Centrality in Transnational Governance: How Networks of International Institutions shape Power Processes

ALEXANDER H. MONTGOMERY *Reed College* ahm@reed.edu

Forthcoming as Chapter 2 in *New Power Politics: Networks, Governance, and Global Security*, ed. Deborah Avant and Oliver Westerwinter. Oxford University Press, Oxford, UK

Abstract
In this article, I argue that network centrality approaches can illuminate power processes in transnational security governance. Most approaches to power and centrality focus on the direct effects of the possession of resources or ties. By contrast, I argue that centrality can also inform how network structures constrain behavior through diffuse power processes. I illustrate my argument by replicating two important papers on socialization through democratic international organizations and producing order through alliance hierarchies. I demonstrate that using network conceptualizations and measurements of these processes allows for better connections between theory and empirics, more precise hypothesis testing, broadened scope, and improved models. I find that socialization by democratic IOs is more important than dispute resolution mechanisms in preventing conflict and that ordering through hierarchical structures occurs throughout the entire international alliance system.

Keywords
Network analysis; transnational governance; power; centrality; socialization; hierarchy

Introduction

A traditional view of power in international politics holds that it resides in the possession of important resources. Actors with significant stocks of military hardware, economic wealth, and other high-value assets, the argument goes, enjoy advantages when it comes to influencing others. But a great deal of research suggests that power also resides in ties (patterns of association) that link together actors in networks. Some of these ties are material, such as trade and capital flows, while others are symbolic, such as friendship. Whether material or symbolic, however, these ties determine actors' relative positions in networks. These positions, in turn, profoundly structure agents' abilities to determine their circumstances and fates.

The power-political consequences of network position have received increasing attention in the field of international relations. Much of that attention focuses on centrality—a measure of actors' importance in a network. Recent work stresses attention to network centrality as a direct source of power for states, individuals, and movements. It consequently neglects how occupying a central position in a network can also powerfully constrain actors; it also emphasizes direct dyadic effects of power while slighting diffuse, network-wide implications. In this chapter, I argue that network centrality can be used to understand these broader power processes in international relations.

I illustrate my point by replicating and extending two important papers in the field that engage with power processes around socialization dynamics and international order. Jon Pevehouse and Bruce Russett's paper sits at the conjunction of three foundational literatures on international organizations (IOs), the democratic peace, and dispute resolution. They posit that as the density of ties between states through democratic IOs increases, conflicts will abate. I build upon their research by demonstrating that this is caused by diffuse socialization through all democratic IOs rather than direct socialization by states or dispute resolution mechanisms.[1] David Lake's paper challenges dominant understandings of anarchy in IR. It posits that countries that lack alliance network ties to countries other than the US are in subordinate positions within a hierarchical relationship. I extend his research by demonstrating that the same power dynamics have diffuse structural effects that order the entire international alliance system.[2] Through these examples, I demonstrate that employing network analysis allows for better connections between theory and empirics, more precise hypothesis testing, broadened scope, and improved models.

Network Analysis as an Approach

Networks create social structures that can influence agents' identities, the options they enjoy, the pressures they face, and how they make decisions. Network analysis offers practical tools to measure these potential sources of influence and constraint and their distribution in any system of actors. It concerns relationships defined by ties among nodes (or actors). Nodes can be individuals such as people or corporate actors such as organizations and states. Ties can be conduits for the exchange of material resources (for example, weapons, money, drugs, or disease) or non-material resources (e.g., information, beliefs, symbols, and norms). Network analysis examines the associations among nodes in addition to the attributes of particular nodes: relationships are not properties of actors but of systems of actors. While this study is necessarily limited in scope to the effects of network positions, network analysis can also analyze the creation and growth of networks through processes including selection and contagion. I make no assumptions here about which processes dominate network creation.

---

[1] Pevehouse and Russett 2006.

[2] Lake 2007.

Like rational choice approaches, network analysis is not a unified set of theories about behavior but rather a framework for analysis based on a set of assumptions and tools that can be applied to an assortment of processes, from conflict to norm diffusion. It is grounded in three principles: nodes and their behaviors are mutually dependent, not autonomous; ties between nodes are channels for the transmission of resources; and persistent patterns of association among nodes create structures that can define, enable, or restrict the behavior of nodes. The underlying difference between network analysis and standard ways of analyzing processes is accordingly the use of concepts and indicators that identify associations among units rather than solely focusing on the attributes of the units. Networks are defined as any set or sets of ties between any set or sets of nodes; no assumptions are made about the homogeneity or other characteristics of the nodes or ties. Consequently, network analysis can be used to analyze any kind of ties, including market or hierarchical transactions. Beyond these basic principles, network analysis enables calculation of structural properties, such as centrality of nodes, groups, or the entire network.[3]

Networks, IR, and Centrality

As the methodology of network analysis continues to advance, so too do applications to the study of IR.[4] However, current network centrality approaches in IR remain wedded to a 'capabilities' model of political power. Network ties, in this approach, amount to an additional resource that—like military hardware and hard currency stocks—actors may accumulate to enhance their influence. For example, a number of scholars have focused on how the centrality of NGOs enable some organizations to be much more important or effective than others. This is due to their ability to receive or spread information more quickly, their possession of exclusive ties to important actors, or the sheer number of ties to other organizations.[5] Other scholars have adopted a social network approach to analyzing patterns of conflict and cooperation between states. These approaches focus on centrality as an asset that can be used to coerce or convince other states due to a relative or absolute advantage in mobilization of support, a general indicator of status or prestige, or a conduit for important information on relative capabilities.[6]

Such work provides important insights, but it downplays the structural character of networks and consequently misses important power processes. Indeed, one of the key purposes of network analysis is to measure social structure. If social structure is shorthand for relatively durable patterns

[3] For a good overview of network analysis, see Scott 2012. The most comprehensive, if slightly dated, technical overview is Wasserman and Faust 1994. For recent additions to Wasserman and Faust, see Carrington, Scott, and Wasserman 2005. For a much more concise and up-to-date reference, see Knoke and Yang 2008; also see Carrington and Scott 2011. A useful online textbook is Hanneman and Riddle 2005; For an historical overview of the development of the field, see Freeman 2004.

[4] Notable recent work in IR using network analysis principles and techniques other than centrality includes Corbetta 2010; Cranmer, Desmarais, and Menninga 2012; Cranmer, Heinrich, and Desmarais 2014; Elkins 2009; Kinne 2013, 2014; Manger, Pickup, and Snijders 2012; Maoz 2010; Oatley et al. 2013; Ward, Ahlquist, and Rozenas 2013; Ward, Siverson, and Cao 2007.

[5] Böhmelt, Koubi, and Bernauer 2014; Carpenter 2014; Carpenter et al. 2014; Carpenter 2011; Lake and Wong 2009; Moore, Eng, and Daniel 2003; Murdie 2014; Murdie and Davis 2012; Carpenter this volume.

[6] Dorussen and Ward 2008; Hafner-Burton and Montgomery 2006, 2008, 2012; Kim 2010; Maoz 2010, Ch.7; Maoz et al. 2007; Murdie, Wilson, and Davis 2016; Ward 2006. But see Kinne 2012 for a conception of centrality as a constraint on action.

of interaction, then network analysis provides a rigorous means of measuring structural variation.[7] Yet a significant number of international-relations applications of network analysis use relational data but conjoin it to an agent-centric understanding of power. Once a more relational ontology is adopted—one consistent with standard sociological interpretations of network analysis—we gain a fuller appreciation of the connection between power and networks. This allows us to use network analysis to talk about a variety of different dimensions of power, including how positions constrain as well as enable and how power can act in diffuse as well as direct ways.[8]

Indeed, there exists very little consensus about what particular network positions provide actors with the greatest advantages or influence. This lack of consensus resides in the fact that network position, such as the centrality of a given actor, does not automatically translate into the possession of greater influence. Rather, the relative agency constituted by the positions of actors in networks—combined with the capacity to exercise the agency—determines whether power is possessed by those agents and whether they can successfully use that power.

To complicate matters, network analysis includes a panoply of different measures of centrality. Many of these were created to analyze specific networks or particular types of ties—and therefore often involve theoretical foundations that do not translate to other domains.[9] The communications-network origins of classic centrality measures, i.e., degree, betweenness, and closeness, means that while the behavior of these metrics are well understood, they must be re-theorized when used in other domains. More recent measures often suffer from a lack of theoretical underpinnings or systematic testing of properties, making it hazardous to apply them across domains. These difficulties make it problematic to articulate clear connections between centrality and various phenomena.

Power and Centrality

These difficulties are particularly acute with respect to power, due to the relatively narrow conception of power in networks expressed by "power centrality."[10] This measure covers situations where being connected to other powerful individuals is most useful as well as situations where being connected to relatively isolated individuals is advantageous. It does not cover brokerage between two powerful, but not directly connected individuals or groups, nor does it evaluate the efficiency of propagation through a network. It is also intimately connected to the idea of power as a resource held by individuals rather than as a constraining force across entire networks. Calculation of power centrality also requires specification of parameters for which little clear theoretical or empirical guidance exists. Consequently, parameters are often chosen without any grounding in theory or practice, and so it is difficult to interpret the results in meaningful ways. It is a potentially useful measure of a particular conception of power, but does not exhaust the possibilities for power in centrality measures.

---

[7] Neorealist approaches to the structure of the international system focus on the distribution of material properties, creating a structure that can be measured by the number and capabilities of great powers (Mearsheimer 2001; Waltz 1979). However, these accounts do not exclude and are generally complementary to network conceptions of social structure; see Goddard and Nexon 2005; Hafner-Burton, Kahler, and Montgomery 2009; Hafner-Burton and Montgomery 2006.

[8] Avant and Westerwinter (this volume).

[9] Attempts to provide theoretical foundations are often based on specific processes, e.g. Friedkin 1991. These often end up articulating additional measures whose properties are not well-understood.

[10] Bonacich 1987.

Although the nature and source of power in networks has been discussed by many others across disciplines, these discussions have primarily to do with either the power of specific individuals or exchange relations.[11] Similarly, since centrality scores were originally based on communications networks, these metrics are commonly understood in the networks literature as prestige or status indicators of individuals rather than as indicators of underlying social structures.[12] Centrality measures cannot be assumed to mean the same thing when applied to networks of states as networks of overlapping executive boards or schoolchildren on the playground. Moreover, these notions of power are focused on individual agents and ignore wider processes that involve power that operates through structural constraints and pressures.

Consequently, I follow Duvall and Barnett in broadly defining power as "…the production, in and through social relations, of effects that shape the capacities of actors to determine their circumstances and fate."[13] This is a notion of power that bridges across the four faces of power, which were formulated historically rather than designed as a deliberate typology.[14] They divide power into two categories: the specificity of social relations of power (direct/diffuse) and how power is expressed (interaction/constitution). The first distinction very closely aligns to the problem faced by most centrality approaches: they treat power and centrality as "mechanistic, flush with contact, direct, or logically necessary." By contrast, diffuse approaches "allow for the possibility of power even if the connections are detached and mediated, or operate at a physical, temporal, or social distance."[15] By including not only direct and intentional effects but also diffuse and unintentional ones, this definition is a broad notion of power that, I argue, can be operationalized through centrality measures.

Centrality measures cannot be directly mapped onto the direct/diffuse distinction. However, it is possible to tease out some basic guidelines for conceptualizing and measuring power processes through centrality. In general, direct relations may involve political effects that can be captured by a centrality metric that weighs proximate ties more heavily than more distant ones, while analyzing power processes due to diffuse relations might call for a metric that takes into account more indirect ties. For example, degree centrality is a sum of the strength of the ties immediately connected to a given individual and so is direct.[16] Eigenvector and power centrality also focus on immediate ties but

---

[11] For an early discussion of power exerted through networks in world politics, see Stoll and Ward 1989; Ward and House 1988. For a general political science treatment of power in political networks, see Knoke 1990. For a general discussion of power dependence in exchange networks in sociology, see Cook and Yamagishi 1992; Emerson 1962. On social capital and network power, see Borgatti 2006; Borgatti, Jones, and Everett 1998; Lin, Cook, and Burt 2001.

[12] Freeman's classic articulation of the definitions of degree, closeness, and betweenness centrality were based on notions of network communication and consequently although the measures are useful, these conceptions are not directly applicable to most IR networks. See Freeman 1979 For such accounts in IR, see Hafner-Burton and Montgomery 2006, 2008, 2012; Kim 2010; Maoz 2010, Ch.7; Maoz et al. 2007.

[13] Barnett and Duvall 2005, 42. Barnett and Duvall follow Scott's network-based definition of social power, "an agent's intentional use of causal powers to affect the conduct of other agents." Scott 2008, 29. For Scott's complete formulation, see Scott 2001.

[14] Barnett and Duvall 2005, 43n.13. For a discussion of the faces of power and networks, see Hafner-Burton and Montgomery 2009.

[15] Barnett and Duvall 2005, 47–48

[16] This assumes a one-mode network, i.e., all of the nodes are of one type. In an n-mode network (n>1), nodes of one type must go through at least one other type in order to produce effects, making degree centrality potentially indirect. See my analysis below of Pevehouse and

are somewhat more diffuse, since they also take into account the centrality of those actors as well.[17] Betweenness measures the importance of an actor by determining the number of geodesics (shortest paths) that actor is on between all pairs of actors in a network. It is consequently more diffuse than degree, eigenvector, and power measures. But it still favors some paths over others; flow betweenness corrects this by taking into account all possible paths (even those that are not the shortest) between every pair and therefore is even more diffuse. Actors with high closeness centrality have short paths between them and all other actors, and information central actors have short paths over strong ties, and so both depend on the structure of an entire network component. As a result, these are very diffuse measures, although they emphasize slightly different types of diffusion.[18] The choice of which metric to use will depend on the particular type of power process—whether it is through access to other important actors (e.g., degree, eigenvector, and power), brokerage between unconnected groups (e.g., betweenness and flow betweenness), or speed of diffusion through a network (e.g., closeness and information).[19]

Power works through the ties studied in this article (international organizations) through both direct and diffuse relations. To begin with the simplest concept, mutual membership in a given organization allows for direct interaction between states that belong to the organization. This measure is typically interpreted as the tie strength among these states. These ties enable power processes through, e.g., dispute resolution mechanisms and direct, regularized interactions between states. Through frequent interactions, states can socialize each other to norms of behavior due to having more access to each other; the more organizations that both belong to, the greater the chance of socialization.

But looking at the effects of interactions over a large set of organizations adds a second component of socialization. In addition to direct interactions between states, diffuse power processes come into play. Organizations not only provide mechanisms and meeting places, they also socialize states through the teaching of appropriate behavior. Organizational membership both provides identities for states through membership and teaches regulatory norms.[20] Overall organizational membership of an individual state thus provides a measure of the diffuse structural pressures placed on that state to conform to the rules and norms of those organizations. These rules, norms, and ideas of appropriate behavior then act as an aggregate structural constraint on the actions of those states. While socialization is ultimately a process that involves the internalization of rules and norms even in the absence of structural constraints,[21] the effects of constraints in behavior should be observable even prior to internalization.

However, these are not the only mechanisms through which membership operates. Exclusion is often as important as inclusion, and so while membership produces effects, non-membership also can produce effects, whether in a single organization or across multiple

---

Russett.

[17] In a sense, these could be seen as very diffuse, since ultimately the centrality of actors throughout an entire network component is affected by the addition or subtraction of a single tie. However, the effects of doing so drop off significantly with increased distance.

[18] See Kinne 2012 for a conceptualization of closeness centrality in trade networks as a constraint on disputes.

[19] For overviews of degree, betweenness, closeness, and information centrality see Wasserman and Faust 1994, Ch.5. For eigenvector and power centrality, see Bonacich 1987.

[20] Finnemore 1996; Gheciu 2005; Lewis 2005; Meyer et al. 1997; Powell and DiMaggio 1991.

[21] Successful socialization depends on the internalization of these diffuse, external constraints (Schimmelfennig 2000, 2005), and can best be observed in the absence of those constraints.

organizations. To take an extreme example, exclusion of certain states from international organizations—whether by their choice or not—can make certain states structurally weak, placing them in the categorical roles of being pariahs, rogues, and outlaws. This constrains behavior of both the included and the excluded through (among other mechanisms) role expectations. The role of a given state likely depends on the density of ties in multiple, intersecting networks, rather then just in organizations, but the latter are often a crucial determinant; the most obvious example is that UN membership is usually taken as an indication of stateness itself.

It does not necessarily require a large number of organizational ties for a state to be structurally powerful, nor do states have to be entirely excluded from all international organizations to be positioned in roguish categorical roles. For example, being a member of two organizations with otherwise disjoint membership makes a state a structurally powerful broker between those organizations or the states within them. Brokerage thus creates hierarchies of influence, with dominant and subordinate roles.[22] Yet highly central network positions are not only a source of influence for the central actors; they also create constraining effects for each actor depending on their positions over the entire network. For example, with divide-and-conquer rule comes the expectation of the provision of collective goods by the most central actor.[23] Subordinate positions may face varying degrees of pressures to contribute as well, while those outside the entire network face an entirely different set of pressures due to exclusion. Brokers may experience role strain if they cannot act in consistent ways across multiple sets of role expectations; such positions are tricky to navigate, and may prove disastrous if multivocal strategies come apart.[24] Selective inclusion and exclusion from some organizations but not others thus also creates important brokerage effects.

The distribution of organizational ties thus helps to order international relations by placing states in particular roles. These roles are often overlooked by approaches that examine membership in individual organizations or sum up the total number of organizations a state or pair of states belong to. These approaches ignore the emergent effects of nominally symmetrical international organization membership. In aggregate, patterns of organizational ties constitute a dominance ordering over the entire system. This ordering constrains not only the ostensibly isolated and weak but also the apparently powerful by exerting pressure on both to fulfill particular roles associated with those positions.

Applications to International Politics

International relations scholars can—and should—use measures of network centrality to test theories about power processes. In this section, I highlight two examples where a network centrality approach informs existing exemplary research by offering new insights into power politics. In each of these applications, I use the original methodology and add or substitute the appropriate network measure(s) that can extend the research. Ideally, network models include the dynamics of the network itself, treating the evolution of the network as endogenous.[25] However, in order to produce

[22] Brokerage power is not limited to inter-state relationships. As the contributions of Avant and Westerwinter in this volume illustrate, brokers also emerge and exert influence on governance in situations where state and non-state actors in various configurations collaborate to govern an issue area.

[23] MacDonald 2014; Nexon and Wright 2007.

[24] On multivocality and the manipulation of identity and interests in networks by brokers, the classic study is Padgett and Ansell 1993. On an international scale, and particularly for contrasts between successful and unsuccessful attempts, see Goddard 2009. For recent work that incorporates multivocality into wider frameworks, see Padgett and Powell 2012.

[25] Recent models are able to model cross-sectional network dynamics; see, in particular, the

results that are as directly comparable as possible to the original results, I limit the scope here to direct replication and extension. Finally, while my analyses here use binary connections (whether an alliance exists or not, and whether a state belongs to an international organization), many of these measures can be generalized to valued flows as well.

Democratic Socialization through International Organizations

It is a long-standing controversy whether or not joint memberships in international organizations (IOs) reduce violence between states. On one side of the controversy are scholars who argue that IOs stave off wars between members. They allow states to communicate information and facilitate bargaining, provide states with mechanisms to make credible commitments and resolve disputes, and expand states' understandings of identity and self-interest.[26] On the other side of the controversy are scholars that see IOs either as epiphenomenal or as exacerbating conflicts between members by increasing competition over resources and aggravating longstanding differences.[27]

In a seminal article, Jon Pevehouse and Bruce Russett propose a theory about IOs composed mainly of democracies.[28] They argue that densely democratic IOs are far more likely to bring about peaceful relations between members than are IOs with a smaller proportion of democracies. To test their theory, Pevehouse and Russett measure IOs from 1885 to 2000, counting joint dyadic membership in IOs whose members' average level of democracy is equal to or greater than 7 on the Polity scale. Their statistical results show that for a given dyad, the more joint memberships in IOs composed of democracies they possess, the less likely it is that the states in the dyad will engage in fatal militarized international disputes. From these results, the authors conclude that densely democratic IOs help quell violent conflict between member states in ways that other IOs do not. Pevehouse and Russett acknowledge that their statistical results cannot explain how democratic IOs help keep the peace. This metric measures multiple different aspects of intergovernmental relations at the same time: indicators of trust, shared interests, willingness to cooperate, and so forth. Consequently, it is a noisy indicator, and as with all indicators, must be carefully unpacked.[29]

Their theory is that democratic IOs 1) monitor members' behavior and prevent autocratic backsliding; 2) provide dispute settlement and mediation mechanisms; and 3) socialize members to trust each other and find peaceful alternatives to deal with potential conflicts. The first two mechanisms are straightforward, direct applications of power, and are properly measured through joint democratic IOs; the third, however, not only requires a different measure, but could either be direct (states socializing each other) or diffuse (organizations socializing the states) applications of power. A centrality approach can help to differentiate this third mechanism.

It is difficult to measure socialization directly, but it is possible to measure the totality of the structural pressures that any particular state (or other actor) is subject to due to a network. In the IO

---

ergm and latentnet packages in statnet: Handcock et al. 2008. There are two general classes of models that currently simulate full longitudinal network dynamics along with behavior: Stochastic Actor-Oriented Models (SAOMs, see Snijders, van de Bunt, and Steglich 2010). and Temporal Exponential Random Graph Models (TERGMs, see Cranmer and Desmarais 2011).

[26] Dorussen and Ward 2008; Keohane and Martin 1995; Martin and Simmons 1998; Oneal, Russett, and Berbaum 2003; Oneal and Russett 1999; Russett and Oneal 2001; Russett, Oneal, and Davis 1998.

[27] Boehmer, Gartzke, and Nordstrom 2004; Hafner-Burton and Montgomery 2006; Mearsheimer 1994; Ward, Siverson, and Cao 2007.

[28] Pevehouse and Russett 2006

[29] I thank Deborah Avant and Oliver Westerwinter for pointing this out.

literature, socialization is defined as a "process by which actors acquire different identities, leading to new interests through regular and sustained interactions within broader social contexts and structures."[30] I create two measures to reflect diffuse (by democratic IOs) and direct (by by democratic states in IOs) socialization. To gauge the diffuse socialization pressures on states by democratic IOs, I set the variable *Democratic IO Socialization* to the indegree centrality of states in the two-mode state-Democratic IO network. Although one-mode indegree centrality is a direct measure, here two-mode indegree centrality is an indirect and diffuse measure since it is the institutions rather than the states who created those institutions who are the agents of socialization. Two-mode indegree centrality is the total number of incoming ties from democratic IOs for each state (i.e., the number of democratic IOs they belong to). If x_{ij} is the strength of the tie between actors i and j, then the indegree centrality of actor i is: [31]

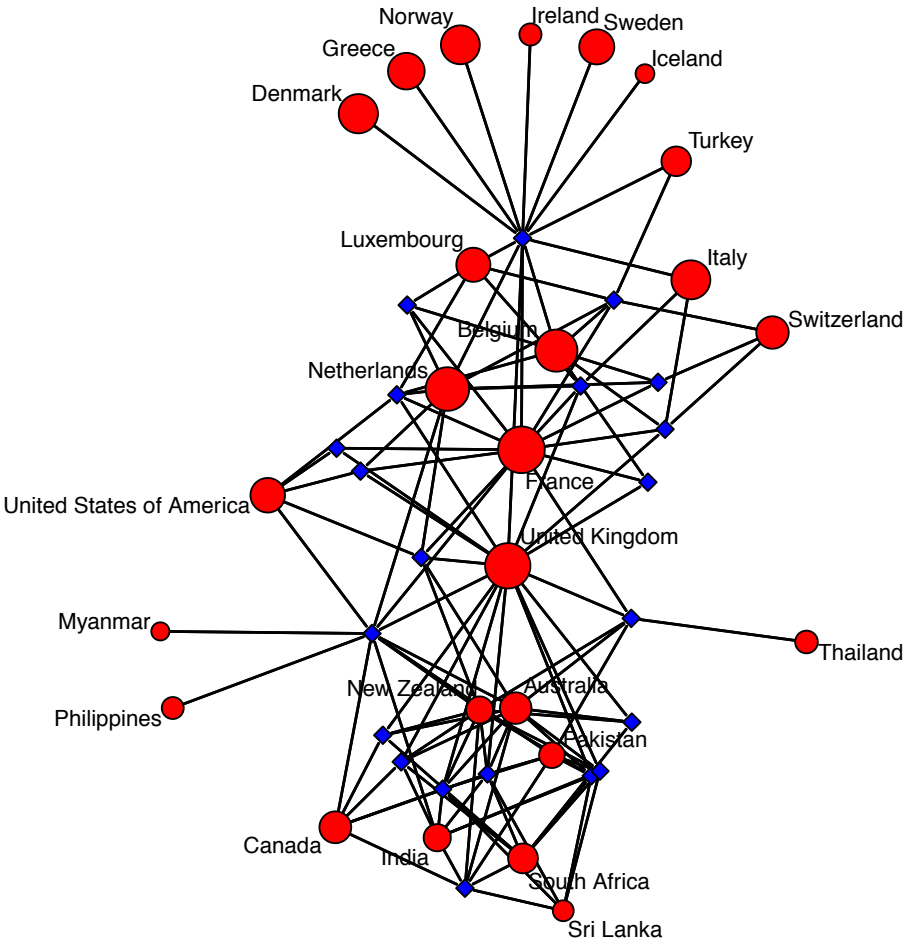
$$C_D(n_i) = \sum_j x_{ij}$$

States may also socialize each other directly through interactions in IOs. In this conceptualization, IOs are simply venues for socialization and so the effect is direct rather than diffuse. I measure this democratic socialization effect for a given target state by summing up the number of democratic states (polity score equal to or greater than 7) in each IO the target state belongs to. This results in the variable *Democratic State Socialization.* For both variables, I hypothesize that a weak-link mechanism operates: the extent to which either socialization mechanism could dampen down conflict depends on the less-pressured member of a dyad.

Figure 1 illustrates the distribution of the values of these two variables relating socialization, IOs, and conflict. The number of incoming ties for each state indicates *Democratic IO Socialization,* i.e., the number of democratic IOs each state belonged to in 1950 (e.g., Switzerland has 3, while Turkey has 2). The node size is proportional to *Democratic State Socialization* the same year. Some states are potentially open to socialization by multiple democratic IOs, but not *Democratic State Socialization* (such as Pakistan and Sri Lanka), whereas others are likely to be socialized by democratic states but possess few ties to democratic IOs (e.g., Norway). Centrality measures can thus be used to determine whether it is simply democratic IOs themselves, ties from democratic states in IOs, or both that dampen conflict.

[30] Bearce and Bondanella 2007, 706
[31] Wasserman and Faust 1994, 178

Figure 1. Democratic IO Network, 1950. Round nodes are states, diamond nodes are democratic IOs.



NOTE: Node size indicates the potential for *Democratic State Socialization*, while the number of incoming ties from IOs indicates potential for *Democratic IO Socialization*. Only states that belong to a democratic IO are pictured. Graphs plotted using the sna package in R.[32]

Table 1 shows my findings. Model 1 of Table 1 replicates Pevehouse and Russett (2006) (their Model 1 on page 984); the dependent variable is the onset of a militarized dispute between two states in which at least one fatality occurs.[33] Model 2 substitutes *Democratic IO Socialization* for *Joint Democratic IOs*, demonstrating that states that are subject to more structural pressure from these IOs are less likely to engage in militarized disputes. Model 3 substitutes *Democratic State Socialization*; while states subject to socialization pressures from other democratic states are slightly less likely to engage in disputes, the results are not statistically significant. Model 4 is a simultaneous test of Pevehouse and Russett's *Joint Democratic IOs* and *Democratic State Socialization*, while Model 5 tests both socialization pathways simultaneously. Due to the high correlation between *Joint Democratic IOs* and *Democratic IO Socialization* (0.8172), a direct test of which of these two causal pathways dominates is

[32] Butts 2013. Defaults were used (e.g., Fruchterman-Reingold was used for vertex placement) except for employing two-mode plotting.

[33] Following them, I use a logit model and lag the dependent variable by one year.

not possible. However, AIC tests indicate that overall Model 1.2 (*Democratic IO Socialization*) is preferred.

Table 1. Fatal Militarized Disputes and Centrality, 1885-2000

	Model				
	1.1	1.2	1.3	1.4	1.5
Joint Democratic IOs	-0.0791*			-0.0779*	
	(0.0366)			(0.0369)	
Democratic IO		-0.0963*			-0.0942*
Socialization$_s$		(0.0392)			(0.0397)
Democratic State			-0.0001	-0.0001	-0.0001
Socialization$_s$			(0.0002)	(0.0002)	(0.0002)
Democracy$_s$	-0.0627***	-0.0635***	-0.0731***	-0.0624***	-0.0635***
	(0.0141)	(0.0148)	(0.0155)	(0.0142)	(0.0147)
Dependence$_s$	-52.0107**	-62.3092**	-59.9219**	-53.3720**	-63.7466*
	(18.2724)	(24.1725)	(19.0724)	(18.9104)	(25.0648)
Contiguity	1.6353***	1.6298***	1.6275***	1.6225***	1.6206***
	(0.2635)	(0.2624)	(0.2587)	(0.2593)	(0.2586)
Distance	-0.6933***	-0.7067***	-0.6910***	-0.6898***	-0.7043***
	(0.1036)	(0.1078)	(0.1027)	(0.1045)	(0.1087)
Major Power	1.3484***	1.4919***	1.3183***	1.3442***	1.4891***
	(0.1903)	(0.1922)	(0.1906)	(0.1907)	(0.1926)
Cumulative MIDs	0.1175***	0.1132***	0.1189***	0.1182***	0.1136***
	(0.0145)	(0.0145)	(0.0143)	(0.0144)	(0.0143)
Joint IOs	-0.0013	-0.0004	-0.0023	0.0018	0.0019
	(0.0068)	(0.0067)	(0.0101)	(0.0103)	(0.0104)
N	454380	448087	454380	454380	448087
AIC	5709	5486	5709	5703	5488

NOTE: * = p<.05; ** = p<.01; *** = p<.001. I use robust standard errors with clustering on dyads.

Only two out of the three effects—both *Joint Democratic IOs* and *Democratic IO Socialization*, but not *Democratic State Socialization* —are statistically significant. Since the first two cannot be run together in a single model, I used the models where each was tested separately to determine substantive significance. In each case, I compared the base rate of fatal MIDs to the rate when the variable of concern was raised from the median to the 95% level.[34] *Joint Democratic IOs* decreased the probability of a fatal militarized dispute by 14% in Model 1, while *Democratic IO Socialization* decreased it by 24% in Model 2.

Degree centrality measures thus shed new light on Pevehouse and Russett's theoretical model, providing a better connection between theory and empirics and more precise hypothesis testing: it allows a way to measure two different variants of the socialization mechanism as distinct from the credible commitment or dispute settlement mechanisms. The authors' original results hold up: the general relationship between democratic IOs and conflict is negative and statistically significant. The additional results show that the relationship between conflict and *Democratic IO Socialization* is not only in the same direction, but is more substantively significant and an improved model as well. It is clearly the organizations themselves and not simply exposure to individual states in the organizations that is causing the socialization effect. In other words, democratic IOs are shaping the identities and interests of other states in the network through socialization: the diffuse effects of power matter more than the direct effects.

[34] I chose the 95% level due to the asymmetrical distribution of democratic IOs. At median, the number is 0; at 95%, 3 (e.g., Switzerland in Figure 3); at maximum, 47.

International Order through Alliance Hierarchies

The diffuse effects of power are not limited to enabling or constraining disputes; the distribution of ties across international institutions can also order international relations and create hierarchies. Many important historical and contemporary international actors, such as empires, dependencies, and protectorates interact with each under hierarchical, rather than anarchical, relationships.[35] In these relationships, one state subordinates some or all of its sovereignty to a dominant state in exchange for social order. David Lake develops a groundbreaking theoretical framework for identifying and understanding hierarchies.[36] His theory is that the legitimate authority of the dominant state in a hierarchy relationship rests on the provision of a stable international social order for the subordinate, lessening their need to spend on defense. To test his theory, Lake measures alliance hierarchies from 1950 to 2000 by counting up the number of alliance partners that each subordinate has that are not also partners of the dominant state—in this case, the United States. He divides 1 by this number to produce a measure of hierarchy vis-à-vis the United States, where higher values represent fewer independent (or politically autonomous) alliances and thus greater hierarchy. He uses this measure to show that states subordinate to the United States in international alliance hierarchies are likely to spend less on defense.

Lake's analysis derives hierarchies from states' network positions. His measure of alliance hierarchies is closely related to a network concept (structural similarity) that is better used to determine whether two actors hold similar network positions rather than whether one actor is dominant over the other.[37] Network centrality, and in particular flow betweenness, offers an alternative that provides for generalization of Lake's theory to the entire international system. In Lake's theory, hierarchy is present when the subordinate state has either weak or no independent ties to other states—i.e., when the dominant state acts as a broker between the subordinate state and other states. What makes an empire or colonial attempts successful is the creation of strong ties with subordinate units, while fragmenting or minimizing ties between the subordinates.[38] Yet this powerfully affects both units: the subordinate can decrease its defense efforts and extract concessions from the dominant, while as the broker, the dominant must compensate for this by increasing its efforts.[39] The extent of this brokerage role can be measured through betweenness.

In this case, the most appropriate measure to test this theory is flow betweenness centrality, since it considers all possible paths for brokerage instead of simply the most direct (shortest) ones. Flow betweenness is derived from the capacity of every pathway that connects each actor to every other actor. The maximum flow m_{jk} between two actors j and k is the minimum of (1) the direct flow out of j and into k and (2) the capacity of each path between the intermediate actors, where the capacity of a series of ties is equal to the strength of the weakest tie. If $m_{jk}(n_i)$ is the maximum flow between j and k that passes through node i, then where $j<k$ and $i \neq j \neq k$, then the flow betweenness of node i in a graph of g nodes is:[40]

[35] The current US basing network is one; see Cooley and Nexon, this volume.

[36] Lake 2009; Lake 2007.

[37] Lake uses a measure derived from an intermediate step in the process of calculating the "S" similarity of alliance portfolios (Signorino and Ritter 1999). For a discussion of structural similarity measures and international relations, see Hafner-Burton and Montgomery 2006.

[38] MacDonald 2014; Nexon and Wright 2007.

[39] Cooley and Nexon, this volume.

[40] Freeman, Borgatti, and White 1991, 148.

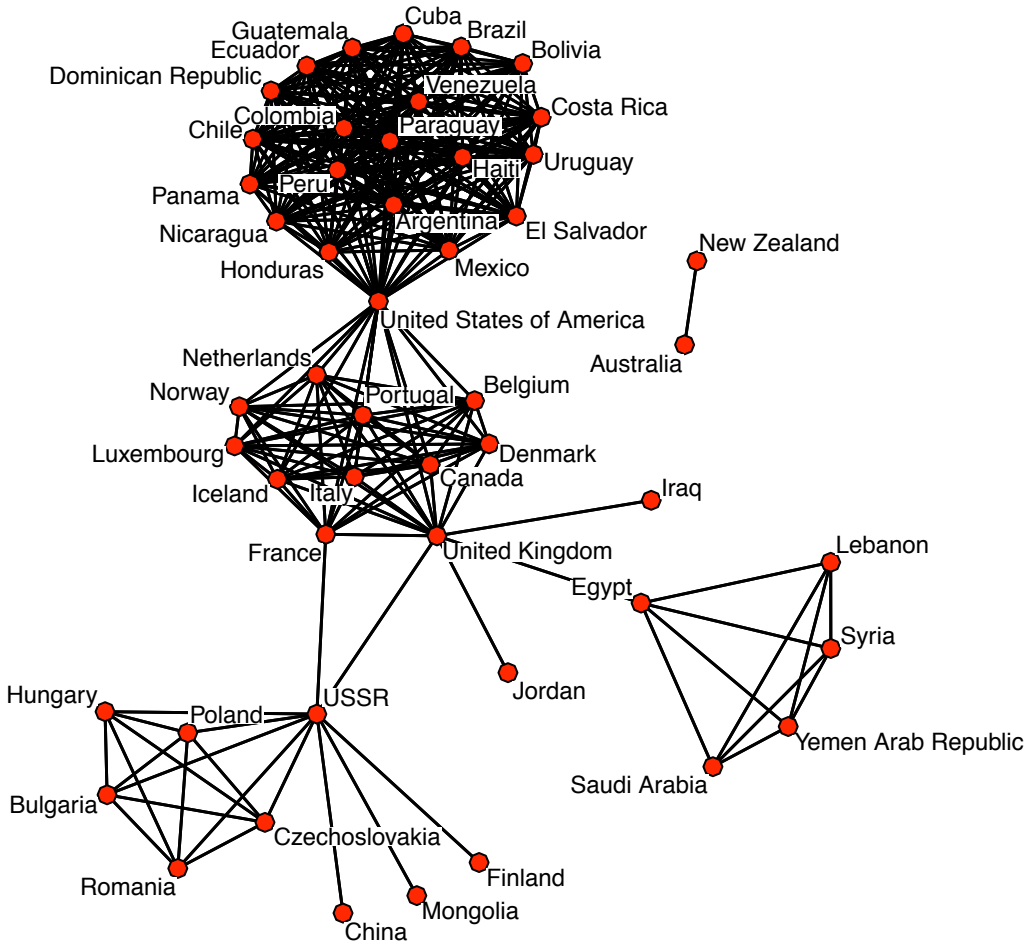
$$C_F(n_i) = \sum_j^g \sum_k^g m_{jk}(n_i)$$

This is standardized to the range (0,1) by dividing it by the total flow between all actors where actor *i* is neither a origin nor a destination:

$$C'_F(n_i) = \frac{\sum_j^g \sum_k^g m_{jk}(n_i)}{\sum_j^g \sum_k^g m_{jk}}$$

Figure 2 illustrates the advantages of using flow betweenness to measure hierarchy. In 1950, the United States was the sole broker between European and Latin American countries. While structural similarity captures some useful aspects of the alliance network, flow betweeness allows us to distinguish between a state that is only allied to one country (for example, Mongolia to the USSR) and a state that is allied to many countries other than the United States, whether through the same alliance or not (for example, Brazil is allied to 19 other states as well as to the United States). Conventional betweenness centrality does not distinguish between these two cases, since it calculates only the shortest, most direct path. Moreover, it measures the diffuse effects of alliances, since changes in any part of the international alliance structure can potentially alter the flow betweenness of a given state, regardless of how distant.

Figure 2. International Alliance Network, 1950.



NOTE: Only states that have at least one alliance are pictured. Graphs plotted using the sna package in R.[41]

This brokerage measure can be used to determine whether hierarchical relationships have a diffuse effect throughout the international system, or whether the effect is only direct for states that are specifically subordinate to the most central state in the network, the United States. Lake tests whether states subordinate to the United States will spend less on their defense effort; I extend this hypothesis with respect to all subordinate states, as well as all dominant states. I also test whether there is a separate, stronger effect specific to the lead state; that is, whether subordinate states that are allied to the United States will make even less of a defense effort than states that are in otherwise similar positions that are not allied to the United States. Finally, to distinguish between marginal states that are entirely dependent on one other state (such as Iraq in the figure above), which have a flow betweenness of zero, and states that are complete isolates with no alliances, which also have a flow betweenness of zero, I include a dummy variable for having no allies.

[41] Butts 2013.

Table 2. Defense Effort and Alliance Flow Betweenness, 1950-2000

	Model			
	2.1	2.2	2.3	2.4
Index of Independent Alliances	-0.0090***			
	(0.0027)			
Alliance Flow Betweenness			0.0417	0.2709*
			(0.0950)	(0.1120)
No Allies		-0.0043***	-0.0020*	-0.0039***
		(0.0012)	(0.0009)	(0.0012)
US Ally		-0.0096***		-0.0121***
		(0.0027)		(0.0031)
Lagged Defense Effort	0.6440***	0.6558***	0.6789***	0.6593***
	(0.0728)	(0.0714)	(0.0689)	(0.0708)
Index of Military Personnel	-0.0018	-0.0019	-0.0029	-0.0022
	(0.0018)	(0.0018)	(0.0017)	(0.0017)
Index of Exchange Rate Regime	-0.0000	0.0003	-0.0011	0.0000
	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Index of Relative Trade Dependence	0.0077	0.0092	0.0070	0.0100
	(0.0075)	(0.0075)	(0.0073)	(0.0074)
MID Involvement	0.0033***	0.0033***	0.0031**	0.0033***
	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Number of other Allies	0.0003**	0.0001	-0.0001	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Real GDP Per Capita	0.0000*	0.0000*	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Democracy (Polity2)	-0.0003*	-0.0003*	-0.0004**	-0.0003*
	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Constant	0.0026	0.0057**	0.0039	0.0054**
	(0.0017)	(0.0021)	(0.0020)	(0.0020)
N	4522	4522	4522	4522
Pseudo-R^2	.4441	.4649	.4702	.4753

NOTE: * = p<.05; ** = p<.01; *** = p<.001

Table 2 illustrates the results. Model 1 of Table 2 replicates Lake's (2007) analysis (his model 3 on page 74), in which the dependent variable is defense spending as a percentage of GDP.[42] Following Lake, I test for a unique U.S. effect in Model 2. These results provide additional support for Lake's findings. Simply being allied to the most powerful state (in this case the United States) decreases the defense effort by about the same as Lake's index of independent alliances. There is something special about being in a subordinate relationship to the US that affects military spending. It is possible that US alliances are more voluntary than others; for example, the USSR's allies during the Cold War had to be kept in line through coercion. The relationship between the US and its allies may involve more trust, which can reflect a qualitatively different role relationship that permits even less defense spending than usual. Alternatively, simply being allied to the most powerful state in the system may have an additional effect.

What about hierarchical relationships with states other than the US? Model 3 replaces Lake's measure of US alliance hierarchies with the variable *Alliance Flow Betweenness*, measuring the effects of strong and weak brokerage positions throughout the entire network, while also including a dummy for states with no alliances (*No Allies*) at all. If the international alliance system had hierarchical effects but not a US-specific effect, we would expect the estimate for flow betweenness to be

[42] Following Lake, my model is a Time-Series Cross-Sectional regression with correction for first-order autoregression and panel corrected standard errors. All independent variables are lagged one year.

positive and significant. While it is indeed in the right direction, in this regression it lacks significance.

If there is a general effect of alliance hierarchy, it may be masked by the US-specific alliance effect seen in Model 2. In Model 4, I control for the US-specific alliance effect, including the variable *US Ally*. I find that flow betweenness is positive and significant. States with low centrality (flow betweenness) in the alliance network—those more dependent on others—are likely to spend less on their military than other states, just as Lake predicted. Conversely, states with high centrality (in Figure 2, the United States, the USSR, the UK, France, and Egypt) are likely to spend more. States with no alliances at all, however, also make less of a defense effort in Models 2, 3, and 4—this may be an effect of being minor states that are less involved in the international system and are operating outside of the structural power dynamics that constrain both dominant and subordinate.

The magnitude of these effects is substantial. The average alliance flow betweenness centrality for states that possess at least one alliance is 0.0154 (about Libya in 1989). The maximum flow betweenness centrality by a state other than the US is 0.188 (France in 1963), while for the US the maximum is 0.476, reached in 1955. Moving from the mean to the minimum (zero) decreases a state's defense efforts by about a half a percent of GDP, while moving from the mean to the French level in 1963 increases it by about 4.7 percent of GDP; increasing it to the maximum US level leads to an increase of 12.5 percent of GDP. AIC tests are unavailable in STATA for the class of models used in this estimation, but Pseudo-R^2 scores indicate an improved model fit across my three models.

These centrality measures thus build upon Lake's important findings by making better connections between theory and empirics, improving model fit, and broadening the scope of his theory by extending it to include diffuse effects across the entire international system as well as direct effects. States with higher flow betweenness centrality are likely to spend more on their military than other states, while states with low flow betweenness spend less. But there is something special about the US alliance hierarchy, which provides bigger incentives for subordinates to spend less on defense. This may be a hegemonic effect rather than a US-specific effect, but during the time period studied, these are indistinguishable.

Conclusion

A network approach to measuring the influence of institutions has much to offer the study of transnational governance and security. Theoretically, it allows for an expanded notion of power that takes into account the diffuse effects of institutional networks as well as the direct ones. Empirically, centrality measures can offer scholars a way to analyze power effects that come from both diffuse and direct structural constraints placed on agents by their network positions rather than their possession of resources. Network conceptualizations and measurements of these processes allows for better connections between theory and empirics, more precise hypothesis testing, broadened scope, and improved models.

As a small but growing number of scholars are beginning to realize, a centrality approach is fundamentally changing the way the core of political behavior in IR can be conceptualized and analyzed, from conflict to markets to norm diffusion. I have demonstrated this through extensions of research on two different structural effects by international institutions: socialization to different interests and identities by democratic international organizations and ordering the international system through hierarchies of alliances. A centrality approach shows that socialization by democratic IOs is more important than dispute resolution mechanisms in preventing conflict and that ordering through hierarchical structures occurs throughout the entire international alliance system. Here, it is a complement rather than a wholesale replacement for existing theoretical notions and measures; centrality alone cannot account for the unique role of the US in the international system.

Although my analysis here is limited to diffuse power and centrality measures, network analysis offers a wide array of theoretical concepts and complementary structural measures of positions within networks. The particular measure here, centrality, can inform debates not only on politics but also on any other issues that involve network ties. Moreover, network methodologies can account for structures of complex interdependence. The results here are inherently preliminary in that they only represent a partial inclusion of network methodologies; since even long-standing results like the democratic peace have been already demonstrated to be an artifact of network structures,[43] probably no dyadic result is safe until tested using the full range of network tools.

Presently, network analysis remains underused and underappreciated, although a growing community of scholars is taking up network tools and applying them to the study of politics, particularly in International Relations. The potential for theoretical and empirical innovation for the field, however, is vast. Network analysis offers new insights into the nature of power politics as a set of relations among actors at all levels involved in relationships of all kinds, while network methodologies in general, and centrality concepts in particular, offer new ways to measure and test long-standing concepts and theories that have yet to be fully explored.

Biblography

Barnett, Michael N., and Raymond Duvall. 2005. "Power in International Politics." *International Organization* no. 59 (1):39-75. doi: 10.1017/S0020818305050010.

Bearce, David H., and Stacy Bondanella. 2007. "Intergovernmental Organizations, Socialization, and Member-State Interest Convergence." *International Organization* no. 61 (4):703-733. doi: 10.1017/S0020818307070245.

Boehmer, Charles, Erik Gartzke, and Tim Nordstrom. 2004. "Do Intergovernmental Organizations Promote Peace?" *World Politics* no. 57 (1):1-38. doi: 10.1353/wp.2005.0008.

Böhmelt, Tobias, Vally Koubi, and Thomas Bernauer. 2014. "Civil Society Participation in Global Governance: Insights from Climate Politics." *European Journal of Political Research* no. 53 (1):18-36. doi: 10.1111/1475-6765.12016.

Bonacich, Phillip. 1987. "Power and Centrality: A Family of Measures." *American Journal of Sociology* no. 92 (5):1170-1182. doi: 10.1086/228631.

Borgatti, Stephen P. 2006. "Identifying Sets of Key Players in a Social Network." *Computational and Mathematical Organization Theory* no. 12 (1):21-34. doi: 10.1007/s10588-006-7084-x.

Borgatti, Stephen P., Candace Jones, and Martin G. Everett. 1998. "Network Measures of Social Capital." *Connections* no. 21 (2):27-36.

Butts, Carter T. 2013. sna: Tools for Social Network Analysis R package version 2.3-1.

Carpenter, Charli. 2014. *"Lost" Causes: Agenda Vetting in Global Issue Networks and the Shaping of Human Security*. 1 edition ed. Ithaca ; London: Cornell University Press.

Carpenter, Charli, Sirin Duygulu, Alexander H. Montgomery, and Anna Rapp. 2014. "Explaining the Advocacy Agenda: Insights from the Human Security Network." *International Organization* no. 68 (2):449-470. doi: 10.1017/S0020818313000453.

Carpenter, R. Charli. 2011. "Vetting the Advocacy Agenda: Network Centrality and the Paradox of Weapons Norms." *International Organization* no. 65 (1):69-102. doi: 10.1017/S0020818310000329.

Carrington, Peter J., and John Scott. 2011. *The Sage Handbook of Social Network Analysis*. London: SAGE.

[43] Both latent network (Ward, Siverson, and Cao 2007) and TERGM (Cranmer and Desmarais 2011) approaches have found joint democracy to be insignificant.

Carrington, Peter J., John Scott, and Stanley Wasserman. 2005. *Models and Methods in Social Network Analysis*, *Structural analysis in the social sciences*. Cambridge, UK: Cambridge University Press.
Cook, Karen S., and Toshio Yamagishi. 1992. "Power in Exchange Networks: A Power-Dependence Formulation." *Social Networks* no. 14 (3-4):245-265. doi: 10.1016/0378-8733(92)90004-Q.
Corbetta, Renato. 2010. "Determinants of Third Parties' Intervention and Alignment Choices in Ongoing Conflicts, 1946--2001." *Foreign Policy Analysis* no. 6 (1):61-85. doi: 10.1111/j.1743-8594.2009.00102.x.
Cranmer, Skyler J., and Bruce A. Desmarais. 2011. "Inferential Network Analysis with Exponential Random Graph Models." *Political Analysis* no. 19 (1):66-86.
Cranmer, Skyler J., Bruce A. Desmarais, and Elizabeth J. Menninga. 2012. "Complex Dependencies in the Alliance Network." *Conflict Management and Peace Science* no. 29 (3):279-313. doi: 10.1177/0738894212443446.
Cranmer, Skyler J., Tobias Heinrich, and Bruce A. Desmarais. 2014. "Reciprocity and the Structural Determinants of the International Sanctions Network." *Social Networks* no. 36:5-22. doi: 10.1016/j.socnet.2013.01.001.
Dorussen, Han, and Hugh Ward. 2008. "Intergovernmental Organizations and the Kantian Peace: A Network Perspective." *Journal of Conflict Resolution* no. 52 (2):189-212. doi: 10.1177/0022002707313688.
Elkins, Zachary. 2009. "Constitutional Networks." In *Networked Politics: Agency, Power, and Governance*, edited by Miles Kahler, 43-63. Ithaca, NY: Cornell University Press.
Emerson, Richard M. 1962. "Power-Dependence Relations." *American Sociological Review* no. 27 (1):31-41. doi: 10.2307/2089716.
Finnemore, Martha. 1996. *National Interests in International Society*, *Cornell studies in political economy*. Ithaca, NY: Cornell University Press.
Freeman, Linton C. 1979. "Centrality in Social Networks: Conceptual Clarification." *Social Networks* no. 1 (3):215-239. doi: 10.1016/0378-8733(78)90021-7.
Freeman, Linton C. 2004. *The Development of Social Network Analysis: A Study in the Sociology of Science*. Vancouver, BC: Empirical Press.
Freeman, Linton C., Stephen P. Borgatti, and Douglas R. White. 1991. "Centrality in Valued Graphs: A Measure of Betweenness Based on Network Flow." *Social Networks* no. 13 (2):141-154. doi: 10.1016/0378-8733(91)90017-N.
Friedkin, Noah E. 1991. "Theoretical Foundations for Centrality Measures." *American Journal of Sociology* no. 96 (6):1478-1504. doi: 10.1086/229694.
Gheciu, Alexandra. 2005. "Security Institutions as Agents of Socialization? NATO and the `New Europe'." *International Organization* no. 59 (4):973-1012. doi: 10.1017/S0020818305050332.
Goddard, Stacie E, and Daniel H. Nexon. 2005. "Paradigm Lost? Reassessing Theory of International Politics." *European Journal of International Relations* no. 11 (1):9-61. doi: 10.1177/1354066105050136.
Goddard, Stacie E. 2009. "Brokering change: networks and entrepreneurs in international politics." *International Theory* no. 1 (2):249-281. doi: 10.1017/S1752971909000128.
Hafner-Burton, Emilie M., Miles Kahler, and Alexander H. Montgomery. 2009. "Network Analysis for International Relations." *International Organization* no. 63 (3):559-592. doi: 10.1017/S0020818309090195.
Hafner-Burton, Emilie M., and Alexander H. Montgomery. 2006. "Power Positions: International Organizations, Social Networks, and Conflict." *Journal of Conflict Resolution* no. 50 (1):3-27. doi: 10.1177/0022002705281669.

Hafner-Burton, Emilie M., and Alexander H. Montgomery. 2008. "Power or Plenty: How Do International Trade Institutions Affect Economic Sanctions?" *Journal of Conflict Resolution* no. 52 (2):213-242. doi: 10.1177/0022002707313689.
Hafner-Burton, Emilie M., and Alexander H. Montgomery. 2009. "Globalization and the Social Power Politics of International Economic Networks." In *Networked Politics: Agency, Power, and Governance*, edited by Miles Kahler, 23-42. Ithaca, NY: Cornell University Press.
Hafner-Burton, Emilie M., and Alexander H. Montgomery. 2012. "War, Trade, and Distrust: Why Trade Agreements Don't Always Keep the Peace." *Conflict Management and Peace Science* no. 29 (3):257-278. doi: 10.1177/0738894212443342.
Handcock, Mark S., David R. Hunter, Carter T. Butts, Steven M. Goodreau, and Martina Morris. 2008. "statnet: Software Tools for the Representation, Visualization, Analysis and Simulation of Network Data." *Journal of Statistical Software* no. 24 (1):1-11.
Hanneman, Robert A., and Mark Riddle. 2005. Introduction to Social Network Methods. Riverside, CA: University of California, RiversideAvailable from http://faculty.ucr.edu/~hanneman/.
Keohane, Robert O., and Lisa L. Martin. 1995. "The Promise of Institutionalist Theory." *International Security* no. 20 (1):39-51. doi: 10.2307/2539214.
Kim, Hyung Min. 2010. "Comparing Measures of National Power." *International Political Science Review* no. 31 (4):405. doi: 10.1177/0192512110371239.
Kinne, Brandon J. 2013. "Network Dynamics and the Evolution of International Cooperation." *American Political Science Review* no. 107 (4):766-785. doi: 10.1017/S0003055413000440.
Kinne, Brandon J. 2014. "Dependent Diplomacy: Signaling, Strategy, and Prestige in the Diplomatic Network." *International Studies Quarterly* no. 58 (2):247-259. doi: 10.1111/isqu.12047.
Kinne, Brandon J. 2012. "Multilateral Trade and Militarized Conflict: Centrality, Openness, and Asymmetry in the Global Trade Network." *The Journal of Politics* no. 74 (1):308--322.
Knoke, David. 1990. *Political Networks: The Structural Perspective*, *Structural Analysis in the Social Sciences*. Cambridge, UK: Cambridge University Press.
Knoke, David, and Song Yang. 2008. *Social Network Analysis*. Los Angeles: Sage Publications.
Lake, David A. 2009. *Hierarchy in International Relations*. Ithaca: Cornell University Press.
Lake, David A. 2007. "Escape from the State of Nature: Authority and Hierarchy in World Politics." *International Security* no. 32 (1):47-79. doi: 10.1162/isec.2007.32.1.47.
Lake, David A., and Wendy Wong. 2009. "The Politics of Networks: Interests, Power, and Human Rights Norms." In *Networked Politics: Agency, Power, and Governance*, edited by Miles Kahler, 127-150. Ithaca, NY: Cornell University Press.
Lewis, Jeffrey. 2005. "The Janus Face of Brussels: Socialization and Everyday Decision Making in the European Union." *International Organization* no. 59 (4):937-971. doi: 10.1017/S0020818305050320.
Lin, Nan, Karen S. Cook, and Ronald S. Burt. 2001. *Social Capital: Theory and Research*. New York: Aldine de Gruyter.
MacDonald, Paul K. 2014. *Networks of Domination: The Social Foundations of Peripheral Conquest in International Politics*: Oxford University Press.
Manger, Mark S., Mark A. Pickup, and Tom A. B. Snijders. 2012. "A Hierarchy of Preferences: A Longitudinal Network Analysis Approach to PTA Formation." *Journal of Conflict Resolution*. doi: 10.1177/0022002712438351.
Maoz, Zeev. 2010. *Networks of Nations: The Formation, Evolution, and Effect of International Networks, 1816-2001*. New York, NY: Cambridge University Press.
Maoz, Zeev, Ranan D. Kuperman, Lesley G. Terris, and Ilan Talmud. 2007. "Network Centrality and International Conflict, 1816-2001: Does it Pay to be Important?" In *Applications of Social*

Network Analysis: Proceedings of the 3rd Conference on Applications of Social Network Analysis, edited by Thomas N Friemel. Konstanz: Universitat Verlag Konstanz.
Martin, Lisa L., and Beth A. Simmons. 1998. "Theories and Empirical Studies of International Institutions." *International Organization* no. 52 (4):729-757. doi: 10.1162/002081898550734.
Mearsheimer, John J. 1994. "The False Promise of International Institutions." *International Security* no. 19 (3):5-49. doi: 10.2307/2539078.
Mearsheimer, John J. 2001. *The Tragedy of Great Power Politics*. New York, NY: Norton.
Meyer, John W., John Boli, George M. Thomas, and Francisco O. Ramirez. 1997. "World Society and the Nation-State." *American Journal of Sociology* no. 103 (1):144-181. doi: 10.1086/231174.
Moore, Spencer, Eugenia Eng, and Mark Daniel. 2003. "International NGOs and the Role of Network Centrality in Humanitarian Aid Operations: A Case Study of Coordination During the 2000 Mozambique Floods." *Disasters* no. 27 (4):305-318. doi: 10.1111/j.0361-3666.2003.00305.x.
Murdie, Amanda. 2014. "The Ties that Bind: A Network Analysis of Human Rights International Nongovernmental Organizations." *British Journal of Political Science* no. 44 (1):1-27. doi: 10.1017/S0007123412000683.
Murdie, Amanda, and David R. Davis. 2012. "Looking in the Mirror: Comparing INGO Networks across Issue Areas." *Review of International Organizations*.
Murdie, Amanda M., Maya Wilson, and David R. Davis. 2016. "The View from the Bottom: Networks of Conflict Resolution Organizations and International Peace." *Journal of Peace Research*.
Nexon, Daniel H., and Thomas Wright. 2007. "What's at Stake in the American Empire Debate." *American Political Science Review* no. 101 (2):253-271. doi: 10.1017/S0003055407070220.
Oatley, Thomas, William Winecoff, Andrew Pennock, and Sarah Bauerle Danzman. 2013. "The Political Economy of Global Finance: A Network Model." *Perspectives on Politics* no. 11 (1):133--153.
Oneal, John R., Bruce Russett, and Michael L. Berbaum. 2003. "Causes of Peace: Democracy, Interdependence, and International Organizations, 1885-1992." *International Studies Quarterly* no. 47:371-393. doi: 10.1111/1468-2478.4703004.
Oneal, John R., and Bruce M. Russett. 1999. "The Kantian Peace: The Pacific Benefits of Democracy, Interdependence, and International Organizations, 1885-1992." *World Politics* no. 52 (1):1-37. doi: 10.1017/S0043887100020013.
Padgett, John F., and Christopher K. Ansell. 1993. "Robust Action and the Rise of the Medici, 1400-1434." *American Journal of Sociology* no. 98 (6):1259-1319. doi: 10.1086/230190.
Padgett, John Frederick, and Walter W Powell. 2012. *The Emergence of Organizations and Markets*. Princeton, N.J.; Oxford: Princeton University Press.
Pevehouse, Jon C., and Bruce M. Russett. 2006. "Democratic International Governmental Organizations Promote Peace." *International Organization* no. 60 (4):969-1000. doi: 10.1017/S0020818306060322.
Powell, Walter W., and Paul DiMaggio. 1991. *The New Institutionalism in Organizational Analysis*. Chicago, IL: University of Chicago Press.
Russett, Bruce M., and John R. Oneal. 2001. *Triangulating Peace: Democracy, Interdependence, and International Organizations*. New York, NY: Norton.
Russett, Bruce, John R. Oneal, and David R. Davis. 1998. "The Third Leg of the Kantian Tripod for Peace: International Organizations and Militarized Disputes, 1950-85." *International Organization* no. 52 (3):441-467. doi: 10.1162/002081898550626.

Schimmelfennig, Frank. 2000. "International Socialization in the New Europe: Rational Action in an Institutional Environment." *European Journal of International Relations* no. 6 (1):109-139. doi: 10.1177/1354066100006001005.
Schimmelfennig, Frank. 2005. "Strategic Calculation and International Socialization: Membership Incentives, Party Constellations, and Sustained Compliance in Central and Eastern Europe." *International Organization* no. 59 (4):827-860. doi: 10.1017/S0020818305050290.
Scott, John. 2001. *Power*. Cambridge; Malden, Mass.: Blackwell Publishers.
Scott, John. 2008. "Modes of Power and the Re-Conceptualization of Elites." *The Sociological Review* no. 56:25--43. doi: 10.1111/j.1467-954X.2008.00760.x.
Scott, John. 2012. *Social Network Analysis*. 3rd ed. Los Angeles: SAGE Publications Ltd.
Signorino, Curtis S., and Jeffrey M. Ritter. 1999. "Tau-b or Not Tau-b: Measuring the Similarity of Foreign Policy Positions." *International Studies Quarterly* no. 43 (1):115-144. doi: 10.1111/0020-8833.00113.
Snijders, Tom A.B., Gerhard G. van de Bunt, and Christian E.G. Steglich. 2010. "Introduction to Stochastic Actor-Based Models for Network Dynamics." *Social Networks* no. 32 (1):44-60. doi: 10.1016/j.socnet.2009.02.004.
Stoll, Richard, and Michael D. Ward. 1989. *Power in World Politics*. Boulder, CO: Lynne Rienner Publishers.
Waltz, Kenneth N. 1979. *Theory of International Politics*. 1st ed. New York, NY: McGraw-Hill.
Ward, Hugh. 2006. "International Linkages and Environmental Sustainability: The Effectiveness of the Regime Network." *Journal of Peace Research* no. 43 (2):149-166. doi: 10.1177/0022343306061545.
Ward, Michael D., John S. Ahlquist, and Arturas Rozenas. 2013. "Gravity's Rainbow: A Dynamic Latent Space Model for the World Trade Network." *Network Science* no. 1 (1):95-118. doi: 10.1017/nws.2013.1.
Ward, Michael D., and Lewis L. House. 1988. "A Theory of the Behavioral Power of Nations." *Journal of Conflict Resolution* no. 32 (1):3-36. doi: 10.1177/0022002788032001001.
Ward, Michael D., Randolph M. Siverson, and Xun Cao. 2007. "Disputes, Democracies, and Dependencies: A Reexamination of the Kantian Peace." *American Journal of Political Science* no. 51 (3):583-601. doi: 10.1111/j.1540-5907.2007.00269.x.
Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge, UK: Cambridge University Press.