## Generalized Trust in Multi-organizational Policy Arenas: Studying Its Emergence from a Network Perspective


Ramiro Berardo



*Political Research Quarterly* 2009; 62; 178 originally published online May 20, 2008;
DOI: 10.1177/1065912907312982

**Political Research Quarterly**
Volume 62 Number 1
March 2009 178-189

10.1177/1065912907312982
http://prq.sagepub.com
hosted at
http://online.sagepub.com

# Generalized Trust in Multi-organizational Policy Arenas

## Studying Its Emergence from a Network Perspective

Ramiro Berardo
*University of Arizona, Tucson*

This study tests hypotheses linking the structural characteristics of policy networks to the feelings of trust of their members. A social capital perspective suggests that actors in denser networks should trust others more, while an alternative "centrality" approach suggests that trust may be a byproduct of the occupation of key positions in the group. The author tests these expectations with data mapping policy networks in twenty-two estuaries in the United States and finds that centrality is a better predictor of trust. This opens room for questioning the real value of trust as a necessary ingredient in the solution of collective action dilemmas.

***Keywords:*** *trust; estuaries; policy networks; centrality; density; collaboration; information control*

Social scientists have generously exposed the benefits of trust for interpersonal and interorganizational relationships, which include the improvement of information flows (Gnyawali and Madhavan 2001), the reduction of uncertainty over time (Kollock 1994), and the decrease of the costs of transactions in political interactions (Bromiley and Cummings 1995; Scholz and Lubell 1998), among others. Particularly in the study of collective action dilemmas, the role of trust in the emergence of cooperative behavior has been carefully addressed (Coleman 1990; Lubell 2007; Ostrom 1990), and some have deemed this attribute a "necessary condition" to reaching agreement when multiple visions collide (Sabatier et al. 2005). However, there is still a surprising lack of research directed at uncovering whether levels of trust are affected by the structure of the policy networks in which actors are embedded.[1] In other words, we know much more about the positive effects of trust than about its determinants.

This work extends the ongoing line of research linking collective action and trust by studying how actors trust others depending on how they relate to them. The predominant vision claims that actors participating in denser networks obtain more information about the behavior of other members in the group, which in turn should increase the overall levels of trust (Coleman 1988, 1990; Putnam 1993, 1995). In this article, I narrow this argument by focusing on the relationship between *ego density* and trust. In network analysis, the network of a given actor—an "ego"—is formed by the nodes connected with this ego. Ego density refers to the percentage of ego's contacts that are linked to each other. A second approach, however, suggests that trust might be a byproduct of the occupation of positions of centrality in the overall network. It would not be those who gather greater information about their partners who trust others more but rather those who control the flows of "unique" information between other nodes in the network. Of course, if trust emerges as a consequence of occupying central roles in a network, then researchers might question the role of trust as a needed ingredient to solve collective action problems. After all, this "rationalized trust" would be a reflection of the feelings of invulnerability of the powerful central actor rather than the result of the emergence of dense, cooperative structures needed to end collective action dilemmas.

To empirically test the applicability of these two different visions, I observe organizational behavior in networks of twenty-two estuaries of the United States. An estuary is the physical place where the fresh water of

Ramiro Berardo, Assistant Professor of Political Science, University of Arizona; e-mail: berardo@email.arizona.edu.

**Author's Note:** I would like to thank Tom Carsey, Chris Reenock, Erin Westfall, Simon Andrew, and three anonymous reviewers for their valuable comments on previous drafts of this article. Mike Rickman provided research assistance. Most important, I extend my gratitude to John T. Scholz for both his comments on earlier versions and for giving me access to the data used in this article. The usual caveats apply.

a river meets the salty water of an ocean. The ecological complexity of the natural system usually requires the concerted actions of multiple types of users and regulatory authorities (Schneider et al. 2003), which provides an ideal setting to study how trust develops.

The next section defines trust and describes what a policy network is, introducing the hypotheses linking trust to the density of networks and the positions of centrality that actors occupy in those networks. Later sections describe the research design (including issues of data collection, measurement of variables, and estimation techniques), present the results, and discuss their implications.

## Networks and the Generation of Trust

*Trust* is a difficult concept to grasp (Siegrist, Earle, and Gutscher 2007), and definitions usually overlap or plainly contradict each other. Most of the time, they describe interpersonal attitudes at the dyadic level—how one actor trusts another one—but studies treating trust as a generalized attitude held by individuals toward whole groups are also common (McEvily et al. 2002; Lubell 2007). Since the collective action dilemmas in estuaries are usually the result of multiple-player games (Schneider et al. 2003) that might require an overall increase of levels of trust among stakeholders, this work continues with the study of *generalized* trust. This is defined as *the attitude held by an actor (ego) toward a group of others (alters) that emerges as a consequence of the repeated interaction between them and that is represented by ego's expectation that the members of the group will fulfill their obligations*.

With the exception of treating trust as *generalized*, the proposed definition is standard in every other respect, and it incorporates an obvious sense of uncertainty because the attitude is based on an expectation and not factual assurance about the partners' cooperation. In other words, actors who trust others may expect cooperative responses, but full information about the counterparts' future behavior is incomplete. It is in this sense that trusting others is always a risk-taking behavior (Williamson 1993).

As it happens with trust, authors often disagree on the meaning of the term *policy network* and the dimensions that should be considered to define them. Nevertheless, there seems to be extended agreement on one basic point: the term should be used as a label encompassing the structured relationships occurring among public and private actors who are likely to affect policy outcomes in a given arena (Kickert, Klijn, and Koppenjan 1997).

The study of policy networks frequently focuses on the potential positive effects of these networks on the policy process, sustaining the idea that negotiation is facilitated as a consequence of the more direct process of communication among the actors who form them. The often implicit presumption is that networks build trust among their members through the repetition of interactions. There is less agreement, however, on how it is that alternative network structures affect trust. I test two approaches with different expectations with regard to this issue.

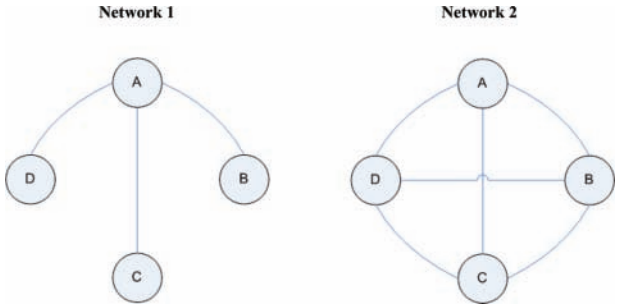
## Network Density and Collaborative Reputations: The Benefits of Greater Flows of Information

The more common vision linking network structure to trust suggests that higher density in a network helps reducing opportunistic behavior, therefore providing a rational basis for increased trust (Putnam 1995, 67). In dense networks in which actors are closer to each other and share more common contacts, the ability to monitor and sanction members who cheat on agreements is greater than in less dense networks.

According to scholars in this tradition, the basic process in action is simply one in which actors share a larger and more complete flow of information regarding their interactions with each other. This information can be used as a valuable asset by any of the actors in the network to inform opinions about the possible behavior of others. Knowing someone directly gives the player valuable information on how that "alter" may behave in the future based on how he or she has behaved in the past. But this "baseline" hypothesis (Burt 2001) can be extended by arguing that trust is likely to increase when ego's contacts are connected between them, which should make the monitoring and sanctioning mechanisms of the network more efficient.

Figure 1 illustrates the concept of ego network density for actor A, with the nodes B, C, and D representing the components of that ego network and the lines between them representing cooperative links in which members regularly practice risky exchanges that provide mutual benefits. From the perspective of actor A, network 2 on the right represents a fully dense ego network in that all of A's contacts know and exchange with each other. Network 1 represents no density since none of actor A's contacts are in contact with each other. The measure of ego network

**Figure 1**
**Comparable Networks with Same Actors but Different Linkages**




density for a given actor is the *percentage* of that actor's contacts who know each other; for actor A, density equals 100 percent in network 2 and 0 percent in network 1 (I offer more details on measurement below).

We can use Figure 1 to explain how ego density enhances the importance of reputation and increases the levels of trust as a consequence. Consider, for instance, the relationship between actors A and B. In the first network on the left of the illustration, only the potential loss of future benefits in exchange with actor A would prevent actor B from cheating on actor A. In network 2, however, actor B must also consider the damage that cheating on actor A would cause in the relationship B maintains with actors C and D since actor A can communicate the defection, harming B's reputation. Thus, it seems plausible that the network on the right would more effectively prevent defection because of the structure linking the nodes. This control of "harming" information that actor A has and the increased trustworthiness of its partners should boost its trust in the nodes in the network. Incidentally, the reader should also notice that as a result of the extra links in network 2, A should also become more trustworthy since defective behavior by A onto B, C, or D can also be communicated among the connected alters.

Overall, the argument here exposed is that dense, tightly connected groups are most likely to develop positive norms of punishing defections beyond the simple withdrawal of future exchanges, thereby increasing trust and trustworthiness by reducing even further the risk of defection for exchanges within the group (Coleman 1988). In other words, it is plausible that actors with denser ego networks trust others more in their policy arenas as a consequence of having developed structures that facilitate cooperative behavior and the circulation of information between partners. In short, I expect actor A to show higher trust when A's ego network is denser (network 2 in Figure 1). This study focuses on the network of exchanges among the policy-related organizations rather than individuals in estuaries, but the same logic applies whether the nodes in the network are individuals or organizations. Formally,

*Hypothesis 1:* The higher the density in the ego network of a respondent's organization, the higher the level of trust toward others.

## Centrality and the Control of Information Flows

A second approach to how the availability of information affects individual attitudes has perhaps the longest history in network analysis but has not been linked to trust in political science. The approach is based on the concept of *centrality* and basically contends that central actors have greater influence and power in their groups. Bavelas and other scientists working in the Group Networks Laboratory at MIT in the 1940s and 1950s were the first to report that centrality influenced the way in which communication processes developed (Bavelas 1950; Bavelas and Barrett 1951). Since then, researchers in different disciplines have observed that central actors in networks can influence the overall performance of those networks; they can function as "filters" of the information flowing among other actors that compose the network and coordinate the activities and exchanges among them (Freeman 1979; Scholz, Berardo, and Kile, forthcoming). In this study, I measure centrality using the standard "betweenness" measure widely utilized in network analysis and developed by Freeman (1979). The measure captures how much control an ego has over the flows of information between other nodes; specifically, for each ego, it calculates the percentage of shortest paths linking all *other pairs* in the network in which the ego is located. The more often the ego is located in the shortest paths of other actors, the greater its centrality. For example, the betweenness score for A in Figure 1 increases from 0 percent in network 2 (A is not present in any of the shortest paths linking the other nodes) to 100 percent in network 1 (actor A is present in the three shortest paths linking D, B, and C).[2]

An ego located in a central position has clear informational advantages over its counterparts in noncentral positions and by controlling the informational

flows creates a power differential in its favor (Emerson 1962; Brass and Burkhardt 1993). From this perspective, it should be the informational exchange benefits that central—and hence more powerful—actors provide to others that sets the basis for enhanced trust.

Consider the centrality of actor A in both networks in Figure 1. In this case, actor A increases its centrality in network 1 because none of the remaining nodes in the network are directly connected to each other. For instance, if B wants to collect information about D or C, or if either of these demands information about B, then A becomes a very useful resource since it is the most central actor in the network and can provide the needed information. The centrality hypothesis argues that actor A in network 1 should exhibit higher trust because its contacts need A to reach places in the network to which they do not have direct access. This reduces A's vulnerability to defective behavior, providing a rational basis for greater trust. More generally,

*Hypothesis 2:* The higher the centrality of the respondent's organization in the estuary network, the higher the level of trust toward others.

## An Empirical Extension: Trust and Its Effect on Networks

In addition to the two hypotheses presented in the previous section, I also explore the dynamic relationship between trust and the network measures of ego network density and betweenness centrality. The exploration of this relationship is possible because trust has been measured twice, once prior to the collection of data used in the construction of the network measures (more details on the data-collection process are given in the following section).

Although the network literature seldom discusses the impact of trust on networks, the logic of the analyses discussed in the previous section suggests negative relationships among the variables of interest. Actors with lower levels of trust would presumably seek dense, clustered relationships with actors who know each other because this would increase the monitoring and punishment potential and thereby reduce the risks associated with exchanges with all contacts.[3] In debt with transaction costs economics, the argument holds that as trust grows, the need to create structures that reinforce punishment mechanisms diminishes, creating the expected negative impact of trust on the density of ego networks.

*Hypothesis 3:* The higher the level of trust toward others, the lower the density in the ego network of a respondent's organization.

The same logic suggests a negative relationship between trust and betweenness centrality. An ego with lower levels of trust should seek to fill positions that give it a power differential, controlling information about other actors that might be needed by them. By increasing its betweenness centrality value, the risk of exchange for the ego might be reduced. As the ego's sense of trust increases, the relative gain from occupying central positions might appear less important to the ego, which could lead to the negative relationship.

*Hypothesis 4:* The higher the level of trust toward other contacts, the lower the centrality of the respondent's organization in a network.

## Research Design

The data used in this study were collected in twenty-two U.S. estuaries as part of a larger study of the National Estuary Program (NEP; Schneider et al. 2003). The NEP was created by the U.S. Congress in 1987 as part of the amendments to the Clean Water Act under Section 320 and is administered by the Environmental Protection Agency. Twelve of the twenty-two estuaries in the sample maintain NEP status, while the remaining ten are not members of the program.[4]

The research team conducted a two-wave survey with a panel of respondents in 1999 ($t_1$) and 2001 ($t_2$). A total of 864 surveys were completed in the first wave, with 503 of those respondents (58.2 percent) also answering the second wave.[5] The analysis is performed with the data collected from the 503 respondents who completed the survey in both waves. All of these respondents were drawn from available lists of the active policy makers in estuaries with NEP status, whereas snowball techniques were used in the remaining estuaries under study. In the last case, respondents generated up to three names of stakeholders that were interviewed later. The process continued until thirty interviews were completed in each estuary or until no new names were generated.

The basic design consists of estimating a model of structural equations that calculates (1) the impact of trust at $t_1$ on the network measures of ego network density and betweenness centrality and (2) the impact of the network measures on trust measured at $t_2$. The lack of measures of networks at $t_1$ does not allow me

to separate the impact of first-wave network structures from the impact of first-wave trust, but this structural estimation at least contributes to a more comprehensive picture of the dynamic interaction between networks and trust.

## Measuring Trust, Density of the Ego Network, and Centrality

For each respondent, values for trust at $t_1$ and trust at $t_2$ are obtained from answers to the following question: "Thinking about the range of contacts you had with other stakeholders, how much do you completely trust these stakeholders to fulfill promises and obligations made in the context of the partnership?" The answer was placed in a scale ranging from 0 (*complete distrust*) to 10 (*complete trust*). As explained above, the model controls for the dynamic relationship between trust and the individual position in the network, which is possible because of the measurement of trust in both waves of observations. For the first wave ($t_1$), the observed mean for trust is 6.11, with a standard deviation of 1.95. For the second wave ($t_2$), these values are 6.44 and 2.00, respectively.

The network variables of ego density and betweenness centrality were measured following a somewhat complex procedure. First, each respondent was asked during the second wave of data collection to identify the organizations in the estuary with which he or she regularly communicated for estuary-related issues in the previous two years. Then, a square matrix was produced for each estuary in which rows and columns were labeled in the same order with the names of the organizations to which the respondents belong. The data obtained from the respondents were recorded in the rows. Hence, each cell in the matrix contains a 1 whenever the respondent in the row organization named the column organization as a contact and a 0 otherwise. Since there are cases of respondents who belong to the same organization, I aggregated their responses in the row representing their organization in the matrix.[6]

The matrices were then converted into symmetric form, under the assumption that links are reciprocated. The adoption of this assumption was a product of field interviews carried on by the author with sixteen members of nine organizations that are part of the estuary network in Tampa Bay. The interviews were completed between fall 2003 and spring 2004. The majority of these sixteen respondents argued that contacts among stakeholders tend to be of a reciprocal nature and that once contacts are initiated, relationships develop in a give-and-take manner.

With the matrices ready, I used UCINET (Borgatti, Everett, and Freeman 2002) to estimate measures of betweenness centrality and ego network density. The latter is calculated for a given actor A by counting how many links exist among A's contacts and dividing this number by the total possible number of such links. UCINET multiplies this value by 100, giving the variable an ideal range between 0 and 100 (descriptive statistics for this and other variables are contained in the supplemental materials of this article available at http://prq.sagepub.com).

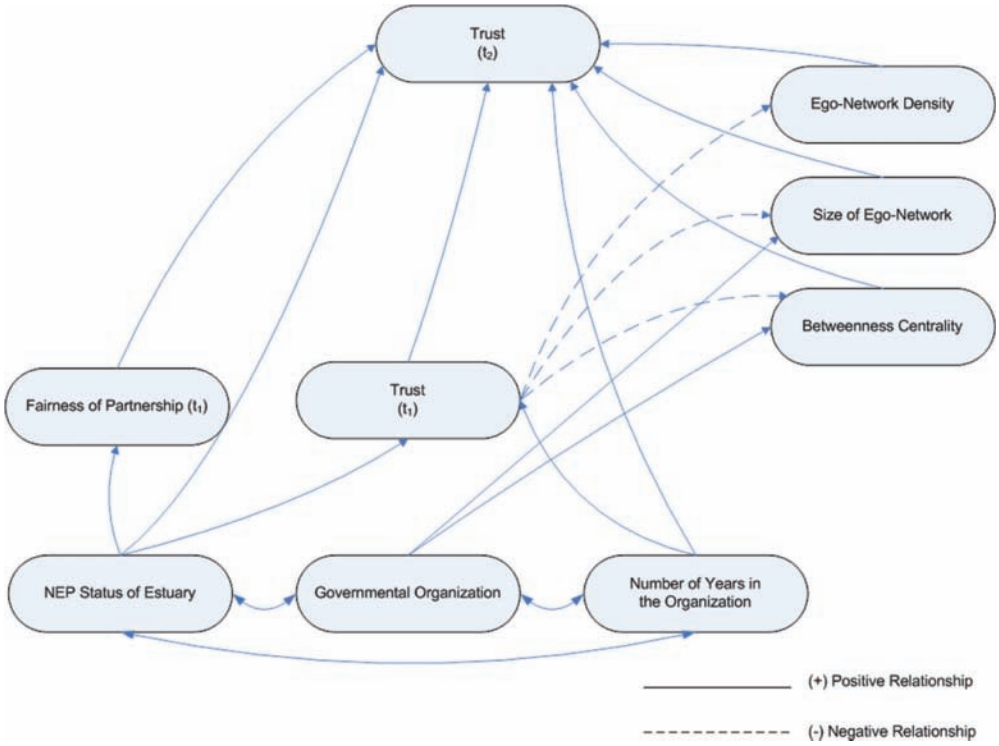
Betweenness centrality is calculated by counting the number of shortest paths between pair of nodes in the network in which A is present and dividing this number by the total number of shortest paths that exist in the estuary (not including those in which A is at one end of the path). As in the previous case, UCINET also multiplies the obtained value by 100, which gives the variable an ideal range between 0 and 100.[7]

## Model of Structural Equations and Control Variables

The four hypotheses already discussed are contained in the model of structural equations in Figure 2. The model is recursive (no causal feedback or mutual causation between any pair of variables) and includes other variables thought to influence trust. The first of these is the size of the organization's ego network (or *degree* in network analysis jargon). Previous studies have associated the size of an actor's set of contacts with the power reached by the actor in question (Brass and Burkhardt 1992). Hence, it could be possible that a respondent's statements about trust are influenced by the size of the ego network of his or her organization, if the argument linking power to the sheer availability of resources holds. This variable is measured by the total number of contacts that the respondent's organization has (or the number of 1s that the organization's row has in the matrix used to calculate network measures).

A second control variable is the perception of fairness of the partnership process, which some have identified as an important feature in explaining how trust emerges between actors seeking collaborative solutions to common problems (Leach and Sabatier 2005). Therefore, I expect a positive relationship between the perceived fairness of the partnership process in the estuary reported by the respondents and their trust in other stakeholders.

**Figure 2**
**A Structural Model Predicting Generalized Trust**

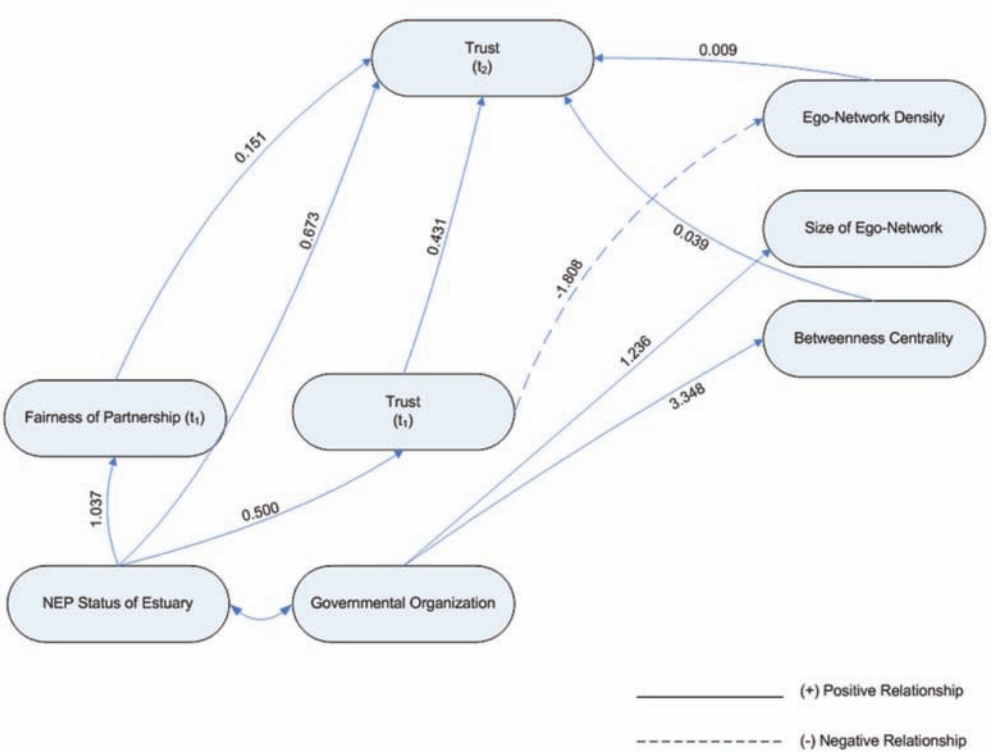



Note: The figure contains observed variables, path coefficients (one-headed arrows), and covariances between exogenous variables (two-headed arrows). Each one of the endogenous variables has an error term that has been deleted from the picture to preserve simplicity.

The variable is constructed with two indicators (Cronbach's $\alpha = .71$). The first one is the level of agreement of the respondent with the statement "Overall, the decision-making process in the partnership is/was fair to all stakeholders." The second is the level of agreement with the statement "Your organization's/your interests and concerns are/were adequately represented in the partnership." The agreement scale for both indicators goes from 0 (*strongly disagree*) to 10 (*strongly agree*). I calculated the mean value for these two responses. Hence, the variable keeps the metric of the original indicators that compose it. The data used to construct the variable were collected during the first wave of observation.

Another variable in Figure 2 is the NEP status of the estuary in which the organization participates. Estuaries with NEP status receive funds and technical support to create and implement a comprehensive conservation management plan[8], and maintain formal institutional structures–management conferences- to design and implement these plans. Previous work has shown that these structures positively affect the attitudinal traits that facilitate cooperation (Lubell 2005); therefore, it is expected that actors participating in estuaries that are members of the NEP will experience greater trust in other stakeholders just as a consequence of the existence of this institutional arrangements that do not exist in non-NEP estuaries. In addition to this direct effect, I hypothesize that the NEP status of estuaries may affect trust through indirect effects illustrated in Figure 2. First, I control for the indirect effect of NEP status that may operate through the level of trust reported by respondents in the first wave of observation. Second, because of the introduction of incentives that help reduce the chances of defection of the various actors involved in the decision-making process at the estuary level, it is expected that respondents in estuaries with NEP status will perceive the partnership process to be more fair (Schneider et al. 2003; Lubell 2005), which in turn should affect the level of trust in the second wave of observation. NEP status is measured with a

**Figure 3**
**Significant Paths in the Model Predicting Generalized Trust**




Note: All coefficients statistically significant at the .01 level.

dichotomous variable adopting a value of 1 when the estuary is a NEP member and 0 when it is not.

The model also controls for the number of years the respondent has spent with her organization. One of the causes of higher trust may just be the long history of personal interaction with others in the policy network of the estuary. It is possible that the stated level of trust is just a reflection of repeated interactions with others—an individual, rather than organizational, trait. If that is the case, there should be a positive relationship between the number of years an individual has worked in her organization and the level of trust reported at both $t_1$ and $t_2$.

The last variable in Figure 2 captures whether or not the respondent works for a governmental organization. The inclusion of this variable may help explain how networks adopt their particular characteristics. Specifically, I will argue that governmental organizations should exhibit larger size in their networks and higher betweenness centrality in comparison to nongovernmental ones because governmental organizations are usually the most active type of actors in settings such as the estuaries under study (Schneider et al. 2003; Scholz, Berardo, and Kile, forthcoming). A dichotomous variable is used to measure the type of organization (1 = *governmental*, 0 = *nongovernmental*).

The model also includes two paths originated in trust measured at $t_1$ that were not discussed before for the sake of simplicity. First, there is a proposed positive relationship between level of trust at $t_1$ and level of trust at $t_2$. I include this variable to control for unmeasured factors affecting trust that do not change over time, particularly those factors that might also affect network variables and might otherwise produce spurious relationships between network characteristics and trust. I expect a positive effect that should be considerably greater than the effect of the network variables. The second path links trust at $t_1$ to the size of the organizational network. The same logic discussed in a previous section to describe the expectations of negative relationship between trust at $t_1$ and network measures suggests that trust and network size will also be negatively related because of diminishing returns. Actors with high levels of trust are less likely to perceive the

advantage of increasing their set of contacts, given the costs involved in maintaining the new links.

## Results

I used AMOS (analysis of moment structures) to estimate the model in Figure 2.[9] Commonly used fit indexes for the estimation of structural equation models indicate that the model behaves well. For instance, the comparative fit index (Bentler 1990) of .937 indicates the proportion in the improvement of this model relative to a null model in which the observed variables are assumed to be uncorrelated, and the Bentler-Bonett normed fit index of .935 also exceeds the standard .9 threshold, showing that the model is clearly closer to the saturated rather than the independence model. Finally, the chi-square–*df* ratio equals 3.14. Taken together, these numbers show a reasonable fit of the model to the data. Figure 3 reports only the significant paths obtained from the estimation.[10]

Let us first examine the coefficients linking organizational ego network density and betweenness centrality to the main dependent variable of trust observed at $t_2$. Both coefficients are positive and significant, as hypothesized by the two main theoretical approaches tested here. However, even though the coefficient for ego density is significant, its impact is almost negligible. A one-unit change in the scale measuring ego density produces, on average, an increase of only .009 in the scale measuring trust. This means that respondents in organizations with networks that are fully interconnected (ego density = 100) show a positive difference of less than 1 point out of 10 in the scale of trust in comparison to respondents in organizations with networks that have a density value of 0. On the other hand, the coefficient for betweenness centrality indicates that a comparable change from the lowest to highest value would change trust by approximately 4 points out of 10, a fourfold increase in magnitude compared to ego density. In sum, both network relationships significantly affect trust, but the less familiar betweenness centrality measure has considerably greater practical importance in explaining generalized trust. It seems that generalized trust increases when the control of information that comes from occupying central roles in the network also grows, and not particularly as a consequence of belonging to close communities that provide the assurance of strong reputations built on repeated interactions. This opens room to question the true value of generalized trust as a needed ingredient for the solution of collective action dilemmas since it seems that the attribute is largely a byproduct of the occupation of powerful positions in the estuary. We discuss the implications further in the conclusion.

Turning now to the impact of prior trust on current network characteristics, only one of the hypotheses discussed above was confirmed (although the three coefficients were negative as predicted). Both organizational betweenness centrality and size of ego network do not seem to be affected by first-wave trust, but the density of the organization's ego network is. This is consistent with the argument that actors who trust others will not seek contacts with stakeholders already known to their set of acquaintances, but when trust is low or nonexistent, on the other hand, making sure that the information about counterparts flows from a variety of well-informed sources is a top priority. It is interesting that prior trust has a negative impact on density but not on betweenness centrality, while betweenness has a considerably stronger positive impact on trust than does ego network density. These results suggest that the behavior of respondents who lack trust may be triggered by a self-defense mechanism that pushes for structures that provide assurance against defection, even though the higher density in their ego networks does not seem to improve their levels of trust. However, this interpretation is purely speculative because of the lack of first wave network controls in the estimations.

Regarding the remaining variables in the model, three of them affect generalized trust at $t_2$ at the .01 level of statistical significance. Respondents in estuaries that belong to the NEP experience higher levels of trust than do respondents in estuaries that are not part of the program—on average—but again the effect is not large in magnitude—only two-thirds of a point in the 10-point scale that measures trust (coefficient = 0.673). We can also see that NEP status seems to affect the level of trust through two indirect paths that go through fairness of partnership and trust measured at $t_1$. Total effects caused may be calculated by summing the direct and indirect effects, and customarily, standardized coefficients are used when the scales of the variables are not identical. In this case, however, this exercise cannot be performed because the variable capturing the NEP status of the estuaries is dichotomous, in which case interpretation in terms of standard deviation is senseless. Suffice it to say that the effect of the exogenous variable on the level of trust is positive as predicted and that the indirect effects add some extra value to that positive relationship, showing that the NEP does indeed help in

creating the conditions thought to facilitate cooperative collective action.[11]

The perception that the decision-making process in the estuary is fair to the stakeholders involved has a slightly larger positive effect than the NEP variable, increasing trust by about 1.5 points when varied from its lowest to highest possible score (a 1-unit change in the measure of fairness produces, on average, an increase of approximately 0.15 in the scale of trust). Trust measured at $t_1$ also has a statistically significant positive effect as predicted. A change from the lowest to the highest value of this variable induces a change slightly larger than 4 points out of 10 in trust measured at $t_2$.

Finally, as hypothesized, governmental organizations occupy more central positions and maintain larger ego networks in comparison to nongovernmental organizations, although the effects are not large in magnitude. In betweenness centrality, governmental organizations outscore nongovernmental organizations by a little more than 3 points on average—on a scale ranging from 0 to 100—while the ego networks of governmental organizations contain—on average—approximately one more actor than the ego networks of nongovernmental organizations.

## Conclusion

This study has provided evidence to improve our understanding of how networks can enhance trust among critical stakeholders in large-scale collective action arenas. The governance of common pool resources increasingly involves a broad array of resource users and regulatory authorities attempting to resolve complex externality issues across traditional functional and geographic boundaries (Schneider et al. 2003). In these situations, many consider trust a critical ingredient for developing mutually advantageous agreements among disparate stakeholders with their own goals and resources.

The findings that I showed support two somewhat diverse visions of what engenders trust. The first of these visions reflects the communitarian perspective on social capital (Taylor and Singleton 1993), which emphasizes the importance of cohesion in an organization's immediate group of contacts. When a network is dense, the actions of all members are highly visible and actors enjoy the benefits of mutual control and monitoring that allow reputations to develop as a basis for credible commitments. This should increase the trust levels. In this analysis, the density of an organization's networks—the proportion of one's friends who know each other—does indeed lead to higher levels of trust although the change is certainly small.

On the other hand, it is surprising that the lesser-recognized vision of network centrality plays an even greater role in the development of trust within estuaries. Members of organizations with broader network connections dispersed throughout the estuary experience higher levels of trust, and differences in betweenness centrality scores have considerably greater impact on trust than do differences in the density of the ego networks. Organizations that occupy more central positions in the network provide indirect links among a broader collection of actors in the estuary. The risk of trusting others for respondents in central organizations may be reduced by the future value of these links to those for whom the organization provides extensive links. This reduced risk in some way influences perceptions of trust.

The greater impact of the second vision suggests the limited applicability of the communitarian vision of social capital for complex policy settings such as the estuaries we study. Attempting to develop a dense, close-knit policy community in such settings would be extremely time-consuming and perhaps even counterproductive (cf. Bardach 1998), mainly because they do appear to enhance trust, but only to a very minimal extent. The vision of extensive connections linking diverse stakeholders and government agencies through centralized network hubs provides a more plausible scenario for the development of trust in complex governance settings.

But clearly, these findings constitute a riddle for scholars and policy practitioners who strongly emphasize the importance of trust for building cooperative relationships since it is not possible to increase the centrality scores for all the actors in the network at the same time. In other words, for an actor to be central, others need to be peripheral; therefore, manipulating the links in the network is not an effective course of action for creating the conditions under which the majority of stakeholders will show high levels of generalized trust.

Of course, even more important is the fact that the trust that emerges as the byproduct of occupation of central roles in a network is not orthogonal to the notion of power because centrality gives the actor the capacity to withhold, release, and alter information to his or her best interest and hence to dominate actors in the non-central positions (Brass and Burkhardt 1993). Hence, the problem: a rationalized trust that emerges as a consequence of a feeling of invulnerability is,

obviously, a poor variant of the type of trust that is needed to facilitate collective action (Cook, Hardin, and Levi 2005). Given that previous studies in political science have not always properly considered this dimension of the quality of trust that results from occupying specific positions in a policy network, the results I have shown here call for a reconsideration of the almost unquestioned role of this attribute as a necessary element to explain cooperative behavior and, in a more extreme sense, suggest that actors trying to achieve collective action might well "distrust the power of trust."

## Appendix
### Results of the Estimation of the Structural Model

| | Unstandardized Coefficient | *SE* |
|---|---|---|
| Direct effects | | |
| Ego network density | 0.009*** | (0.003) |
| Betweenness centrality | 0.039*** | (0.011) |
| Size of ego network | –0.016 | (0.013) |
| Trust $t_1$ | 0.431*** | (0.039) |
| National Estuary Program (NEP) status | 0.673*** | (0.163) |
| Fairness of the partnership | 0.151*** | (0.038) |
| Number of years in the organization | 0.011 | (0.010) |
| Indirect effects | | |
| NEP status → trust $t_1$ | 0.500*** | (0.182) |
| Trust $t_1$ → ego network density | –1.808*** | (0.632) |
| NEP status → fairness of the partnership | 1.037*** | (0.183) |
| Trust $t_1$ → betweenness centrality | –0.118 | (0.151) |
| Trust $t_1$ → size of ego network | –0.108 | (0.132) |
| Governmental organization → betweenness centrality | 3.348*** | (0.601) |
| Governmental organization → size of ego network | 1.236*** | (0.528) |
| Number of years in the organization → trust $t_1$ | 0.004 | (0.012) |

***$p < .01$, two-tailed.

## Notes

1. A network is defined as a collection of nodes (actors) and the links (relationships) connecting those nodes.

2. In Figure 1, there is a perfect negative correlation between ego density and betweenness centrality, but this is a consequence of using a simplified drawing to illustrate the rival hypotheses. When more nodes are introduced, it is possible to obtain, for instance, constant values of ego density with increasing or decreasing values of betweenness centrality. In the estuaries under analysis, there is a negative—although weak—correlation between the two measures (Pearson's $r = –.167$).

3. Researchers exploring participation in U.S. watershed partnerships have tested a similar theoretical argument (Focht and Trachtenberg 2005).

4. The estuaries with National Estuary Program (NEP) status are Albermarle-Pamlico, Barnegat Bay, Casco Bay, Charlotte Harbor, Corpus Christi, Delaware inland bays, Long Island Sound, Lower Columbia River, Maryland coastal bays, Mobile Bay, New Hampshire estuaries, and Tampa Bay. Estuaries without NEP status are Apalachicola Bay, Atchafalaya Bay, Cape Fear, Grays Harbor, Lower St. Johns River, Martha's Vineyard, Penobscot Bay, Pensacola Bay, Saco Bay, and St. Andrews Bay.

5. The main losses of respondents were because of changes in occupation (the respondent abandoned the organization for which he or she had been working) and in some cases the impossibility of contacting the individual after repeated tries. I found no statistically significant differences between respondents who were dropped from the sample in the second wave and those who remained in the study for any of the variables included in the model that were measured during the first wave of observation.

6. The 503 respondents represent a total of 403 organizations, of which 344 have one representative in the sample (the remaining 59 organizations have two or more individuals in the sample). Aggregating the individual responses by organizational identity would pose a problem for the statistical analysis if the responses were considerably different. To rule out this potential problem, the estimation of the main model in this article was performed both for the 503 respondents and then for only the 344 individuals who uniquely represent their organizations. Results from these different estimations were very similar, in both the magnitude of the coefficients and their levels of significance, and reflect the fact that there is a very strong correlation between the mentions of contacts that different individuals in the same organization made (results available online under "supplemental materials").

7. Scholars have long discussed the effects of sampling in the production of centrality measures in network analysis. Interested readers may find informative discussions in Costenbader and Valente (2003) and Stork and Richards (1992).

8. Estuaries in the NEP are divided into five "tiers" according to the date they were inducted into the program. The first tier contains six estuaries that were initially incorporated as members in 1987, while the fifth tier is composed of the last group of

estuaries that entered the program in 1995 (estuaries in tiers 2, 3, and 4 were incorporated into the program in 1988, 1990, and 1993, respectively).

9. AMOS does not perform estimations with clustered standard errors, which should be used to account for the potentially correlated error terms of respondents who participate in the policy process of the same estuary. I estimated each of the equations contained in Figure 2 separately using Stata and clustering the errors by estuary. There were no differences in the levels of significance reached by each of the estimated coefficients.

10. The appendix contains all the coefficients for both the direct and indirect effects hypothesized in Figure 2.

11. In an alternative estimation of the model tested here, I used a modified version of the NEP variable to determine whether respondents in estuaries with a longer history in the program behaved differently. I created six dummy variables capturing the respondent's estuary status (one dummy for non-NEP and one for each of the five NEP tiers). I then ran the three regressions embedded in the model that contained NEP as an explanatory variable, including five of these dichotomous variables in the equation (the dummy for tier 1 NEP was left out as the baseline category). Respondents from non-NEP estuaries scored consistently lower than the baseline category in the three equations (less trust at $t_1$ and $t_2$ and less perception of fairness in the partnership process), but there were no significant differences among respondents from NEP estuaries. These results are available from the author on request.

## References


Bardach, Eugene. 1998. *Getting agencies to work together: The practice and theory of managerial craftsmanship*. Washington, DC: Brookings Institution.

Bavelas, Alex. 1950. Communication patterns in task oriented groups. *Journal of the Acoustical Society of America* 22:271-82.

Bavelas, Alex, and Dermot Barrett. 1951. An experimental approach to organizational communication. *Personnel* 27:366-71.

Borgatti, Stephen P., Martin G. Everett, and Linton C. Freeman. 2002. *Ucinet for Windows: Software for social network analysis.* Lexington, KY: Analytic Technologies.

Brass, Daniel J., and Marlene E. Burkhardt. 1992. Centrality and power in organizations. In *Networks and organizations: Structure, form, and action*, ed. Nitin Nohria and Robert G. Eccles, 191-215. Boston: Harvard Business School Press.

Brass, Daniel J., and Marlene E. Burkhardt. 1993. Potential power and power use: An investigation of structure and behavior. *Academy of Management Journal* 36:441-70.

Bromiley, Philip, and Larry L. Cummings. 1995. Transaction costs in organizations with trust. In *Research on negotiation in organizations*, ed. Robert Bies, Blair H. Sheppard, and Roy J. Lewicki, 219-47. Greenwich, CT: JAI.

Burt, Ronald S. 2001. Bandwidth and echo: Trust, information, and gossip in social networks. In *Networks and markets: Contributions from economics and sociology*, ed. Alessandra Casella and James E. Rauch, 30-74. New York: Russell Sage.

Coleman, James S. 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94:95-120.

Coleman, James S. 1990. *Foundations of social theory.* Cambridge, MA: Harvard University Press.

Cook, Karen, Russell Hardin, and Margaret Levi. 2005. *Cooperation without trust?* New York: Russell Sage.

Costenbader, Elizabeth, and Thomas W. Valente. 2003. The stability of centrality measures when networks are sampled. *Social Networks* 25:283-307.

Emerson, Richard M. 1962. Power-dependence relations. *American Sociological Review* 27:31-40.

Focht, Will, and Zev Trachtenberg. 2005. A trust-based guide to stakeholder participation. In *Swimming upstream. Collaborative approaches to watershed management*, ed. Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 85-136. Cambridge, MA: MIT Press.

Freeman, Linton C. 1979. Centrality in social networks. Conceptual clarification. *Social Networks* 1:215-39.

Gnyawali, Devi R., and Ravindranath Madhavan. 2001. Network structure and competitive dynamics: A structural embeddedness perspective. *Academy of Management Review* 26:431-45.

Kickert, Walter J. M., Eric-Hans Klijn, and Joop F. M. Koppenjan. 1997. Introduction: A management perspective on policy networks. In *Managing complex networks. Strategies for the public sector*, ed. Walter J. M. Kickert, Eric-Hans Klijn, and Joop F. M. Koppenjan, 1-13. London: Sage.

Kollock, Peter. 1994. The emergence of exchange structures: An experimental study of uncertainty, commitment, and trust. *American Journal of Sociology* 100:313-45.

Leach, William D., and Paul A. Sabatier. 2005. To trust an adversary: Integrating rational and psychological models of collaborative policymaking. *American Political Science Review* 99:491-503.

Lubell, Mark. 2005. Do watershed partnerships enhance beliefs conducive to collective action? In *Swimming upstream. Collaborative approaches to watershed management*, ed. Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 201-32. Cambridge, MA: MIT Press.

Lubell, Mark. 2007. Familiarity breeds trust: Collective action in a policy domain. *Journal of Politics* 69:237-50.

McEvily, Bill, Roberto A. Weber, Cristina Bicchieri, and Violet Ho. 2002. Can groups be trusted? An experimental study of collective trust. Working Paper 308, Carnegie Mellon Behavioral Decision Research, Carnegie Mellon University, Pittsburgh, PA.

Ostrom, Elinor. 1990. *Governing the commons. The evolution of institutions for collective action.* New York: Cambridge University Press.

Putnam, Robert D. 1993. *Making democracy work.* Princeton, NJ: Princeton University Press.

Putnam, Robert D. 1995. Bowling alone: America's declining social capital. *Journal of Democracy* 6:65-78.

Sabatier, Paul A., William D. Leach, Mark Lubell, and Neil W. Pelkey. 2005. Theoretical frameworks explaining partnership success. In *Swimming upstream. Collaborative approaches to watershed management*, ed. Paul A. Sabatier, Will Focht, Mark Lubell, Zev Trachtenberg, Arnold Vedlitz, and Marty Matlock, 173-200. Cambridge, MA: MIT Press.

Schneider, Mark, John Scholz, Mark Lubell, Denisa Mindruta, and Matthew Edwardsen. 2003. Building consensual institutions: Networks and the National Estuary Program. *American Journal of Political Science* 47:143-58.

Scholz, John T., Ramiro Berardo, and Brad Kile. Forthcoming. Do networks enhance cooperation? Credibility, search, and

collaboration in joint environmental projects. *Journal of Politics* 70.

Scholz, John T., and Mark Lubell. 1998. Trust and taxpaying: Testing the heuristic approach to collective action. *American Journal of Political Science* 42:398-417.

Siegrist, Michael, Timothy C. Earle, and H. Gutscher. 2007. *Trust in cooperative risk management: Uncertainty and skepticism in the public mind.* London: Earthscan.

Stork, Diana, and William D. Richards 1992. Nonrespondents in communication network studies: Problems and possibilities. *Group and Organization Management* 17:193-209.

Taylor, Michael, and Sara Singleton. 1993. The communal resource: Transaction costs and the solution of collective action problems. *Politics and Society* 21:195-214.

Williamson, Oliver E. 1993. Calculativeness, trust, and economic organization. *Journal of Law and Economics* 34:453-502.