The Intergovernmental Network of World Trade: IGO Connectedness, Governance and Embeddedness

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Membership in certain intergovernmental organizations (IGOs), such as the World Trade Organization, has long been argued to stimulate trade. Yet, evidence linking IGOs to trade is mixed. We argue that identifying the influence of IGOs requires attention not only to the institutions IGOs enact, but to the network through which they enact them. We incorporate the full set of IGOs by using shared-IGO membership to create a network of connectivity between countries. This approach allows us to demonstrate that trade between two countries increases by an average of fifty-eight percent with every doubling of the *strength* of IGO connection between them. We also contribute to debates regarding the mechanisms through which structural relationships influence economic behavior by showing that substantial trade benefits occur not only through economic IGOs, but also through IGOs that were formed for social and cultural purposes, and that connections through IGOs that are organizationally strong have more impact than those through minimalist IGOs. The broader network formed by IGO connections is also important, as there is greater trade between countries that have dissimilar relationships to others. We reason that such dissimilarities in the IGO network create brokering opportunities, where trade between two poorly connected countries flows between a third that is better connected to both.

Institutions are the bedrock of commercial exchange. Defined as formal or informal sets of rules, norms and decision-making principles, institutions help lower the uncertainty and risk inherent in transactions among traders. In this light, institutions are widely viewed as a pillar of economic growth, bolstering incentives for commerce. Recently, attention has turned from whether institutions matter to questions about how they matter. In this article, we consider the link between the social structures in which institutions are embedded and their efficacy. Institutions are associated with social units (groups, networks, organizations, nations), which determine which actors are subject to the institutions, with which others they may more effectively trade, and what happens when they violate the institution. We examine the link between institution and social structure in the context of inter-governmental organizations (IGOs), a prominent institutional form aimed at promoting international trade and smoothing international interactions more generally.

The significance of social structure is readily apparent in international trade, where national and sub-national borders can often act as substantial barriers, even when the social units they divide have comparable institutions (Frankel, 2000). One of the most striking illustrations of the connection between social structure and institutional governance is the European Community (now the European Union), which is associated with an increase in intra-EC trade. The success of the EC is not so much a story of institutional innovation, at least with respect to the institutions that govern trade per se, but rather of the creation of an integrated, trans-national society, which has helped to expand the set of actors that may effectively interact under the institutional umbrella (Fligstein and Stone Sweet, 2002).

Recent sociological analyses of the EC notwithstanding, most studies underemphasize the link between institutions and the social structures that host them.

This is particularly clear in the literature on international institutions and trade, which has struggled to show a connection between IGOs and global commerce. IGOs are organizations that meet regularly, are formed by treaty, and have three or more states as members (Pevehouse, et al., 2003). Prominent examples include the World Trade Organization (WTO) and the United Nations (UN). More representative of the more than three hundred current IGOs, however, are organizations like the Andean Development Corporation, or the Universal Postal Union. Researchers have sought for decades to identify the economic impact of these increasingly pervasive organizations, but have produced little evidence of any positive effect (e.g., Jacobson, Reisinger and Mathers, 1986; Rose, 2004). Consequently, IGOs have been attributed only a marginal role in increasing trade (Milner, 1999). We contend that this mixed record is due to a failure to fully account for the *social structural* implications of IGOs. More specifically, IGOs create an inter-country network in which a large and inter-related set of trade-related institutions is embedded. Accounting for this broader network enables us to paint a very different picture of the influence of IGOs on trade.

The recognition that IGOs forge connections between countries makes relevant a large sociological literature that links inter-actor connections to exchange. This literature has shown that a range of formal and informal connections between actors smoothes exchange between them (Granovetter, 1985; Uzzi, 1996, DiMaggio and Louch, 1998), and that the pattern of connections is a key determinant of competition (Burt, 1992). We apply these ideas to help understand the influence of connections through IGOs for bilateral trade, and find support for both the idea that more connections increase trade, and that the broader network affects competition, such that trade between two countries is less if they have similar patterns of connections to others.

Our context also allows us to make a fresh contribution to the network approach to economic sociology by taking up two criticisms of that literature. The first criticism is that network theorists reify social structure, and under-attend to issues regarding the origin and change of networks (Fligstein and Stone Sweet, 2002). In our context it is clear that IGO connections are forged through IGOs themselves, and that these organizations form a link between trade-related institutions, on the one hand, and a broader network of countries, on the other. Furthermore, by tracking IGOs over an extended period (1885 to 1992), we produce dynamic measures of the network these IGOs help create.

With sufficient dynamism in our network variables, we are able to overcome a related limitation of static analyses of network influence: namely, that they may confound network measures with persistent attributes of the nodes or the dyads. We achieve this by including a variety of control variables and dyad fixed effects, which permit us to show that IGO connections influence trade *independent* of other notable factors, including physical distance, population and economy size, regime type, ethnic and colonial ties, and shared language. Our specifications also include year fixed effects, which control for global trends and events that may affect trade and/or international relations.

The second criticism is that network theorists have under-emphasized the institutional content of connections, treating social structure as an end in itself and failing to account for the fact that similar social structures can house various and sometimes opposing institutions (Salancik, 1995, Nee and Ingram, 1998). Essentially, this is the opposite of the criticism of the institutions literature that motivated us to consider social structure in the first place. In our reading, it is not that network theorists ignore institutions, but rather that they are catholic as to the mechanisms through which connections may influence exchange. This approach is empirically justifiable, as most

connections contain a diverse set of influences on exchange. However, it would be theoretically useful to have more evidence that identifies specific mechanisms through which connections affect exchange, especially in light of arguments by economists that the influence of connections can be accounted for by non-social mechanisms (Gibbons, 1999). We are able to produce such evidence by dividing IGO connections into those that arise through IGOs formed for economic purposes (EIGOs) and those formed for social and cultural purposes (SCIGOs). Consistent with a core principle of economic sociology, we find that SCIGO connections bring substantial increases in bilateral trade. Furthermore, we find that the magnitude of the effect of both EIGO and SCIGO connections depends on the *organizational capacity* of the IGOs that create them. This result sheds new light on the mechanisms of network influence by linking the benefits of association to more formal structures.

IGOs and the Governance of Trade

The new institutional analysis of exchange relies on transaction costs, which arise because of the risk of malfeasance and uncertainty inherent in trading (Williamson, 1975). In almost every exchange, there is a moment where one of the parties has control over all or most of the goods, and must decide whether to follow through on the agreed upon bargain, or make a grab for more. This problem is obvious in the simplest of exchanges, as where children swap toys on the playground. The risk of malfeasance increases substantially when the exchange is more complex, as in global commerce, where differences in law, physical distance, and language have all been found to impede trade (Frankel, 2000).

The second source of transaction costs, uncertainty, may be a more important inhibitor of international trade. The risk of malfeasance aside, exchange is frought with difficulties in recognizing opportunities for exchange, finding partners, measuring quantity and quality, and equating the value of goods that may be imperfectly divisible. Indeed, these factors are likely behind the so-called "border effects" (Helliwell, 1998) that riddle trade, whereby commerce tends to flow more between sub-national units of a country (i.e., provinces or states) than across national borders, controlling for physical distance and economic size. Here, political-cultural differences make communication and understanding more difficult, the upshot being that many opportunities for international exchange are doubtless missed (Evans, 2003).

Institutions are widely thought to moderate these transaction costs. Laws that enforce contracts at the domestic level enable exchange partners to credibly commit to future actions, and reduce the risk of malfeasance (North, 1990). When legal sanctions are ineffective or inaccessible, reputation and normative sanctions can create similar benefits (Macaulay, 1963; Greif, 1994). An example of an IGO that promotes rules of "fair" exchange is the WTO, which sets out rights and obligations for trade based on the principles of non-discrimination and reciprocity, and provides for a dispute resolution mechanism to adjudicate these rights and obligations (Busch and Reinhardt, 2002). Other IGOs reduce uncertainty by promoting efforts at harmonization, like the International Organization for Standardization. Still others focus on specific issue-areas, such as the World Intellectual Property Organisation, or specific sectors, like the International Coffee Organization.

For all the theoretical interest in IGOs, the fact remains that empirical studies have turned up results that are far from impressive. In the case of international trade, in particular, one could be forgiven for questioning all the attention to IGOs. The reason for

this skepticism is that, despite persistent research efforts, there is little hard evidence that IGOs promote trade. Why this disconnect between theory and evidence? We argue that the literature has not given sufficient attention to the role of IGOs in affecting connections *between* their members. The very earliest efforts to identify the influence of IGOs ignored membership—or at least the idea that membership brought specific countries under the umbrellas of IGOs—and simply correlated counts of IGOs with international outcomes (e.g., Singer and Wallace, 1970). Later efforts have partly overcome this problem by correlating outcomes for a specific country (i.e., levels of trade, GDP growth, participation in war, etc.) with the number of IGOs that it belongs to. Representative of this approach, Jacobson, Resinger and Matthews (1986) find mixed results regarding the link between IGO memberships and trade, noting that IGO memberships seem to matter only for developing countries, and only in certain periods.

While the count of memberships recognizes that countries must typically be part of IGOs to benefit from their influence, this approach misses the fact that that influence is often dependent on *both* countries to a transaction being subject to the same IGOs. In other words, it is not just membership, but *joint membership*, that matters. This is most obvious with regard to the many IGOs that promote coordination. After all, what good is it to adopt a convention regarding measurement, data transmission, or accounting, when the parties you would like to transact with do not observe the same convention? The idea that IGO governance depends on connections created by joint membership has recently been applied in analyses of the likelihood of war, and has reinvigorated that important research tradition (Russett and Oneal, 2001; Gartzke, 2002). We propose that identifying the influence of IGOs on bilateral trade requires a similar shift to the connections among countries that IGOs create, *and* to the broader network formed by those connections.

Recent analyses of bilateral trade have considered these so-called "dyadic" connections formed by the WTO and its predecessor, the General Agreement on Tariffs and Trade (GATT), but have produced mixed results. For example, Mansfield, Milner and Rosendorff (2000) conclude that a GATT/WTO connection promotes trade, while Rose (2004) concludes that it does not. These analyses are a step in the right direction, but they do not go far enough. By considering only one IGO, they miss important issues about the multiplexity of dyadic connections and the interdependence of overlapping institutions. Network theorists emphasize that important inter-actor relationships are "thick", with multiple dimensions of understanding and influence (Uzzi, 1996). As for institutional interdependence, even a small international transaction might depend on the existence of dozens of IGOs which might help a buyer find a seller, coordinate transportation and communication between them, provide them with standardized measurements to base negotiations on, and in the end convert currencies and clear a check.

It is not that we think that all IGOs are of the same importance, for in fact we will show that different types of IGOs impact differently on trade. Rather, we subscribe to the view that issues of multiplexity and interdependence necessitate consideration of a broad set of IGOs, at least as a starting point. Reflecting the web of institutional support that IGOs can yield, we look for an influence on bilateral trade of the overall IGO connectedness of two countries. We define two countries as being connected through an IGO when they are simultaneously members of that IGO, and are thereby subject to its governing rules. As a first cut, then, the overall IGO connectedness between two countries is simply a count of all the IGOs in which they share membership.

Hypothesis 1: As the IGO connectedness between two countries increases, trade between them will increase.

Institutional Governance vs. Social Embeddedness

Hypothesis 1 rests on a utilitarian analysis of IGO connectedness. That treatment does not, however, exhaust the theoretical potential of the idea that relationships govern exchange. Relationships may also produce non-utilitarian outcomes that are important for exchange, such as trust, empathy and sympathy (Granovetter, 1985). It is therefore worthwhile to distinguish the utilitarian and affective dimensions of relational governance, even though they co-occur in most relationships. IGO connectedness presents a rare empirical opportunity to make this distinction, because while many IGOs pursue economic ends, others are formed for explicitly cultural and social purposes. Thus, a finding that SCIGOs, like the Nordic Children's Film Council or the World Health Organization, promoted bilateral trade could join results such as those presented by DiMaggio and Louch (1998) as evidence of the economic impact of relations with a (mainly) social origin.

Two arguments form the microfoundation of our assertion that SCIGOs affect trade: (1) that they increase awareness, sympathy, empathy, and even trust between the citizens of different countries; and (2) that the resulting shift in cross-national relations and perceptions results in more trade. The first argument is the harder to establish, in the face of a shortage of systematic research on the effects of SCIGOs, and of the determinants of cross-border relations and sentiments. Nevertheless, a number of arguments support the idea that SCIGOs produce positive interpersonal associations between citizens of different countries. Indeed, this is the espoused objective of many SCIGOS, as with the Department of Social Sciences of UNESCO, which aimed to "knit together social science scholars of the world…with the expectation that this will increase international understanding (Angell, 1950:282)." One way SCIGOs may affect this end is

by forging connections between citizens of different countries. Such contact may be a primary goal of an SCIGO, as with the Asia-Europe Foundation, whose mission is "to foster contacts and intercultural dialogue among people from all walks of life in Asia and Europe" (www.asef.org), or the Bureau International des Expositions, which promotes world fairs (www.bie-paris.org). SCIGOs may also forge bilateral contacts indirectly as they bring citizens of different nations together for meetings or other operational purposes. Contact with citizens of other nations has been shown to reduce antipathy, and promote more positive stereotypes (Reigrotski and Anderson, 1959).

SCIGOs may promote bilateral sympathy and empathy by creating the perception of joint-purpose between the citizens of states that pursue shared social, cultural, humanitarian, or other non-economic ends. Almost all SCIGOs represent such joint purposes; examples include those that protect the environment (e.g., the International Coral Reef Initiative) and those that pursue social welfare (e.g., the Inter-American Children's Institute). There is plentiful evidence from social psychology that groupings produce affinity to group members, the ubiquitous ingroup/outgroup effect. In the specific context of associations forged through IGOs, Russett and Oneal (2001: 233) show that the "affinity" between two states increases as the number of IGO connections between them increases. Bilateral affinity, a variable created by Gartzke (2000), is "the rank order correlation of states' voting in the United Nations General Assembly…[as it] increases two states are thought to share more interests in common (Russett and Oneal, 2001: 231)." Since Russett and Oneal's result was based on an aggregate measure of IGO connectedness, we performed an additional test of Gartzke's affinity variable on IGO connectedness, disaggregating this variable into its component parts, including those created by EIGOs and those created by SCIGOs. That analysis showed not only that

SCIGOs were a positive influence on bilateral affinity, but also that they were more positive in that regard than EIGOs.

If SCIGOs do create bilateral sympathy, understanding and affinity, and interpersonal connections that span borders, the next question is whether these affect bilateral trade. It is well known in the literature on international business that exchange partners and products are less attractive to the extent that they seem foreign, so anything that increases familiarity between nations can be expected to also increase trade between them (Zaheer, 1995; Bilkey and Nes, 1982; Grosse and Trevino, 1996). For example, the psychological trait "worldmindedness" has been shown to increase professional buyers' willingness to purchase foreign products (Crawford and Lamb, 1982). Worldmindedness, which taps an orientation to "international sharing and welfare and reflects an empathy for the peoples of other countries (Kosterman and Feshbach, 1982)," is just the sentiment that many SCIGOs aim to create.

Trade may also be affected by the sense of shared purpose (affinity) that SCIGOs create. Again, there is experimental evidence to show that ingroup affinity facilitates economic cooperation (e.g., Erev, Bornstein and Galili, 1993). The oldest axiom regarding global commerce is that trade follows the flag, a truism that is supported by a number of studies which indicate that there is more trade between allies (Mansfield, Milner and Rosendorff, 2001; Oneal and Russett, 2001). Even more closely related to our argument, Guiso, Sapienza and Zingales (2004) analyze data on trust between nations obtained from the Euro-Barometer surveys, and find that nations whose citizens feel more trust for each other experience more bilateral trade. Given the evidence that trust, familiarity, shared purpose, and contact between nations promote trade, and the likely possibility that SCIGOs promote those things, we predict that:

Hypothesis 2: As social/cultural IGO connectedness between two countries increases, trade between them will increase.

Organizational Capacity of IGOs

So far we have argued that IGOs influence trade by forging a network of bilateral connections which hosts transaction-smoothing rules *and* affects inter-country sentiments. The next step in our theory development is to recognize that some IGOs have more impact than others, beyond the structure they create, and the institutions they overlay on that structure. This step is important substantively, because even casual observers of international organization realize that IGOs vary in their capacities to affect their members and achieve their goals, and that it would be a mistake to ignore the distinction between minimalist organizations (such as the International Wool Study Group) and more powerful ones (like the WTO). It also matters theoretically, as institutional arguments too often emphasize institutions of a given form (laws, organizational policies, social norms, etc.) while under-attending to the interdependence between forms, which is so often fundamental to their impact (Nee and Ingram, 1998). For example, the effectiveness of an organizational policy will depend on other institutions, such as the national law and culture within which the organization operates (e.g., Meyer and Rowan, 1977; Dobbin and Sutton, 1998) and the social norms held by the organization's participants (e.g., Heckathorn, 1990).

Our current claim is that the effectiveness of an IGO connection will depend on the organizational capacity of the IGO. The issue of whether an IGO has "teeth" is particularly salient, because the basis of IGO authority is voluntary association. IGOs bind their member countries through treaties, and if a country chooses to flout a treaty, the only real sanctions are those imposed by other members, as there is no "higher court" (or third-party enforcer) that can compel members to follow through on their

commitments. Just as the norms of a well-structured social group (e.g., Jewish diamond traders) can be expected to have more bite than those of a loosely structured group (e.g., passengers on a subway), the policies of IGO's with effective mechanisms of communication, coordination, dispute resolution and enforcement should have more impact than those of minimalist IGOs.

Gartzke (2002) demonstrates that the impact of IGOs depends on their organizational structures in an analysis of the determinants of war. As we do, he operationalizes connectedness between two countries as a function of the number of IGOs in which they share membership. He finds that connections through IGOs that were "structured" reduced the incidence of war, while connections through "minimalist" IGOs had no effect. According to Gartzke (p. 22), minamilist IGOs are "without an extensive bureaucracy beyond research, planning, and information gathering," while structured IGOs contain "structures of assembly, executive, and/or bureaucracy to implement policy, as well as formal procedures and rules." The emphasis here on a bureaucratic capacity to implement has a satisfying correspondence to arguments proffered by Weber (Gerth and Mills, 1946) and Skocpol (1985) about the source of states' institutional strength.

The example of the GATT/WTO illustrates both the nature of associative control of IGOs, and the importance of organizational structure to empower them. Although among the most renowned economic IGOs, the GATT/WTO is often likened to a "court without a bailiff." Its influence to quell trade disputes is largely informal, more like a social norm than a law: "the basic force of the procedure [comes] from the normative force of the decisions themselves and from community pressure to observe them" (Hudec, 1987: 214). As Busch and Reinhardt (2002) explain, the punch of the GATT/WTO comes from the potential to produce a clear normative statement embodied

in a ruling, a potential which induces most disputants to settle before a ruling is rendered. But what is required to enable a "clear normative statement?" At a minimum, there must be an accepted standard of what constitutes a violation, and a means of adjudicating this would-be violation. In a small social group, an informal consensus might be sufficient backing for a rule, but in a context as complicated as international trade, formal rules are typically necessary, as reflected in Gartzke's definition of a structured IGO, and as exemplified by the WTO's covered agreements. Beyond the standard of non-discriminatory trade, it is necessary that WTO rulings are perceived as legitimate. Here, Weber's arguments regarding professional bureaucracy as a source of legitimacy are useful—the legitimacy and normative weight of WTO rulings depends on whether "justice" is seen as being rendered by objective and capable interpreters of its rules.

The significance of IGO structure seems equally likely for SCIGOs as it does for EIGOs like the WTO. SCIGOs may not have to enforce policies, but they will nevertheless depend on a bureaucracy to implement policies. The following prediction, therefore, applies for both EIGOs and SCIGOs:

Hypothesis 3: IGO connectedness through structured IGOs has a greater positive effect on bilateral trade than connectedness through minimalist IGOs.

Competition in the IGO Network

The broader pattern of IGO connectedness may influence bilateral trade between two countries through the mechanism of competition. In the literature on networks, it is well accepted that the potential for competition between two actors increases as a function of the similarity of their pattern of relationships to others (Burt, 1992). Actors with more similar relationships have more similar capabilities, information, and other resources. Modern structural sociologists have identified benefits, ranging from the

promotion of managers, to the innovativeness of laboratories and the profitability of industries to actors who stand between disconnected—or weakly connected—others. In our context, two countries that had the same IGO connections to all other countries would have a similar set of import and export opportunities, at least to the extent that opportunities are a function of the institutions that contribute to surety, trust, communication, transportation, and other inputs to effective trade. In network parlance, these two countries would be labeled structurally equivalent in the IGO network. *Structural equivalence* is a familiar concept in the network literature, defined as a measure of the degree of similarity, in terms of the pattern of relationships to others, between two actors (Lorrain and White, 1971).

But how does the level of trade between two countries depend on structural equivalence? The significance of relationships to others comes from the fact that international trade is an open system, in the sense that countries engage in trade not only to satisfy domestic interests, but also in response to opportunities and necessities that derive from trade itself. This is most apparent in what is called transshipment, which occurs when a country imports goods from one trading partner and exports them to another. Such flow-through trade, whether transparent or obfuscated, depends on a relatively weak connection between the original exporter and the ultimate importer. If those countries were well connected institutionally, politically and geographically, then they presumably would not need the services of the country that stands between them to facilitate this flow-through trade.

In recent decades, the country that best represents the implication of *low* structural equivalence for trade is Hong Kong, which intermediated between China, with which it has strong intergovernmental ties, and other countries that were more weakly tied to China (Hanson and Feenstra, 2001). For example, in the late 1990s, the United States

objected to transshipments of textiles from China through Hong Kong as a means of circumventing quota restrictions. Interestingly, New Zealand, in turn, cited this example in raising questions about its own enthusiasm for negotiating an economic agreement with Hong Kong, fearing a flood of Chinese textiles in the wake of a crack-down by U.S. authorities on Hong Kong.[1] While Hong Kong is the textbook example for transshipment, the phenomenon happens elsewhere. Recently, Brussels requested that Poland more fully "secure" its borders on the eve of that country's accession to the EU, one fear being that Poland's relatively close relations with non-members could well inspire a surge of transshipment into the lucrative European market.

Straight transshipment may be the most obvious form of brokering in international trade, but a country spanning weakly connected others may also import raw materials or low-value inputs from one, transform them, and send value-added exports to the other.[2] Alternatively, assembly industries may develop in a country due to preferential access to an export market. Volkswagen, for example, set up shop in Mexico to service the local market, but with trade liberalization sweeping that country in the lead up to the North American Free Trade Agreement (NAFTA) and the completion of the Uruguay Round of the GATT, Volkswagen's Mexico facility emerged as a key exporter to the US and Canada, its two NAFTA partners.[3]

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[1] Supplementary Submission by the Central Districts Federated Clothing, Laundry and Allied Workers Union on the proposed Hong Kong free trade and investment Agreement, at www.canterbury.cyberplace.org.nz

[2] We do not suggest that structural inequivalence in the IGO network is the only reason that countries occupy different positions in global production systems. Human capital, natural endowments, and industrial policy obviously affect which countries provide raw materials, labor, and technology in global production. Commodity-chain theory in sociology also highlights the importance of country power in determining the pattern of production (Gereffi and Korzeniewicz, 1994). Our argument is consistent with these claims, and we would simply add to any of them that whatever determines which countries do what in globally-distributed production, importing and exporting is required, and the IGO network smoothes those transactions.

[3] www.umich.edu/~cibe/case_pdf/97-12.pdf; www.autonews.com/news.cms?newsId=2709

The bases of all of these opportunities for flow-through trade are differences (inequivalences) in the strength of connectedness in the IGO network. If, for example, other countries established the same strong connection to China that Hong Kong had—a development that would make them more structurally equivalent to Hong Kong—they could trade directly with China without relying on Hong Kong for transshipment. Trade between Hong Kong and its newly structurally equivalent alters would fall. Thus, we make the following prediction:

Hypothesis 4. Trade between two countries will be negatively related to the structural equivalence between them in the IGO network.

ANALYSES OF TRADE

Model

To test our hypotheses, we use the "gravity" model, which is the standard for analyses of bilateral trade. According to Rose (2004: 99), the gravity model is "a completely conventional device used to estimate the effects of a variety of phenomena on international trade." The model uses a log-log specification to explain trade between two countries as a function of their joint income, asserting trade flows will be proportional to the product of their GDPs[4]. We use the bench-line specification of the gravity model described by Rose (2004: 100) with control variables suggested by Oneal and Russett (2001) and the variables we have created to represent the IGO network:

$$\ln(\text{Trade}_{ijt}) = \beta_0 + \beta_1 \ln(\text{GDP}_i\text{GDP}_j)_t + \beta_2 \ln(\text{GDP}_i\text{GDP}_j/\text{Pop}_i\text{Pop}_j)_t + \beta_3 \ln(\text{IGOCON}_{ijt}) + \beta_4 \text{StrucEquiv}_{ijt} + \beta_5 \text{Democ}_{ijt} + \beta_6 \text{Ally}_{ijt} + \sum_{ij}\phi_{ij}D_{ij} + \sum_t \alpha_t Y_t + \varepsilon_{ijt},$$

[4] The typical gravity model also includes the log of the distance between the two countries, which we cannot include because we use dyad fixed effects. We show below that our results are robust in a random-effects model that includes the log of distance.

where *i* and *j* are the countries in a dyad, *t* denotes time, and the variables are:

• $Trade_{ijt}$ is the real value of bilateral trade between *i* and *j* in year *t*,

• GDP is real GDP,

• Pop is population,

• $IGOCON_{ijt}$, which tests Hypothesis 1, is IGO connectedness, the number of IGOs that *i* and *j* are *simultaneously* members of in year *t*. IGOCON is replaced by subcomponents representing connectedness through economic and social/cultural IGOS to test Hypothesis 2. Those variables are in turn replaced by their subcomponents representing connectedness through minimalist and structured IGOs to test Hypothesis 3,

• $StrucEquiv_{ijt}$ tests Hypothesis 4, and is the Pearson product-moment correlation between the vectors of *i* and *j*'s IGO connections to *other* countries in year *t*,

• $Democ_{ijt}$ is the minimum of the democracy/autocracy scores (taken from the Polity III database) of *i* and *j* in year *t*. This control is included because democracies are expected both to trade more *and* join more IGOs with each other,

• $Ally_{ijt}$ is an indicator variable coded 1 if *i* and *j* have a military alliance in year *t* (taken from the Correlates of War database). This control is included because allies are expected both to trade more *and* join more IGOs with each other,

• {D} is a set of dyad-level fixed effects, and

• {Y} is a set of year fixed effects.

The dyad and year fixed effects are important in this specification (Green, Kim and Yoon, 2001; Rose, 2004). First, they account for the non-independence of observations in our data. Second, they effectively control for all stable dyadic and time-varying global influences on trade. Examples of relevant dyad-level influences include the distance between the two countries, whether they share language, a border, religion, or colonial history. The dyad fixed-effects take all of these stable influences out of the mix. Similarly, the year fixed effects account for historical influences that affect all

dyads, including discrete events of global import such as the Great Depression, the world wars and the fall of state socialism, as well as trends such as the legitimacy of international relations or international trade. In other words, the fixed effects control for all influences on trade except those which vary both within a dyad *and* across time. With the fixed-effects in place, the coefficients indicate the expected change in bilateral trade of a one unit change in an independent variable for a given dyad in a given year, not correlations between variables across dyads or time. This is the best way to directly test our hypotheses.

Data and Variable Construction

We take our trade, GDP, and population data directly from the data used in Oneal and Russett (2001). These data are particularly appealing for our purposes because they cover the period 1885 to 1992, whereas other datasets focus on the most recent fifty years, when trade data have been more readily accessible. The period before World War II represents substantial change in the network of IGO connections, so this longer time series is important for testing our hypotheses, though as we show below, our results are comparable when we restrict our analysis to the post-war period. Furthermore, given that some analyses of bilateral trade have shown sensitivity to certain key coding decisions—notably what to do about zero trade values before taking their natural logarithm—it is convenient to use Oneal and Russett's data, given that their codings are the result of a series of methodological debates (though here too, we show below that our results are robust to various popular treatments of the relevant variables).

Oneal and Russett obtained trade data from: (a) the IMF for the post-World War II era; (b) the League of Nations for the inter-war period, and (c) annual editions of *The Stateman's Yearbook* (e.g., Epstein, 1913) for pre-World War I. They also relied on

other archival sources in their effort to compile the data, and check its reliability and robustness (Russett and Oneal, 2001: 139-140). They converted current values of trade and GDP to real U.S. dollars (1990=100), list bilateral trade in $1,000,000's and add $100,000 before taking the log (to allow the logs of dyads with zero trade), and list real GDP in $1,000,000's and population in 1,000s before logging. We take their data in these forms, so the basic data inputs to our gravity models, including the dependent variable, are the same as theirs. Table 1 lists the 135 countries in the dataset, and the time frame over which each country is observed.

The basis of our operationalizations of the IGO network is the time-varying listing of IGOs and their members, from 1816 to 2001, provided by Pevehouse et al. (2003). According to their definition, an IGO must:

(1) include three or more members of the Correlates of War-defined state system;

(2) hold regular plenary sessions at least once every ten years; and

(3) possess a permanent secretariat and corresponding headquarters.

IGOs may be formed directly by the states themselves, or may be "emanations" formed by another IGO. Pevehouse et al. list all of the IGOs formed directly by states, but exclude emanations. This treatment is appropriate for our purposes because emanations are *not* independent from their parent IGOs and do not therefore represent independent sources of IGO connections. Pevehouse et al. identify 497 IGOs that existed at some point in history. In the first year of our analysis, 1885, there were 14 IGOs operating, 43 in 1914, 65 in 1938, and 314 in 1992, which is the last year of our analysis.

We used the IGO-member listing to create a time-varying affiliation matrix of connectedness between two countries. The affiliation matrix is produced by multiplying $\mathbf{X}_t$, a country by IGO matrix, with the cells indicating whether a country is a member of a given IGO at time t, by its transpose: $\mathbf{C}_t = \mathbf{X}_t \cdot \mathbf{X}_t^T$. Thus, $\mathbf{C}_t$ is a symmetric country by

country matrix where the cell c_{ijt} indicates the number of IGOs that country *i* and country *j* share joint membership in at time *t*. To test hypotheses 2 and 3 we followed the same procedure to create affiliation matrices of connections through EIGOs and SCIGOs, and the minimalist and structured representatives of each of those types. This required that we code IGOs as to their function and structure. We followed available coding schemes to do so, and describe the process in the Appendix. We take the natural logarithms of the IGO Connectedness variables, both for consistency with the treatment of other variables in the gravity model, and because exploratory analysis indicated that this functional form best represented the impact of IGO Connectedness in our models (our results are qualitatively similar when the IGO Connectedness variables are not logged). We added 0.1 to all measures of IGO Connectedness before taking the natural logarithms.

Structural equivalence, which tests hypotheses 4, is simply the Pearson product-moment correlation between the vectors that represent *i* and *j's* IGO connections to all other countries (Wasserman and Faust, 1994:368). This measure captures the degree of similarity between two countries' IGO connections *to others*, to get at our argument that similarities in relations to others represent competition, while dissimilarities represent brokering opportunities. Some readers have wondered why we use this continuous measure of structural equivalence rather than a measure based on pure structural holes (complete disconnects) in the IGO network. The reason is that brokering opportunities in the IGO network arise from differences in the strength of IGO connections, not from complete disconnects which were relatively rare, especially in later years. For example, currently all countries have *some* connection to China in the IGO network (there are no complete disconnects), yet much trade to and from China flows through Hong Kong because its IGO Connection to China is stronger than that of most other countries.

Descriptive statistics for the variables are presented in Table 2. Generally, the correlations between variables that appear in the same models (e.g., not comparing IGO Connectedness to its economic and social/cultural components) are modest, although there are some correlations > .50 among the network variables. We therefore conducted a number of investigations to insure that our estimations were not compromised by multicollinearity. We estimated hierarchically-nested regression models, and used F-tests to indicate the joint-significance of more-highly correlated variables (Kmenta, 1971: 371). The nested models (presented below) showed that the coefficients of correlated variables were robust to various model specifications, and the results of the F-tests were consistent with the tests of individual significance, indicating that their standard errors were not inflated. Additionally, we estimated our models on random sub-samples of the data, obtaining results comparable in all ways to those we report below (Greene, 1997). We also estimated models with the network variables entered singularly, and again, the results were consistent with those we report here. Thus, there is no evidence that multicollinearity compromised our estimations.

Results

Table 3 presents the results of fixed-effects gravity models. Model 1 includes the control variables. Model 2 adds structural equivalence and is a significant improvement over Model 1 ($F_{1,143278} = 352.22$, $p < .001$). The coefficient on that variable indicates that there is less trade between two countries when they are more structurally equivalent, in support of Hypothesis 4. Model 3 adds the aggregate IGO Connectedness measure, and improves on Model 2 ($F_{1,143277} = 4231$, $p < .001$). The positive coefficient for IGO Connectedness is as predicted by Hypothesis 1: as two countries become more connected to each other through joint-membership in IGOs, the trade between them increases.

When IGO Connectedness between two countries doubles, the level of trade between them is expected to increase by 58% ($2^{0.656}$ -1). Since IGO Connectedness is based on the full set of IGOs, this result indicates the average impact of IGO connections on trade. Model 4 replaces the aggregate IGO Connectedness measure with one that reflects connections only through EIGOs and SCIGOs, excluding IGOs that had general or military/political functions[5]. As expected, connectedness through EIGOs and SCIGOs (which make up more than eighty percent of all IGOs) brings a large increase in trade.

Model 5 breaks out the separate effects of EIGO and SCIGO connections. A test of joint significance indicates that the inclusion of these measures improves on Model 2 ($F_{2,143276} = 1939$, $p < .001$; Model 2 is the appropriate comparison because the logging of the IGO Connectedness measures means that Model 5 is not nested in Models 4 or 3). Consistent with Hypothesis 2, the positive coefficient of SCIGO Connectedness indicates that affiliations through these social and cultural organizations do increase bilateral trade. The final model in Table 3 breaks EIGO and SCIGO Connectedness into that which comes from minimalist and structured IGOs. The four connectedness measures that result are jointly significant ($F_{4,143274} = 486.5$, $p < .001$). As Hypothesis 3 predicted, connections through structured IGOs do more to increase trade than connections through minimalist IGOs. This is true for both EIGOs ($F_{1,143274} = 45.99$, $p < .001$) and SCIGOs ($F_{1,143274} = 615.65$, $p < .001$).

The coefficients in Model 6 suggest that doubling the level of connection through minimalist and structured EIGOs is associated with increases in trade of 7.8% and 12.2%,

[5] General and political/military IGOs accounted for 89 of the 497 total IGOs. We chose not to highlight specific effects for these "other" IGOs because they do not fit as cleanly into the mechanisms of transaction governance and awareness/affinity that we have highlighted. Presumably, general and political/military IGOs affect trade through both of these mechanisms, but operate also to affect the international balance of power in a way that is beyond the scope of this paper. Supplementary models indicated that connections through general and political/military IGOs are associated with higher trade, although the inclusion of these additional connectedness measures does not affect the coefficients of EIGOs and SCIGOs which we interpret to test hypotheses 2 and 3.

respectively. For corresponding figures for SCIGOs are 1.1% for minimalist and 19.6% for structured. While we predicted that SCIGOs would increase trade, we were surprised by the magnitude of the effect of connections through structured SCIGOs, which is even larger than that of structured EIGOs ($F_{1,143274} = 65.13$, $p < .001$).

The control variables in all of the models in Table 3 behave as expected. Richer countries, as indicated by GDP and GDP per capita, trade more. Trade is also higher as a function of the minimum level of democracy in the dyad, supporting the claim that democracy promotes trade (Oneal and Russett, 2001). Military allies also trade more, consistent with the familiar "trade follows the flag" argument.

Robustness Checks

While the results in Table 3 are consistently in support of our hypotheses, there remain alternative model specifications and functional forms of the variables to consider. Table 4 presents a battery of robustness checks of our results. The first alternative we consider is a theoretical one: IGOs may influence trade through the creation of legitimacy. Very briefly, the argument contains the following elements: countries are more legitimate to the extent they employ familiar structures and engage in certain "state-like" activities, including participation in international organizations (Meyer, et al., 1997) and are more attractive trading partners as a function of their legitimacy (Meyer and Rowan, 1997). These arguments suggest the total number of IGO memberships of the states in a dyad (as an indicator of their legitimacy) as a predictor of trade[6]. In Model 7, the natural logarithm of this variable is added to our full model. Consistent with the

[6] Trade may also increase as a function of the total number of IGOs in the world system, as they may legitimize international relations more broadly (Boli and Thomas, 1999). In our models, such historical trends are completely controlled for by the year fixed effects.

legitimacy argument it has a positive effect on the level of bilateral trade, but importantly, its inclusion does not change the results concerning our main variables of interest.

We also re-estimated our model using only dyads that exist for at least twenty years in the data, reported as Model 8. The reason for doing this is that Oneal and Russett (2001) suggest that their results were more stable for longer-duration dyads. The results are essentially the same as those reported for all dyads. In Model 9 we examined sensitivity to the process by which zero values of trade are logged by rescaleing the dependent variable, listing trade in dollars and adding $1 before taking the log (as opposed to listing in $1,000,000s and adding $100,000). This effort produces results that are comparable to those in Model 6. Model 10 re-estimates Model 6 using only post-World War II observations. The results are still consistent with all of our hypotheses, except for structural equivalence, which has the expected negative effect on trade but is not statistically significant.

Model 11 re-specifies the GDP and population variables to match the treatment in Oneal and Russett (2001), where the GDPs of both countries are first logged and then added, as are the countries' populations. The results for the variables that test our hypotheses are unaffected by this re-specification. In Model 12 we include the natural logarithm of the distance between *i* and *j*, a variable that is typically included in gravity models but which requires us to use random rather than fixed dyad-level effects, since it does not vary within dyads. As expected, trade is lower when distance is higher, and other results are comparable to those reported above.

The Direction of Causality and the Problem of Endogeneity

While our main models and robustness checks provide consistent evidence that an increase in IGO connectedness is associated with an increase in bilateral trade, they do

not demonstrate the direction of causality. There are credible alternatives to our argument that IGO connections cause changes in trade. Below, we describe these alternatives, and evaluate them in light of our analysis.

1) IGO connectedness and trade may be spuriously correlated through one or more other variables. Spurious correlation might occur due to global or local (dyadic) influences. Our models include year fixed effects to control for the possibility that IGO connectedness and trade are spuriously correlated due to some broad historical process. Further, the averages across all dyads in a year of IGO connectedness and trade are *negatively* correlated (-0.48) and follow very different time trends. Thus, there is no reason to believe that some global trend produces a spurious correlation in our data. In contrast, there are a number of dyad-level factors that are likely to affect both IGO connectedness and trade. Most of these, however, are accounted for by our dyad-level fixed effects, which absorb the influence of any persistent characteristic of the dyad, such as geographic distance, shared border, language, culture, religion, or colonial heritage. Our models also control for the most likely time-varying dyadic influences on IGO connectedness and trade: namely, the levels of democracy and economic productivity in the dyad, and the presence of military alliances between its members.

2) Reverse causality: countries join IGOs because they trade with each other. It is hard to see how a reverse causality argument could account for the *full pattern* of the relationship between the IGO network and trade. Our theory predicts not only an association between economic IGO connections and trade, but also an effect for social/cultural IGO connections, and differential effects for connections through minimalist and structured IGOs. We also make a prediction for structural equivalence, a measure that depends on the network beyond the dyad. At a minimum, any reverse causality argument would have to account for all of these effects. Reverse causality

arguments must also detail the mechanisms through which trade in a dyad leads to specific changes in the IGO network. A single IGO connection between two countries emerges through membership in an IGO that includes *at least* one other country-member, and usually many more, and is therefore coupled to IGO connections to *all of them*. A given country cannot target an IGO connection to another country in response to trade in the dyad, because any attempt to do so would have repercussions throughout the network.

3) IGO Connectedness may be a signal of goodwill, not causally related to trade, but just something countries do to indicate that they are open to trade. This claim is inconsistent with the fact that more structured IGO's matter more than minimalist IGOs. If IGO connections were merely a signal of goodwill or openness, then there is little reason why their impact should depend on the organizational capabilities of the IGOs.

4) If endogeneity does exist, coefficient estimates for IGO connectedness will be inconsistent. The above arguments lead us to believe that the causal relationship we specify is most consistent with the results of the analysis. Nevertheless, it would be foolish to deny that IGO connectedness and trade may have some reciprocal relationship. If they do, the consistency of our coefficient estimate for IGO connectedness would be compromised. Instrumental-variable estimation is an increasingly popular method for adjusting for endogeneity (Greene, 1997; for recent sociological applications see Ingram and Roberts, 2000; Burris, 2004). This technique involves creating proxies for the endogenous variable by using variables other than the dependent variable of the regression. In other words, we need a model of IGO connectedness that does not rely on past levels of trade. To build this model, we relied on the literature on the causes of war, with the logic that peace and IGO connections are two types of bilateral relations that may be explained by similar factors (Russett and Oneal, 2001).

Specifically, we used lagged values of the following variables to predict the IGO connectedness[7] between two countries: whether they share a border; the distance between them; whether they began a militarized dispute in either of the two previous years; the time since their last militarized dispute; whether either was a major power; whether they were military allies; the similarity of the countries' levels of democracy; the total number of IGOs existing in the world system; and an interaction of the distance between the countries, on the one hand, and the total number of IGOs, on the other, to reflect the fact that IGO connections tend to be regionalized. These variables are taken from the Correlates of War datasets. We used predicted values from that regression as a proxy for IGO connectedness in Model 13 in Table 4. Consistent with our theoretical arguments, the instrument for IGO connectedness had a positive and significant influence on bilateral trade, and the effects of other variables are largely unchanged. Thus, we conclude that endogeneity does not undermine our claim that increases in IGO connectedness affect increases in bilateral trade.

Discussion

Why has the literature generally failed to turn up consistent evidence that IGOs promote trade? We argue that analysts have not captured the structure behind the efficacy of IGOs. The institutions that IGOs enact are not disembodied influences on international relations, but rather operate within a social-structure formed by the simultaneous memberships of countries in IGOs. By identifying the network of bilateral connections that IGOs forge between countries, we discover substantial effects on trade.

[7] We applied the instrumental variables procedure only for the aggregate IGO connectedness variable and not its social, economic, minimalist and structured subcomponents. Applying instrumental variables to the subcomponents would result in the awkward specification of including in the same model two or more covariates that rely on substantially the same instruments. In supplementary analyses, we re-estimated four versions of our full model, substituting instrumented versions of the four subcategories of IGO connectedness one at a time. Results of those regressions were comparable to those reported in Model 13.

For example, a doubling of the level of connection between two countries across all IGOs is associated with a 58% increase in trade. The shift to the network of IGO connections also highlights the indirect influence of structural configurations that affect trading patterns, such as the dis-equivalencies that facilitate flow-through trade.

While the basis of our analysis of IGOs is an integration between network and institutional theories, our context also allows us to develop and test two ideas that are central to those theories, but have so far been the subject of more speculation than systematic analysis. The first concerns the distinctly social influence of relationships on economic exchange. The division of IGOs into economic and social/cultural categories allows us to separate features of ongoing economic relationships that are typically confounded, and thus gives us rare insight into this issue, which is critical to the relevance of economic sociology. Although we expected to find a trade-benefit from SCIGO connections, the results are stark in their magnitude, with those connections (when braced by organizational structure) doing even more to promote trade than connections through EIGOs. This is a victory for arguments that the economic impact of relationships depends, to an important extent, on social mechanisms. The relevance of SCIGO connections is still more interesting in light of recent arguments that identify limitations of economic connections between states. Recent work makes clear that preferential trade agreements, in particular, are struck by states looking to increase their bargaining power in multilateral trade rounds (Mansfield and Reinhardt, 2003). This "defensive" integration is likely to be more cyclical, and perhaps less robust, than integration realized through social/cultural IGOs, which may be more palatable domestically.

The second contribution to theory concerns the interdependence between different levels of institutions. Although few would dispute the idea that institutions operate

through an interdependent hierarchy, it has fallen between the cracks of the division of labor between different schools of institutionalism in the social sciences. We hypothesized that the efficacy of the principles that IGOs infuse into their members' relations depends on the structures of the IGOs themselves. We found that both economic and social/cultural IGO connections were more beneficial when they were through IGOs with effective bureaucratic structures as opposed to a minimalist IGOs. The efficacy of bureaucracy in this context is suggestive as to the basis of institutional authority in international relations and injects organization into discussions of "order without law," which have so far emphasized interpersonal relations (Macauley, 1963; Ellickson, 1991). And while we are confident that structured IGOs matter more for trade than minimalist ones, we realize that we have only scratched the surface of this issue. We would like to see more case studies examine the efficacy of specific IGOs (e.g., Fligstein and Mara-Drita, 1996; Busch and Reinhardt, 2002), leading to a more comprehensive categorization of IGO structure than the one we use here.

Our focus on IGOs is not meant as a slight to other mechanisms of international connectivity, such as non-governmental organizations (NGOs) and multinational corporations (MNCs). On the contrary, the influence of NGOs on world culture, for example, is the subject of an active research program in sociology (eg., Boli and Thomas, 1999). Evidence from that program indicates that NGOs may serve a purpose analogous to that we ascribe to SCIGOs, in terms of knitting together national cultures, creating empathy, sympathy and trust at the seams. This observation suggests a second-order influence of the linkage between NGOs and world culture to trade. Strange (1996) suggests a direct symbiosis between IGOs and NGOs, where NGOs get funding, and IGOs (or IGO bureaucrats) get flexibility to pursue interests in ways their mandates may

preclude. The possible interdependencies between IGOs and MNCs is likewise worthy of further study.

Despite the impressive gains in trade that can result from IGO membership, the decisions of states to join them may not be easy. There are costs associated with IGO membership, and these must be weighed against any expected gains. Most obviously, there are the direct costs of operating IGOs, which are often assessed to members using various formulas (i.e., based on GDP). These direct costs may typically pale in comparison to the benefits of increased trade, but they are not always trivial, as evidenced by the ongoing battle between the U.S. and UN over dues to that organization.

The second cost is the risk that IGOs may be diverted from their original purposes, or the will of their members, by powerful bureaucrats. Michel's "iron law" represents a threat not only to the effectiveness of IGOs, but to the very autonomy of their member-states (Strange, 1996). Cox and Jacobson (1973) present case studies of decision making in eight IGOs. They identify a trend to bureaucratization, and citing UNESCO and the International Labor Organization as specific examples, claim "[T]he existence of a large organization is itself a potentiality and a pressure for the expansion of tasks (424)." Indeed, goal displacement and unjustified budgetary growth were among the criticisms the U.S. made when withdrawing from UNESCO in 1984. Cox and Jacobson begin the process of identifying features of an IGO's structure and mandate that affect whether it is likely to be more subject to the influence of the individual participants (bureaucrats, consultants, member-representatives) or of its member states. This distinction is an important one for extending our research, and fully specifying its policy implications. A clear understanding of what preserves member influence in IGOs would be useful for: (1) identifying which IGOs are most useful for promoting trade and other

desired outcomes; (2) helping countries decide which IGOs to join; and (3) guiding the designers and managers of IGOs.

Another contributing factor to the U.S. decision to withdraw from UNESCO, that organization's perceived anti-Westernism and anti-Semitism, is useful for illustrating the third, and perhaps greatest, cost of IGO connections. The sociological literature on embeddedness is clear that there is a dark side to relational constraints (Uzzi, 1996). They bind related parties for better or worse. To this point, we have concentrated on the advantages of relational constraints to smooth trade. In the IGO context, relational constraints may also subject states to unwanted economic, political and ideological dictates. It is not possible to fully mitigate this risk through careful design of the structure and scope of IGOs—any relationship that the parties derive benefit from opens the door to normative influence on a range of issues (Homans, 1950).

These potentialities suggest that a given IGO connection may be a panacea, or a devil's compact, depending on the IGO's structure and mandate, and the cultures, histories, economies and polities of the connected countries. At the same time, we do not want to slight the benefits to trade of IGO connectedness merely because they are only part of the equation of benefits and costs. The gains to trade from IGO membership are substantial, and their pattern sheds important light on the interdependence between economy and society.

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Appendix
Coding of IGO Function and Structure

Information on the functions and structures of IGOs comes mainly from the listing for each IGO that appears in the Yearbook of International Organization, braced by various other sources. A research assistant who was unfamiliar with our hypotheses performed the coding. It was not practical to have multiple coders because the coding effort required extensive archival work, which involved a learning curve for finding information on IGOs which were sometimes obscure. For both function and structure, the coder initially applied a fine-grained coding scheme. We then collapsed fine-grained subcategories into the categories we used in the actual analysis. This process allowed us to be more precise about the exact nature of each IGO, and therefore more confident in the aggregate categories that we use for our analyses. The coder also identified her confidence in each coding, based on the quality of the evidence that supported it. We used those confidence measures in supplementary analyses to insure our results were robust to the data quality supporting the coding.

IGO Function

IGOs have specific functions that are outlined in their mandates. We began with the four-category coding of IGO functions (general purpose, military, economic and social/cultural) that Jacobson (1996) provides for IGOs in 1981 and 1992. By comparing Jacobson's coding to the available information on each IGO, we identified the criteria for each category. We then broke down the criteria for economic and social/cultural codings into subcategories to produce the nine-category scheme presented in Table A1, which we applied to all IGOs in our data. In the analysis, IGO Connectedness is calculated using IGOs from all nine categories. EIGO Connectedness is calculated using the 241 IGOs

from categories 3 through 6. SCIGO Connectedness is calculated using the 167 IGOs from categories 7 through 9. We also examined in preliminary analysis the effects of the economic and social/cultural subcategories of IGOs. These were comparable to those using the aggregate categories, although IGO connectedness measures using the subcategories tended to be highly correlated.

IGO Structure

To identify IGOs as minimalist or structured, we began with the three-category coding of IGO structure that appears in Gartzke (2002:22):

> 1) Minimalist: IGOs that contain plenary meetings, committees, and possibly a secretariat without an extensive bureaucracy beyond research, planning, and information gathering.
>
> 2) Structured: IGOs that contain structures of assembly, executive (non-ceremonial), and / or bureacucracy to implement policy, as well as formal procedures and rules.
>
> 3) Interventionist: IGOs that contain mechanisms for mediation, arbitration, and adjudication, and / or other means to coerce state decisions (such as withholding loans or aid), as well as means of enforcement of organizational decisions and norms.

We applied this categorization scheme using a "coding sheet" we obtained from Erik Gartzke and Charles Boehmer, which breaks down the above categories into specific roles, structures and policies. We checked our categorizations against those that Gartzke (2002) supplies for IGOs up to 1970 and reconciled any differences.

In preliminary analysis, we used all three categories, and broke up our connectedness measures into those through minimalist, structured, and interventionist IGOs. This worked well when applied to the full set of IGOs, with results showing a moderate impact on trade of connections through minimalist IGOs, a bigger impact for structured IGOs, and a still bigger impact for interventionist IGOs. When we applied the

three-categories of structures to the economic and social/cultural subcategories of IGOs, the results were not as clean. Particularly, results for connections through interventionist IGOs were unreliable. This is probably because relatively few EIGOs are interventionist, and even fewer SCIGOs are. When we include small categories in the analysis, the results are overly sensitive to what we add to zero-connections before logging them. To avoid this methodological problem, we aggregated the second and third categories to create a single structured category, which we compare to the minimalist category to test Hypothesis 3.

Table A1
Coding Scheme for IGO Function

Function	Description	Examples
1. General Purpose (59/497 IGOs)	Umbrella organizations; organizations that: focus on communication between governments; focus on and the administration of governments; perform multiple functions of standardizing, harmonizing, monitoring and administering international agreements.	UN, Nordic Council, African Civil Service Observatory, Organization of American States
2. Military / Political (30/497 IGOs)	Regional political and/or military alliances; any organization created for military alliance/defense/security purposes.	Imperial Defense Committee, Warsaw Treaty Organization, North Atlantic Treaty Organization
3. EIGO: Monitoring, surety and general economic (105/497 IGOs)	Organizations that: perform multiple trade related functions; monitor and enforce international economic transactions; establish international trade agreements; help process international transactions; protect property rights.	European Patent Office, East Caribbean Currency Area, East African Common Market, World Trade Organization
4. EIGO: Standardization and Harmonization (36/497 IGOs)	Organizations that promote standards and conventions that smooth communications and transportation.	Organization for Cooperation of Railways, Universal Postal Union, International Bureau of Weights and Measures
5. EIGO: Cooperation and Development (67/497 IGOs)	Organizations that promote development; organizations that manage international public goods.	Caribbean Development Bank, Indian Ocean Commission, Economic Cooperation Organization
6. EIGO: Industry Specific (33/497 IGOs)	Organizations that address issues regarding the international structure and operation of specific industries.	International Wheat Council, International Pepper Community, Inter-American Federation of Cotton
7. SCIGO: Environmental (33/497 IGOs)	Organizations that have activities related to conservation/environment.	International Fund for Saving the Aral Sea, International Coral Reef Initiative
8. SCIGO: General (67/497 IGOs)	Organizations that address health, disease, disaster, social welfare cultural organizations; humanitarian organizations.	Arab Labor Organization, International Exhibitions Bureau, Nordic Children's Film Council, International Labor Organization
9. SCIGO: Education and Research (67/497 IGOs)	Educational, scientific, research and technology organizations.	Commonwealth Science Council, European Space Agency, University of the South Pacific

Table 1
Countries Analyzed

Country Name	Years of Observation†	Country Name	Years of Observation†	Country Name	Years of Observation†
Afghanistan	1925 - 1938	Germany West)	1955 - 1988	Nicaragua	1925 - 1990
Albania	1925 - 1938	Germany	1885 - 1938	Niger	1960 - 1989
Algeria	1963 - 1992	Ghana	1960 - 1990	Nigeria	1960 - 1992
Angola	1975 - 1989	Greece	1885 - 1992	Norway	1905 - 1992
Argentina	1887 - 1990	Guatemala	1925 - 1992	Oman	1971 - 1989
Australia	1920 - 1992	Guinea	1959 - 1992	Pakistan	1950 - 1992
Austria	1920 - 1992	Guinea-Bissau	1974 - 1992	Panama	1925 - 1992
Austria-Hungary	1885 - 1913	Guyana	1966 - 1990	Papua New Guinea	1976 - 1992
Bahrain	1975 - 1988	Haiti	1934 - 1989	Paraguay	1920 - 1992
Bangladesh	1973 - 1992	Honduras	1925 - 1992	Peru	1885 - 1992
Belgium	1885 - 1992	Hungary	1920 - 1992	Philippines	1950 - 1992
Benin	1960 - 1992	Iceland	1950 - 1992	Poland	1920 - 1992
Bolivia	1925 - 1992	India	1950 - 1992	Portugal	1885 - 1990
Botswana	1966 - 1989	Indonesia	1960 - 1992	Rumania	1885 - 1988
Brazil	1890 - 1992	Iran	1925 - 1992	Russia	1885 - 1989
Bulgaria	1908 - 1992	Iraq	1932 - 1987	Rwanda	1962 - 1992
Burkina Faso	1960 - 1992	Ireland	1922 - 1992	Saudi Arabia	1927 - 1989
Burma	1950 - 1989	Israel	1953 - 1992	Senegal	1960 - 1992
Burundi	1962 - 1992	Italy	1885 - 1992	Sierra Leone	1961 - 1992
Cameroon	1961 - 1992	Ivory Coast	1960 - 1992	Singapore	1965 - 1992
Canada	1920 - 1992	Jamaica	1962 - 1992	Somalia	1960 - 1989
Central Afr.Rep.	1962 - 1992	Japan	1885 - 1992	South Africa	1920 - 1992
Chad	1962 - 1992	Jordan	1954 - 1990	Spain	1885 - 1992
Chile	1895 - 1992	Kenya	1965 - 1992	Sri Lanka	1950 - 1992
China	1890 - 1992	Korea	1905 - 1905	Sudan	1971 - 1992
Colombia	1900 - 1992	Korea, South	1953 - 1992	Swaziland	1968 - 1989
Comoros	1975 - 1992	Kuwait	1980 - 1989	Sweden	1885 - 1992
Congo	1961 - 1990	Laos	1984 - 1992	Switzerland	1885 - 1992
Costa Rica	1925 - 1992	Latvia	1920 - 1938	Syria	1961 - 1992
Cuba	1925 - 1938	Lesotho	1972 - 1992	Tanzania	1963 - 1988
Cyprus	1960 - 1992	Liberia	1925 - 1986	Thailand	1890 - 1990
Czechoslovakia	1920 - 1990	Lithuania	1920 - 1938	Togo	1961 - 1990
Denmark	1885 - 1992	Luxemburg	1920 - 1992	Trinidad & Tobago	1962 - 1992
Dominican Rep.	1925 - 1992	Malawi	1965 - 1992	Tunisia	1960 - 1992
Ecuador	1925 - 1992	Malaysia	1960 - 1992	Turkey	1885 - 1992
Egypt	1937 - 1992	Mali	1960 - 1990	Uganda	1962 - 1992
El Salvador	1925 - 1992	Mauritania	1961 - 1992	United Arab Emir.	1980 - 1989
Estonia	1920 - 1938	Mauritius	1968 - 1992	United Kingdom	1885 - 1992
Ethiopia	1925 - 1986	Mexico	1890 - 1992	U.S.A.	1885 - 1992
Fiji	1970 - 1990	Mongolia	1929 - 1990	Uruguay	1925 - 1992
Finland	1920 - 1992	Morocco	1956 - 1992	Venezuela	1900 - 1992
France	1885 - 1992	Mozambique	1976 - 1992	Yugoslavia	1921 - 1990
Gabon	1961 - 1992	Nepal	1960 - 1986	Zaire	1965 - 1989
Gambia	1965 - 1990	Netherlands	1885 - 1992	Zambia	1964 - 1992
Germany (East)	1970 - 1988	New Zealand	1920 - 1992	Zimbabwe	1967 - 1992

†Years of observation may not be inclusive due to data availability. There are no observations during the World Wars, 1914-1919 and 1939-1945.

Table 2
Basic Statistics

	Mean	S.D.	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
(1) ln(Trade)	2.58	2.77	.25	.24	.26	.21	.40	.17	.30	.09	.30	.66	.49	.30	.02
(2) ln(IGO Connectedness)	2.81	1.09		.92	.90	.84	.50	.78	.63	.75	.63	.36	.36	.17	.15
(3) ln(EIGO & SCIGO Connectedness)	2.59	1.00			.97	.98	.54	.84	.70	.83	.58	.37	.40	.18	.18
(3) ln(EIGO Connectedness)	2.14	1.04				.83	.56	.87	.63	.76	.55	.39	.41	.18	.16
(4) ln(SCIGO Connectedness)	1.53	0.96					.46	.75	.79	.89	.53	.35	.38	.15	.22
(5) ln(EIGO Connectedness$_{minimal}$)	0.55	1.40						.26	.51	.30	.51	.32	.26	.28	.15
(6) ln(EIGO Connectedness$_{structured}$)	1.66	1.37							.55	.72	.43	.39	.40	.06	.16
(7) ln(SCIGO Connectedness$_{minimal}$)	0.52	1.35								.51	.53	.40	.32	.14	.21
(8) ln(SCIGO Connectedness$_{structured}$)	0.94	0.90									.38	.23	.35	.10	.21
(9) Structural Equivalence	0.61	0.23										.30	.17	.18	.26
(10) ln(GDP_i * GDP_j)	34.57	2.60											.51	.16	-.06
(11) ln((GDP per cap)$_i$ * (GDP per cap)$_j$)	16.13	1.45												.37	-.08
(12) Min. Democracy in dyad	-3.26	6.65													.02
(13) Military Allies	0.13	0.34													

Table 3
Fixed-Effects (Dyad and Year) Gravity Models of Bilateral Trade, 1885-1992

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ln(IGO Connectedness)			0.656***			
			(.011)			
ln(EIGO & SCIGO Connectedness)				0.588***		
				(.010)		
ln(EIGO Connectedness)					0.470***	
					(.009)	
ln(SCIGO Connectedness)					0.130***	
					(.009)	
$\ln(\text{EIGO Connectedness}_{\text{minimal}})$						0.109***
						(.004)
$\ln(\text{EIGO Connectedness}_{\text{structured}})$						0.166***
						(.007)
$\ln(\text{SCIGO Connectedness}_{\text{minimal}})$						0.017***
						(.005)
$\ln(\text{SCIGO Connectedness}_{\text{structured}})$						0.258***
						(.008)
Structural Equivalence		-.684***	-1.831***	-1.696***	-1.694***	-1.367***
		(.036)	(.040)	(.040)	(.040)	(.039)
$\ln(GDP_i * GDP_j)$	0.151***	0.185***	0.083***	0.070***	0.057***	0.060***
	(.013)	(.013)	(.013)	(.013)	(.013)	(.013)
$\ln((\text{GDP per cap})_i * (\text{GDP per cap})_j)$	0.761***	0.731***	0.853***	0.859***	0.878***	0.865***
	(.016)	(.016)	(.016)	(.016)	(.016)	(.016)
Min. Democracy in Dyad	0.007***	0.008***	0.010***	0.010***	0.010***	0.011***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Military Allies	0.159***	0.132***	0.127***	0.130***	0.112***	0.164***
	(.019)	(.019)	(.019)	(.019)	(.019)	(.019)
Observations	149102	149102	149102	149102	149102	149102
Dyads	5725	5725	5725	5725	5725	5725
Within-Dyad R-squared	0.3372	0.3388	0.3578	0.3542	0.3562	0.3531

*** p < .001; ** < .01; standard errors in parentheses

Table 4
Fixed-Effects (Dyad and Year) Gravity Models of Bilateral Trade, 1885-1992
Robustness Checks

	Model 7 International legitimacy	Model 8 Dyads that last => 20 years	Model 9 Re-scaling of trade before logging	Model 10 Post-World War II observations	Model 11 Oneal and Russett (2001) gravity model	Model 12 Random-effects model with distance	Model 13 Instrumental variables
ln(EIGO Connectedness$_{minimal}$)	0.109***	0.123***	0.253***	0.019***	0.109***	0.127**	
	(.014)	(.005)	(.014)	(.015)	(.004)	(.004)	
ln(EIGO Connectedness$_{structured}$)	0.165***	0.195***	0.861***	0.285***	0.166***	0.132***	
	(.007)	(.008)	(.022)	(.017)	(.007)	(.007)	
ln(SCIGO Connectedness$_{minimal}$)	0.016***	0.010***	0.261***	0.022***	0.017***	0.011***	
	(.005)	(.005)	(.016)	(.006)	(.005)	(.005)	
ln(SCIGO Connectedness$_{structured}$)	0.235***	0.276***	0.864***	0.321***	0.258***	0.216***	
	(.008)	(.009)	(.026)	(.017)	(.008)	(.008)	
Structural Equivalence	-1.454***	-1.456***	-3.410***	-.073	-1.367***	-.1.338***	-.999***
	(.040)	(.044)	(.040)	(.070)	(.039)	(.037)	(.040)
ln(GDP_i * GDP_j)	0.069***	0.086***	2.027***	0.361***		0.503***	0.201***
	(.014)	(.014)	(.044)	(.021)		(.007)	(.014)
ln((GDP per cap.)$_i$ * (GDP per cap.)$_j$)	0.862***	0.838***	-.824***	0.652***		0.564***	0.751***
	(.016)	(.017)	(.053)	(.022)		(.010)	(.017)
Min. Democracy in Dyad	0.011***	0.013***	0.001	0.006***	0.011***	0.012***	0.001
	(.001)	(.001)	(.003)	(.001)	(.001)	(.001)	(.002)
Military Allies	0.163***	0.174***	-.117	-.154***	0.164***	0.101***	0.011
	(.019)	(.020)	(.062)	(.036)	(.019)	(.018)	(.021)
Ln(IGO Memberships$_i$ + IGO Memberships$_j$)	0.086***						
	(.007)						
ln(GDP)$_i$ + ln(GDP)$_j$					0.925***		
					(.011)		
ln(Population)$_i$ + ln(Population)$_j$					-.865***		
					(.016)		
ln(Distance Between *i* and *j*)						-.835***	
						(.021)	
Instrumented Version of ln(IGO Connectedness)							0.4899***
							(.02902)
Observations	149102	112654	149102	115776	149102	149102	134122
Dyads	5725	2916	5725	4981	5725	5725	5691
Within Dyad R-squared	0.3537	0.4089	0.2439	0.2908	0.3531	0.3477	0.3273

*** p < .001; ** p < .01; standard errors in parentheses