The Social Dynamics of International Organization Membership*

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Abstract

Why do states join international organizations (IOs)? Cooperation theory offers a number of plausible answers to this question. However, empirical analysis of IOs has not kept pace with theory. We identify three key limitations in existing empirical research on IO membership. First, the units of analysis commonly used to model membership, such as the country-year or dyad-year, do not sufficiently distinguish between the attributes of states and the attributes of IOs. Not only do states select IOs, but IOs also select states, which necessitates careful attention to the attributes of each. Second, empirical models generally ignore the match quality between countries and IOs, implicitly assuming that all IOs are equally accessible to all countries. In practice, many IOs are functionally off-limits to large numbers of states, while others attract only certain types of states. Third, although cooperation theorists have long argued that IO membership is partially influenced by social effects, where the IO memberships of some states influence the memberships of others, few empirical models incorporate social effects into the analysis. We address these limitations by modeling IO membership as a dynamic affiliation network. Using newly collected data at the state-IO level, we build an inferential network model that addresses all three of the above limitations. The analysis shows that state-IO match quality and social effects are, by far, the primary determinants of IO membership.

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Why do states join international organizations? Cooperation theorists have offered numerous answers to this question.[1] Yet, the empirical study of membership in formal intergovernmental organizations (IOs) has historically lagged behind theory. Until recently, IO membership was rarely treated as a dependent variable (with Jacobson, Reisinger, and Mathers (1986) and Shanks, Jacobson, and Kaplan (1996) as notable exceptions). Recent scholarship has revived interest in IO membership as an outcome worthy of analysis (e.g., Donno, Metzger, and Russett 2015; Poast and Urpelainen 2013). This increased attention, in turn, has generated promising new opportunities for reconceptualizing and refining the empirical analysis of membership.

This paper introduces an approach that theorizes and empirically models IO membership as a type of social network. As typically employed, social networks involve a population of nodes—such as individuals, firms, or countries—with ties or edges connecting the nodes to one another. Yet, networks can take many forms. Of particular relevance to IOs is the *affiliation network*, which has been extensively employed in other fields—such as legislative processes, management, and industrial organization—to model affiliations between actors and events. An affiliation network consists of two heterogeneous populations of nodes, where ties form between populations but not within them. This framework is often used to explain individual organizational memberships, as in directors on corporate boards (Mizruchi 1996) and, most famously, southern women and the social functions in which they participate (Breiger 1974; Davis, Warner, Gardner, and Gardner 1941; Homans 1950). Additional well-known examples include soccer players and the clubs for which they play (Onody and de Castro 2004), music fans and their favored music genres (Lambiotte and Ausloos 2005), or national economies and export products (Hidalgo and Hausmann 2009).

Defining IO membership as an affiliation network offers numerous benefits. First, because the affiliation network builds upon a state-IO unit of analysis, it places states and IOs on equal footing, allowing us to consider simultaneously the attributes of both. Thus, we need not rely on dyadic or country-level counts of IO membership, or focus only on membership in particular IOs. Instead, we include the full population of both states and IOs, with relevant covariates for each group. In short, affiliation networks eliminate the unit-of-analysis problem. Second, because the network

[1] See, e.g., Abbott and Snidal (1998); Gilligan and Johns (2012); Koremenos, Lipson, and Snidal (2001); Martin and Simmons (1998); Stein (1982).

approach incorporates covariates at both the state and IO level, it allows us to precisely specify the conditions that "match" states with IOs. Membership is largely a matter of "fit" between state and IO (cf. Poast and Urpelainen 2013). However, due to the unit-of-analysis problem, empirically implementing fit or match quality is difficult. The affiliation network allows us to incorporate state-IO determinants of match quality, such as geography, economic development, culture, regime type, and so on. Third, the network approach allows us to directly assess social dynamics in IO membership—a phenomenon that many have alluded to but few have empirically explored (e.g., Abbott and Snidal 1998; Barnett and Finnemore 2004; Johnston 2001). The well-known pathologies of IOs suggest that efficiency gains are only part of the story (Barnett and Finnemore 1999; Haas 1990). Abbott and Snidal (1998) argue that IOs act as community representatives (see also Deutsch, Burrell, Kann, Lee, Lichterman, Lindgren, Loewenheim, and Van Wagenen 1957). If states join IOs not simply to achieve the immediate gains bestowed by membership, but also to strengthen an emergent shared community, we should observe states responding not only to an IO's institutional characteristics, but also to the membership patterns of other countries. For example, states may prefer to join IOs whose members are, on average, "like them" in key respects. Or, in a direct reflection of social influence, states may prefer to join IOs only with their current, well-established IO partners. Of course, these social dynamics are not devoid of strategic interests. As scholars of political community have long argued, a coherent, well-developed sense of community helps states better achieve their goals (Abbott and Snidal 1998; Adler and Barnett 1998; Boehmer and Nordstrom 2008; Deutsch et al. 1957; Lupu and Traag 2013; Risse-Kappen 1996).

Employing newly collected country-IO data, we model IO membership as an affiliation network for the period 1965–2005. We show that membership is a function of (1) the attributes and characteristics of both state and IOs, (2) a tendency for states to join IOs composed of members similar to themselves, (3) the dyadic "match quality" between states and IOs, and (4) social dynamics generated by and endogenous to the IO network itself. The results show that, of these various influences, the latter two—i.e., the quality of the match between state and IO, and endogenous network influences—are by far the strongest predictors of IO membership.

1 Literature Review

Early work on international organizations emphasized the role of political community, as exemplified by security organizations in the North Atlantic (Deutsch et al. 1957). Subsequent inquiries focused on explaining outcomes and processes within specific IOs, such as voting patterns in the United Nations General Assembly (Alker and Russett 1965). These approaches eventually gave way to the more theoretical arguments of regime theorists and liberal institutionalists, both of which focused on how international institutions—including but not limited to formal international organizations—help states overcome transaction costs, information asymmetries, and larger collective-action problems.[2] More recent approaches combine the interests of states in advancing their goals with questions of rational institutional design, effectively arguing that the institutional features of organizations are both an outcome of state interests and a means of facilitating achievement of those interests (e.g., Koremenos 2005; Koremenos, Lipson, and Snidal 2001; Martin and Simmons 1998).

Yet, despite these promising theoretical advances, empirical studies of IOs—especially studies that treat membership as a dependent variable—remain relatively rare.[3] More commonly, IO membership is employed as one of many exogenous covariates, as in the voluminous liberal peace literature (Pevehouse and Russett 2006; Russett, Oneal, and Davis 1998). Those studies that do focus on IO membership as an outcome tend to be constructed monadically, with the goal of determining why some states join more IOs than others. For example, both Jacobson, Reisinger, and Mathers (1986) and Shanks, Jacobson, and Kaplan (1996) find that a state's tendency to join IOs depends on such factors as economic size, democracy, and development. Pevehouse (2005) more specifically suggests that leaders in democratizing states join IOs in order to signal their commitment to political reform, a hypothesis supported by evidence from Mansfield and Pevehouse (2006, 2008). Poast and Urpelainen (2013) amend this democratizing logic slightly, arguing that fledgling democracies prefer to create new IOs rather than join existing IOs. Additional analyses have shown that IO

[2] See, among others Krasner (1983), Keohane (1984), and Martin and Simmons (1998: 738).

[3] We refer here to studies of IOs as a general phenomenon. Studies of membership in *specific* institutions are, in contrast, abundant. These include studies of accession to the World Trade Organization (e.g., Davis and Wilf 2016; Jones 2009; Pelc 2011), the European Union (e.g., Gray 2009; Moravcsik and Vachudova 2003), the International Criminal Court (e.g., Chapman and Chaudoin 2013; Simmons and Danner 2010), and numerous others.

membership may be influenced by majoritarian electoral systems (Rey and Barkdull 2005), or by the number of veto points in a political system (Minnich 2005).

Boehmer and Nordstrom (2008), motivated by an interest in IOs as political community, take the important step of examining IO membership as a dyadic phenomenon. They find that pairs of states are likely to share more IO memberships if they are democratic, trade dependent, mutually economically developed, geographically proximate, militarily allied, and/or mutually "active" in international politics. However, this pooled dyad-year approach, by reducing memberships to dyadic counts of shared ties, effaces the unique characteristics and structural features of IOs, while also ignoring completely both the determinants of match quality between states and IOs, and the potential for endogenous influences in IO membership.

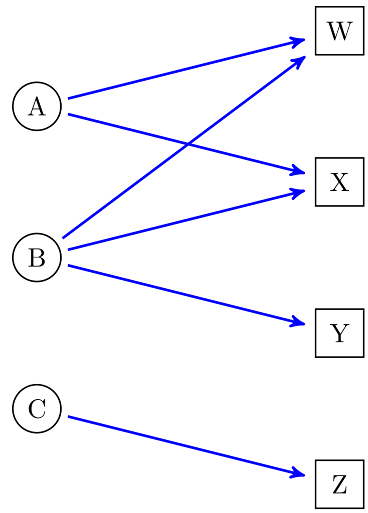
Donno, Metzger, and Russett (2015) provide, to our knowledge, the only study of IO membership that employs a state-IO-year unit of analysis. Specifically, the authors argue that IOs "screen" for risk when admitting new members, preferring not to admit members that could potentially destabilize relations and/or invoke collective punitive actions. Although this analysis clearly moves beyond problematic country-year and dyad-year units of analysis, it nonetheless suffers from the same two methodological problems as Boehmer and Nordstrom (2008). That is, it does not sufficiently control for match quality between countries and IOs, and it does not consider the possibility of endogenous network influences.

2 Theory

Our theory addresses three fundamental issues in the study of IO membership. While these issues carry important methodological implications, they are, first and foremost, issues of theoretical interest. First, what is the appropriate unit of analysis for theorizing and modeling IO membership? Second, how do we match states to IOs? And third, are there important endogenous influences that drive IO membership?

Our responses to these issues employ the concept of an affiliation network, which is a type of

Figure 1: Illustration of an Affiliation Network



Note: Circles are actors (e.g., countries). Squares are events (e.g., IOs). Edges indicate membership of actor in event.

bipartite or two-mode network (which, in turn, constitute a specific subclass of multilevel networks). The affiliation network, illustrated in Figure 1, consists of two distinct groups of nodes, typically referred to as *actors* and *events*. Ties form between actors and events, but not between actors themselves or between events themselves. In a directed affiliation network, such as the one in Figure 1, one set of nodes (in this case, the actors) is assumed to initiate the ties, while the other set of nodes acts as recipients, targets, or sinks.

In the case of IO networks, the actors are states, and the events are organizations. The affiliation network is an intuitive and empirically accurate representation of IO membership. The building blocks of the network are state-IO dyadic pairings, which can be represented as an asymmetric rectangular matrix, where rows correspond to states and columns correspond to IOs, and where matrix entries indicate whether a given state belongs to a particular IO. In short, this representation of IO membership reflects the long-standing observation that the country- and dyad-level frameworks typically employed in IR are inadequate for the study of IO membership (Donno, Metzger, and Russett 2015).

2.1 The unit of analysis

Theories of IO membership—or of participation in international institutions more generally—typically subsume the unit-of-analysis problem into a game theoretic setting. Institutions are modeled as a strategic interaction in which two or more actors (i.e., states) must decide whether to cooperate, and the design of the institution dictates the terms of cooperation, such as the distribution of gains, risk of noncompliance, necessity of monitoring, and so on. In this framing, the question of IO membership can be thought of as a more specific question about why states cooperate, with the formal organization offering a particular set of incentives (Gilligan and Johns 2012).

The cooperation literature makes clear that institutional design is crucially important in determining when, where, and how cooperation will occur. Yet, the units of analysis typically employed in empirical IR research do not allow us to accurately model the influence of institutional characteristics. For example, the commonly used state- and dyad-level units of analysis require counts of IO membership, which ultimately conflates all IOs. Of course, we might separately assess i's probability of joining specific IOs (or, separately, assess i and h's probability of sharing membership in a specific IO), but such an approach is not easily generalized to the 400+ IOs currently in existence.

Because the network approach builds upon a country-IO unit of analysis, it allows us to separately consider the monadic characteristics, such as variation in institutional design, of each IO in the network. In this framing, instead of asking why i and h share membership in many IOs, or why i joins more IOs than h, we simply ask why i pursues membership in some IO j. We then control for important monadic attributes of both the prospective member state and the IO. States and IOs are thus on equal footing. (Throughout, we use i and h to refer states, and j and k to refer to IOs.)

At the same time, analysis of affiliation networks allows us to retain cooperation theorists' focus on IO membership as a type of strategic interaction. That is, analysis is not limited only to the respective monadic attributes of states and IOs. We can also consider the potential for strategic interactions between an i prospective member state and the various h member states of an IO. For example, i may prefer to join IOs where the h current member states are wealthier, more democratic, or more open to trade. Or i may prefer to join IOs whose members are similar to itself in regime type, wealth, or military power. This latter effect corresponds to homophily, or an attraction of actors for ties to similar others (McPherson, Smith-Lovin, and Cook 2001).

The various monadic features that influence membership are too numerous to develop separate hypotheses for each. In general, based on existing literatures, we expect that countries that are more democratic, wealthier, and more powerful are more likely to join IOs (Jacobson, Reisinger, and Mathers 1986; Shanks, Jacobson, and Kaplan 1996). Further, IOs that address economic issues should be especially popular targets for membership, as should less institutionalized IOs.

2.2 Match quality

The country-IO unit of analysis, despite its intuitive appeal, raises a dilemma. As others have noted, IOs are diverse (Boehmer, Gartzke, and Nordstrom 2004; Ingram, Robinson, and Busch 2005; Poast and Urpelainen 2015). While some IOs address topics that uncontroversially appeal to all states, such as postal services and telecommunications, other IOs focus on narrow issues. The African Groundnut Council or the Coalition for Rainforest Nations, for example, likely hold appeal for only a very few countries. In short, not all IOs are equally accessible to all countries. The affiliation network approach, and its reliance on the state-IO unit of analysis, encourages us to think about specific ways in which states match to IOs. Many IOs explicitly employ some form of limited membership. For example, the Organization for Petroleum Exporting Countries (OPEC) limits membership to countries with "a substantial net export of crude petroleum." Other IOs may be *de jure* open to all independent states but, *de facto*, are likely to be pursued by only a handful of countries. The Cocoa Producers Alliance (CPA), despite being nominally open to any state, is most likely to attract countries with substantial cocoa production and/or large volumes of cocoa exports. This problem of unequal access is not merely theoretical. If the IO membership dataset includes country-IO pairings that are empirically unlikely or even impossible, then estimates of a statistical model's parameters will almost certainly be biased. We thus cannot model IO membership without first considering which countries are eligible to join which IOs. We address this problem using the concept of *match quality*, which refers to the potential for a "fit" between i and j. In some cases, match quality is deterministic, meaning that i is either eligible for membership in j or not (e.g., OPEC). In other cases, match quality is probabilistic, increasing or decreasing the probability of i joining organization j but not imposing strict (in)eligibility rules (e.g., CPA).

We distinguish ten types of match quality, of which the most important, by far, is geography. Well over half of the world's IOs are regional organizations, intended to attract membership only from the countries of a particular geographic area. Many regional IOs impose strict geographic requirements. Only African states are permitted full membership in the African Union. Only countries in the Americas may join the Organization of American States (OAS). We refer to any such strict criterion as a *hard match*, as it permits no ambiguity about who may and may not join. Other regional IOs employ looser criteria, remaining ambiguous about who may join. The Asian Development Bank (ADB), for example, focuses on development issues within Asia, but its membership includes numerous extraregional states. We refer to these more ambiguous criteria as a *soft match*. Although Asian countries are more likely to join the ADB (i.e., a soft match between Asian countries and the ADB increases the probability of membership), they are not the only countries permitted to do so. This framing allows us to construct two separate variables for each dimension of match quality: one that indicates whether a hard regional match exists between i and j, and another that indicates whether a soft regional match exists.[4]

The ten dimensions of match quality are as follows:

- *Region.* A regional match between state i and IO j indicates that i is geographically located within j's region of emphasis. The majority of IOs include some sort of regional emphasis. This category also includes cases where an IO limits membership only to members of other IOs. For example, the Inter-American Children's Institute is accessible only to OAS member states, while the Arab Fund for Economic and Social Development is open only to members of the Arab League. In these cases, an ij match indicates that i fulfills the stated prerequisite

[4] Insofar as a hard match effectively makes membership impossible for those countries that fall outside the IO's membership criteria, a simple control variable is insufficient. In such cases, a zero value for the dependent variable erroneously implies that, although i is not currently a member of IO j, it potentially could become a member. Thus, rather than including a separate variable for regional hard matches, we code the dependent network variable to include "structural zeros," i.e., pairwise matrix entries where a network tie is not only absent, but impossible.

for membership in j.[5]

- *Development.* An economic development match between i and j indicates that i falls within a category of development—e.g., developed versus least-developed economies—emphasized by the IO. Examples at the IO level include the Organization for Economic Cooperation and Development (OECD) and the International Bank for Reconstruction and Development (IBRD).

- *Language.* A language-based ij match indicates that at least 1% of country i's population speaks a language emphasized by j, as defined by Maoz (2013). Examples include the Latin Union and Agence de la Francophonie.

- *Ethnicity.* An ethnic ij match indicates that i's dominant ethnicity matches an ethnicity emphasized by organization j. Examples include the League of Arab States and the Joint Administration of the Turkic Culture and Arts.

- *Commerce.* A commercial ij match indicates that country i exports/imports a good or service emphasized by j, specifically at levels exceeding 1% of total global export/import of that good or service. Examples include the Union of Banana Exporting Countries and the International Tin Council.

- *Industry.* An industry-based ij match indicates that country i produces a good or service emphasized by j, specifically at levels exceeding 1% of global production of that good or service. Examples include the International Bauxite Association and the Cocoa Producers Alliance.

- *Science.* For organizations that emphasize science, technology, and research, an ij match indicates that country i scores at least 100 on the World Bank's index of scientific and technical journal articles. Examples include the Joint Institute for Nuclear Research and the International Office of Epizootics.

- *Religion.* A religion-based ij match indicates that country i's dominant religion matches

[5] Many IOs are open only to UN member states. Since this criterion de facto covers all states (at least for recent years), we code such organizations as having open membership.

a religion emphasized by the organization. An example is the Organization of the Islamic Conference.

- *Environment.* An environmental ij match indicates that country i is geographically affected by or otherwise interested in issues covered by organization j. Examples include the International Coral Reef Initiative and the Congo Basin Forest Partnership.

- *Finance.* All financial organizations are currently coded as open membership.

The expected impact of match quality is straightforward:

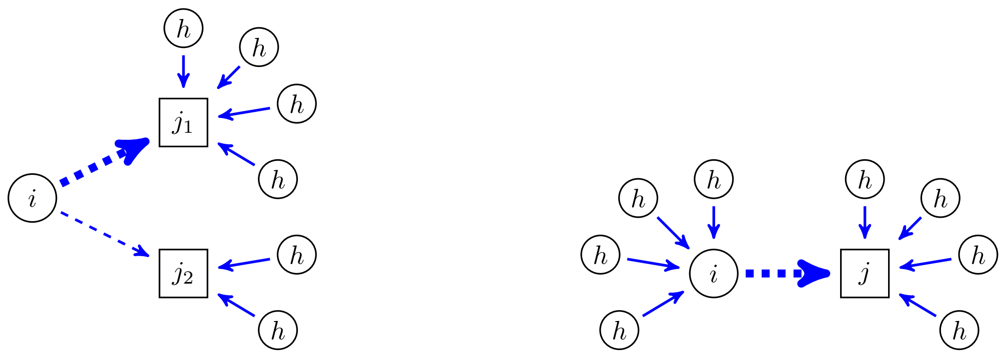
Hypothesis 1 *The better the match quality between a state and an IO, the more likely the state is to join that IO*

2.3 Social dynamics

In principle, both the unit-of-analysis problem and the match quality problem can be addressed via a country-year unit of analysis. The greatest contribution of the network approach, however, is its ability to provide theoretical and methodological tools for understanding the social dynamics of IO membership. Networks do not merely consist of nodes and edges. They also involve interdependencies, where the probability of a state-IO tie between a given i and j depends on the absence or presence of other state-IO ties in the network. Put differently, states are influenced in their IO membership by the membership patterns of other states.

Interdependence in networks, as in IR more generally, takes many forms. We focus on three fundamental network influences. First, we consider degree-based *preferential attachment*, a so-called first-order network effect. In a preferential attachment process, when forming new ties, nodes preferentially attach to the most popular or high-degree nodes, where degree is defined simply as a node's current number of network ties (Newman 2001). This process, which is also known as the "Matthew effect" or "rich get richer," should result in networks consisting of a few high-degree nodes, or "hubs," and a much larger number of low-degree nodes—i.e., "scale-free"

Figure 2: Degree and Assortativity in an Affiliation Network



(a) Preferential attachment

(b) Degree-based assortativity

Note: Circles are states. Squares are IOs. Solid lines are memberships. Dashed lines are prospective memberships.

networks (Barabási and Bonabeau 2003; Maoz 2012). Figure 2(a) illustrates the basic logic, where country i faces a choice between IOs j_1 and j_2. If, ceteris paribus, node j_1's larger number of network ties—i.e., from the other h countries in the system—motivates i to choose j_1 over j_2, then a preferential attachment process may be at work. More generally, when preferential attachment exists, the $i \rightarrow j$ state-IO tie is endogenous to the other $h \rightarrow j$ ties in the network.

Why might preferential attachment drive IO membership? The literature on institutions suggests two possibilities. The first, somewhat heterodox possibility is that large organizations generate more substantial backpatting and opprobrium effects, which in turn increase group cohesion and enhance the efficacy of organizational actions (Johnston 2001). In this view, states should be attracted to the increased effectiveness of large-membership organizations, generating an empirically observable preferential attachment effect. The second, more widely held view is that large numbers create collective action problems. Large organizations see more free riding, monitoring problems, increased difficulty of actor-specific punishments and enforcement, and an overall reduction in efficacy (Koremenos, Lipson, and Snidal 2001; Oye 1986). Multilateralism involves a deeper/broader trade-off, where organizations with fewer members, ceteris paribus, are more flexible, less likely to experience paralytic free riding, and generally more focused on addressing specific, manageable issues.[6] In this case, we should observe a counter-preferential attachment process, where states avoid large organizations. We thus assess two hypotheses:

Hypothesis 2 *States are more likely to join IOs that have many members*

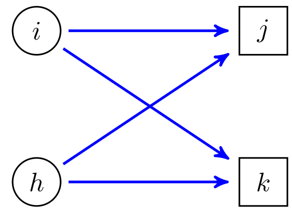
Hypothesis 3 *States are more likely to join IOs that have few members*

We also consider a second-order network effect, *assortativity*, which involves an interaction between the respective degrees of countries and IOs. Assortativity, also known as "assortative mixing" (Newman 2002), is closely related to homophily (i.e., "birds of a feather flock together") (McPherson, Smith-Lovin, and Cook 2001). Whereas homophily generally refers to the formation of ties between nodes that share key monadic attributes, assortativity refers specifically to the formation of ties on the basis of degrees or network activity (Newman 2003). We focus on "outdegree-indegree" assortativity, illustrated in Figure 2(b). In this scenario, countries that join large numbers of IOs are more likely to favor IOs that have large numbers of member states, while relatively less active countries favor IOs with smaller memberships.

The IO literature again offers competing theoretical perspectives on this possibility. Larger, more active states may push for membership in large-membership organizations in order to retain influence, set agendas, and/or employ those organizations' resources to their advantage. For example, Thompson (2006) argues that powerful countries work through the UNSC in order to signal benign intentions and reduce the costs associated with uses of force. Obversely, smaller, less-active countries may find it beneficial to join small-membership organizations, where they are more likely to exercise influence. Both of these possibilities—active countries favoring large IOs and less active countries favoring small IOs—suggest an assortativity process. On the other hand, if less active countries wish to gain an audience with more powerful countries, they may prefer larger organizations over smaller. At the same time, even if active countries favor large IOs, they may find themselves with a dearth of such IOs to join, given the relative abundance of regional organiza-

[6] The "large-N" problem is widely recognized by IR scholars. See, for example, Downs, Rocke, and Barsoom (1998); Johnston (2001); Stone, Slantchev, and London (2008). But also see Slapin and Gray (2014) for an opposing perspective.

Figure 3: Four-Cycle Closure in an Affiliation Network



Note: Circles are states. Squares are IOs. Lines indicate membership.

tions. These counter-arguments do not necessarily suggest a competing hypothesis, but they do imply that the assortativity hypothesis may not be accurate. We thus test a single hypothesis:

> **Hypothesis 4** *Highly active countries are more likely to join IOs that have large memberships, while less active countries are more likely to join IOs that have small memberships*

Third-order network effects involve more complex interdependencies. In typical one-mode or unipartite networks, transitivity is the most commonly studied form of third-order influence. Transitivity is essentially a closure process, where nodes form ties to friends of friends rather than venturing to form ties with socially distant others (Holland and Leinhardt 1971; Watts and Strogatz 1998). While transitivity is inapplicable to two-mode networks, we nonetheless anticipate closure dynamics. Specifically, we consider so-called "four-cycle closure" (Vu, Pattison, and Robins 2015). As Figure 3 illustrates, a four-cycle involves overlap in the membership portfolios of the actor nodes. If i and h form ties in such a way as to increase the correlation between their respective portfolios, then a closure process may be at work. Alternatively, i and h may form ties in a way that minimizes the degree to which they share ties in the same organizations (that is, they may avoid four-cycles), which would reflect a fractionalization process.

In short, four-cycle closure means that nodes prefer to form ties to the same IOs as their current IO partners. Consider again the illustration in Figure 1. Here, actor A is a member of two organizations, out of four possible. If A joins organization Z, A will not see an increase in four-cycles with either actor B or C. Indeed, the only member of Z is actor C, and C is not an actor with whom A currently has extensive organizational ties. In fact, A and C's ties are mutually exclusive. The two actors occupy distinct modules or neighborhoods within the network. In contrast, if A joins organization Y, the number of four-cycles between A and B increases by two. Assessing four-cycle closure thus allows us to measure tendencies toward in-group cohesion in IO membership, where states prefer to join IOs with already established partners—i.e., members of their current in-group—instead of venturing into relationships with new and/or untested partners.

This logic of closure and group cohesion is strongly supported by the IO literature. Deutsch et al. (1957) famously argued that IOs are integral to an emergent political community in the North Atlantic, tying participants together in a "network of expectations." Abbott and Snidal (1998) continue this logic, entertaining the possibility that IOs can create, implement, represent, and potentially reshape community values. Empirical studies of IO membership also often invoke the language of community. Boehmer and Nordstrom (2008), in modeling shared membership as a dependent variable, explicitly draw upon community analogies to explain why some states mutually participate in more IOs than others. Relatedly, Bearce and Bondanella (2007) find that increased collaboration in IOs leads to a convergence in states' foreign policy preferences—which the authors further interpret as a sign of political community.

Empirically, club-like groupings of states, based around overlapping memberships in particular subsets of IOSs, are a recurring feature of world politics (Kinne 2013). Third-world countries, for exampled, distinguished themselves through membership in institutions like the Nonaligned Movement and the Group of 77. Soviet-bloc states clustered around organizations like the Warsaw Pact, the Council for Mutual Economic Assistance, and the Communist Information Bureau. Today, the world's more economically developed states distinguish themselves with IOs like the Organization for Economic Cooperation and Development, and the Bank for International Settlements, as well as so-called club organizations like the G20 (Keohane and Nye 2002).

The motivations for political community and in-group cohesion need not be purely symbolic or immaterial. As articulated by Abbott and Snidal (1998), IOs allow states "to create social orderings appropriate to their pursuit of shared goals." In short, political community helps states achieve their interests. Two general mechanisms explain the utility of this strategy. First, uncertainty about preferences, as well as the inevitable potential for miscalculation in anarchy, leaves states inherently mistrustful of one another (Jervis 1978). Cooperation, especially at deep levels, requires trust (Kydd 2000*a*,*b*, 2005; Rathbun 2011). Ceteris paribus, levels of trust are higher among established collaborators and "friends of friends," which in turn reduces the risks—and thus the costs—of cooperation (Kydd 2001). In short, tendencies toward in-group cohesion represent a strategy for identifying trustworthy partners (Richters and Peixoto 2011). Second, having a cohesive group of established collaborators allows states to generate beneficial externalities from their IO memberships, such as issue linkages to new organizations or reputational mechanisms that enable previously unavailable forms of cooperation. For those states within the group, these externalities are essentially club goods—*excludable* from those outside the group, but *non-rivalrous* within the group (Buchanan 1965; Cornes and Sandler 1996; Olson 1965). Consequently, cooperating with those within the group yields a higher payoff, which engenders path dependence (Keohane 1988). A state's core group of collaborators constitutes an equilibrium that, once chosen, is "locked in" by the institutions that comprise it (Martin and Simmons 1998: 746).

Hypothesis 5 *States prefer to join the same IOs as their current IO partners*

3 Research Design

We represent the state-IO membership network as an $N \times M \times T$ stack of matrices, denoted $\mathbf{G}$, where N is the number of states in the system and M is the number of IOs, and T is the number of years or cross-sections of data. Let $\mathbf{g} = \mathbf{G}(t)$ be a specific $N \times M$ network matrix at time t. Then $g_{ij} = 1$ if state i is a member of IO j at time t, zero otherwise. Note that $\mathbf{g}$ is rectangular and asymmetric, such that $g_{ij} \neq g_{ji}$. In sum, the data are structured as a two-mode, longitudinal, directed, binary affiliation network.

We model the creation, maintenance, and termination of ties in the $\mathbf{G}$ network using a modified stochastic actor-oriented model (SAOM) of network evolution (Snijders 2001, 2005, 2008; Snijders, van de Bunt, and Steglich 2010). The SAOM is perhaps most intuitively described as an agent-based model in which statistical inference is achieved by comparing simulated network data to real-world networks, with the goal of selecting SAOM parameters that generate simulated networks that resemble as closely as possible the observed network data. The SAOM relies upon a nodal utility function, $f_i(\mathbf{g})$, which is assumed to apply identically to all actor nodes in the network $\mathbf{g}$. When creating or terminating ties, actors seek to maximize $f_i(\mathbf{g})$, which can be parameterized for a given i as a linear combination of various effects,

$$f_i(\beta, \mathbf{g}) = \sum_{m=1}^{L} \beta_m s_{im}(\mathbf{g}) \tag{1}$$

where $s_{im}(\mathbf{g})$ represents the $1 \ldots L$ user-specified variables that determine the formation, maintenance, and/or termination of ties in the network. In practice, these variables consist of five types of effects: (1) IO-specific monadic covariates, such as issue mandates; (2) country-specific monadic covariates, such as regime type or GDP; (3) similarity or homophily metrics, which reflect similarities between country i and the current members of j; (4) ij dyadic determinants of match quality, such as a regional complementarity between i and j; and (5) endogenous network influences (i.e., social dynamics), such as degree, assortativity, and/or four-cycles. Each specified s_{im} effect is weighted by a respective β_m parameter. In most cases, a negative β parameter estimate indicates that a specified effect discourages network tie formation, while a positive estimate indicates that a specified effect encourages tie formation.

Because the utility function contains endogenous terms, the model's parameters must be estimated via simulation. Snijders (2005) recommends simulated method of moments. We employ simulated method of moments estimation by first summing each $s_{im}(\mathbf{g})$ statistic over all i nodes in the network and all T years of observed data, which yields target statistics. An iterative Robbins-Monro Markov-chain Monte Carlo algorithm searches the parameter space and locates $\hat{\beta}$ values that generate simulated networks in which calculated target statistics are equal to those in the observed networks (Snijders 2005). The estimation algorithm incorporates a number of fundamental assumptions. First, the network evolves continuously, one tie at a time, with potentially large numbers of tie changes occurring unobserved between observation moments (i.e., between the T annual cross-sections of data). Second, actor nodes exercise individual agency in that they choose g_{ij} ties in such a way as to maximize the payoff from their respective utility function. That is, states select IO memberships that yield the largest return, which retains the assumption that states are rational actors (Koremenos, Lipson, and Snidal 2001). Third, the opportunity for actors to change ties is stochastically determined by a rate function, separate from the objective function. Fourth, once an actor changes a tie, that change is immediately reflected in the network structure for all remaining actors, which ensures that the network evolves in a truly continuous process.

3.1 Monadic country- and IO-level covariates

We consider a variety of influences at the country and IO levels, each of which enters Eq. 1 as an additional $s_{im}(\mathbf{g})$ network statistic. At the state level, we consider democracy, which is measured dichotomously, following Boix, Miller, and Rosato (2012). We also consider economic development, operationalized as log-transformed per-capita gross domestic product (Feenstra, Inklaar, and Timmer 2015). And, finally, we consider military power, operationalized as log-transformed Correlates of War CINC scores (Singer 1987). Our initial expectation is that democracy, wealth, and power should increase participation in IOs.

At the IO level, we rely upon the subject coding developed by Poast and Urpelainen (2015), which divides IOs into six mutually exclusive categories, based on substantive issue areas: economic, commodities, resources, political, technical, and other/miscellaneous. Specifically, we include an additional $s_{im}(\mathbf{g})$ statistic in the model for each IO category, coded as dummy variables, where a value of one indicates that the IO in question is of that type. We generally expect states to have a preference for economic and technical IOs, given the abundance of those particular types.

3.2 Country-IO homophily metrics

Our network perspective allows us to consider a unique form of homophily, which considers the degree of similarity between a prospective member state i and the current member states of IO j. The central question here, as elaborated previously, is whether i is more likely to join IOs whose current membership consists of states that are "more similar" to i in key respects. Specifically, drawing upon the state-level monadic covariates discussed above, we consider whether those current member states are, on average, similar to i in terms of regime type, levels of economic development, and/or military power. There exists substantial evidence not only that democracies are more active in IOs, but that democracies favor joining IOs with other democracies (Pevehouse and Russett 2006). Our expectations on wealth and power are less clear. On one hand, some IOs clearly focus on wealthy states, while other IOs are clearly intended to advance the interests of underdeveloped economies. Both examples suggest an income-based homophily effect between i and the current members of j, where countries at similar income levels prefer to collaborate with one another. On the other hand, many organizations, such as those devoted to economic underdevelopment, intentionally match underdeveloped with developed economies, which suggests a heterophilous rather than homophilous effect. Power likewise generates conflicting expectations. While powerful states clearly have a stake in international institutions (Foot, MacFarlane, and Mastanduno 2003; Ikenberry 2001; Mearsheimer 1995), well-known historical examples like NATO and the Warsaw Pact suggest that powerful countries prefer to partner with militarily dissimilar states rather than potential competitors.

3.3 Dyadic country-IO match quality

Controlling for match quality between the i prospective member and the j organization is, by far, the biggest data challenge. We collected extensive new data on both IOs and states in order to generate, on a case-by-case basis, reliable measures of dyadic state-IO match quality. For IOs, the data come primarily from the *Yearbook of International Organizations*, founding charters, secondary academic resources, and websites of IOs. Consistent with our theory, we generate ten separate controls for match quality, each of which enters Eq. 1 as an additional $s_{im}(\mathbf{g})$ model term. The match terms are operationalized as simple dummy variables. For example, *Match:Regional* equals one if there are no geographic criteria excluding membership for country i in IO j. Thus, this variable always equals one for universal membership organizations. *Match:Regional* also equals one if i is geographically located in the IO's primary area of activity—for example, pairings between, say, Caribbean countries and the Association of Caribbean States. Similarly, the remaining match terms equal one if there is a probabilistic match on that dimension between i and j, zero otherwise. Importantly, we employ highly precise guidelines in coding all of the match variables. For example, because the Central Commission for the Navigation of the Rhine is open only to states bordering the Rhine River, the country-IO observations involving this IO only equal one for those countries that border the Rhine. Similarly, country-IO observations involving the Union of Banana Exporting Countries only equal one for countries that export bananas. And so on.

3.4 Endogenous network effects

To test Hypotheses 2, 3, 4, and 5, we include three endogenous network statistics. The first is defined as

$$\text{IO degree}_i = \sum_j g_{ij} \times \left(\sum_h g_{hj} \right)^{1/2}, \tag{2}$$

where the h subscript refers to other states, $i \neq h$, who have ties to—i.e., are members of—IO j. Because this statistic captures the attraction of countries for IOs with large memberships, it directly reflects preferential attachment and thus allows us to test Hypotheses 2 and 3. Note that we employ a square-root transformation both to reduce collinearity between this statistic and other model terms, and because the benefits of preferentially attaching to high-degree nodes are likely to exhibit declining marginal returns.

The second network variable is

$$\text{Country-IO assortativity}_i = \sum_j g_{ij} \times \left(\sum_j g_{ij} \right)^{1/2} \times \left(\sum_h g_{hj} \right)^{1/2}, \tag{3}$$

where, as above, the h subscript refers to other states, $i \neq h$, who have ties to IO j. This statistic captures the assortative tendency of high-degree countries to extend ties to high-degree IOs, with the square-root transformations reflecting a potential declining marginal return. Eq. 3 allows us to test Hypothesis 4.

Finally, we include a third network variable,

$$\text{Four-cycle closure}_i = \left(\sum_{h \neq j \neq k} g_{ij} g_{ik} g_{hj} g_{hk} \right)^{1/2}, \tag{4}$$

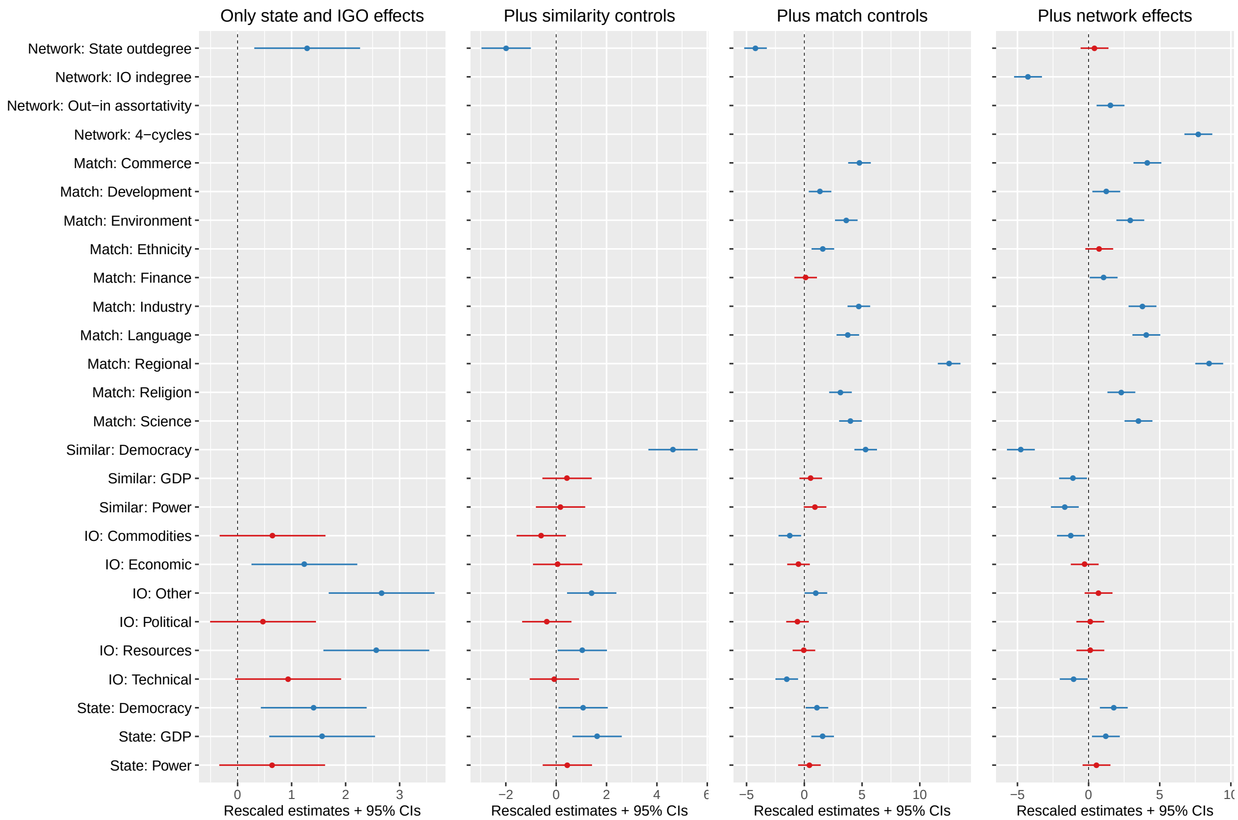
where the subscripts j and k refer to IOs, and i and h refer to countries. In short, Eq. 4 captures the extent to which a given i pursues closure in its IO memberships, favoring ties to organizations that allow continued collaboration, via institutional fora, with its established organizational partners. This statistic thus allows us to test Hypothesis 5.

4 Analysis

We estimate a series of models, sequentially adding model terms in order to observe how controlling for increasingly complex forms of influence affects parameter estimates. The forest plot in Figure 4 illustrates the results across four models. First, as illustrated in the left-most column of Figure 4, we estimate a model containing only state- and IO-level monadic covariates (along with an "outdegree" or network density term, which is the SAOM equivalent of a constant). The positive estimate for the *Network: State outdegree* term indicates a strong baseline tendency for actors to form new country-IO ties. (In a sparse network, where few nodes form ties, this estimate would be strongly negative). The state-level monadic covariates indicate that both wealth and democracy increase activity in IOs. While military power is positively correlated with IO membership, the estimate is insignificant. The results for IO-level covariates are somewhat puzzling. As anticipated, economic IOs are more likely to attract members, as suggested by the significantly positive estimate for *IO: Economic*. Yet, the estimates for *IO: Other* and *IO: Resources* are the largest and most precise, and these are among the least numerous types of IOs (Poast and Urpelainen 2015). Possibly, the relative scarcity of these types of IOs translates into large memberships.

The second model, shown in the second panel of Figure 4, incorporates similarity/homophily con-

Figure 4: Stochastic Actor-Oriented Model of IO Membreship



Note: Dots are estimated β parameters. Lines are 95% confidence intervals. Estimates in blue are statistically significant at the 5% level. For clarity of presentation, all estimates are rescaled and standardized.

trols for the monadic covariates. These measures indicate the relative similarity between prospective member i and the current members of j, with respect to democracy, wealth, and power. The estimates reveal a powerful democratic homophily effect. The positive estimate for *Similar: Democracy* indicates that democratic countries are more likely to join a particular IO if that organization is composed, on average, of democratic member states. In contrast, the insignificant estimates for the remaining similarity metrics indicate that states have little interest in either wealth-based or power-based homophily.

We next add the country-IO match terms to the model, as illustrated in the third panel of Figure 4. Unsurprisingly, these variables exercise a powerful effect, with significantly positive estimates for nine of the 10 match terms. The *Match:Regional* term is especially influential. All else equal, the probability of a country joining an IO with which there is a regional match is about 65 times greater than the probability of that country joining some other IO. Incorporating this control also impacts the remaining estimates. The estimate for *IO: Resources* is now insignificant, while the estimate for *IO: Other* has weakened and is now closer to zero. And two of the IO-level attributes—*IO: Technical* and *IO: Commodities*—are significantly negative. The state-level estimates for democracy and GDP remain significantly positive. Overall, these results suggest that, once we account for match quality, IO attributes diminish significantly as determinants of membership.

The final model, illustrated in the right-most column of Figure 4, incorporates the endogenous network influences. These results yield a number of important insights. First, the estimate for *Network: IO indegree* is significantly negative, which supports Hypothesis 3 over Hypothesis 2. Ceteris paribus, consistent with long-held assumptions on the large-N problem, states generally avoid IOs with large memberships. Substantively, this effect is powerful. A mere one-unit increase in the degree centrality of IO j decreases i's probability of joining that IO by nearly 65%. At the same time, there appears to be a weak assortativity effect in IO membership, consistent with Hypothesis 4. Combining the positive estimate for *Network: Out-in assortativity* with the negative estimate for *Network: IO indegree* suggests that (1) states generally favor organizations with small memberships, (2) this tendency is most pronounced among less central states, and (3) highly active states are especially likely to join IOs with large memberships.

Perhaps most importantly, the estimate for *Network: Four-cycles* is positive, large, and extremely precise. There appears to be a strong tendency toward closure in the IO network. To understand this result, consider a hypothetical scenario where country i must choose between two organizations, j_1 and j_2. Assume that forming a tie to IO j_1 will increase by one the number of four-cycles between i and some other country h, with whom i already shares numerous IO ties, while forming a tie to IO j_2 will not increase the number of four-cycles at all. Based on the model's estimates, i is about 35 times more likely, ceteris paribus, to choose j_1 over j_2. In short, states prefer to form IO-based collaborations with their current IO partners. This effect persists despite myriad controls for state attributes, IO attributes, homophily effects between states and IOs, state-IO match quality, and additional endogenous network influences. Social dynamics appear to be a profound source of IO membership.

5 Conclusion

This paper explores IO membership as a type of affiliation network. We argue that existing approaches to IO membership, which tend to employ pooled dyad-year and country-year analyses, are flawed in numerous ways. First, the unit of analysis does not permit sufficient empirical consideration of the monadic attributes of both states and IOs. Second, these approaches do not—and, due to methodological limitations, often cannot—incorporate issues of country-IO dyadic match quality. Third, these approaches altogether ignore the social dynamics of IO membership, wherein states join IOs not only because of those organizations' institutional characteristics, but also because they are responding to the membership decisions of other countries—particularly those countries with whom they've already established IO partnerships. We show that modeling IO membership as an affiliation network remedies these problems. More substantively, we show that match quality and endogenous network dynamics are, by far, the strongest predictors of membership.

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