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IGO membership, network convergence, and credible signaling in militarized disputes

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Abstract

Existing studies of intergovernmental organizations (IGOs) and militarized conflict focus on dyadic counts of shared IGO membership. However, dyadic approaches are inconsistent with the basic properties of IGOs. Because IGOs are multilateral organizations, shared membership necessarily involves ties to third parties. This article employs network analytics to develop a novel explanation of how third-party IGO ties reduce militarized conflict. The analysis first examines the 'structural similarity' of states, defined by the extent to which states share similar patterns of IGO membership with relevant third parties. High levels of structural similarity indicate that states interact with a common set of IGO collaborators. The analysis then shows that micro-level changes in IGO membership effect changes in structural similarity, leading to the macro-level phenomenon of 'network convergence,' wherein states increasingly collaborate with the same third parties over time. Substantively, convergence results in increased overlap and integration between states' respective local networks of IGO partners. Because network convergence is costly, involving a combination of IGO-based accession, sovereignty, and alignment costs, it is unlikely to be pursued by purely exploitative state types. Consequently, convergence provides cooperative types with a mechanism for signaling a preference for cooperation over conflict. These credible signals in turn establish mutual trust among cooperators and effectively reduce the risk of militarized conflict. Extensive empirical analysis shows that, in fact, network convergence strongly correlates with a decline in militarized dispute initiations. The more that states collaborate with one another's IGO partners, the less likely they are to fight.

How might intergovernmental organizations (IGOs) affect militarized conflict? This question represents a long-standing puzzle in international relations (Singer & Wallace, 1970). Early studies concluded that mutual collaboration in IGOs reduces dyadic conflict (e.g., Russett & Oneal, 2001), but more recent research finds substantial variation in the effects of IGO membership (e.g., Boehmer, Gartzke, & Nordstrom, 2004; Pevehouse & Russett, 2006). Existing studies typically adopt a dyadic framework, where the influence of IGOs is defined in terms of the number of memberships shared by given pairs of states. While this dyadic approach has yielded valuable insights, it is incompatible with basic IGO properties. Membership in IGOs is rarely, if ever, dyadic, but instead necessarily involves multilateral commitments.[1]

Some scholars have begun using network analysis to better capture the multilateral aspects of shared IGO membership (Dorussen & Ward, 2008; Hafner-Burton & Montgomery, 2006; Maoz et al., 2006). This emerging literature argues that analysis of shared IGO membership must explore the qualitative properties of those memberships, particularly with regard to how IGO comemberships connect states to politically salient third parties. This article adopts a similar perspective. Specifically, I use IGO data to identify states' main IGO partners or networks of collaborators, and I then determine, for given pairs of states, the degree of overlap in their respective networks—i.e., the extent to which states share ties to the same third parties. This 'friends of friends' conceptualization of IGO membership, which is rooted in the network principle of structural similarity, emphasizes memberships that are more inclusive of states' key partners. Changes in these networks over time engender 'network convergence,' a macro-level or structural process wherein states' respective IGO portfolios grow increasingly similar, such that even states who previously occupied highly dissimilar political spheres come to mutually collaborate with the same third parties. At the micro level, network convergence depends on concrete choices by states to increase IGO collaboration both with one another and with one another's partners. These micro-level dynamics, while seemingly monadic or dyadic in orientation, implicate macro-level shifts in multilateral commitments.

Network convergence is costly for states. IGO membership often involves restrictions on accession, losses of sovereignty, and risky political realignments. For individual IGOs, these costs are generally quite small; but network convergence aggregates and amplifies membership costs across multiple

[1] IGOs consist of at least three member states (Pevehouse, Nordstrom, & Warnke, 2004).

states and organizations. The costliness of restructuring one's IGO portfolio credibly signals an interest in cooperation over conflict, specifically with regard to those states most directly targeted by convergence processes. Ultimately, only a state with a genuine interest in cooperation should be willing to trade the potential benefits of enhanced multilateral collaboration for the costs of convergence. By acting as a costly signal of trustworthiness, convergence lowers the risk of conflict. As states grow more similar in their IGO portfolios over time, they should become increasingly less likely to initiate disputes against one another.

This analysis contributes to emerging research on the informational role of IGO networks (Dorussen & Ward, 2008). While others have identified a signaling role for strong IGOs (e.g., Boehmer, Gartzke, & Nordstrom, 2004), this article deemphasizes institutional capacity and focuses instead on the informational content of macro-level shifts in patterns of IGO membership. Changes in states' unique membership patterns reveal, in part, whether those states have an interest in cooperation—and, if so, with whom. These structural considerations are analytically distinct from questions of whether IGOs possess the strength and resources to independently mediate disputes or intervene in conflicts directly. Instead, I identify an instrumental aspect of IGO membership, where the costs and multilateral consequences of IGO membership itself convey strategically valuable information to prospective partners. This dynamic structural approach highlights oft-ignored avenues of indirect, third-party signaling, while also allowing a role for weak or otherwise inefficacious IGOs.

The article proceeds in four parts. First, I review prior literature and articulate the network approach to IGO membership. Second, I construct a theory linking network convergence to credible signaling, and I generate testable hypotheses. Third, I subject the hypotheses to empirical analysis over the 1970–2000 period, the results of which strongly support the hypotheses and confirm that network convergence is a powerful suppressor of conflict. The fourth section concludes.

IGO membership and network convergence

The network characteristics of IGO membership are now widely recognized (Cao, 2009; Dorussen & Ward, 2008; Hafner-Burton & Montgomery, 2006; Ingram, Robinson, & Busch, 2005; Maoz et al., 2006). In network terms, IGO membership is an affiliation network, where 'nodes' in one group (e.g., states) share ties to nodes in a second group (e.g., IGOs). Figure 1(a) illustrates such a network using eight countries (circular nodes) and four organizations (square nodes).[2] Figure 1(b) projects these affiliations into a social network, where the number of IGO memberships shared between a given pair of states defines the strength of their corresponding network tie. Ceteris paribus, stronger network ties indicate greater dyadic collaboration.

[Figure 1 about here.]

Much recent work on IGO networks focuses on the 'structural equivalence' of states (Cao, 2009; Hafner-Burton & Montgomery, 2006; Ingram, Robinson, & Busch, 2005; Maoz et al., 2006). Two nodes are structurally equivalent if 'they have exactly identical patterns of ties sent to and received from all the other network actors' (Knoke & Yang, 2008: 76). That is, if two states have identical ties to the other states in the system, they occupy structurally equivalent positions in the network. In Figure 1(a), for example, Colombia and Mexico are members of the same two organizations (and no others) and are thus perfectly structurally equivalent. Because such perfect equivalence is rare in real-world networks, analysts typically focus on *structural similarity*.

Structural similarity captures multilateral implications of IGO membership that go unnoticed by dyadic counts. In Figure 1(a), Venezuela and Colombia share membership in two IGOs—CDB and ACS. Venezuela and Iran also share membership in two IGOs—SITTDEC and OPEC. By dyadic standards, the VEN-IRN and VEN-COL pairs collaborate at equal levels and are thus functionally equivalent. However, these dyads differ substantially in how their respective comemberships engender multilateral connections to the five 'target' states on the right side of Figure 1(a). Because Venezuela is a member of all four IGOs, it collaborates to some degree with all five target states. Colombia collaborates with four of these states (Germany, Mexico, Jamaica, and Cuba), while Iran collaborates with only three of them (Nigeria, Jamaica, and Cuba). Further, Colombia not only collaborates with all three of Venezuela's most frequent collaborators—Mexico, Jamaica,

[2] Figure 1 based on data from year 2000 (Pevehouse, Nordstrom, & Warnke, 2004). Countries are Colombia, Venezuela, Iran, Germany, Mexico, Jamaica, Cuba, and Nigeria. Organizations are the Caribbean Development Bank; the Association of Caribbean States; the South Investment, Trade and Technology Data Exchange Centre; and the Organization for Petroleum Exporting Countries.

and Cuba—but does so via two IGOs (CDB and ACS). In contrast, Iran collaborates with only two of Venezuela's main collaborators, and only via a single IGO membership (SITTDEC). In short, by virtue of its IGO memberships, Colombia shares ties not only with Venezuela, but also with Venezuela's major partners. Iran's memberships, on the other hand, substantially limit its third-party ties.

These structural patterns are also reflected in Figure 1(b). Colombia's strongest ties (the thicker lines) extend to countries that also have strong ties with Venezuela (e.g., Jamaica and Mexico), while Iran has weak or nonexistent ties to these countries. The node positions in 1(b) are in fact determined by structural similarity, such that more proximate nodes are more similar in their ties to third parties.[3] (E.g., Colombia and Mexico's close proximity reflects their high structural similarity; without jittering, they would be plotted at precisely the same point.) Assessing node placement reinforces the above intuition; Venezuela and Colombia are substantially more structurally similar in their shared IGO memberships than are Venezuela and Iran, despite these dyads having an equal number of comemberships.

Hafner-Burton & Montgomery (2006) use structural similarity to analyze the distinctive social groups or 'clusters' created by IGO membership, arguing that in-group dynamics reduce conflict among states that share similar membership patterns. However, their empirical results are inconsistent; structural similarity reduces conflict in some model specifications but proves insignificant in others (Hafner-Burton & Montgomery, 2006: 20). Maoz et al. (2006) also address structural similarity in IGO membership, and they too find inconsistent results; the effects of similarity vary by model type, sample selection, and years of analysis. These inconclusive results are due in part to the fact that scholars have not yet linked network analytics to prevailing theories of conflict, especially those derived from bargaining models of war. For example, Maoz et al. (2006) frame their argument in terms of traditional realist/liberal paradigms, while Hafner-Burton & Montgomery (2006) invoke realist concepts of power and prestige, supplemented by social-psychological insights.

I instead connect IGO networks to asymmetric information, which Fearon (1995) identifies as a primary cause of war. I further shift emphasis from static measures of structural similarity to

[3]The formal measure of structural similarity, discussed later, assigns VEN-COL a structural similarity score of 0.202 and VEN-IRN a lower score of 0.136.

network convergence, a process whereby states' respective networks of collaborators merge over time, such that they increasingly collaborate with the same third parties. Network convergence is defined, for a given i 'focal state' and j 'target state,' as a positive change in ij structural similarity over a specified time span, as defined by those states' ties to the k third parties in the system. (I use this convention for i, j, and k throughout the article.) Focusing on the dynamics of membership brings attention to the costs that states incur when restructuring their IGO portfolios. Because these costs reveal novel information about strategic interests, they help dispel the information asymmetries that presage conflict.

Mechanistically, network convergence involves two closely related micro-level behaviors. First, ij convergence occurs if i joins an IGO in which j is currently a member, or if i and j mutually create a new IGO. Importantly, convergence occurs not because i and j now share an additional membership, but because they have mutually increased collaboration with the k third parties in the IGO. Thus, if i joins an IGO whose membership consists of j's most frequent collaborators, ij network convergence increases more substantially than if i joined an IGO consisting of member states with whom j does not otherwise collaborate extensively. In Figure 1(a), membership in either CDB or OPEC would increase Cuba's direct collaboration with Venezuela by one IGO. However, membership in CDB would contribute more substantially to VEN-CUB convergence than would OPEC membership, since a larger number of Venezuela's key partners—Colombia, Jamaica, Mexico—are also CDB member states. In dyadic terms, OPEC membership is functionally equivalent to CDB membership. But in network terms, the latter increases multilateral collaboration much more than the former.

Second, ij convergence occurs if i increases collaboration with third parties who themselves share IGO memberships with j. For example, if Nigeria were to join SITTDEC, its similarity with Colombia would increase. Although Colombia is not a SITTDEC member, SITTDEC membership increases Nigeria's collaboration with many of Colombia's partners (e.g., Cuba, Jamaica, and Venezuela). This aspect of IGO membership—which is completely ignored by dyadic counts—opens new avenues for signaling and creates opportunities for third parties to play screening roles. By increasing collaboration with j's partners, i may be able to credibly signal an interest in cooperation.

As these micro-level behaviors accumulate across the network, they generate observable shifts in structural similarity. These macro-level shifts—rather than the micro-level decisions to join, establish, or abandon IGOs—are the focus of this analysis. Taken individually, IGOs are blunt instruments for signaling cooperative intent. But macro-level patterns in membership—aggregated across hundreds of IGOs, dozens of partners, and multiple years of analysis—reveal which states are most frequently and deeply targeted for collaboration, and by whom.

The logic of network convergence and credible signaling

Network convergence reduces conflict by revealing credible information about state preferences. In developing this argument, I first discuss the logic of costly signaling. I then discuss three types of costs in IGO membership and show how the dynamics of network convergence aggregate and amplify these costs, generating credible signals. Finally, I consider how IGO heterogeneity conditions the effect of convergence.

Conflict and costly signals

To understand how IGOs affect conflict, we first require a theory of contests (Boehmer, Gartzke, & Nordstrom, 2004). Bargaining models of war emphasize information asymmetry as the primary cause of conflict, where states use costly signaling—mobilizations, movements, public statements, etc.—to credibly convey resolve and clarify the range of acceptable bargained outcomes (Fearon, 1995). This logic is readily apparent in crisis escalation, where bargaining over some disputed good carries a nontrivial risk of militarized force. However, as I argue below, network convergence is more likely to affect conflict initiation than escalation. And in the context of initiation, uncertainty about resolve or willingness to fight matters less than uncertainty about *trustworthiness*. Kydd defines trust as the belief that one's opponent would rather cooperate than exploit one's cooperation for its own benefit (2005: 6). To cultivate trustworthiness and forestall militarized confrontations, a state must convince others that it is a cooperative rather than exploitative type. As in crisis bargaining, conflict avoidance requires credible information, conveyed via costly signals; but in the longer-term cooperative scenarios of trust-and-reassurance games, costly signals are not shows of resolve, but small, incremental actions that reassure others of one's benign intentions. These signals must be costly enough that exploitative types would be unwilling to send them, but not so costly as to make cooperative types overly vulnerable (Kydd, 2005: 186–187).

Successful costly signaling allows potential partners to reliably separate cooperative from exploitative types (Kydd, 2005: Chapter 7). Dispute initiations between cooperative states thus represent a failure of trust and reassurance—and should occur only if state preferences are not signaled with sufficient credibility. Indeed, given systemic anarchy, costly signaling is one of the few available means of promoting cooperation. Accordingly, in order for IGOs to affect conflict, 'they must impinge on the causal processes that lead states to fight'—that is, they must provide novel avenues for sending credible, informative signals (Boehmer, Gartzke, & Nordstrom, 2004). Network convergence fulfills two essential conditions of credible signaling: it generates costliness by aggregating the costs of IGO membership across a wide swath of institutions, and, through membership, it directs those costs toward specific targets. I now turn to a discussion of the costs inherent to network convergence.

The costs of IGO membership

Prior scholarship identifies at least three types of costs in IGO membership. First, IGO membership depends on a variety of adjustment, bargaining, and other *accession costs*. These include such basic costs as dues-paying and providing support for official delegations, as well as more substantial ex-post costs—e.g., extending aid or assistance to third parties, providing resources for election monitoring, participating in sanctions regimes, or contributing forces to multilateral coalitions. Strongly institutionalized IGOs, such as the EU and WTO, condition membership on costly political and economic adjustments, which may involve lengthy negotiations and require leaders to expend political capital in mobilizing domestic support (Moravcsik & Vachudova, 2003; Pelc, 2011). Indeed, rejection of membership incurs reputation costs from both domestic and international audiences. Given that IGO accession often requires unanimous consent from member states (Schneider & Urpelainen, 2012), the pursuit of membership poses nontrivial risks for leaders. For example, failure of the Czech Republic's bid to join NATO almost certainly would have led to a collapse of the Czech coalition government (Szayna, 1999: 127)

IGO membership also imposes *sovereignty costs*, defined narrowly as the delegation of decision-making authority to intergovernmental bodies (Bradley & Kelley, 2008), or more broadly as constraints on the unilateral pursuit of state interests (Abbott & Snidal, 1998). These restrictions span diverse issue areas, from prosecution of war criminals (Simmons & Danner, 2010) to regulation of trade barriers (Guzman, 2004). The severity of sovereignty costs depends on the centralization and independence of IGOs (Abbott & Snidal, 1998). While many of these costs are known to states ex ante, others emerge only ex post—for example, through punitive decisions by judiciary bodies or arbitration panels. Indeed, with strong compliance mechanisms, states face both constrained policymaking and potential punishments for noncompliance (cf. Chayes & Chayes, 1996).

Finally, because IGO portfolios act as a form of de facto political alignment, IGO membership also imposes *alignment costs*. Club-like groups of states, integrated by particular sets of IGOs, are a recurring feature of international politics (Hafner-Burton & Montgomery, 2006). Soviet-bloc states clustered around the Warsaw Pact, the Council for Mutual Economic Assistance, and the Communist Information Bureau. Third-world countries favored the Nonaligned Movement and the Group of 77. Today, highly developed states favor the OECD, the Bank for International Settlements, and 'club organizations' like the G20. As Abbott & Snidal argue, states 'consciously use IOs [...] to create information, ideas, norms, and expectations; to carry out and encourage specific activities; to legitimate or delegitimate particular ideas and practices; and to enhance their capacities and power' (1998: 8). A state's IGO partners provide a stable reference group of collaborators. Substantial shifts in IGO portfolios are costly insofar as they signal support for new norms and principles, or suggest declining support for the ideas and practices of the reference group.

Network convergence as signaling

These membership costs are directly implicated by network convergence. Positive trends in convergence reflect both the increased number of k third parties with whom i and j collaborate, and the multiplicity of IGOs through which collaboration occurs. By increasing its collaboration with j's various partners, i multiplies the accession, sovereignty, and alignment costs of IGO membership. At the same time, convergence funnels these costs toward specific targets, which provides the directionality necessary for credible signaling. If i simply incurred costs in a vacuum, no information would be revealed. Because costs emerge specifically in relation to j's partners, they are directed toward and hold informational value for j. Together, costliness and directionality enable credible signaling.

Convergence increases *accession costs* because i must bargain with a more heterogeneous group of states—i.e., not only j, but also j's partners—and earn the approval of a larger, more diverse audience. Such complex bargaining not only absorbs resources but also increases the probability of politically costly rejections. And because convergence involves a broad range of IGOs, these bargaining difficulties proliferate across variegated institutional fora, further increasing i's costs. The costliness of bargaining over multilateral institutions is well established (Downs, Rocke, & Barsoom, 1998; Koremenos, Lipson, & Snidal, 2001); in convergence, these costs are amplified by the multiple actors and organizations involved. *Sovereignty costs* increase because convergence requires commitments to new organizations. Further, by collaborating with a larger group of states, i dilutes its relative influence over institutional procedures, which reduces i's ability to bias institutions in its favor and increases the probability of organizational outcomes—e.g., decisions of judicial bodies—that run contrary to its interests. Densely overlapping organizational constraints reduce i's ability to exploit IGOs for unilateral advantage. Finally, convergence increases *alignment costs* by shifting i's IGO portfolio away from the reference group, which may deteriorate relations with group members and imperil i's access to associated information, ideas, and practices. Indeed, convergence toward new collaborators strongly correlates with divergence away from a reference group; even when states retain their prior IGO memberships, new IGO commitments shift their overall political alignments.

The k third parties involved in convergence play a screening role that provides directionality to i's signals. Even if i's actions are not explicitly motivated by intent to signal j, the willingness of j's partners to collaborate with i reveals strategically valuable information about i's trustworthiness—much as acceptance of new members into an IGO acts as an informative 'seal of approval' for external observers (Gray, 2009). The probability of j interpreting i's actions as a signal of cooperative intent depends largely on the dynamics of the convergence process, such as the number of IGOs and k third parties involved; the more substantially i restructures its IGO portfolio, the more likely i is to attract the attention of j's foreign policy apparatus. Further, the closer the relationship between j and k, the greater j's confidence in k's evaluative standards, and the more credibly k's willingness to cooperate with i signals trustworthiness. Indeed, through its organizational ties to k, j may be able to glean strategic information about i's history as a partner and its willingness to fulfill organizational obligations (cf. Dorussen & Ward, 2008). In the early 1990s, for example, Poland, Hungary, and the Czech Republic pursued membership in both the EC/EU and NATO. The EU's willingness to incorporate former Soviet-bloc states into European institutions credibly informed the United States of those countries' preparedness for NATO membership. By screening for trustworthiness, j's current partners provide valuable information about prospective partners.

Of course, IGOs also perform practical functions; otherwise, states would not join them (Abbott & Snidal, 1998: 5). Nonetheless, IGO membership is a calculated risk. States make a bet that the promised benefits of membership will outweigh the costs. As states increase their mutual interdependence in IGO networks, these costs and prospective benefits accumulate, such that defection not only disrupts the provision of benefits, but also forfeits the sunk accession, sovereignty, and alignment costs. Exploitative types may be willing to accept limited costs in order to exploit the cooperation of others, but the long-term, deeply embedded costs of network convergence should be anathema to those only interested in exploitation. Network convergence credibly signals trustworthiness and separates exploitative from cooperative types, thus reducing the probability of conflict.

Hypothesis 1 *Network convergence between two countries reduces the probability of militarized conflict between them*

Consider the case of post-Cold War Georgia. Upon gaining independence, Georgia inherited Soviet-era leaders and the Russian sphere of influence. Nonetheless, Georgia has strongly pursued collaboration with the West. It acquired memberships in the NATO-sponsored Euro-Atlantic Partnership Council (EAPC) and Partnership for Peace, and in organizations like the Council of Europe, the Organization for Security and Cooperation in Europe (OSCE), and the European Bank for Reconstruction and Development (EBRD). Although these organizations also include Russia and other post-Soviet states, they are dominated by Western powers. Thus, while dyadic counts of IGO comembership would imply that the EAPC, OSCE, and EBRD increased direct collaboration between Russia and Georgia, the heavily European composition of these organizations in fact shifted Georgia's IGO portfolio strongly toward the West.

Georgia also favors cosmopolitan organizations like the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), the International Organization for Migration (IOM), the International Fund for Agricultural Development (IFAD), and the International Criminal Court—all organizations that espouse uniquely western ideals but are ignored by Russia and most pro-Russian republics. Perhaps most conspicuously, working in concert with a handful of neighbors, Georgia established organizations that provide alternatives to the Russian sphere of influence, such as the GUAM Organization for Democracy and Economic Development (GUAM) and the Community of Democratic Choice. Both organizations include Western-oriented post-Soviet states but deliberately exclude Russia and its allied republics; GUAM in fact exists primarily as an alternative to the Russia-dominated Collective Security Treaty Organization (CSTO).

Finally, Georgia has deliberately ignored—or, in some cases, exited—organizations dominated by Russian interests. These include CSTO, which Georgia left in 1999 (in preparation for its NATO bid), as well as organizations intended to facilitate cooperation among the Commonwealth of Independent States (CIS), including the Eurasian Patent Organization, the CIS's Inter-State Bank, and the Eurasian Economic Community. Georgia's trajectory stands in sharp contrast to, say, Belarus, which, despite inheriting a strategic position similar to Georgia's, co-founded multiple CIS organizations and continues to shun even benign IGOs like ICCROM, IOM, and IFAD. Measures of network convergence capture this trajectory well. Over the 1995–2005 period, Russia and Georgia's number of shared IGO memberships *increased* from 32 to 36, but their structural similarity *decreased* by 47%—an exceptional case of network divergence. (In contrast, Belarus and Russia's structural similarity held steady this entire period.) At the same time, Georgia increased in structural similarity (by as much as 50–70%) with major powers like the US, UK, France, and Germany, and with small integrated states like Belgium, Netherlands, and Norway. These trends reflect deliberate Georgian efforts to signal an interest in cooperation with the West.

IGO heterogeneity

IGO heterogeneity can affect signaling in numerous ways. For example, accession, sovereignty, and alignment costs may vary according to the strength of IGOs (cf. Abbott & Snidal, 1998). Or states may be uncertain of or unable to foresee the full costs of membership. For some IGOs, prospective partners may simply not view membership as costly. While these concerns readily affect individual organizations, the macro-level perspective subsumes institutional variations by emphasizing the *overall* IGO activity of states. As the case of Georgia illustrates, deep convergence involves myriad institutions. Even minimally institutionalized IGOs involve some costs; when aggregated, these costs can accumulate rapidly. As well, convergence typically occurs over periods of many years, which allows states to continually focus and reinforce the credibility of their signals through regular adjustments to their IGO portfolios. I thus anticipate a statistically significant pacific effect even for convergence in weak organizations.

Nonetheless, IGO heterogeneity may affect how strongly convergence impacts conflict. Ingram, Robinson, & Busch (2005)—following the typology of Boehmer, Gartzke, & Nordstrom (2004)—categorize the *structure* of IGOs as either minimalist, structured, or interventionist, depending on size and scope of bureaucracy, extent of formal rules and procedures, and strength of enforcement and coercion mechanisms. The authors further define IGO *function* as general purpose, economic, military/political, or social/cultural. In determining the relationship between IGO heterogeneity and convergence, I consider two possibilities. First, the effects of convergence may increase as IGO membership becomes more costly. This possibility is consistent with evidence that strongly institutionalized security IGOs most affect conflict (Boehmer, Gartzke, & Nordstrom, 2004). Because the membership costs of such organizations are high, convergence sends a more credible signal of cooperative intent. On the other hand, most IGOs in this category are formal military alliances, and, like other strong IGOs, alliances erect substantial entry barriers and require high ex ante levels of trust. If membership presumes trust, then network convergence provides no novel information, and the impact of convergence on conflict will be weak. A second possibility, then, is that convergence in middle-range IGOs—structured and/or economic IGOs—has the strongest influence. These organizations, when compared to weaker minimalist or social/cultural varieties, exhibit entry barriers that are formidable but not so high as to limit access only to already trusted states. Instead, they create opportunities for potential partners to signal trustworthiness by accepting the costs of membership.

Hypothesis 2 *The effects of network convergence are strongest among interventionist IGOs, security IGOs, and interventionist-security IGOs*

Hypothesis 3 *The effects of network convergence are strongest among structured IGOs, economic IGOs, and structured-economic IGOs*

Theoretical clarifications

Some clarifications are in order. First, while I treat structural similarity as a source of cooperation, similarity may also presage competition. In trade networks, for example, structurally similar states occupy comparable market positions and may therefore compete over access to export markets (Cao, 2009; Ingram, Robinson, & Busch, 2005). The impetus behind this competition is the potential substitutability or 'redundancy' of structurally similar nodes (Burt, 1992). If i and j occupy identical positions in the network, then a potential k partner only requires ties to one of them, not both, which compels structurally similar states to compete for ties. However, ties in the IGO network do not exhibit this rivalrous characteristic. While states do of course take risks in joining IGOs, one state's membership does not ipso facto preclude the membership of another. Further, insofar as states rely on IGO memberships as signaling devices, redundancy may be desirable, as it allows states to continually confirm and enhance the credibility of their signals. I thus view structural similarity as indicative of closure or social proximity rather than competition (Friedkin, 2006).[4] Because structurally similar actors share a common social environment, they are more likely to share homogeneous preferences (Burt, 1978). Network convergence is a deliberate merging of social environments and, thus, a signal of compatible interests.

Second, IGO scholars often treat organizations themselves as independent actors, capable of pro-

[4]Competition in IGO networks is best captured via status-based measures, such as centrality (cf. Hafner-Burton & Montgomery, 2006).

viding strategic information, acting as mediators, or directly intervening in disputes (e.g., Boehmer, Gartzke, & Nordstrom, 2004; Dorussen & Ward, 2008). My argument is complementary to this scholarship. I focus on membership dynamics, rather than IGOs themselves, because the underlying theory of contests—information asymmetries—places unique emphasis on costly signaling. Even when provided by a neutral mediator, information alone has a negligible effect on conflict (Boehmer, Gartzke, & Nordstrom, 2004). In order to fundamentally alter bargaining dynamics, information must be credible, and credibility requires costly signaling. This emphasis on signaling also addresses a related concern—that the effects of network convergence are in fact epiphenomenal to shared preferences. Again, in an environment characterized by asymmetric information, signaling is essential to conflict avoidance. While preferences matter, they are inherently opaque. Uncertainty about the intentions of others, combined with the risks of being suckered by an exploitative type, can lead to conflict even between states with uniformly cooperative preferences (Jervis, 1978; Kydd, 2005). Preferences are irrelevant without credible information.

A final concern is that the effects of convergence are driven by selection bias. Those countries that employ IGO membership as a form of signaling may simply be more pacific in general.[5] This possibility is not so much a threat to inference as a direct reflection of the argument. The fact that cooperative types are more likely to select themselves into IGO-based forms of signaling (and pay the associated costs) is precisely what separates them from exploitative types. While some states may, in principle, join IGOs simply out of a more pacific disposition, with no intention of signaling, such actions nonetheless have the impact, in practice, of differentiating cooperators from exploiters—the latter of whom should always be skeptical of deep cooperation. Network convergence captures this dynamic by identifying large-scale shifts in states' IGO portfolios. Ceteris paribus, greater convergence reflects a more concerted effort at credible signaling, or a stronger selection effect. Directly incorporating the selection mechanism into the model not only avoids selection bias but also directly measures the impact of selection itself.

[5] I thank an anonymous reviewer for this suggestion.

Empirical analysis

I first describe the measure of network convergence, and I then estimate a series of dispute initiation models. The online appendix contains results for numerous robustness checks and alternative model specifications.

Measuring structural similarity and network convergence

Data for the IGO network come from Pevehouse, Nordstrom, & Warnke (2004) and are structured for a given year as a dichotomous, asymmetric $N \times M$ matrix, where N is the number of states in the system and M is the number of IGOs. Matrix entries equal one if a given state (row) is a member of a particular IGO (column). I project this two-mode network into a $N \times N$ adjacency matrix, denoted $\mathbf{H}$, where the ij^{th} element of $\mathbf{H}$ is an integer value indicating the number of IGOs in which i and j share membership, and h_{ii} indicates i's total number of IGO memberships (cf. Wasserman & Faust, 1994: 308–309). This one-mode projection reflects the argument that states use IGO membership to signal cooperative intent to particular other targets. In the two-mode network, a given i's membership activity is targeted at specific IGOs. The one-mode projection shifts emphasis to the actual states with whom i interacts via those memberships—which, consistent with the theory, effectively defines membership as an instrument for collaborating with particular other targets.[6]

The measure of network convergence is derived from $\mathbf{H}$ in three steps. First, to account for variation in the IGO activity of states, each h_{ij} entry in row i is weighted by i's total IGO participation, h_{ii}. Second, structural similarity is calculated as Pearson product-moment correlations on both the rows and columns of the weighted $\mathbf{H}$ matrix (Wasserman & Faust, 1994). The resulting dyadic similarity scores range from 1 (perfect similarity) to -1 (perfect dissimilarity). Finally, to measure network convergence, seasonal differences in similarity scores are calculated over time. Rather than choose a time span arbitrarily, I assess the effects of convergence over spans of one to twenty years. I refer to this basket of convergence variables as $\Delta\text{Convergence}_{ij}$ and to specific convergence variables as

[6] See the online appendix for discussion of other approaches to measuring similarity.

$t\Delta\text{Convergence}_{ij}$, where t is the number of years over which convergence is measured. The online appendix formally details each of these steps.

[Figure 2 about here.]

Figure 2 illustrates structural similarity in Europe at two time periods. In 1965, similarity is highest among Eastern Bloc states like Russia, Romania, Hungary, Bulgaria, and Czechoslovakia, and, separately, among Western European states like Belgium, Italy, Netherlands, France, United Kingdom, and West Germany. By 2000, similarity scores show strong evidence of Bulgaria, Hungary, Romania and even Russia converging toward West European states. Notable outliers, such as Albania and Iceland, are also well represented. Figure 3 graphs the five-year measure of convergence, 5ΔConvergence, for all countries in the year 2000, where nodal proximity indicates more substantial increases in structural similarity over the 1995–2000 period. This figure provides a cross-sectional overview of precisely who converges toward whom.

[Figure 3 about here.]

IGO convergence and dispute initiation

Data on militarized interstate disputes are drawn from Maoz (2005) and include all independent states in the international system. The unit of analysis is the directed dyad-year, which distinguishes between initiators and targets of conflict. The dependent variable, MID_{ij}, equals 1 if i initiates a dispute against j in year t, zero otherwise. Directed dyads more readily facilitate controls for potential unit-level dependencies in the data, such as a particularly conflict-prone i or j.[7] Availability of IGO data limits analysis to the post-1965 period.[8] The baseline model incorporates a battery of standard control variables, including dyadic shared IGO memberships; the S index of shared preferences; mutual democracy; trade interdependence; military capabilities; military

[7] The results are nonetheless robust to nondirected analysis. See the online appendix.

[8] Prior to 1965, IGO membership data are available only at five-year intervals (Pevehouse, Nordstrom, & Warnke, 2004).

alliances; and both geographic distance and contiguity.[9] I also include a 'peace years' count and three cubic splines (Beck, Katz, & Tucker, 1998), as well as a control for system size (Raknerud & Hegre, 1997).

Methodologically, the analysis uses descriptive network statistics (i.e., structural equivalence) to model extra-dyadic aspects of an exogenous covariate (i.e., IGO membership). However, IR scholars increasingly recognize that dyadic conflict data themselves are rife with complex dependencies, and these dependencies may lead to biased estimates in traditional logit or probit models (Ward, Siverson, & Cao, 2007). While this critique is fundamentally correct, a consensus method for modeling dependencies in MID data has not yet emerged. I thus conduct the main analyses according to current standards in the field—binary logit with clustered standard errors and controls for duration dependence. To assess robustness, I also estimate a series of alternative specifications, including fixed- and random-effects models, k-adic units of analysis, and network evolution models.

To accommodate lags of up to five years, the analysis begins in 1970. The first column of Table 1 shows the results for the baseline logit model, which are generally unsurprising. The estimated effect of dyadic shared IGO membership is significant but *positive*, which is puzzling but consistent with Dorussen & Ward (2008), Boehmer, Gartzke, & Nordstrom (2004), and others. Preference similarity and shared democracy both reduce the probability of conflict initiation, as does distance. Military capabilities and geographic contiguity increase the probability of conflict initiation. Alliances and trade dependence have no effect.

[Table 1 about here.]

Columns two through four introduce three variants of network convergence, based on differences between current-year levels of structural similarity and one-, three-, and five-year lags of similarity, respectively. The estimates for all three are negative, with the one-year version significant at $p < 0.1$, and the three- and five-year versions significant at $p < 0.001$. These results suggest that, as hypothesized, network convergence has a negative impact on the probability of conflict. As

[9] Data sources, respectively, are Pevehouse, Nordstrom, & Warnke (2004); Signorino & Ritter (1999); Jaggers & Gurr (1995); Gleditsch (2002); Singer (1987); Gibler & Sarkees (2004); Gleditsch & Ward (2001); and Stinnett et al. (2002). Time-varying covariates are lagged by one year. See the online appendix for variable operationalization.

countries increase in structural similarity, they grow less likely to initiate disputes. Importantly, this correlation holds even when controlling for the dyad's total number of shared IGO memberships. The effect of $\Delta\text{Convergence}_{ij}$ is not simply an artifact of states joining more IGOs or having greater access to organizational resources. Evaluation of model fit further indicates that both the three-year and five-year operationalizations of convergence significantly increase the model's log-likelihood and decrease the associated BIC statistics. $5\Delta\text{Convergence}_{ij}$, in particular, yields the best fit—a finding to which I return below.

While the results thus far support Hypothesis 1, they also raise numerous questions. Most importantly, if the effects of IGO convergence are time sensitive, what is the optimal time span over which to assess their impact? We are interested not merely in the statistical significance of estimates, but in the substantive impact of convergence on the probability of conflict. Using predicted probabilities from Models 2–4, Figure 4 illustrates variation in the probability of conflict for each $\Delta\text{Convergence}_{ij}$ measure. Convergence over the course of a single year ($1\Delta\text{Convergence}_{ij}$) has a small but noticeable effect on conflict initiation, while shifts over three- and five-year periods exercise increasingly strong effects. Indeed, increasing $5\Delta\text{Convergence}_{ij}$ from its minimum to its maximum reduces the probability of MID initiation by 90%.

[Figure 4 about here.]

I next estimate a series of models that measure convergence over spans of one to 20 years. I restrict analysis to a constant set of 'durable dyads' (i.e., dyads that appear in the data set continuously for at least 20 years), which helps to determine precisely when the pacific benefits of convergence are most likely to emerge. Figure 5 plots percentage changes in the predicted probability of conflict initiation for a one-standard-deviation increase (from the mean) in the relevant $\Delta\text{Convergence}_{ij}$ variable. The estimates reveal that the effects of network convergence emerge definitively at the five-year mark and are most strongly felt over spans of eight to ten years. Indeed, a standard-deviation increase in either $8\Delta\text{Convergence}_{ij}$, $9\Delta\text{Convergence}_{ij}$, or $10\Delta\text{Convergence}_{ij}$ reduces the probability of conflict initiation by nearly 30%.

[Figure 5 about here.]

The special significance of the eight-to-ten-year mark is perhaps not surprising. Such a time span exceeds the tenure of most democratic leaders and many autocratic leaders (Bueno de Mesquita et al., 2003). Since leadership turnover potentially undermines international commitments (Leeds, Mattes, & Vogel, 2009), processes of convergence that outlast individual leaders are likely to be especially credible. As well, for newly emergent regimes, periods of consolidation may last a decade or longer. Indeed, scholars often use the ten-year mark as a threshold for stable transition. IGO-based mechanisms of credible signaling may be especially important to new regimes, as such states often lack well-established means—for example, strong diplomatic ties—for sending credible signals to potential partners. Whatever the case, a decade-long commitment to multilateral collaboration surely signals trustworthiness.

Dependencies in dyadic conflict data

To address the complex dependencies of dyadic conflict data, I employ a number of alternative model specifications, focusing on the $5\Delta\text{Convergence}_{ij}$ measure. Model 5 uses dyadic fixed effects to account for unobserved heterogeneity, as recommended by Green, Kim, & Yoon (2001). Although this approach severely limits the sample, the estimated coefficient for $5\Delta\text{Convergence}_{ij}$ remains negative and highly significant.[10] In Model 6, I conduct a random-effects analysis, as suggested by Beck & Katz (2001). To capture heterogeneity across individual units, I estimate a non-hierarchical, multilevel model with crossed random effects for initiator (ζ_i) and target (ζ_j).[11] The precision of the estimates of ζ_i and ζ_j suggest that this model is more efficient than the pooled model. Even so, the estimate for $5\Delta\text{Convergence}_{ij}$ remains negative and highly significant.

[Table 2 about here.]

Models 7 and 8 consider two additional complications of MID data. Given the complexity of these models, I discuss only the main results, reserving a full discussion of model assumptions and

[10]In a fixed-effects linear probability model, which retains the full sample, the estimate for $5\Delta\text{Convergence}_{ij}$ is negative and significant at the 0.1% level.

[11]Mixed-effects models are sensitive to highly correlated covariates. Since the peace-years cubic splines are highly correlated, I drop them from the model and use only the peace-years count.

estimation procedures for the online appendix. First, many conflicts are not dyadic but 'k-adic' in nature, involving three or more states. Poast (2010) shows that disaggregating k-adic events into individual dyads may lead to biased parameter estimates. Model 7 uses the Poast (2010) method to organize the data into k-adic units of analysis, where each observation includes anywhere from 2 to k actors. The independent variables are operationalized as k-adic means. Second, conflicts are often interdependent, such that involvement by one state changes the probability of involvement for others (Ward, Siverson, & Cao, 2007). Using a stochastic actor-oriented model (SAOM) of network evolution (Snijders, 2001), Model 8 controls for specific first-order ('Activity'), second-order ('Reciprocity'), and third-order ('Balance') interdependencies in MID data. In both the k-adic model and the SAOM, the estimate for 5ΔConvergence$_{ij}$ remains negative and highly significant, even while estimates for many of the control variables change signs or significance. The effect of IGO convergence is highly robust to the myriad complexities of conflict data.

Effects of IGO heterogeneity

To test Hypotheses 2 and 3, I use data from Ingram, Robinson, & Busch (2005). I derive alternate versions of the 5ΔConvergence$_{ij}$ variable, based on convergence only in specific categories of IGOs. I re-estimate Model 4 using these alternate measures and generate predicted probabilities. Focusing first on each possible combination of structure and function, I estimate nine separate models. For example, in the case of military/political organizations, I separately estimate the effects of 5ΔConvergence$_{ij}$ in minimalist-military, structured-military, and interventionist-military IGOs. Figure 6(a) plots, for each model, changes in the predicted probability of MID initiation. Notably, convergence in military organizations, regardless of structure, has little substantive effect on conflict initiation—contrary to H2. Most likely, the member states of such organizations already share high levels of trust, and convergence offers little ex post information. Convergence in economic organizations, however, significantly reduces conflict initiation in two out of three categories. As predicted by H3, the strongest overall effect is produced by IGOs that are both economic and structured; for such organizations, a standard-deviation increase in 5ΔConvergence$_{ij}$ decreases the probability of conflict initiation by over 20%. Convergence in cultural IGOs reduces conflict only if those IGOs are structured or interventionist—in which case the effect is similar for both.

[Figure 6 about here.]

I also estimate the effects of convergence across IGO structures, without regard to function. As illustrated in Figure 6(b), while all three categories reduce the probability of conflict, structured IGOs exert the strongest effect. Finally, I estimate the effects of convergence across IGO functions, without regard to structure. As shown in Figure 6(c), military IGOs again have no statistically significant effect on conflict initiation. Cultural and economic IGOs, however, both significantly reduce conflict initiation, with economic IGOs exercising, by far, the strongest effect. These results strongly support H3 and provide virtually no support for H2. The effect of network convergence is strongest among mid-range IGOs, where opportunities for signaling aren't precluded by prohibitively high entry barriers, but states must nonetheless endure membership costs.

Convergence versus preferences

Finally, I address the possibility that reductions in conflict result not from convergence, but from shared preferences. The baseline model already includes S scores, but additional measures, such as τ_b scores and UNGA affinity scores, also require consideration. Interestingly, these indices are closely related to structural equivalence, as they use relational data to measure similarity in states' structural positions. Specifically, the S and τ_b indices employ data on formal military alliances, while the affinity index uses data on voting in the UN General Assembly.[12] For each measure, I calculate both ij preference similarity at time t and changes in preferences between $t-5$ and t (calculated identically to $5\Delta\text{Convergence}_{ij}$). This approach controls not only for shared preferences, but also for preference convergence. Table 3 displays correlations between $5\Delta\text{Convergence}_{ij}$ and each of the preference measures. The low correlations suggest that network convergence is a distinct empirical phenomenon.

[Table 3 about here.]

[12] See, respectively, Signorino & Ritter (1999); Bueno de Mesquita (1975); and Gartzke (1998).

I estimate six different versions of Model 4, one for each of the preference measures. Figure 7 uses predicted probabilities from these models to precisely illustrate the relationship between preferences and network convergence. Note, first, that the estimates for $5\Delta\text{Convergence}_{ij}$ are entirely unaffected by the inclusion of the preference measures, remaining negative and significant in all six models, while the effect of shared preferences is significantly negative in only half the models. (See the respective legends of Figure 7 for estimates and standard errors.) More importantly, the predicted probabilities show that the impact of network convergence is both distinct from and substantively stronger than the impact of shared preferences. Indeed, of the preference measures, only $5\Delta\text{Affinity}_{ij}$ approaches network convergence in the strength of its influence. Even so, this influence in no way confounds the important role of convergence. The results reconfirm Hypothesis 1. The effect of convergence is not spurious, but is distinct from and, in fact, more powerful than the effect of preferences alone.

[Figure 7 about here.]

Conclusion

Overall, the results strongly support the hypothesis that network convergence credibly signals trustworthiness. Additional robustness checks in the online appendix show that the effect of convergence cannot be explained by regional heterogeneity, economic development, or alternative model specifications. The evidence shows simply that as states converge in their IGO memberships, they become increasingly less likely to initiate disputes against one another. This pacific effect emerges definitively around the five-year mark and is strongest over periods of eight to ten years, where it is best positioned to corroborate a state's preference for cooperation over conflict.

The theory and empirics developed here offer a unique take on the IGO-conflict relationship. Rather than grounding the pacific influence of IGOs in their capacity to serve as neutral mediators or to intervene in conflicts directly, this analysis locates IGO influence in macro-level membership patterns, where a state's IGO portfolio acts as an instrument for credibly signaling cooperative intent. The positions of states in the global IGO network—and the micro-level changes they effect in order to alter their positions—reveal strategically valuable information about how those states see themselves in the international system and how they relate to others.

This analysis carries numerous implications. It allows a role even for weak and seemingly inefficacious organizations, the existence of which often puzzles orthodox approaches to IGOs. It also emphasizes *membership*—and not just institutional characteristics—as a distinctive and strategically valuable characteristic of IGOs. As well, the theory identifies avenues of credible communication that are often ignored. The possibility of signaling trustworthiness indirectly, through structural ties and network convergence, creates new signaling opportunities for states that lack direct means of sending credible signals to potential partners, such as newly emergent or post-transition regimes. Finally, the analysis contributes to the growing evidence on the value of network analysis in the study of international relations. Rather than merely adopting network measures without considering theoretical implications, the approach here explicitly ties network concepts to prevailing issues in international relations, thus illustrating how network analytics bring complex causal dynamics into sharp relief.

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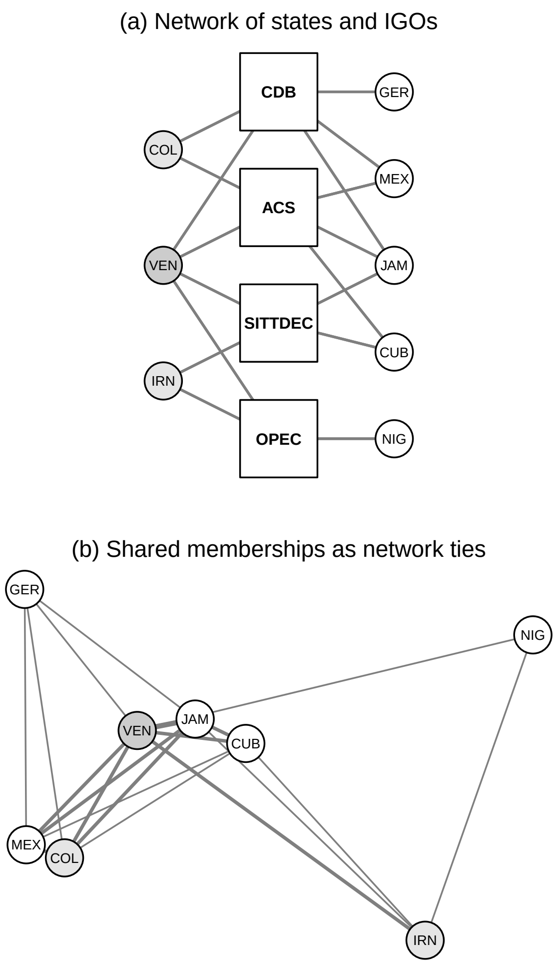

Figure 1: Structural similarity in an IGO network

In (a), lines indicate state-to-IGO memberships. In (b), lines indicate state-to-state comemberships; node positions determined by multidimensional scaling with slight jittering; proximate nodes are more structurally similar. See fn. 2 for acronyms.

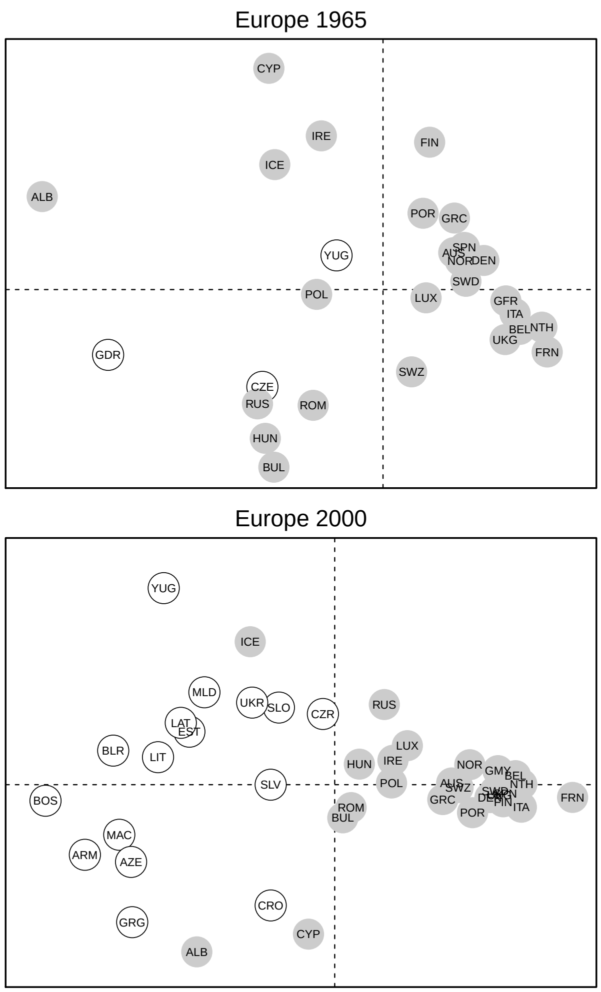

Figure 2: Structural similarity in Europe

Node positions determined by multidimensional scaling with slight jittering. Proximate nodes are more structurally similar. Gray nodes are countries present in both years. See online appendix for acronyms.

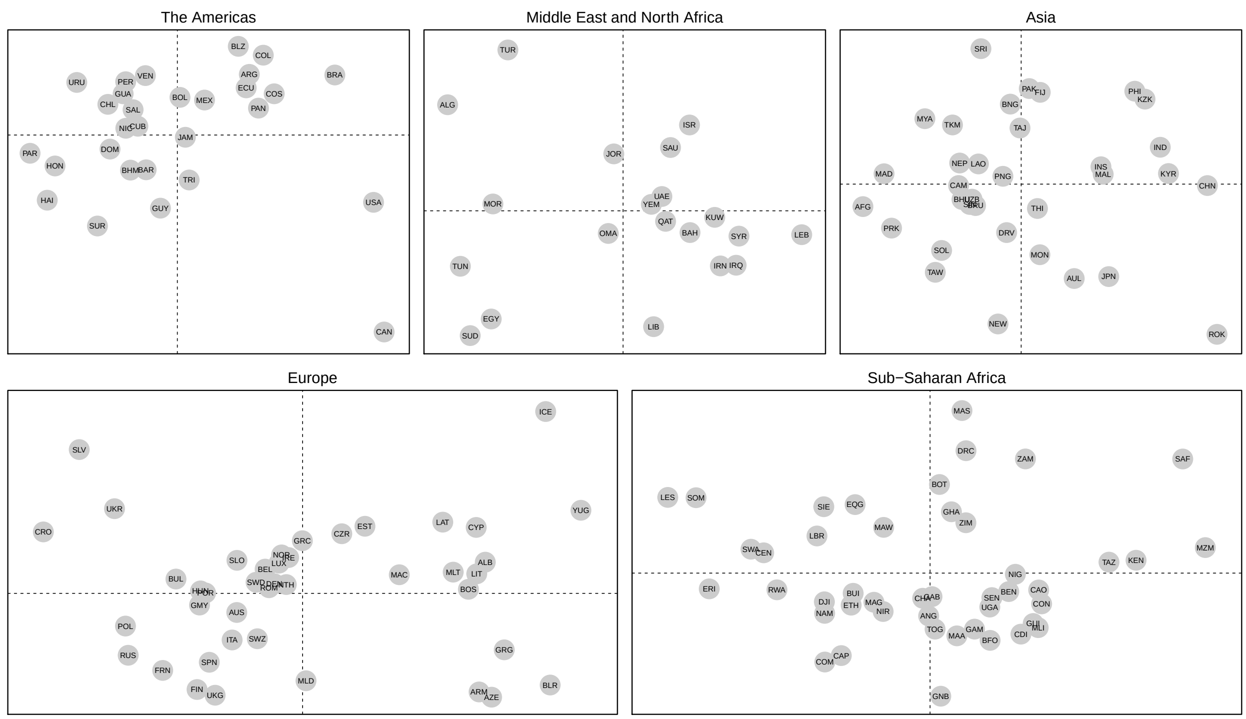

Figure 3: Network convergence from 1995 to 2000

Proximity of nodes indicates extent of convergence over a five-year period (5ΔConvergence). Node positions determined by multidimensional scaling with slight jittering. See online appendix for acronyms.

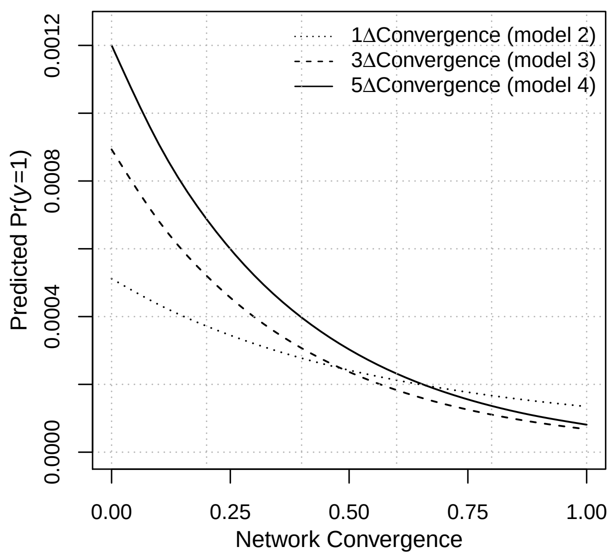

Figure 4: Effect of convergence on probability of dispute initiation

Lines show predicted pr(MID) across levels of convergence. Convergence variables standardized between zero and one. Controls held at respective means.

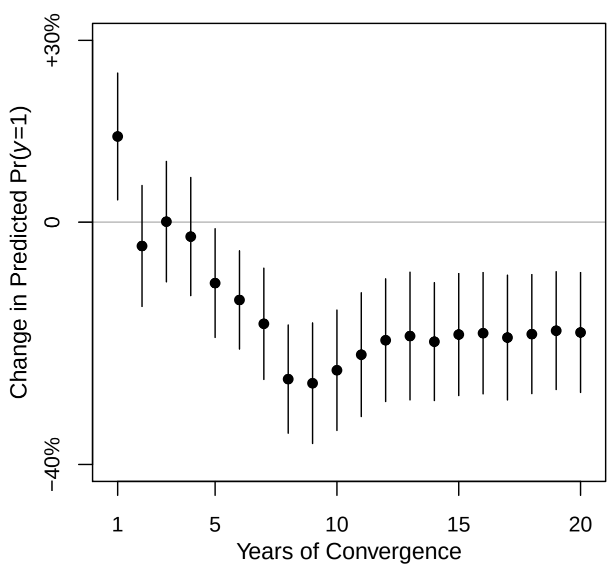

Figure 5: Effect of network convergence over 20 years

Dots indicate estimated percentage change in pr(MID) for an increase in convergence of one standard deviation (from the mean). Lines are 95% confidence intervals. Estimates drawn from 20 separate regressions of 289,124 dyad-year observations. Controls held at respective means.

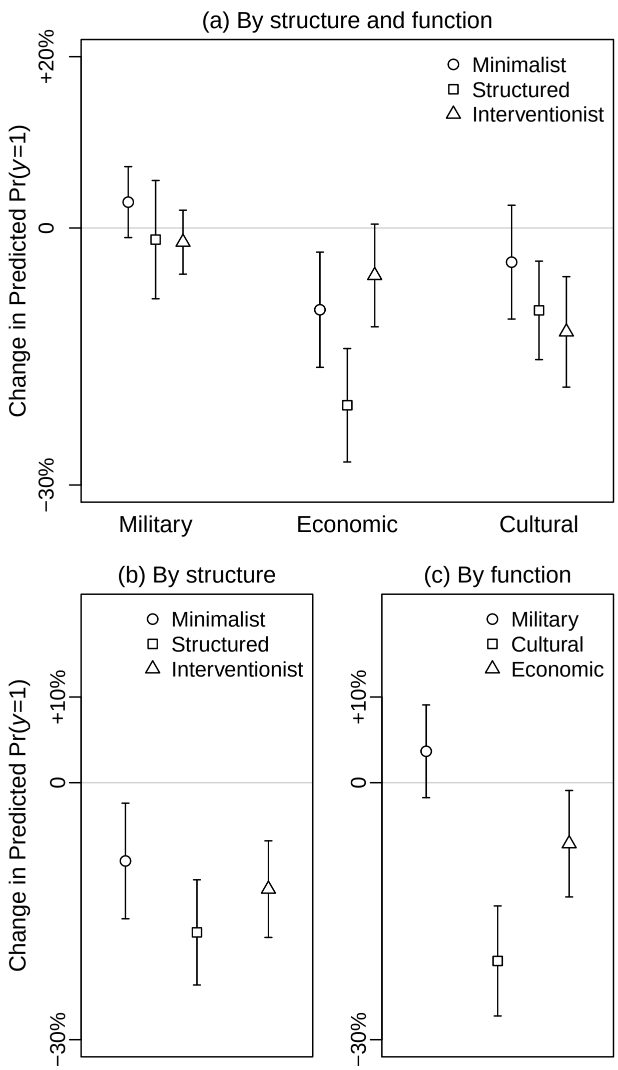

Figure 6: Effect of IGO heterogeneity

Symbols show estimated percentage change in pr(MID) for an increase in $5\Delta\text{Convergence}_{ij}$ of one standard deviation (from the mean). Lines are 95% confidence intervals. Estimates drawn from 15 separate regressions of Model 4, using alternate IGO categories. Controls held at respective means.

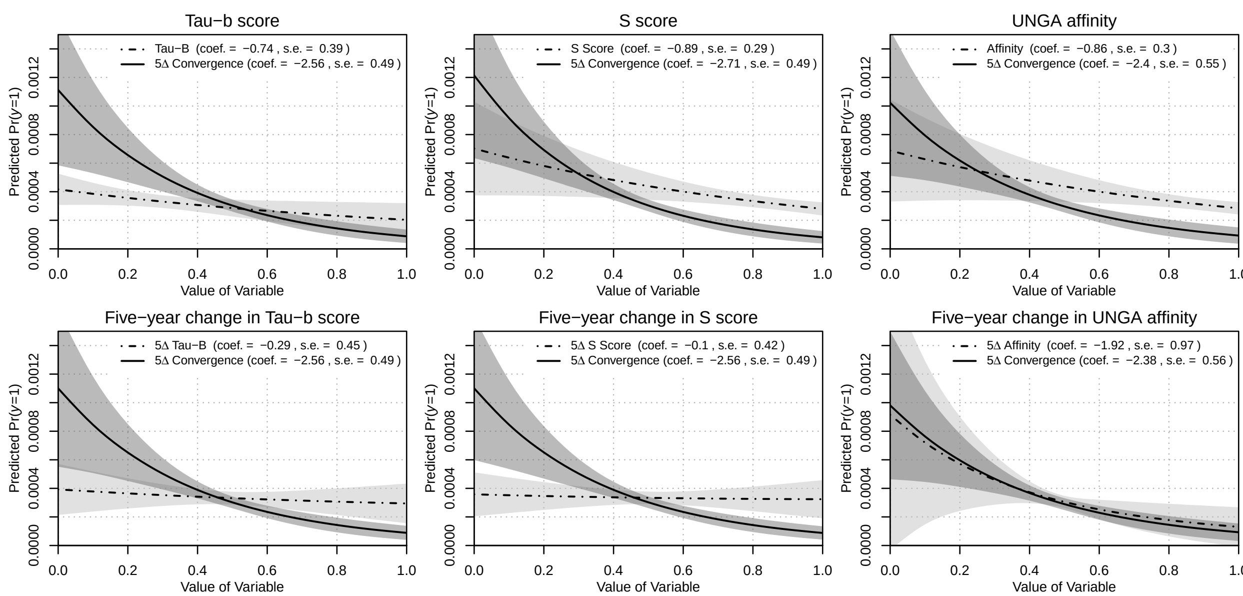

Figure 7: Effect of network convergence versus effect of shared preferences

Each panel represents a separate regression, with corresponding parameter estimates and standard errors shown in legends. Lines show predicted pr(MID) across levels of convergence/preferences. Shaded areas are 95% confidence intervals. All measures standardized between zero and one. Controls held at respective means.

Table 1: Effect of IGO network convergence on MID initiation, 1970–2000

	(1) MID	(2) MID	(3) MID	(4) MID
$1\Delta \text{Convergence}_{ij}$		-1.161		
		(0.665)		
$3\Delta \text{Convergence}_{ij}$			-1.939***	
			(0.411)	
$5\Delta \text{Convergence}_{ij}$				-1.760***
				(0.317)
S Score_{ij}	-0.700***	-0.713***	-0.625***	-0.577**
	(0.190)	(0.191)	(0.190)	(0.188)
IGOs_{ij}	0.0126**	0.0124**	0.00474	0.000979
	(0.00389)	(0.00392)	(0.00422)	(0.00432)
Democracy_{low}	-0.0642***	-0.0631***	-0.0483***	-0.0380***
	(0.00973)	(0.00975)	(0.00978)	(0.00970)
Dependence_{ij}	-0.00284	-0.00224	0.00364	0.00698
	(0.00869)	(0.00870)	(0.00877)	(0.00882)
Capabilities_{ij}	0.252***	0.251***	0.246***	0.239***
	(0.0208)	(0.0207)	(0.0202)	(0.0201)
Alliance_{ij}	0.0838	0.0877	0.126	0.127
	(0.142)	(0.142)	(0.139)	(0.138)
Contiguity_{ij}	2.480***	2.412***	2.743***	3.338***
	(0.676)	(0.676)	(0.681)	(0.682)
Distance_{ij}	-0.631***	-0.633***	-0.633***	-0.636***
	(0.0562)	(0.0560)	(0.0560)	(0.0563)
Constant	2.962**	3.070**	3.035**	2.549**
	(0.942)	(0.943)	(0.944)	(0.935)
N	715712	715414	688850	660366
Pseudo R^2	0.348	0.349	0.358	0.364
BIC	10475.3	10478.1	10018.2	9710.2
Log Likelihood	-5143.3	-5137.9	-4908.3	-4754.6

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Binary logit model. Robust standard errors in parentheses, clustered on dyads. Estimates for system size, peace years, and cubic splines not shown.

Table 2: Effect of IGO network convergence on MID initiation, 1970–2000

	(5) MID[a]	(6) MID[b]	(7) MID[c]	(8) MID[d]
5ΔConvergence$_{ij}$	-1.064**	-1.434***	-6.683***	-4.078***
	(0.355)	(0.315)	(1.343)	(0.375)
S Score$_{ij}$	0.592	-0.903***	4.847**	-0.655***
	(0.408)	(0.214)	(1.808)	(0.157)
IGOs$_{ij}$	0.0123	0.0134**	0.0453*	0.004
	(0.00716)	(0.00485)	(0.0210)	(0.004)
Democracy$_{low}$	-0.00541	-0.0375***	-0.177***	-0.045***
	(0.0128)	(0.00985)	(0.0521)	(0.008)
Dependence$_{ij}$	-0.0146	0.000404	-0.0685	-0.014
	(0.0118)	(0.00802)	(0.0592)	(0.007)
Capabilities$_{ij}$	-0.190	0.263***	0.668***	0.274***
	(0.104)	(0.0355)	(0.112)	(0.022)
Alliance$_{ij}$	-0.519*	0.129	-2.161**	0.177
	(0.208)	(0.139)	(0.669)	(0.109)
Contiguity$_{ij}$	1.916*	4.268***	24.77***	1.921***
	(0.818)	(0.576)	(1.150)	(0.121)
Distance$_{ij}$		-1.016***	-0.923***	-0.087***
		(0.0615)	(0.209)	(0.004)
ζ_i		1.121***		
		(0.096)		
ζ_j		0.841***		
		(0.074)		
Activity				0.349***
				(0.050)
Reciprocity				0.368*
				(0.148)
Balance				-0.118***
				(0.016)
Constant/Density		1.972*	-10.40***	-7.88***
		(0.971)	(0.661)	(0.135)
N	12561	660366	259501	–
BIC	4994.3	9538.4		
Log Likelihood	-2435.8	-4675.4		
Method	FE Logit	ME Logit	*k*-adic	SAOM

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Estimates for system size, peace years, and cubic splines not shown. Standard errors in parentheses.

[a] Time-invariant effects dropped. 29,039 dyads dropped due to no nonzero outcomes. χ^2 of LR test = 272.61. Prob > χ^2 = 0.000.

[b] Log-likelihood based on Laplacian approximation with one integration point per level. Cubic splines excluded. χ^2 of LR test = 829.76. Prob > χ^2 = 0.000.

[c] Rare-events logit. Standard errors clustered on dyads. Includes all *k*-adic disputes of $k \leq 5$, plus a sample of non-dispute *k*-ads equal to 10 times the number of dispute *k*-ads. All RHS variables operationalized as *k*-adic means.

[d] Simulated method of moments. Iterations $\beta = 1873$. Iterations s.e.(β) = 5000. $N_{1970} = 75$. $N_{2000} = 174$. All convergence t-ratios < 0.1 (excellent convergence).

Table 3: Correlation between network convergence and preferences

Variables	5ΔConv.	τ_b	$5\Delta\tau_b$	S	$5\Delta S$	Aff.	5ΔAff.
5ΔConvergence	1.000						
τ_b	0.061	1.000					
$5\Delta\tau_b$	0.050	0.286	1.000				
S	-0.030	0.354	0.094	1.000			
$5\Delta S$	0.000	0.083	0.288	0.143	1.000		
Affinity	-0.030	0.130	0.030	0.457	-0.037	1.000	
5ΔAffinity	-0.006	-0.010	0.026	-0.049	0.020	0.270	1.000

Column titles truncated for space

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Data replication: An online appendix and replication files can be found at `http://www.prio.no/jpr/datasets` and at `http://dvn.iq.harvard.edu/dvn/dv/bkinne`. The analysis was conducted in Stata MP 11.2 and `R` 3.0.0.