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The networked peace: Intergovernmental organizations and international conflict

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Abstract

Existing work has shown that membership in intergovernmental organizations (IGOs) can, among other outcomes, reduce conflict, promote democratization, and shape crisis bargaining. The traditional approach to studying how IGOs can reduce conflict has focused on the effects of dyads' direct ties to IGOs. In doing so, these analyses use fairly simple counts of the number of IGOs to which the states in each dyad share membership. We argue that this approach is too narrow; we instead consider the effects of higher-order groupings within the IGO network, which we call IGO clusters. Within these IGO clusters, states share relatively many IGO connections with each other, both directly and through indirect links through third parties, fourth parties, and so on. The effects of indirect IGO ties are especially important within such structures. We use a modularity maximization approach to detect clusters within the IGO network. We find robust empirical support for our hypothesis that the pacifying effect of IGO membership stems from the extent to which pairs of states are more deeply embedded within the wider IGO network. Indeed, we find that once we account for states' shared membership in clusters of IGOs, the simpler dyadic measure of shared IGO membership no longer shows evidence of a conflict-inhibiting effect.

Keywords

intergovernmental organizations, international conflict, networks

Introduction

Intergovernmental cooperation has become increasingly institutionalized. Studies of intergovernmental organizations (IGOs) often examine the effects of IGOs on their member-states or the effects on dyads of *shared* IGO membership. The list of reported effects of IGO membership is long and includes outcomes such as (1) a reduction in the probability of interstate conflict (Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004; Pevehouse & Russett, 2006); (2) shaping crisis bargaining (Chapman & Wolford, 2010); (3) democracy promotion (Pevehouse, 2002); (3) interest convergence (Bearce & Bondanella, 2007); (4) trade promotion (Ingram, Robinson & Busch, 2005); (5) economic policy diffusion (Cao, 2009); and (6) the diffusion of human rights practices (Greenhill, 2015).

With a few notable exceptions (Hafner-Burton & Montgomery, 2006; Dorussen & Ward, 2008), the literature tends to focus on either the direct effects that membership in an IGO has on states, or on the effect that shared membership in common IGOs has on pairs of states. We argue that, in addition to these important effects, the higher-order structure of the global network of IGOs also has more subtle influences on the states embedded within it.[1]

[1] This article contributes to and builds on the broader literature using network analysis in international relations (see generally Dorussen, Gartzke & Westerwinter, 2016; Larson, 2016; Chyzh, 2016). In the language of Dorussen, Gartzke & Westerwinter (2016), we use network analysis as both a theoretical tool and a measurement tool.

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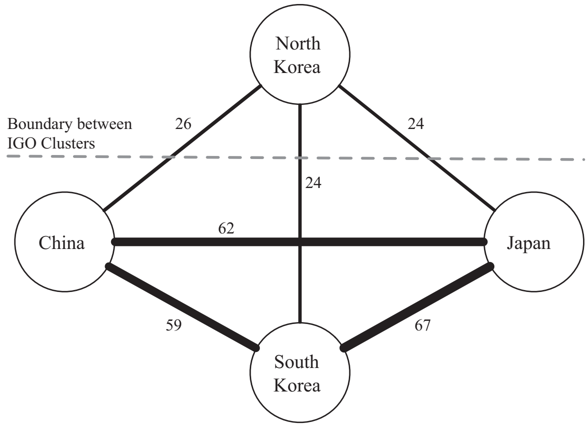

Figure 1. Shared IGO memberships among states in East Asia

Belonging to many of the same IGOs not only binds states to one another through their direct IGO ties, but also organizes states into larger structures which we call *IGO clusters*. IGO clusters contain groups of states that share broadly similar patterns of IGO membership, constituting portions of the IGO network in which interactions among the states can be thought to be especially profound. Co-membership in these IGO clusters creates indirect channels through which IGOs influence states and states influence each other.[2]

The concept of IGO clusters allows us to uncover differences among relationships that would not be apparent from traditional analyses. Consider the example of the relationships that exist among North Korea and its neighbors. In 2005 (the latest year for which we have comprehensive data on IGO memberships), North Korea and China belonged to 26 of the same IGOs. Somewhat surprisingly, this number is only slightly higher than the number of IGO memberships that North Korea shared that year with South Korea and Japan (24 in both cases), two states with which North Korea has a far more hostile relationship. Relying on a simple dyadic count of shared IGO memberships, as is common, therefore provides a somewhat incomplete measure of the extent to which IGOs reduce the probability of conflict among states. Our concept of IGO clusters, we argue, is far more helpful: using the measurement methodology we describe below, we find that in 2005 North Korea belonged to a separate IGO cluster from the one in which South Korea, China, and Japan are embedded (see Figure 1).

The structure of IGO clusters has significant effects that have yet to be analyzed. IGO membership can facilitate the types of information transfer or sharing that can reduce uncertainty and thereby lower the probability of interstate conflict (Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004). In addition to the effects these mechanisms can have through the direct membership of states in IGOs, they can also operate through indirect IGO ties. These ties are particularly dense within IGO clusters, so the effects of this mechanism are especially important within these structures. Regardless of the extent to which states are bound together by direct IGO ties, they can be affected by these mechanisms by virtue of the higher-order structural ties they have within IGO clusters.

This article makes theoretical and empirical contributions to the study of IGOs and conflict. We theoretically describe a network-based mechanism by which IGO membership can reduce conflict. Our argument builds on both the network analytic literature and the international subsystems literatures by focusing on the ways in which joint membership in informal IGO clusters can reduce the risk of conflict. Our empirical results indicate that shared membership in an IGO cluster provides a more powerful explanation of the pacific effects of IGO membership than those provided by prior work. While some existing work has claimed that dyadic joint membership in IGOs can reduce conflict risk (Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004), our results indicate that, when IGO cluster structures are taken into account, individual IGOs may have the opposite effect. Likewise, while other existing work has emphasized other network mechanisms (Dorussen & Ward, 2008), our results indicate that our network-based explanation is more powerful than that provided by existing work.

The remainder of this article proceeds as follows. In the next section, we review the literatures on the effects of IGOs. We then develop our theory of IGO clusters and explain why states that belong to the same IGO cluster are less likely to experience conflict with each other. We then turn to a discussion of how we measure IGO clusters using the network-analytic tool of modularity maximization. We then empirically test the relationship between co-membership in an IGO cluster and interstate conflict. We conclude by suggesting that IR scholars should consider the complex attributes of the structure of the IGO membership network in order to uncover the full extent of the influence of these institutions on states.

[2] Throughout this article we use the term 'IGO network' to refer to the structure of relationships that form among states as a result of their membership in IGOs.

IGOs, information, and conflict

We argue that shared membership in groupings of states that are connected by a dense web of common IGO memberships – what we call IGO clusters – has an effect that goes beyond the effects of individual IGOs. This argument builds on several strands of research that have examined the effects IGOs have on states and the mechanisms by which they have those effects. Much existing work on the effects of IGO membership consists of detailed studies of the impact of membership in one particular institution, such as the ILO, WTO, or NATO (see Gheciu, 2005). Others emphasize the *cumulative* effect of joint membership in multiple IGOs. This dyadic approach has been adopted, for example, by several international relations scholars interested in analyzing whether and how joint IGO membership reduces conflict (e.g. Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004; Pevehouse & Russett, 2006).

Others consider the cumulative effects of IGOs but add to this an examination of the indirect effects of IGO ties on conflict propensity. By 'indirect effects of IGOs', we refer to effects IGOs may have on states by virtue of mechanisms that work not only through direct membership in IGOs, but also through additional ties in the IGO network. Hafner-Burton & Montgomery (2006) examine how states' positions in the IGO network affect their power and, in turn, how this affects dyadic conflict propensity. Their hypotheses rely on the concept of structural equivalence, or the extent to which states have similar social positions in the IGO network. Dorussen & Ward (2008) consider whether the number of separate independent paths between states affects dyadic conflict propensity.[3]

Several recent studies have provided empirical support for the notion that IGO ties reduce interstate conflict (Boehmer, Gartzke & Nordstrom, 2004; Pevehouse & Russett, 2006; Hafner-Burton & Montgomery, 2006; Dorussen & Ward, 2008; Shannon, Morey & Boehmke, 2010). What are the mechanisms for this? Uncertainty about resolve, capabilities, interests, and war costs can make conflict more likely, and states have private information about these factors (Fearon, 1995). IGOs can mitigate such conflicts by facilitating information exchange (sometimes referred to as information sharing) (Russett, Oneal & Davis, 1998). One of the key functions of IGOs is to collect information about member-states and distribute such information to other member-states. IGOs reduce uncertainty by collecting and sharing data on, for example, the military capabilities of member-states (Boehmer, Gartzke & Nordstrom, 2004). While not all international institutions have the power to perform such functions, some have been designed with this purpose in mind and have a more centralized organizational structure (Koremenos, Lipson & Snidal, 2001). For instance, the United Nations headquarters in New York provides a setting in which delegates from its 193 member-states can easily communicate their foreign policy priorities to one another and thereby resolve potential misunderstandings. Indeed, even those who express skepticism about the effectiveness of the UN's institutional framework nonetheless value the ample opportunities it provides for states to engage in more active bilateral diplomacy.[4] For many IGOs – with the OECD perhaps providing a useful example – the gathering and dissemination of information about their member-states' policies, and the development of recommendations for so-called 'best practices', make up the core of these organizations' activities (Barnett & Finnemore, 2004).

Others argue that the informational mechanism by which IGO membership reduces conflict involves costly signaling. How do dyadic IGO ties facilitate costly signaling? IGOs provide opportunities for their member-states to replace the cheap talk of conventional interstate relations with costly signals of capabilities, resolve, and interests (Boehmer, Gartzke & Nordstrom, 2004). Boehmer, Gartzke & Nordstrom (2004) argue that the ability to reduce uncertainty is limited to structured and interventionist IGOs – that is, those that contain structures such as assemblies, executives, or bureaucracies.[5] For instance, some of the more institutionalized IGOs such as the UN and the European Union enable the imposition of economic sanctions on states. Compliance with these sanctions is costly for both the target state and the other members of the organization who must forgo the benefits of continued trade with the target state. The high cost of compliance allows states to demonstrate resolve and thereby reduces the uncertainty about intentions that might otherwise have led to war.

[3] Along similar lines, Wilson, Davis & Murdie (2016) argue that indirect ties in the network of conflict resolution organizations can reduce conflict risk.

[4] Interview with a member of a national delegation to the UN, February 2013.

[5] Likewise, in our empirical analysis, we conduct several tests that account for the possibility that some types of IGOs may be more likely to facilitate costly signaling than others.

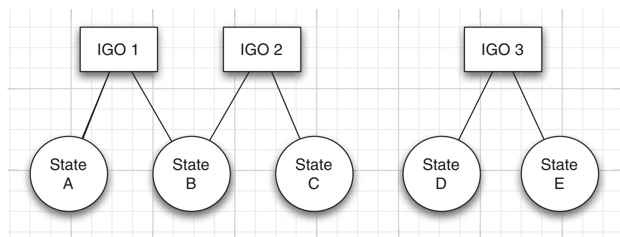

Figure 2. Stylized example of a state–IGO network

The judicial function of some institutionalized IGOs can also facilitate costly signaling. Simmons & Danner (2010) find that commitment to the International Criminal Court (ICC) makes civil war termination more likely, at least within states that have low levels of domestic institutional constraints. Simmons & Danner argue that this can be explained by signaling theory: governments of war-torn states that have difficulty signaling their commitment to peaceful conflict resolution can do so more easily once they can show members of the rebel forces that they themselves could be held criminally liable for their conduct.

A theory of IGO clusters and interstate conflict

Studies of the effects of IGOs have largely focused on the effects of such institutions based on individual membership or dyadic co-membership. In this article, we aim to open a new line of inquiry that analyzes the effects of larger groupings within the broader structure of the IGO network, which we call IGO clusters. In so doing, we focus on the effects of structure, rather than the effects of individual IGOs as actors.

In this section, we develop our theory of IGO clusters. First, we argue that the informational mechanisms that others have argued work through direct IGO ties can also work through indirect ties. Existing work has demonstrated that information can travel across IGO ties through mechanisms such as information exchange and costly signaling. As we have noted, our argument focuses on the effects of structure rather than the effects of actors. We do not propose an additional mechanism; rather, we argue that these mechanisms can have important effects across indirect IGO ties. Second, we argue that the cumulative effects of these mechanisms are likely to be especially important within IGO clusters.

Information and indirect IGO ties

To illustrate the distinction between direct and indirect ties, we consider the stylized example of state and IGO ties shown in Figure 2. In this example, states A and B are members of IGO 1, states B and C are members of IGO 2, and states D and E are members of IGO 3. The network therefore contains two types of relationships between IGOs and states (M1 and M2) and three types of relationships among dyads of states (D1, D2, and D3).

M1: Membership (e.g. IGO 1 and State A).
M2: Non-membership (e.g. IGO 1 and State E).
D1: Direct connections via joint IGO membership (e.g. states A and B).
D2: Indirect connections via joint IGO membership (e.g. states A and C). Note that states A and C do not belong to the same IGO, but they are indirectly connected to each other through state B which serves as a bridge between IGO 1 and IGO 2.
D3: Entirely unconnected states (e.g. states A and D).

Most existing studies focus on how IGOs can affect states in relationships such as M1 (e.g. Gheciu, 2005) and D1 (e.g. Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004; Bearce & Bondanella, 2007).[6] Theories about the cumulative effects of joint IGO memberships tend to conceive of these effects as resulting from D1 relationships. Doing so treats pairs of states that are connected indirectly (D2) as equivalent to pairs of states that are entirely unconnected (D3). As a result, both the D2 and D3 relationships are empirically coded as an absence of an IGO tie, which amounts to losing analytically important information about indirect ties. This approach overlooks some of the more subtle ways in which states' positions in the IGO network condition the interactions that take place among them.

If one thinks of IGOs as only providing direct channels of information exchange – as much of the existing literature tends to do – then states A and B will be more likely to have information about each other by virtue of their joint membership in IGO 1. Likewise, states B and C will be more likely to have information about each other by virtue of their joint membership in IGO 2.[7]

[6] The most prominent exceptions are Hafner-Burton & Montgomery (2006) and Dorussen & Ward (2008). We explain the differences between their arguments and ours in the IGO clusters section below.

[7] There are, of course, many other channels by which states may gain information about each other, such as diplomatic channels and economic exchange. Our empirical analysis is designed to control for such other channels.

Thus, if information is transferred through the IGO network *only* via direct dyadic ties, then (1) state B will be likely to have new information about states A and C, but (2) the IGO network will not affect the extent to which states A and C have information about each other. We argue that the latter conclusion would be incorrect.

A central idea in the study of networks is that information can spread across nodes even when the actors are only indirectly connected to each other (Granovetter, 1973; Simmons, Dobbin & Garrett, 2006). The indirect IGO tie between states A and C can result in that dyad gaining information about each other that they might not have had otherwise. In order for states A and C to learn information about each other via their indirect tie in our stylized example, that information must travel through state B. State B's position in the IGO network therefore provides the link between A and C. Thus, the IGO ties that connect A to B and B to C can also serve as channels by which A and C can exchange information – at least to the extent that B has the incentive to facilitate this.

It is therefore necessary to examine the incentives of state B to facilitate the information transfer between A and C. At times, state B may have an incentive not to share information with A and C about each other. In other scenarios, state B may simply be indifferent as to sharing such information and choose not to do so. Both scenarios can occur in the international relations context, and we do not argue that the indirect tie in this stylized example will *always* lead to states A and C gaining new information about each other. Instead, we argue that by virtue of their indirect tie via state B, states A and C are more likely to gain new information about each other than if this tie did not exist.

Yet why would state B not spread misinformation about states A and C to each other? State B cannot realistically be expected to act as a simple conduit; it is an actor with its own preferences, biases, and incentives to misrepresent. State B might have strategic incentives to spread misinformation, possibly even to foment conflict between its IGO partners. How does the IGO setting result in the spread of accurate information rather than misinformation?

We follow Boehmer, Gartzke & Nordstrom (2004) by analogizing this context to the role of mediators. Mediators can transfer information between parties, but they may be dishonest or biased, so the parties may not believe them. In the example above, the potential role of state B is analogous to a mediator between states A and C. If state B shares with state A information about state C, state A may not trust state B to convey honest information. Indeed, state B may have an interest in provoking conflict between states A and C by spreading misinformation. Mediators are effective if parties believe the information conveyed is accurate or truthful (Kydd, 2003).

The IGO setting creates two related incentives that drive the spread of accurate information. First, repeated interactions create an incentive for mediators to value a reputation for honesty, and thus to be more likely to convey accurate information (Kydd, 2006). The context of international cooperation through formal institutions facilitates the type of repeated interaction between states that results in the accurate spread of information. In the example above, because state B interacts repeatedly with both states A and C, it will have an incentive to build a reputation for honesty. It will therefore have a disincentive to share with its partners misleading or biased information about each other, and at the same time it will have a positive incentive to act as an honest information broker.

Second, in the IGO network, there are many possible intermediaries between the members of any given dyad. Information can be conveyed about state A to state C via many paths. If state B were to attempt to use its position to spread misinformation, possibly to provoke a conflict, its partner states would have many other possible channels through which to validate such information. This would, in turn, increase the possibility that a dishonest information broker would be discovered, thus increasing the potential reputation costs of spreading such misinformation.

As a result of these incentives, we expect that while there may be misinformation in the network, the spread of accurate information should dominate the spread of misinformation, although the extent of this will vary throughout the structure of the IGO network, as discussed below. States such as A and C, although not directly connected to each other via an IGO tie, will often (but not always) be able to use their common IGO partner (state B) to learn about each other, reduce uncertainty, and thereby make conflict between them less likely.

IGO clusters

As noted above, our theory is largely about the effects of the structure of the IGO network. In this subsection, we explain the types of structures in which we expect the IGO information mechanisms to be most important in terms of reducing the likelihood of conflict. Above, we focused on stylized examples of how these mechanisms can operate via third-party IGO links. Yet there is little reason to assume that they would not also operate through higher-order connections. If and to the extent that states A and B have information about each other as a result of their IGO ties, they may also have information about each other's network connections, the connections of those connections, and so on. There are many potential connection types and chains of connection in the IGO network, so we must ask in which types of structures the effects of these mechanisms are most likely to be salient.

This brings us to the concept of connection density. In a group of states with relatively dense IGO ties, there will be many indirect ties through which states can gain information about each other. By contrast, in a more loosely connected group, there will be relatively few links between states and, thus, relatively few paths through which information can be exchanged or signaled. The notion of connection density is also implicit, but not directly operationalized, in much of the literature; counting the number of dyadic ties, as scholars often do, is itself based on the idea that connection density matters, although in such analyses the focus is on the density of direct ties only.

The importance of the density of connections within groups suggests that we should think about the effects of substructures within the IGO network. A rich literature in international relations has analyzed subsystems, but its insights have been insufficiently incorporated into analyses of IGOs and conflict. Several aspects of this literature are particularly important in this context. Most important is Deutsch's (1954) argument that mutual interdependence among groups of states causes them to form cohesive security groups. Mutual interdependence among groups of states leads them to form cohesive security communities (Modelski, 1961; Holsti, 1970; Adler & Barnett, 1998); some of these are embodied in formal institutions while others are informal. As Modelski (1961: 51) argues, 'a subsystem in due course creates and maintains its own solidarity'. The notion of groups is also crucial to many theories about the role of international institutions (Adler & Barnett, 1998; Pevehouse & Russett, 2006; Boehmer & Nordstrom, 2008), but the effects of such structures have not been examined in this literature.

The structure of the IGO network can be usefully analyzed by viewing it not only as a web of ties between states and IGOs or between pairs of states, but by also by thinking of it as having a higher-order structure: specifically, one that includes a number of densely connected groups that share significantly more IGO memberships

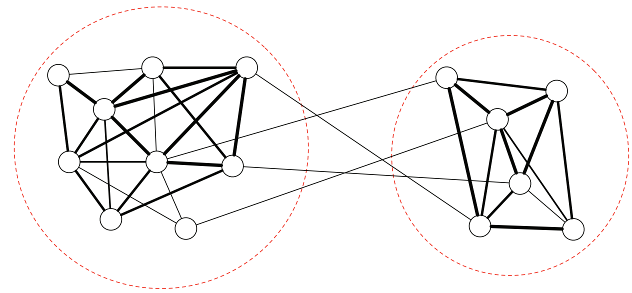

Figure 3. Clusters of states within a stylized IGO network

in common with each other than they do with states outside the group. We refer to such groups as IGO clusters. Figure 3 provides a schematic illustration of this concept using a presentation style adapted from one employed by Newman & Girvan (2004: 1). The circles represent states, while the thickness of each tie connecting the states is proportional to the number of common IGO memberships they share. (The lengths of the ties in the figure are of no significance.) States can be meaningfully partitioned into two distinct clusters (indicated by the dashed circles) on the basis of the relative strength of IGO ties among the states.

Globalization and international cooperation have spread unevenly in the international system. Others have analyzed the extent to which global governance increasingly features regime complexity, overlapping institutions, and institutional density. Many have identified fragmentation in terms of the formal organizations, informal coalitions, rules, adjudication, authority, and norms that govern international relations (e.g. Raustiala & Victor, 2004; Finnemore, 2014). While IGO membership has grown overall, there remains significant variation among states' IGO joining decisions. Some states are much more interested than others in cooperation through IGOs. For instance, in 2000 France belonged to a total of 125 IGOs, whereas Turkey belonged to only 78. Likewise, while some IGOs have near universal membership (e.g. the United Nations), others are exclusive clubs consisting of a handful of states (e.g. NAFTA). Finally, while some pairs of states appear to work together through a wide range of different IGOs, other pairs engage in much narrower forms of cooperation. For example, the Netherlands shared a total of 102 common IGO memberships with France in 2000, whereas in that same year the Netherlands shared only 21 common IGO memberships with Vietnam.

As individual states make individual IGO joining decisions, in part based on the extent to which they seek to cooperate with the other members of those IGOs, the structure of the IGO network forms into a set of IGO clusters. The various dynamics within the international system that drive individual IGO joining and formation decisions also affect the structure of IGO clusters and how that structure evolves. For example, states may have greater incentives to cooperate through IGOs with neighboring states, while cooperation with distant states may be subject to larger transaction costs. This suggests a certain degree of regionalism in the structure of IGO clusters, although in some cases distant states have similar interests and can gain significantly from formal cooperation. Second, the balance of power is likely to play a role in how IGO clusters evolve. If and to the extent that powerful states form IGOs with carefully chosen partners to suit their interests, we might expect to observe a set of IGO clusters centered around competing great powers. On the other hand, even rival powerful states often work together through IGOs[8] – and weaker states are often excluded from such institutions – suggesting a structure of IGO clusters influenced by center–periphery relations.

IGO clusters are informal, latent groupings of states within the IGO network that share relatively many IGO memberships with each other, as compared with the IGO memberships they share with states outside the cluster. IGO clusters are neither actors nor institutions, but structures. States within an IGO cluster need not belong to all of the same IGOs. Some dyads within the cluster may have many joint IGO memberships; other dyads within the cluster may have few joint memberships but nonetheless belong to the same cluster by virtue of having many ties of the second degree, third degree, and so on. When we say that IGO clusters are 'latent' we mean that states are unlikely to be aware of the fact that they are part of an IGO cluster nor aware that such structures even exist. In that respect, IGO clusters differ conceptually from groupings of states that may be defined on the basis of an observable common trait, such as language and geography, or even the members of a semi-formal association like the G-20.

Within IGO clusters, states are relatively densely connected, which means they share many direct ties, third-party ties, fourth-party ties, and so on. The indirect effects of the information mechanisms discussed above are therefore especially important within such groups. Within these structures, states have many paths by which to learn, exchange, transfer, and signal information with and to each other, as well as many paths by which to confirm that the information they have is accurate. Like the subsystems and security communities analyzed by earlier studies (Deutsch, 1954; Adler & Barnett, 1998), IGO clusters are densely connected subgroups of the international system. As Granovetter (1973) demonstrates, within such densely connected network subgroups, information spreads relatively rapidly because actors have strong connections to each other. The density of IGO ties within IGO clusters results in an increase in the types of repeated interactions that prevent information brokers from sending biased information. As Burt (1992) notes, in dense networks, group members have redundant paths by which to obtain information about each other. If and to the extent that information can travel through direct IGO ties, then its effects via indirect IGO ties should be especially observable within IGO clusters. States that belong to the same IGO cluster, therefore, will be less likely to be uncertain about each other's capabilities, resolve, and preferences. These arguments lead to the following hypothesis:

> *Hypothesis:* The probability of conflict is smaller between state dyads that are members of the same IGO cluster, even after accounting for the number of dyadic IGO ties.

Our arguments have built upon, but are distinct from, existing studies of the effect of indirect IGO ties on conflict. In contrast to our focus on information, Hafner-Burton & Montgomery (2006) examine how states' positions in the IGO network affect their power and, in turn, conflict. Their hypotheses rely on the concept of structural equivalence, or the extent to which states have similar social positions within the network. In a second study, Dorussen & Ward (2008) consider, as we do, the effects on conflict of information exchanged through indirect IGO ties. Their hypotheses focus on the number of third-party IGO links as well as the concept of 'maxflow'.

Maxflow is defined as the number of separate independent paths that exist between the members of a dyad within the IGO network. We argue that while the maxflow concept represents an important step forward in thinking about the extradyadic effects of IGO memberships, the structure of the IGO network can exert other extradyadic effects. The stylized exchange networks shown in Figure 4 provide an illustration of the

[8] For example, during the Cold War, Warsaw Pact–NATO dyads typically belonged to more of the same IGOs than most other dyads. In 1960 the median Warsaw Pact–NATO dyad belonged to 18 of the same IGOs, whereas the global dyadic median was 14. By 1990, the median Warsaw Pact–NATO dyad belonged to 42 of the same IGOs, whereas the global dyadic median was 23.

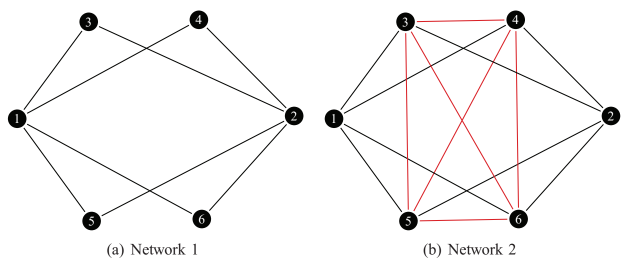

Figure 4. Two exchange networks: Network 2 is more densely connected than Network 1

distinction between the concepts of density and maxflow. On the one hand, Network 2 has greater density than Network 1 because it contains a larger number of connections between the same number of nodes. On the other hand, the maxflow concept does not pick up this distinction in density. For example, in both networks, the maxflow between nodes 1 and 2 is equal to 4. In Network 1, the maxflow between nodes 1 and 2 is equal to 4 because a connection can be made between nodes 1 and 2 using 4 possible independent routes: 1-3-2, 1-4-2, 1-5-2, and 1-6-2. In Network 2 the maxflow between nodes 1 and 2 is again equal to 4, even though the network differs from Network 1 in terms of its density. The additional connections that are present in Network 2 do not provide additional possible independent paths between nodes 1 and 2 but nonetheless serve to bind them within a tighter cluster, as we have argued. Unlike our argument, a theory based on the concept of maxflow would make equivalent predictions regarding the effects of indirect IGO ties in the two networks.

Research design

Identification of IGO clusters

The first challenge in our research design is to define the clusters within the IGO network. The subsystems literature traditionally defines groups of states based on common membership in a geographic region, a particularly important institution, or a set of similar institutions (Deutsch, 1954; Holsti, 1970; Dominguez, 1971). Such an approach would have two limitations in the context of IGO clusters. The first is that it would require us to subjectively decide which IGOs are most important. The second is that, because our definition of IGO cluster focuses on the relative density of ties within such a group, we must take into account all of the ties in the IGO network in order to operationalize IGO clusters.

We first build the IGO network using the Correlates of War 2 International Governmental Organizations Data (Pevehouse, Nordstrom & Warnke, 2004). Data are available in five-year intervals for the period from 1815 to 1965, and annually from 1965 to 2005. We limit our analysis to the years 1960–2000 because of the small numbers of IGO ties prior to 1960 and because of the limited availability of data on other variables for years outside this range.[9] For the purposes of this analysis, we consider only full IGO memberships. The Pevehouse, Nordstrom & Warnke (2004) dataset recognizes IGOs that meet all of the following criteria:

- The organization must consist exclusively of states. This means that organizations that consist of non-state actors (e.g. international business associations or organizations composed of individual actors such as Amnesty International) are not treated as IGOs.
- The organization must have a minimum of three states as members. Bilateral institutions are therefore excluded.
- The organization must have a minimal level of formal institutionalization. Specifically, it needs to have a permanent staff, secretariat, and/or headquarters.
- The organization must have been formed by a formal treaty signed by the founding member-states. Organizations that are mere offshoots of existing organizations are not recognized as independent IGOs.

We use these data to create a network in which states serve as nodes and the number of IGO ties between them serve as the value of the edges. For each dyad-year, we sum the number of shared IGO memberships and assign that number to the edge between those nodes for that year. Thus, for example, if states A and B belong to 15 of the same IGOs in year *T*, then the edge between nodes A and B in the network for year *T* is 15.

The next step in our research design is measuring the clusters within the IGO network. We do so by maximizing a modularity function first developed by Newman & Girvan (2004); to maximise modularity, we use the algorithm developed by Blondel et al. (2008). Applied to the IGO network, modularity maximization attempts to maximize the extent to which states defined as being in a given cluster share IGO memberships and minimize the extent to which states in different clusters share memberships. This method has recently been applied in several areas of international relations research (Lupu

[9] We impute the IGO data for the years 1961–64 based on the 1960 data.

& Voeten, 2012; Lupu & Traag, 2013; Greenhill & Lupu, 2017).

We measure the clusters in the IGO membership for every year from 1960 to 2000. Maps showing the results for 1965, 1980, and 2000 are shown in Figure 5.[10] In 1965, there were three large IGO clusters. The first included most of the Western Hemisphere and China. The second included Europe, the Soviet Union, Japan, and a few others. The third included much of Africa, the Middle East, and South-East Asia. One of the interesting aspects of this result is that mainland China and the United States belong to the same cluster, despite this period preceding the opening of relations between these two countries. This result may be driven by the fact that China shared 16 IGO memberships with the USA during that year, compared to its average of 12 joint memberships with other states. China also belonged to many IGOs in common with Latin-American states, which are also in the same cluster, and these ties likely explain why the algorithm assigns the United States and China to the same cluster.

By 1980, there were four IGO clusters. There was still a single cluster that included Europe, the Soviet Union, and Japan, but this cluster also included the United States. This therefore appears to be a cluster of developed and/or powerful states that joined many of the same IGOs. Latin America formed a distinct IGO cluster in 1980, a result likely driven by the large number of regional IGOs. Likewise, there was a distinct IGO cluster in 1980 that included much of Africa and the Middle East. The fourth IGO cluster included China and several other Asian states. The IGO clusters in 2000 were relatively similar to those in 1980, with two notable changes. First, in the process of opening up its economy and gaining power in the international system, China joined many new IGOs during this period. As a result, by 2000 it was part of the same IGO cluster as most of the other major powers. By contrast, by 2000 India had more IGO memberships in common with its neighbors in South and Southeast Asia, so it was part of that IGO cluster.

Analysis of IGO clusters and conflict

Dependent variable. To test our hypothesis, we follow much of the literature on IGOs and conflict by using as the dependent variable the dyad's involvement in a hostile militarized interstate dispute (MID) (Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004; Hafner-Burton & Montgomery, 2006; Dorussen & Ward, 2008). We use the MID data as corrected by Zeev Maoz. The variable is coded as 1 for dyad-years in which there was an onset of a hostile militarized interstate dispute (MID levels 4 and 5), and 0 otherwise. We lead this variable forward by a year. We exclude dyads with ongoing hostile MIDs.

Key independent variable. Our key independent variable is a binary indicator of whether both members of the dyad are members of the same IGO cluster. In our first model, we begin with a network analysis using membership in all IGOs that meet the definition set out above. Because Boehmer, Gartzke & Nordstrom (2004) argue that only structured and interventionist IGO memberships can facilitate the types of information transfer that can reduce conflict, we analyze a second model that excludes other IGOs. We re-conduct the modularity maximization technique on this network and create a different version of *Same IGO cluster* to be used in Model 2. The IGO clusters in this network are described in the Online appendix. As noted above, common regional interest and affinity may play important roles in shaping IGO formation and thus IGO cluster formation. Indeed, as Figure 5 shows, there is a significant amount of regional clustering in the IGO network, so regional affinity may affect the formation of both individual IGOs and, in turn, IGO clusters. To distinguish the effects of the IGO network from those of regionalism, we estimate a third model based on a network defined to exclude regional IGOs. In Model 3, *Same IGO cluster* is constructed based on this smaller network. The IGO clusters in this network are described in the Online appendix.

Control variables. To ensure comparability with prior findings, especially the work on which we build most closely (Russett, Oneal & Davis, 1998; Boehmer, Gartzke & Nordstrom, 2004; Hafner-Burton & Montgomery, 2006; Dorussen & Ward, 2008), we include in our models a set of controls commonly used in this literature. First, we include a measure of the number of shared IGO memberships in the dyad-year (*Joint IGO membership*). To mirror the construction of *Same IGO cluster*, this variable includes all IGO memberships, all structured and interventionist IGO memberships, and all non-regional IGO memberships in Models 1, 2, and 3, respectively.

Other contacts between dyad members may have effects on conflict propensity and IGO ties, and we control for this using data on dyadic diplomatic missions (*Diplomatic mission*) and the presence of embassies (*Embassy*) using data provided by Dorussen & Ward (2008). We also control for

[10] We constructed these maps using the CShapes package in R (Weidmann, Kuse & Gleditsch, 2010).

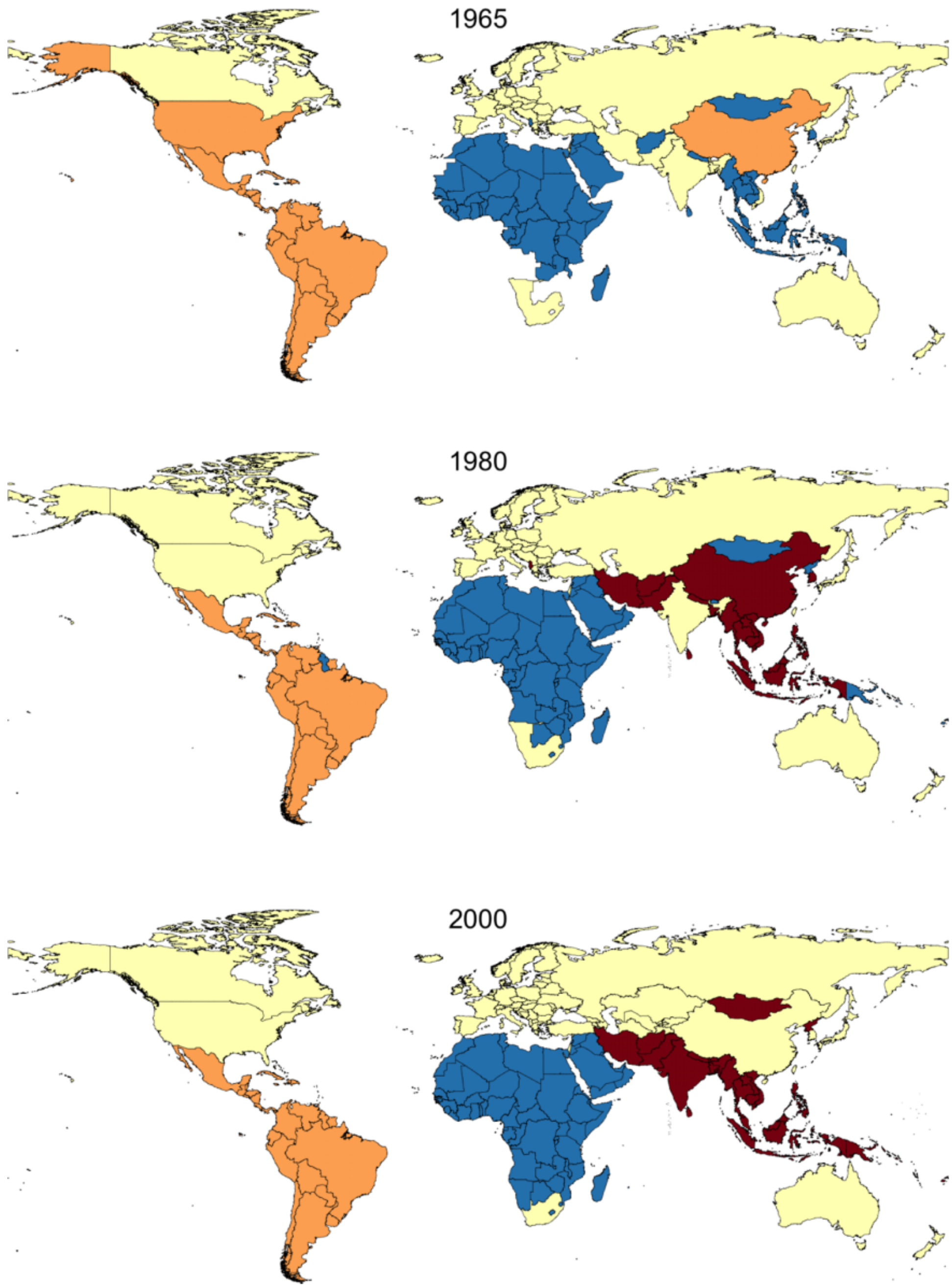

Figure 5. IGO clusters in 1965, 1980, and 2000

economic openness by using the lower of the ratios of total monadic trade-to-GDP in the dyad (*Openness (low)*). To address the effects of economic interactions in the dyad, we control for a measure of the lower of the dyad's two bilateral trade-to-GDP ratios, calculated as is often done in the trade-and-conflict literature (*Trade dependence (low)*) (Oneal & Russett, 1997).[11]

[11] We use the trade and GDP data provided by Gleditsch (2002).

Democratic peace theorists argue that democratic dyads have a smaller conflict propensity (Maoz & Russett, 1992), and we therefore control for the lower democracy score (*Democracy (low)*) in the dyad using the Polity IV data (Marshall & Jaggers, 2009). Conflicts are generally less costly for states to conduct against their immediate neighbors, so we construct a dichotomous variable coded 1 for dyads that share a land border or that are separated by less than 150 miles of water (*Contiguity*). We also control for the logged distance between

Table I. Summary statistics

Variable	*Mean*	*Std dev.*	*Min.*	*Max.*
MID onset$_{t+1}$	0.002	0.046	0	1
Same IGO cluster$_{\text{all}}$	0.352	0.478	0	1
Same IGO cluster$_{\text{structured and interventionist}}$	0.365	0.481	0	1
Same IGO cluster$_{\text{non-regional}}$	0.461	0.498	0	1
Joint IGO membership$_{\text{all}}$	22.99	11.162	0	108
Joint IGO membership$_{\text{structured and interventionist}}$	17.929	6.818	0	59
Joint IGO membership$_{\text{non-regional}}$	21.275	9.361	0	74
Embassy	0.254	0.435	0	1
Diplomatic mission	0.305	0.461	0	1
Openness (low)	1.179	2.083	0.003	51.394
Trade dependence (low)	0.001	0.006	0	0.825
Polity (low)	–3.417	6.489	–10	10
Contiguity	0.035	0.183	0	1
Distance	8.125	1.351	0	9.420
Major power	0.07	0.255	0	1
Alliance	0.07	0.255	0	1
Relative military power	2.432	1.887	0	11.37
N		430,477		

the dyad members' national capitals (*Distance*). The most powerful states are more actively engaged in interstate relations and may be more likely to fight wars. We therefore include a major power indicator variable. Allied states may be less likely to fight each other, so we include a dichotomous variable (*Alliance*) coded 1 for allied dyads based on the COW Alliance dataset (Small & Singer, 1990). Power disparity may also make conflicts more likely. We therefore control for the natural log of the ratio of the dyad members' military power, as provided by the Correlates of War (COW) capabilities index (*Relative military power*). Table I reports summary statistics. We test our hypothesis by estimating a series of logit models with standard errors clustered by dyad. To address temporal dependence, we include time polynomials. The data cover the years 1960 to 2000.

Results and discussion

Table II reports the results of our models of MID onset. The first model uses the IGO clusters in the full network of IGO memberships. Model 2 includes only structured and interventionist IGOs. Model 3 excludes regional IGOs. Consistent with our hypothesis, we find that conflict is significantly less likely among states that are members of the same IGO cluster. This result holds for all three constructions of the IGO network. The results are also substantively quite meaningful: Models 1, 2, and 3 predict that, all else being equal, members of the same IGO cluster are 51%, 36%, and 47% less likely to experience a hostile MID onset, respectively.[12]

The coefficient of *Joint IGO membership* is significant and positive.[13] While prior work has indicated that IGO membership can have a pacific effect, our results show that the mechanism for this effect may be driven largely by state embeddedness in the latent structures we call IGO clusters. When IGO cluster membership is taken into account, our empirical results show that individual IGO membership is associated with a *larger* probability of conflict, which is the opposite of the result reported by prior work such as Russett, Oneal & Davis (1998) and Boehmer, Gartzke & Nordstrom (2004). In addition, while Dorussen & Ward (2008) show that IGOs might reduce conflict through a network mechanism, our robustness tests indicate that the network mechanism for which Dorussen & Ward (2008) find evidence (i.e. maxflow) may not be the mechanism by which IGOs reduce conflict, but rather that they are likely to do so through the mechanism we emphasize (i.e. IGO clusters).

[12] To guard against the possibility of 'overfitting' the model to our data, we tested whether the inclusion of the *Same IGO cluster* variable led to an improvement in the out-of-sample predictive power of these models using the cross-validation method described in Ward, Greenhill & Bakke (2010).

[13] When we exclude *Same IGO cluster* from our models, the coefficient of *Joint IGO membership* remains positive, and is significant in two of the models. The full results of these baseline models are reported in the Online appendix.

Table II. Logit models of militarized interstate disputes

	(1) *All IGOs*	*(2)* *Structured IGOs*	*(3)* *Non-regional IGOs*
Same IGO cluster	–0.542***	–0.381***	–0.474***
	(0.120)	(0.113)	(0.107)
Joint IGO membership	0.015**	0.021*	0.021**
	(0.005)	(0.010)	(0.007)
Embassy	0.616***	0.587***	0.596***
	(0.156)	(0.156)	(0.157)
Diplomatic mission	0.312	0.369	0.270
	(0.188)	(0.190)	(0.192)
Openness (low)	0.023	0.026	0.020
	(0.021)	(0.020)	(0.021)
Trade dependence (low)	–14.323	–14.850	–13.499
	(8.338)	(8.209)	(7.928)
Polity (low)	–0.044***	–0.042***	–0.046***
	(0.010)	(0.010)	(0.010)
Contiguity	2.674***	2.699***	2.669***
	(0.255)	(0.254)	(0.248)
Distance	–0.149***	–0.146***	–0.145***
	(0.028)	(0.028)	(0.028)
Major power	1.297***	1.305***	1.335***
	(0.192)	(0.197)	(0.191)
Alliance	–0.146	–0.176	–0.190
	(0.140)	(0.134)	(0.132)
Relative military power	–0.143***	–0.137**	–0.158***
	(0.042)	(0.042)	(0.044)
Time	–0.054***	–0.050***	–0.052***
	(0.011)	(0.011)	(0.011)
$Time^2$	0.006***	0.006***	0.006***
	(0.000)	(0.000)	(0.000)
$Time^3$	–0.000***	–0.000***	–0.000***
	(0.000)	(0.000)	(0.000)
Constant	–7.618***	–7.746***	–7.684***
	(0.317)	(0.363)	(0.331)
Observations	430,477	430,477	430,477
χ^2	3,147***	3,050***	3,059***

Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The coefficients of the control variables are generally consistent with existing work on MID initiation. The coefficients of *Contiguity* and *Major power* – known to be strong predictors of conflict – are significant, positive, and relatively large. Consistent with the democratic peace literature, we find that *Polity low* is a significant predictor of a smaller probability of conflict. The significant and positive coefficient of *Embassy* may seem counter-intuitive at first, but it should be noted that many small powers tend not to have ambassadorial relations with many other small powers, and such dyads are also unlikely to experience conflict.

One limitation of our research design is the potential for endogeneity between IGO joining and our dependent variables. Our network perspective does not, by itself, overcome the potential for endogeneity that is common to the broader literatures about IGO joining. States have significant power to strategically choose which IGOs they join, which can create endogeneity between IGO joining and various dependent variables. Nonetheless, the move to a network perspective does address this issue to some extent. States have some power to strategically affect which other states will be their direct IGO partners, yet they have much less power to determine which other states will be their IGO cluster partners. This is because the extent to which a particular dyad belongs to the same IGOs will be determined by the IGO joining decisions of those two states. Whether a dyad belongs to the same IGO cluster will depend not only on the decisions of that dyad, but also on the decisions of many other states in the IGO network.

Thus, if state A does not wish to join the same IGOs as state B, state A may simply not join those IGOs. However, if state A does not wish to belong to the same *IGO cluster* as state B, state A has significantly less power to prevent this from happening. To avoid being in the same IGO cluster as state B, state A would have to use its power to influence the IGO joining decisions of many other states, including with respect to IGOs it may not join itself. In a few cases, state A may have such power, but the extent of this power is smaller than the power state A has to make its own IGO joining decisions. As a result, while we cannot say with absolute certainty that states never strategically choose their IGO cluster partners, doing so is less likely than states strategically choosing their direct IGO partners. In other words, the endogeneity problem may be less severe with respect to *Same IGO cluster* than with respect to *Joint IGO membership*, which is the primary treatment variable in much of the existing literature.

Robustness tests

We test the robustness of these results in several ways.

Maxflow: We re-estimate our models while controlling for the maxflow measure (*Maxflow*) provided by Dorussen & Ward (2008). The results of these models, reported in Table 2 of the Online appendix, are consistent with our main results. In addition, these tests indicate that latent clustering, rather than maxflow, is more likely to be the network mechanism by which the pacific effects of IGOs operate. When IGO cluster membership is accounted for, not only is the maxflow variable no longer negatively associated with conflict, but in two of the three models the association is significant and positive, which is the opposite of the result reported by Dorussen & Ward (2008).

Politically relevant dyads: We re-estimate the models reported above by examining only politically relevant dyads, that is, those that are either contiguous or include at least one major power. The results of these models, reported in Table 3 of the Online appendix, are consistent with our main results.

Ongoing MIDs: It may be the case that the mechanisms by which IGO ties reduce conflict operate differently once a conflict is ongoing. In the main models reported above, we excluded dyads with ongoing MIDs. We include dyads with ongoing MIDs in the models reported in Table 4 in the Online appendix. The results are consistent with our main results.

Regionalism: As Figure 5 shows, states in the same geographic region are often in the same IGO cluster – because they tend to join similar IGOs. It might be the case that this underlying regionalism drives both the structure of IGO clusters and conflict behavior, which would bias our results. To test for this, we estimate a series of robustness tests that include a series of additional variables indicating whether both states in the dyad belong to a particular region. Each such variable is coded as 1 if both dyad members belong to the applicable region, and 0 otherwise. The results of these models, reported in Table 5 of the Online appendix, are consistent with our main results.

Security IGOs excluded: It may be the case that states with similar security interests join similar IGOs that primarily include security-related functions. Yet states may also share information via non-security-related IGOs. We therefore re-run the detection algorithm with security IGOs excluded and re-estimate our model of conflict using the resulting cluster membership data, as reported in Table 6 of the Online appendix. The results are consistent with our main results.

TERGM model: To test whether our result is robust to potential interdependencies in the data, we estimate a temporal exponential random graph model (TERGM). A key advantage of using an ERGM is that it can help us understand predictors of individual outcomes in a network while accounting for the fact that events in the network are systematically interdependent. In the case of the IGO network, the ERGM allows us to understand the relationship between *Same IGO cluster* and MID onset while accounting for interdependencies in IGO joining patterns and accounting for the underlying tendency of states to form clusters within the IGO network. The result of this model is reported in Table 7 of the Online appendix. The result is consistent with our main results and indicates that the negative relationship between *Same IGO cluster* and MID onset holds when we account for the underlying interdependent nature of IGO formations.

Interest convergence: As we noted in the introduction, in addition to reducing conflict risk, IGO membership has been argued to lead to interest convergence. Recent studies have suggested that states that share membership in many of the same IGOs are more likely to develop along similar trajectories with respect to indicators of democracy, human rights, and even voting behavior at the UN General Assembly (Pevehouse, 2002; Greenhill, 2015; Bearce & Bondanella, 2007). These convergence effects are often attributed to the ability of IGOs to socialize their member states into group norms, owing in large part to the opportunities that these organizations provide for sharing best practices, making social comparisons, and, more generally, permitting high levels of contact among policymaking elites (Greenhill, 2015: Ch. 2). Although we do not have the space in this article to develop an argument on this point in detail, it may be the case that IGO clusters have similar such effects. Thus, to test the importance of IGO clusters in the international system, we replicate the analysis of Bearce & Bondanella (2007) on the relationship between IGO membership and interest convergence while adding our measure of *Same IGO cluster*. These models are described in detail in the Online appendix. As Table 8 and Figure 4 in the Online appendix show, *Same IGO cluster* is robustly associated with interest convergence. This provides a preliminary indication that the structure of IGO clusters may be of broader importance to the international system, a point we hope to explore further in future work.

Conclusions

IGOs have important effects on states – and in particular on how states interact with and relate to each other. Much of the literature has conceptualized these effects as depending on the extent to which states interact with each other directly in IGOs. While these direct effects are important, we argue for the importance of broader, structural effects of the IGO network. We explain how the transfer of information can operate through indirect IGO ties. Within IGO clusters, these effects are especially important. We find that states belonging to an IGO cluster are significantly less likely to experience a conflict. We also find that when we empirically account for IGO cluster structures, existing explanations such as direct IGO membership and the network effect of maxflow are no longer found to have a negative association with conflict risk.

Our arguments and evidence suggest several areas for further research. IGOs are thought to have important effects we have not discussed in detail, such as promoting democracy (Pevehouse, 2002) and facilitating the diffusion of human rights practices (Greenhill, 2015). The structure of IGO clusters may also affect these mechanisms. It may be the case that human rights practices diffuse differently within versus across IGO clusters. Likewise, just as membership in IGOs with more democratic members aids transitions to democracy (Pevehouse, 2002), it may be that embeddedness in an IGO cluster consisting mainly of democracies has a similar effect.

More broadly, this article has significant implications for how we view the role of IGOs in the international system. Boehmer, Gartzke & Nordstrom (2004: 13) conjecture that 'Preference homogeneity among IGO members increases the effectiveness of efforts to promote peace.' If that is so, then to the extent that the interests of the members of an IGO cluster converge over time, this may reduce the probability of conflict between those states even beyond any reductions resulting from informational mechanisms. This would be good news regarding the long-term prospects for international peace. On the other hand, it could be that if IGO clusters become overly separated from each other in the long run, state interests may converge *within* these groups, but diverge across them, resulting in increased polarization and conflict *across* these groups (Greenhill & Lupu, 2017).

An additional important area for future research is to investigate how IGO clusters form and change over time, a topic we began to investigate in Greenhill & Lupu (2017). For example, as international cooperation becomes more or less fragmented over time, we should be able to measure such fragmentation based on the structure of IGO clusters. We hope to conduct future work on these questions to more precisely identify the effects of IGO clusters and the structure of the IGO network more generally.

This article also has other broader implications. The first of these concerns other literatures in international relations that have focused on the effects of dyadic ties. Theories such as the democratic peace and the commercial or capitalist peace argue that characteristics of state dyads have important effects on their probability of conflict. Our arguments regarding the importance of indirect ties suggest that these literatures could be enriched by examining whether and how extradyadic and structural effects are involved in these phenomena. In addition, our arguments and evidence also have implications for the current debates regarding US engagement in the international community and the effects international institutions may have on the rise of China. Our theory suggests that to the extent that the USA and China seek prolonged peaceful relations, the two states should join IGOs with similar members (even if they do not join all of the same IGOs).

Replication data

Analyses were conducted using Stata 14 and R. The data and command code for the empirical analysis, along with the Online appendix, can be found at http://www.prio.org/jpr/datasets.

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