	LoN/UN Members	IGOs	Global Imports / Global GDP	Global Exports / Global GDP
Year	r	1	0.975	0.924	0.909	0.968	-0.435	0.826	0.842
	Sig. (2-t)		0.000	0.000	0.000	0.000	0.003	0.000	0.000
	N	97	97	65	96	97	45	93	91
Sovereignty	r	0.975	1	0.980	0.928	0.996	-0.455	0.800	0.824
	Sig. (2-t)	0.000		0.000	0.000	0.000	0.002	0.000	0.000
	N	97	97	65	96	97	45	93	91
Sovereignty Wt. x Pop.	r	0.924	0.980	1	0.733	0.981	-0.413	0.738	0.780
	Sig. (2-t)	0.000	0.000		0.000	0.000	0.005	0.000	0.000
	N	65	65	65	65	65	45	62	60
LoN/UN Budget/ Global GDP	r	0.909	0.928	0.733	1	0.905	-0.242	0.674	0.630
	Sig. (2-t)	0.000	0.000	0.000		0.000	0.110	0.000	0.000
	N	96	96	65	96	96	45	92	90
LoN/UN Members	r	0.968	0.996	0.981	0.905	1	-0.438	0.822	0.848
	Sig. (2-t)	0.000	0.000	0.000	0.000		0.003	0.000	0.000
	N	97	97	65	96	97	45	93	91
IGOs	r	-0.435	-0.455	-0.413	-0.242	-0.438	1	-0.408	-0.412
	Sig. (2-t)	0.003	0.002	0.005	0.110	0.003		0.005	0.005
	N	45	45	45	45	45	45	45	45
Global Imports / Global GDP	r	0.826	0.800	0.738	0.674	0.822	-0.408	1	0.996
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.005		0.000
	N	93	93	62	92	93	45	93	91
Global Exports / Global GDP	r	0.842	0.824	0.780	0.630	0.848	-0.412	0.996	1
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.005	0.000	
	N	91	91	60	90	91	45	91	91

Table 7.2.3: Bivariate Correlations among Integration Attributes of Global Governance

Worthy of mention here is the anomaly in the results: the IGO count. It should be repeated here that of all of the variables in this dissertation, the Europa Year Book IGO count is the measure with the least validity, as it measures a somewhat arbitrary inventory of its selected IGOs (excluding the UN and all of its subsidiaries). This output alone would not be cause for discounting this measure, but merely a noteworthy attribute of its variance; however, given the nature of this variable, these r-coefficients support the case that analysis of this variable beyond this point may be leading further research along a methodologically ungrounded and theoretically unsubstantiated path. In short, there is no reason to assume that this count variable is a true indicator of global governance, though postdoctoral analysis on more comprehensive datasets containing tens of thousands of IGOs, such as the Correlates of War IGO Dataset[18], will take into

[18] http://www.correlatesofwar.org/data-sets/IGOs/international-organization-v2.3

consideration such a count as a valid indicator of the integration of diplomatic global governance.

Discounting the IGO count from the Pearson's matrices above and below, the analysis can be broken down into three sub-dimensions of the integration of global governance: the ratio of decolonization (sovereignty) in the world system, the prevalence of the League of Nations and United Nations as the dominant IGOs of their respective times, and trade globalization.

To reiterate a point made in Section 7.1.2, the unweighted sovereignty measure exhibits nearly perfect bivariate correlation with its weighted counterpart ($r = 0.980$, $p < 0.01$), a figure that remains nearly as high when controlling for time ($r = 0.946$, $p < 0.01$). Assuming that this relationship remains constant prior to 1950, it is methodologically sound to assume that the unweighted measure (available for the entire timespan of this dataset) is nearly as valid a proxy for overall colonization, and because the unweighted variable contains 31 more cases, it is the favorable choice between the two to compare to the other dimensions of the horizontal intensification or integration of global governance into the world-system.

Partial Correlations Controlling for Year		Sovereignty	Sovereignty Wt. x Pop.	LoN/UN Budget ÷ Global GDP	LoN/UN Members	IGOs	Global Imports ÷ Global GDP	Global Exports ÷ Global GDP
Sovereignty	**r**	1	0.946	0.446	0.931	-0.153	-0.045	0.025
	Sig. (2-t)	.	0.000	0.000	0.000	0.322	0.669	0.819
	N	0	63	93	94	42	90	88
Sovereignty Wt. x Pop.	**r**	0.946	1	-0.634	0.906	-0.032	-0.111	0.016
	Sig. (2-t)	0.000	.	0.000	0.000	0.836	0.393	0.902
	N	63	0	63	63	42	59	57
LoN/UN Budget ÷ Global GDP	**r**	0.446	-0.634	1	0.241	0.411	-0.329	-0.603
	Sig. (2-t)	0.000	0.000	.	0.019	0.006	0.001	0.000
	N	93	63	0	93	42	89	87
LoN/UN Members	**r**	0.931	0.906	0.241	1	-0.073	0.163	0.248
	Sig. (2-t)	0.000	0.000	0.019	.	0.638	0.121	0.018
	N	94	63	93	0	42	90	88
IGOs	**r**	-0.153	-0.032	0.411	-0.073	1	-0.097	-0.095
	Sig. (2-t)	0.322	0.836	0.006	0.638	.	0.533	0.541
	N	42	42	42	42	0	42	42
Global Imports ÷ Global GDP	**r**	-0.045	-0.111	-0.329	0.163	-0.097	1	0.988
	Sig. (2-t)	0.669	0.393	0.001	0.121	0.533	.	0.000
	N	90	59	89	90	42	0	88
Global Exports ÷ Global GDP	**r**	0.025	0.016	-0.603	0.248	-0.095	0.988	1
	Sig. (2-t)	0.819	0.902	0.000	0.018	0.541	0.000	.
	N	88	57	87	88	42	88	0

Table 7.2.4: Partial Correlations among Integration Attributes of Global Governance

The narrative from the focal perspective of decolonization/sovereignty is such that no notable relationship exists with trade globalization—either in its import or export forms. Furthermore, to reiterate part of Section 7.1.2, highly significant correlations with the LoN/UN budget ÷ global GDP ($r = 0.454$, $p < 0.01$) and with the count of LoN/UN member states ($r = 0.729$, $p < 0.01$). To reprise that discussion, the bureaucratic need for sovereignty to precede membership in either the LoN or the UN does much to sustain this parity among sovereignty and membership in the most prominent IGO illustrated in Figure 7.2.16, which standardizes these values in order to plot them along a single y-axis. For altogether different reasons, these being mathematical, the parity between the measures of import and export globalization is also consistent throughout the period: all imports are also exports, and therefore, any gaps between the import measure and the export measure are related to currency exchanges, reporting errors, and other anomalies exogenous to this analysis of the world-economy.

Section 7.1.2 contains the analysis of the relationship between the LoN/UN budget relative to global GDP and the sovereignty and LoN/UN member counts.

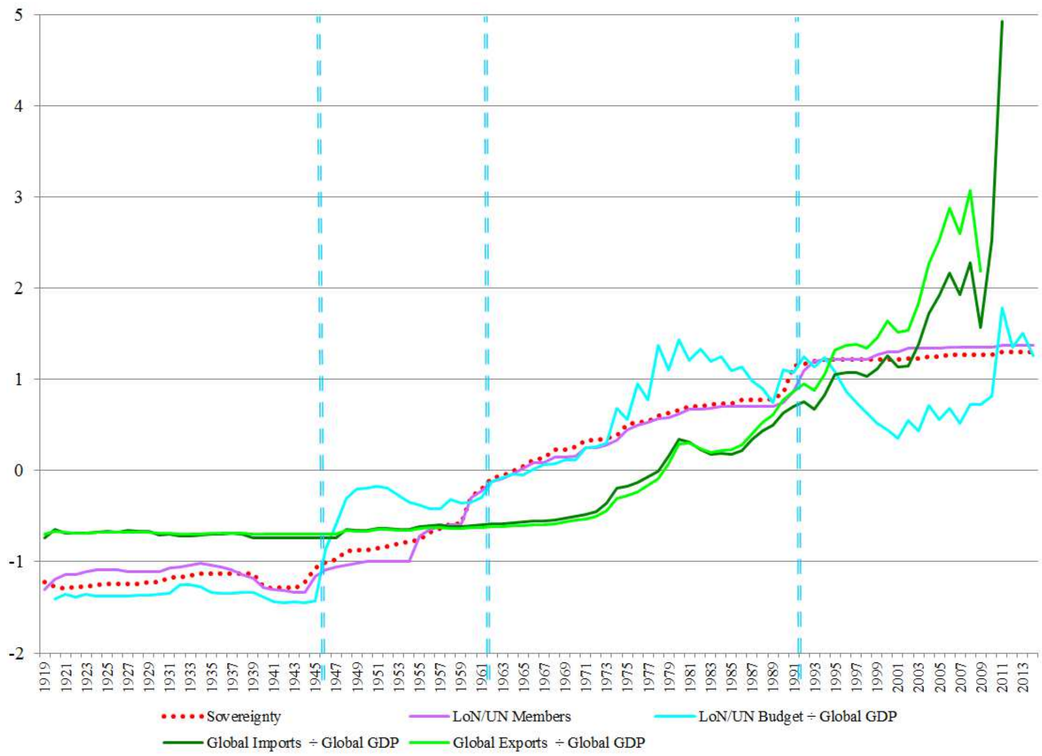
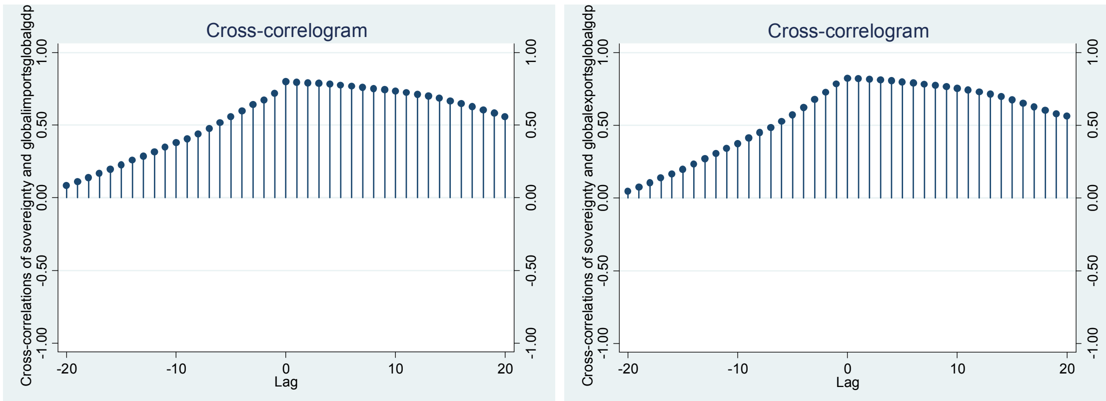


Figure 7.2.16: Integration Attributes of Global Governance, Standardized

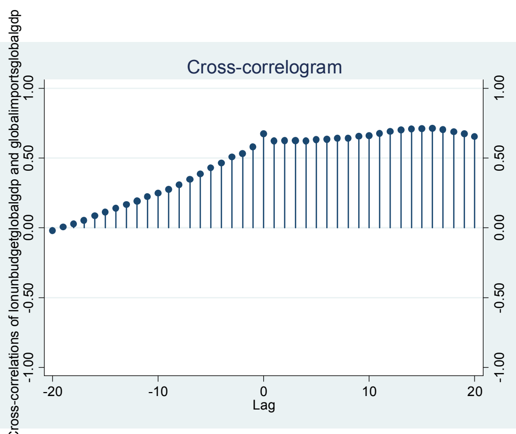
The relationship between decolonization/sovereignty and trade globalization is quite simple: positive collinearity characterizes the bivariate relationship between sovereignty and both the import and export figures relative to global GDP. At the partial level, however, all significance drops, and the measures appear to be completely unrelated. This is further corroborated by the gradually tapering cross-correlograms in Figures 7.2.17 and 7.2.18, which are highly indicative of positively trended trajectories plotted against one another.

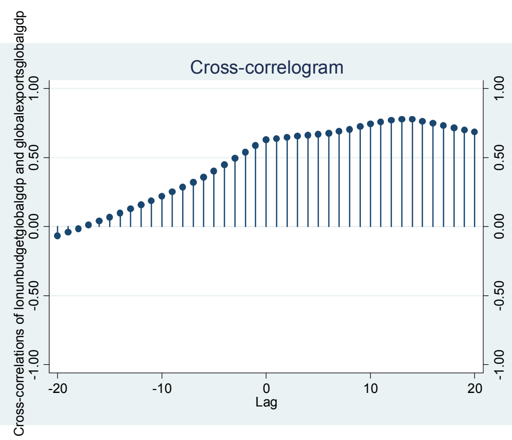


Figures 7.2.17 – 7.2.18: Sovereignty ➔ Global Imports ÷ Global GDP; Sovereignty ➔ Global Exports ÷ Global GDP

The next cluster of relationships ignores sovereignty, and focuses instead on the IGO budgetary and member count data and their relationship to trade globalization. These inter-institutional relationships—that is, relationships between political-diplomatic and economic dimensions of global integration—are highly significant at the bivariate level, as are most bivariate relationships in this section. The r-coefficients for the budgetary figures' relationship to imports and exports exceeded 0.6 in both cases, and the IGO member figures' relationships to imports and exports both exceeded 0.8, all significant at $p < 0.01$. Controlling for time, in no patterned way, results were reduced significantly, with the budgetary figures bearing partial correlations of -0.329 ($p < 0.01$) with import globalization, and -0.603 ($p < 0.01$).

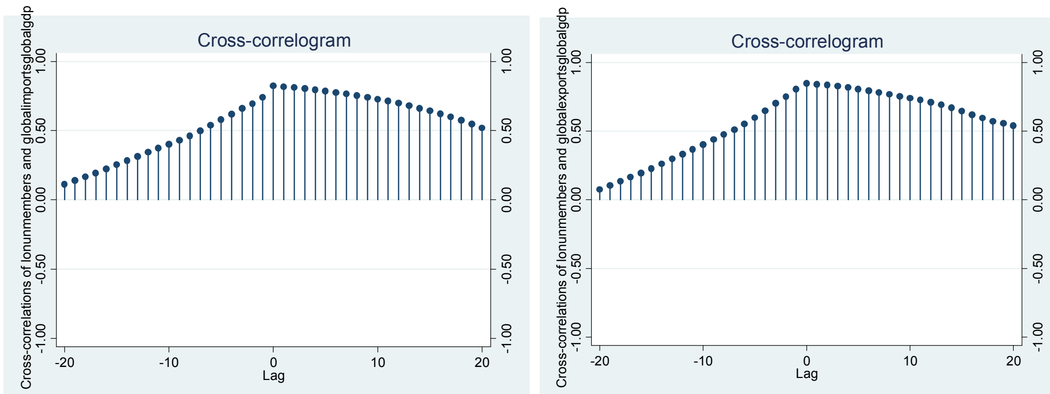
The longitudinal plot in Figure 7.2.16 is suggestive of the fact that much of the strength of the negative partial coefficient comes from the relative invariability of the trade prevalence before the 1970s. However, before this section can be concluded, the next series of cross-correlograms must also be appraised. An assumption drawn here is that budgetary increases tend to increase over the course of the century alongside imports and exports, but on an annual basis, there tends to be more of an inverse relationship. These chronic, somewhat cyclical departures from parity are what account for the negative partial relationships between imports/exports and the budgetary ratio, while a secular trend highly explained by the postwar extension of participation in the world-system to former subsidiaries of empires is what accounts for the strong, positive bivariate correlations among these measures of integration.





Figures 7.2.19 – 7.2.20: LoN/UN Budget ÷ Global GDP ➔ Global Imports ÷ Global GDP; LoN/UN Budget ÷ Global GDP ➔ Global Exports ÷ Global GDP

What is most apparent in each pair of cross-correlograms is their nearly identical output, as is expected when total global imports and exports are assessed. The budgetary figures' relationships to the prevalence of both imports and exports in the world-economy are such that increased investment in the United Nations budget might in fact be a fairly reliable predictor of trade globalization with lags as large as a decade, or more, whereas the causal inverse is less likely to be true.



Figures 7.2.21 – 7.2.22: LoN/UN Members ➔ Global Imports ÷ Global GDP; LoN/UN Members ➔ Global Exports ÷ Global GDP

In the case of the LoN and UN member count, the interpretation is nearly identical, but less exaggeratedly so. The member count is indeed a better factor of trade globalization than its outcome, but it would not be implausible to assume the converse argument that trade globalization might in fact be stimulating an emphasis in consent-based, diplomatic participation on the part of polities.

In conclusion of this section, some indicators of centralization and integration at the highest levels of the world-system are nearly perfectly parallel due either to mathematical homogeneity or the bureaucratic protocols that dictate the structure of the state-IGO network. Some of the more notable yet less expected correlations include the relationship between US GDP ÷ global GDP and its military expenditures, which were negligible at the bivariate level, but after controlling for time, they exceeded 0.7 in the case of both the raw and per-soldier military budgets.

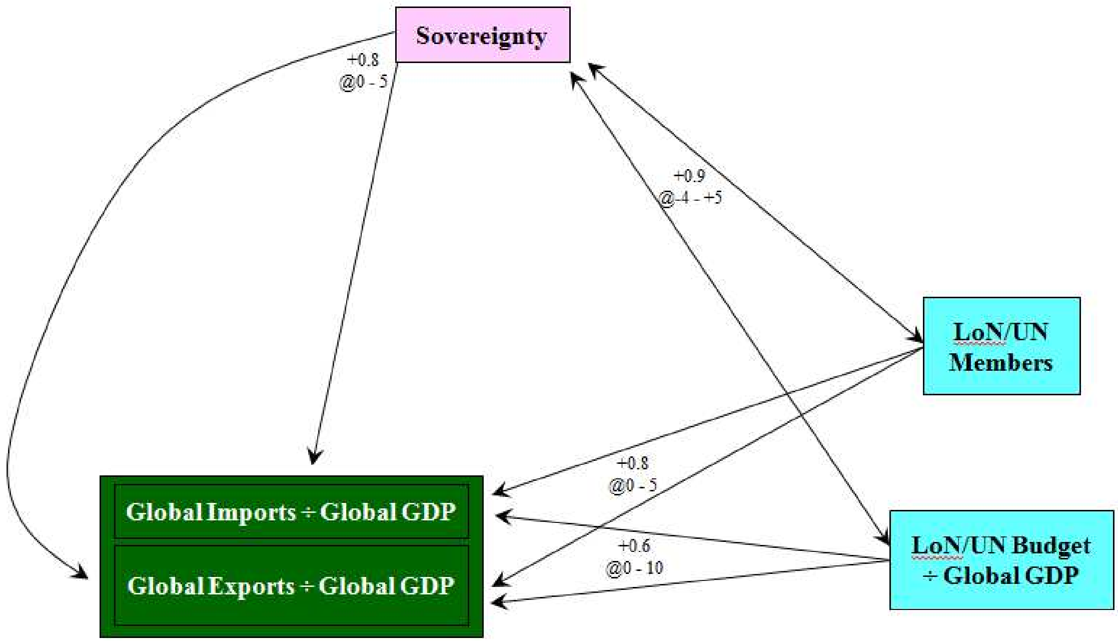


Figure 7.2.23: Optimally Lagged Bivariate Relationships among Indicators of Integration of Global Governance

Based on Figure 7.2.23, the empirically drawn narrative here is one in which—as with centralization attributes—it is the trade variables that are optimally placed as dependent variables in the causal sequence, while sovereignty and the LoN/UN variables serve as both independent and intervening variables. More multivariate options will be available with these variables in Chapter 10, in which relationships among more dissimilar measures will be assessed in conjunction with some of the more notable correlations identified here and in Chapter 9.

7.3. Chapter Summary

Given the vast number of variables in this dataset, a comprehensive analysis of all possible attribute variables would involve a larger undertaking than most dissertations can accommodate. Though a base for future research on global governance is established with the compiling of the dataset, this chapter highlights nonsignificance for the sake of exclusion from subsequent research, yielding the more promising relationships among non-network measures of global governance. To this end, the theoretical diagrams inpFigures 7.1.14, 7.1.25, 7.2.15, and 7.2.22 flag possible unique, lagged effects with optimal correlations and their corresponding lags, a foreshadowing of what might be found with Prais-Winsten regressions or other multivariate time-series research, which will be the focus of Section 9.3.

Chapter 8: Bivariate Analysis of Network Relationships

The layout of this chapter differs thematically from Chapter 7 in that it is primarily organized around research questions more oriented to social network analysis, and secondarily along the structural classification schema, divided into the horizontal/integration dimensions (network density and Krackhardt's connectedness), and its various vertical/centralization dimensions (network centrality, hegemonic node centrality, and the other three Krackhardt's measures (hierarchy, efficiency, and least upper bound). Researchers with the intention of studying relationships among the integration of more than one network, for example, can determine the nature of these relationships in the inter-network section of this chapter; while questions of relationships among different dimensions—such as the density and the centrality—of a single network, are answered in the intra-network section of the chapter.

To remind the reader, the three matrices analyzed in this dissertation are the IGO-state (Matrices 1 – 3), foreign aid (Matrix F), and trade (Matrix T) networks. The two types of relationships discussed in this body of research—inter-network, and intra-network—are first defined for ease of interpretation of the output that follows. Single-dimension inter-network relationships—such as the density of the foreign aid network and the density of the trade network—address questions about the possible causality between the property of a given network and that same property of an entirely different network of global governance. By contrast, inter-dimensional, intra-network relationships answer questions about the causal relationship between two properties of the same network, such as a network's density/integration and its centrality.

More specifically, the idea of intra-network relationships is that one property of a network—such as density—can be causally or spuriously linked to *another* property—such as Krackhart's efficiency or hierarchy—of the *same* network. While some intra-network correlation is an axiomatic result, there is enough of a margin for mathematical independence to assume that intra-network collinearity might be derived from more than just similar computational components; some correlation may even be subject to periodicity, with intermittent periods of positive correlation among various dimensions of any of these networks.

In addition, relationships between a network and its respective hegemonic node will also be included in this section, in order to determine the degree to which the variance in the centralization of a network is dependent on the variance in the centralization of either the UN, in the case of Matrix 2, or that of the US, in the case of Matrices 3, A, and T. In short, how much impact does node centralization—which is not synonymous with world-systems position relative to all the other nodes—have upon the centralization of the entire world-system? Applied to the trade network, for example, this might illustrate how much the fluctuations in US international trade affect the fluctuations in the entire network, particularly after a lag of a few years. With a 0 or negative correlation, the world-economy might be said to elicit a market structure in which the cessation of trade among the hegemon opens alternative market options, or more plausibly, renders those already existing options more appealing to dependent nations, whereas a positive correlation would point to a zero-sum game among cores for the bulk of the market's share.

Any direct or indirect relationships involving any or all of the three network matrices as well as non-network variables (such as the standard deviation of GNP per capita) constitutes a fourth type of relationship, covered in the next chapter, which will integrate all previous analysis, addressing the main questions of this dissertation.

As with Chapter 7, bivariate correlations are complemented by partial correlations controlling for year, removing the secular trend and possibly revealing relationships that are independent of century-long intensification. Cross-correlations also augment the argument of causality among these phenomena.

8.1. Inter-network, Intradimensional Relationships: Network Density and Connectedness

The first relationships tested involve those among the densities of the various networks, proxying the degree to which IGO co-affiliation, foreign aid, and trade are integrated across the period. This addresses the question of whether the integration of global governance occurs uniformly or heterogeneously across networks, as well as the same question regarding its vertical differentiation.

8.1.1. Inter-Network Relationships: Density

Figure 8.1.1 illustrates the possible causal relationships among the densities of the networks, which are subsequently compared to the correlation output. Because the structure of the IGO-related networks (Matrices 1, 2, and 3) is decided 1 to 2 years in advance, it cannot be a dependent variable in Figure 8.1.1 without being lagged by at least 2 years, hence the lack of reciprocal causality back to the density of Matrices 1, 2, or 3. Though the correlations among the densities of Matrices 1, 2, and 3 are so inordinately high (due to the fact that they're measuring different permutations of the same relationships), it is Matrix 3 that measures the density of the IGO-state network with states as the focal unit of interaction, and it is consequently this matrix—not Matrices 1 and 2—that will be considered for bivariate analysis here.

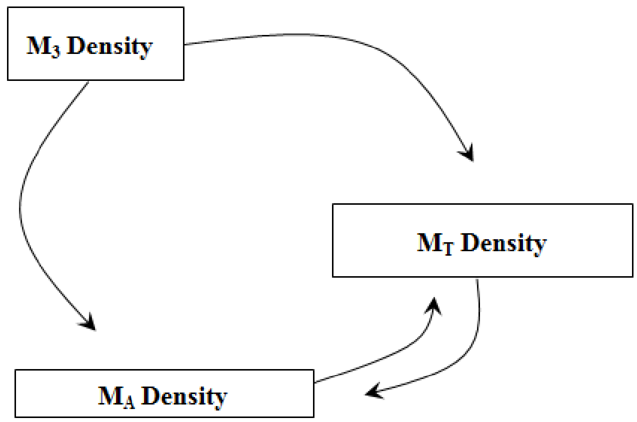


Figure 8.1.1: Unlagged Causality among Network Densities

The following are matrices of Pearson's correlations, all at 0 lags. The first one summarizes the bivariate correlations among all the relevant densities of each matrix, while the second reports the partial correlations, controlling for time. As mentioned in Chapter 7, the cells in the Pearson's matrices have been color-coded based on intensity: red cells have absolute values higher than 0.7; light green cells have absolute values between 0.5 and 0.7; dark green cells have absolute values between 0.3 and 0.499; and gray cells report r-coefficients between -0.2999 and 0.2999.

As is expected, the relationships among the three densities of the IGO-related matrices are both higher than 0.9. This collinearity, as stated previously, is computational rather than causal or spurious, though the correlations among Matrices 3, A, and T are also comparably high, for which there is no computational reason. That is to say, the three separate networks in this study are, in fact, highly related, and possibly causally so.

Bivariate Correlations		Year	M1 Density	M2 Density	M3 Density	MAid Density	MTrade Density
Year	**r**	1	0.785	0.957	0.948	0.930	0.754
	Sig. (2-t)		0.000	0.000	0.000	0.000	0.000
	N	97	97	71	97	53	91
M1 Density	**r**	0.785	1	0.983	0.924	0.886	0.856
	Sig. (2-t)	0.000		0.000	0.000	0.000	0.000
	N	97	97	71	97	53	91
M2 Density	**r**	0.957	0.983	1	0.985	0.880	0.915
	Sig. (2-t)	0.000	0.000		0.000	0.000	0.000
	N	71	71	71	71	53	65
M3 Density	**r**	0.948	0.924	0.985	1	0.906	0.889
	Sig. (2-t)	0.000	0.000	0.000		0.000	0.000
	N	97	97	71	97	53	91
MAid Density	**r**	0.930	0.886	0.880	0.906	1	0.918
	Sig. (2-t)	0.000	0.000	0.000	0.000		0.000
	N	53	53	53	53	53	50
MTrade Density	**r**	0.754	0.856	0.915	0.889	0.918	1
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	
	N	91	91	65	91	50	91

Table 8.1.1: Bivariate Correlations among Network Densities

To verify that the secular trend is not wholly accountable for the disproportionately high coefficients above, the partial correlations below control for the linear increase in time, still yielding collinear values for the relationships among Matrices 1, 2, and 3, but in this case, Matrices 3 and A are now negatively and nonsignificantly correlated by a factor of 0.205 ($p > 0.05$), meaning that in the short-term, foreign aid density decreases at the same time that IGO-state networks become more integrated (though this relationship is considered negligible by some statisticians) while Matrices 3 and T remain strongly positively correlated ($r = 0.834$; $p < 0.001$).

Partial Correlations Controlling for Year		M1 Density	M2 Density	M3 Density	MAid Density	MTrade Density
M1 Density	**r**	1	1	0.911	0.685	0.649
	Sig. (2-t)	.	0.000	0.000	0.000	0.000
	N	0	68	94	50	88
M2 Density	**r**	1	1	0.849	-0.093	1
	Sig. (2-t)	0.000	.	0.000	0.510	0.000
	N	68	0	68	50	62
M3 Density	**r**	0.911	0.849	1	0.205	0.834
	Sig. (2-t)	0.000	0.000	.	0.145	0.000
	N	94	68	0	50	88
MAid Density	**r**	0.685	-0.093	0.205	1	0.900
	Sig. (2-t)	0.000	0.510	0.145	.	0.000
	N	50	50	50	0	47
MTrade Density	**r**	0.649	1	0.834	0.900	1
	Sig. (2-t)	0.000	0.000	0.000	0.000	.
	N	88	62	88	47	0

Table 8.1.2: Partial Correlations among Network Densities

In short, the unlagged correlation coefficients support the argument that the density of the IGO-IGO matrix is highly positively collinear with that of the import/export matrix, but only slightly positively correlated with the density of the foreign aid matrix. Cross-correlations will follow this and other Pearson's matrices in order to highlight any lagged relationships between the density of membership status of countries in the IGOs selected and the densities of the trade and foreign aid networks.

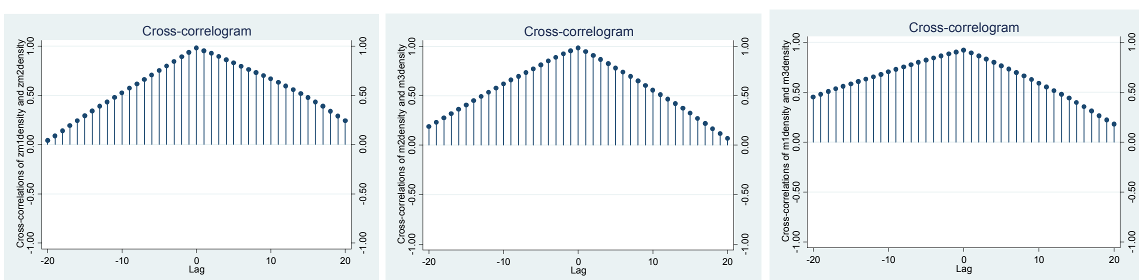
Because, as previously stated, the IGO-related matrix is manifested by decisions made 1 to 2 years before the year reported, its structure cannot be caused by the same year's trade and foreign aid matrices, and thus, any such effects cannot be substantiated with any of the unlagged coefficients reported in Table 8.1.2. Instead, cross-correlations will highlight any possible effects that the structure of the IGO-state networks has on trade and foreign aid, as well as any effects that trade and foreign aid might have on one another.

It can be said so far that the density of the IGO network is a possible predictive factor of the density of the trade network. Though lagged correlations will provide additional insight before this conclusion can be confidently drawn, the longitudinal plot in Figure 6.2.8, found in Section 6.2.1, first tracks the trajectories of the densities of Matrices 1, 2, and 3 throughout the League of Nations and United Nations periods, each standardized so as to be plotted along a single axis given each raw density measure's widely differing ranges.

The overwhelmingly parallel trajectories foreshadow the cross-correlograms that follow, each exhibiting linearly tapering collinearity among the measures. The permuted nature of these matrices accounts for much of the correlation, but it is in the periods of irregularity that more interesting narratives emerge. For example, the disbanding of CENTO and SEATO in the late 1970s seems to affect the original IGO-state network's density (Matrix 1) as well as that of the IGO-IGO co-affiliation network (Matrix 2), but because both CENTO and SEATO are regional—not global—organizations, their limited member rosters do little to rattle the density of the entire system's state-state co-affiliation network (Matrix 3) because the total number of connections in that matrix are not as dependent on the rise and fall of two IGOs, given the comparatively vast amount of possible connections in Matrix 3 (almost 40,000 by the end of the period).

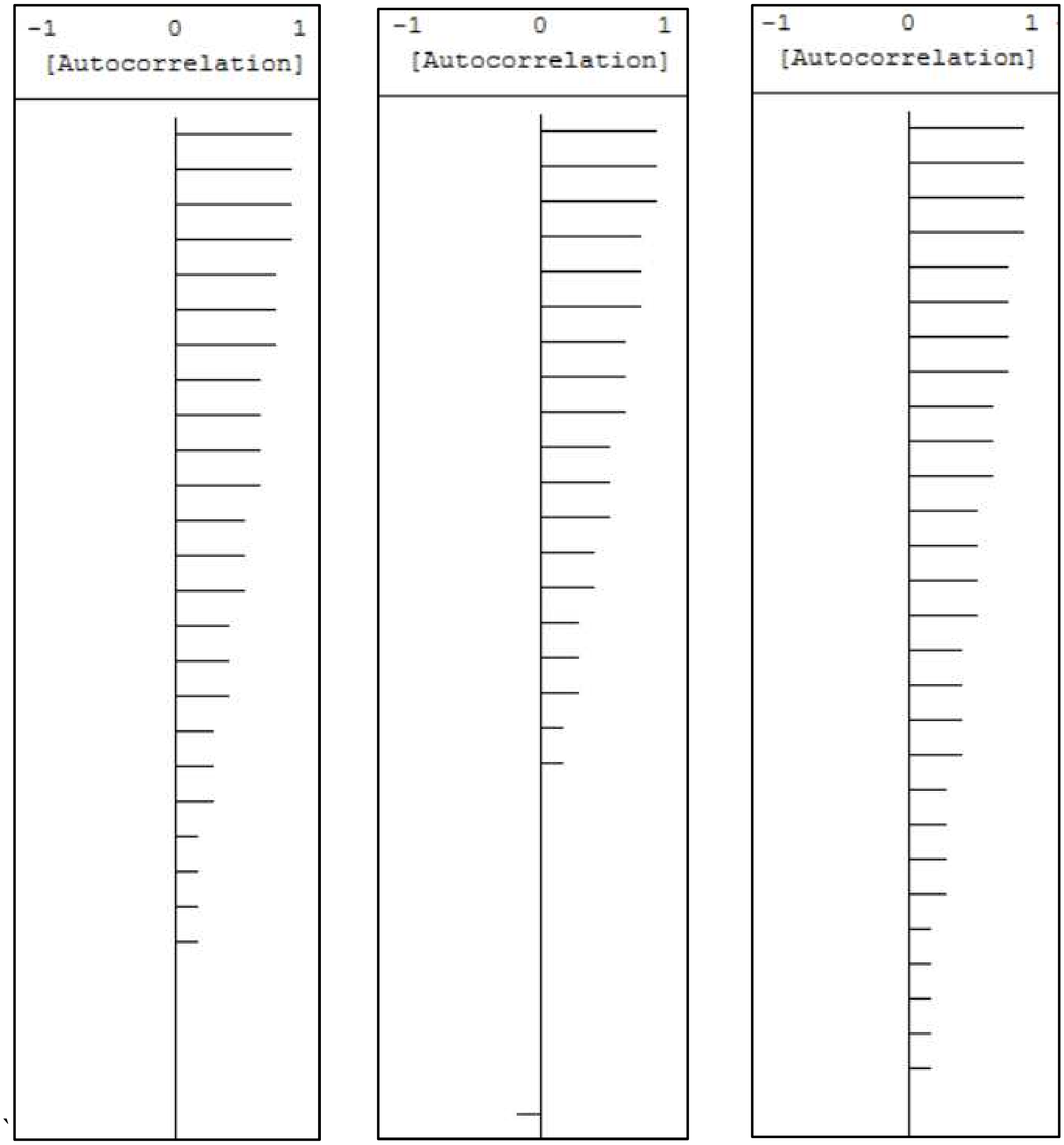
Because the density of the IGO-IGO co-affiliation network in Matrix 2 cannot be computed with only one IGO, density figures are incalculable prior to 1945, though they can be calculated for the state-by-state co-affiliation matrix prior to the founding of the UN. The shifting membership of the League of Nations between 1919 and 1945 affects the density of the raw matrix, but not necessarily the state-state co-affiliation matrix, given that the number of co-affiliations in Matrix 3 is not as affected by states joining or quitting an IGO when it is the only IGO.

Judging by the longitudinal distributions in Figure 6.2.8, found in Section 6.2.1, as well as the cross-correlograms in Figures 8.1.2 through 8.1.4, the collinearity drops off linearly in all the relationships among the three permutations of the IGO matrices, suggesting that the autocorrelation within each of these is most likely confounding much of the apparent zero-order collinearity evident in the three figures below.



Figures 8.1.2 – 8.1.4: Matrix 1 Density ➔ Matrix 2 Density; Matrix 2 Density ➔ Matrix 3 Density; and Matrix 1 Density ➔ Matrix 3 Density

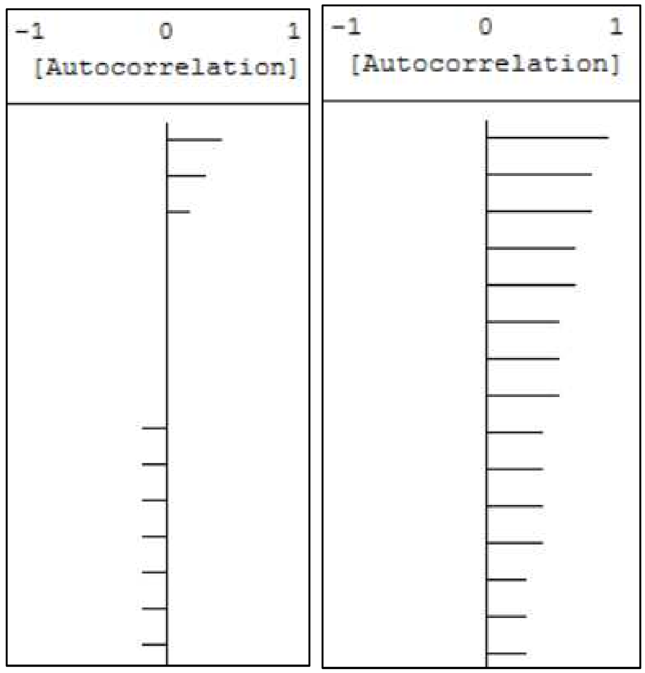
In other words, because the densities of Matrices 1 (raw state-IGO network), 2 (IGO-IGO co-affiliation network), and 3 (state-state network) are nearly perfectly collinear at 0-lags, Figures 8.1.5 through 8.1.7 represent the degree of autocorrelation responsible for the diminishing collinearity with increasing lags. Autocorrelation plots among the densities of the foreign aid and trade matrices (Figures 8.1.8 and 8.1.9) confirm this with gradually diminishing r-coefficients, approximating 0 after 20 – 30 lags.



Figures 8.1.5 – 8.1.7: Autocorrelations of Densities of Matrices 1, 2 & 3, respectively

As expected from the cross-correlations, roughly linearly tapering autocorrelations are evident in all three correlograms above. Though this was altogether expected given the computational homogeneity of these matrices, the documentation of these obvious summary statistics was nevertheless necessary before proceeding to less obvious relationships.

Before analyzing density cross-correlations between the foreign aid and trade networks, the following two autocorrelations illustrate divergent narratives.



Figures 8.1.8 – 8.1.9: Autocorrelations of Densities of Matrices A & T

The density of the foreign aid matrix (Figure 8.1.8) appears to be hardly autocorrelated at all, while the trade network's density (Figure 8.1.9) seems fairly subject to a linearly tapering autocorrelation akin to Figures 8.1.4 through 8.1.6. From this dissimilarity follows that if cross-correlation exists between the densities of these two matrices, it is unlikely that seasonal cycles or secular trends would account for such a relationship, and to confirm this, their unlagged, bivariate coefficient ($r = 0.918$) remains quite high when the secular trend is controlled for (partial $r = 0.900$; $p < 0.001$), suggesting that the overwhelming majority of the correlation here is short-term, not trend-dependent. When lags are applied to the bivariate correlation between Matrices A and T, the following figure is rendered.

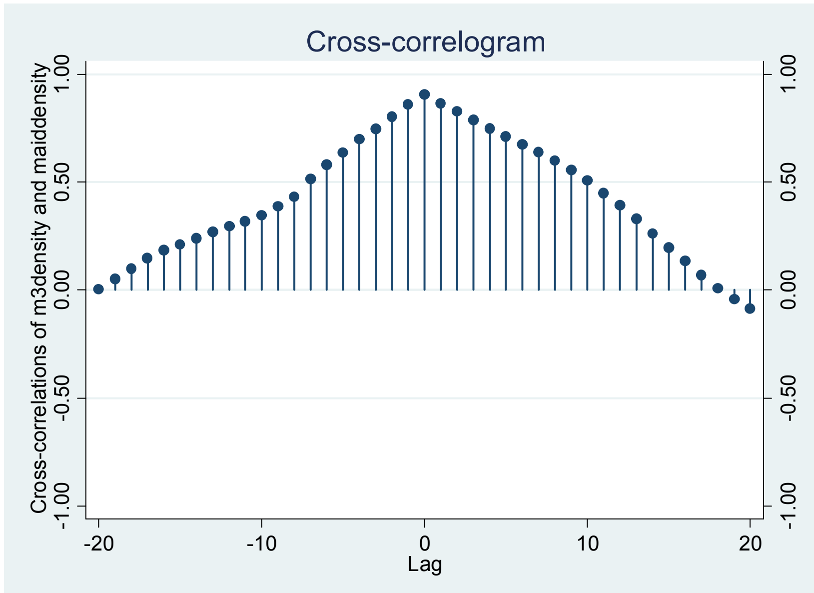


Figure 8.1.10: Matrix 3 Density ➔ Matrix A Density

Figure 8.1.10 resembles Figures 8.1.2 through 8.1.4, all of which point to unlagged correlations being optimal. Similarly, Figure 8.1.11 suggests that lagging is likely to reduce significance here, though the more plausible figure to lag would be foreign aid density, as this continues to have correlation with trade density up to and beyond a 10-year lag. While correlations among the dimensions of computationally related matrices are mathematically expected of the relationships among the densities of Matrices 1, 2 and 3, there is no computational reason that the densities of Matrices 3 and T should be so highly correlated, and the same is true for the relationship between Matrices A and T, cross-correlated below.

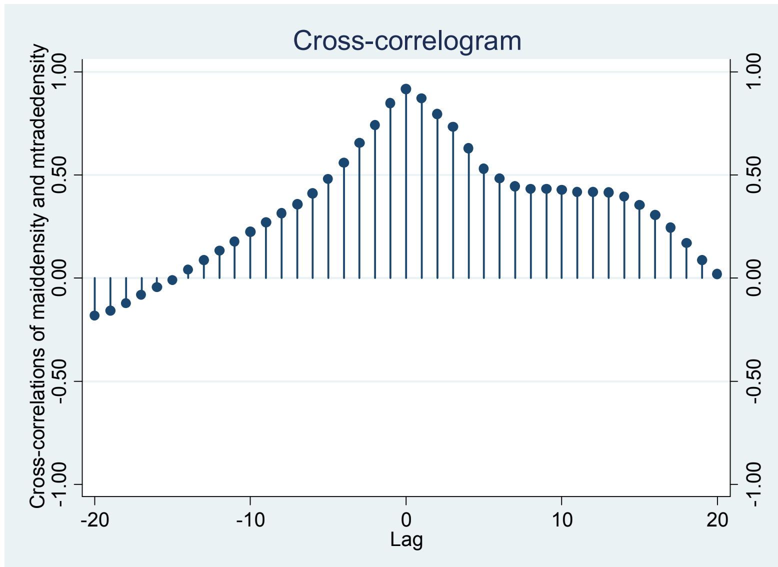


Figure 8.1.11: Matrix A Density ➔ Matrix T Density

Figure 8.1.12 cross-correlates the densities of Matrices 3 and T, yielding a quite significant inter-network relationship, and supporting the theoretical assumption that between the two, the more likely *independent* variable in a multivariate model involving both variables would be the density of Matrix 3. Though the highest correlation between these two was unlagged, it appears that the density of Matrix 3—consistent with the theoretical implications of causality herein—might be affecting the density of the trade network in the much longer term. Again, all lags in this study will be capped at 10 years, given the assumption that lags longer than a decade might be confounded and obscured by the shorter-term processes being measured.

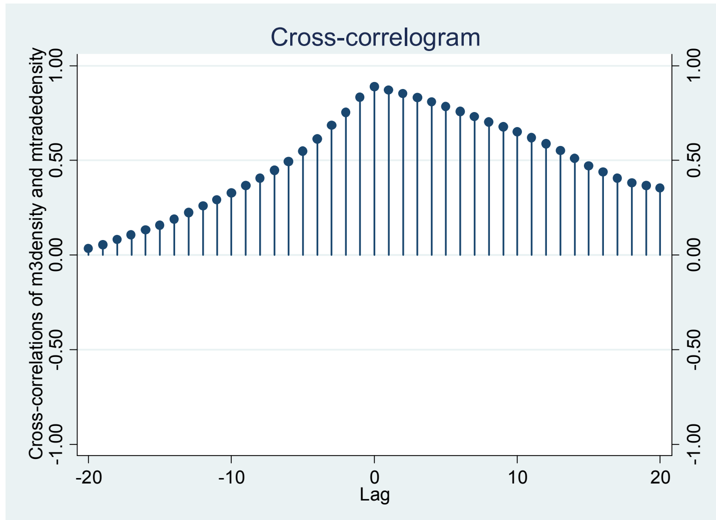


Figure 8.1.12: Matrix 3 Density ➔ Matrix T Density

To complement Figure 8.1.12, Figure 8.1.13 longitudinally plots and standardizes the densities of the state-IGO network, the foreign aid network, and the trade network.

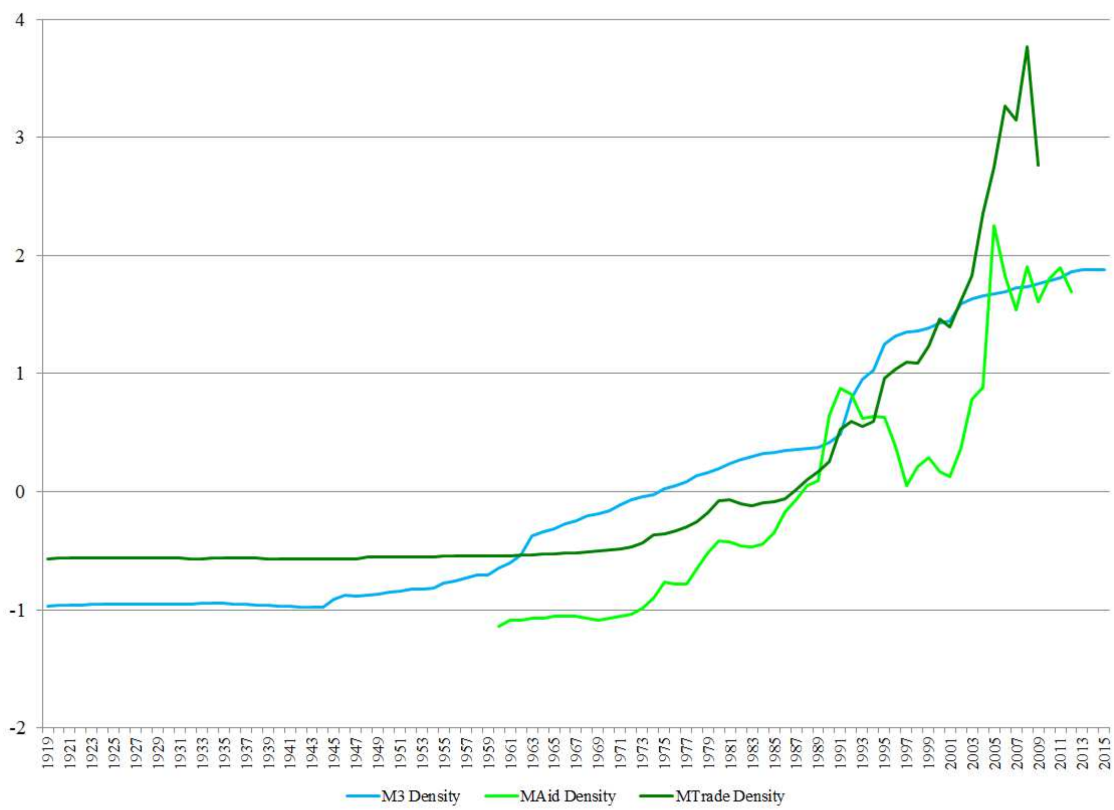


Figure 8.1.13: Densities of Matrices 3, A and T, Standardized

The flat distributions in the densities of Matrices 3 and T during the first five decades of the timeline (when Matrix A data are not available) correspond to fluctuations so small relative to the variance of the later period that the early variance is largely cancelled out in a bivariate correlation, though not necessarily in a partial one. A heteroscedastic distribution—one with greater variance at the high end of the range, in this case—characterizes the densities of both of these matrices, and if foreign aid data went back farther than 1960, a similar phenomenon would likely present itself.

With the cross-correlogram of the foreign aid and IGO matrices in Figure 8.1.10, the most plausible relationship here would be one of immediate (that is, unlagged) causality, in which the density of Matrix 3 might predict better the density of Matrix A, not just due to the cross-correlogram favoring that assumption, but because of 1- to 2-year-lag between membership status being decided upon and its official fruition. Therefore, as previously stated, regardless of what any cross-correlogram might report, any network attribute of Matrices 1, 2, and 3 (only the last of which is relevant here) cannot by logic be determined by any attribute of the trade and foreign aid matrices—and of any attribute variable in the dataset used in this analysis—unless such variable is lagged by at least 2 years. Further analysis of lagged effects on properties of Matrix 3 may fall subject to the scrutiny of temporal precedence in the causal structuring (and lagging) of subsequent hypotheses.

8.1.2. Inter-Network Relationships: Connectedness

Inter-network relationships involving the connectedness of each network conclude this section, though intra-network relationships between connectedness and density—the other proxy for the integration of global governance using network dimensions—will follow later in this chapter. Much as with density, the connectedness of each network is a measure of its horizontal integration, not centralization or hierarchy, though Krackhardt (1994) emphasizes that a fully hierarchical network must by necessity also be fully connected.

Though collinearity is expected among the connectednesses of homogeneously derived network matrices (such as Matrices 1, 2, and 3), among matrices that do not reflect homogeneous dimensions of global governance, the connectednesses of the three networks in this study are multicollinear when the secular trend is ignored. All r-coefficients in Table 8.1.3 exceed 0.9, and even when controlling for time in the partial correlations in Table 8.1.4, the coefficients remain strongly positive, the weakest of them being that between the connectednesses of the foreign aid and of trade networks ($r = 0.793$; $p < 0.001$). The long-term trends, therefore, only account for only a minority fraction of the covariance.

Bivariate Correlations		**Year**	**M3 Connectedness**	**MAid Connectedness**	**MTrade Connectedness**
Year	**r**	1	0.968	0.904	0.959
	Sig. (2-t)		0.000	0.000	0.000
	N	97	97	53	85
M3 Connectedness	**r**	0.968	1	0.961	0.988
	Sig. (2-t)	0.000		0.000	0.000
	N	97	97	53	85
MAid Connectedness	**r**	0.904	0.961	1	0.963
	Sig. (2-t)	0.000	0.000		0.000
	N	53	53	53	50
MTrade Connectedness	**r**	0.959	0.988	0.963	1
	Sig. (2-t)	0.000	0.000	0.000	
	N	85	85	50	85

Table 8.1.3: Bivariate Correlations among Network Connectednesses

By contrast, the bivariate relationship between the connectednesses of Matrices A and 3 has no mathematically endogenous collinearity (i.e., the two matrices are not calculations from the same matrix of raw numbers, though the r-coefficient (0.961; $p < 0.001$) still points to a strong, immediate relationship between the connectednesses of the foreign aid and IGO-state co-affiliation networks. Longitudinally plotted in Figure 8.1.14, these appear as related processes acting on what is most likely a secular trend for both, though the IGO-state network's trend is more linear, while that of foreign aid bears some cyclicality. What appears to be a cyclical trend with at least three distinct upswings is the measure of the connectedness of the foreign aid matrix.

While it will be interesting to see what types of unique, intra-network relationships exist between a network's density and its connectedness, it is clear so far that the relationship between the connectedness of a given network has a highly similar trajectory to the connectednesses of the other two networks. In short, the connectedness of the world-system appears to be a steady, ongoing process with only a few instances of disconnection among nodes throughout the century of interest.

Partial Correlations Controlling for Year		M3 Connectedness	MAid Connectedness	MTrade Connectedness
M3 Connectedness	**r**	1	0.802	0.840
	Sig. (2-t)	.	0.000	0.000
	N	0	50	82
MAid Connectedness	**r**	0.802	1	0.793
	Sig. (2-t)	0.000	.	0.000
	N	50	0	47
MTrade Connectedness	**r**	0.840	0.793	1
	Sig. (2-t)	0.000	0.000	.
	N	82	47	0

Table 8.1.4: Partial Correlations among Network Connectednesses

To reiterate the summary of the partial correlations, not only is the above true in the long-term, given the general boost in the scope of international trade, foreign aid relationships, and IGO membership, but apparently, even short-term increases and decreases are, for the most part, taking place in significant synchrony with one another. This is evident in the nearly perfectly aligned trajectories of each of these connectedness scores in Figure 8.1.14, suggesting that diplomatic ties among nation-states—facilitated by IGOs—might very well serve as a positive predictor of the connectedness of foreign aid and trade relationships as well.

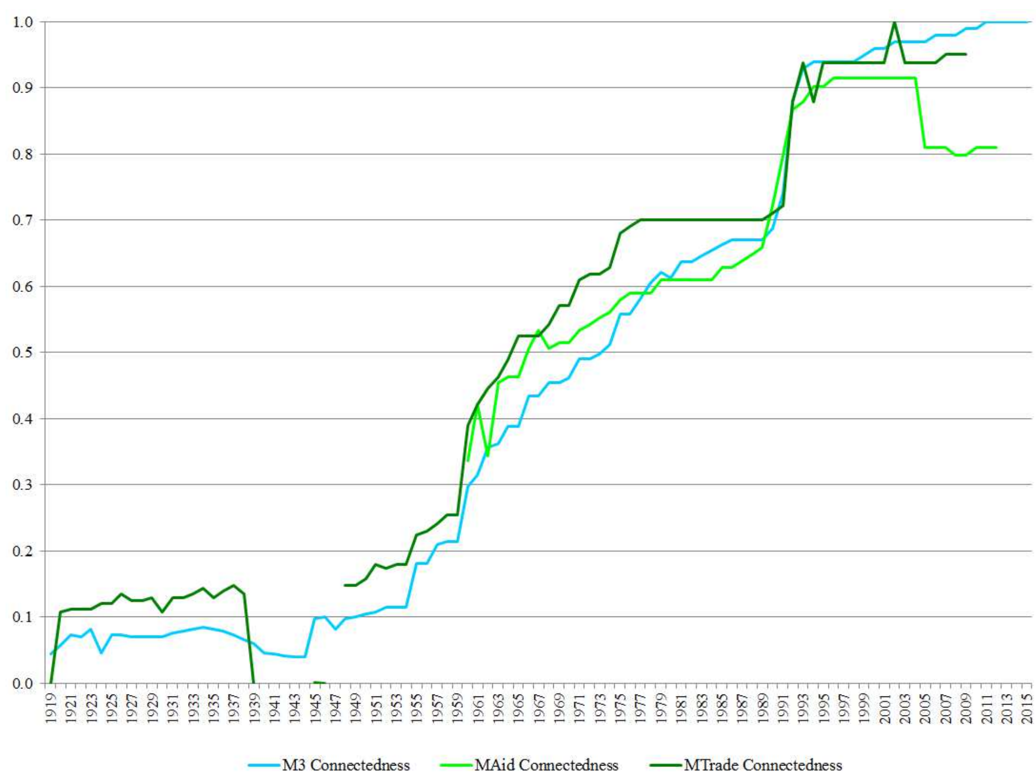
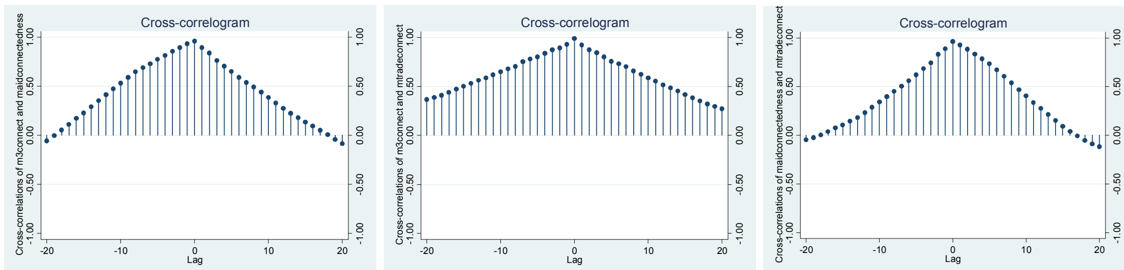


Figure 8.1.14: Connectednesses of Matrices 3, A and T

The cross-correlograms below confirm not only the exceeding collinearity of connectedness across matrices, but also the fact that lags actually decrease the probability of any causal relationship here. These are surprising and substantively important findings, given that there are no mathematical/computational components in common across these three networks.



Figures 8.1.15 – 8.1.17: Matrix 3 Connectedness → Matrix A Connectedness; Matrix 3 Connectedness → Matrix T Connectedness; and Matrix A Connectedness → Matrix T Connectedness

The narrative to be taken away here, echoed by the density output above, is that a single form of integration of global governance, at least insofar as it is measured via these three networks, is highly positively influencing of other integrative forms.

This portion of the chapter has been devoted to answering questions regarding the relationships among dimensions of integration (density and connectedness) of the networks in this study. Every cross-correlogram in this section reports overwhelmingly high, unlagged correlations with every other measure, and in every case, unlagged correlations are optimal relative to lags in either direction. Relationships like these are likely to prevail throughout the next section of the chapter, which applies the same inter-network, intradimensional comparative approach in this section to the centrality of these three networks.

8.2. Inter-network, Intradimensional Relationships: Centrality

So far, only the integration of the world-system (i.e., network density) has been analyzed at the bivariate level. To complement this flat-world measure, the centrality of the world-system offers not only another perspective into the character of the largest networks on Earth, but also into the role played by their most formative actors, namely the United Nations in Matrix 2, and the United States in Matrix 3.

Though this section contains inter-network relationships involving centrality, it also introduces the idea of intra-network relationships, such as the centrality of a network and the centrality of its hegemonic node. As noted in Chapters 3 and 6, normalized centrality is a more valid measure than raw centrality (which is actually the numerator in the fractional formula that renders the normalized value) when comparing individual nodes to groups or to an entire network (see also Everett and Borgatti, 2005) that includes unconnected actors. Though raw Freeman's *unnormalized* degree centralities are also available for future research, only the normalized versions of these values are analyzed and discussed in this dissertation.

This singularizes the scales of node and network centrality by dividing each of their raw values by their maximum-value equivalent—generating a percentile figure potentially ranging from 0 to 100—aiding in the interpretation of values also across networks. Of those whose correlations would be more likely attributed to theoretical, testable principles (rather than those that are permuted from a common matrix), there are some notable narratives that can be drawn from unexpectedly opposite findings, such as the negative relationship between Matrix 3's centrality and that of the UN, coupled with positive relationships between the foreign aid matrix's centrality and the US node centralities, as well as the in- and out-centralities of the trade matrix and those of the US.

This section begins with matrix-to-matrix comparisons, followed by a discussion of node-to-matrix relationships.

An overview of the expected collinearity and causality (or at least bivariate correlation at this juncture) is illustrated in Figure 8.2.1.

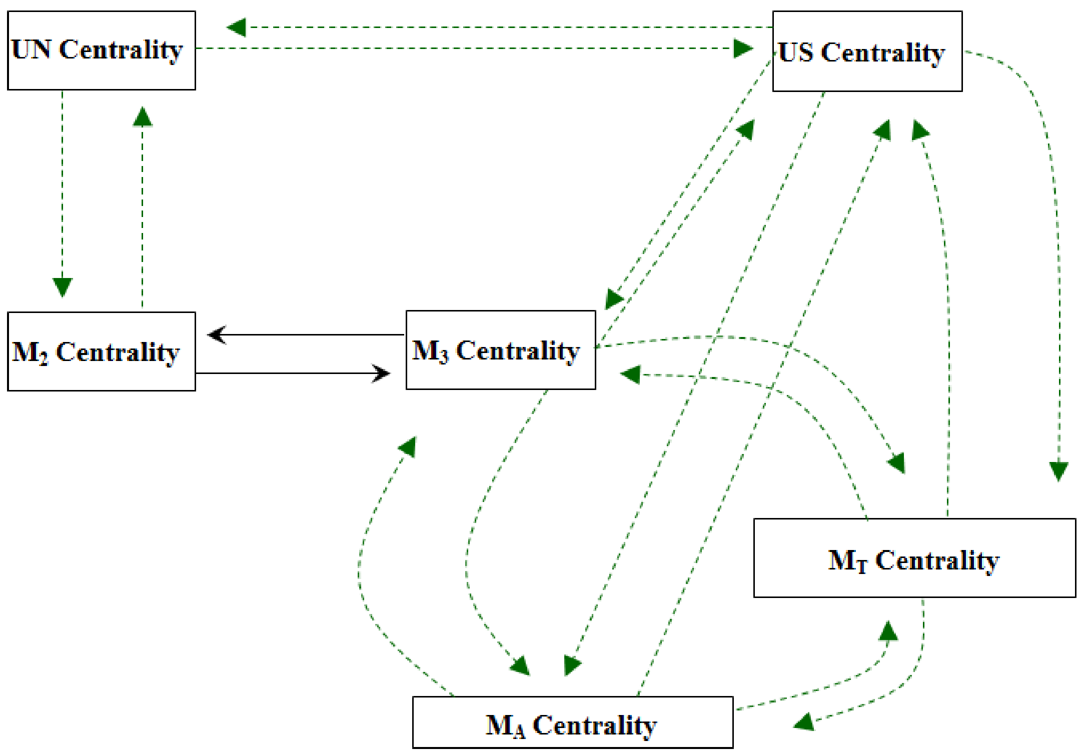
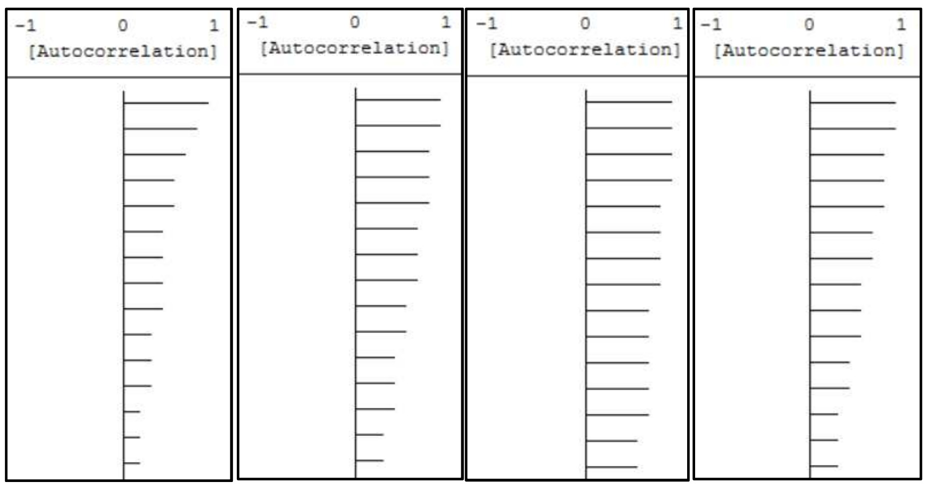


Figure 8.2.1: Centralities of Matrices 3, A, T, and Hegemonic Nodes (the UN and the US)

This theoretical framework highlights the most likely relationships to be expected if the structure of one network affects the structure of another (dashed-lined arrows) as well as relationships based on mathematical/computational collinearity (solid-lined arrows). The former constitute the empirical basis for subsequent hypothesis testing of the relationships among the centralities of the matrices, while the latter will be included in order to reduce redundancy in analyses of possible causality detailed in Chapter 9.

8.2.1. Matrix Centralities

Before proceeding to more complex bivariate analysis, brief mention is needed of the autocorrelation values of the centralities of each of the various IGO networks and their respective central nodes. Figures 8.2.2 through 8.2.5 show the linearly tapering decrease in autocorrelation across the periods that characterize the densities of these networks.

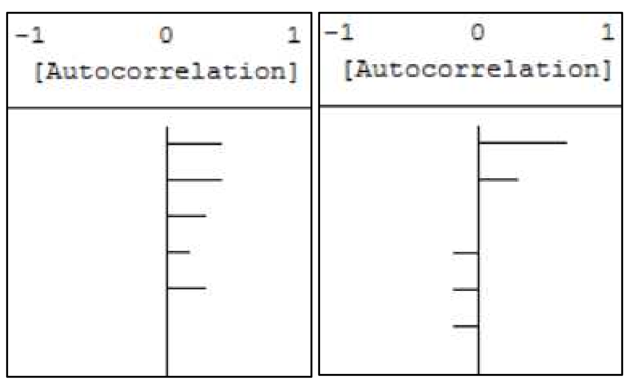


Figures 8.2.2 – 8.2.5: Autocorrelations of the Centralities of Matrix 2, the UN, Matrix 3, and the US, respectively

The two leftmost correlograms are relevant to IGO co-affiliations, while the three to the right represent dimensions of the state co-affiliation matrices. The levels of autocorrelation for all variables are inordinately high, and in the case of the centrality of Matrix 3, more persistently so. Autocorrelation can be dealt with in several ways, including calculating the absolute or proportional change scores of each variable across time. Rather than resorting to this rather problematic technique[19], however, the method of preference remains periodization of at least some of these relationships.

[19] Change score analysis adds several methodological issues to the analysis: it tends to be dominated by local noise, be very sensitive to lag specification, and consequently produces a very low R^2. It is also often

Unlike the correlograms in Figures 8.2.2 through 8.2.5, which represent the densities Matrices 2 and 3 and their respective hegemonic nodes, and exhibit high, gradually decreasing autocorrelation endemic of so many other variables in this study, Figures 8.2.6 and 8.2.7 illustrate the centrality of receiverships. The leftmost correlogram—reflecting in-centrality—bears moderate autocorrelation during a half-decade or so, while the centrality of donorships on the right appears to have significant first-order autocorrelation that sharply drops to insignificance and then possibly becomes negative after a 4- or 5-year lag. In the case of both of these centralities, the elimination of some of the autocorrelation's confounding effects may make it possible for bivariate relationships involving either of these two dimensions to change drastically when either of these is lagged by 5 or more years.



Figures 8.2.6 – 8.2.7: Autocorrelations of In- and Out-Centralities Matrix A

Matrix 2—the permuted IGO-IGO co-affiliation matrix—is the odd variable in this set, as it reflects the properties of IGOs, specifically their number of co-affiliates, while Matrices 3, A, and T reflect interaction among nation-states. As was the case with density, Matrix 2's relationship to Matrices A and T will be held with less weight than

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the case that change scores contain only a small proportion of the total variance in variables (Robert Hanneman, correspondence, 5/13/2016). These complications greatly outweigh the intended benefits of the incorporation of this method into the analysis.

any correlations evident between Matrix 3's centrality and that of Matrices A and T, as well as that of the US in these matrices. The rationale for this is presented in Chapter 6 and expanded upon below.

The opening Pearson's bivariate correlation matrix in Table 8.2.1 begins the discussion of the matrix centralities of each network, followed by Table 8.2.2, which plots the partial equivalent of the bivariate matrix, controlling for time. To recap some of the methodological aspects of these variables, Matrices 2 and 3 are symmetric, and thus the calculation of in- and out-centralities is irrelevant here; rather, single centrality measure is rendered. On the other hand, the bidirectional/asymmetrical structure of the import/export and recipient/donor networks produces separate in- and out- centralities for each half of each matrix.

In the case of the foreign aid network, US centrality is held constant at 0 as a recipient, and therefore only the variation in the out-centrality of the United States (as a donor) is analyzed here. By contrast, both the in- and out-centralities of the trade network's hegemonic node are variable, and therefore included in this analysis.

Bivariate Correlations		Year	M2 Centrality	M3 Centrality	MAid In-Centrality	MAid Out-Centrality	MTrade In-Centrality	MTrade Out-Centrality
Year	r	1	-0.752	-0.909	0.428	0.217	-0.035	0.272
	Sig. (2-t)		0.000	0.000	0.001	0.119	0.744	0.009
	N	97	71	97	53	53	91	91
M2 Centrality	r	-0.752	1	0.482	-0.465	-0.285	-0.213	-0.714
	Sig. (2-t)	0.000		0.000	0.000	0.038	0.088	0.000
	N	71	71	71	53	53	65	65
M3 Centrality	r	-0.909	0.482	1	-0.298	-0.090	-0.202	-0.389
	Sig. (2-t)	0.000	0.000		0.030	0.522	0.054	0.000
	N	97	71	97	53	53	91	91
MAid In-Centrality	r	0.428	-0.465	-0.298	1	0.235	-0.060	0.335
	Sig. (2-t)	0.001	0.000	0.030		0.090	0.676	0.017
	N	53	53	53	53	53	50	50
MAid Out-Centrality	r	0.217	-0.285	-0.090	0.235	1	-0.071	0.037
	Sig. (2-t)	0.119	0.038	0.522	0.090		0.624	0.801
	N	53	53	53	53	53	50	50
MTrade In-Centrality	r	-0.035	-0.213	-0.202	-0.060	-0.071	1	0.724
	Sig. (2-t)	0.744	0.088	0.054	0.676	0.624		0.000
	N	91	65	91	50	50	91	91
MTrade Out-Centrality	r	0.272	-0.714	-0.389	0.335	0.037	0.724	1
	Sig. (2-t)	0.009	0.000	0.000	0.017	0.801	0.000	
	N	91	65	91	50	50	91	91

Table 8.2.1: Bivariate Correlations among Network Centralities

Partial Correlations Controlling for Year		M2 Centrality	M3 Centrality	MAid In-Centrality	MAid Out-Centrality	MTrade In-Centrality	MTrade Out-Centrality
M2 Centrality	r	1	-0.737	-0.240	-0.190	-0.363	-0.803
	Sig. (2-t)	.	0.000	0.086	0.177	0.003	0.000
	N	0	68	50	50	62	62
M3 Centrality	r	-0.737	1	0.243	0.264	-0.562	-0.353
	Sig. (2-t)	0.000	.	0.082	0.059	0.000	0.001
	N	68	0	50	50	88	88
MAid In-Centrality	r	-0.240	0.243	1	0.162	-0.051	0.252
	Sig. (2-t)	0.086	0.082	.	0.252	0.730	0.081
	N	50	50	0	50	47	47
MAid Out-Centrality	r	-0.190	0.264	0.162	1	-0.065	-0.024
	Sig. (2-t)	0.177	0.059	0.252	.	0.657	0.870
	N	50	50	50	0	47	47
MTrade In-Centrality	r	-0.363	-0.562	-0.051	-0.065	1	0.763
	Sig. (2-t)	0.003	0.000	0.730	0.657	.	0.000
	N	62	88	47	47	0	88
MTrade Out-Centrality	r	-0.803	-0.353	0.252	-0.024	0.763	1
	Sig. (2-t)	0.000	0.001	0.081	0.870	0.000	.
	N	62	88	47	47	88	0

Table 8.2.2: Partial Correlations among Network Centralities

The only mathematically necessary collinearity in this output is that between the properties of Matrices 2 and 3, but even this is just mildly correlated ($r = 0.482$; $p < 0.001$), a lower-than expected relationship, given that the figures are permuted from the same raw data. An explanation for this, as noted in Chapter 6, and again in Section 8.1, may be that the number of IGOs in Matrix 2 (less than 12 on any given year) versus the whole of the nation-states in Matrix 3 (close to 200 in the last few decades) renders them differentially sensitive to the founding or disbanding of an IGO or to the joining or quitting of a nation-state. The partial correlation for this relationship becomes highly negative ($r = -0.737$; $p < 0.001$). Though there is no applicable causal mechanism between these inverse permutations of Matrix 1, the mathematical relationship between the two appears to be—at least in part—that while both are subject to a general trend of diminishment (i.e., the IGO-state network is becoming less centralized over the course of the century of interest), short-term changes in the constituency of IGO nodes are covarying inversely during a significant portion of the timeline.

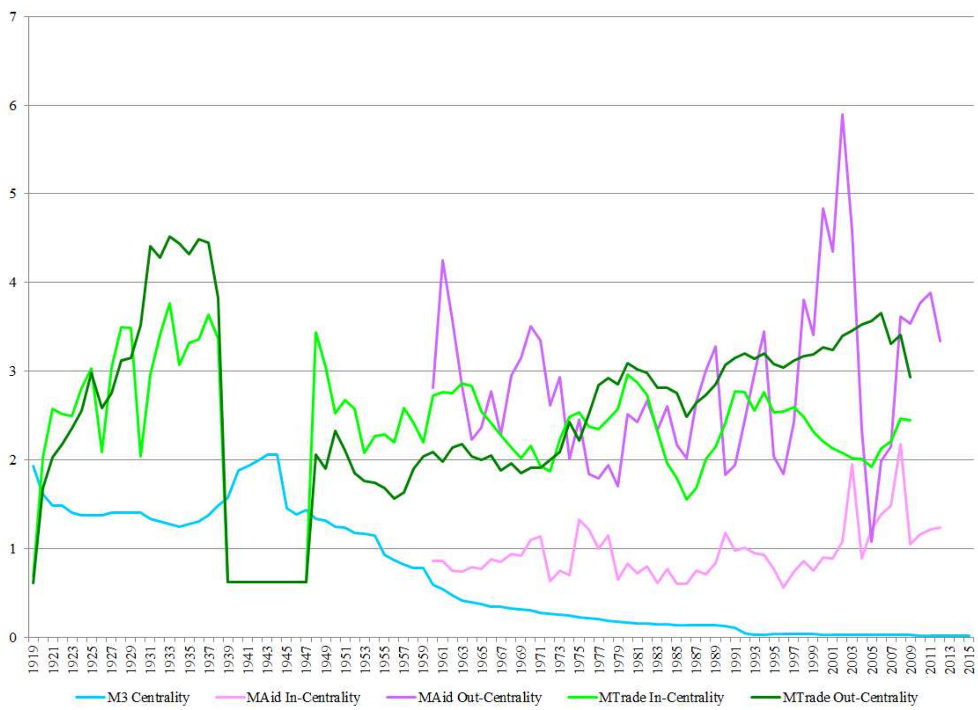
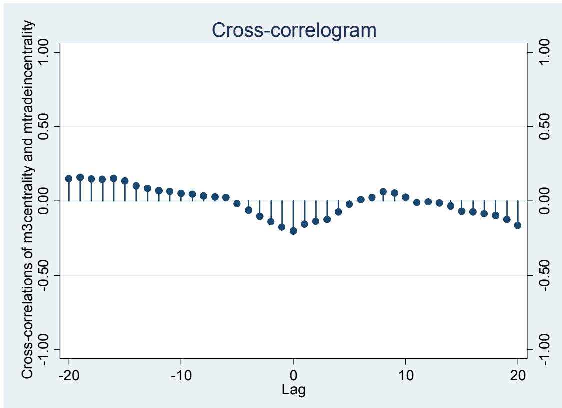
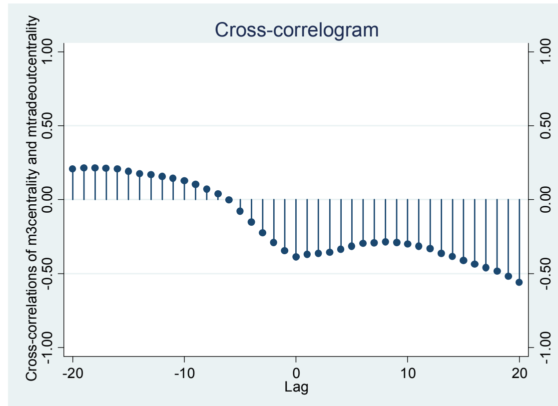


Figure 8.2.8: Centralities of Matrices 3, A and T

Figure 8.2.8 illustrates the trajectories of the network centralities of Matrices 3, A, and T, aiding in the discussion of the cross-correlograms that follow. Visually, there appears to be no positive relationship between Matrix 3's centrality and most of the other network centrality figures. The most significant, unlagged relationship (not controlling for time) across dissimilar matrices—that is, ones not mathematically comprised of one another—is that between Matrices 3 and T (out-centrality) ($r = -0.389$; $p < 0.001$), a coefficient that hardly changes when controlling for time ($r = -0.353$; $p < 0.001$). If causality is involved in this correlation, the centrality of Matrix 3 is presumably predictive of the centrality of global exports, but negatively so.

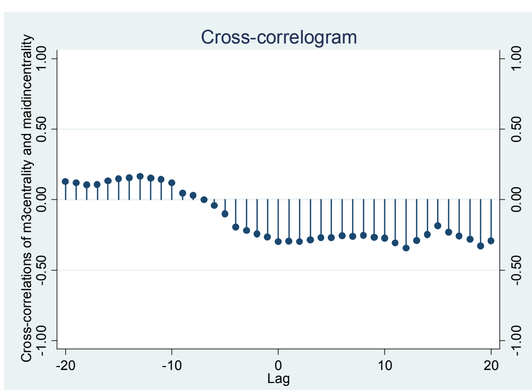
The simple interpretation from the two cross-correlograms below is that without controlling for long-term effects, Matrix 3's centrality and that of imports are not likely to share any causal relationship, while Matrix 3's relationship to the export network might be such that the centralization of the former may very well be a predictor of the decentralization of the latter. In sum, the more centralized that IGO-state affiliations become, the more that the exporter network becomes diffused. This coefficient slightly diminishes with each annual lag until almost a decade, when it approximates its unlagged strength. Export centrality might therefore be a possible outcome of, at least in part, Matrix 3's centrality, though only multivariate analysis can empirically satisfy this question beyond this speculation.

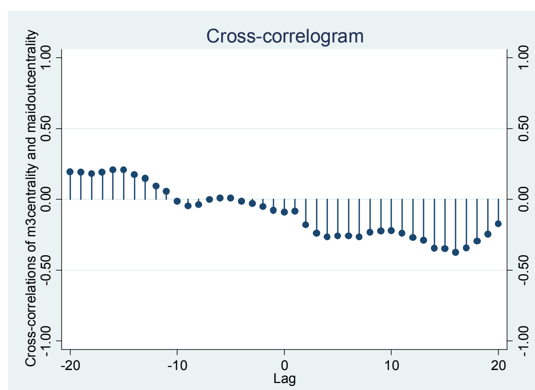




Figures 8.2.9 – 8.2.10: Matrix 3 Centrality ➔ Matrix T In-Centrality; Matrix 3 Centrality ➔ Matrix T Out-Centrality

As foreshadowed by the weak coefficients of the relationships between Matrix 3's centrality and Matrix A's in- ($r = -0.298$; $p < 0.05$) and out-centralities ($r = -0.090$; $p > 0.1$), Figures 8.2.11 and 8.2.12 below do not illustrate strong enough correlations to build a case for bivariate causality. In the case of foreign aid in-centrality this is further substantiated by the negligible partial coefficient that these two variables produce.

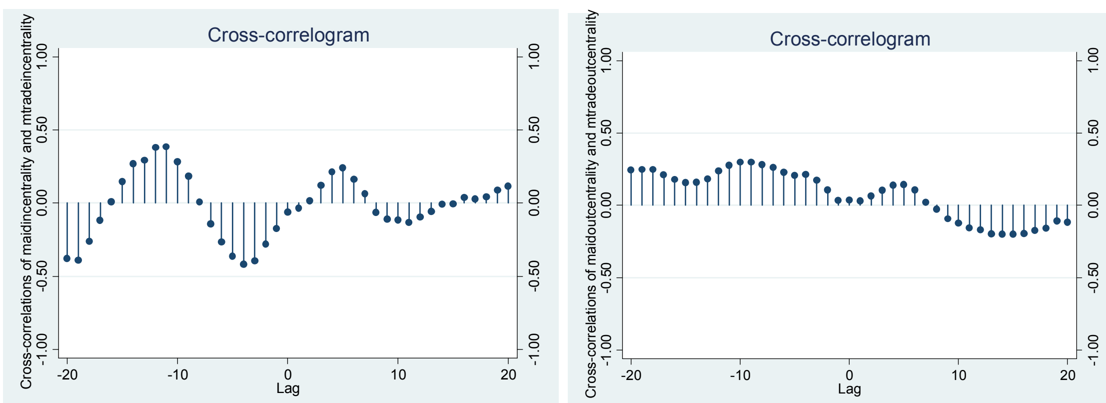




Figures 8.2.11 – 8.2.12: Matrix 3 Centrality ➔ Matrix A In-Centrality; Matrix 3 Centrality ➔ Matrix A Out-Centrality

The last pair of cross-correlograms in this section represents the lagged relationships between the in-centralities of Matrices A and T in Figure 8.2.13, as well as their out-centralities in Figure 8.2.14. Their unlagged, bivariate coefficient in Table 8.2.1

is a near-zero figure (-0.060), so it doesn't stand out as very important, but the significantly positive to significantly negative oscillations in this cross-correlogram strongly suggest that lagging trade in-centrality by 5 or 10 years would fit a model drawing causality from import centrality to aid receivership centrality. Though any suspicion of long-term bivariate correlation between the out-centralities is discounted by this finding, it is noteworthy that import and aid receivership centralities should be so cyclically cross-correlated throughout the first few decades, particularly when it is the import variable that is lagged.



Figures 8.2.13 – 8.2.14: Matrix A In-Centrality → Matrix T In-Centrality; Matrix A Out-Centrality → Matrix T Out-Centrality

The partial correlation between the in-centralities of Matrices A and T, imposing a 5-year lag on import centrality, yields a nonsignificant r-coefficient of -0.051, leading to an ambiguous finding. The longitudinal plots in Figure 8.2.8 obviate the positive correlations between the in- and out-centralities of the trade network to one another, while for the foreign aid network the in- and out-centralities appear to be negatively correlated. This points to the fact that in this nearly perfectly graph-hierarchical network, increases in the centrality of an already polarized out-network a few core aid donors are an indication of more aid money flowing *towards* a greater number of recipient nodes, which necessarily deflates the in-centrality of the foreign aid network. That is, when donors increase aid, they are likely to do so, at least in part, by establishing new ties to prospective recipients rather than merely increasing funding to a static number of client states.

Regarding import and export centralities—the concentrations of connections among one or few importers and exporters—these were highly positively correlated (bivariate $r = 0.724$; partial $r = 0.763$; both p-values < 0.001), while the relationship between foreign aid donor and recipient centrality were not significantly correlated ($r = 0.162$; $p > 0.1$), at least not without lags.

In conclusion of Section 8.2.1, inter-network relationships exist when it comes to their centrality, such as of the state-to-state IGO co-affiliation network (Matrix 3), which appears most explanatory of export centrality in the trade network. While the centralities of imports and exports in the relatively bidirectional trade network are highly positively correlated, the comparatively unidirectional foreign aid matrix does not exhibit such correlation between the centralities of its donorship and receivership halves. Matrix 3's short-term, negative correlations with the in- and out-centralities of the trade network, however, are worth noting.

8.2.2. Network and Node Degree Centrality

This portion of the analysis shifts the emphasis to intra-network dimensions, as it seeks to understand the distribution of the node centralities of the UN and US within the greater context of the centralities of their respective matrices. Matrix 2 is once again relevant here, as it is its centrality relative to the UN's node centrality that is assessed here. The undirected centrality of the IGO-IGO co-affiliation matrix measures the degree to which IGO ties are clustered among a few countries or dispersed evenly throughout the system.

8.2.2.1 Network and Node Degree Centralities of the IGO-State Affiliation Networks

A substantive review would best precede the quantitative summary of this section. The United Nations, World Bank, and International Monetary Funds are the three major IGOs in this network, all sharing nearly identical rosters of co-affiliation, which also happen to comprise almost every possible member node in the last few decades. Given the nearly parallel centrality of these three prominent IGOs, their co-affiliations actually increase when a new IGO arises, such as the WTO in 1995. The new IGO initially usurps only 109 of the nearly 200 possible affiliations in the larger matrix, creating only a moderate number of co-affiliations with other IGOs, thereby lowering the centrality of the network. However, the UN, IMF, and WB—having nearly every node in the matrix in their membership inventory—gain centrality via the co-affiliations that they encumber in 1995 when the WTO is linked to them by these 109 original member countries.

Bivariate Correlations		Year	M2 Centrality	M2 UN Centrality	M3 Centrality	M3 US Centrality
Year	r	1	-0.752	0.821	-0.909	0.960
	Sig. (2-t)		0.000	0.000	0.000	0.000
	N	97	71	71	97	97
M2 Centrality	r	-0.752	1	-0.901	0.482	-0.573
	Sig. (2-t)	0.000		0.000	0.000	0.000
	N	71	71	71	71	71
M3 Centrality	r	-0.909	0.482	-0.475	1	-0.961
	Sig. (2-t)	0.000	0.000	0.000		0.000
	N	97	71	71	97	97

Table 8.2.3: Bivariate Correlations among Centralities of Matrices 2 and 3, and Their Hegemonic Nodes

Table 8.2.3 highlights the relevant matrix-to-node centralities that are most significant without lagging or controlling for time as a possible spurious agent, followed by Table 8.2.4, which provides the partial correlation equivalents, controlling for time. Collinearity characterizes most of the bivariate relationships, and arguably all of the partial relationships, including the peculiarly near-perfect relationship between the centrality of the UN in Matrix 2 and the centrality of its converse: Matrix 3.

Partial Correlations Controlling for Year		M2 Centrality	M2 UN Centrality	M3 Centrality	M3 US Centrality
M2 Centrality	**r**	1	-0.754	-0.737	0.807
	Sig. (2-t)	.	0.000	0.000	0.000
	N	0	68	68	68
M3 Centrality	**r**	-0.737	1	1	-0.760
	Sig. (2-t)	0.000	0.000	.	0.000
	N	68	68	0	94

Table 8.2.4: Partial Correlations between Centralities of Matrices 2 and 3, and Their Hegemonic Nodes

The 21st century's gradual increase in the UN's node centrality is due largely to the incorporation of more countries into the WTO and ICC since their inception (1995 and 2002, respectively). This same phenomenon, however, by increasing the total possible number of connections, has a slight, decentralizing effect on the matrix[20], as is evident in Figure 6.2.23, found in Section 6.2.2.

The cross-correlogram plotting this relationship provides a narrative of immediate, inverse proportionality between the UN's centrality and that of its constituent matrix. This negative, unlagged relationship ($r = -0.901$; $p < 0.001$) diminishes only slightly when controlling for time ($r = -0.754$; $p < 0.001$), suggesting that the long-term

[20] The IGO dataset, which reports yearly tabulations of IGO membership per nation-state, can be found in *Appendix I*.

effects are only accounting for a minor fraction of the covariance between the centralities of the IGO-IGO co-affiliation matrix and the UN.

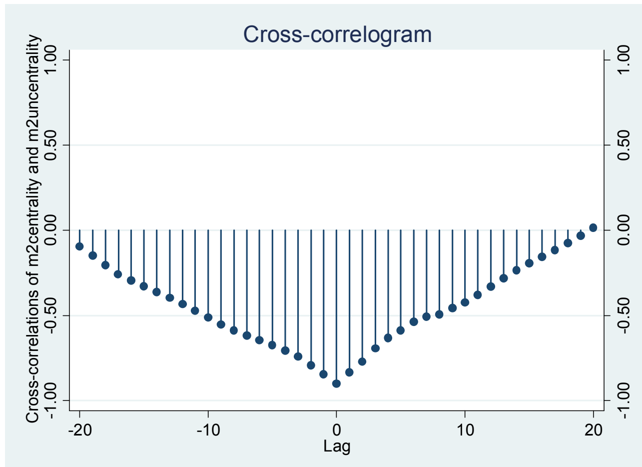


Figure 8.2.15: Matrix 2 Centrality ➔ UN Centrality

Lagging these variables, a narrative favoring unlagged, inverse proportionality prevails here, and this is most likely due to the computational homogeneity of these measures. That is, there is no exogenous causality explaining the covariance between these figures.

Figure 6.2.31, found in Section 6.2.5, directs the attention to Matrix 3—the state-to-state co-affiliation network—and its hegemonic node, the United States. The figure plots a generally decentralizing trend of Matrix 3's centrality—with World War II acting as a counterforce, concentrating League of Nations membership into less and less nodes in the system—while the concentration of co-affiliations involving the US appears—at least after the War—to almost always increase.

Matrix 3's centrality's bivariate correlation with the node centralities of the US, is -0.961 ($p < 0.001$), while its partial equivalent is -0.760 ($p < 0.001$). Though during nearly the entire period, these two figures oscillate in mutual opposition, it is during periods of change in the existence of an IGO that the relationships become more punctuatedly antithetical. One example is the dip in Matrix 3 centrality during the early 1990s, preceding the WTO's founding, when the bulk of the former Soviet Republics began to join the major IGOs, decentralizing the matrix while simultaneously centralizing the US's co-affiliations.

To complement this argument, the cross-correlogram in Figure 8.2.16 confirms the previous output, which very slightly inflates, the left portion of the graph, suggesting that the hegemon's centrality is a better predictor of the network's centrality than vice-versa.

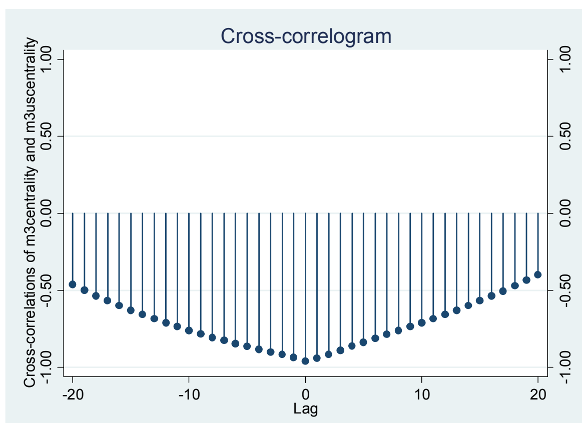


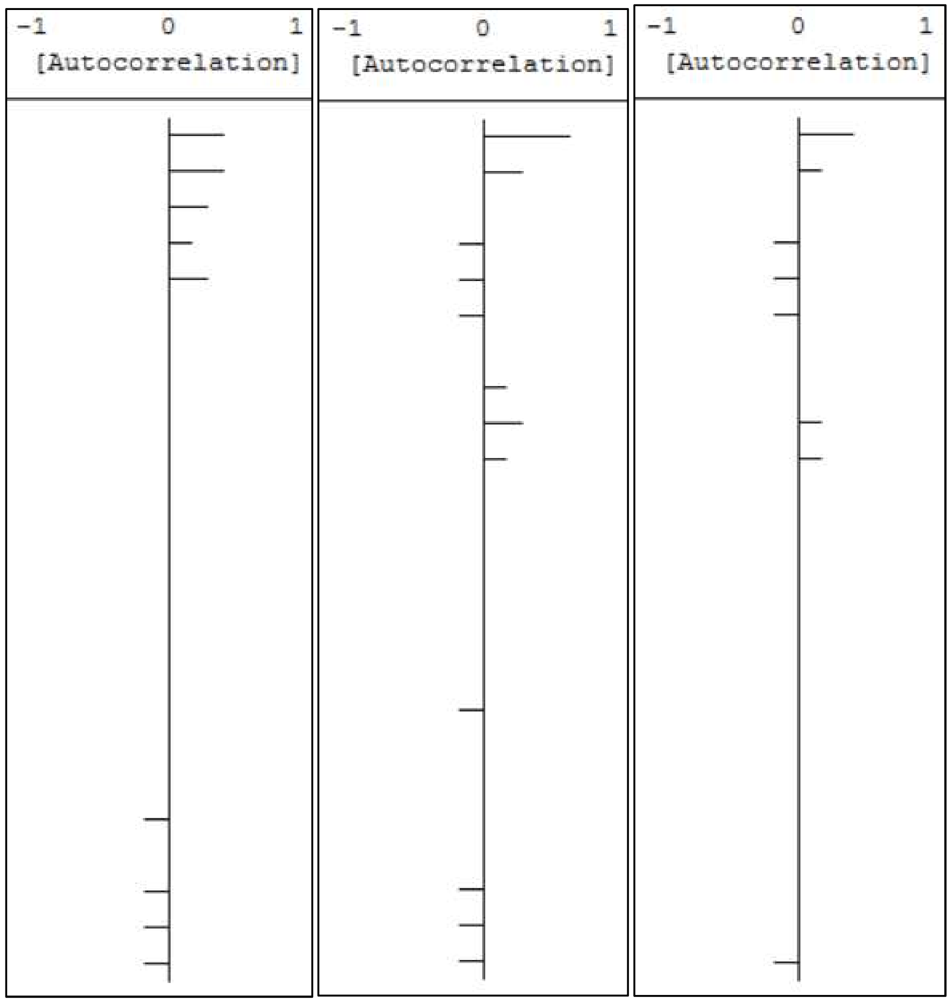
Figure 8.2.16: Matrix 3 Centrality → US Centrality

Given that IGO co-affiliation centrality is about as soft a form of power as is measured in the working dataset, hegemonic node centrality in Matrices 2 and 3 are more ambiguous proxies for this dimension of global governance than the hegemonic node centralities of the foreign aid (out-centrality, in this case) and trade networks.

8.2.2.2 Network and Node Degree Centralities of the Foreign Aid Networks

Next in the analysis is the complement of foreign aid network and node centralities to the above discussion. The US never received foreign aid during the period for which Roodman's (2012) data were available; thus, in-centrality is invariantly 0 for this node, and is consequently not part of this analysis.

Matrix A is unlike Matrix 3 in its directedness, and therefore its in- and out-centralities reflect not only different roles played by nodes, but also nearly mutually exclusive nodes playing those roles. This is antithetical to both Matrices 3 and T, whose interactions are symmetric in the case of the state-to-state co-affiliation matrix, and overwhelmingly bidirectional in the case of the trade matrix.



Figures 8.2.17 – 8.2.19: Autocorrelations of In- and Out-Centralities of Matrix A, and Out-Centrality of US, Respectively

Figures 8.2.17 through 8.2.19 plot the autocorrelations of the centralities of the foreign aid matrix (both the receivership and the donorship halves), as well as the centrality of the US as a foreign aid donor in that matrix. While the case of the network's in-centrality is one of typical 1st-order autocorrelation, the autocorrelations of the out-centrality of donors and of the US as a donor in the foreign aid matrix are both a departure from that of the in-centrality and remarkably similar to one another, and this foreshadows a highly significant (and probably positive) correlation between the two.

The cyclicality evident in these two oscillations is confirmed by the zigzagging trajectories of all three centralities, plotted longitudinally in Figure 6.3.10, found in Section 6.3.2.

Whereas the trajectories between the centralities of Matrix 3 and the United Nations were inversely related, the relationships between the out-centrality of the hegemon to the centrality of the foreign aid network are positively correlated, as is expected from this type of patron-client network, which has a higher centrality ceiling than the more bilateral trade network.

Of particular interest to the current hegemonic cycle in this graph is the period of slight divergence between the out-centrality of the matrix and of the US in this matrix, which takes place between the late 1980s and the turn of the millennium. In essence, the 1990s, much like the pivotal period of 1962 mark a divergence from the usual primacy of the US as a source of foreign aid. The narrative for 1962 is deeply grounded in the inter-core tensions between the US and the USSR that did not affect the rest of the world-economy, though it (1) decreased the number of recipients to whom aid was administered (such as Afghanistan, Namibia, and South Korea), and (2) decreased the overall value to countries to whom it did administer aid (such as Brazil, Mexico, and Tunisia). A few *increases* in aid from the US were also evident in the dataset (such as in the aid given to Austria, Estonia and other entities already hostile to Soviet power), though these were greatly outnumbered by the diminished outflow of US-reported, nonmilitary aid in 1962. From a strictly tactical point of view, this strategy placed an immediate shift in the emphasis of receivership on the basis of political affiliation rather than humanitarian development *programmes*. Whether this is an alternative to other forms of hegemonic global governance or a complement remains to be seen in Chapter 9, but historically, this pivotal shift and subsequent return in 1963 to the previously established complement of receivers of foreign aid co-occur with a definite emphasis of militarism on behalf of the NATO powers as well as what was then termed the Second World.

Bivariate Correlations		Year	MAid In-Centrality	MAid Out-Centrality	MAid US Centrality
Year	**r**	1	0.428	0.217	0.224
	Sig. (2-t)		0.001	0.119	0.107
	N	97	53	53	53
MAid In-Centrality	**r**	0.428	1	0.235	0.354
	Sig. (2-t)	0.001		0.090	0.009
	N	53	53	53	53
MAid Out-Centrality	**r**	0.217	0.235	1	0.799
	Sig. (2-t)	0.119	0.090		0.000
	N	53	53	53	53

Table 8.2.5: Bivariate Correlations among Centralities of Matrix A, and Out-Centrality of US

To return to the empirical analysis, before considering lagged correlations, the baseline bivariate coefficients as first assessed. The centrality pertaining to the donorship portion of the graph was correlated by a factor of 0.799 ($p < 0.001$) with the US's centrality as a donor, while its recipient centrality portion of the network yielded an r-coefficient of 0.354 ($p < 0.001$) when correlated with that of the US. In short, the matrix and node out-centralities are collinear as might be expected by now, while the receivership centrality—though not expected to have borne any significant correlation with the primary donors' centralities—does actually report significant coefficients that are not collinear, having an ideal amount of correlation to take the analysis further with all four of these relationships. That is, the more that the US donates aid relative to the rest of the donorship inventory, the more that the receivership inventory is centralized, and even more so, the donorship network as a whole.

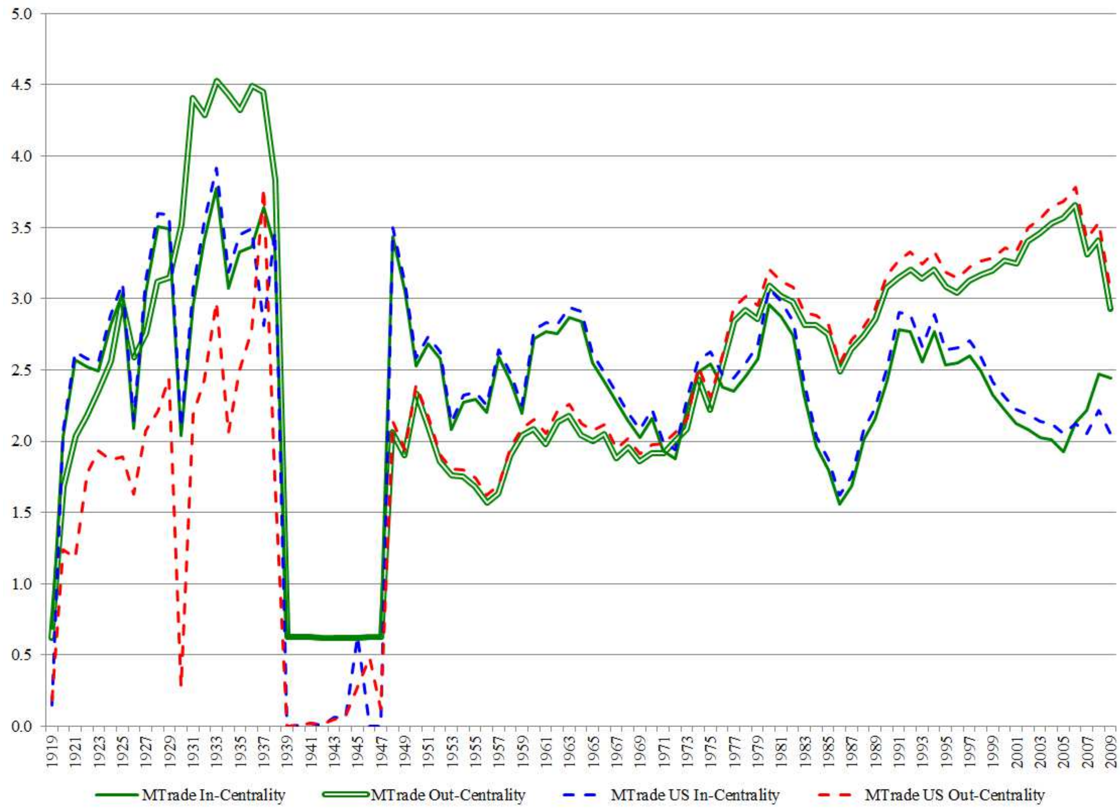
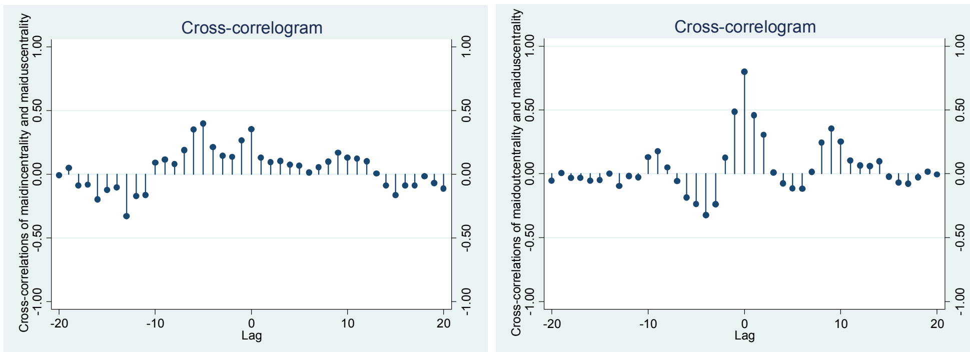


Figure 8.2.20: In- and Out-Centralities of Trade Matrix and of US in Trade Matrix

The introduction of the following two correlograms marks a departure from much of what has been found so far with respect to lagged, bivariate correlations. As foreshadowed by the autocorrelation found in Figures 8.2.18 and 8.2.19, temporal cyclicality in the correlations is evident, particularly in the export half of the matrix, illustrated by Figure 8.2.22. In both figures, it is evident that unlagged correlations are probably optimal—certainly in the cast of the export half-matrix.



Figures 8.2.21 – 8.2.22: Matrix A In-Centrality ➔ US Out-Centrality in Matrix A; Matrix A Out-Centrality ➔ US Out-Centrality in Matrix A

Though the foreign aid network is not subject to a secular trend, and therefore partial correlations do not correct for increasing floors, ceilings, or equilibria, the partial coefficients have been reproduced below in order to illustrate that the relationship between the out-centrality of the matrix and that of the hegemon remains strongly positive. This suggests that a great deal of the remaining covariance comes from the concentration of foreign aid ties in relatively few nodes (best of all, the US); in this scenario, because most of the activity involves few donors, the centrality of ties to the greatest of those donors represents much of the centrality of the matrix itself.

Partial Correlations Controlling for Year		MAid In-Centrality	MAid Out-Centrality	MAid US Centrality
MAid In-Centrality	r	1	0.162	0.293
	Sig. (2-t)	.	0.252	0.035
	N	0	50	50
MAid Out-Centrality	r	0.162	1	0.789
	Sig. (2-t)	0.252	.	0.000
	N	50	0	50

Table 8.2.6: Partial Correlations among Centralities of Matrix A, and Out-Centrality of the US

To capitulate, though at the strictly bivariate level, some of these correlations were significant enough to warrant further inquiry, by the time that time is controlled for, the unexpectedly positive correlation between the receivership matrix's centrality, and the hegemonic donor's centrality was rendered nonsignificant, meaning that the slight incline after the early 1990s in all three of the related trajectories was accounting for a fair proportion of the covariances that appeared significant at the bivariate level. These findings help to answer questions about the relative benefits of hegemony as regards the foreign aid network, though in order to accomplish this, these foreign aid centrality measures must be scrutinized against non-network factors, such as US GDP per capita, in Chapter 9.

8.2.2.3 Network and Node Degree Centralities of the Trade Networks

To quantify these visually evident correlations, at the bivariate level, the network-to-node relationship explored here is between the centrality of the import network and the US's centrality in that network. This is followed by the centrality of the export network's relationship to the US's centrality in that network. Much as with the foreign aid matrices, there is no secular trend to correct for in this cluster of variables, and therefore partial correlations are not quite as useful. Nevertheless, the partial correlation matrix follows the bivariate version for the sake of comprehensiveness.

The in-centralities of the trade network and its hegemonic node are still developing along somewhat parallel trajectories, but not quite as uniformly as the export side of the matrix. Rather than reproducing similar graphs, this section refers the reader's attention to the longitudinal trajectories plotted in Figure 6.4.15, found in Chapter 6, which chart the in- and out-centralities of the trade network and its hegemonic node, the US. These matrix and node centralities are unanimously correlated with coefficients significant at the 0.001-level. As with the foreign aid networks, this level of parity substantiates a prewar/postwar periodization of the dataset for a discrete analysis of each period.

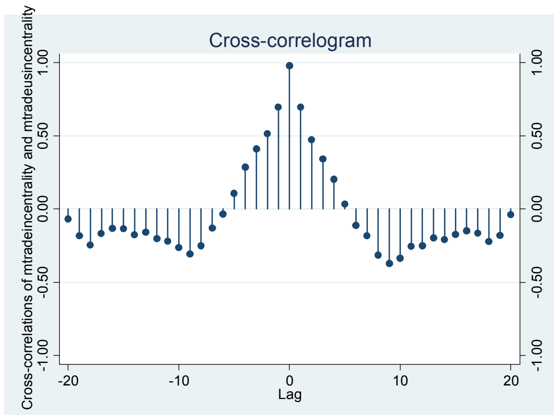
Bivariate Correlations		Year	MTrade In-Centrality	MTrade Out-Centrality	MTrade US In-Centrality	MTrade US Out-Centrality
Year	r	1	-0.035	0.272	0.035	0.701
	Sig. (2-t)		0.744	0.009	0.745	0.000
	N	97	91	91	91	91
MTrade In-Centrality	r	-0.035	1	0.724	0.980	0.599
	Sig. (2-t)	0.744		0.000	0.000	0.000
	N	91	91	91	91	91
MTrade Out-Centrality	r	0.272	0.724	1	0.726	0.775
	Sig. (2-t)	0.009	0.000		0.000	0.000
	N	91	91	91	91	91

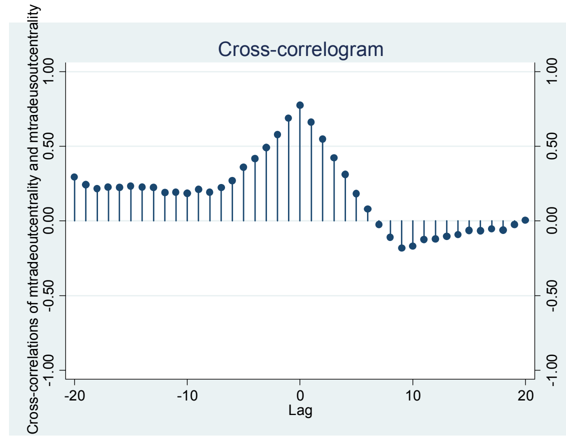
Table 8.2.7: Bivariate Correlations among Centralities of Matrix T and the US

Partial Correlations Controlling for Year		MTrade In-Centrality	MTrade Out-Centrality	MTrade US In-Centrality	MTrade US Out-Centrality
MTrade In-Centrality	r	1	0.763	0.983	0.874
	Sig. (2-t)	.	0.000	0.000	0.000
	N	0	88	88	88
MTrade Out-Centrality	r	0.763	1	0.745	0.852
	Sig. (2-t)	0.000	.	0.000	0.000
	N	88	0	88	88

Table 8.2.8: Partial Correlations among Centralities of Matrix T and the US

As regards the first relationship, the US's in-centrality plotted to its own import network yields a bivariate r-coefficient of 0.980 ($p < 0.001$), and an even stronger partial r-coefficient of 0.983 ($p < 0.001$). The export equivalent of these relationships, that is, the network's centrality's correlation coefficient with the US's centrality, is 0.775 ($p < 0.001$) at the bivariate level, and 0.852 ($p < 0.001$) when controlling for time. As with previous measures, we see here a prominent, short-term covariance worth looking into with cross-correlograms. Lagging these effects, it is evident, as with the foreign aid equivalent of these relationships, that immediate effects are optimal here, and most likely computational in nature.





Figures 8.2.23 – 8.2.24: Matrix T In-Centrality ➔ US In-Centrality in Matrix T; Matrix T Out-Centrality ➔ US Out-Centrality in Matrix T

To add to the discussion of the bivariate coefficients among the out-centralities, the fact that these remain strongly significant when controlling for time is nonetheless an important finding, for while there is not an exponential rate of growth along these trajectories as the period progresses, there *is* a certain periodicity to at least some of these trajectories.

In sum, the relationship between the centralities of networks and of the most prominent nodes within those networks—the UN and US—tends towards negativity where IGO membership is concerned, and towards positivity, bordering parity at times, in the case of foreign aid and trade. In some ways, these are characteristics of the symmetric properties of Matrix 3, for example, versus the asymmetric, bidirectional nature of the aid and trade networks, and it is their compositional nature that renders the correlations among some of its network-to-node pairs.

8.3. Inter-network, Intradimensional Relationships: Krackhardt's Measures

Even more sensitive than centrality to the structure of these three types of matrices are some of the Krackhardt measures, some of which consequently yield invariant or nearly invariant values of 0 or 1. These invariances are not to be taken as computational irregularities, but rather as idiosyncrasies of each network; each a descriptive statistic in and of itself. Though complete invariability across the period prevents some Krackhardt measures from being analyzed in this and subsequent chapters, their contexts in their constituent matrices will nonetheless be discussed as they become relevant.

As with the section above, autocorrelations and cross-correlations will follow the initial, unlagged bivariate and partial matrices of relationships among the Krackhardt measures of each matrix, which excludes variables that remained constant (at 0 or 1) throughout the period. Figure 8.3.1 illustrates with green, dashed arrows the possible inter-network, intradimensional relationships discussed in this section and in Section 8.1.2, as well as intra-network, interdimensional relationships, depicted by black, solid arrows.

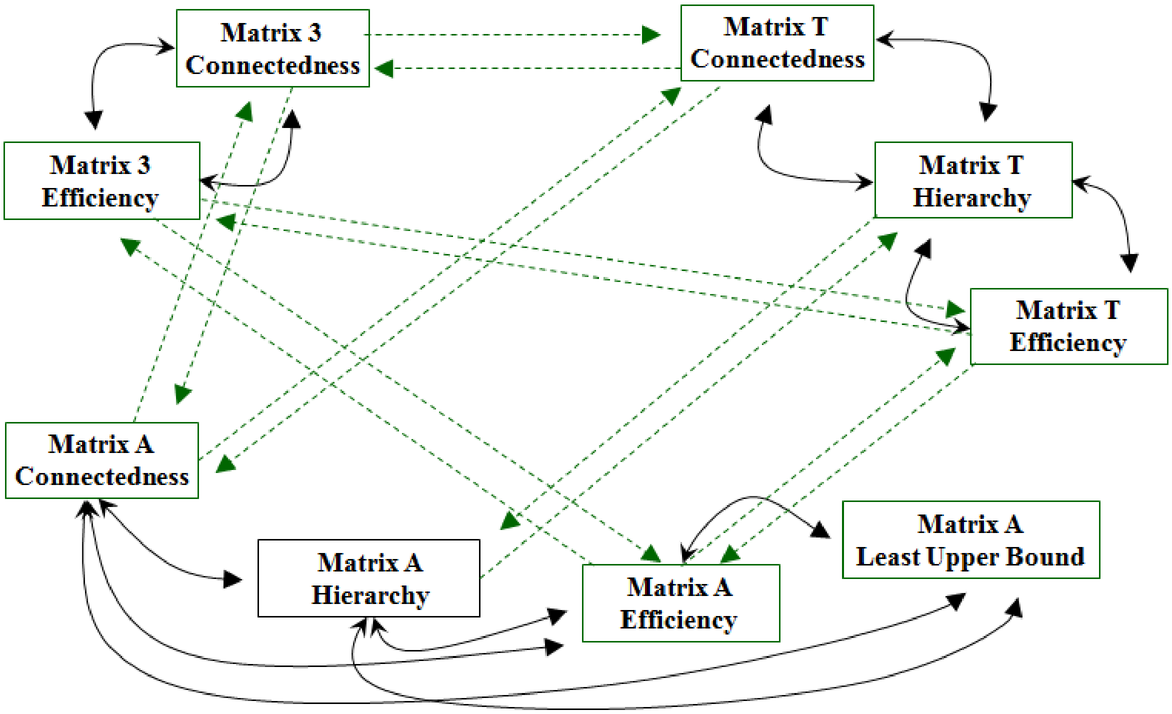


Figure 8.3.1: Available Krackhardt Measures of the State-based Matrices (3, A and T)

Tables 8.3.1 – 8.3.4 report the bivariate and partial correlations among the connectednesses, hierarchies, and efficiencies of each network. Other than a value of 0.9992 during 1920, the least upper boundedness of Matrix T remains constant at 1.0; consequently, this measure will be treated as a constant, and will be ignored in the remainder of the analysis. Following from this, Matrix A becomes the only network that rendered a least upper boundedness figure with analyzable variability, so its relationship to other LUBs cannot be estimated here, though its intra-network relationships will later be assessed when it is compared to other dimensions of Matrix A.

Bivariate Correlations		Year	MAid Hierarchy	MTrade Hierarchy
Year	r	1	-0.245	-0.256
	Sig. (2-t)		0.077	0.014
	N	97	53	91
MAid Hierarchy	r	-0.245	1	0.080
	Sig. (2-t)	0.077		0.579
	N	53	53	50
MTrade Hierarchy	r	-0.256	0.080	1
	Sig. (2-t)	0.014	0.579	
	N	91	50	91

Table 8.3.1: Bivariate Correlations among Network Hierarchies

Because Krackhardt's network connectedness is a better measure of integration, its highly significant inter-network relationships are detailed in Section 8.1.2. A less promising relationship is found between the hierarchies of the foreign aid and trade matrices ($r = 0.080$; $p > 0.1$), the coefficient becoming ever less significant ($r = 0.019$; $p > 0.1$) when controlling for time. From this, it can be concluded that at least without lagging, no relationship is likely to exist here.

Partial Correlations Controlling for Year		MAid Hierarchy	MTrade Hierarchy
MAid Hierarchy	r	1	0.019
	Sig. (2-t)	.	0.898
	N	0	47
MTrade Hierarchy	r	0.019	1
	Sig. (2-t)	0.898	.
	N	47	0

Table 8.3.2: Partial Correlations among Network Hierarchies

To complement this, Figure 8.3.2 plots these hierarchies longitudinally across the period. In essence, the foreign aid network is nearly perfectly hierarchical (i.e., almost no donor is ever simultaneously a recipient of aid), while the trade network is almost never hierarchical, with a few exceptions during periods when trade is stagnated by war or other factors not charted in this dissertation. It is also important to note that the correlation coefficients above do not reflect any values prior to 1960, the first year for which Roodman's dyadic foreign aid data are available.

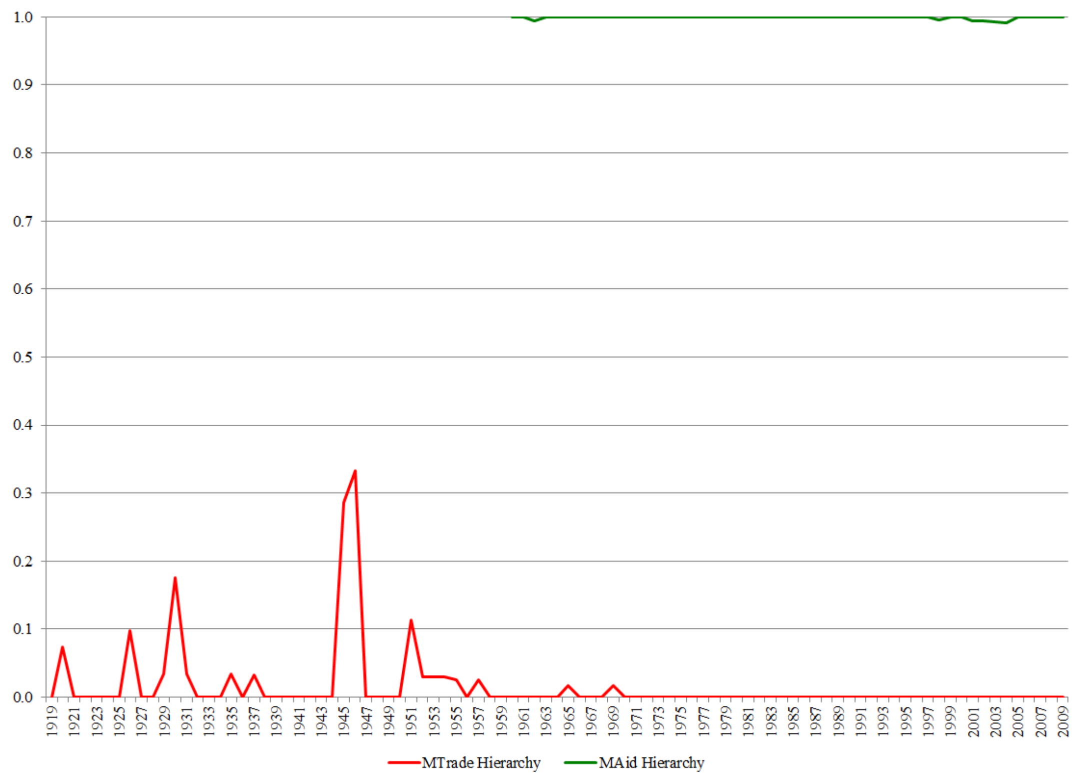


Figure 8.3.2: Hierarchies of Matrices A and T

The sparseness of variability in both of the hierarchy measures does not necessitate the incorporation of lagging into the analysis. Cross-correlograms will be omitted here, though the next set of relationships does beg the question of lagged causality once unlagged collinearity is evident.

Bivariate Correlations		Year	M3 Efficiency	MAid Efficiency	MTrade Efficiency
Year	r	1	-0.762	-0.967	-0.785
	Sig. (2-t)		0.000	0.000	0.000
	N	97	64	53	85
M3 Efficiency	r	-0.762	1	0.907	0.578
	Sig. (2-t)	0.000		0.000	0.000
	N	64	64	46	57
MAid Efficiency	r	-0.967	0.907	1	0.929
	Sig. (2-t)	0.000	0.000		0.000
	N	53	46	53	50
MTrade Efficiency	r	-0.785	0.578	0.929	1
	Sig. (2-t)	0.000	0.000	0.000	
	N	85	57	50	85

Table 8.3.3: Bivariate Correlations among Network Efficiencies

The efficiency of the foreign aid matrix is highly collinear with that of Matrix 3 (r = 0.907) and Matrix T (r = 0.929), and both of these are greater than 0.999 when controlling for time.

Partial Correlations Controlling for Year		M3 Efficiency	MAid Efficiency	MTrade Efficiency
M3 Efficiency	r	1	1	0.041
	Sig. (2-t)	.	0.000	0.713
	N	0	50	82
MAid Efficiency	r	1	1	1
	Sig. (2-t)	0.000	.	0.000
	N	50	0	47
MTrade Efficiency	r	0.041	1	1
	Sig. (2-t)	0.713	0.000	.
	N	82	47	0

Table 8.3.4: Partial Correlations among Network Efficiencies

A slighter but still significant relationship ($r = 0.578$; $p < 0.001$) exists at the bivariate level between Matrices 3 and T, though this becomes nonsignificant ($r = 0.041$; $p > 0.1$) when controlling for time.

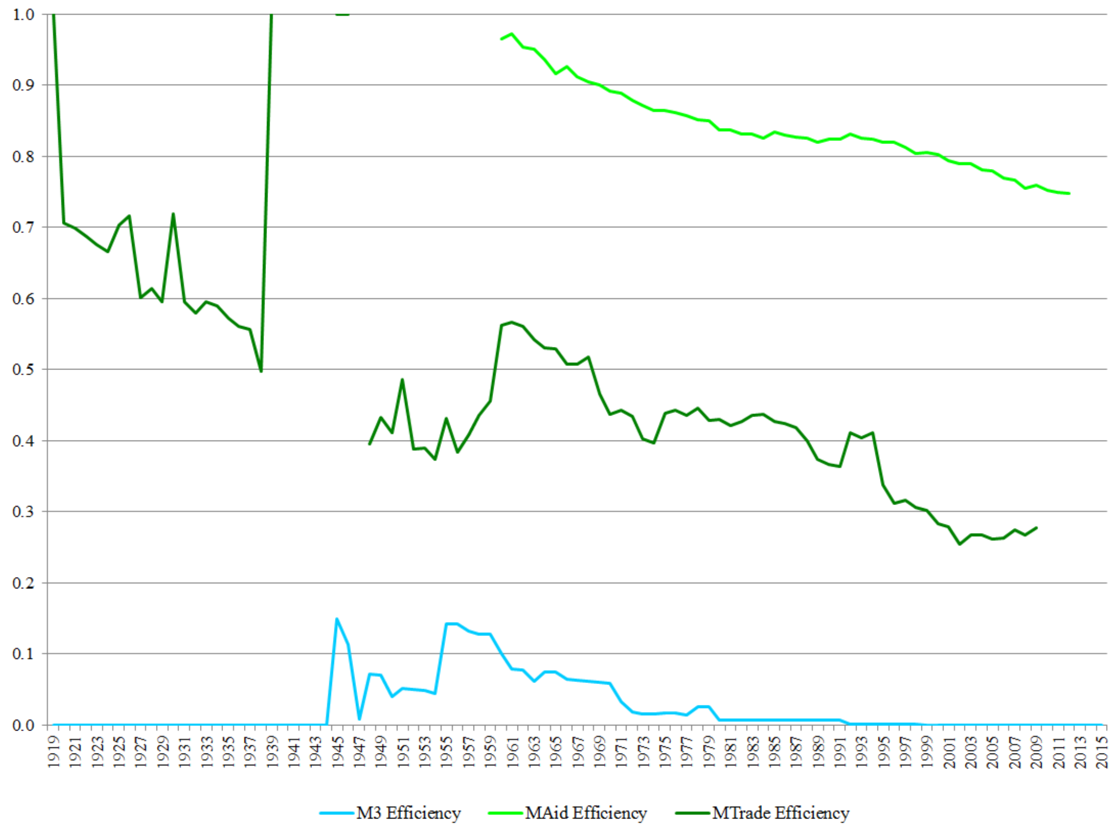
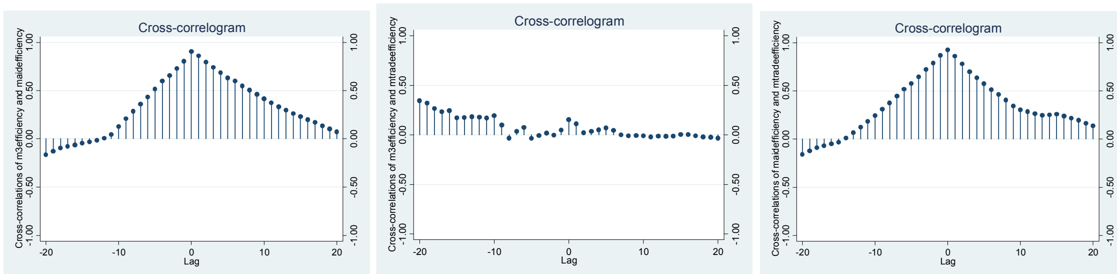


Figure 8.3.3: Efficiencies of Matrices A and T

It appears from Figure 8.3.3's gradual tapering of efficiency in all three networks—particularly in Matrices 3 and T—might be better assessed with lags. Cross-correlations follow in Figures 8.3.4 through 8.3.6, suggesting that while the cross-correlations between the efficiencies of Matrices 3 and A (Figure 8.3.4) are nearly identical to those reflecting the relationships between Matrices A and T (Figure 8.3.6), the cross-correlations in Figure 8.3.5 point to a non-relationship between Matrices 3 and A warranting no further attention to this at the bivariate level, regardless of lags.



Figures 8.3.4 – 8.3.6: Matrix 3 Efficiency ➔ Matrix A Efficiency;
Matrix 3 Efficiency ➔ Matrix T Efficiency; Matrix A Efficiency ➔ Matrix T Efficiency

The question primarily addressed in Sections 8.1 and 8.2 is: How is each property (density, node centrality, and Krackhardt measures) of the networks in this study related *across* networks? As far as Krackhardt values can reveal, there is little support for the argument that—lagged or not—participation in IGOs may be a contributing factor to the *fortification of soft power* in the form of trade and nonmilitary aid. Some relationships between the dimensions of the foreign aid matrix and the trade matrix are evident, however, and these will be assessed in Chapter 9 in the context of all network and non-network attributes of global governance.

8.4. Intra-network, Interdimensional Relationships: Horizontal Dimensions

In Sections 8.1 through 8.3, correlational observations were necessarily limited to one dimension at a time, such as the connectednesses of Matrix 3 and the same dimension of the foreign aid matrix. The logic used here to analyze relationships pivots the relational axis, correlating instead variables that comprise different dimensions of the same networks (or nodes, in the case of centralities). This direction of analysis complements the inter-network relationships above with intra-network relationships, forecasting any prominent causal trends that will be further analyzed in Chapter 9.

8.4.1. Density to Connectedness

This section is comprised of only one pair of indicators, meaning that for any of the three matrices there is only one proxy for the relationship between two horizontal, network-derived, integration-based indicators of global governance, these being density and connectedness. The analysis of the relationship between these two *within* each network follows. As established throughout most of this chapter, the following output reports the bivariate and partial correlations between the densities and connectednesses of each of the state-based matrices, followed by longitudinal plots and bivariate cross-correlograms.

Bivariate Correlations		**Year**	**M3 Connectedness**	**MAid Connectedness**	**MTrade Connectedness**
Year	**r**	1	0.968	0.904	0.959
	Sig. (2-t)		0.000	0.000	0.000
	N	97	97	53	85
M3 Density	**r**	0.948	0.980	0.916	0.953
	Sig. (2-t)	0.000	0.000	0.000	0.000
	N	97	97	53	85
MAid Density	**r**	0.930	0.887	0.777	0.835
	Sig. (2-t)	0.000	0.000	0.000	0.000
	N	53	53	53	50
MTrade Density	**r**	0.754	0.801	0.750	0.739
	Sig. (2-t)	0.000	0.000	0.000	0.000
	N	91	91	50	85

Table 8.4.1: Bivariate Correlations between Network Densities and Connectednesses

These matrices place densities along the y-axis and connectednesses along the x-axis, drawing the reader's attention to the diagonal, which—if we ignore the year—exhibits the three intradimensional, inter-network coefficients necessary to assess these relationships. At the bivariate level, it is evident that the more connected a network is, the more saturated (i.e., dense) it also becomes, though this is not a mathematical truism.

Partial Correlations Controlling for Year		M3 Connectedness	MAid Connectedness	MTrade Connectedness
M3 Density	**r**	0.788	0.433	0.490
	Sig. (2-t)	0.000	0.001	0.000
	N	94	50	82
MAid Density	**r**	-0.146	-0.409	-0.554
	Sig. (2-t)	0.301	0.003	0.000
	N	50	50	47
MTrade Density	**r**	0.431	0.242	0.088
	Sig. (2-t)	0.000	0.094	0.427
	N	88	47	82

Table 8.4.2: Partial Correlations between Network Densities and Connectednesses

Though a negative correlation between these two horizontal dimensions is impossible given that an increase in connectedness always translates to an increase in the numerator used to calculate the density ratio, such a high trio of coefficients between the density and connectedness of Matrix 3, A, and T (r = 0.980, 0.777 and 0.739, respectively) is not to be taken for granted as a mathematical certainty. Nevertheless, while correlation between these two measures of integration is more likely to be spurious than directly causal, it will be useful to use one as a control for the other in multivariate models testing for unique effects.

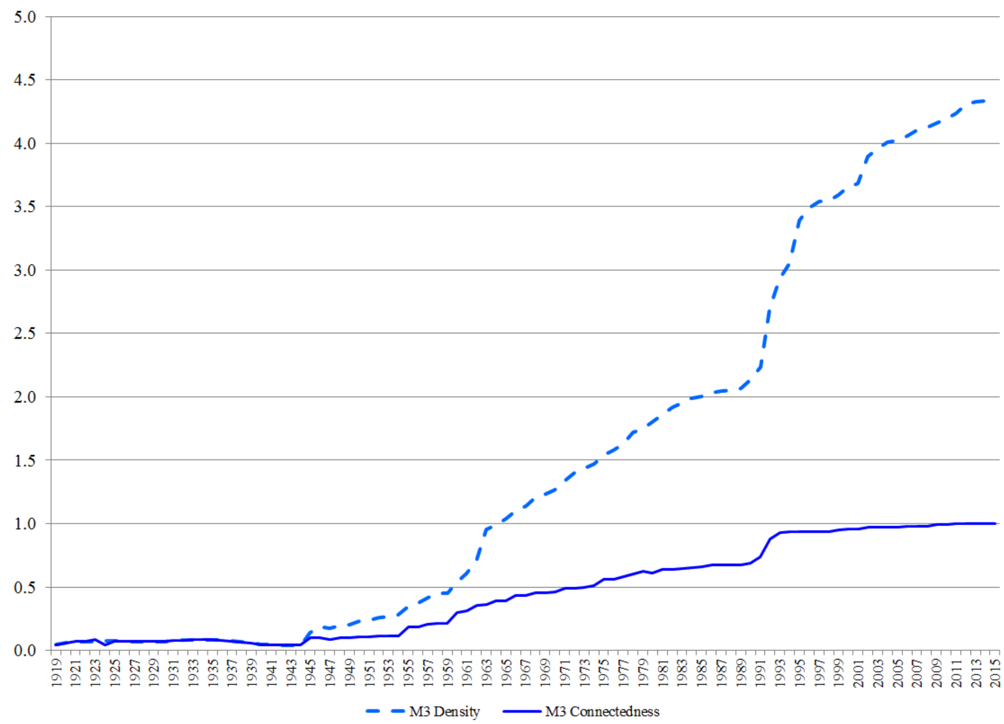


Figure 8.4.1: Density and Connectedness of Matrix 3

Controlling for time does little to diminish the r-coefficient for Matrix 3's density and connectedness (0.788; $p < 0.001$), though it renders negative the relationship between foreign aid density and connectedness ($r = -0.409$; $p < 0.01$), while trade density and connectedness are altogether not correlated ($r = 0.088$; $p > 0.1$) when controlling for time.

Longitudinally, Figure 8.4.1 plots the density and connectedness of Matrix 3, while Figures 8.4.2 and 8.4.3 do the same for the foreign aid and trade matrices, respectively. The latter two do not exhibit nearly as much parity in their trajectories, forecast by the bivariate and partial coefficients discussed above.

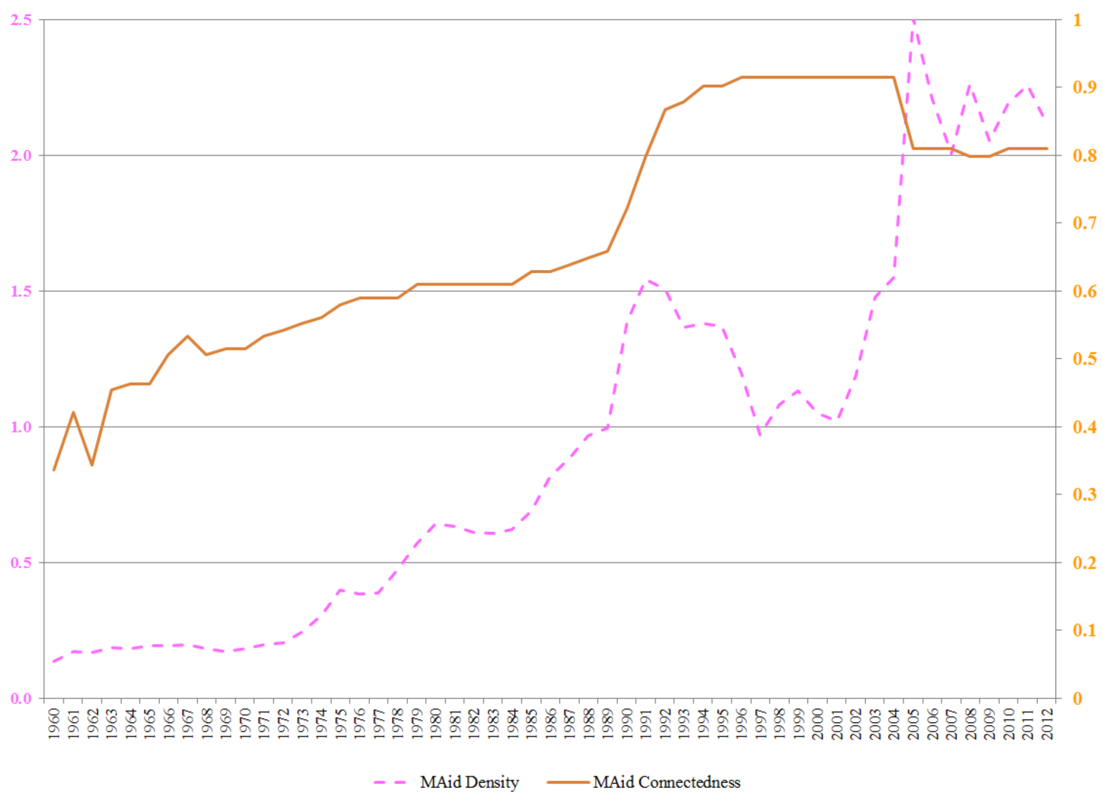


Figure 8.4.2: Density and Connectedness of Matrix A

With respect to Matrix T, it appears that the connectedness (quantified along the right y-axis) of the matrix—that is, the degree of approximation to an ideal state in which every nation is trading at least $1 of goods per year with at least one nation—approaches saturation before density (left y-axis) begins to exponentially approximate its maximum value in the range.

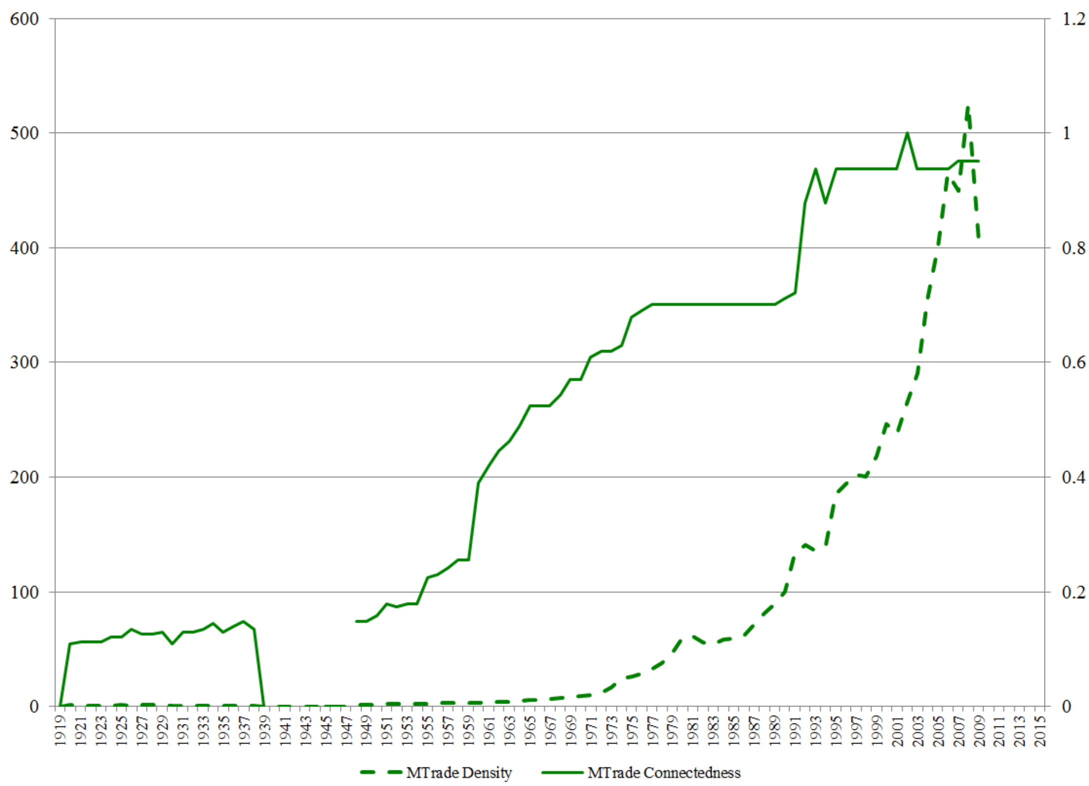
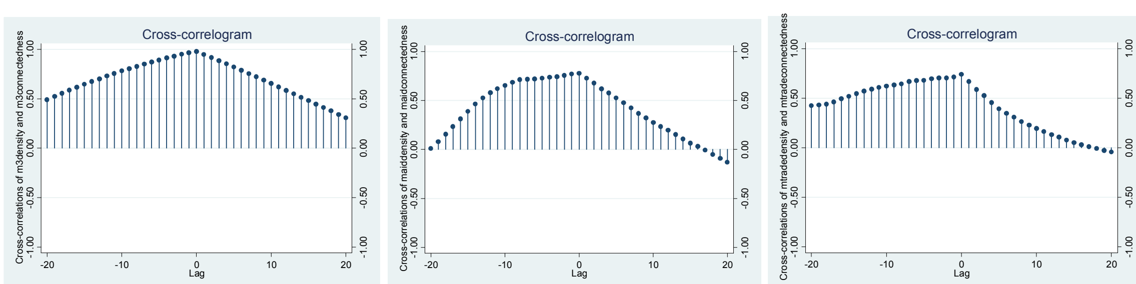


Figure 8.4.3: Density and Connectedness of Matrix T

The cross-correlograms in Figures 8.4.4 through 8.4.6 illustrate the lagged relationships between the density and connectedness of Matrices 3, A, and T, in that order.



Figures 8.4.4 – 8.4.6: Matrix 3 Density → Matrix 3 Connectedness; Matrix A Density → Matrix A Connectedness; Matrix T Density → Matrix T Connectedness

As has been the case in prior output presented in this chapter, two divergent narratives develop here: In the case of Matrix 3, an unlagged correlation is the ideal correlation, and it is nearly perfect, while lags in either direction make density a less viable predictor of connectedness, and vice-versa. In the case of Matrices A and T, a narrative posing connectedness as a possible predictor of density with up to a decadal lag is far more plausible than its causal converse, though density is still significant correlated with connectedness when lagged by up to five years or so.

No surprising conclusion comes from this: the degree to which connections are added, and a singular structure is formed from each constituent node is highly positively related to its total connections divided by the total possible connections among nodes, this being the density of a network.

8.5. Intra-network, Interdimensional Relationships: Vertical Dimensions

This section adjusts the previous perspective by 90 degrees, focusing now on relationships among different dimensions of the same network, all of which measure—at least predominantly—inequality and polarization within a matrix. An analysis of the relationships among the Krackhardt values of Matrix 3, A, and T is followed by a comparison of matrix centrality to Krackhardt's vertical properties for each matrix.

8.5.1 Krackhardt's Connectedness, Hierarchy, Efficiency, and Least Upper Boundedness

Before this portion of the analysis is discussed, it is necessary to state that the inclusion of Krackhardt's connectedness here does not imply that it is a vertical dimension. It is included in part because it is otherwise impossible to assess any intra-network relationships among the Krackhardt measures of Matrix 3, which are tabulated below, but also to settle methodological questions about the relationship between the connectedness of a network (which must be 1.0 if a graph is to be *completely* hierarchical) and Krackhardt's vertical dimensions of each network.

Bivariate Correlations		Year	M3 Connectedness	M3 Efficiency
Year	r	1	0.968	-0.762
	Sig. (2-t)		0.000	0.000
	N	97	97	64
M3 Connectedness	r	0.968	1	-0.771
	Sig. (2-t)	0.000		0.000
	N	97	97	64
M3 Efficiency	r	-0.762	-0.771	1
	Sig. (2-t)	0.000	0.000	
	N	64	64	64

Table 8.5.1: Bivariate Correlations among Krackhardt Values of Matrix 3

Some of the negative correlations above are possible forecasts of causality isolated at the multivariate level, such as that between Matrix 3's connectedness and efficiency (r = -0.771). Such relationships bear little prospect for multivariate analysis, and might be included merely as controls for more likely factors on either dimension of vertical differentiation within the world-system.

Partial Correlations Controlling for Year		M3 Connectedness	M3 Efficiency
M3 Connectedness	r	1	-0.582
	Sig. (2-t)	.	0.000
	N	0	94
M3 Efficiency	r	-0.582	1
	Sig. (2-t)	0.000	.
	N	94	0

Table 8.5.2: Partial Correlations among Krackhardt Values of Matrix 3

Controlling for time reduces the already negative correlation by a minor factor, though it maintains its significance (r -0.582; $p < 0.001$), which means that while the negative trend is accounting for a small portion of the correlation ([-0.771] – [-0.582] = 0.189), it is actually short-term fluctuations that ought to be more closely looked at.

Longitudinally plotting these two Krackhardt values in Figure 8.5.8, it becomes evident just how unrelated these two figures are. While its connectedness has been a nearly unanimously increasing line, the efficiency of Matrix 3 is highly sensitive to the number of IGOs with which states have co-affiliation, and returns to nearly perfect graph-inefficiency (i.e., full redundancy, or co-affiliation) once nearly all nation-states are members of the largest IGOs, as is seen in Figure 6.2.32, found in Section 6.2.6.

Lagging the bivariate correlations reveals that the negative relationship persists with at least a decadal lag, and the relationship appears more persistent when the causality stems from efficiency to connectedness.

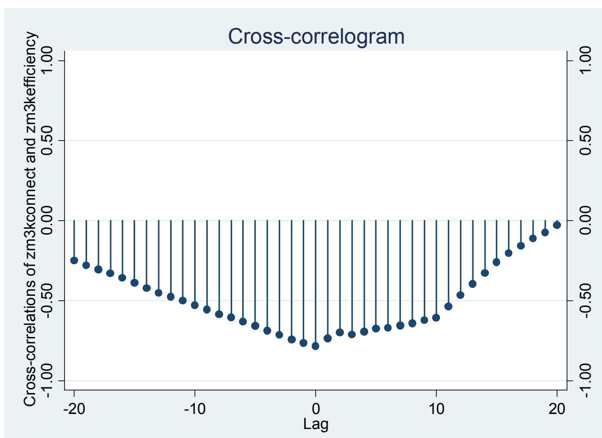


Figure 8.5.1: Connectedness of Matrix 3 ➔ Efficiency of Matrix 3

The next set of relationships involves the foreign aid matrix, which exhibits relatively high intra-network coefficients, with the exception of the relationship between its hierarchy and efficiency. This highly hierarchical matrix (donors are almost never aid recipients) gradually loses graph-efficiency throughout the half-century for which data are available. Because its hierarchy is nearly invariant, however, its relationship to the other values here is questionable (both before and after controlling for time), and will be excluded from subsequent analysis.

Bivariate Correlations		Year	MAid Connectedness	MAid Hierarchy	MAid Efficiency	MAid LUB
Year	r	1	0.904	-0.245	-0.967	0.979
	Sig. (2-t)		0.000	0.077	0.000	0.000
	N	97	53	53	53	53
MAid Connectedness	r	0.904	1	-0.326	-0.844	0.860
	Sig. (2-t)	0.000		0.017	0.000	0.000
	N	53	53	53	53	53
MAid Hierarchy	r	-0.245	-0.326	1	0.167	-0.336
	Sig. (2-t)	0.077	0.017		0.232	0.014
	N	53	53	53	53	53
MAid Efficiency	r	-0.967	-0.844	0.167	1	-0.966
	Sig. (2-t)	0.000	0.000	0.232		0.000
	N	53	53	53	53	53
MAid LUB	r	0.979	0.860	-0.336	-0.966	1
	Sig. (2-t)	0.000	0.000	0.014	0.000	
	N	53	53	53	53	53

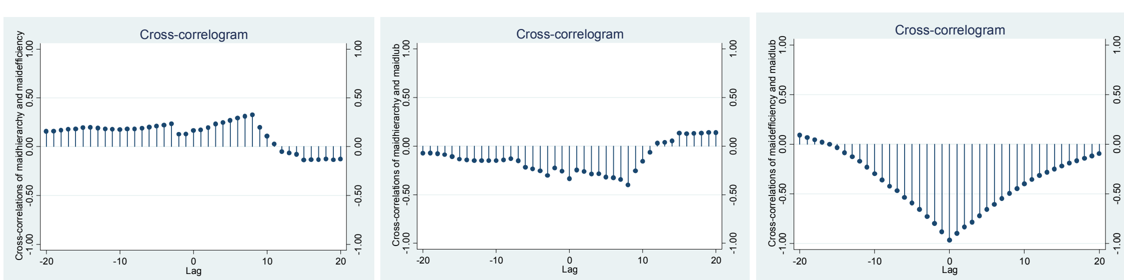
Table 8.5.3: Bivariate Correlations among Krackhardt Values of Matrix A

Bivariate relationships among the Krackhardt measures of the foreign aid matrix that *do* bear mention include those between the connectedness measure and the efficiency and least upper bound measures, which bear r-coefficients of -0.844 and 0.860 (both p-values < 0.001), respectively. These relationships are reversed in polarity, as the connectedness/efficiency relationship now has a positive coefficient ($r = 0.281$; $p < 0.05$), while the connectedness/LUB coefficient is negative ($r = -0.294$; $p < 0.05$). The only partial correlations with enough significance to warrant further inquiry here are those that the least upper bound measure shares with hierarchy ($r = -0.484$; $p < 0.001$) and efficiency ($r = -0.368$; $p < 0.01$).

Partial Correlations Controlling for Year		MAid Connectedness	MAid Hierarchy	MAid Efficiency	MAid LUB
MAid Connectedness	r	1	-0.252	0.281	-0.294
	Sig. (2-t)	.	0.071	0.043	0.034
	N	0	50	50	50
MAid Hierarchy	r	-0.252	1	-0.282	-0.484
	Sig. (2-t)	0.071	.	0.043	0.000
	N	50	0	50	50
MAid Efficiency	r	0.281	-0.282	1	-0.368
	Sig. (2-t)	0.043	0.043	.	0.007
	N	50	50	0	50
MAid LUB	r	-0.294	-0.484	-0.368	1
	Sig. (2-t)	0.034	0.000	0.007	.
	N	50	50	50	0

Table 8.5.4: Partial Correlations among Krackhardt Values of Matrix A

Figure 6.3.22, found in Section 6.3.4, plots these Krackhardt values longitudinally, obviating the near-zero variance exhibited by the network's graph-hierarchy, which results from the singularity of the donor/recipient role. Cross-correlograms including connectedness have been omitted here for the sake of focusing on the lagged, bivariate correlations among the *vertical* dimensions of global governance. Figures 8.5.2 through 8.5.4 illustrate these relationships.



Figures 8.5.2 – 8.5.4: Matrix A Hierarchy ➔ Matrix A Efficiency; Matrix A Hierarchy ➔ Matrix A Least Upper Boundedness; Matrix A Efficiency ➔ Matrix A Least Upper Boundedness

The first cross-correlogram suggests that any positive relationship between the hierarchy and the efficiency of the aid network would be optimally lagged by 8 years, with hierarchy being the predecessor in the causal relationship. Similarly, the negative correlation between hierarchy and least upper boundedness would also be optimally lagged by 8 years. Lastly, the highly negative relationship between efficiency and least upper boundedness in this matrix is best studied unlagged.

Bivariate Correlations		Year	MTrade Connectedness	MTrade Hierarchy	MTrade Efficiency	MTrade LUB
Year	**r**	1	0.959	-0.256	-0.785	0.177
	Sig. (2-t)		0.000	0.014	0.000	0.094
	N	97	85	91	85	91
MTrade Connectedness	**r**	0.959	1	-0.378	-0.764	0.128
	Sig. (2-t)	0.000		0.000	0.000	0.245
	N	85	85	85	85	85
MTrade Hierarchy	**r**	-0.256	-0.378	1	0.541	-0.121
	Sig. (2-t)	0.014	0.000		0.000	0.254
	N	91	85	91	85	91
MTrade Efficiency	**r**	-0.785	-0.764	0.541	1	-0.147
	Sig. (2-t)	0.000	0.000	0.000		0.179
	N	85	85	85	85	85
MTrade LUB	**r**	0.177	0.128	-0.121	-0.147	1
	Sig. (2-t)	0.094	0.245	0.254	0.179	
	N	91	85	91	85	91

Table 8.5.5: Bivariate Correlations among Krackhardt Values of Matrix T

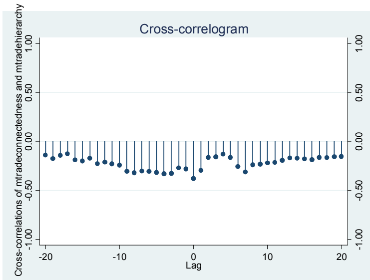
Lastly, the comparatively decentralized trade matrix exhibits near-invariability in its least upper boundedness, meaning that virtually no node is solely an importer or exporter, and in the case of the trade matrix, only one year (1920) exhibits a *significant* departure from this rule. The term *significant* is used here to refer to $ amounts that render the LUB measure lower than 0.9991. Consequently, the relationships involving least upper boundedness will be ignored here, though they are reported in the two tables that follow.

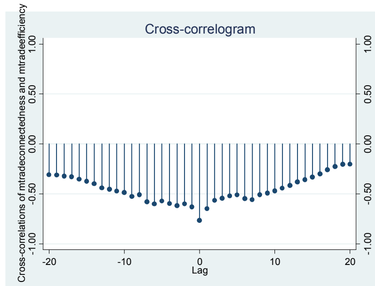
Partial Correlations Controlling for Year		MTrade Connectedness	MTrade Hierarchy	MTrade Efficiency	MTrade LUB
MTrade Connectedness	**r**	1	-0.488	-0.063	-0.151
	Sig. (2-t)	.	0.000	0.569	0.171
	N	0	82	82	82
MTrade Hierarchy	**r**	-0.488	1	0.567	-0.080
	Sig. (2-t)	0.000	.	0.000	0.456
	N	82	0	82	88
MTrade Efficiency	**r**	-0.063	0.567	1	-0.014
	Sig. (2-t)	0.569	0.000	.	0.898
	N	82	82	0	82
MTrade LUB	**r**	-0.151	-0.080	-0.014	1
	Sig. (2-t)	0.171	0.456	0.898	.
	N	82	88	82	0

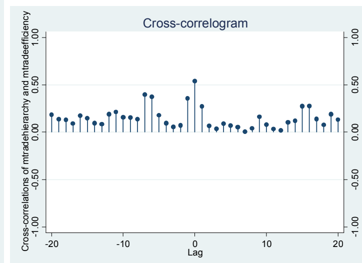
Table 8.5.6: Partial Correlations among Krackhardt Values of Matrix T

The more notable correlations at the bivariate level include that between connectedness and efficiency ($r = -0.764$; $p < 0.001$), as well as the hierarchy/efficiency coefficient ($r = 0.541$; $p < 0.001$), though the negative relationship between connectedness and hierarchy ($r = -0.378$; $p < 0.001$) is significant as well. This coefficient actually grows when controlling for time ($r = -0.488$; $p < 0.001$), as does the hierarchy/efficiency relationship ($r = 0.567$; $p < 0.001$).

As can be seen in Figure 6.4.27, found in Section 6.4.4, it is the inverse relationship between connectedness and efficiency that is worth assessing in further detail, though cross-correlations involving hierarchy will also be presented. Figure 8.5.5 graphs the cross-correlations between the connectedness and hierarchy of the trade matrix, suggesting that the negative, unlagged correlation—while moderate—is still optimal when compared to lags in either direction. Similarly, though more significantly, the best lag to apply to any testable, inverse relationship between connectedness and efficiency here is zero. Though positive, the relationship between the hierarchy and efficiency of the import/export network is also best assessed without lags. While connectedness is technically considered an integrative dimension of global governance, it is an integral component of Krackhardt's definition of a pure out-tree, and is thus included in the portion of the analysis that follows.







Figures 8.5.5 – 8.5.7: Matrix T Connectedness ➔ Matrix T Hierarchy; Matrix T Connectedness ➔ Matrix T Efficiency; Matrix T Hierarchy ➔ Matrix T Efficiency

The most telling finding here is that there is no coherent narrative to span these interdimensional, intra-network relationships. Some of Krackhardt's measures (such as the connectedness and efficiency of the trade network) are by their very definitions antithetical to one another, others (such as the foreign aid matrix's connectedness and least upper bound) are nearly parallel at times, while others appear to bear no relationship whatsoever. As with previous output, controlling for time is a useful tool, as it allows for a distinction between the long- and short-term relationships among these indicators of global governance.

8.5.2 Matrix Centrality and Krackhardt's Measures

Having assessed Krackhardt's network dimensions, the normalized matrix centrality of each state-based network is now compared to its Krackhardt counterparts, matrix by matrix. Table 8.5.7 reports the coefficient representing the relationship between Matrix 3's centrality and efficiency to be 0.686 ($p < 0.001$), but by the time that time is controlled for, Table 8.5.8's coefficient for the same relationship has been reduced to -0.174 ($p > 0.05$).

Bivariate Correlations		Year	M3 Efficiency
Year	r	1	-0.762
	Sig. (2-t)		0.000
	N	97	64
M3 Centrality	r	-0.909	0.686
	Sig. (2-t)	0.000	0.000
	N	97	64

Table 8.5.7: Bivariate Correlations among Vertical Dimensions of Matrix 3

Seeing as both of the computable, variable, vertical dimensions of Matrix 3 are negatively collinear with the time variable, it is safe to say that the bulk of the correlation is dependent on the decentralization and concurrent decrease in graph-efficiency that takes place after the mid-1950s, as is evident in Figure 8.5.8, though the efficiency score, as stated when compared to other Krackhardt measures, is too volatile, given its sensitivity to the IGOs from which Matrix 3 draws its co-affiliations for each nation-state node.

Partial Correlations Controlling for Year		M3 Efficiency
M3 Centrality	r	-0.174
	Sig. (2-t)	0.091
	N	94

Table 8.5.8: Partial Correlations among Vertical Dimensions of Matrix 3

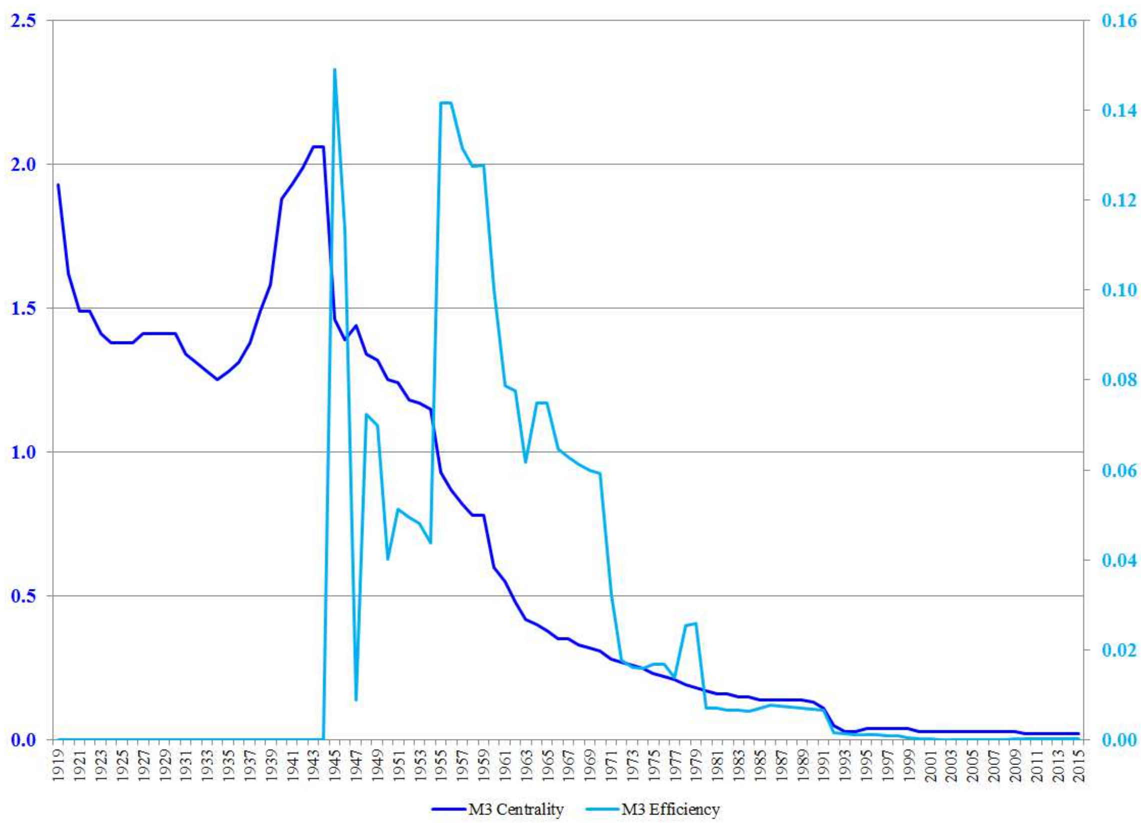


Figure 8.5.8: Vertical Dimensions of Matrix 3

Next are the relationships among the in- and out-centralities of the foreign aid matrix and Krackhardt's vertical dimensions of this network. The coefficients at the bivariate level range from moderately positively correlated—as is the case for the in-centrality/least upper bounds relationship ($r = 0.474$; $p < 0.001$)—to moderately negatively correlated—as with the in-centrality/efficiency ($r = -0.407$; $p < 0.01$) and out-centrality/hierarchy ($r = -0.437$; $p < 0.01$) relationships, with its fair share of nonsignificant findings as well. It bears repeating that the hierarchy measure of this matrix is nearly invariant, given that donors are hardly ever recipients of aid during the same year, and thus its coefficients will be interpreted as being highly dependent on the relative invariance of this figure.

Bivariate Correlations		Year	MAid Hierarchy	MAid Efficiency	MAid LUB
Year	r	1	-0.245	-0.967	0.979
	Sig. (2-t)		0.077	0.000	0.000
	N	97	53	53	53
MAid In-Centrality	r	0.428	-0.151	-0.407	0.474
	Sig. (2-t)	0.001	0.280	0.003	0.000
	N	53	53	53	53
MAid Out-Centrality	r	0.217	-0.437	-0.123	0.286
	Sig. (2-t)	0.119	0.001	0.379	0.038
	N	53	53	53	53

Table 8.5.9: Bivariate Correlations among Vertical Dimensions of Matrix A

Controlling for time renders the in-centrality relationships fairly inert, with only the least upper boundedness of Matrix A exhibiting any arguably significant relationship with in-centrality ($r = 0.296$; $p < 0.05$). It is the centrality of the *donorship* portion of the foreign aid matrix that bears what are most likely non-random relationships with the vertical Krackhardt measures.

Partial Correlations Controlling for Year		MAid Hierarchy	MAid Efficiency	MAid LUB
MAid In-Centrality	r	-0.053	0.031	0.296
	Sig. (2-t)	0.710	0.827	0.033
	N	50	50	50
MAid Out-Centrality	r	-0.406	0.347	0.369
	Sig. (2-t)	0.003	0.012	0.007
	N	50	50	50

Table 8.5.10: Partial Correlations among Vertical Dimensions of Matrix A

Out-centrality—quite inversely proportional to in-centrality in the case of this matrix—appears to moderately correlate positively with efficiency, and even more highly so with least upper boundedness. Though the hierarchy/out-centrality will be ignored due to the limited range of the hierarchy values, it is promising that the efficiency and least upper boundedness of the matrix were positively correlated in the short-term with the donorship's centrality in the matrix, suggesting that donorship centrality might be a predictor of the efficiency and/or least upper boundedness of the foreign aid matrix, or vice-versa.

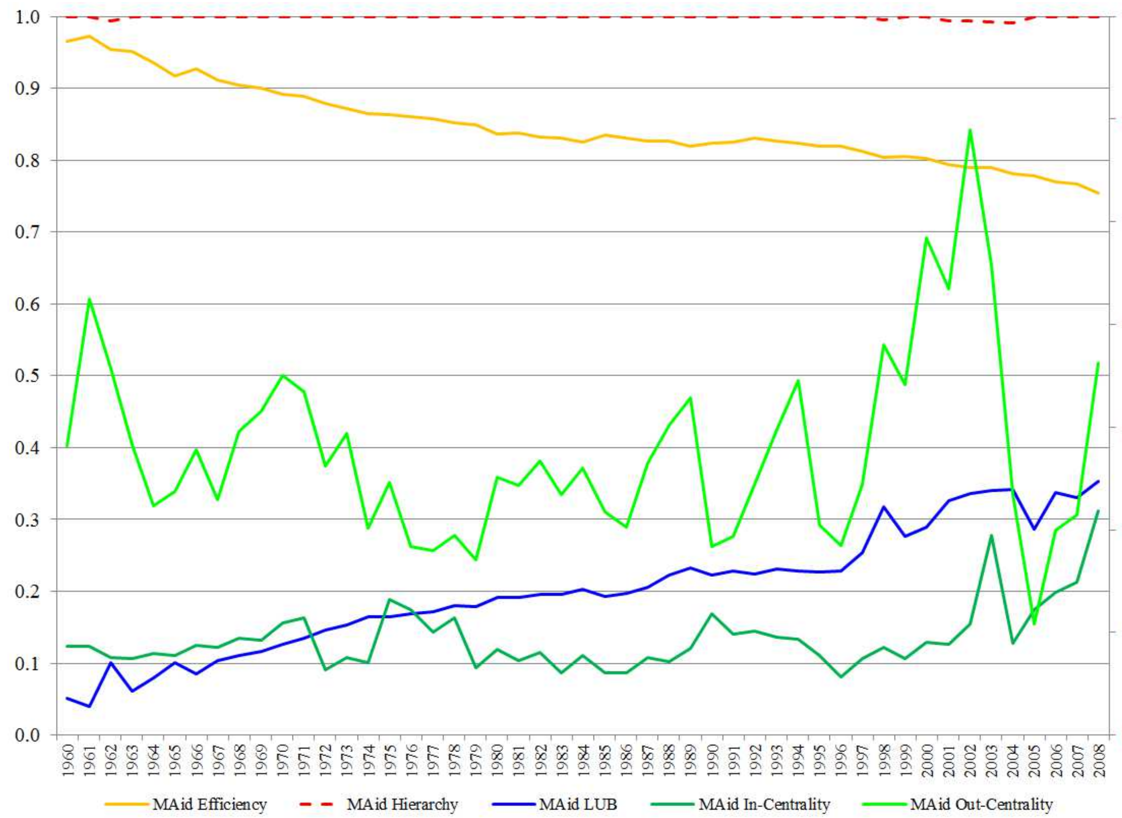
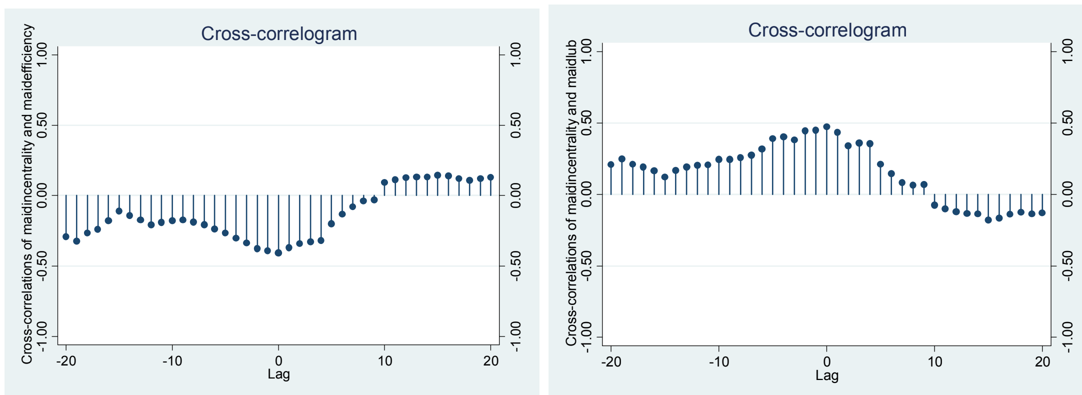


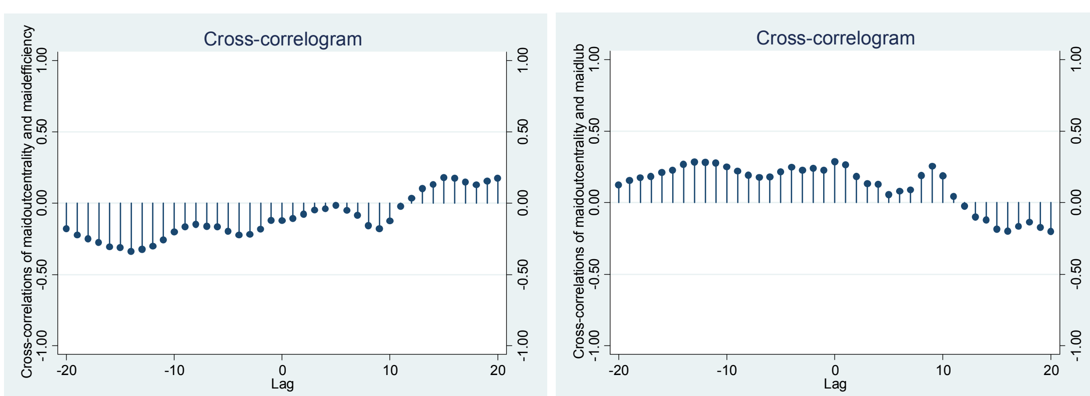
Figure 8.5.9: Vertical Dimensions of Matrix A

A better glimpse of these trajectories is evident in Figure 8.5.9, and the cross-correlograms in Figures 8.5.10 through 8.5.13 further illustrate the fact that at the bivariate level, the in-centrality of the foreign aid matrix is optimally correlated with efficiency (negatively) at no lags, and with least upper boundedness (positively), also with zero lags. While the polarity of these relationships is the same when out-centrality replaces in-centrality, the negative correlation with graph-efficiency becomes significant when foreign aid graph-efficiency is lagged by four or five years.



Figures 8.5.10 – 8.5.11: Matrix A In-Centrality ➔ Matrix A Efficiency; Matrix A In-Centrality ➔ Matrix A Least Upper Boundedness

The nearly unidirectional nature of the foreign aid matrix gives it a starkly different structure than that of the trade matrix, in which importers are almost always also exporters. The relationships within the trade network are far more haphazard than previous intra-network output. Correlations are nearly all nonsignificant, with the out-centrality/efficiency relationship ($r = -0.393$; $p < 0.001$) being the most prominent, followed by that between import centrality and the graph-hierarchy of the trade network ($r = -0.277$; $p < 0.01$).



Figures 8.5.12 – 8.5.13: Matrix A Out-Centrality ➔ Matrix A Efficiency; Matrix A Out-Centrality ➔ Matrix A Least Upper Boundedness

As with the foreign aid matrix's hierarchy, the trade matrix's least upper boundedness is nearly invariant, and consequently coefficients related to this measure will be ignored in this portion of the analysis and hereafter.

Bivariate Correlations		Year	MTrade Hierarchy	MTrade Efficiency	MTrade LUB
Year	r	1	-0.256	-0.785	0.177
	Sig. (2-t)		0.014	0.000	0.094
	N	97	91	85	91
MTrade In-Centrality	r	-0.035	-0.277	-0.237	0.041
	Sig. (2-t)	0.744	0.008	0.029	0.700
	N	91	91	85	91
MTrade Out-Centrality	r	0.272	-0.223	-0.393	0.090
	Sig. (2-t)	0.009	0.034	0.000	0.397
	N	91	91	85	91

Table 8.5.11: Bivariate Correlations among Vertical Dimensions of Matrix T

The partial coefficients continue to support an argument for an out-centrality/efficiency relationship ($r = -0.301$; $p < 0.01$), and the in-centrality/hierarchy relationship gets slightly stronger, ($r = -0.295$; $p < 0.01$). Controlling for time also reveals a possible relationship between the in-centrality and efficiency of the trade network ($r = -0.427$; $p < 0.001$).

Partial Correlations Controlling for Year		MTrade Hierarchy	MTrade Efficiency	MTrade LUB
MTrade In-Centrality	r	-0.295	-0.427	0.048
	Sig. (2-t)	0.005	0.000	0.654
	N	88	82	88
MTrade Out-Centrality	r	-0.165	-0.301	0.044
	Sig. (2-t)	0.121	0.005	0.680
	N	88	82	88

Table 8.5.12: Partial Correlations among Vertical Dimensions of Matrix T

Figure 8.5.14 below longitudinally plots both import and export centrality scores against the three vertical Krackhardt dimensions of this network. With least upper boundedness remaining nearly constant at 1.0, the variance of the rest of the measures poses no singular narrative from which to draw conclusions about these specific relationships.

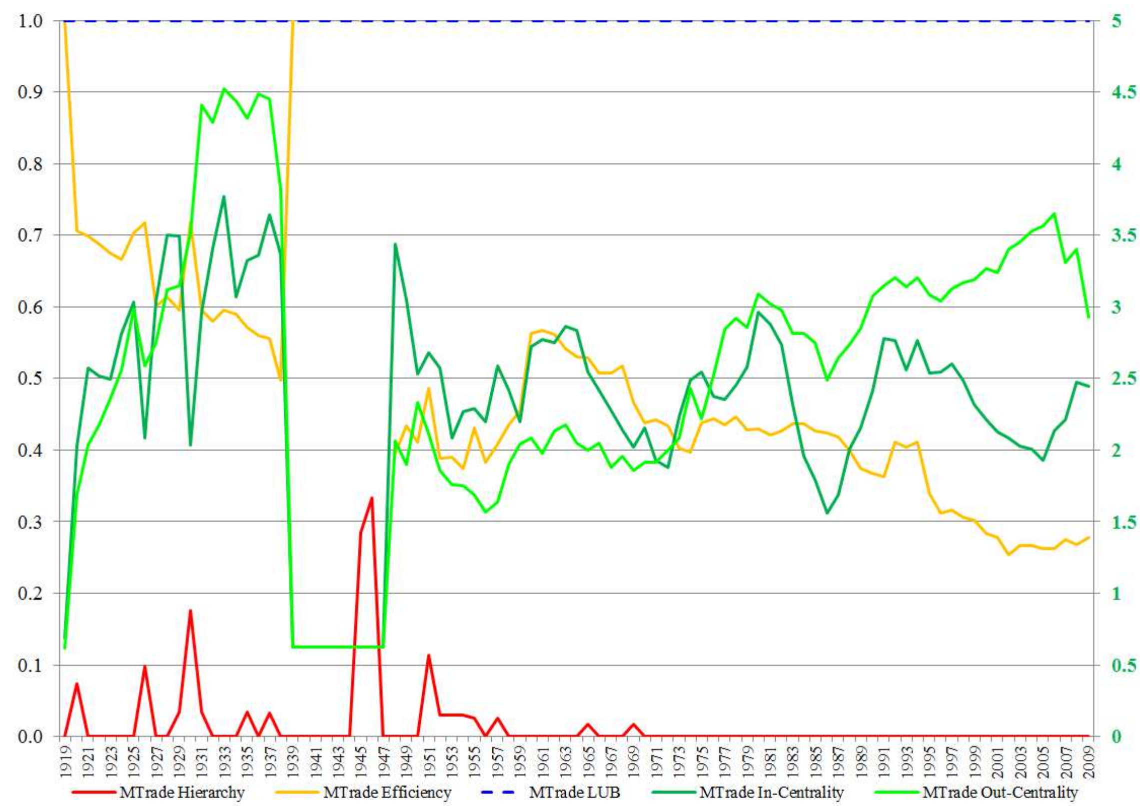
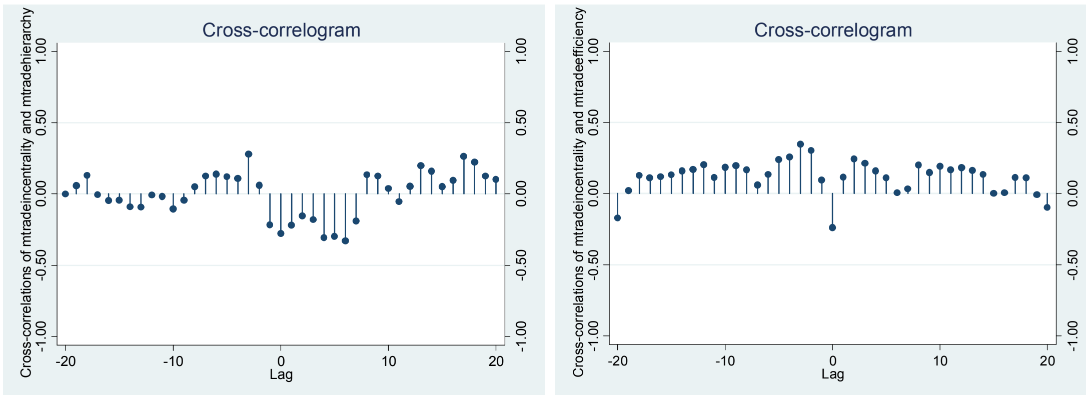
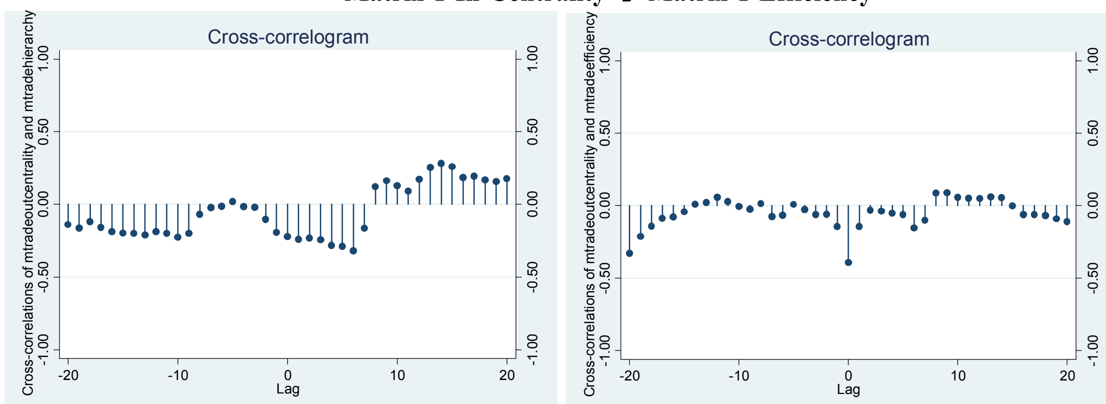


Figure 8.5.14: Vertical Dimensions of Matrix T

The cross-correlograms below are as irregular as the longitudinal plot above. Neither the in- nor the out-centrality of the trade matrix bear the overwhelming and tapering correlations that have characterized much of this chapter so far. Instead, it appears that negative relationships might be significant at the 0.01-level, but usually without lagging, the only exception being Figure 8.5.17, wherein lagging out-centrality by up to six years increases the coefficient with graph-hierarchy.



Figures 8.5.15 – 8.5.16: Matrix T In-Centrality → Matrix T Hierarchy; Matrix T In-Centrality → Matrix T Efficiency



Figures 8.5.17 – 8.5.18: Matrix T Out -Centrality → Matrix T Hierarchy; Matrix T Out-Centrality → Matrix T Efficiency

It can be concluded from this series of coefficients, longitudinal plots and cross-correlograms that there is a long-term trend affecting some of the values of these figures, and it is not always the exponential growth curve that characterizes so many of the attribute measures in the previous chapter. In general, these matrices tell a story of gradual trends of interconnectedness often coupled by a diminishment of centralization across the matrices.

8.6 Horizontal to Vertical Dimensions

The majority of intra-dimensional relationships have already been explored. This section omits the usual bivariate and partial matrices, given that these correlations already appear on previous tables, and opts for a more qualitative interpretation of the graphs below.

8.6.1 Density to Centrality

The first pair of dimensions plotted in this section is a reflection of Matrix 2: the IGO-IGO co-affiliation matrix. Descriptively, this network is comprised of a mostly increasing roster of IGOs connected to one another by an ever-increasing list of member states. Each new IGO introduces more possible ties within the network, and it is the case in this particular network that after the initial founding of the UN and Bretton-Woods institutions, it is only the comparatively exclusive ICC that diminishes the saturation of this network. This substantively explains the inverse relationship between the two, particularly during the dissolution of exclusive IGOs such as CENTO and SEATO during the late 1970s, and the formation of highly inclusive ones, such as the WTO, in 1995.

The fact that Matrix 2's density and centrality are significantly correlated, though negatively, as shown in Figure 6.2.23, found in Section 6.2.2, is not altogether an unexpected finding; the trajectories of density and centrality of a network are likely to diverge when the N of the matrix (determining all possible ties) changes exponentially or otherwise significantly.

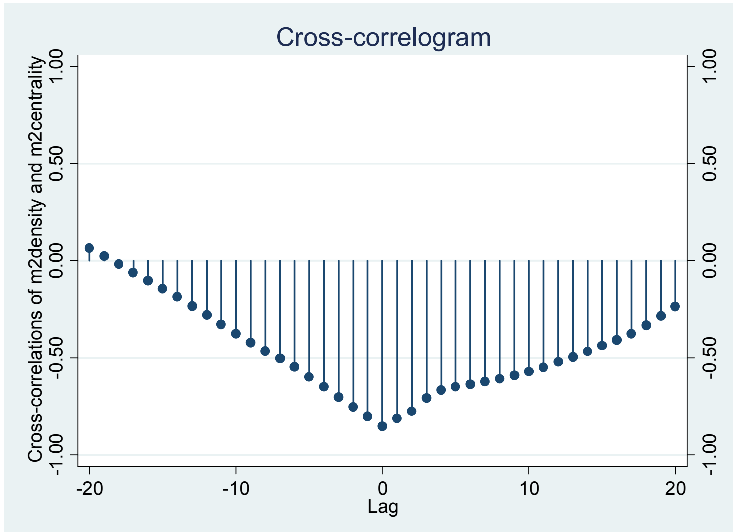


Figure 8.6.1: Matrix 2 Density ➔ Matrix 2 Centrality

The longitudinal plot in Figure 6.2.26, found in Section 6.2.4, illustrates the trajectory of each dimension of Matrix 2, whose centrality remains quite stationary (supporting the world polity argument) while its density (i.e., participation among nation-states in the international/diplomatic arena) increases.

By contrast, the strong but tapering negative correlation between the density and Freeman's degree centrality of the state co-affiliation matrices is caused by the overall drop—albeit a cyclical one—in the Freeman's centrality of this network during the century of interest, which coincides with the densification of the network over time.

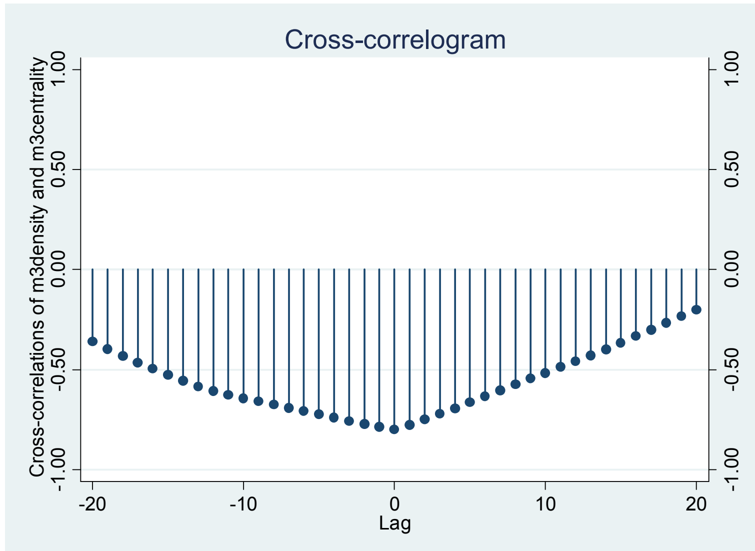


Figure 8.6.2: Matrix 3 Density ➔ Matrix 3 Centrality

The oscillations in the centrality measure point to: (1) the League of Nations period (1919 – 1944), (2) the early (1945 – 1961) and late (1961 – 1991) Cold War periods, and (4) our current period (1992 – 2015), while those same three discrete cutoffs also point to comparatively sharp rises in the density of the network. It will be interesting to see how the waning centrality of Matrix 3 will be affected by other properties of the world-system in multivariate models.

The two co-affiliation networks (Matrices 2 and 3) are permuted from the original state-IGO affiliation matrices. However, Matrix 2 has a maximum total of 12 IGO cases along each axis, while Matrix 3 has almost 200 nation-state cases along each axis, and the incorporation (or extinction) of a highly connected (or disconnected) node in each of these networks across time might have a strong effect on the attributes of Matrix 2, but not necessarily on those of Matrix 3, which is always far larger than its IGO co-affiliation counterpart.

Some relationships resulted unexpectedly in extremely high 0-lag correlations, such as that between the IGO co-affiliation network's density and the centrality of the United Nations in that network. While the density and centrality of a network might be mildly correlated, the centrality of the network's hegemonic node—in this case the UN—is actually quite strongly and positively correlated with the network's density. Figure 6.2.23, found in Section 6.2.2, clearly shows the similar sensitivities that the density and centrality formulas have to changes the structure of the network with sometimes just the addition or subtraction from one node.

To serve as an example, the inception of the UN coincides with very few other very highly connected IGOs, and it is not until the 1950s that NATO, CENTO, and SEATO—all regional/disconnected IGOs—come into existence, mathematically driving the centrality of the UN down via the incorporation of nation-states into these exclusive organizations. With the dissolution of CENTO and SEATO in the late 1970s, the density of the network rises, given that the denominator of that formula (based on the total number of possible ties) goes down by a far larger figure than the number of actual nodes tied to those organizations.

The inception of the WTO—by contrast, highly inclusive—increases the total number of ties as well as the UN's number of co-affiliations with this new IGO. The ICC was founded in 2002, causing a small dip in both figures due to an initial lag in the inclusion of some countries, a lag that was corrected within a few years when most of the world joined the ICC. For the most part, however, controlling for the rise or demise of any given IGO, the network's density and the UN's centrality both exhibit a pattern of exponential growth, which might account for part of the collinearity.

8.7. Inter- and Intra-network Relationships

The analysis has now reached a stage which integrates the inter-network and intra-network relationships already discussed. The next chapter integrates network and non-network factors, incorporating this chapter's findings into a comprehensive causal model regressing inequality on both attribute variables and the various dimensions of each network's integration and hierarchy.

Another finding flags a *positive* relationship between the centrality of the trade (export) network and the centrality of the foreign aid (donor) network ($r = 0.420$). Both constitute the out-portion of each matrix, presumably the patron node in any given dyadic trade or aid relationship among nation-states. Its converse, the relationship between the centralities of the trade (import) network and the foreign aid (recipient) network, yields a negative relationship ($r = -0.464$), suggesting that the centralization of foreign aid and international trade might collectively benefit the majority of exporters and donors while creating a zero-sum arena of competition among importers and recipients. This leads to an engaging question: while the donor is the clear patron in a foreign aid dyad, is the patron of the trade network the importer or the exporter? This question might be empirically addressed in another study by looking at the types of imports and exports in which a country trades. As a general rule, however, raw materials are the export staple of peripheral, dependent actors, while highly technical products and tertiary-sector services typically characterize the exports of a core power.

Analysis of the cross-correlations between the out-centralities of these two networks should yield a justifiable coefficient for further multivariate testing, but this complicates the theoretical question of soft versus hard power. Since both trade and foreign aid are types of soft power, why does one prevail when the other fails?

8.8. Chapter Summary

Due to the heterogeneity of these dimensions of global governance across networks, it was expected that only intra-network dimensions, if any, would be collinear. Surprisingly, however, it appears that the integration of the system, particularly when measured by density, is a phenomenon that affects all networks of global governance relevant to this dissertation relatively similarly.

This is not the case for its features of vertical differentiation, as here, relationships are more tentative, and specific to the unique structure of each network. The highly imbalanced nature of the foreign aid network, for example, is subject to quite different cycles and trends than those that characterize the vertical features of the far more balanced trade network, for example.

In sum, it will be in Chapter 9 where unique—that is, statistically controlled for—causal mechanisms will be identified, if any, via Prais-Winsten regressions, which are intended to account for the copious autocorrelation found throughout the working dataset.

Chapter 9: Comprehensive Analysis

Chapter 7 addresses relationships among institutionally similar attributes of the world-system as indicators of global governance, answering the question: what are the relationships among indicators of the same dimension (or similar dimensions) of global governance? Chapter 8, on the other hand, focuses on relationships within and across the three main networks studied in this dissertation. It is in the current chapter, however, that the effects of hegemonic activities—such as military expenditures—on the state of hegemony itself, as proxied by US GDP per capita, for example, become more evident. Some of the patterns and relationships uncovered during the bivariate stages of analysis will be further assessed, testing for unique causal effects that control for a multitude of similar and dissimilar factors. Periodization also plays a key role in this chapter, adding a much needed layer of analytical depth that the unperiodized analysis has hereto lacked. The chapter begins with a discussion of the temporal cutoffs that comprise the periodization scheme.

9.1 Periodization

Having surveyed the univariate properties the bivariate relationships most conducive to the testing of unique effects of global governance on the level of economic development of the United States, a case for periodization as an element in the regression analysis will be made. Based on the majority of the univariate findings, the four periods—discussed in greater detail in previous chapters—are classified as the League of Nations period (1919 – 1944), (2) the early (1945 – 1961) and late (1961 – 1991) Cold War periods, and (4) the current, post-Cold War period (1992 – 2016).

Correlations calculated on the Cold War scheme as it is coded assume the effect of the periodization to be linear, though in reality it might be curvilinear, which might appear as a nonsignificant finding at the bivariate level. Ideally, if periodization is to be an improvement in the explanation of inequality, multivariate results controlling for time should render findings to be dissimilar from the findings reflecting an unperiodized regression (i.e., one not controlling for time), and more specifically, there should be a significant improvement in the model's R^2. Section 9.3.1 addresses this question.

To begin with, the longitudinal plot below displays three cross-sectionally standardized measures of hegemony—US GDP per capita, and US military expenditures (raw and per soldier)—plus US GDP as a proportion of the world's GDP. The rightmost y-axis corresponds to the non-standardized proportion of US GDP relative to global GDP, while the leftmost y-axis represents the number of standard deviations above the mean that correspond to the hegemon's raw values, relative to all other nation-states values.

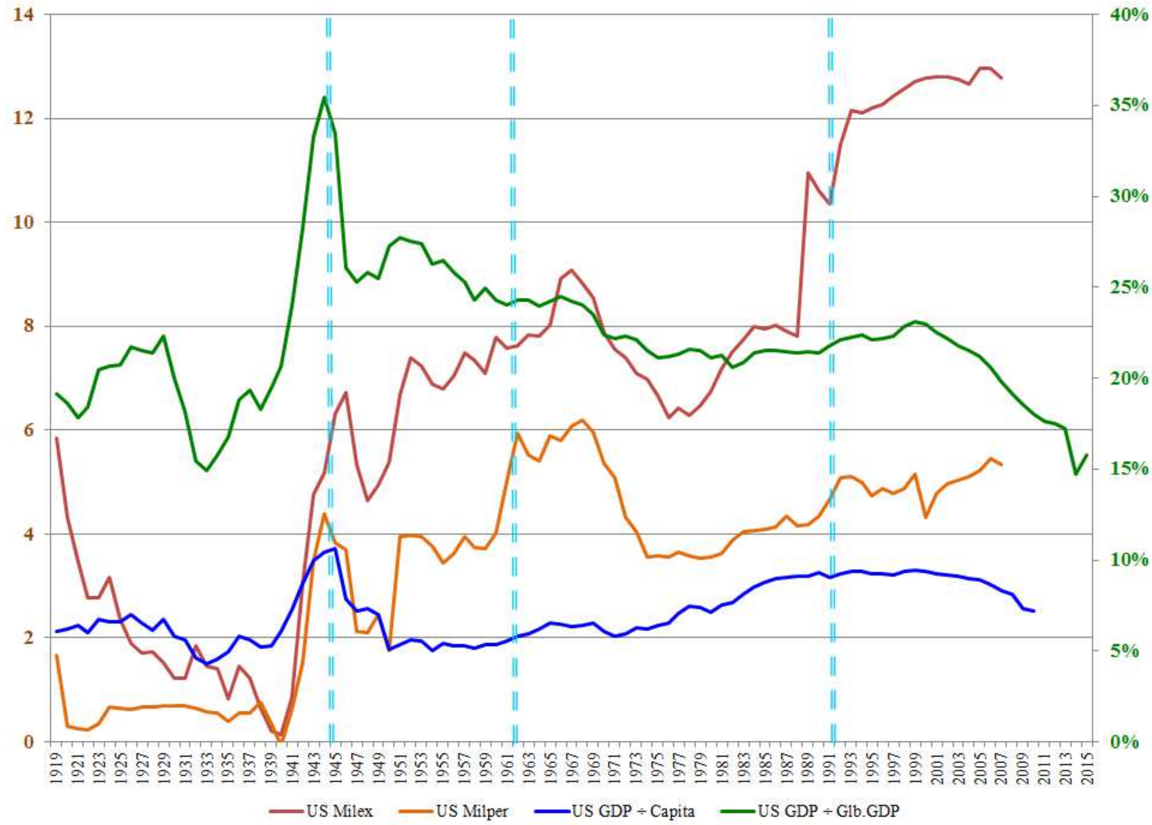


Figure 9.1.1: Periodized Longitudinal Plot of Four Hegemonic Variables

Only two of these measures are included in the multivariate model, though each exemplifies shifts in the hegemon's relative position to the rest of the world, and the later stages—though more subtly demarcated—appear to be somewhat subject to cyclical forces. In addition to sometimes subtle but notable directional shifts and/or scale changes in the longitudinal trajectories above, there is also significant evidence of a positive correlation between the periodization scheme and the dependent variable, illustrated by the blue line in Figure 9.1.1, though it appears from the cross-correlogram in Figure 9.1.2 that the periodization scheme might be more predictive of the dependent variable's variance if the cutoffs are made about half a decade earlier.

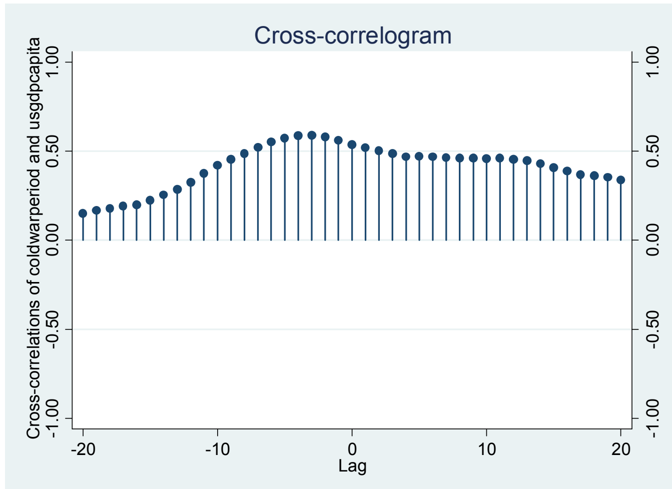


Figure 9.1.2: Cold War period ➔ US GDP per Capita, Standardized

The right portion of the model suggest that lagging the cutoffs—that is, shifting the cutoffs even a few years forward in time—gradually decreases the *bivariate* covariance between linear periodicity and the dependent variable. On this note, partial correlations controlling for time are redundant with periodicity, and consequently unnecessary.

To return to the issue of cutoffs, while shifting these would raise the r-values of this relationship from 0.537 at 0 lags to an optimal 0.574 at -4 lags, both coefficients are significant at $p < 0.001$, meaning that there is no substantial improvement in changing the periodization scheme, particularly with no theoretical justification for doing so.

Thus far, the questions that have been empirically settled include those related to: (1) intra-network relationships (such as that between the density and centrality of Matrix 2), (2) inter-network relationships (such as that between the densities of Matrices 3 and T), and relationships not related to networks (such as that between the United States' military budget and its GDP per capita; see Figure 7.2.7). To recap, aside from the network/non-network distinction, two other typologies of global governance have been incorporated:

> **Structural:** *centralization* vs. *integration* of global governance
> **Institutional:** *economic* vs. *diplomatic* vs. *military* dimensions of global governance

These typologies facilitate broader conclusions about which general dimensions of global governance are affecting which others. Combining these conceptual distinctions, each indicator in this study can be further categorized as a proxy for economic centralization, economic integration, political centralization, and political integration. This assumes that diplomatic and military dimensions are collapsed into a single political dimension.

This conceptualization clusters indicators conceptually as shown in Figure 9.2.1, which uses a color scheme (detailed below) based on these three typologies.

9.2 Reassessment of Indicators of Global Governance

This section addresses the results put forth so far, and makes a case for an empirically grounded reduction of variables to be scrutinized at the multivariate level, followed by a final overview of descriptive findings, and implications for answering the final question of this dissertation: how does each indicator or dimension of global governance affect the hegemon's material level of subsistence?

To this end, Figure 9.2.1 includes all variables that have not been eliminated from the study at previous stages of the analysis. Clustered by their respective dimensions, each indicator is further color coded: yellow boxes represent network properties, violet boxes represent network node properties (i.e., node centrality), while black boxes represent non-network attributes of the world-system or its hegemon.

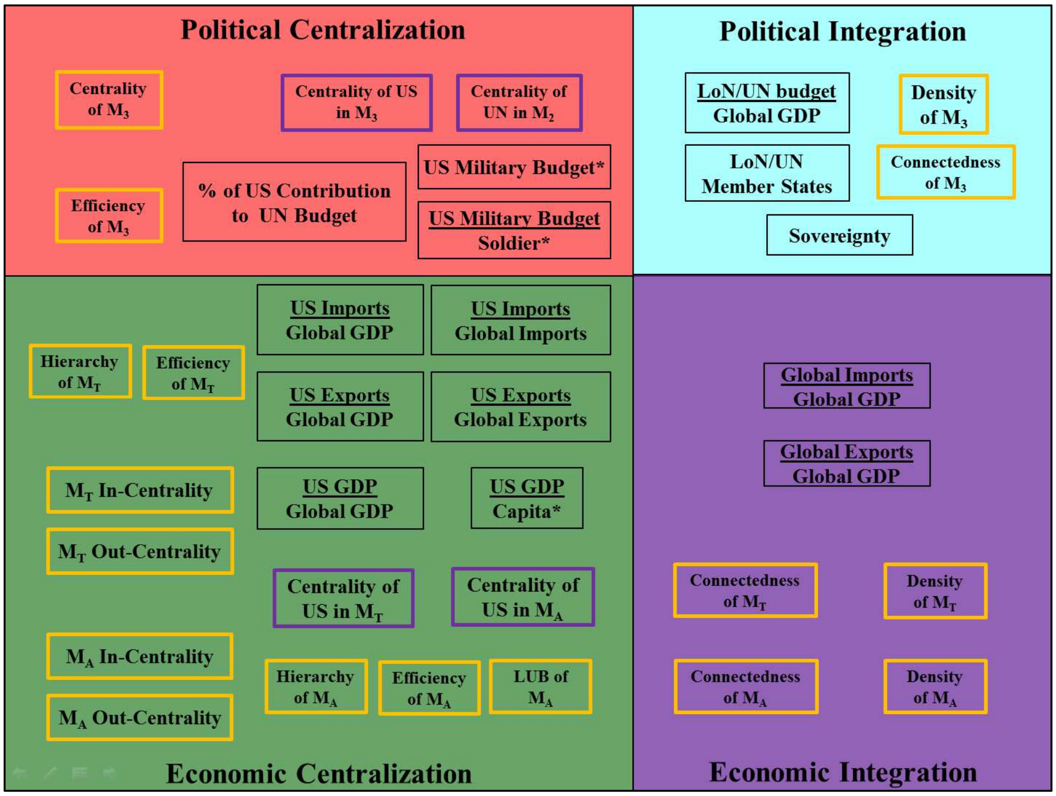


Figure 9.2.1: Conceptualization of Indicators of Global Governance

This diagram is further trimmed below based on irregularities and/or redundancies among some of the indicators therein, and from the remaining variables, a multivariate model derived from this final variable set is subsequently presented and tested.

9.2.1 Elimination of Variables Based on Empirical Grounds

Since many of these variables are mathematically homogeneous—that is, they are computed from identical or very similar raw figures—collinearity can easily be eliminated by eliminating some of these redundant indicators. Such measures will be dropped at this stage of the analysis, these including: global exports ÷ global GDP (highly collinear with global imports ÷ global GDP); US military expenditures per soldier (moderately collinear and redundant with raw US military expenditures); US imports ÷ global GDP (US imports ÷ global imports has a more manageable range, and greater validity as a measure of US prevalence in the world-economy); as well as US exports ÷ global GDP and US exports ÷ global exports (both indicators of US centrality are redundant with their import counterparts). With respect to hegemonic trade figures, when global GDP is a denominator of US imports or exports, this yields exponentially trended data, while the measure of US trade relative to world trade is (1) detrended, (2) cyclical, and (3) highly sensitive to World War II's impact on the import/export sector of the economy. Consequently, measures of US trade relative to global GDP will be omitted from the multivariate analysis.

In addition, as mentioned in Chapter 7, the Europa Year Book's IGO count has already been omitted from the analysis due to its questionable validity and limited availability, timewise.

The logic applied to the US trade figures discussed directly above also applies to the network equivalent. The in- and out- centralities of the trade matrix are collinear with one another, though the same does not apply to the nonmilitary foreign aid matrix, which is asymmetrical by its nature. Therefore, both the in- and out-centralities of Matrix A will be considered in the analysis. Likewise, sovereignty and the LoN/UN member count are nearly identical, and therefore the latter will be used in favor of the former.

A noteworthy parity characterizes the trajectories of US GDP per capita (standardized against all other nations) and US GDP ÷ global GDP (see Figure 7.1.1 for reference). Before 1950, both variables oscillate nearly perfectly, though this parity disappears in the 1950s. Because the per-capita figure is more consistent with an ideal type cycle, its trajectory will be used to proxy economic hegemony rather than US GDP ÷ global GDP.

Regarding the integration of networks, it is only with the IGO networks that connectedness and density are highly collinear. Consequently, density will be used in preference over connectedness in the case of Matrix 3's integration. Because the densities and connectednesses of the aid and trade networks are not collinear, both dimensions of these networks will be kept in the analysis.

Another issue leading to the elimination of variables is irregularity in variances. The graph-hierarchy of the trade matrix is nearly invariant at 0 for more than half of the period in the study, given that most or all importers are also exporters. Its distribution might be better studied independently in a separate effort; it will be omitted from the multivariate analysis. The hierarchy of Matrix A is even more invariant, though it is almost always a 1, indicative of the nearly perfect patron-client structure of the foreign aid network.

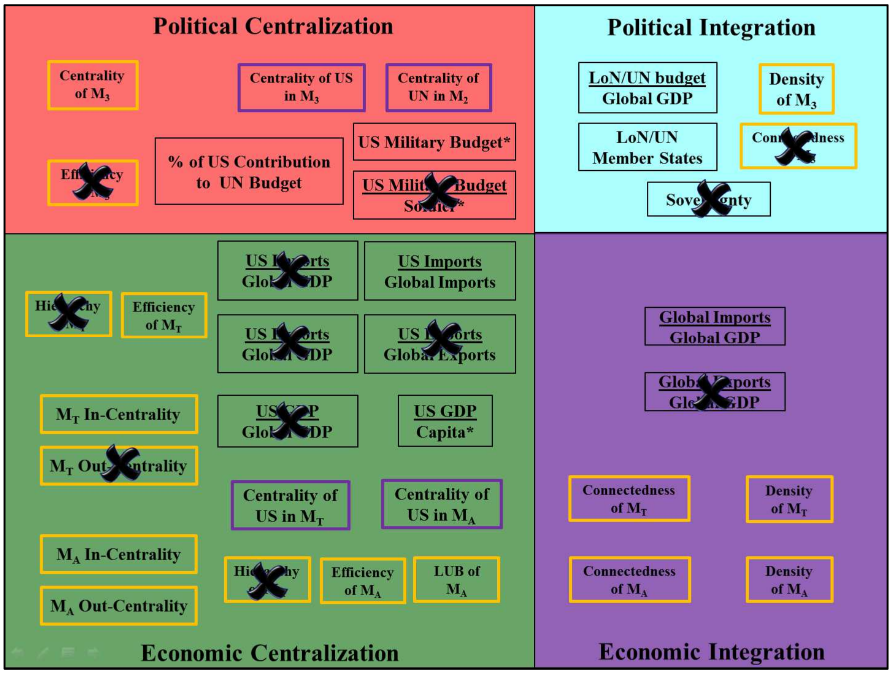


Figure 9.2.2: Reduction of Indicators of Global Governance

A similar case pertains to Matrix 3: though Krackhardt's graph-efficiency can be computed for this variable even with only the League of Nations as the sole IGO node (while centrality cannot), its value prior to the inception of the United Nations is invariably 0, and therefore is likely to confound multivariate results. Yielding figures from 1945 onward, the centrality of Matrix 3 measures a much more linear trajectory that appears synchronous enough with efficiency to justify eliminating efficiency and keeping centrality. Figure 9.2.2 reproduces Figure 9.2.1, identifying the variables dropped from the subsequent portion of the analysis due to redundancy or other issues.

9.2.2 Final Analysis of Bivariate and Partial Correlations

Section 7.1.1 postulates that the hegemon benefits linearly from growth in the import/export sector of the world-economy, drawing this tentative conclusion from the unlagged collinearities between the hegemon's imports/exports relative to global GDP and global imports/exports relative to global GDP (see Figures 7.1.5 through 7.1.8) as well as various relationships involving US GDP per capita (standardized). This introduces the central question of this chapter, which assigns the hegemon's standardized per-capita GDP to be the dependent variable in the Prais-Winsten regressions[21] that follow in Section 9.3. While some of the output presented will be redundant with previous chapters, the bivariate discussion in this chapter will opt to reference the original analyses in Chapters 7 and 8 when possible.

The matrix for the entire inventory of remaining measures in this chapter is too large to reproduce herein, but some of its subsets will be presented below, once further elimination of variables has been completed. To begin with, at the bivariate level, the out-centralities of Matrix A and of the US in that matrix are (1) collinear with one another (r = 0.779), and (2) not significantly correlated to anything else. The highest r-coefficients associated with Matrix A's out-centrality are those with US imports as a proportion of global imports (r = 0.363) and with the LoN/UN budget as a proportion of global GDP (r = -0.354), and no other coefficient associated with the centrality of the US in that matrix is above 0.3. Controlling for time, in most of these cases, does very little to increase the coefficients, if at all. The in-centrality equivalent for this matrix is only slightly more significant in a handful of its coefficients, both in its bivariate and partial forms. Consequently, the relative irrelevance of all three of these figures demands that they be removed from the consideration for regression analysis.

[21] Prais-Winsten regression is designed to account for the zero-order autocorrelated error, or residuals, that are evident in many of the variables discussed in this chapter.

A similar case can be made for Matrix T's in-centrality, as well as that of the US in that matrix. Though collinear with one another, they are hardly related to anything else, with only a few exceptions at the partial level. In the case of the trade matrix itself, its in-centrality is correlated to US imports ÷ global imports by a factor of -0.531 when controlling for long-term change. This coefficient warrants the inclusion of the trade matrix's in-centrality, but the in-centrality of its hegemonic node here would be redundant, and thus will also be removed from further analysis.

The Pearson's matrix in Table 9.2.1 presents the bivariate relationships among the time variable, the categorical period variable, the level of economic development of the United States (standardized against all other nations) as a proposed variable of analytical focus, and the remaining non-network attributes of global governance to be analyzed in this section. As was evident in some of the preliminary findings regarding these measures, collinearity is still an issue in the variables selected for multivariate study. Some of this is due to autocorrelation among many of these measures, which will be addressed by the Prais-Winsten iterations integral to that type of regression model.

Bivariate Correlations		Year	Cold War Period	US GDP ÷ Capita	US Milex	US% Contrib to UN	US Imports ÷ Global Imports	Global Imports ÷ Global GDP	LoN/UN Budget ÷ Global GDP	LoN/UN Members
Year	r	1	0.843	0.904	0.816	-0.881	0.760	0.972	0.502	0.986
	Sig. (2-t)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cold War Period	r	0.843	1	0.726	0.859	-0.630	0.621	0.829	0.267	0.882
	Sig. (2-t)	0.000		0.000	0.000	0.000	0.000	0.000	0.066	0.000
US GDP ÷ Capita	r	0.904	0.726	1	0.734	-0.801	0.809	0.827	0.611	0.902
	Sig. (2-t)	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
US Milex	r	0.816	0.859	0.734	1	-0.510	0.687	0.833	0.049	0.799
	Sig. (2-t)	0.000	0.000	0.000		0.000	0.000	0.000	0.741	0.000
US% Contrib to UN	r	-0.881	-0.630	-0.801	-0.510	1	-0.595	-0.844	-0.708	-0.881
	Sig. (2-t)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
US Imports ÷ Global Imports	r	0.760	0.621	0.809	0.687	-0.595	1	0.671	0.265	0.741
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000		0.000	0.069	0.000
Global Imports ÷ Global GDP	r	0.972	0.829	0.827	0.833	-0.844	0.671	1	0.412	0.948
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000		0.004	0.000
LoN/UN Budget ÷ Global GDP	r	0.502	0.267	0.611	0.049	-0.708	0.265	0.412	1	0.554
	Sig. (2-t)	0.000	0.066	0.000	0.741	0.000	0.069	0.004		0.000
LoN/UN Members	r	0.986	0.882	0.902	0.799	-0.881	0.741	0.948	0.554	1
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Table 9.2.1: Bivariate Correlations among Non-network Attributes of Global Governance

By contrast, we can see that many of the collinear coefficients (highlighted in red) become more moderate in their intensity once time is controlled for in Table 9.2.2. It is worthy of remark that the relationship between the United States' military budget (standardized against all other nations' budgets) becomes highly positively correlated with its percentage contribution to the United Nations budget when time is controlled for. The bivariate relationship, as one would expect from visually assessing the trajectories of US military expenditures and its proportional contribution to the UN budget, is negative ($r = -0.510$, $p < 0.001$). However, controlling for time often reveals patterns that are not visible in a longitudinal plot. Though not as evident in Figure 7.2.1, this relationship becomes positive ($r = 0.761$, $p < 0.001$) when trend-controlled. This is rather surprising and thought-provoking, given that the most plausible expectation of this relationship would be zero-sum in that the more economic emphasis a hegemon places on diplomacy, the less it has left to spend on militarism. This is a queer finding, given that (1) the US contribution to the UN budget punctuatedly decreases during discrete periods, and never increases, and (2) the trajectory of its military expenditures is characterized—at least relative to other military budgets—by cycles of growth and diminishment (Figure 7.2.5).

Partial Correlations Controlling for Year		Cold War Period	US GDP ÷ Capita	US Milex	US% Contrib to UN	US Imports ÷ Global Imports	Global Imports ÷ Global GDP	LoN/UN Budget ÷ Global GDP	LoN/UN Members
Cold War Period	r	1	-0.160	0.550	0.441	-0.057	0.071	-0.335	0.561
	Sig. (2-t)	.	0.282	0.000	0.002	0.701	0.636	0.021	0.000
	df	0	45	45	45	45	45	45	45
US GDP ÷ Capita	r	-0.160	1	-0.014	-0.024	0.436	-0.527	0.426	0.140
	Sig. (2-t)	0.282	.	0.923	0.873	0.002	0.000	0.003	0.347
	df	45	0	45	45	45	45	45	45
US Milex	r	0.550	-0.014	1	0.761	0.178	0.290	-0.720	-0.056
	Sig. (2-t)	0.000	0.923	.	0.000	0.231	0.048	0.000	0.710
	df	45	45	0	45	45	45	45	45
US% Contrib to UN	r	0.441	-0.024	0.761	1	0.244	0.112	-0.649	-0.158
	Sig. (2-t)	0.002	0.873	0.000	.	0.099	0.452	0.000	0.290
	df	45	45	45	0	45	45	45	45
US Imports ÷ Global Imports	r	-0.057	0.436	0.178	0.244	1	-0.453	-0.207	-0.084
	Sig. (2-t)	0.701	0.002	0.231	0.099	.	0.001	0.162	0.573
	df	45	45	45	45	0	45	45	45
Global Imports ÷ Global GDP	r	0.071	-0.527	0.290	0.112	-0.453	1	-0.375	-0.289
	Sig. (2-t)	0.636	0.000	0.048	0.452	0.001	.	0.009	0.049
	df	45	45	45	45	45	0	45	45
LoN/UN Members	r	-0.335	0.426	-0.720	-0.649	-0.207	-0.375	1	0.413
	Sig. (2-t)	0.021	0.003	0.000	0.000	0.162	0.009	.	0.004
	df	45	45	45	45	45	45	0	45

Table 9.2.2: Partial Correlations among Non-network Attributes of Global Governance

Similarly, US military expenditures appear to be as intensely (though negatively) correlated with the LoN/UN member count. The relationship between the US military budget and the two measures of UN prevalence is complex to say the least: while its short-term correlation with the US contribution to the UN budget (a stagnant or decreasing figure) is positive, its short-term correlation with the LoN/UN member count (a mostly increasing figure) is negative. It can be inferred from this that though the hegemon is periodically decreasing its fiscal prominence in the UN budget, this is not an indication of the UN's recession in the world-system, but likely one of decentralization, wherein China and other nation-states now encumber a comparatively greater portion of the UN budget, given their relative prominence in the world-economy. Similarly, as the US places increased emphasis on its military budget—and less on its UN expenditures relative to other nations—the UN continues to extend membership to emerging nations.

Bivariate Correlations		Year	Cold War Period	US GDP ÷ Capita	M3 Density	M3 Centrality	M3 US Centrality	M2 UN Centrality	MAid Density	MAid Connectedness	MAid Efficiency	MAid LUB	MTrade Density	MTrade In-Centrality	MTrade Connectedness	MTrade Efficiency
Year	r	1	0.843	0.904	0.973	-0.944	0.898	0.940	0.908	0.939	-0.956	0.973	0.892	-0.278	0.962	-0.946
	Sig. (2-t)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055	0.000	0.000
Cold War Period	r	0.843	1	0.726	0.914	-0.830	0.921	0.818	0.749	0.904	-0.751	0.822	0.808	-0.125	0.911	-0.817
	Sig. (2-t)	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.397	0.000	0.000
US GDP ÷ Capita	r	0.904	0.726	1	0.832	-0.899	0.830	0.821	0.803	0.883	-0.863	0.841	0.669	-0.242	0.854	-0.774
	Sig. (2-t)	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.097	0.000	0.000
M3 Density	r	0.973	0.914	0.832	1	-0.897	0.912	0.961	0.876	0.947	-0.894	0.949	0.930	-0.234	0.970	-0.944
	Sig. (2-t)	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.109	0.000	0.000
M3 Centrality	r	-0.944	-0.830	-0.899	-0.897	1	-0.927	-0.828	-0.805	-0.925	0.968	-0.921	-0.735	0.263	-0.953	0.892
	Sig. (2-t)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.000	0.000
M3 US Centrality	r	0.898	0.921	0.830	0.912	-0.927	1	0.835	0.738	0.945	-0.865	0.870	0.747	-0.248	0.938	-0.893
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.089	0.000	0.000
M2 UN Centrality	r	0.940	0.818	0.821	0.961	-0.828	0.835	1	0.836	0.881	-0.854	0.915	0.912	-0.211	0.903	-0.906
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.151	0.000	0.000
MAid Density	r	0.908	0.749	0.803	0.876	-0.805	0.738	0.836	1	0.812	-0.828	0.839	0.903	-0.161	0.830	-0.814
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.275	0.000	0.000
MAid Connectedness	r	0.939	0.904	0.883	0.947	-0.925	0.945	0.881	0.812	1	-0.862	0.898	0.793	-0.130	0.968	-0.893
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.380	0.000	0.000
MAid Efficiency	r	-0.956	-0.751	-0.863	-0.894	0.968	-0.865	-0.854	-0.828	-0.862	1	-0.956	-0.789	0.346	-0.921	0.923
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.016	0.000	0.000
MAid LUB	r	0.973	0.822	0.841	0.949	-0.921	0.870	0.915	0.839	0.898	-0.956	1	0.873	-0.310	0.940	-0.956
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.032	0.000	0.000
MTrade Density	r	0.892	0.808	0.669	0.930	-0.735	0.747	0.912	0.903	0.793	-0.789	0.873	1	-0.225	0.838	-0.872
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.125	0.000	0.000
MTrade In-Centrality	r	-0.280	-0.125	-0.242	-0.234	0.263	-0.248	-0.211	-0.161	-0.130	0.346	-0.310	-0.225	1	-0.198	0.334
	Sig. (2-t)	0.055	0.397	0.097	0.109	0.070	0.089	0.151	0.275	0.380	0.016	0.032	0.125		0.178	0.021
MTrade Connectedness	r	0.962	0.911	0.854	0.970	-0.953	0.938	0.903	0.830	0.968	-0.921	0.940	0.838	-0.198	1	-0.927
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.178		0.000
MTrade Efficiency	r	-0.946	-0.817	-0.774	-0.944	0.892	-0.893	-0.906	-0.814	-0.893	0.923	-0.956	-0.872	0.334	-0.927	1
	Sig. (2-t)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.000	

Table 9.2.3: Bivariate Correlations among Network Attributes of Global Governance

Much like Table 9.2.1 above, there is almost unanimous collinearity among the network measures considered in this portion of the analysis. The exceptional measure here is the in-centrality of the trade matrix, which has been retained for its moderate correlations with other network and attribute measures of global governance. Also, the relationship between the trade network's density and the GDP per capita of the US (standardized), while not collinear, is highly significant ($r = 0.699$, $p < 0.001$), forecasting significant b-coefficients in a regression testing for unique effects based on this variable pair.

At the partial level of analysis, there are many possible relationships to be tested here, but if the dependent variable her is to be the US' level of economic development as measured by the z-score of its GDP per capita relative to all other nations' values, then it is the second column in the matrix that is most useful. We see here that trade density—the only non-collinear relationship at the bivariate level involving the dependent variable—is now the only collinear relationship, suggesting that while controlling for time has rendered this relationship more prominent, the remainder of the relationships were largely due to secular trends, and have either been eliminated or rendered to median levels representing correlation independent of computational homogeneity and other forms of collinearity.

Partial Correlations Controlling for Year		Cold War Period	US GDP ÷ Capita	M3 Density	M3 Centrality	M3 US Centrality	M2 UN Centrality	MAid Density	MAid Connectedness	MAid Efficiency	MAid LUB	MTrade Density	MTrade In-Centrality	MTrade Connectedness	MTrade Efficiency
Cold War Period	r	1	-0.160	0.752	-0.190	0.691	0.136	-0.073	0.604	0.352	0.010	0.232	0.212	0.682	-0.110
	Sig. (2-t)	.	0.282	0.000	0.201	0.000	0.361	0.625	0.000	0.015	0.945	0.117	0.152	0.000	0.462
	df	0	45	45	45	45	45	45	45	45	45	45	45	45	45
US GDP ÷ Capita	r	-0.160	1	-0.492	-0.323	0.093	-0.200	-0.103	0.234	0.016	-0.393	-0.710	0.023	-0.135	0.587
	Sig. (2-t)	0.282	.	0.000	0.027	0.536	0.178	0.490	0.114	0.916	0.006	0.000	0.880	0.364	0.000
	df	45	0	45	45	45	45	45	45	45	45	45	45	45	45
M3 Density	r	0.752	-0.492	1	0.290	0.378	0.591	-0.082	0.427	0.542	0.049	0.601	0.165	0.536	-0.320
	Sig. (2-t)	0.000	0.000	.	0.048	0.009	0.000	0.586	0.003	0.000	0.742	0.000	0.269	0.000	0.028
	df	45	45	0	45	45	45	45	45	45	45	45	45	45	45
M3 Centrality	r	-0.190	-0.323	0.290	1	-0.548	0.525	0.382	-0.336	0.673	-0.036	0.719	0.002	-0.496	-0.011
	Sig. (2-t)	0.201	0.027	0.048	.	0.000	0.000	0.008	0.021	0.000	0.808	0.000	0.988	0.000	0.944
	df	45	45	45	0	45	45	45	45	45	45	45	45	45	45
M3 US Centrality	r	0.691	0.093	0.378	-0.548	1	-0.062	-0.421	0.673	-0.051	-0.038	-0.275	0.005	0.611	-0.303
	Sig. (2-t)	0.000	0.536	0.009	0.000	.	0.678	0.003	0.000	0.735	0.799	0.062	0.976	0.000	0.038
	df	45	45	45	45	0	45	45	45	45	45	45	45	45	45
M2 UN Centrality	r	0.136	-0.200	0.591	0.525	-0.062	1	-0.119	-0.010	0.447	0.010	0.478	0.155	-0.014	-0.151
	Sig. (2-t)	0.361	0.178	0.000	0.000	0.678	.	0.424	0.949	0.002	0.949	0.001	0.299	0.925	0.312
	df	45	45	45	45	45	0	45	45	45	45	45	45	45	45
MAid Density	r	-0.073	-0.103	-0.082	0.382	-0.421	-0.119	1	-0.277	0.327	-0.456	0.491	0.229	-0.384	0.332
	Sig. (2-t)	0.625	0.490	0.586	0.008	0.003	0.424	.	0.060	0.025	0.001	0.000	0.122	0.008	0.023
	df	45	45	45	45	45	45	0	45	45	45	45	45	45	45
MAid Connectedness	r	0.604	0.234	0.427	-0.336	0.673	-0.010	-0.277	1	0.347	-0.189	-0.285	0.398	0.691	-0.045
	Sig. (2-t)	0.000	0.114	0.003	0.021	0.000	0.949	0.060	.	0.017	0.204	0.052	0.006	0.000	0.762
	df	45	45	45	45	45	45	45	0	45	45	45	45	45	45
MAid Efficiency	r	0.352	0.016	0.542	0.673	-0.051	0.447	0.327	0.347	1	-0.385	0.479	0.285	-0.015	0.195
	Sig. (2-t)	0.015	0.916	0.000	0.000	0.735	0.002	0.025	0.017	.	0.008	0.001	0.052	0.918	0.188
	df	45	45	45	45	45	45	45	45	0	45	45	45	45	45
MAid LUB	r	0.010	-0.393	0.049	-0.036	-0.038	0.010	-0.456	-0.189	-0.385	1	0.050	-0.175	0.060	-0.471
	Sig. (2-t)	0.945	0.006	0.742	0.808	0.799	0.949	0.001	0.204	0.008	.	0.737	0.238	0.690	0.001
	df	45	45	45	45	45	45	45	45	45	0	45	45	45	45
MTrade Density	r	0.232	-0.710	0.601	0.719	-0.275	0.478	0.491	-0.285	0.479	0.050	1	0.054	-0.161	-0.193
	Sig. (2-t)	0.117	0.000	0.000	0.000	0.062	0.001	0.000	0.052	0.001	0.737	.	0.717	0.279	0.194
	df	45	45	45	45	45	45	45	45	45	45	0	45	45	45
MTrade In-Centrality	r	0.212	0.023	0.165	0.002	0.005	0.155	0.229	0.398	0.285	-0.175	0.054	1	0.268	0.226
	Sig. (2-t)	0.152	0.880	0.269	0.988	0.976	0.299	0.122	0.006	0.052	0.238	0.717	.	0.069	0.127
	df	45	45	45	45	45	45	45	45	45	45	45	0	45	45
MTrade Connectedness	r	0.682	-0.135	0.536	-0.496	0.611	-0.014	-0.384	0.691	-0.015	0.060	-0.161	0.268	1	-0.187
	Sig. (2-t)	0.000	0.364	0.000	0.000	0.000	0.925	0.008	0.000	0.918	0.690	0.279	0.069	.	0.208
	df	45	45	45	45	45	45	45	45	45	45	45	45	0	45
MTrade Efficiency	r	-0.110	0.587	-0.320	-0.011	-0.303	-0.151	0.332	-0.045	0.195	-0.471	-0.193	0.226	-0.187	1
	Sig. (2-t)	0.462	0.000	0.028	0.944	0.038	0.312	0.023	0.762	0.188	0.001	0.194	0.127	0.208	.
	df	45	45	45	45	45	45	45	45	45	45	45	45	45	0

Table 9.2.4: Partial Correlations among Network Attributes of Global Governance

Other than this, what remains the most relevant with respect to the dependent variable and the network dimensions of global governance is the relationship between the former and: (1) centrality of Matrix 3 ($r = -0.492$, $p < 0.001$), (2) the centrality of the US in Matrix 3 ($r = -0.323$, $p < 0.05$), (3) the least upper bound of Matrix A ($r = -0.393$, $p < 0.01$), (4) and the efficiency of Matrix T($r = 0.587$, $p < 0.001$). Nevertheless, a model limited to only these variables substantiates very little hypothesis testing, and thus, while the strongest b-coefficients are likely to involve the variables in this paragraph, the rest of the measures are included in the regression in hopes that at least as controls, but also in hopes that some unique effects can be found among variables exhibiting even moderate correlations with the dependent variable. Accounting for the autocorrelation that is evident in most of these measures, as Prais-Winsten regression does, should also bring out some of the patterns that might still be hidden or confounded within the collinearity found, especially among autocorrelated measures subject to secular trends.

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9.2.3 Final Analysis of Cross-correlograms

Though several relationships between US GDP per capita and other non-network variables were assessed in Sections 7.1.1 and 7.1.2, this section complements that analysis by providing an overview of cross-correlations between the dependent variable and the various network variables discussed in Section 9.2.2, as well as the relationship between US GDP per capita and the US's percentage contribution to the UN budget. Lagging this bivariate relationship, Figure 9.2.3 below illustrates the effect of US GDP per capita on the UN budget percentage figure. Lagging the UN budgetary proportion by half a decade will yield the greatest amount of correlation here, suggesting that the relative level of economic development of the United States increases 5 years after a reduction in the proportion of the US contribution to the UN budget is made. These results must be taken with discretion, however, taking into consideration the irregular trajectory of the UN budget figure (see Figure 5.3.12).

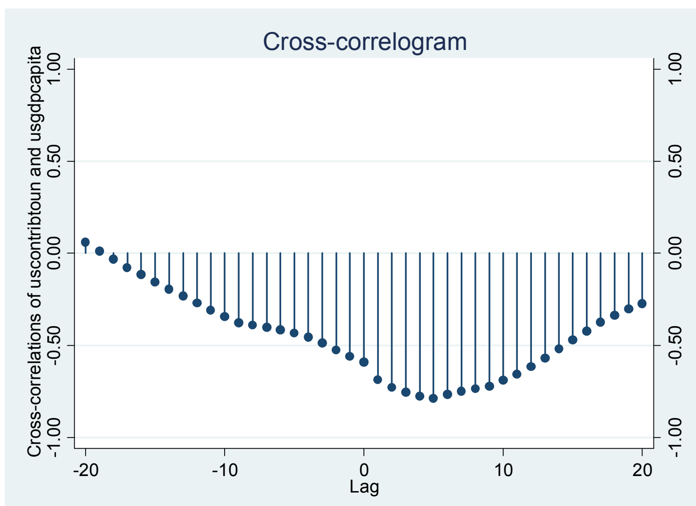
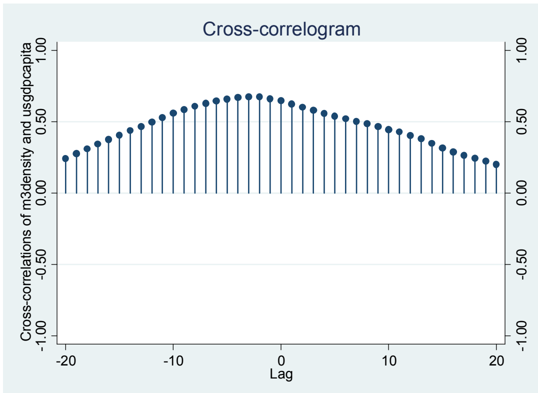
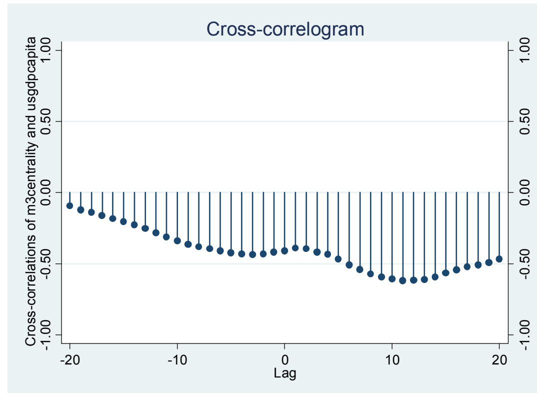


Figure 9.2.3: US% Contribution to UN Budget ➔ US GDP per Capita, Standardized

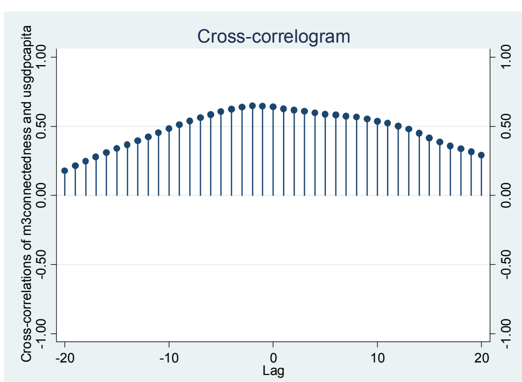
The analysis now turns to the relationships between US GDP per capita and the network measures considered for multivariate analysis. Highly correlated with most of these at the bivariate level, and with a handful when controlling for time, the per-capita measure plots as follow when cross-correlated against the various dimensions of Matrix 3.

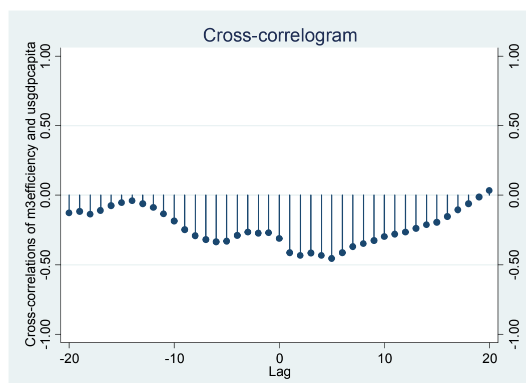




Figures 9.2.4 – 9.2.5: Matrix 3 Density ➔ US GDP per Capita, Standardized; Matrix 3 Centrality ➔ US GDP per Capita, Standardized

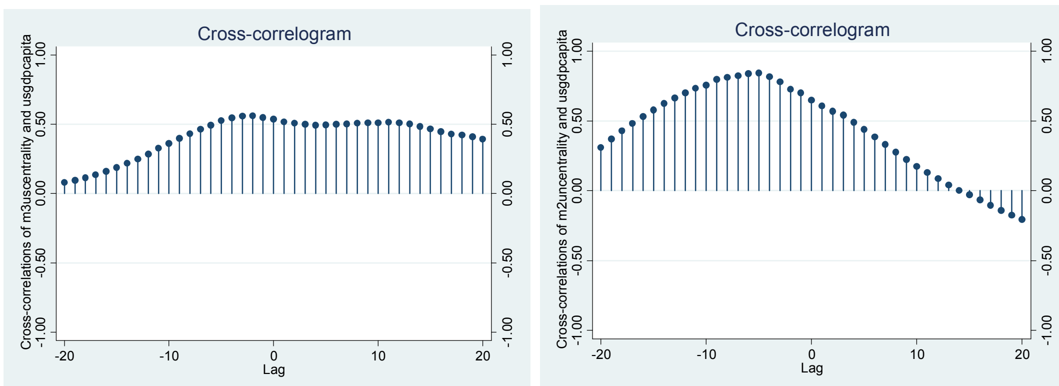
It is evident from Figures 9.2.4 and 9.2.6 that the integrative dimensions of Matrix 3—its density and connectedness, respectively—are more likely to be predicted by the dependent variable than vice-versa, though this does not negate the fact that either dimension of Matrix 3's integration would be a viable factor of US GDP per capita as far as 10 years down the line, which is the temporal cutoff in this study for considering lagged coefficients to be valid.





Figures 9.2.6 – 9.2.7: Matrix 3 Connectedness ➔ US GDP per Capita, Standardized; Matrix 3 Efficiency ➔ US GDP per Capita, Standardized

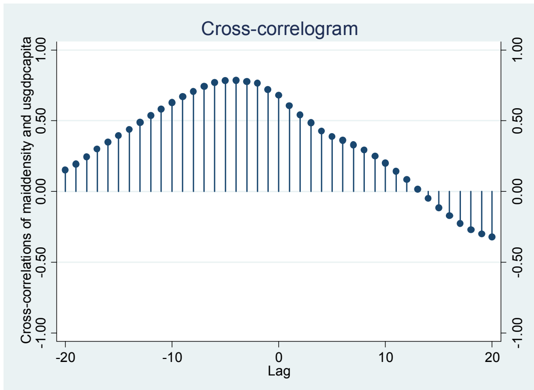
By contrast, Figures 9.2.5 and 9.2.8 illustrate negative correlations—more significantly so when the centrality and efficiency of Matrix 3 are presumed to be the causal factor, placing these two features of the matrix's vertical differentiation as prime suspects in a model testing for unique effects on the focal variable, the level of economic development of the United States relative to that of every other nation.

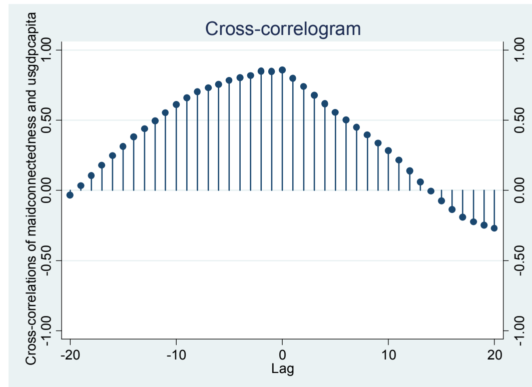


Figures 9.2.8 – 9.2.9: US Centrality in Matrix 3 ➔ US GDP per Capita, Standardized; UN Centrality in Matrix 2 ➔ US GDP per Capita, Standardized

Lastly, Figures 9.2.8 and 9.2.9 plot the lagged correlations between the node centralities of the US and UN against the GDP per capita of the US. The first asserts that within a decadal lag in either direction, significantly positive correlation is found; from this, it is expected that unique effects are likely to be found between this variable pair, as well as between variable pairs involving US GDP per capita and other US-based figures. Regarding Figure 9.2.9, the UN's centrality in the much smaller IGO-IGO matrix appears to also be affected by US GDP per capita when lagged, and the converse relationship only remains significant within 6 or 7 years, depending on the significance level.

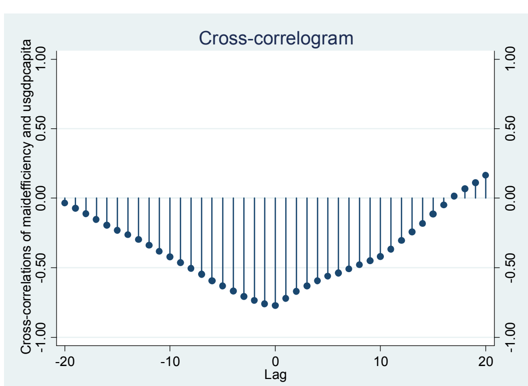
The next series of relationships involve the foreign aid matrix. With respect to the integrative dimensions of Matrix A, two similar cross-correlograms are shown below. Though the general story is the same—positive correlations well within collinear levels characterize both—it is slightly more the case with Figure 9.2.10 that lagging the dependent variable in this case reveals the optimal bivariate relationship.

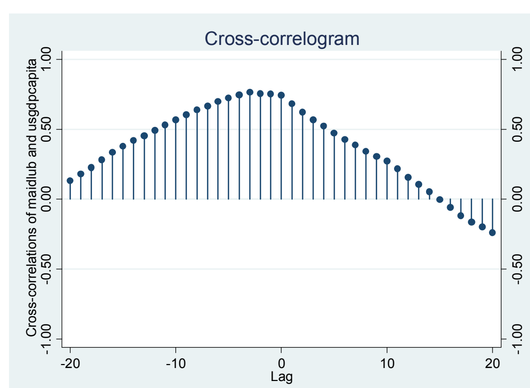




Figures 9.2.10 – 9.2.11: Matrix A Density ➔ US GDP per Capita, Standardized; Matrix A Connectedness ➔ US GDP per Capita, Standardized

Figure 9.2.12 illustrates, on the other hand, a negative relationship in which the efficiency of the foreign aid network—that is, its lack of redundancy, or alternative options for foreign aid relations, in this case—decreases the primacy of US GDP per capita, implying that the degree to which aid recipient nations are dependent on a single node for aid is a predictor (optimally unlagged) of the hegemon's material standard of living relative to the rest of the word-system, though negatively so. This implies that the hegemon is not directly benefiting from any exclusivity as a donor to any recipient nation. That is, its standard of living appears to increase as foreign aid becomes more diffused along multiple (redundant) donors.

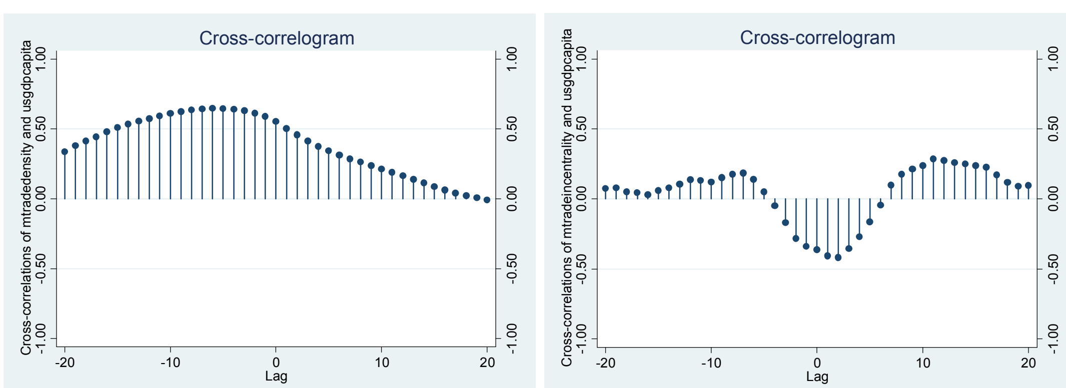




Figures 9.2.12 – 9.2.13: Matrix A Efficiency ➔ US GDP per Capita, Standardized; Matrix A Least Upper Boundedness ➔ US GDP per Capita, Standardized

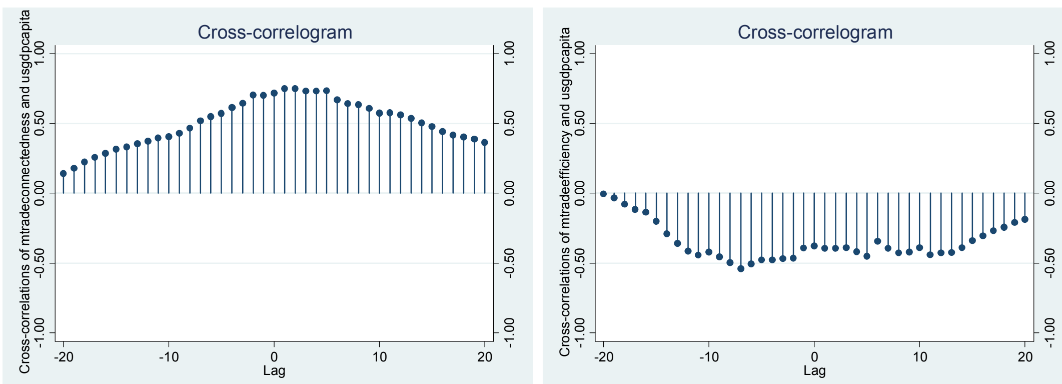
Figure 9.2.13 tells a similar story to the previous pair of relationships, in which US GDP per capita serves as the optimal predictor variable when cross-correlated against the least upper boundedness of Matrix A, or the degree to which every recipient nation has only one aid donor per year. As above, there is no theoretical basis here for assuming that GDP per capita can affect the horizontal or vertical properties of these matrices directly. Lagging in the other direction still yields coefficients in which the GDP per capita figure might have a significant, unique effect on the least upper boundedness of the foreign aid matrix.

The last segment of Section 9.2.3 evaluates the lagged relationships involving the trade matrix. Figure 9.2.4, much as some of the previous cross-correlograms involving Matrix A, points to a scenario in which US GDP per capita predicts the density of the trade network better than Matrix T's density predicts the former. However, as with all of the relationships with the aid matrix, this figure expresses that there still exist significant correlations wherein US GDP per capita is an outcome variable well into half a decadal lag, though after that significance is increasingly compromised.



Figures 9.2.14 – 9.2.15: Matrix T Density → US GDP per Capita, Standardized; Matrix T In-Centrality → US GDP per Capita, Standardized

Perhaps the most unique and peculiar cross-correlogram in this chapter so far is Figure 9.2.15, wherein it does not take more than 5 years in either direction for lags go render near-zero coefficients. Acceptable significance is found here at -3 to +4 lags, beyond which coefficients within the 10-year lag limit yield negligible figures not worth pursuing at the multivariate level. The optimal correlation here lags Matrix T's in-centrality by 2 years, but unlagged values can be used at comparable levels of confidence/significance.



Figures 9.2.16 – 9.2.17: Matrix T Connectedness ➔ US GDP per Capita, Standardized; Matrix T Efficiency ➔ US GDP per Capita, Standardized

The final pair of cross-correlograms in this section highlights another pair of relationships in which lagging either decreases the coefficient, as is the case with Matrix T's connectedness, or provides only a marginal improvement over the unlagged coefficient, as in the case of the effects of Matrix T's efficiency on US GDP per capita.

It can be concluded from this section so far that when it comes to network variables, unlagged measures are usually a reasonable choice over lagging, particularly in a direction that is counter-theoretical, reversing the causality assumed in this chapter. Therefore, none of the measures assessed herein will be lagged.

9.3 Multivariate Analysis of US GDP per Capita Regressed on Other Dimensions of Global Governance

The variance of US GDP per capita, particularly when standardized against the values of all other nations within an annual cross-section, serves as a measure of the hegemon's relative primacy during the century of interest. This section focuses its attention on this attribute of the principal actor in the world-economy, using indicators of each general dimension of global governance as stated above and elaborated upon below. Each Prais-Winsten regression is presented within the context of its conceptual nature, followed by an all-inclusive model facilitating a more comprehensive discussion.

9.3.1. Periodized versus Unperiodized Models

Before the more substantive discussion of causal mechanisms among these proxies of global governance begins, it is necessary to measure the degree to which periodization is a useful improvement upon a model that does not take cycles, phases, scale shifts and/or other temporal phenomena into consideration. Tables 9.3.1 and 9.3.2 allow for a comparison of R^2-coefficients, the improvement between them being 0.1091 - 0.0867 = .0224.

Prais-Winsten Regression, Null Model, Unperiodized				
$R^2 = 0.0867$	β	Std. Err.	t	P>|t|
Constant	2.450	0.284	8.63	0.000
Durbin-Watson (original):	0.115			
Durbin-Watson (transformed):	1.407			

Prais-Winsten Regression, Null Model, Periodized				
$R^2 = 0.1091$	β	Std. Err.	t	P>|t|
Cold War Period	-0.234	0.102	-2.28	0.025
Constant	3.005	0.516	5.83	0.000
Durbin-Watson (original):	0.193			
Durbin-Watson (transformed):	1.397			

Tables 9.3.1 – 9.3.2: Unperiodized and Periodized Null Regression Models

The improvement is marginal, and suggests that any additional improvement on the overall explainability of the model will most likely be applicable throughout the periods, as it will be based on the rest of the proxies in the regressions that follow. It also appears from the β-coefficient in Table 9.3.2 that a somewhat significant ($p < 0.05$) reduction in the dependent variable occurs over the long course of the four periods, a finding that is more telling of the periods after 1945 than of the League of Nations period, as is evident in Table 9.1.1.

A final and important finding regarding periodization is that it only has a significant effect on the dependent variable (and consequently alters more drastically the coefficients of the other factors when removed) in the case of the models exclusively testing for the effects of diplomatic and military indicators on US GDP per capita. These are both held to be political dimensions of global governance, and will be discussed in their respective sections below.

The ρ (rho) values for each model are not included in the tables, though they can be found in the Appendix, and can be interpreted independently of the discussion at hand based on the following schema. In short, the ρ–coefficient reports the zero-order autocorrelation of the residuals from the regression, a measure of the effects of omitted variables and random variation. Numbers close to 1 indicate that omitted variables are positively correlated from one year to the next (in the case of this dataset, much of it is due to trendedness), while values approximating 0 indicate no such pattern. Similarly, the Durbin-Watson statistics—which *are* included in each model below—will also not be individually discussed. These are based on ρ, and test the null hypothesis that there is no zero-order serial correlation of the errors (Prais and Winsten, 1954). Durbin-Watson values of 2.0 point to no serial correlation, while any increase from 2.0 represent positive serial correlation, and values approaching zero indicate negative serial correlation. Only three of the Durbin-Watson values (and none of them adjusted/transformed) are close to 0, these being in the null models, as well as in the Military Factors model. It is worthy of note that these are also the three most concise models in the study, and therefore these values are more sensitive to each factor's autocorrelation than the larger models, whose values could be raised by at least one factor with minimal autocorrelation.[22]

As with other factors that have p-values slightly exceeding conventional parameters, there is at least a possibility that their effects would be more significant if the Prais-Winsten iterations were to reduce autocorrelated residuals completely. Consequently, p-values as high as 0.400 will be discussed here, even if they are not statistically significant.

9.3.2. Network and Non-network Dimensions of Global Governance

The first typology involves the distinction between the matrix-based indicators of global governance computed specifically for this dissertation, and the attribute variables compiled from external data sources. This provides further insight into the question of whether network structures support or counteract other patterns of global governance (specifically, how they affect the hegemon's relative level of economic development).

Attribute-based: This section characterizes the attribute portion of the dataset. Given the heterogeneous nature of this category, the only conceptual commonality among the attribute variables is that they are not matrix-based variables. The model including only attribute-based variables should therefore be interpreted with the assumption that the majority of the variables have less mutual similarity (covariance) among them than does

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[22] My thanks to Robert Hanneman for clarification on the interpretation on ρ-coefficients and Durbin-Watson values.

its comparatively homogeneous counterpart, the network-based model below. The R^2 for this model is 0.4938, suggesting that about half of the variance in the dependent variable is collectively explained by the attribute factors in the model.

The generalizations drawn from this cluster are quite evenly distributed (there are 5 positive relationships and 3 negative). The only significant effect in this model stems from US imports as a proportion of global imports ($\beta = -1.323$, $p < 0.05$), meaning that for every percentage (i.e., 0.001-unit) increase in this figure, US GDP per capita will decrease by 1.323 x 0.001 = 0.0013 standard deviations. In more substantive terms, since this factor ranges from 0.0000093 to 0.0505, its tiny fluctuations relative to the variance of the outcome variable impose a substantial impact on the economic development of the United States relative to the rest of the world's nations.

Prais-Winsten Regression, Attribute Factors

R^2 = 0.4938	β	Std. Err.	t	P>|t|
Cold War Period	-0.163	0.118	-1.38	0.172
US Milex	0.028	0.038	0.73	0.466
US% Contrib to UN	0.017	1.871	0.01	0.993
US Imports ÷ Global Imports	-1.323	0.540	-2.45	0.018
Global Imports ÷ Global GDP	0.453	21.648	0.02	0.983
LoN/UN Budget ÷ Global GDP	-19012.580	15113.210	-1.26	0.214
LoN/UN Members	0.004	0.005	0.71	0.479
Constant	3.077	0.958	3.21	0.002
Durbin-Watson (original):	0.639			
Durbin-Watson (transformed):	1.680			

Table 9.3.3: Regression on Non-network Attributes of Global Governance

Because of the multiple cases of autocorrelated variables in this and the other models, some of these factors—though not significant by statistically conventional considerations—should still be assumed to have an effect on US GDP per capita. Other than the periodization scheme, these include US military expenditures, the LoN/UN budget relative to global GDP, and the LoN/UN member count. As far as periodicity is concerned, it appears that, controlling for the other factors, each of the periodic successions imposes a 0.163-unit decrease on US GDP per capita, a moderate but notable effect. The β-coefficient for US military expenditures is 0.028, meaning that for every unit increase in the standard deviation of this measure, a 0.028-unit increase in US GDP per capita is to be expected, taking into consideration the other variances in the model. This is again a slight but important consideration, as even a marginal return on investment here validates the rationale for a hegemon's investment in its coercive apparatus. However, the p-value for this coefficient suggests that this effect ought to be dismissed as nonsignificant.

The LoN/UN budgetary quotient—a variable with a comparatively microscopic variance (values range from 0.00000038 to 0.000027—decreases the z-score of US GDP per capita by 19012%. Put in a scale more appropriate to the factor, a 0.000001-unit increase in this budgetary quotient causes US GDP per capita to drop by 0.019 standard deviations. Given that this variable is theoretically less directly related to the outcome variable than some of the others, fluctuations in the funding of the League of Nations (which is completely financially independent of the United States) and the United Nations are not affecting the dependent variable as significantly as most of the other factors. The LoN/UN member count—though its p-value is comparable to that of US military expenditures—only increases the dependent variable by 0.004 units for every member state that joins either organization. However, its p-values render the effect negligible, at least in this model. The p-values for the other two factors pose their independent effects to be overwhelmingly nonsignificant, and will not be elaborated upon.

Network-based: The network- or matrix-based variables in this dissertation include all of the density, centrality, node centrality, and Krackhardt measures of Matrices 2, 3, A, and T, the three matrices whose dimensions are the most theoretically and methodologically applicable in the multivariate portion of the analysis. However, many of these have been omitted due to (1) redundancy/collinearity with similar dimensions of the same network, (2) zero or near-zero variances, and/or (3) theoretical overlap with a more valid proxy for the same general dimension of global governance. What remains are the measures that are held to have minimal redundancy with one another.

The R^2 for this model is 0.4088, not quite as strong as the attribute model, but still placing about 40% of the variance in the dependent variable as being collectively explained by the various network dimensions tabulated below. The only statistically significant β-coefficient ($p < 0.05$) in this model represents the unique effect of the centrality of the import portion of the trade matrix. Periodicity; US centrality in Matrix 3; Matrix A's density, efficiency, and least upper boundedness; and Matrix T's connectedness and efficiency all yielded extremely nonsignificant coefficients ($p > 0.4$), and will be ignored in this discussion.

Matrix 3's horizontal and vertical structure—when controlling for the other network factors—impose a few effects that might warrant further consideration. The density and centrality of the state-based co-affiliation matrix both decrease the dependent variable; specifically, for every unit increase in density (which has a range of less than 5), the dependent variable decreases by 0.351 units, while a 0.01-unit increase in its centrality (whose range is about 2) decreases it by 0.014 units, a negligible amount.

The node centrality of the United Nations in Matrix 2—the IGO-based co-affiliation matrix—ranges roughly from 30 to 55, and its unit increase causes US GDP per capita to increase by 0.008 standard deviations, a minimal effect. The only feature of the foreign aid matrix whose coefficient had any acceptable significance was its connectedness. As a measure of integration alternative to density, Krackhardt's connectedness increases the dependent variable by a ratio of 1 to 0.788. Given that the possible range of Krackhardt values is 1 (from 0% to 1%), and that this measure's actual values range roughly from 0.3 to 0.9, we can deduce that, if considered significant, a percentage increase in the connectedness of the foreign aid network leads to a 0.0078-unit increase in the relative economic development of the United States.

R^2 = 0.4088	β	Std. Err.	t	P>|t|
Cold War Period	0.088	0.150	0.59	0.560
M3 Density	-0.351	0.246	-1.43	0.163
M3 Centrality	-1.419	1.171	-1.21	0.233
M3 US Centrality	-0.003	0.012	-0.30	0.768
M2 UN Centrality	0.008	0.010	0.86	0.398
MAid Density	0.072	0.094	0.76	0.450
MAid Connectedness	0.788	0.685	1.15	0.258
MAid Efficiency	-0.830	3.110	-0.27	0.791
MAid LUB	0.069	1.025	0.07	0.947
MTrade Density	0.001	0.001	1.05	0.300
MTrade In-Centrality	-0.209	0.078	-2.69	0.011
MTrade Connectedness	0.040	0.730	0.05	0.957
MTrade Efficiency	0.044	0.774	0.06	0.955
Constant	3.633	2.942	1.24	0.225
Durbin-Watson (original):	1.514			
Durbin-Watson (transformed):	1.210			

Prais-Winsten Regression, Network Factors

Table 9.3.4: Regression on Network Dimensions of Global Governance

The trade network's density—having a questionably significant p-value—only raises the dependent variable by 0.001 units for its own unit increase, but given that the range of this variable exceeds 500, this is a dubious effect at best. This networks in-centrality, on the other hand, exhibits the only statistically significant finding among unique effects, and, as it follows, it has a far more profound effect on the dependent variable, accounting for all other covariances in the regression. For every unit increase in the centrality of the import half-matrix (whose range is roughly 3½), US GDP per capita decreases by 0.209 units, meaning that the US becomes slightly less developed as the import sector of the world-economy becomes centralized. This contradicts theoretical expectations that the hegemon benefits from the concentration of trade into a few oligarchic nodes, but the matter of fact is that the US is not always the central node in this matrix (often it is the UK, and at times it is Japan). Furthermore, this overall centrality score is not only affected by changes in imports among rich, powerful, active nodes, but by shifts all along the network, and therefore it is very likely that the underlying process that these numbers fail to show is one in which peripheral and semiperipheral actors (which overwhelm the matrix relative to cores) also stand to benefit from imports. The more non-hegemonic actors that are lifted by the tide of international trade, the less *relatively* developed that the hegemon will be, which will lower the z-score of US GDP per capita.

This last finding is not only important because it is statistically significant, but also because it elucidates a possibility that the regression itself cannot quantify with these data, this being the effect that trade centrality has on all non-hegemonic nodes' relative levels of economic development. Overall, however, it does not appear that testing for unique effects of network dimensions on the economic development of the US is a very fruitful undertaking. The next two typologies should render more though-provoking discussions, as they are grounded in structural and institutional distinctions, which are more valid in a macrosociological sense than the attribute/network distinction, which simply contrasts established measures of global governance with this dissertation's contribution to the data.

9.3.3. Structural Dimensions of Global Governance

With the structural typology, the focus is now turned to the verticality and horizontality of the world-system. The question addressed in Section 9.3.3, then, is one that separates arguments of integration and interaction being the catalysts for the economic development of the current hegemon (and possibly the rest of the world-system) from arguments that systemic centrality itself begets more centrality, albeit expressed as the economic development of the system's hegemon relative to all other actors.

Centralization: The term centralization here encompasses both the literal meaning of network and node centrality as well as each network's vertical Krackhardt dimensions, and also includes non-network proxies, namely US military expenditures per soldier, the percentage of the US contribution to the UN budget, and global imports relative to global GDP.

The R^2 for this model is 0.4565, comparable to the explanatory potential of the models in the previous typology. Periodicity here appears to have an immaterial consequence on the variance of US GDP per capita, as do most other measures, including US Military expenditures, the US percentage contribution to the UN budget, the centrality of the US in Matrix 3 and of the UN in Matrix 2, the efficiency and least upper boundedness of the foreign aid matrix, and the efficiency of the trade matrix.

Prais-Winsten Regression, Centralization Factors

R^2 = 0.4565	β	Std. Err.	t	P>|t|
Cold War Period	-0.031	0.089	-0.35	0.732
US Milex	0.009	0.022	0.39	0.698
US% Contrib to UN	0.385	1.090	0.35	0.726
US Imports ÷ Global Imports	1.861	1.762	1.06	0.298
M3 Centrality	-1.800	0.707	-2.55	0.015
M3 US Centrality	-0.006	0.009	-0.63	0.534
M2 UN Centrality	0.006	0.007	0.78	0.442
MAid Efficiency	-0.189	2.196	-0.09	0.932
MAid LUB	0.097	0.755	0.13	0.899
MTrade In-Centrality	-0.084	0.082	-1.02	0.317
MTrade Efficiency	0.176	0.680	0.26	0.797
Constant	2.891	2.031	1.42	0.163
Durbin-Watson (original):	1.407			
Durbin-Watson (transformed):	1.491			

Table 9.3.5: Regression on Centralizing Factors of Global Governance

As for the factors that do arguably have some consequences upon the variance of US GDP per capita, the US import quotient, while not statistically significant by conventional expectations, effects a 1.861-unit increase in the outcome variable for every unit increase in itself. Hardly worthy of mention here is also the effect of the centrality of the import portion of the trade network on the dependent variable, which is -0.084. With a range of just over 3, a 0.01-unit increase in this factor only decreases the standard deviation of US GDP per capita by 0.00084 units.

The most significant independent variable in the centralization model is the centrality of the state-to-state co-affiliation network, or Matrix 3. This β-coefficient points to a scenario in which a 0.1-unit increase in the centrality of Matrix 3 (which ranges from 0.02 to almost 2.0) decreases relative US GDP per capita by 0.18 standard deviations. This is the most powerful effect in the model, suggesting that the more centralized that the co-affiliation matrix of the most prominent IGOs becomes, the more that the rest of the world catches up with the hegemon, in terms of economic development as proxied by GDP per capita.

While the centrality of the IGO matrix is not the theoretically most plausible factor in this model to be linked to direct, unique effects upon the outcome variable, this surprising finding calls to mind the question addressed by the next model, which deals with the degree to which the integrative dimensions of these networks (and of non-network elements of the world-system) benefit the relative development of the hegemon.

Integration: The integration factors model in Table 9.3.6 below reports an R^2 of 0.3590, with as many nonsignificant factors as the preceding models. The factors omitted from this discussion due to nonsignificance are: periodicity, the LoN/UN budgetary quotient, the densities of Matrices 3 and A, and the connectednesses of Matrices A and T.

Not quite statistically significant, but still considered for discussion are the LoN/UN member count, and the density of Matrix T. The first of these, which ranges from 39 to 193 member states, increases the GDP per capita of the United States by 0.007 standard deviations for every nation that joins either IGO. The density of the trade matrix, on the other hand, decreases the dependent variable by 0.002 units for every unit increase. Over the course of the century, this small coefficient has quite an effect, given the range of this factor, which is over 500.

What remains is one conventionally significant ($p < 0.1$) factor: global imports as a proportion of global GDP. This factor's miniscule range of about 0.05 sets the interpretation of the coefficient to be such that a 0.001-unit increase in this small proportion of the world-economy's annual activity increases the standard deviation of US GDP per capita by 0.047.

Prais-Winsten Regression, Integration Factors

$R^2 = 0.3590$	β	Std. Err.	t	P>|t|
Cold War Period	0.006	0.094	0.07	0.946
Global Imports ÷ Global GDP	47.232	27.110	1.74	0.089
LoN/UN Budget ÷ Global GDP	-7327.842	9302.126	-0.79	0.435
LoN/UN Members	0.007	0.007	0.94	0.355
M3 Density	-0.144	0.195	-0.73	0.467
MAid Density	0.029	0.084	0.35	0.731
MAid Connectedness	0.083	0.516	0.16	0.873
MTrade Density	-0.002	0.001	-1.37	0.179
MTrade Connectedness	0.542	0.692	0.78	0.438
Constant	1.205	0.683	1.76	0.085
Durbin-Watson (original):	1.399			
Durbin-Watson (transformed):	1.157			

Table 9.3.6: Regression on Integrative Factors of Global Governance

The conclusion to be drawn from this model is that while most integrative properties of the world-system/world-economy have little unique effect on the economic development of the United States relative to the rest of the planet, the argument can be made that hegemonic development might, in part, be explained by the development of the import sector of the world-economy, and given the global and hegemonic import-export collinearities identified in Chapters 7 and 8, by the export sector as well.

9.3.4. Institutional Dimensions of Global Governance

The next and final typology to be explored is built around the ideas of old institutionalism (Turner 1997, 2013), which draw clear boundaries among systematized and ritualized social activities, such as religion or education. In this case, the factors in this dissertation have been separated into economic, diplomatic, and military. Furthermore, diplomatic and military factors can be conceptually collapsed into a single political dimension, though the regression models do not combine these, as their separation lends itself to a discussion of hard vs. soft forms of geopolitical relations and governance. It is perhaps because there is more theoretical basis behind these three models that a greater amount of statistical significance is exhibited in Section 9.3.4. The foremost finding among these models is that—proportional to the number of factors in each—their R^2 values are higher than any of the previous regressions.

Economic factors: By far the most explanatory regression in this chapter is the economic factors model. With an R^2 of 0.6437, this 11-factor regression discounts periodicity as a viable factor (as do most of the models), as well as the efficiency and least upper boundedness of the foreign aid matrix, and the connectedness and efficiency of the trade matrix.

Only one variable that does not meet conventional standards of statistical significance is still included in this discussion due to its p-value not exceeding 0.400, and the possibility that correlated residuals might be confounding this coefficient. This factor is the in-centrality of the trade matrix. As with previous regressions, this factor decreases the dependent variable, but not by a substantial amount. With a range of less than 4, a 0.01-unit increase in import centrality causes a drop in the US GDP per capita of 0.001 standard deviations, controlling for all other economic factors. As previously seen in Sections 9.3.2 and 9.3.3, this variable consistently affects the dependent variable negatively, and sometimes (in the case of the network factors model), significantly so.

Prais-Winsten Regression, Economic Factors				
R^2 = 0.6437	**β**	**Std. Err.**	**t**	**P>|t|**
Cold War Period	0.025	0.074	0.34	0.732
US Imports ÷ Global Imports	2.708	1.489	1.82	0.077
Global Imports ÷ Global GDP	42.503	22.176	1.92	0.063
MAid Density	0.153	0.075	2.02	0.050
MAid Connectedness	0.699	0.357	1.96	0.058
MAid Efficiency	-1.003	1.965	-0.51	0.613
MAid LUB	0.618	0.757	0.82	0.420
MTrade Density	-0.003	0.001	-2.77	0.009
MTrade In-Centrality	-0.122	0.076	-1.60	0.119
MTrade Connectedness	0.233	0.480	0.49	0.630
MTrade Efficiency	-0.072	0.594	-0.12	0.904
Constant	2.400	1.902	1.26	0.215
Durbin-Watson (original):	1.575			
Durbin-Watson (transformed):	1.674			

Table 9.3.7: Regression on Economic Factors of Global Governance

The remainder of the factors in the model were statistically significant ($p < 0.1$), most of them only mildly so. From these results, it appears that a 0.01-unit increase the US import quotient—which ranges from 0 to 0.343—increases the dependent variable by 0.027 standard deviations. The density of the aid network, and its connectedness (whose range is roughly ½) also impose a positive effect on the relative economic development of the United States. In the case of density, a 0.01-unit increase spurs a drop in the dependent variable by 0.0015 standard deviations, not a particularly sizable amount, given this factor's range, which is roughly 2. Similarly, a 0.01-unit increase in the connectedness figure increases the dependent variable by 0.007 standard deviations, controlling for other economic factors.

Ranging from 0.0000093 to 0.0505, the global import quotient also reports a moderately significant effect ($p < 0.1$) on US GDP per capita. A 0.001-unit increase in this factor decreases the dependent variable by 0.042 standard deviations.

The most statistically significant β-coefficient in the economic factors model. Trade density's effect ($p < 0.01$) lowers the standard deviation of US GDP per capita by 0.003 units for every unit increase in its 500-unit range.

The economic factors model has proven to be the most explanatory of the regressions so far, and the analysis below will confirm that no other single model collectively explains the variance of US GDP per capita better. The political indicators have been separated into two models below to test for effects of soft versus hard forms of political power irrespective of one another.

Diplomatic factors: The diplomatic factors model reports an R^2 of 0.5186, which, given the number of independent variables in the model, makes this model a better explainer of the dependent variable than most others. However, the only statistically significant factor here is periodicity. The periodization scheme's β-coefficient ($p < 0.05$) reports that every succession across the four periods causes a drop by 0.273 standard deviations of the GDP per capita of the United States. Only three factors—the LoN/UN budget relative to global GDP, the LoN/UN member count, and Matrix 3's centrality—yield moderately acceptable p-values, while the rest of the factors—the percentage of the US contribution to the UN budget, Matrix 3's density, the centrality of the US in Matrix 3, and that of the UN in Matrix 2—pose no noteworthy effect on US GDP per capita.

The β-coefficient of the LoN/UN budget relative to global GDP is always larger, given its miniscule range. However, even taking this into account, the effect on the dependent variable is gargantuan. We can infer from this figure that every 0.000001-unit increase in this figure (which ranges from 0.00000038 to 0.000027), causes US GDP per capita to drop by 0.0232 standard deviations.

Prais-Winsten Regression, Diplomatic Factors

$R^2 = 0.5186$	β	Std. Err.	t	P>|t|
Cold War Period	-0.275	0.121	-2.27	0.027
US% Contrib to UN	-0.277	1.952	-0.14	0.887
LoN/UN Budget ÷ Global GDP	-23236.250	14859.210	-1.56	0.123
LoN/UN Members	0.018	0.011	1.55	0.127
M3 Density	0.076	0.293	0.26	0.796
M3 Centrality	1.163	0.779	1.49	0.141
M3 US Centrality	-0.006	0.013	-0.43	0.667
M2 UN Centrality	0.004	0.012	0.31	0.760
Constant	0.979	1.890	0.52	0.607
Durbin-Watson (original):	0.999			
Durbin-Watson (transformed):	1.803			

Table 9.3.8: Regression on Diplomatic Factors of Global Governance

The next factor with a questionable effect on the dependent variable is the LoN/UN member count, whose β-coefficient raises US GDP per capita by 0.018 standard deviations for every member state that joins either IGO. Lastly, a 0.01-unit increase in the centrality of Matrix 3 (which ranges from 0.02 to just over 2.0) increases the dependent variable by 0.011 standard deviations.

Overall, despite its promising R^2, this model did not provide much insight as to the independent effects of diplomacy on the relative score of the US in the GDP per capita distribution. In essence, it says that controlling for one another, no single diplomatic factor had a unique effect, at least not one that remained unaffected by autocorrelated residuals, though controlling for all diplomatic factors, the periodization scheme captures some notable drops in the primacy of the US along the continuum of GDP per capita z-scores.

Military factors: The last of the conceptually selected models reports an R2 of 0.2030. This simple, two-factor regression is unanimously significant in its unique effects, testing the impact of the sole indicator of hard power in this chapter—US military expenditures, standardized—on the only other cross-sectionally standardized variable in this chapter, US GDP per capita. Since these figures are both expressed in the same metric, this β-coefficient states that for every unit increase in the standard deviation of the United States' military budget, a consequent increase by 0.087 standard deviations is encumbered by the dependent variable. In other words, as was seen in the attribute factors model in Section 9.3.2, there appears to be a significant ($p < 0.01$), though slight, return on investment evident in this causal relationship between the hegemon's military budget and its standard of living relative to the rest of humanity's.

Prais-Winsten Regression, Military Factors

$R^2 = 0.2030$	β	Std. Err.	t	P>|t|
Cold War Period	-0.258	0.099	-2.61	0.011
US Milex	0.087	0.029	3.04	0.003
Constant	2.469	0.386	6.39	0.000
Durbin-Watson (original):	**0.169**			
Durbin-Watson (transformed):	1.537			

Table 9.3.9: Regression on Military Factors of Global Governance

The other independent variable in this model—periodicity—is also significant ($p < 0.01$). Here, controlling for military expenditures, as in other models, periodicity imposes a drop in the standardized values of US GDP per capita, in this case by a factor of 0.258 z-scores for every periodic succession.

The military model's contribution lies in the fact that while military expenditures do not have much impact on the dependent variable when controlling for similar factors in other models, its direct effects controlling for periodicity should be regarded as effects that are confounded or drowned out altogether by the covariances among the other factors that more intensely affect the dependent variable's trajectory across the period.

9.3.5. Comprehensive Regression Model of Global Governance

The analysis now turns to the final and most inclusive model, testing the unique effects of every variable included in the regressions so far, including the periodicity control. Expectedly, its R^2 is higher than all others, given the inclusivity of all preceding R^2 values within it, as it is the additive result the R^2s of all the previous models minus their explanatory overlap, the result being 0.7270. This is a sizeable portion of the variance of US GDP per capita as explained collectively by the independent variables. However, much like previous models, unique effects seldom meet conventional criteria for significance. To review, this study's more permissive inclusion of effects whose p-values approach 0.400 hopes to capture some of the relationships that might have reported significant effects if it were not for the overwhelming serial correlation of residuals, which the Prais-Winsten can only partly account for.

Table 9.3.10 reports several factors' effects as being nonsignificant, even at the inclusive 0.400 p-level used for identifying weaker effects that are possibly confounded by autocorrelation and similar mathematical noise. Most can be most easily eliminated due to excessively high p-values, these being: periodicity, US military expenditures, the percentage of the US contribution to the UN budget, the LoN/UN budget divided by global GDP, the LoN/UN member count, the density of Matrix 3, the efficiency and least upper boundedness of the foreign aid matrix, and the in-centrality, connectedness, and efficiency of the trade matrix.

This leaves eight factors' effects for interpretation. The first of the moderately significant effects is that of the centrality of the state-to-state co-affiliation matrix. With a range of roughly 2.0, a 0.01-unit increase in this factor causes 0.015-unit decrease in the cross-sectional standard deviation of US GDP per capita. The centrality of the US in that matrix also imposes a diminishing effect. This measure ranges from 0 to about 55, and thus each unit-increase in this factor diminishes the dependent variable by 0.016 z-scores. Along the same conceptual lines, the centrality of the UN in the IGO-IGO co-affiliation network (Matrix 2) also decreases the dependent variable by 0.015 standardized units, though this measure's range of 23.5 (from 31.3 to 54.8) is slightly smaller than that of Matrix 3's centrality, so we can assume the actual effect of the UN's centrality in Matrix 2 to be more explanatory of the dependent variable than the effect of the US's centrality in the much larger Matrix 3.

$R^2 = 0.7270$	β	Std. Err.	t	P>|t|
Cold War Period	0.128	0.160	0.80	0.431
US Milex	0.003	0.024	0.14	0.890
US% Contrib to UN	0.786	1.152	0.68	0.501
US Imports ÷ Global Imports	4.931	2.347	2.10	0.045
Global Imports ÷ Global GDP	49.171	26.006	1.89	0.069
LoN/UN Budget ÷ Global GDP	-8545.414	10032.180	-0.85	0.402
LoN/UN Members	-0.006	0.011	-0.56	0.577
M3 Density	-0.176	0.269	-0.65	0.519
M3 Centrality	-1.525	1.305	-1.17	0.252
M3 US Centrality	-0.016	0.012	-1.32	0.199
M2 UN Centrality	0.015	0.010	1.50	0.144
MAid Density	0.150	0.089	1.68	0.104
MAid Connectedness	1.009	0.749	1.35	0.189
MAid Efficiency	-2.279	3.068	-0.74	0.464
MAid LUB	0.257	0.993	0.26	0.798
MTrade Density	-0.003	0.001	-2.29	0.030
MTrade In-Centrality	-0.055	0.092	-0.60	0.556
MTrade Connectedness	0.218	0.759	0.29	0.776
MTrade Efficiency	0.029	0.810	0.04	0.971
Constant	4.003	2.886	1.39	0.176
Durbin-Watson (original):	1.833			
Durbin-Watson (transformed):	1.668			

Prais-Winsten Regression, All Factors

Table 9.3.10: Comprehensive Regression Model

Another few moderately significant coefficients correspond to the foreign aid matrix, these being its integrative factors: density and connectedness. A 0.01-unit increase in the density of the foreign aid network, which has a range of about 2.0, imposes an increase of 0.0015 in the hegemon's relative level of economic development, not a significant amount at all. A 0.01-unit increase in its connectedness, on the other hand, which has a range of about 0.58, causes the dependent variable to drop by 0.01

standard deviations, a comparatively stronger effect, even when taking both ranges into consideration.

What remain to discuss are the most significant unique effects in the comprehensive model, these being the effects of US imports as a proportion of global imports, global imports as a proportion of global GDP, and the density of the trade matrix. It is relevant to the discussion of the economic factors model that these three financial dimensions of global governance would their statistical significant when regressed upon alongside noneconomic measures, as is most easily seen in Table 9.3.12 below. In the case of US imports proportional to all imports, which never exceed 35%, a percentage increase (i.e., 0.01 units) in this proportion causes an increase of 0.049 standard deviations in the dependent variable. Similarly, a percentage increase in global imports divided by global GDP, a proportion that barely exceeds 0.05 at its peak, imposes a 0.492-unit increase on the dependent variable. Lastly, the density of the trade matrix in which the aforementioned imports (and exports) are exchanged also poses a unique effect on US GDP per capita. For every unit increase in this factor, whose range is roughly 500, there is a consequent 0.003-unit decrease in the standardized values of the hegemon's level of economic development, contradicting the directly preceding discussion of the non-network factors' influence on the outcome variable. The conclusion to be drawn from these last three coefficients—particularly because of their statistical significance and mutual homogeneity—is that while the proliferation of the import sector and the prevalence of the US in that sector of the world-economy directly benefit the hegemon's GDP per capita, it is apparent that the density of the network—which takes into account not only the number of importers and exporters, but also the amounts of money traded among nations—most likely increases the GDP per capita of peripheral and semiperipheral (and perhaps also non-hegemonic core nations), thereby flattening the core-periphery hierarchy with respect to economic development, ultimately lowering US GDP per capita relative to the GDP per capita of all other nations.

9.3.6. Summary of Regression Analysis

Taking a step back and surveying the summary statistics of each overall model in Figure 9.3.11, it becomes possible to discern that the most explanatory Prais-Winsten regression in this chapter is the economic factors model, which only has 11 factors, and yet its R^2 (0.644) is nearly as high as its equivalent in the all-inclusive model (R^2 = 0.727).

Prais-Winsten Regression Summary

Factors	R^2	Factors	Durbin-Watson (transformed)
Null	0.0867	0	1.407
Periodicity	0.1091	1	1.397
Attribute	0.4938	7	1.680
Network	0.4088	13	1.210
Centralization	0.4565	11	1.491
Integration	0.3590	9	1.157
Economic	0.6437	11	1.674
Diplomatic	0.5186	8	1.803
Military	0.2030	2	1.537
All Factors	0.7270	19	1.668

Table 9.3.11: Tabulated Summary of Regression Models

Regarding the Durbin-Watson values, the fact that their post-iterative transformations yielded values between 1 and 2 points to small amounts of residual zero-order autocorrelation, in some cases (such as in the diplomatic factors model), almost none.

Table 9.3.12 combines all of the models for quick reference and a final analysis, in which it becomes evident that—with the exception of periodicity—there are prevailing trends in the causal mechanisms of each of these factors with respect to the dependent variable at hand, even if the effects are not always statistically significant.

Wholly positive effects on US GDP per capita include those of US military expenditures, global imports divided by global GDP, the centrality of the UN in Matrix 2, both integration measures (i.e., the density and connectedness) of the foreign aid matrix, the least upper boundedness of the foreign aid matrix, and the connectedness of the trade matrix. Predominantly (but not ubiquitously) positive effects on the dependent variable were evident in the case of the US percentage contribution to the UN budget, US imports divided by global imports, the LoN/UN member count, and the efficiency of the trade matrix.

By contrast, consistently negative effects on the dependent variable were reported by the LoN/UN budget divided by global GDP, the centrality of the US in Matrix 3, the efficiency of the foreign aid matrix, and the centrality of the import half of the trade matrix. Lastly, the three factors with predominantly (but not ubiquitously) negative effects on the outcome variable are the density and centrality of Matrix 3 and the density of the trade matrix.

Given that most of these patterned effects across models were not statistically significant, the attention here will be focused on those factors that were most uniquely explanatory of US GDP per capita. What appears to most sustain or even bolster economic hegemony during the century is the proliferation of the hegemon's imports relative to the rest of the import sector, followed by the proliferation of the import sector relative to the world-economy's total annual output. To contradict this finding, however, is the most significant pattern of diminishing effects, this being the effect of the trade matrix's density on US GDP per capita.

Substantively, it can best be concluded from this generalized pattern of findings that the hegemon's absolute import prevalence, proxied by its imports relative to all other imports, is the primary instrument of the reproduction of this actor's economic primacy as measured by GDP per capita standardized against all other nations' GDPs per capita. The conclusion holds true for the relationship between the proliferation of global imports in the world-economy; the globalization of trade directly increases the hegemon's economic development throughout the century.

However, it is now necessary to address the counter-finding that as trading partners couple with one another and the import/export matrix becomes saturated, US GDP per capita is decreased relative to all other GDP per capita values.

Summary of β-Coefficients	Attribute Factors	Network Factors	Centralization Factors	Integration Factors	Economic Factors	Diplomatic Factors	Military Factors	All Factors	Dominant Trend
Cold War Period	-0.163	0.088	-0.031	0.006	0.025	-0.275	-0.258	0.128	none
US Milex	0.028		0.009				0.087	0.003	+
US% Contrib to UN	0.017		0.385			-0.277		0.786	+/–
US Imports ÷ Global Imports	-1.323		1.861		2.708			4.931	+/–
Global Imports ÷ Global GDP	0.453			47.232	42.503			49.171	+
LoN/UN Budget ÷ Global GDP	-19012.6			-7327.8		-23236.3		-8545.4	–
LoN/UN Members	0.004			0.007		0.018		-0.006	+/–
M3 Density		-0.351		-0.144		0.076		-0.176	–/+
M3 Centrality		-1.419	-1.800			1.163		-1.525	–/+
M3 US Centrality		-0.003	-0.006			-0.006		-0.016	–
M2 UN Centrality		0.008	0.006			0.004		0.015	+
MAid Density		0.072		0.029	0.153			0.150	+
MAid Connectedness		0.788		0.083	0.699			1.009	+
MAid Efficiency		-0.830	-0.189		-1.003			-2.279	–
MAid LUB		0.069	0.097		0.618			0.257	+
MTrade Density		0.001		-0.002	-0.003			-0.003	–/+
MTrade In-Centrality		-0.209	-0.084		-0.122			-0.055	–
MTrade Connectedness		0.040		0.542	0.233			0.218	+
MTrade Efficiency		0.044	0.176		-0.072			0.029	+/–

Table 9.3.12: Tabulated Summary of Unique Effects by Model

There is a general trend in the non-network variables that suggests that most of these attributes of global governance boost the hegemon's level of economic development relative to everyone else's, while network dimensions are more divided in terms of the polarity of their effects. Furthermore, it appears that the unilateral foreign aid matrix steepens the distribution of GDP per capita, at least at the peak of this distribution, by increasing the hegemon's score relative to all others, an effect that is only excepted by the efficiency of this matrix, which is a measure of its non-redundancy of paths to the acquisition of foreign aid in this case. Substantively, this means that the degree to which aid recipients have multiple donors decreases the aid monopoly of the hegemon over client states, and forces US GDP down relative to all other actors.

Overall, it appears that the softest forms of power—diplomatic—are the least relevant with respect to explaining the variance in the dependent variable. This does not mean that hard power is the most relevant, seeing as military expenditures did not yield very significant coefficients alongside other factors, though there was a slight, underlying pattern of positive effects, which was interpreted herein as a hegemon's return on investment of its military complex. It was rather, in the variables capturing attributes or network dimensions of international trade that the most relevant relationships with US GDP per capita were found.

9.3.7. Post-Hoc Regression Technique: Variable Inflation Factors

The multivariate analysis in this dissertation, despite great attempts to eliminate redundancies in regression factors detailed in chapters 7, 8, and 9, has been riddled with collinearity, even across certain variable pairs wherein no mathematical relationship exists. In one sense, collinear cases among substantively dissimilar variables can be interpreted as a close connectedness between, for example, the trade and foreign aid networks, or the US military budget and the sovereignty/decolonization variable (weighted and unweighted). One way to distinguish nonsignificance in the multivariate models discussed throughout Section 9.3 from p-values that have been inflated (that is, rendered nonsignificant) by collinearity, particularly by multicollinearity involving the dependent variable (US GDP per capita), is to calculate the Variance Inflation Factors (VIFs) for each of these regression models.

Variance Inflation Factors are useful for detecting multicollinearity, highlighting cases in which the p-values of the β-coefficients might have been more significant had it not been for such overwhelming covariance within the models. Though Stata does not compute VIFs for Prais-Winsten regressions, it does provide them for standard OLS regressions. This is not necessarily problematic; the VIFs for the models that do *not* account for serial autocorrelation (i.e., OLS regressions, not reproduced in this dissertation) address the problem of collinearity, which would presumably be indirectly eliminated in the Prais-Winsten regressions due to most of the collinear relationships involving variables that are also highly serially autocorrelated.

Table 9.3.13 summarizes the VIFs of each factor by model, color-coding the results by the intensity of the figures (see legend at bottom of table). Values under 8 are not problematic, meaning that collinearity between a given factor and the dependent variable is absent; correlations and unique effects are moderate at best. Values between 8 and 10 are questionably problematic, in that variance inflation is likely to be responsible for nonsignificant β-coefficients, which are the norm herein. Values higher than 10 are most certainly problematic in this regard, indicating that an independent variable influences the outcome variable in close conjunction with other independent variables.

Independent Variable	Null	Attribute	Network	Centralization	Integration	Economic	Military	Diplomatic	Comprehensive
Cold War Period	1	**13.49**	**75.58**	**21.98**	**11.03**	**11.95**	6.87	**22.27**	**110.1**
US Milex		8.6		8.16			6.87		**31.94**
US% Contrib to UN		**12.85**		**16.24**				**19.31**	**18.17**
US Imports ÷ Global Imports		1.3		**10.93**		6.56			**20.86**
Global Imports ÷ Global GDP		7.66			**115.67**	**155.53**			**275.81**
LoN/UN Budget ÷ Global GDP		5.86			9.48			8.67	**21.54**
LoN/UN Members		**40.28**			**253.03**			**269.29**	**969.45**
M_3 Density			**445.87**		**212.4**			**195.41**	**686.94**
M_3 Centrality			**266.74**	**75.78**				**69**	**410.41**
M_3 US Centrality			**47.99**	**48.19**				**46.44**	**88.42**
M_2 UN Centrality			**37.21**	**15.29**				**16.41**	**52.53**
M_{Aid} Density			**17.49**		**16.47**	**18.35**			**34.42**
M_{Aid} Connectedness			**111.44**		**35.66**	**35.87**			**180.52**
M_{Aid} Efficiency			**371.15**	**115.26**		**44.47**			**453.62**
M_{Aid} LUB			**75.76**	**52.15**		**37.61**			**102.94**
M_{Trade} Density			**60.42**		**92.35**	**60.95**			**131.02**
MTrade In-Centrality			2.01	4.82		4.88			8.27
M_{Trade} Connectedness			**100.33**		**97.45**	**53.64**			**181.03**
M_{Trade} Efficiency			**23.76**	**32.87**		**23.03**			**57.7**
Mean VIF	*1*	*12.86*	*125.83*	*36.51*	*93.73*	*41.17*	*6.87*	*80.85*	*201.88*

VIF < 8
8 < VIF < 10
10 < VIF < 50
50 < VIF

Table 9.3.13: Tabulated Summary of Variable Inflation Factors by Model

Most of the figures above are well above 10, and about half of *these* cases are above 50. Given how inordinately high the values in Table 9.3.13 are, this output reinforces the argument already made for accepting p-values well above statistically conventional levels, such as 0.05, though it does not itself dictate what an acceptable p-value for any given coefficient is. What are most noteworthy here, given its rarity, are the figures in the white cells, which are found modally in the attribute factors and military factors models, as well as with the in-centrality of the trade matrix in all models that included this factor, with the comprehensive model being the only arguably exception, having a moderately acceptable VIF of 8.27.

As regards the *attribute model*, we can take this to mean that import figures and the LoN/UN budget relative to global GDP had coefficients that were most likely not stripped of their unique effects' significance due to collinearity involving the dependent variable. Referring to Table 9.3.3, it is evident that the LoN/UN budget relative to global GDP is not significant ($p = 0.214$), and neither is the US imports relative to global imports quotient ($p = 0.983$), though the globalization of the import sector of the world economy ($r = -1.323$, $p < 0.05$) is significant by conventional standards.

In the case of the *military model*, a less sophisticated interpretation can be drawn, which is that regardless of periodization or *linear* trendedness, the effect of the military expenditures of the United States on the outcome variable should be taken as significant only when its p-value is less than 0.05. As reported in Table 9.3.9, the US military budget's coefficient ($r = 0.087$, $p < 0.001$) is highly significant when controlling for periodization and accounting for zero-order autocorrelation.

As to the uniqueness of the in-centrality of the trade matrix (that is, the centrality of imports in the world-economy), its effects are also to be interpreted more conservatively, assuming that variance inflation is not an issue that confounds these coefficients' intensity and significance. This variable is a network-based measure of the economic centralization of global governance. Its coefficients in the network, centralization, and economic factors models are 0.011, 0.317, and 0.119, respectively. It is only in conjunction with other network dimensions that trade in-centrality is statistically significant, while it is now more conclusive that this variable does not impose a unique effect on US GDP per capita when regressed upon along with the other centralizing and/or economic factors used in these regressions.

9.4 Chapter Summary

While the combination of Prais-Winsten regressions and variance inflation factors allows for at least a partial discounting of some of these coefficients, inconclusiveness still characterizes much of the output. Periodization seems to have had an ambiguous effect on the GDP per capita of the United States. While such a typology was not formally used in this particular study, hegemonic (or top-down) indicators of global governance treated as independent variables here, such as the US percentage contribution to the UN budget or the centrality of the US in Matrix 3, were mostly inconsequential with respect to unique effects upon US GDP per capita. Only one of these, US imports relative to global imports, had a consistently significant effect in all models except the centralization factors model. Non-hegemonic (bottom-up) dimensions of global governance, on the other hand, did have a comparatively significant effect on the dependent variable, the most notable being global imports relative to global GDP, and the density of the trade matrix, these being highly related mathematically to one another.

In sum, though there are nebulous portions of Table 9.3.12 and the rest of the output relevant to this dissertation, the general narrative is that most effects on the GDP per capita of the hegemon are positive, even if not always significant. That is, the level of economic development of the hegemon relative to those levels of the rest of the world's nations' is actually fostered, not curtailed, by most other dimensions of global governance. The most notable exceptions to this rule include the effects of: the LoN/UN budget relative to global GDP, US centrality in the state-to-state co-affiliation matrix[23], the efficiency of the foreign aid matrix[24], and the in-centrality of the trade matrix.

Though more incisive arguments will be made in Chapter 10 based on the output discussed in Part III, it is clear that both the network and attribute data, as they have been measured and calculated are fraught with collinearity and other redundancies, as well as problematic levels of autocorrelation. Some of this autocorrelation was addressed in earlier chapters via logarithms, quotients, and other detrending techniques, but this often yielded anomalies or peculiarities in distributions that added new, unnecessary complexities. Subsequent work with these variables must rely on sound transformations of the data that reduce autocorrelation without detracting from the validity of the measures.

[23] These effects were wholly nonsignificant by conventional standards.
[24] Ibid.

Chapter 10: Conclusion

The final chapter of this dissertation begins with a review of the general findings uncovered throughout the previous five chapters. Substantive arguments for the nature, structure, evolution, and future of global governance cap the chapter, plotting a course for future research, including refinements of recent attempts to analyze these variables at the multivariate level (Álvarez, 2013, 2014, 2015)[25].

10.1 Meta-Analysis of Findings

The first section of this chapter is organized around the *institutional* typology of indicators, discussing economic, diplomatic, and military forms of global governance separately, primarily in the context of their facilitation of the economic development of the system's hegemon. Sections 10.1.1 through 10.1.4 are intended to review the highlights of the findings, and contextualize the conclusions that follow it in Section 10. 5.

10.1.1. Economic Dimensions of Global Governance

Two economic indicators—global imports relative to global GDP and its export counterpart—exhibit variances at a scale far smaller than most other indicators in this study. Some studies would opt to rescale these miniscule percentage figures, while others might simply discuss effect coefficients in their standardized forms. This dissertation has instead opted to retain the original scales, carefully accounting for

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[25] Álvarez (2013) compares UK and US hegemony along most of the axes/variables discussed in this dissertation; Álvarez (2014) emphasizes shifts in institutional emphasis with respect to global governance; Álvarez (2015) integrates the structural and institutional typologies in this dissertation in an attempt to isolate specific intra- and interdimensional causal relationships among the dimensions of global governance.

heterogeneous scales in its interpretive discussion of results involving variables with dissimilar ranges, found in Chapter 9. This facilitates a discourse more inclusive of readers outside the field of sociology, broadening the relevance of these findings and conclusions to the interests of legislators, politicians, diplomats, investors, and activists alike.

Irrespective of range scales, economic variables of a *non-network* nature were either cyclical, such as US GDP per capita (see Figure 5.2.3), or exponentially trended (towards growth), such as global imports relative to global GDP (see Figure 5.2.8), which is arguably the most influential variable across the models. Imposing a consistently positive effect on the dependent variable, global imports as a proportion of global GDP reports one outlier coefficient—specifically, in the attribute factors model—is drastically lower than its counterparts, but also carries a standard error comparable to those of its equivalent coefficients in the other models. The anomaly allows for the interpretation of these results to focus on the more substantive or conceptual typologies in the study (i.e., the institutional and structural), in which the coefficients for this factor are all statistically significant ($p < 0.01$). Substantively, in three of the four theoretical models, the proliferation of the import (and export) sectors of the world-economy quite unambiguously benefit the hegemon's level of economic development relative to the development of all other nations. That is to say, the US's level of economic development relative to everyone else's is boosted with the intensification of international trade in the world-economy. Globalization has a positive effect on US economic development, although this effect has not trickled down to the vast majority of people living in the US.

A convincing explanation for this is Thomas Piketty's (2014) argument that the rate of return on investment is greater than the rate of economic growth over the long term, thus resulting in extreme concentration of wealth at the top, a phenomenon evident in other nations in the world-system.

Similarly, and much more expectedly than the finding above, the measure of US imports relative to global imports—that is, the degree of concentration of all activity into the hegemonic actor—has a mostly positive, and sometimes highly significant effect ($p < 0.05$ or 0.1, see Table 9.3.12 for details). The narrative to be told here is that at least in the models that control for economic factors and all factors combined, the concentration of imports in the US increases the hegemon's relative level of economic development, whereas when controlling for other attribute factors (i.e., removing all network-based measures from the model), the effect is reversed, and this measure's growth actually diminishes the dependent variable. This finding merits further multivariate research, given how comparatively significant it is a factor in Chapter 9.

As regards the network-based economic indicators of global governance, the density of the foreign aid network was not trended in a linear fashion, as are many of the variables in this study. It exhibits an apparent cycle coupled with an upward trend, as evident in Figure 6.3.5. The centralities of this network, as well as the out-centrality of the US as a donor in this network possess more jagged (possibly cyclical) trajectories across the period with a singular scale, in which hegemonic node out-centrality is nearly parallel to the out-centrality of the matrix most of the time (see Figure 6.3.10). Substantively, we can conclude from these centrality scores that irrespective of the fact that the foreign aid network is becoming more saturated over the long term (with the exception of the 1990s, characterized by a disintegration of the foreign aid network), its centralization is independent of both its densification and secular trends. The turn of the millennium characterizes the point at which both the donor sector of the aid matrix and the US in that half of the matrix was at its peak. It is notable that the 2002 US foreign aid budget was largely decided prior to the events of September 11, 2001, and is more a byproduct of the Clinton Administration than of the Bush Administration that succeeded it, which ushers in a sharp decline in aid donorship centrality relative to the other large donors. However, the partial disintegration (diminishment of density) of the foreign aid network does not perfectly coincide with a drop in US donorship centrality, which doesn't take place until the mid-1990s. In short, if a relationship between the density of the foreign aid network and the centrality of the US as a donor exists, it is at best tentative, intermittent, and only supported empirically with these data a 5-year lag.

Illustrated in Figure 6.3.22, the Krackhardt values of the foreign aid matrix are either slightly upwardly trended, as in the case of connectedness and least upper boundedness, slightly downwardly trended, as with its efficiency, or nearly constantly held at 1, as is the case of the hierarchy score of any matrix of with a patron-client structure such as this one. As previously mentioned, the hierarchy of the foreign aid matrix is assumed to remain at or near 1.0 due to the nearly perfect exclusivity between donorship and receivership of foreign aid. By contrast, the trade matrix, discussed below, has a near-zero graph-hierarchy given the fact that almost every importer is also simultaneously an exporter.

The trade matrix's density is characterized by an exponential growth trend that takes off slightly in the 1950s (see Figure 6.4.7), and then more prominently in the 1970s (see Figure 6.4.6). As has been the established pattern here, the last century might be characterized by a densification of the IGO, foreign aid, and trade networks, but they have not become more centralized in the social networks sense of the term. In the case of the trade matrix, it is actually less centralized during the postwar period than prior to it, as is the node centrality of the US in this matrix (see Figure 8.2.20). There is a very close and parallel relationship between the centralities of the trade matrix and of the United States in that matrix, as well as in the foreign aid matrix (see Figure 6.3.10), in which the donor centrality of both the matrix and of the US are in near-perfect parity between 1963 and 1986, and in still substantial parity thereafter. It can be concluded from this that regardless of the fact that these matrices are becoming denser over the course of the century, cyclical or irregular patterns characterize their centralities, and the hegemon's position in those matrices (as opposed to Matrices 1, 2, and 3) is highly predictive of their overall steepness or centrality.

The trade matrix's density was among the contending variables for the most explanatory factor throughout the models. Its predominantly negative effects on US GDP per capita in the economic factors and comprehensive model are both significant ($p < 0.05$ and 0.01, respectively), while its negative effect in the integration factors model is not statistically significant ($p = 0.179$) by conventional statistical standards. The summary narrative to be drawn from this factor's effects on US GDP per capita is that the more densely packed and active that the trade matrix becomes, the more that the benign forces of a capitalist free market can supersede unilateral forms of international interaction, flattening the measurable hierarchy along which GDP per capita is distributed, thereby decreasing the z-score of its highest outlier. In other words, the unfettered hand of the world-economy actually narrows the gaps in the worldwide distribution of GDP per capita, bringing the hegemon's level of economic development closer to the global mean.

Regarding Krackhardt's dimensions of the trade matrix, its least upper boundedness was held constant at 1 throughout the period, while its hierarchy was nearly always 0. Again, this seeming anomaly is actually typical and characteristic of bilateral, presumably egalitarian matrices such as a trade network. Also, its connectedness almost constantly grows, often in tandem with its density, while its efficiency gradually drops along a fairly tumultuous trajectory (see Figures 8.2.22 and 8.5.1). The latter two measures were used in the multivariate analysis, but proved to have little impact on the dependent variable.

Excessive collinearity between the dependent variable and other factors was evident throughout the relevant bivariate output, and it is a near-certainty that some of it still confounds the Prais-Winsten multivariate output presented in this chapter. Due to such collinearity with the dependent variable, for example, US GDP as a proportion of global GDP was omitted from the multivariate analysis, as were other economic measures, such as any export figures (which were mostly redundant with their import counterparts).

10.1.2. Diplomatic Dimensions of Global Governance

Global governance formation in the sense of the prevalence of international organizations occurs primarily after the World Wars, and two of the measures of IGO prevalence in this study capture this intensification quite well. Much like the global imports figure discussed in Section 10.1.1, the League of Nations and United Nations budgets relative to global GDP had an extremely low range of values, and reflect the upward sweep in fiscal emphasis that marks the transition between the League of Nations period and the Cold War (see Figure 5.3.7). Though not incorporated into the study due to collinearity with the LoN/UN member state count, sovereignty scores trended upward in a linear fashion, while the LoN/UN budget relative to global GDP (the fiscal equivalent of the IGO member count) was irregularly trended, with at least two visible upward scalar sweeps during the early and late Cold War periods (see Figure 5.3.19). There were other irregularly distributed variables in this factor block, which is likely a cause for this type of indicator having little significance in the multivariate regressions. The US percentage of the contribution to the UN budget (see Figure 5.3.12) might be a valid indicator of the hegemon's relative emphasis on global governance, but it is comparatively weaker as an explanatory factor of its economic prevalence than, for example, its military budget (see Figure 5.4.1).

As with the sovereignty/decolonization proxies and the LoN/UN member counts (see Figure 5.3.3 for both), a linear trend of growth characterizes the density of each of the IGO related networks (i.e., Matrices 1, 2 and 3, see Figure 8.1.2), indicative of a world polity narrative in which after World War II, nation-states' participation in IGOs increases at almost the same rate as the acquisition of sovereignty by these newly participating members of IGOs. By contrast, the centralities of each of these matrices and of their respective hegemonic nodes appear to conform to neither trends nor cycles. Node and matrix trajectories oscillate with highly negative correlation in the IGO-state matrices, which means that while the United States is becoming more centralized in its state-to-state co-affiliations, Matrix 3 drops sharply in centrality after the founding of the UN. The same relationship exists between Matrix 2 and the United Nations, in that the UN's centrality in such a small co-affiliation network increases as more nation-states join the network and consequently flatten the overall distribution of nodes throughout the IGO-to-IGO co-affiliation matrix.

10.1.3. Military Dimensions of Global Governance

The raw and per-soldier military measures proved to be sometimes synchronous with soft-power measures, such as the LoN/UN budgetary quotient (see Figure 7.1.24). Its effects on the dependent variable were wholly positive, but only significant when controlling for periodicity, meaning that beyond a bivariate relationship between these untrended, cyclical, standardized measures, there isn't a unique effect here beyond a marginal return on investment.

10.1.4. Periodicity and World War II

Four-step periodicity did not have much of a quantifiable effect on the multivariate models, though there tends to be a narrative of gradual, overall diminishment of US GDP per capita relative to other nations' levels of economic development that critically impacts many of these variables, including the dependent variable (see Figure

7.2.1), not only during wartime years; the periods that follow are wholly dissimilar from the interwar period with respect to most of these measures, particularly (but not exclusively) those that are trended.

The most obvious indicator of the stairstep sequence of US economic declines since World War II is that of its percentage contribution to the UN budget. Interestingly, it drops by a number larger than 2% exactly once per period since the UN's founding (data are not relevant for the LoN period), and each of these notable dips is roughly at the median of each period's range. First, it must be noted that the US's percentage contribution to the UN budget is also the highest percentage amount that any member state can contribute, and therefore it is not a figure solely resulting from unilateral hegemonic decisions and processes. As this figure is purposely lowered at the level of the United Nations, this mathematically forces the decentralization of the UN's budgetary contribution structure, and imposes a greater responsibility on other nations (most of them cores) to assume the bulk of the percentage that is removed from the greatest contributor's portion.

Given their somewhat cyclical patterns within a linear trend of growth, military expenditures will most likely not stabilize or plateau, but will either continue to increase with more hegemonic emphasis on militarism (in the case of a gradual hegemonic decline), or less (in the case of a more rapid and punctuated decline), as happened with Germany and Japan, and less so with Italy after the last intercore war. Though raw military expenditures relative to those of all other countries continue to rise to unprecedented heights, the per-soldier quotient actually puts figures at the turn of the century, when its military focus was on Iraq and Afghanistan, below those of the late 1960s, when most of its military apparatus was active in Southeast Asia, though they are slightly above those of the early 1990s, when most of its military's efforts were directed towards Iraq and other Persian Gulf states.

There are other indicators of a waning hegemony across the periods. The dependent variable itself—US GDP per capita—is currently on a downward swing, which begins at the cusp of the current period, in the 1990s. US GDP relative to global GDP begins its own downswing at the turn of the century, falling at an even faster rate than the standardized per-capita figure (see Figure 5.2.3). The US also has a diminished share of the export sector of the world-economy, even if its imports are stable and recovering (see Figure 5.2.17). In other measures, however, the hegemon continues to hold a prevalent position in the distribution of global prevalence, and is likely to continue to do so, short of infrastructural and/or administrative mismanagement of its economy and consequent hegemony.

10.2 Reflections, Generalizations, and Conclusive Arguments

The causal questions in this dissertation revolve around which dimensions of global governance serve as the best predictors of which other dimensions. This has been answered using the distinct foci itemized below.

- **Institutional typology:** Diplomatic vs. economic vs. military. Which institutional forces of global governance explain which others?
- **Structural typology:** Centralization vs. integration. Which dimension of global governance explains the other?
- **Networks-based typology:** Specific to the network dimensions only

- *Intra-network:* Does integration explain centralization, or vice versa?
- *Node-to-network:* Does hegemonic node centrality explain matrix centrality, or vice versa?
- *Inter-network:* Does the development of one network of global governance, such as foreign aid, explain the development of another, such as trade?

As regards the first typology, it appears that economic factors—dwelling in the gray area between softer power, such as diplomatic relations, and harder power, such as investment in a military apparatus used primarily for offensive/offshore rather than defensive/stateside operations—are the more determinant predictors of the relative economic development of the world-system's current hegemon. That is to say, it is the economic sector—rather than in militarism or diplomacy—that internally affects the economic primacy of the United States, though non-economic factors are also worth mentioning in the discourse that follows.

Regarding the relationship between integration and centralization—that is, the structural properties of global governance—it is clear that the networks of global governance are almost always becoming denser while their centralities (given the inclusion of so many actors) are either gradually decreasing or oscillating as hegemonic actors usurp many of the connections with emerging nodes. It is difficult to draw generalized conclusions about the Krackhardt measures in this dissertation, given that each network was so structurally different from the others.

As regards inter-network relationships, the densities of Matrices 3, A, and T are highly collinear (though foreign aid density exhibits an anomalous drop during the 1990s). The vertical dimensions of these matrices, and of the UN and US in their respective networks, have no singular narrative. Most are not significantly correlated across matrices, the main exception being the foreign aid network's efficiency, which is collinear with the efficiencies of both the trade matrix, and the IGO-IGO co-affiliation matrix.

Regarding intra-network (that is, inter-dimensional) relationships, collinearity characterizes the relationships between the density and connectedness of any given matrix. The output consistently suggests that connectedness is a better predictor of density than density is of connectedness, as is particularly evident in Figure 8.4.3. The mathematical reason for this is that connectedness simply measures any international trade regardless of how nominal the value, longitudinally charting its path towards singularity of connectedness, while the density figure reflects a greater overall saturation of trade, which tends to occur years or decades after trading partnerships have been established among nation-states.

Though statistically strong, relationships among the vertical dimensions of each network were particularly problematic in this dissertation, seeing as relationships were either inversely collinear (as with the centralities of Matrix 3 and the node centrality of the US in that matrix), or positively collinear (as was the case with the out-portion of the aid matrix).

With respect to relationships between integration and centralization factors, in the case of Matrices 2 and 3, density and centrality were inversely collinear, suggesting that decentralization is a consequence of the IGO networks becoming more saturated, which emphasizes the role of non-core nodes in the network. Matrices A and T yield ambiguous cross-correlations, and will not be further generalized upon.

Predictions of macrosociological forces, such as housing markets, are sometimes based on extrapolations that could predict continued intensification of many of these features of global governance (such as the densification of the IGO and trade networks). Sometimes, they can foreshadow a downturn in an already established cyclical trajectory (such as the out-centrality of the foreign aid network or the in-centrality of the trade network). On this note, generalizations herein about the United States as a system-wide hegemon must be taken with precaution when applied to previous or future hegemons, given: (1) the unprecedented scalar changes taking place during the postwar period; (2) the uniqueness of each regional and global hegemon's methods of achieving and reproducing its hegemony; and (3) the impact of variables exogenous to this study, such as innovative technologies that facilitate the recession of one hegemony and the concurrent succession of another (see Section 10.3 for suggestion on further research). Hegemonic transitions are as unique as the hegemons themselves, and transform not only the nation-states assuming the role of each rising and waning hegemon, but the entire network, in this case, the world-system; consequently, these results and their accompanying interpretations are held to be accurate descriptions of the era in which they are empirically couched, though these inferences should not apply to, for example, a Chinese hegemony, given the vast infrastructural, sociocultural, military, and other differences between China and the historical hegemons.

The same can be said for measures not based on hegemony. Just as technologies such as the telegraph and the railroad shaped some of the earliest IGOs, these organizations in turn have transformed the world-system in such a way that generalizations drawn from the decades following World War II are only slightly applicable to the interwar period (as periodization in some of the graphs illustrated), and certainly far less applicable to the decades and centuries that precede the empirical portion of this dissertation.

To concisely state the summation of the above findings, as each abstract element and corporate embodiment of global governance develops and proliferates, it becomes evident *thus far* in this study that there is no cohesive paradigm that encompasses either a single period, regression model, or even a factor's unique effect on the economic development of the system's hegemon.

However, one final lens can be used to survey the findings of this dissertation. By pivoting the axis of focus along the temporal dimension that demarcates the development of global governance to the period in question (1919 – present), an altogether different perspective can be gained on the nature, structure, and possible future of global governance. Among the more identifiable types of trajectories encountered in this study is the *exponential upward trend*, which includes global imports (and exports) divided by global GDP (see Figure 5.2.8), US imports (and exports) divided by global GDP (see Figure 5.2.11), and trade density (see Figure 6.4.6). From this, it can be concluded that after the 1960s, the intensification of international trade relative to the whole of the world-economy essentially globalized the economies of much of the world. This economic form of global governance is likely to continue to proliferate throughout the emerging or as yet untapped markets until approaching—even if not reaching—a full saturation point. There might remain a hermit kingdom, an Isolation Island, or other virtually untappable markets, but those will *increasingly decrease* in scope and number as the various resource-related conflicts of this century unravel, and encroachment claims most of these outlier polities and indigenous peoples. In other words, this expected continued upward trend in the *connectedness* of economic globalization (in the form of both foreign aid and trade), is likely to continue along an asymptotic trajectory towards complete global integration. However, this phenomenon might also continue to be characterized by moderate downswings in the overall *density*, which can still decrease in conjunction with the incorporation of new markets into the world-economy as long as the average nodes in this networks decrease their overall amount of trading or foreign aid activity.

Similar to the exponential trend discussed above is a *linear upward trend*, embodied primarily by sovereignty (see Figure 5.3.3), the density of the IGO-related networks (see Figure 6.2.8), and the connectednesses of all networks in this study (see Figure 8.1.15). It is noteworthy that while the globalization of trade increases exponentially, global governance via IGOs (at least the IGOs held to be most prominent throughout the period) is more gradual. Sovereignty (a measurable proxy for decolonization) is a necessary precondition for membership in the League of Nations and United Nations. These two measures are nearly perfectly collinear, and not by mathematical necessity, which is a testament to the fact that at least since the establishment of the United Nations, this has been a world in which the UN has been a hub of interstate diplomacy to virtually all sovereign nations. Since its inception, the UN and Bretton-Woods institutions have evolved in tandem with the decolonization of the world-system, granting membership to nearly every nation-state within 12 months of their transition from colony to sovereignty. Though these three central IGOs have extended membership to a nearly identical manifest of members, the rest of the IGOs included in the empirical analysis have been more exclusive (e.g., the G8, NATO, CEATO and SENTO), or have even been shunned by the hegemon (e.g., the International Criminal Court). The near future state of the state-IGO networks depends largely on the continued—that is, concluded—decolonization of the world, given (1) the close relationship between sovereignty and IGO membership and (2) the almost fully decolonized state of the world.

This raises the issue of decolonization and neocolonialism. By decolonization, what is meant is the acquisition of nominal political sovereignty, which can be compromised informally or formally via structural adjustment programs, military invasions and occupations, covert operations (see reference to Go [2011] below), agreements contingent upon foreign aid, trade embargos, and other factors not empirically addressed in this body of work. The world-system *is* already at near-saturation; unless another wave of formal colonization sweeps the globe—an unlikelihood—there will be no further waves of decolonization as measured in this manner, though we are living in transformative times, and neocolonialism today is a far more subtle and subjectively perceived phenomenon. Its predecessor—colonialism—

declared itself with a very clear, unified, and rigid system of symbols and legal codes, whereas the contemporary form of one country's apparatus of power over another relies only partially—if at all—on militarism and symbolic overtures of imperial power (e.g., flags, architecture, literature) over the colonized word. The success of soft power has been evident throughout this dissertation, which supports Nye's (1990) Polanyian position that hard power alone cannot sustain a hegemony.

As discussed earlier in the dissertation, Gramsci's (1971) notions of *invisible* power—these being rooted in Marxian notions of symbolism, values, and emotions—constitute an even softer form of power than that generated by trade agreements and even the patron-client relationships involved in foreign aid. It appears from the diplomatic factors model in Table 9.3.12 that the softness of such forms of power when US GDP is regressed upon them only (not controlling for covariances with military and economic factors) renders these coefficients nonsignificant. In fact, diplomatic factors are almost unanimously nonsignificant, though it is likely that their inclusion as controls in other models—particularly in the comprehensive model—renders other coefficients significant.

The United Nations, International Monetary Fund, and other major IGOs exercise a certain amount of non-colonial power, much as US hegemony has not been colonial. Rather, as Go (2011) notes, it is organized as clientelism in which the US intervenes both militarily and covertly when a local regime fails to play along. The subtler forms of global power discussed above that were not part of the empirical analysis may very well be working in conjunction with hegemonic military presence throughout the world system to facilitate a rapidly changing mechanism of global governance. Given the massification of propaganda at this stage of the Information Age, this mechanism is likely to be so reliant on the technological and covert management of information that social science literature will only fully grasp its full nature and scope in retrospect. Nevertheless, empirically so far, many of the formal aspects of IGO networks and trade are trending toward flatness (i.e., reductions in centrality and Krackhardt's measures of hierarchy, efficiency, and least upper boundedness), but on the other hand, hegemonic military spending (relative to all other nations), for example, has been on the rise, and may continue to reach unprecedentedly highly positive z-scores (i.e., deviations from the mean).

Some variations on a *linear upward trend*, such as a long-term trend with short-term cycles, are also evident, as in the case of the LoN/UN budget relative to global GDP (see Figure 5.3.7) and the US military budget (per soldier and absolute, both standardized against all other countries, see Figure 5.4.1). As with other proxies of institutional scope exogenous to this study, such as polities' territorial sizes and urban populations (Inoue, et al., 2014), is possible that certain floor or ceiling limits are being established and reestablished throughout the century by developments in hegemonic militarism and the role that the UN plays in the world-system.

There are as many cyclical patterns as there are growth trends to be found throughout this dataset. Considered a dependent variable in Chapter 9, US GDP per capita exhibits a prominent cyclical trajectory (see Figure 5.2.3) following the spike caused by World War II.

Less prominent cycles such as those above include the trajectories of US imports (and exports) relative to global imports (and exports) (see Figure 5.2.17), the in- and out-centralities of the foreign aid network, and the out-centrality of the US in that network (see Figure 6.3.10). Also, the import/export figures, which are highly sensitive to World War II, stabilize during the Cold War and, much like US GDP relative to global GDP discussed above. The US figure also exhibits cycles along a slightly downward trend, suggesting a lessening of US prominence in the import/export sector of the world-economy. Given the diminishment of US exports relative to global exports during the postwar period discussed at the end of Section 10.1.4, it is clear that an imbalance between US import and export prevalence, if persistent, may trigger further strain upon the hegemon's internal economy, given that it is buying from other actors in the world-economy more than it is selling, and the revenues of hegemony can only fund a certain amount of excess beyond this trade deficit. This may be an oversimplification that ignores all manner of economic activity, such as direct portfolio investment, currency fluctuations, and the hegemon's financialization—that is, an increase in the prevalence of its tertiary sector—but as it is measured here, the trajectories of economic centrality do not point to a sustainable hegemony in the coming decades, certainly not one emphasizing consent-based strategies of governance.

Continued US decline, particularly in its participation in forms of soft power, is likely to be the trend for the coming decades, though an alternative scenario involving a second round of US economic hegemony—much as the British enjoyed—is also possible, particularly given how entrenched in the United States the global market has become, and vice-versa. In short, it is in the best interest of China and other economic cores for the US economy to prosper—at least in certain sectors. Consequently, its level of economic development will likely remain high despite its geopolitical wane. More alarming for the fate of democracy, and the continuity of the values of the Enlightenment that brought forth the principles of global governance, however, are the indirect (and therefore lagged) effects that this might have for the world-system at large if its military cores were to again manifest a multipolar, interimperial rivalry. Viewed from a linear perspective, this would revoke many of the aspects of globalization, and consequently of the world's most ongoing social revolutions, most of which involve human rights. Needless to say, global war will greatly upset the vitality of the international market and foreign aid sector, let alone the IGO structure, and virtually any regularity in the trajectory of any and every measure of global governance analyzed in this dissertation.

To expand on the previous paragraph's position on US economic prosperity in the near future, the alternate proxy of GDP-based hegemony is that of US GDP relative to global GDP (see Figure 5.2.3) is somewhat related to the highly irregular trajectory of the US' percentage contribution to the United Nations (see Figure 5.3.12). The 1940s characterize a sharp rise and less dramatic drop in US GDP relative to global GDP, followed by a gradual decline in US prevalence over the world-economy marked by a gradual, overall drop in this figure during the postwar decades. If things continue as they have for the last six or seven decades, we can expect US GDP relative to global GDP to drop below 15% (the lowest it has been since the Great Depression) within one to two decades. There appears to be a broad popular realization of this trend, which drove the explicitly hegemonic rhetoric of the 2016 US election cycle. A continued reduction in this percentage would not necessarily be a detriment to the world-economy; it simply points to a flattening of the core-periphery hierarchy, rendering its hegemon less prominent in the overall share of the world's GDP. The EU and Japan, for example, are also decreasing their respective shares of global GDP, mostly due to the economic rise of China and India, two already large markets. Whether or not this staves off war or incites it will be greatly determined by struggles to control water, land, oil, and a few other basic resources as the 21st century will most likely see the commodification of every natural resource, including air.

And, as a final empirical observation, there are downward trends to be found throughout the dataset, such as in the centrality of the state-to-state co-affiliation matrix (see Figure 6.2.23) and in the efficiency of the foreign aid and trade matrices (see Figures 6.3.22 and 6.4.27). Substantively, we can conclude from these two findings that: (1) as more member states join more IGOs we transition from the highly exclusive IGO environment of the League of Nations period to the far more inclusive and participatory global polity of the current century, and (2) as the foreign aid sector develops, recipient nations have more options (graph-efficiency proxies a lack of alternative options for aid recipients) to receive aid, thereby democratizing this sector of the world-economy.

Having drawn inferences from current trends, cycles and other patterns it can be most succinctly put that while the world-system is becoming ever more connected, saturated, integrated, and inclusive, the nature of the IGO-state networks is such that the world-system is also becoming more decentralized as more nation-states now participate in civil discourse—i.e., diplomacy—much like individuals have in civil society. If and when this civil discourse among nations breaks down, or neocolonial strategies supersede it in functionality, there may be alternatives for non-cores to restructure the system while a hegemonic rivalry ensues. Seen through the social networks lens, trade is becoming less centralized as transportation and communication technologies continue to break down barriers among peripheral actors that were previously maintained and exploited by core broker states. And with respect to the in- and out-centralities of the foreign aid networks, it is best to eschew any hopes of forecasting their scope, as their zigzagged longitudinal distributions yield little regularity in both their frequency and intensity. There may be hope in a world of intercore wars for peripheral and semiperipheral actors to coalesce independently of cores via trade, aid, and/or IGO formation/membership.

As with much historical social science, the particularities of each period—its movers and shakers, its technologies of conflict resolution and their consequent ideologies—dictate the degree to which X affects Y or Y affects X. Given the heterogeneity of the bulk of these measures, this is not a surprising conclusion; the nature of global governance is heterogeneous; it is sui-generis, in that it is not the result of any single agent, unified corporate structure, or specific society. It is trans-civilizational, and therefore not grounded in the traditional fears of externalities to *the nation* or the groupthink of conventional governing structures that now coexist with the instruments of global governance. Because of this, it is not possible to draw a singular generalization about the state or process of global governance, save that it is likely to continue to replace nation-statehood as the dominant level of political efficacy as our century matures. This is measured primarily by the continued increase in density of seen in all of the networks, with the foreign aid network being a partial exception during the 1990s.

However, recent global events are likely to put great strain on the system of global governance, in that the ability of the hegemon to print money—what Michael Mann (2013) terms dollar seigniorage—has enabled it to engage in warfare without having to raise taxes. Furthermore, the current US president-elect has publicly declared his opposition to financial regulation, potentially opening the door to another (and possibly more severe) financial collapse like the one which devastated the US economy in 2008. These military and economic realities portend a downswing of economic globalization, and likely a further entrenchment of the popular resentment of systems of global governance that manifested this year in the Brexit vote, the election of Donald Trump, and the rise of far-right parties in European nations. It remains to be seen whether the existing institutions of global governance can withstand these imminent stressors.

One pair of researchers (Mounk and Foa, 2016; Mounk and Foa, forthcoming 2017) see evidence for the decline of democracy worldwide; in addition to the reality that Freedom House indicators of democracy/freedom have declined year-on-year since 2005, they found that support among citizens for democratic forms of government has been declining, while support for authoritarianism and antisystem parties and movements is increasing.

It is appropriate to note as this chapter is concluded that any and all predictions presume the continuity of the current world-economy being able to sustain a population approaching 8 billion within a decade of this dissertation's defense. This is, therefore, an optimistic expectation, presuming that humanity can and will find and implement viable solutions to global-scale anthropogenic, environmental catastrophes that are already manifesting (Hamilton, 2010). Failure to do so would certainly render impossible the intensified interaction on which global governance depends, let alone the material and technological grid that supports it. If global governance is to characterize the next stage in the sociocultural development of the species, the ecological problems created by the last three generations must be solved by the next generation, lest we regress to less tolerant and progressive forms of social organization.

10.3 Directions for Ongoing and Future Research

Given the tentativeness and ambiguity of many of the findings discussed throughout this work, it is nearly impossible to provide a single narrative of the last century, let alone to use this to generate a singular prediction. Rather, each major dimension of global governance—whether network-based or otherwise—exhibits its own unique trajectory, with network densities, for example, becoming ever more saturated, and centralities, by contrast, diminishing. Given this heterogeneity of findings and consequent narratives, this research lends itself to the compartmentalization of some of these specific variables and their peculiarities. This section charts a few directions in which this research has already gone and/or will most likely head in the near future.

Statistical/methodological contributions: One proposed direction to take with this dataset is one that simply addresses some of the computational properties of social network dimensions, such as centrality. This dissertation uses only Freeman's degree centrality, which captures an unattenuated centrality measure, unlike Bonacich's attenuation-sensitive centrality scores, which capture the degree to which centrality can be affected by adjacent actors who are either highly connected or highly peripheral in a network. Amplifying the dataset with the centralities of other nodes would allow for the charting of the Bonacich centrality of state-IGO and Trade Networks as far back as 1870, depending on which IGOs are taken into account.

Institutional analysis: Questions related to the social, political, religious, legislative, and economic transformations upon which global governance rests have been omitted from this work, though they are highly relevant to a larger discussion of global governance. Their quantification is more problematic than the effort, given the difficulty of standardizing measures with such dissimilar logics, such as religion and economy. Nevertheless, the current dissertation serves as a basis for incorporating the tradition of Old Institutionalism (see Turner 2013) to the empirical analysis of shifts in the institutional order, which I contend are fundamentally related to the rise and development of global governance (Álvarez 2013).

Economic and Diplomatic (Soft Political) Power: With respect to the institutional distinction between economic and political soft power, a state-level analysis expanding on some of these variables can assess the overall distribution of the proportion of the UN budgetary responsibility, and its correlation with each country's GDP per capita. This effort will elucidate just how steep the core-periphery hierarchy is when measured as such, and settle questions regarding the proportionality of budgetary responsibilities to the UN and national economic development.

Hegemonic node centrality: While only one hegemonic node was used in each network (either the UN in Matrix 2 or the US in all other matrices), this dissertation omits discussion of other central nodes in these networks, such as the UK, Japan, and Russia. A paper entitled *Network Centrality and Node Centrality in a State-IGO Network: 1945 – 2018* (Álvarez, forthcoming) has emerged from this dissertation, and incorporates much of the content related to node centrality herein. Similar articles using the foreign aid and trade network will also be drawn from this body of research. Similarly, using a more comprehensive dataset of IGOs[26], the relative primacy of the UN, WB, IMF, NATO, and other prevalent IGOs will also be assessed.

Predictive/inferential discourse: Lastly, it is my hope that this dissertation will be followed by a more comprehensive, book-sized effort entitled *Forecasts of Global Governance: 2019 – 2029*. Social science has yet to truly tap into the discourse of the social consequences of collective organization outside of our current biosphere. As the planet becomes more saturated with human inhabitants and the core nations increasingly look to the Moon and Mars as viable fonts of resources, social science will have to account for networks and other features of governance that transcend the planet's scope and account for interglobal aid, trade, affiliation, hegemony, and other features of the expanding world-system.

10.4 Epilogue

This dissertation was completed during the eve of the Obama Administration, which ushered in a period of flourishing progressive human rights movements symbiotic

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[26] See http://www.uia.org/faq/intorgs1 for a fairly comprehensive list of IGOs.

with globalization, including feminism, immigrant movements, and the LBGTQ movement. It has not been unanimously progressive in all fronts, as is most evident in the case of indigenous rights issues, particularly as related to the human rights abuses of Standing Rock, and the poisoning of the Animas River in the nominally sovereign Na-Dene, or Navajo, Nation.

Suffice to say, the *current* face of the hegemon is a relatively pacifistic one, though the same cannot be said of the near future in light of the most recent and most unforeseen US election. The regressive change already expected to sweep every state and institution within the hegemon's borders after the upcoming presidential transition has already posed security concerns for the majority of the citizens of the United States, and has become a far greater concern for the remaining 96% of the human population, against whom the largest and most sophisticated apparatus of coercive power is more likely to be used. From an IGO perspective alone, the stability of NATO may wane in the coming years, as may the fundamental structures of the UN and other key players in the IGO sector of the world-system.

As with most speculation during this period of global warming, massive biodiversity decline, systemic ecological collapse, optimism is presumed in any prediction. Global warming alone has forced entire island nations to evacuate their populations, while the populations of other nations find it difficult to find potable water.

If humanity survives the 21st century with the continuity of the civilizations that now constitute it—that is, if we do not run out of potable water to sustain a population exceeding 9 billion in the next three decades—then we must also brave the advent of impending waves of intolerance echoing those of eight decades past. This dissertation has empirically obviated one phenomenon above all others: the impact of World War II on all aspects of global governance (other than foreign aid), and it is a certainty that a third-iteration of a global, intercore conflict would wrack the foundations of global governance with as much fervor as the forces that brought these charters, treaties, coalitions, and institutions into being. What must be understood by those vying for hegemony in the coming century is that at this scale of human social complexity, the interstate system and the IGOs that now mediate that system are neither a luxury nor a social experiment nor the enemy of hegemony; they are essential qualities of the world-system, originally emergent from it and now integral to its perpetuation.

And for the rest of the world, the overwhelming complexity that comes with the integration of these forces of global governance, and other aspects of globalization, does not necessarily coincide with stability in any measurable sense. In fact, it is generally with increased interaction that unequal relationships manifest, escalate, and most importantly, reproduce themselves beyond single lifetimes and discrete historical periods. The integration of the system increases the overall number of conduits by which these inequalities manifest, and if and when a crucial part of the system fails, greater interdependence leads to greater fragility of the system.

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Appendix: Data and Selected Output

External Data Sources

- Correlates of War (2010) military budgets
- Maddison, et al. (2010) population and GDP
- Roodman (2012) dyadic foreign aid
- Correlates of War, Barbieri (2009) dyadic trade
- United Nations and World Bank

Data Internally Generated and Recoded for Doctoral Analysis

- IGO-state Affiliations, 1919 – 2016, used to generate Matrix 1
- Foreign Aid Matrices, 1960 – 2008, derived from Roodman (2012)
- Trade Matrices, derived from Barbieri (2009)
  - 1900 – 1945
  - 1945 – 2009
- Sovereignty/Decolonization, Weighted by Population, 1900 – 2016, derived from Chase-Dunn, et al. (2005), Maddison (2010), and other sources
- Comprehensive global governance dataset, 1919 – 2016, and selected graphs

Selected Output

- Pearson's Unlagged Bivariate and Partial Correlation Matrices
- Prais-Winsten regression models, raw output
- Matrix 1, selected years
- Matrix 2, selected years
- Matrix 3, selected years
- Matrix A, selected years
- Matrix T, selected years