Structural Equivalence and International ConflictA Social Networks Analysis

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Structural Equivalence and International Conflict

A SOCIAL NETWORKS ANALYSIS

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The concept of international affinity—albeit under different names—captures a central place in international relations research. This study examines how different types of affinity affect the likelihood of conflict between states. The authors discuss different types of affinities as these appear in the realist and liberal paradigms. They offer a social networks conception of structural affinity—the concept of *structural equivalence*—which reflects the similarity of international ties across a set of different networks. They test the hypotheses derived from these paradigms, using both existing measures of affinity and their own structural equivalence measures. Their findings suggest that (1) strategic affinity has a consistent dampening effect on the probability of dyadic conflict, (2) trade-related affinity does consistently affect the probability of dyadic conflict, and (3) intergovernmental organization–related affinity has a negative impact on conflict, mostly in the twentieth century.

Keywords: *international affinity; structural equivalence; dyadic conflict*

Implicit or explicit notions about the impact of affinity-related factors on dyadic conflict underlie many studies in international politics. Quite a few determinants of international conflict—alliances, regimes, trade interdependence, or joint

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intergovernmental organization (IGO) membership—reflect latent notions of affinity. Realist scholars view alliances as an indicator of reflecting common strategic interests (Gowa 1999; Farber and Gowa 1997). Liberals perceive trade as reflecting economic interdependence. Institutionalists view joint IGO membership as indicators of shared visions of collective management of international politics (Keohane and Martin 1995; Russett and Oneal 2001). Other scholars consider cultural traits to reflect identity-based affinities (e.g., Huntington 1996; Henderson 1998, 2004; Henderson and Tucker 2001; Russett, Oneal, and Cox 2000).

Deductive theories of international conflict also emphasize latent notions of affinity as empirical indicators of utility functions (Bueno de Mesquita 1981; Bueno de Mesquita and Lalman 1992). These notions treat affinity as some form of "revealed preferences." In other words, dyadic affinities—such as alliance ties—represent the result of states' decisions to pool resources for the purpose of common security. Similarly, a state's trading partners reflect its revealed economic preferences. Other kinds of affinities that cannot be readily interpreted as revealed preferences may also constrain choice. For example, the democratic peace literature—especially in its normative incarnation (e.g., Maoz and Russet 1993)—asserts that common norms determine states' behavior in conflict situations.

The concept of affinity is widely used in different disciplines such as cultural anthropology, sociology, social psychology, and organizational behavior (e.g., Swift 1999; Bowles and Gintis 2004). Two definitions characterize the literature. One views affinity as a perception of belonging to, "liking" of, or identification with a given group, organization, culture, or political movement (Swift 1999, 184; Gaffié, Marchand, and Cassagne 1997, 180). The other conception of affinity focuses on the degree of similarity among a set of units on a number of traits. This similarity may be based on subjective perceptions or on observable attributes (Bowles and Gitnis 2004).

We offer to integrate these two conceptions. To do so, however, it is important to distinguish between what we call *structural affinity* and *direct affinity*. *Direct affinity* taps the extent to which two actors are directly related to each other (e.g., have an alliance, trade with each other), share certain traits (e.g., have a similar regime, have multiple IGO memberships in common), have positive attitudes toward each other (e.g., based on survey data of their respective populations), or perceive each other to be "like myself" (e.g., have the same religion); these are based on direct relations, mutual perceptions, or common traits, *independently of other actors in the system*.

S*tructural affinity* reflects the extent to which actors are similar to each other in terms of *their relations with other actors*, or in terms of the similarity of their traits, *in relation to other actors' traits*. Actors who perceive themselves to be similar to each other may well have similar relations with other actors. The converse is not true, however. Two actors may feel that they are different from one another, but these differences pale in comparison to their differences with respect to other actors in the system.

We define structural affinity as the extent to which any two states are equivalent (or similar) to each other in terms of their attitudes toward, the traits they share, or their relations with all other states in the system. This definition allows incorporation of both notions of affinity discussed above. If we have attitude data, we can use information about the extent to which states "like" or "dislike" other national groups to establish the extent to which two states "like" or "dislike" each other, as well as the extent to which each state's pattern of "liking" or "disliking" other states matches that of the other state in the dyad. If we have information about relations between states in the system, we can use it to match the pattern of relations between one state and other states in the system with the pattern of relations between another state and the remaining states in the system. Finally, if we have information about both attitudes (liking or disliking), about relations, or about common or different traits, this definition enables us to integrate multiple types of information into a single estimate of structural affinity. We elaborate on this issue below.

In this study, we discuss different types of affinity-related conceptions deduced from the realist and liberal paradigms.[1] We explore the following issues:

1. How do these paradigms address the relationships between different types of affinity and dyadic conflict?
2. How does the social networks concept of structural affinity relate to existing conceptions and measures of affinity?
3. How does structural affinity that integrates these paradigms affect the probability of dyadic conflict? Does integrative affinity affect the probability of dyadic conflict differently than the impact of its components?

Our conception of structural affinity is based on social networks analysis, an approach that was widely used in epidemiology, sociology, social psychology, economics, and organizational behavior (Wasserman and Faust 1997, 3-27; Watts 2003, 47-55) and even in American and comparative politics (e.g., Huckfeldt, Johnson, and Sprague 2004; Knoke 1994; Knoke et al. 1996). This approach offers a framework for the systematic study of relationships among individuals, groups, organizations, and states that is eminently suitable for international relations. Unfortunately, with few exceptions in the late 1960s (e.g., Brams 1966, 1969), few studies used this approach to analyze international relations (Hoff and Ward 2004, 161; Maoz et al. 2005, 35-7). We demonstrate—through the concept of structural equivalence—how social networks analysis can illuminate important aspects of the relationship between different types of international affinity and dyadic conflict behavior.[2]

STRUCTURAL AFFINITY AND PARADIGMS OF WORLD POLITICS

The key divide in theories of international politics is still between the realist and liberal perspectives (e.g., Keohane and Martin 1995; Russett and Oneal 2001). Both

1. In a subsequent article, we explore affinities based on cultural traits of states.

2. A more elaborate discussion on how social network analysis can be applied to international relations problems is provided in Maoz et al. (2005) and Hoff and Ward (2004).

perspectives envision a negative linkage between dyadic affinity and conflict. They differ, however, in terms of the kind of factors that define this linkage. These differences stem directly from their (informally) axiomatic foundations. Each paradigm emphasizes a different dimension of affinity that is said to dampen the probability of dyadic conflict. In addition, each paradigm either dismisses or downgrades the impact of affinity-related factors that are not part of its world view.

REALISM

Realists argue that states avoid cooperation due to fear of cheating and due to relative gains calculations (Mearsheimer 1994-1995). When they do cooperate, however, is when they must—that is, when they face common enemies and/or threats (Mearsheimer 1994-1995, 12-3). Strategic interests of states are difficult to identify empirically. One way of gleaning interests is through the concept of "revealed preferences," which assumes that rational behavior reveals the kind of preferences that induced it (Morrow 1997). Building on this notion of revealed preferences, realists see alliance ties as a key indicator of shared strategic interests.

But alliance ties between states tell only part of the story of strategic affinity. Two states may not have direct ties with each other, but their pattern of strategic commitments to third parties may be highly similar. This indicates that despite the lack of a direct alliance, their perception of friends and foes is quite similar. Likewise, two states may have an intermittent interest that binds them together for an ad hoc common objective, but their outlook of the international system in terms of friends and foes may be diametrically opposed (Maoz et al. forthcoming). The pattern of alliance commitments of states reflects the extent to which they have common perceptions of threats and opportunities, of friends and foes (Bueno de Mesquita 1981; Mearsheimer 1994-1995, 13; Farber and Gowa 1997; Gowa 1999). Thus, the realist paradigm argues the following:

Realist hypothesis 1: The greater the degree of *strategic affinity* between states—defined in terms of common interests and measured in terms of the pattern of their alliance commitments—the lower the likelihood of conflict between them.

The realist perspective also posits that affinities that arise out of institutional arrangements other than security alliances or out of trade simply reflect "the distribution of power in the world" (Mearsheimer 1994-1995, 13). Accordingly,

Realist hypothesis 2: Affinities that do not reflect security interests of states do not affect the probability of dyadic conflict.

LIBERALISM

Liberal theorists readily admit that strategic affinities reduce the likelihood of dyadic conflict. Yet, they argue that—side-by-side strategic affinity—economic and institutional affinities also affect the probability of dyadic conflict. Trade-related affinity reflects subscription to an international economic regime. It reflects not only direct trade ties but also a pattern of trade with third parties, which suggests a common vision of the international political economy. Liberal arguments about structural economic affinity can go both ways. First, economic affinity reflects mutual gains, thus diminishing the competitive impact of relative gains on cooperation. Hence, seen in such terms, the liberal paradigm suggests the following:

> *Liberal hypothesis 1:* Trade-related affinity—to the extent that it reflects states' subscription to similar international regimes—tends to reduce the likelihood of conflict between them.

At the same time, common patterns of trade of two states may actually reflect competition between them over the same markets (Burt and Talmud 1993). This competition may be a source of conflict. Thus,

> *Liberal hypothesis 2:* To the extent that trade-related affinity reflects states' competitive environment, it increases the likelihood of conflict between them.[3]

Joint IGO membership reflects a normative commitment to an institutional management of international politics, rather than to a self-help anarchical structure (Keohane and Martin 1995; Russett and Oneal 2001). The liberal paradigm reasons that institutions have two effects on state behavior. First, they provide information that reduces suspicions of cheating and create long-term benefits that offset short-term incentives to compete (Keohane and Martin 1995; Axelrod and Keohane 1986). Second, institutions induce norms (e.g., reciprocity) that states find costly to violate (Keohane and Martin 1995, 45-6). The cost of cutting ties, once established, facilitates long-term cooperation (Crescenzi 2003, 2005).

> *Liberal hypothesis 3:* IGO-related affinity reflects states' subscription to similar or different international regimes. The greater the degree of IGO-related affinity between states, the lower the likelihood of conflict between them.

A COMBINED PERSPECTIVE OF INTERNATIONAL AFFINITY

The hypotheses discussed above are often treated as rival, mutually exclusive views of the effects of different types of affinity on conflict. Yet realist and liberal conceptions may, in fact, complement each other. International affinity is a multilayered concept that encompasses multiple dimensions of dyadic relations. Strategic and economic factors may have a compound impact on dyadic conflict. First, compound structural affinity incorporates economic, institutional, and interest-related factors. States may perceive affinity as the degree of common traits or interests over a wide set of relationships or attributes.

3. The difference between these two interpretations of economic affinity and conflict depends on whether similar patterns of trade between two states and other members of the system are based on complementary commodities (e.g., pencils and erasers, cars and fuel, hamburgers and cheese) or on the same or competing commodities (e.g., pencils and pencils, pencils and pens, beef and chicken).

Second, the behavioral consequences of affinity may be more complex than those posited by each of the paradigms. High affinity on one relationship may offset the effects of a different type of affinity. For example, economic interdependence may offset difference in alliance portfolios as a determinant of the probability of conflict. Compound affinity based on a wide array of relationships or identities may have a different impact on dyadic conflict than any of its individual components. Thus, integrative affinity may have a negative impact on conflict, while some of its components (e.g., alliance-based affinity or trade-based affinity) may have a positive effect on conflict. The following integrative hypothesis relates dyadic affinity to conflict:

> *Integrative hypothesis:* The higher the integrated degree of affinity between two states across strategic interests, economic ties, and shared IGO memberships, the lower the probability of dyadic conflict.

To the best of our knowledge, this is the first study that examines the effect of compound or integrated notions of affinity—based on a number of different relations and attributes—on dyadic conflict.

STRUCTURAL EQUIVALENCE AS A MEASURE OF AFFINITY

Bueno de Mesquita (BdM) (1981) was probably the first to convert the concept of structural affinity into an empirical measure via the similarity of alliance portfolios. Alliance portfolios are considered an indicator of the extent to which the strategic interests of two states converge. Farber and Gowa (1995, 1997) attempted to debunk the democratic peace proposition by arguing that common (alliance) interests—rather than common regime types—reduce the probability of dyadic conflict.

BdM's measure of strategic affinity uses the Tau-b measure of ordinal association to assess the similarity of alliance portfolios of dyad members with third parties in the system. Similar alliance portfolios indicate high affinity (or convergent interests); negative values indicate conflicting interests. Two nonaligned states typically receive the score of zero, which is the midpoint of the Tau-b scale (–1 to +1).

Signorino and Ritter (S-R) (1999) offer another measure, based on the Euclidean distance between states' relationships on some property, which—according to them—seems to overcome the anomalies of the Tau-b score. We discuss some of the properties and limitations of these two measures of structural affinity.

First, the Tau-b measure requires measuring affinity on a single relational variable. Yet, different types of relations might yield different affinity measures. The Tau-b score does not allow integration of different relationship types into a single measure (Signorino and Ritter 1999, 125).

Second, the Tau-b scheme requires count data such that they can be placed in a $k \times k$ table to apply ordinal measures of association. This scheme does not apply to cardinal quantities, such as amounts of trade between states.

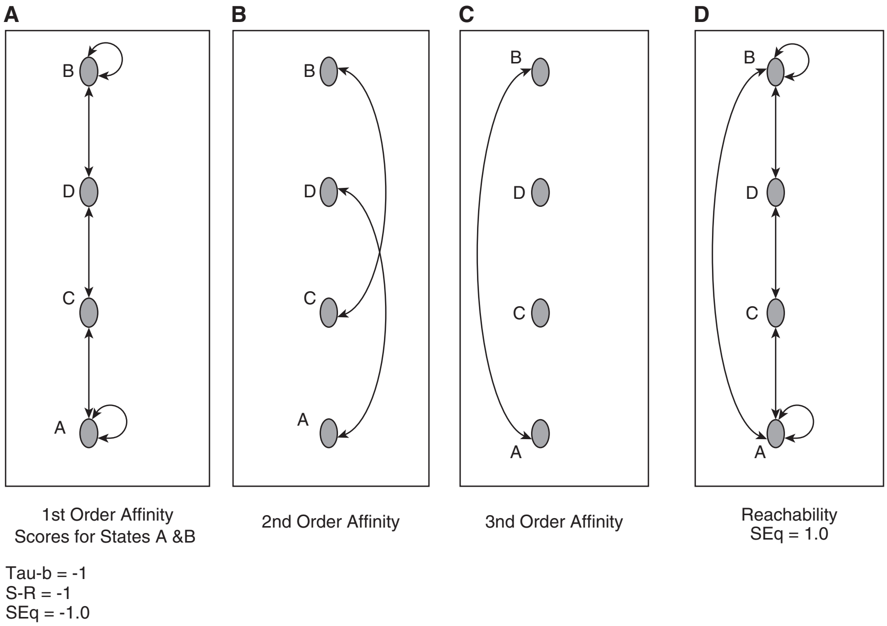

Figure 1: First-, Second-, and Third-Order Alliance Ties in a Hypothetical System

The S-R measure overcomes these problems as well as additional statistical anomalies (Signorino and Ritter 1999, 121-3), but it is limited with respect to three additional issues. First, both measures require relational indicators of affinity. Alliances, trade, diplomatic relations, or even conflict can all be used for the Tau-b and S-R measures of affinity. However, affinities based on affiliations such as membership in international organizations or ethnic similarities do not fit into these measurement schemes. A mechanism for converting affiliation-based data into relational data is required before such measurement schemes can be applied.

This is an important limitation because certain aspects of international affinity can be based on the affiliation of states with certain institutions or—alternatively—on cultural or political (e.g., regime) attributes of states. Consider the following example. The pioneering work of Russett, Oneal, and Davis (1998; cf. Russett and Oneal 2001) on the effect of joint membership in IGOs on dyadic conflict suggests that states that share many common IGO memberships are significantly less likely to fight each other than states that share few IGO memberships. However, their measure of joint IGO membership does not necessarily reflect institutional affinity. Two states may share few joint IGO memberships, but their patterns of IGO affiliations may be similar (because they may be affiliated with few IGOs in general). States that share many IGO memberships may have low institutional affinity because their patterns of IGO membership with third parties are quite different.

Second, both the Tau-b and S-R scores are based on first-order relations. They do not take account of affinities (or common interests) formed by indirect relations. For example, two states may have both direct and indirect ties with other states. If the map of their relationship is based only on direct ties, then it might miss indirect relationships.

Consider the following example referring to the relationship between states A and B in Figure 1 that shows a hypothetical alliance network. All direct affinity measures between these states (Figure 1a) yield a score of –1, thus leading us to conclude that the relationship between A and B is decidedly negative. Figure 1b shows the second-order relationships in this network (the ally of my ally). State A has a second-order alliance with itself and with D, while B has an alliance with itself and with state C. Figure 1c displays the third-order relationships (the ally of the ally of my ally). A and B have an indirect alliance with each other and are also tied to all other members of the network. Figure 1d is the *reachability graph* that includes both direct and indirect alliances.[4] Since A and B are tied to all other members of the network through both direct or indirect ties, they are completely equivalent in terms of their alliance ties and thus would have a perfect affinity score. Thus, looking only at direct relations as an indicator of affinity may lead to misleading or biased insights about relationships.[5]

Why should we care about indirect relationships? The key reason is that some indirect relationships may have a profound impact on direct ones. The notion of "the enemy of my enemy is my friend" represents a fundamental idea in political realism about common enmities that form the basis for common interests (Mearsheimer 1994-1995, 13). It may also have important logical implications for systemic instability (Lee, Muncaster, and Zinnes 1994; Saperstein 2004). Allies often get entangled in unwanted third-party wars due to chain-ganging processes (Christensen and Snyder 1990; Snyder 1997; Maoz 1990, 193-215). Indirect trade may have profound effects on direct trade because the exports of a trading partner may determine its ability to import from us. Indirect institutional affinity is more difficult to justify because it is less clear what it implies in a substantive sense. Therefore, the reliance on a distinction between direct and structural affinity depends on the specific theoretical implications of a given network. In this article, we restrict our discussion and analyses to indirect strategic affinity and indirect economic affinity but not to indirect institutional affinities.[6]

4. In this particular example, it is identical to Figure 1c, but this is not a general case.

5. If ties represent magnitudes of relations (e.g., percent gross domestic product [GDP] traded between states), indirect relations are discounted. So if the direct relations in Figure 1a between A and C is 0.3 and the direct relation between C and D is 0.5, then the indirect relations between A and D in the second-order relationship would be $0.3 \times 0.5 = 0.15$.

6. There is a question of how many lines of separation matter in the assessment of different types of indirect affinity. In other words, when considering indirect strategic affinity, should we focus only on my ally and the ally of my ally, or should we focus on the ally of my ally of my ally . . . and so forth? Likewise, when examining trade networks, should we focus on the trading partners of my trading partner or on the trading partners of the trading partners of my trading partner and so on? The answer to this question is based on how far one believes that indirect affinity goes. For some issues, one may wish to go all the way from direct (first-order) ties to $n - 1$ indirect ties. For a discussion of these matters in the context of measuring interdependence, see Maoz (2006).

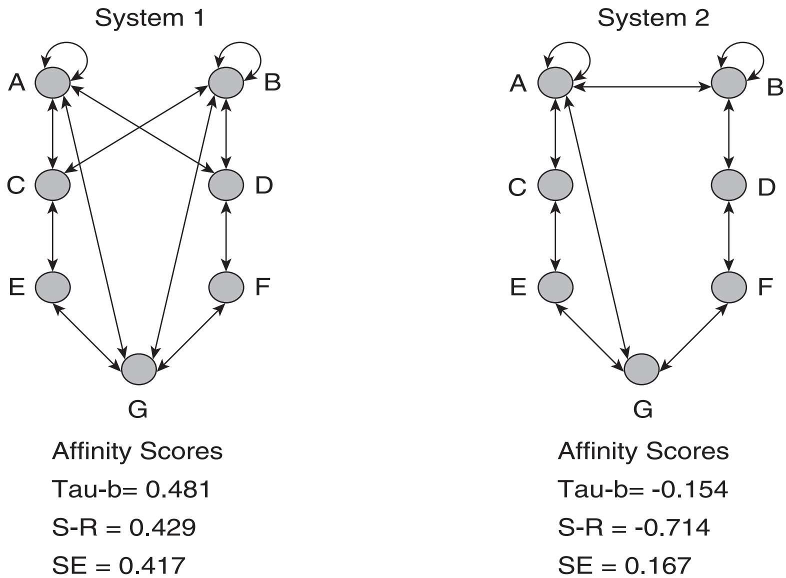

Figure 2: Structural Equivalence in Two Hypothetical Networks

Second, Maoz et al. (forthcoming) showed that there exist significant imbalances between direct and indirect relationships in world politics: enemies of enemies can be both allies and enemies simultaneously. States that share linguistic or religious affinities can be both allies and enemies. Thus, first-order measures of affinity may have a different effect on conflict than measures that incorporate both first-order and higher order affinities.

Third, Tau-b measures assume symmetrical relationships. If state A is aligned with state B, then state B is aligned with state A by definition. However, if we use exports as a measure of affinity, then the level of export by state A to state C may not be the same as the level of exports of state C to state A. This creates considerable problems of interpretation.[7]

Given these problems, we offer an alternative conception of international affinity as part of our attempt to understand international relations as a set of international networks (Maoz et al. 2003a, 2003b, 2004, 2005, forthcoming; Maoz 2006). A network is defined as a set of nodes that designate people, groups, institutions, or states

7. The Signorino and Ritter (S-R) (1999) measure can be applied to both symmetrical and asymmetrical relationships. However, the interpretation of the case wherein the Euclidean distance between state *i* and *j* is not equal to the Euclidean distance between state *j* and *i* on the same issue space is not straightforward. The Euclidean distance measurement in the social network framework of structural equivalence is both conceptually and mathematically similar to the S-R approach but is more readily interpretable in the sense that it measures incoming and outgoing distances between units in the network.

and a rule that defines whether and how any two nodes are tied to each other (Watts 2003, 27; Wasserman and Faust 1997, 20). We can define a relationship by a statement such as “lives next to,” “speaks the same language as,” or—in an international relations (IR) context—“is allied with,” “exports to,” “has diplomatic relations with,” and so forth. This relationship can be binary (yes/no), ordinal (level of alliance commitment, rank of diplomatic mission), or ratio level (e.g., “proportion of gross domestic product [GDP] due to export to,” “number of people killed in conflict with,” etc.). Such relationships can be symmetric or asymmetric.

Networks can be displayed as graphs or as sociomatrices. We use the concept of structural equivalence in social networks analysis to tap dyadic affinity. This concept rests on the distinction between direct similarity—defined in terms of the links or ties between two states—and structural affinity—defined in terms of the similarity between the ties each state has with other states in the system. We start with a conceptual definition of structural equivalence and then define the measure of this concept formally.

Consider the affinity between states A and B (we can perform a similar analysis for any two members of these systems). In Figure 2a, A and B are not connected, but they have a similar pattern of ties with other states. All three measures of affinity produce positive and moderately high affinity scores. In Figure 2b, A and B have a direct tie, yet they have different relationships with other members of the system. Thus, their affinity scores are much lower. In fact, both the Tau-b and S-R scores are negative, with the latter showing a strong negative affinity between the two states. In contrast, the structural equivalence (SEq) measure reflects affinity in terms of the similarity of ties between each of these states and all other states in the system. This demonstrates rather well how measures of similarity differ from measures of structural affinity.

Formally, let $N = [1, 2, k, \ldots, n]$ represent the set of nodes (states in our case) that make up a given network. Let $\Re = [\Re_1\ \Re_2, \ldots, \Re_r]$ denote a set of relationships (alliances, trade, IGO membership) on which these nodes may or may not be connected. Each network is defined by a square sociometric $\mathbf{X}^r$, with entries x^r_{ij} denoting the relationship between row node i and column node j on relation r. We define the structural equivalence of nodes i and j on relationship r as

$$SE^r_{ij} = S^r[(x_{ik}, x_{jk}), (x_{ki}, x_{kj})] \qquad \forall\ i,j,k \in N;\ r \in R, \tag{1}$$

where $S^r(x_{ik}, x_{jk})$ is some measure of similarity of the ties going out of i and j to any third node k on relation r, and $S^r(x_{ki}, x_{kj})$ is a measure of similarity of the ties coming in from any node k to i and j, respectively.[8] Structural equivalence can be defined on any given relationship separately. It can be also be defined over multiple relationships. Thus, we can measure separate affinity types in terms of the similarity or dissimilarity of alliance portfolios, trade relations, diplomatic missions sent and received, and so forth. We can also integrate across the entire set of relationships

8. Wasserman and Faust (1997, 356-7) use slightly different notations, but the definitions used here are the same as theirs.

(alliances, trade, diplomatic missions, etc.) and measure the overall extent of equivalence.

There are different measures of structural equivalence—for example, Euclidean distances, correlations, or proportion of exact matches between individual profiles of relationships (Wasserman and Faust 1997, 366-75).[9] The measure we use here is that of bivariate or multiple correlation. Specifically, to measure the structural equivalence between nodes *i* and *j* on a relationship *r*, we use the formula for the Pearson product-moment correlation, such that

$$Se_{ij}^{r} = \frac{\sum_{k=1}^{n}(x_{ik} - \bar{x}_{\bullet i})(x_{jk} - \bar{x}_{\bullet j}) + \sum_{k=1}^{n}(x_{ki} - \bar{x}_{i\bullet})(x_{kj} - \bar{x}_{j\bullet})}{\sqrt{\sum_{k=1}^{n}(x_{ik} - \bar{x}_{\bullet i})^2 + \sum_{k=1}^{n}(x_{ki} - \bar{x}_{i\bullet})^2}\sqrt{\sum_{k=1}^{n}(x_{jk} - \bar{x}_{\bullet j})^2 + \sum_{k=1}^{n}(x_{kj} - \bar{x}_{j\bullet})^2}}, \qquad [2]$$

where $\bar{x}_{i\bullet}, \bar{x}_{j\bullet}$ are the respective means of the outgoing connections from *i* and *j* (row means) of matrix $\mathbf{X}^r$, and $\bar{x}_{i\bullet}, \bar{x}_{j\bullet}$ are the means of the incoming connections to *i* and *j*, respectively (column means). For any given sociometric and for any pair of nodes, structural equivalence is simply the correlation between two rows *ij* and the corresponding columns. If we want to measure structural equivalence across a number of different relationships, we simply use the formula for the multiple correlation coefficient, such that

$$SE_{ij}^{\Re} = \frac{\sum_{r=1}^{2\Re}\sum_{k=1}^{n}(x_{ikr} - \bar{x}_{ir\bullet})(x_{jkr} - \bar{x}_{jr\bullet})}{\sqrt{\sum_{r=1}^{2\Re}\sum_{k=1}^{n}(x_{ikr} - \bar{x}_{ir\bullet})^2}\sqrt{\sum_{r=1}^{2\Re}\sum_{k=1}^{n}(x_{jkr} - \bar{x}_{jr\bullet})^2}}, \qquad [3]$$

where the multiple correlation is based on both $\Re$ matrices and $\Re$' transposed matrices (hence the relationship index running to $2\Re$), and $\bar{x}_{ir}, \bar{x}_{jr}$ are the means of the incoming and outgoing ties in the rth sociometric (Wasserman and Faust 1997, 369).

How does the measure of structural equivalence overcome the limitations of the current measurement schemes? First, structural equivalence can tap any order of relationship between states. Second, it can reflect first-order relationships (e.g., direct alliances, direct trade relations), or it can reflect any level of indirect relationship. Third, we can measure structural equivalence scores on the basis of any single relationship or multiple relationships. For that, we simply revert to multiple correlation coefficients.[10]

Fourth, our data can reflect a binary (presence or absence) of a relationship (the presence or absence of alliances, the presence or absence of diplomatic relations, etc.) or ordinal (the level of alliance commitment or the level of diplomatic mission),

9. For additional conception of equivalence (e.g., role equivalence, matched equivalence), see Wasserman and Faust (1997, 461-502).

10. It is also possible to weigh multiple correlation coefficients such that some relationships would receive higher weights in the overall affinity scores, as is the case with the S-R measure, but we do not discuss this in the present study.

or they can measure magnitudes of relationships (e.g., the proportion of a state's GDP that is due to exports to another state).

Fifth, we can derive structural equivalence scores from either relational or affiliational data (or from a mix of relational and affiliational data). Consider the membership of states in IGOs. Suppose our data consist of a set of states and a list of IGOs. Entries in this data matrix denote whether state *i* is a member of IGO *g*. This affiliational matrix (**A**) can be converted into a relational network by multiplying it by its transpose (**S = AA'**). Each entry *ij* in the resulting sociometric **S** denotes the number of IGOs that states *j and i* share in common. (The diagonal of this matrix, *ii*, denotes the number of IGOs for each state.) The resulting sociometric allows integration of affiliational data into a multiple relationship measurement of structural equivalence.[11]

Finally, as noted, structural equivalence measures encompass both symmetrical relationships (i.e., $x_{ij} = x_{ji}, \forall\ i, j \in N$) and directed relationships ($x_{ij} \neq x_{ji}$). It follows that structural equivalence is a more flexible, general, and precise conception of structural affinity than either the Tau-b or S-R measures. It is not only a different way of measuring similarities between states but an entirely different conception of international affinity defined in structural terms.

RESEARCH DESIGN

SPATIAL-TEMPORAL DOMAIN

Our study covers all dyads over the period from 1816 to 2001. We use this population to generate the measures of structural equivalence. Our statistical analyses are performed both on the entire population of dyads and on the politically relevant dyad population. Politically relevant states consist of directly or indirectly (through colonial possessions) contiguous states or dyads that include a major power or a regional power (Maoz 1996, 139-41). The unit of analysis is the dyad-year. We focus on politically relevant dyads because there is no a priori reason to expect that conflict between Costa Rica and Thailand is a function of their alliance or trade relations; these states simply do not have the opportunity to fight (Siverson and Starr 1991).

DATA SOURCES

1. Conflicts: Militarized interstate disputes (MIDs) and war data are taken from the dyadic MID data set (Maoz 2005). Coding rules for these data are documented in Gochman and Maoz (1984) and Jones, Bremer, and Singer (1996).
2. Regime data are taken from the Polity IV data set (Jaggers and Gurr 1995), at http://www.cidcm.umd.edu/inscr/polity/index.htm.

11. This operation allows straightforward application of the S-R measure on the converted sociomatrix. On the other hand, to apply the Tau-b score to the relational data requires converting the count entries in the sociomatrix into ordinal levels, thus causing significant loss of information.

3. Contiguity, capability, and alliance data: These are Correlates of War data sets and are documented and available from the COW2 Web site at http://cow2.la.psu.edu/. Stinnett et al. (2002) and Gochman (1991) document the contiguity data. Singer (1990) discusses the military capability. The alliance data set is documented in Gibler and Sarkees (2004). We also used the Gleditsch and Ward (2001) distance between capitals data set (http://weber.ucsd.edu/~kgledits/mindist.html). Finally, we also used the newly created Alliance Treaty and Obligations Project (ATOP) data set compiled by Brett Ashley Leeds: http://atop.rice.edu/home (Leeds 2003).
4. Trade data: We used two different data sets and performed analyses on both: the Barbieri, Keshk, and Pollins (2004; Barbieri 1996, 2002) data set, covering the period from 1870 to 1996, and the Oneal and Russett (2005) and Gleditsch (2002) trade data sets. The Oneal-Russett data set covers the period from 1885 to 2000 and uses the Gleditsch trade data for the period from 1948 to 2000.[12]
5. IGO membership: The IGO data set is documented by Pevenhouse, Nordstrom, and Warnke (2004) and downloaded from the COW2 Web site at http://cow2.la.psu.edu/.

DEPENDENT VARIABLES

The dependent variables are defined as the occurrence of a militarized interstate dispute or a war during a given year (assigned a score of 1 and 0 otherwise). We examine disputes and wars under way for reasons discussed by Maoz (1998), but we also ran analyses on MIDs and wars begun. Results are basically identical.

INDEPENDENT VARIABLES

Structural equivalence scores are measured on three international networks: alliances, trade, and IGOs. We discuss each in turn.

Alliance structural equivalence (ALLYSEq). We constructed an alliance network matrix for each year over the period from 1816 to 2000. We measured structural equivalence on the basis of two different matrix types. The first type, BA_t, is a binary alliances matrix whose entries, ba_{ijt}, indicate whether state i had a formal alliance of any type with state j (score of 1) or not (0) for year t. In line with Bueno de Mesquita's (1981) logic, the main diagonal of the alliance matrix is coded 1, meaning that each state has a defense pact with itself (it would defend itself if attacked). The second matrix is a valued alliance matrix VA_t and uses the ATOP alliance codes. Entries in this matrix are coded on a scale of $0 \leq va_{ijt} \leq 1$ according to a procedure discussed by Maoz (2006) that takes account of the level of commitment entailed in certain alliances and allows for a dyad to have multiple alliance commitments during a given year. Diagonal cells are also 1. We calculate the annual structural equivalence scores for each of the two matrices using equation (2) above.

12. We use two trade data sets due to the divergent results on interdependence and conflict (e.g., Barbieri 1996, 2002 vs. Russett and Oneal 2001). This allows us to test the extent to which our trade-related findings are robust with respect to the trade data set.

We also computed third-level structural equivalence scores using the following procedure. First, for each year, we generated a third-order reachability matrix defined as $AR^3=\Sigma_{k=1}^{3} BA^k$, with entries ar_{ij}^3 set at 1 if state i has a direct, indirect (ally of an ally), or third-order (ally of an ally of an ally) relationship with state j and 0 otherwise. We then calculated third-order structural equivalence scores from this matrix as well.[13]

Trade structural equivalence (TRADESEq). We followed the same procedure as for the alliance data. The entries in the trade (VT) matrices, vt_{ij}, are i's exports going to state j as a proportion of state i's GDP. Diagonal entries are defined as $vt_{ii}=1-\sum_{j\neq i} export_{ij}\, GDP_i$ which designates the portion of the state's GDP that is not due to trade. Thus, VT matrices reflect directed and valued networks. When the Oneal-Russett data are used, the vt_{ij} entries are defined as VT_{ij}, $(trade_{ij})/GDP_i$ where $trade_{ij}$ is the total trade (exports and imports) between states i and j. This is less than an ideal measure because directionality is enabled only by the division of trade to GDP, not by the direction of trade. It is necessitated, however, by the lack of differentiation of exports and imports in this data set. The main diagonal of the matrix in this case is defined as the complement of the proportion of trade to the state's GDP. Here, too, we applied the same procedure as with the alliance matrices to compute third-order structural equivalence figures.[14]

IGO membership. The IGO data set forms a series of affiliation matrices; each matrix, IGA_t, is an $n \times k$ matrix , with n rows reflecting the number of states in year t and the k columns reflecting the IGOs existing during this year. Each entry in this matrix, iga_{ijt}, is 1 if state i was a member of IGO j at year t and 0 otherwise. These matrices are measured once every five years for the period from 1815 to 1965 and every year thereafter. We first converted each of these matrices into a sociometric that is obtained by multiplying matrix IGA_t by its transpose ($IGO_t = IGA_t \times IGA_t$). Each entry igo_{ij} denotes the number of IGOs that states i and j share in common. Diagonal entries igo_{ii} denote the number of IGO memberships of state i. Structural equivalence scores were then computed from the IGO sociomatrices. Since in the second-order IGO reachability matrices, for most years, each state had a second-order SEq score of 1.0 with each other state, there was no point in calculating higher order structural equivalence scores for IGO membership. For the period from 1816 to 1965, we extrapolated structural equivalence periods for missing years such that $igose^t_{ij} = igose^{t-1}_{ij} + (igose^{t5}_{ij} - igose^{t5}_{ij})/5$ where $igose^{t5}_{ij}$ is the structural equivalence score for the ij dyad in the next half-decade and is the structural equivalence score

13. We restricted reachability to third-order relations because most fourth or higher order alliance matrices were empty.

14. Trade-based indices are somewhat problematic. The Barbieri, Keshk, and Pollins (2004) trade data set contains about 50 percent missing data. One of the key reasons for using the Oneal and Russett (2005) data set is that is contains a far smaller rate of (about 23 percent) missing data due to extrapolation. We treated missing data as no trade.

for the previous half-decade. We ran separate analyses on both extrapolated data and on actually measured data. The results were essentially similar for both versions.

Integrated SEq scores. We used alliances, trade, and IGO sociomatrices to generate a hypermatrix (Wasserman and Faust 1997, 154) by joining the three separate matrices for each year where data were available for all three. We then computed the integrated SEq scores using the multiple correlation algorithm for the combined matrix.

CONTROL VARIABLES

As is customary in this genre, we control for variables that are known to affect the probability of dyadic conflict. These variables are the following.

Regime structure (MINREG). We use the weak-link Maoz and Russett (1993) regime score (ranging from –90 to 70 in our data).
Capability ratios (CAPRAT). The military capability ratio is computed as the ratio of the strongest member of the dyad to the weakest using the Composite Index of National Capabilities (CINC) score (Kadera and Sorokin 2004).
Contiguity. Since we analyze politically relevant dyads only (Maoz 1996), we employ the Gleditsch and Ward (2001) distance variable as a reasonable approximation of contiguity that is of an interval rather than a nominal or ordinal nature.
Traditional alliance affinity measures. We use the BdM affinity scores as provided in the EUGENE program (Bennett and Stam 2000, 2002).[15]
Years of peace and splines. Following Beck, Katz, and Tucker (1998), we employ peace years (*PEACEYRS*) and cubic splines of order 1 to 3 (*_SPLINE1*, *_SPLINE2*, *_SPLINE3*) to control for time dependence anomalies generated by ordinary logit.

ESTIMATION AND COMPARISON OF MODELS

To assess the extent to which the measures of structural equivalence improve upon existing measures of affinity, we follow a two-track strategy. First, we start by estimating a baseline equation in which the dependent conflict variable is regressed only on the set of control variables and the splines.

The baseline equation is given by

$$p(CONFLICT_{ijt} = 1) = \alpha - \beta_1 MINREG_{ij(t-1)} - \beta_2 CAPRAT_{ij(t-1)} + \beta_3 DISTANCE_{ij} \\ \beta_{10} PEACEYRS_{ij} + \sum_{i=10}^{12} \beta_i \_SPLINE^* + \varepsilon, \quad [4]$$

15. Analyses involving the traditional affinity scores are not reported here. All data and analyses including these scores are available from the project's Web site at http://psfaculty.ucdavis.edu/zmaoz/datasets.html.

where $CONFLICT_{ijt}$ is the conflict measure (MID/War) for dyad *ij* at year *t*. The $\_SPLINE^*$ variables are the cubic splines of order 1 to 3.

We then proceed in a sequential manner to introduce the independent variables, up to the point where we reach the full model, given by equation (5).

$$\begin{aligned} p(CONFLICT_{it} = 1) = \alpha &- \beta_1 MINREG_{i(t-1)} - \beta_2 CAPRAT_{i(t-1)} + \beta_3 CONTIG_{i(t-1)} \\ &- \beta_4 ALLYSE_{i(t-1)} - \beta_5 TRADESE_{i(t-1)} - \beta_6 IGOSE \\ &- \beta_7 PEACEYRS + \sum_{i=8}^{10} \beta_i \_SPLINE^* + \varepsilon, \end{aligned} \tag{5}$$

Note that the *ALLYSEq* and *TRADESEq* variables are run twice, once with the first-order SEq scores and once with the third-order SEq scores. Finally, the individual SEq and S-R scores are replaced by the integrated SEq and S-R scores, respectively. In addition to running the equations with ordinary logit and cubic splines, we ran the same equations using population-averaged generalized estimating equation (GEE) models (with AR(1) correction for autocorrelation). The results were substantially similar.

To evaluate the relative impact of a given set of measures of the affinity variables on the outcome variable, we compare the pseudo R^2 of this equation to the baseline equation via the following measure:

$$MIF = \frac{R_A^2 - R_B^2}{1 - R_B^2},$$

where *MIF* is the marginal improvement in fit statistic, and R^2_A, R^2_B stand for the pseudo-R^2 measures of the alternative model (including one or more independent variables) and the R^2 of the baseline model, respectively.[16]

EMPIRICAL RESULTS

We start by discussing correlations among the structural equivalence measures, as well as the correlations between SEq measures and the alliance-based measures of affinity used by BdM and S-R. These correlations are presented in Table 1.[17]

16. One may argue that the percent correct prediction is a better estimate of the relative fit of the models. However, given the rare-event nature of the nonzero values of the dependent variables, modal predictions perform better than model-based predictions.

17. These correlations are presented for illustration purposes only. Since the data are set as cross-sectional time series, straightforward correlations cannot allow for meaningful relational inferences. They do allow, however, to remove fears of colinearity when they are relatively low, which is exactly what we see in Table 1.

TABLE 1

Correlations between Indices of Structural Equivalence

	SEq Alliance First Order	*SEq Trade First Order*	*SEq IGO First Order*	*SEq Alliance Third Order*	*SEq Trade Third Order*	*SEq IGO Third Order*	*Integrated SEq*
SEq trade first order	0.216***	1.000					
SEq IGO first order	0.318***	0.228***	1.000				
SEq alliance third order	0.787***	0.204***	0.295***	1.000			
SEq trade third order	0.076***	0.413***	0.206***	0.061***	1.000		
SEq IGO third order	0.077***	0.137***	0.717***	0.079***	0.287***	1.000	
Integrated SEq	0.695***	0.320***	0.656***	0.693***	0.207***	0.348***	1.000
Tau-b alliance	0.656***	0.226***	0.289***	0.621***	0.157***	0.093***	0.594***
S-R weighted alliance	0.205***	0.114***	0.036***	0.174***	0.203***	–0.076***	0.304***

NOTE: *n*s vary considerably for pairs of correlations. These range between 368,048 (when trade data are involved) to 626,374 (with alliance data). SEq = structural equivalence; IGO = intergovernmental organization; S-R = Signorino and Ritter (S-R) (1999).

*** $p < .001$.

TABLE 2

Logit Analysis of the Effects of Structural Equivalence Measures of Affinity and Control Variables on Dyadic International Conflict: All Dyads, 1816-2000

	MIDs			*War*		
Independent/ Control Variable	*Model 1 (Baseline)*	*Model 2*	*Model 3 (Integrated SEq)*	*Model 4 (Baseline)*	*Model 5*	*Model 6 (Integrated SEq)*
Minimum regime score	–0.003**	–0.004**	–0.004**	–0.005**	–0.004**	–0.005**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capability ratio	–0.001*	0.001	0.000	–0.003**	–0.004**	–0.003**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Distance	–0.001**	–0.001**	–0.000**	–0.001**	–0.001**	–0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Alliance SEq, first order	—	–0.368**	—	—	—	
		(0.075)				
Alliance SEq, third order	—	—	—	–0.323**	—	
				(0.128)		
Trade SEq, first order[a]	—	–0.574**	—	—	—	
		(0.088)				
Trade SEq, third order[a]	—	—	—	–1.778**	—	
				(0.177)		
IGO SEq	—	0.319**	—	—	—	
		(0.097)				

Integrated SEq (alliance, trade, IGOs)			−0.330**			0.245*
			(0.067)			(0.118)
Constant	−2.614**	−2.167**	−2.057**	−3.089**	−1.469**	−2.049**
	(0.076)	(0.123)	(0.113)	(0.115)	(0.165)	(0.141)
Model statistics	n = 450,086; χ^2 = 13,735; R^2 = 0.520	n = 447,190; χ^2 = 10,959; R^2 = 0.544; MIF = 0.128	n = 449,969; χ^2 = 10,963; R^2 = 0.539; MIF = 0.119	n = 450,306; χ^2 = 1,032.9; R^2 = 0.165	n = 381,873; χ^2 = 2,076.3; R^2 = 0.248; MIF = 0.099	n = 438,255; χ^2 = 1,428.4; R^2 = 0.209; MIF = 0.053

NOTE: Estimates of splines and years of peace variables are not presented here due to space constraints. *n*s vary due to missing data and different time spans for individual variables. SEq = structural equivalence; IGO = intergovernmental organization; MID = militarized interstate dispute; MIF = marginal improvement in fit statistic.

a. Barbieri, Keshk, and Pollins (2004) trade data set.

*p < .05. **p < .01.

Due to the exceedingly large *N*s, almost any correlation is statistically significant. However, for the most part, correlations between different indices of structural affinity (e.g., between alliance, trade, and IGO SEq) are relatively low. These correlations suggest that most of the affinity-related indices should be expected to have independent effects on conflict among states. The correlations between the SEq indices of affinity and the traditional (Tau-b and S-R) indices are also generally low, suggesting that these sets of measures may well tap different dimensions of affinity. The high correlations are between the first and third order of affinity on the same variable and between individual elements of affinity and the integrated affinity index, which are not at all surprising. We move to an analysis of the effect of structural affinity indices on the probability of dyadic conflict. This is done in Table 2.

The leftmost columns in the two blocks of Table 2 report the baseline models that reflect the effect of the control variables on the probability of dyadic MIDs and wars.[18] The results suggest that strategic affinity—as expected by the realist paradigm—has a negative impact on the probability of dyadic conflict. Trade-related affinity, as hypothesis 1 of the liberal paradigm expects, has also a significant negative impact on the probability of conflict. However, institutional affinity tends to have a positive impact on the probability of conflict, contrary to the expectation of the liberal paradigm. The effects of strategic and economic affinity on conflict hold both for first-order structural equivalence and for measures of affinity that are based on first- to third-order affinities. Finally, the integrated measure of affinity also has a significant negative impact on the probability of dyadic MIDs and war.

The models that include the affinity indices do a slightly better job of reducing the unexplained variance compared to the baseline model. Since the *N*s are very large (and due to substantial amounts of missing data on some variables), these improvements in fit are not negligible and suggest that better data on the various affinity-related variables may improve our ability to predict the occurrence of such conflicts.

To examine the robustness of these results, we examine in Table 3 variations in the relationships between different dimensions of affinity and dyadic conflict. We also limit our analysis in this table to politically relevant dyads only to remove possible selection effects from the population.

The results of Table 3 largely confirm the previous results. However, some cross-time variations are notable. First, both strategic and trade-related affinity has a negative impact on the probability of dyadic conflict that is generally robust with respect to time. The effect of IGO-related affinity on conflict is not. IGO-related affinity does not significantly affect dyadic conflict in the nineteenth century; it positively

18. We provide comparisons of the marginal effects of the structural equivalence (SEq)–based measures vis-à-vis the Tau-b and S-R measures of affinity in the replication Web site (http://psfaculty.ucdavis.edu/zmaoz/datasets.html).

19. The consistent negative impact of trade SEq on conflict is observed with the Oneal and Russett (2005) data. The Barbieri, Keshk, and Pollins (2004) data provide less consistent results for the twentieth century in the case of militarized interstate disputes but generally conform with the above statement.

TABLE 3

Structural Equivalence and Dyadic Conflict: Periodic Breakdown of Logit Analyses (Politically Relevant Dyads Only)

	MIDs				*War*			
	Nineteenth Century	*Twentieth Century*	*1946-2001*	*1946-2001*	*Nineteenth Century*	*Twentieth Century*	*1946-2001*	*1946-2001*
Minimum regime score	0.003	–0.005**	–0.004**	–0.005**	–0.016*	–0.010**	–0.013**	–0.016**
	(0.002)	(0.001)	(0.001)	(0.001)	(0.008)	(0.001)	(0.003)	(0.003)
Capability ratio	–0.004**	–0.001**	–0.003**	–0.003**	–0.083*	–0.009**	–0.016**	–0.014**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.042)	(0.002)	(0.004)	(0.002)
Distance	–0.000	–0.000**	–0.000**	–0.000**	0.000	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Alliance SEq, first order	–0.664**	–0.307**	–0.120	—	–0.856*	–1.379**	–0.128	—
	(0.260)	(0.074)	(0.086)		(0.441)	(0.248)	(0.350)	
Trade SEq, first order[a]	—	–0.928**	–0.923**	—	—	–0.807	–15.093**	—
		(0.299)	(0.361)			(0.777)	(5.231)	
IGO SEq	–0.173	0.004	–0.385**	—	0.231	0.728*	–1.417**	—
	(0.129)	(0.100)	(0.133)		(0.230)	(0.300)	(0.348)	

Table 3 (Continued)

	MIDs				*War*			
	Nineteenth Century	*Twentieth Century*	*1946-2001*	*1946-2001*	*Nineteenth Century*	*Twentieth Century*	*1946-2001*	*1946-2001*
Integrated SEq (alliance, trade, IGOs)	—	—	—	–0.186* (0.081)	—	—	—	–0.904** (0.306)
Constant	–1.792** (0.176)	–0.524** (0.134)	–0.304 (0.175)	–0.629* (0.150)	–1.497** (0.381)	–1.528** (0.283)	–1.567** (0.335)	–2.701** (0.246)
Model Statistics	n = 12,817; LR χ^2 = 480; R^2 = 0.286; MIF = 0.017	n = 52,502; LR χ^2 = 1,341; R^2 = 0.524; MIF = 0.083	n = 37,817; LR χ^2 = 963; R^2 = 0.531; MIF = 0.108	n = 37,996; LR χ^2 = 935; R^2 = 0.528; MIF = 0.098	n = 12,843; LR χ^2 = 130; R^2 = 0.137; MIF = 0.049	n = 52,527; LR χ^2 = 1,271; R^2 = 0.288; MIF = 0.089	n = 37,842; LR χ^2 = 336; R^2 = 0.243; MIF = 0.083	n = 38,024; LR χ^2 = 301; R^2 = 0.214; MIF = 0.061

NOTE: Estimates of splines and years of peace variables are not presented here due to space constraints. *n*s vary due to missing data and different time spans for individual variables. SEq = structural equivalence; IGO = intergovernmental organization; MID = militarized interstate dispute; MIF = marginal improvement in fit statistic.

a. Barbieri, Keshk, and Pollins (2004) trade data set.

*$p < .05$. **$p < .01$.

affects conflict propensity throughout the twentieth century but has a negative impact on conflict in the post–World War II era.

The dampening effects of strategic and trade-related affinity on dyadic conflict are significant and consistent across time and population of dyads. The effects of institutional affinities on conflict are, by and large, consistent with the expectations of the liberal paradigm (liberal hypothesis 1, in the case of economic affinity), but these effects are not as consistent and robust as the effects of strategic and economic affinity.

By and large, the control variables exhibit consistently significant effects on dyadic conflict, in accordance with previous studies linking regime scores, capability ratios, and contiguity to dyadic conflict (e.g., Bremer 2000).

CONCLUSION

This study offers one of the first systematic analyses of the effects of different conceptions of structural affinity on dyadic conflict. Several findings emerge.

1. Strategic affinity significantly reduces the probability of MIDs and war. This finding is fairly robust across spatial and temporal stratifications. This supports the realist claim that strategic affinity, defined in terms of common interests, reduces the probability of conflict between states.
2. The effects of liberal conceptions of affinity—defined in terms of trade and IGO-based relations—on conflict receive significant support, but this is not as robust and consistent as in the case of strategic affinity. The support for hypotheses focusing on trade-based affinity is significantly more robust than for those focusing on institutional affinity.[19]
3. An integrated measure of structural equivalence that incorporates trade, alliances, and IGO-based relations seems to have a consistently negative effect on the probability of conflict. This suggests that an integrated perspective of world politics—one that includes both realist and liberal notions of conflict and cooperation—has significant theoretical and empirical potential.
4. Conceptualizations of affinity that are based on *indirect* associations between dyad members and third parties have also a significant predictive potential with regard to the probability of dyadic conflict.

We believe that this study contributes to our knowledge about international politics in several ways. First, it offers a new perspective of the effects of affinity on international relations, one that considers not only direct ties between states but also how these states are tied to other states or entities in the system. This approach allows us to examine different notions of affinity as these are discussed by different paradigms of world politics. More important, it allows us to think and analyze international relations in terms of integrative models, models that combine ideas from different theoretical paradigms within one theoretical framework. This opens the door to new or more complex ideas about the structure of relations among states and their effects on conflict and cooperation in world politics.

Second, the results reported herein suggest that this approach offers a superior strategy compared to previous efforts at measuring and employing this concept. We need to explore additional dimensions of affinity, such as diplomatic relations, voting patterns, and regime structure. These new dimensions of dyadic affinity can be studied either in isolation or integrated into one comprehensive conception.

Third, this study suggests the usefulness of social networks approaches to the study of international politics. International politics is about relations between states. The structure and dynamics of these relations can be systematically modeled by social networks analysis. We presented only one facet of this approach here, but other applications may shed light on various aspects of conflict and cooperation at the national, dyadic, and systemic levels of analysis (Maoz et al. 2005; Hoff and Ward 2004).

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