The Emergence of Social Capital:
Micromotives and the Macrostructure of Civil Society

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> "[E]very neighborhood must be organized; the neighborhood groups must then be integrated, through larger intermediary groups, into a true state. Neither our cities nor our states can ever be properly administered until representatives from neighborhood groups meet to discuss and thereby to correlate the needs of all parts of the city, of all parts of the state" (Follett 1918).

> "Government and elected officials must help revive and support intermediary institutions linking citizens to the state; . . . provide incentives for citizens to discuss how to make public agencies work better; . . . foster innovative programs to reward civic participation and make it habit-forming; finance local efforts to use technology for networking and community building; and review legislative and administrative decisions (past and future) to understand more fully their role in building or depleting our nation's stock of social capital." (Putnam 2005)

These two quotes, separated by almost a century, illustrate an enduring focus on the need to create intermediary institutions that support civic discourse and strengthen engagement of ordinary citizens with elite decision makers. Such innovations in civic institutions are held by reformers to foster civil society networks that facilitate collective action, promote civic culture, and facilitate "coming to public judgment" that moves beyond mass opinion to communicate reasoned compromises to decision makers ((Yankelovitch 1991; Putnam 2000; Fung 2004). A growing literature in political science has examined the impact of social structures such as political networks and associational activities on social norms, group cohesion, and associated collective action outcomes.

The importance of civil society networks has been popularized by Putnam's conception of social capital that includes, "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit' (Putnam 1995, p. 67). The range of benefits ascribed to improved macro civic structures includes the generation of norms of reciprocity and political tolerance through thick and diverse networks (Coleman 1990; Mutz 2002; Mutz 2002). Far ranging networks are argued to facilitate collective action by bringing together individuals and organizations that share common interests and the providing

them the information and civic skills necessary for self-organization (Granovetter 1973; Oliver and Marwell 1988; Putnam 2000; Putnam and Feldstein 2003). Vertical networks connecting communities and political and administrative decision makers create channels of communications that can improve the responsiveness of political actors to community demands (Laumann and Pappi 1976; Hill and Matsubayashi 2005). Possibly most importantly, these benefits are argued to be self-perpetuating in that they lead to a virtuous cycle of benefits, in which social capital improves governance which in turn promotes further civic engagement that further develops stocks of social capital (Adler and Kwon 2002; Putnam and Feldstein 2003).

From a standpoint of political reform, the implication of social capital theory is that a means of promoting better governance is through institutional innovation to create localized participatory institutions such a community councils; community policing groups; or school level advisory bodies (Berry, Portney et al. 1993; Fung 2004). This in turn has stimulated a debate about whether such localized decision making improves democratic function or represents a "local trap" that privileges what may be highly parochial local concerns over the broader social goals (Cohen and Rogers 1995; Purcell 2008).

A weakness of the social capital literature is that it has not established empirically the linkages between participatory institutions and the generation of the types of social capital found to have positive effects on democratic governance. In general it is theorized that institutional innovations that create community councils, citizen juries, or other forums for participation reorder the constraints and opportunities faced by civic actors, leading to changed patterns of interaction that reshape the landscape of civil society. Less is known about the individual behavioral responses to changing constraints and opportunities, how these shape social interactions, on what basis, and to what effect. It is through the aggregation of individual-level decisions to enter sustained social interactions that macro-level network structures emerge, with clear implications for political practice; yet this process of emergence has received scant attention.

Institutional reform initiatives assume that actors will build a set of relationships that promote positive macro-level structures, but to be effective, the opportunities provided by reform must be congruent with the individual incentives of system actors. If for example, actors are concerned primarily with status seeking in network relationships or shun ties with those from

different social backgrounds, the resulting macro-level network may involve a degree of stratification and structural separation that inhibits rather than promotes civic participation and dialogue.

This paper investigates how democratic innovation can lead to network emergence and in turn, development of social capital. Building on recent work on the emergence of policy networks (Berardo and Scholz 2010; Feiock, In Won Lee et al. 2010; Henry, Lubell et al. 2011), we develop a model of the factors that motivate individual civic actors to form and maintain relationships with others. We estimate the model using data from a system of neighborhood councils in Los Angeles that was created by a 1999 city charter reform. This in turn informs a simulation of network emergence that links "micro-motives" to macro-network forms (Schelling, 1978). Specifically, the simulation permits an analysis of how the aggregation of relatively subtle patterns of individual motives and choices can shape the particular form of the resulting political network.

I. Micromotives and the Emergence of Civic Networks

The important role of network emergence processes has been neglected in part due to conceptual conflation of associational memberships per se with social capital. (Portes 1998; Adler and Kwon 2002). Many studies measure social capital through use of measures on individual level measures of engagement with specific participatory institutions such as volunteer organizations, faith-based organizations, community councils, and the like (Putnam 2000). In essence associational membership is used as a proxy for, rather than an antecedent of, social capital. The fundamental conception of social capital, however, is based on personal networks, rather than simple membership in associations. Bourdieu (1985, 248) for example, defines social capital as "[t]he aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition." In this definition there is a clear separation between the networks themselves—relationships that can be employed for resource attainment—and the instrumental and affective resources that are acquired through such network ties.

The democratic effects of institutional reform do not emerge from the simple availability of an institution in an "if you build it they will come" dreamscape. Nor does numeric

membership in an organization necessarily imply the development of social capital that will strengthen civic culture and improve governance outcomes. Rather, political networks are formed through the aggregation of numerous decisions by individual actors to form, maintain, and dissolve specific relationships. These decisions are a function of actors' goals and constraints and the information available concerning their local network environment. In turn the democratic effects of institutional reform rest on the macro-level structure of institutionalized relationships and the extent to which these social ties enable actors to access network based resources such as information, norms or reciprocity and political support. These resources in turn support network members in collaborating together and acting collectively (Putnam 2000; Hill and Matsubayashi 2005; Musso, Weare et al. 2006).

In a manner similar in spirit to Schelling's seminal observations about the macro social effects of individual level decisions, macro-level networks emerge from disaggregated individual actions that are based on limited information and motivated by preferences that may have little to do with the requisite system-level properties necessary to support civic action. For example, take the network illustrated in Figure 1. It is broken into two components, preventing valuable information and resources contained in the group on the left with the group on the right. A single tie between an actor in each component can successfully bridge between the groups. In terms of the macro-level criteria of bringing actors closer together (e.g., minimizing the average geodesic distance) to facilitate information sharing, the optimal tie is one between the most central actor in each group, A and F.

Under certain circumstances, A and F may wish to form such a tie. If they are each most interested in increasing their prestige by becoming more central in the network and if each had perfect information concerning not only the structure of their component but of the other component, they would benefit for forging a tie. Yet, their individual motivations may not make this tie optimal. For example, A and F may seek relationships with others with whom they share commonalities such as ideology, gender, or policy beliefs. If the color of the nodes in Figure 1 indicates social commonality, A would not be interested in forging a tie with F. Rather, A in this case is more likely to forge a tie with M in the other component, and F would prefer to forge a tie with M or K. These ties, however, would not have the beneficial macro bridging effects.

As this example suggests macro-level networks emerge epiphenomenally from individual decisions. The macro structure is not simply the sum of individual decisions, but a new structure that creates new resources, possibilities, and constraints for the constitutive actors (Monge and Contractor 2003). The social capital literature has recognized this micro-macro link, although it has not generally framed it from a perspective of emergence. For example in his work on Italian regional governance, Putnam (1993) links current support for governance reform to social associations that developed for centuries preceding the reform. Similarly, in his later work (2000) he link declines in social capital to changes in TV viewing and work habits.

A burgeoning literature on political networks models networking activities of individual actors as efforts to access instrumental and affective resources while being constrained by the costs of forging and maintaining relationships (Berardo and Scholz 2010; Feiock, In Won Lee et al. 2010; Feiock and Scholz 2010; Henry, Lubell et al. 2011). Civic volunteers, who devote considerable time and energy to endeavors that yield limited personal benefits, are thought to have strong policy preferences and a desire to effect changes in their communities (Verba, Schlozman et al. 1995; Fiorina 1999). Consequently, it is assumed that civic actors will seek to form and maintain relationships that further these political goals by increasing their stock of social capital.[1]

While there is general agreement that social capital constitutes the aggregate of the benefits an actor accrues from her social network, different authors have focused on a range of specific benefits (Putnam 1995; Portes 1998; Adler and Kwon 2002; Lin 2008). We focus on three benefits that can motivate network attachment. The first involves the affective resources that arise when actors form strong, trust-based relationships. The second relates to the instrumental resources that actors can obtain by being able to access resources, such as money, information, and expertise, controlled by their network alters (Lin 2001; Lin 2008). The third centers on the prestige and influence that an actor can obtain being in a central network position and by being connected to prestigious and influential alters. (Laumann and Pappi 1976;

[1] Relationship choices can be motivated social as well as strategic interests. For example, triadic closure in often observed in networks wherein if A-B and B-C have strong ties, then it is more likely that A-C will form a tie (Simmell). This process can be motivated by sociability in that a friend of a friend is also someone with whom one is more likely to enjoy socializing. At the same time, it can be strategic in that a closed triad can support better monitoring and enforcement of norms (Coleman 1990; Berardo and Scholz 2010). Here, we nevertheless focus on the strategic benefits of relationships.

Galaskiewicz 1979; Stone 1980). Each of these motivations would have distinct implications for the types of resultant social relationships.

Trust-Based Relationships. Civic actors interested in organizing collective action will benefit from forming strong relationships that build trust and a common sense of purpose. Such relationships are valuable for facilitating collective action by mitigating incentives to shirk in prisoner dilemma type strategic interactions (Coleman 1990; Putnam 1993). In particular, higher risk collective action, such as action requiring the sharing of sensitive political information or participating in potentially dangerous political protest, are often supported through stronger bonds (McAdam 1986; Berardo and Scholz 2010; Feiock, In Won Lee et al. 2010). Actors can form these strong bonds by seeking network closure, where they create a densely connected cadre of actors.

Such closely knit network clusters may be formed through a variety of actions. First, actors can do so by reciprocating existing relationships. Specific reciprocity, wherein actor A is more likely to have a relationship with actor B if actor B has a relationship with actor A, is supported by the norm of returning cooperative behavior and punishing defectors (Axelrod 1984; Henry, Lubell et al. 2011).[2] In Figure 2a, this tendency is illustrated by the greater probability that actor A will form a relationship with actor B who has already communicated with A.

Second, actors can form new relationships with alters that are already known to an actor's existing partners (Coleman 1990). Trust-based relationships can also be promoted through transitivity. Transitivity occurs when A has a trusted relationship with B and B has a trust-based relationship with C. This situation provides A with social information and supports to form a relationship with C. Transitivity is related to network closure that improves cooperation through heightened monitoring of behavior and sanctioning of poor behavior (Coleman 1988; Berardo and Scholz 2010; Feiock, In Won Lee et al. 2010). Such network closure can increase the durability of ties, thereby improving the resilience of otherwise fragile volunteer organizations (Carley 1991), In Figure 2b, this tendency is illustrated by the great tendency for actor A to form

[2] It may be argued that conversational ties, the types of ties examined in this study, are undirected, that a conversation between A and B necessarily indicates reverse tie is present that B is having a conversation with A. In contrast, other relationships are more naturally classified as directed. For example, in an influence network A might be influenced by B while B is not influence by A.

relationships with alter B with whom it already shares a partner, rather than another alter who is disconnected from A's existing social circle.

Homophily and proximity are two additional mechanisms that promote trust-based relationships. Homophily is the tendency of actors to forge and maintain relationships with others who are similar to themselves. Homophily has been shown to be a powerful and consistent force in developing social structure (Marsden 1987; Popielarz and McPherson 1995; McPherson, Smith-Lovin et al. 2001; Henry, Prałat et al. 2011). Conversely, a number of studies find that increased diversity appears to inhibit associational activities (Alesina and Ferrara 2000; Rotolo 2000; Costa and Kahn 2003). This tendency has numerous instrumental and affective roots. Actors may perceive that similar others are more likely to have compatible interests, beliefs, and work practices, or similarity between actors may circumvent cultural or class differences that may create tensions in relationships (Brass 1995; Henry, Lubell et al. 2011). Because individuals and organizations are multidimensional, homophily can act on a number of axes. Race has been found to be an important attractor, but gender, ideology, policy beliefs, and organizational sector are also possible commonalities that facilitate relationships (Marsden 1987; Henry, Lubell et al. 2011; Henry, Prałat et al. 2011). Figure 2c illustrates this propensity. Actor A is shown as a member of an existing network and actor attributes are coded by the color of the node. Homophily then predicts that actor A is more likely to form a new relationship with B, an alter that shares its attribute rather than the alternative alters that do not.

Proximity between actors, like homophily, increases the likelihood that actors share particular policy perspectives. In an urban environment many of the problems that motivate civic activists are centered within place, as with zoning, crime, and traffic problems. Thus, more proximate actors are more likely to benefit from collaboration. Also, it is noteworthy that proximity greatly increases the probability of having chance interactions with others and decreases the costs of maintaining the relationship (Monge and Contractor 2003). Despite the rise of electronic forms of communication, serendipitous interaction and learning occurs more naturally in face-to-face settings, spatially bounding the extent of relationship that can be formed. Longer distances relationships are certainly possible, but the costs to develop and maintain them increase with physical distance. This propensity is illustrated in Figure 2d, where actor A is more likely to form new relationship with the nearest alter.

First set of Hypotheses: Individual motivations to build trust-based relationships for collective action will lead civic actors to 1) reciprocate relational ties, 2) form relationships with actors with whom they share an existing partner 3) form relationships with actors who share common characteristics, and 4) form relationships with actors that are more proximate geographically.

Network-based Resources. Actors also construct their personal networks to gain access to critical resources while at the same time they seek to consolidate their networks in ways that limit the availability of these resources to competitors (Pfeffer and Salancik 1978). Actors can rely on their direct contacts and the larger networks to which those contacts belong to seek out a range of different resources that are useful for civic action. These include legal, business, and political expertise, technical skills such as knowledge on how to build a web presence and launch an internet-based campaign. Social networks also provide a wealth of information goods including gossip, insider information, news, and information concerning employment and volunteer opportunities (Katz 1957; Beggs and Hurlbert 1997; Lin 2008; Son and Lin 2008).

If an actor is primarily seeking network-based resources in relationship building decisions, the types of relationships that he or she develops out will differ markedly from those that provide affective supports. Dense homogeneous ties support strong, trust-based relationships through redundancy that facilitates monitoring and sanctioning. This same redundancy, however, reduces the range of novel resources to which an actor has access. Within a fully connected subgroup, for example, information can circulate rapidly within the group, but it is more difficult for the group to access novel and different information from outside the group (Granovetter 1973). Similarly, group homogeneity that may promote cooperation also reduces the range of skills, expertise and other resources that the group controls.

Thus, resource seeking behavior depends on the formation of relationships that connect actors to novel and varied parts of social networks. Granovetter (1973) characterized these as weak ties because they reach outside a closed and insular subgroups connected with strong and redundant ties. Building on this work, Burt (1992, 2000) has argued that actors gain informational advantages by bridging structural holes and connecting otherwise disparate subgroups in a network and has shown that such bridging roles explain the success of individuals

within organizations. In Figure 2e, this tendency predicts that actor A is more likely to form a relationship with B because B connects A to a broader range of novel alters.

> ***Second Set of Hypotheses***: Motivations to access resources controlled by network actors will lead civic actors to seek out relationships that involve 1) weak ties that access novel parts of their network environment, 2) relationships with alters who control resources, and 3) relationships with a diverse set of actors.

Prestige and Influence. Actors can also strive to develop a set of relationships that improve their prestige and potential influence. As one element of socio-economic status, prestige is a predictor of civic participation, but it can also be an important outcome. Many civic activists harbor political ambitions and are interested in building a political base through their volunteerism, while others are small business owners who benefit from exposure in the community. An actor's prestige can improve to the extent that they are more prominent or central in their network and associated with more prestigious and influential actors. Stone (1980) argues that social relationships are patterned based on underlying social stratification which elevates the prestige and centrality of elites. Individuals tend to interact with others who can reciprocate benefits. Thus, there is a tendency for ties to concentrate on those elites that are perceived to control resources, which initiates a self-reinforcing process, known as preferential attachment, wherein increased centrality augments the prestige of actors which leads to further interest in forming relationships with that actor (Stone 1980; Barabási and Albert 1999).

Influence increases with particular relationships. Centrality in networks has been associated with increased influence (Galaskiewicz 1979). Also direct connections to influential actors generate influence At the city level unlike higher levels of government, it is common for individuals to have personal contacts with political and administrative officials and make use of them to address public matters of concern to them (Laumann and Pappi 1976; Verba, Schlozman et al. 1995).

> ***Third Set of Hypotheses***: Motivations related to prestige and influence will lead civic actors to produce 1) more expansive networks, 2) relationships with alters who are prestigious.

We now turn to an empirical examination of the manner in which micro-level decision processes are reflected in network structure. First, we introduce the methods and the neighborhood council data we use to estimate the model of network formation. We then turn to the findings. We examine the macro-level features of the neighborhood council network and compare these features to norms of democratic participation. We then report our findings on the micro-level processes that the exponential random graph model estimates are the factors that lead to the emergence of the observed network.

II. Methods and Data

Recent advances in statistics have developed a family of exponential random graph models (ERGM) that facilitate the analysis of network generation processes that yield macro level structures based on individual level decisions (Wasserman and Pattison 1996; Robins, Pattison et al. 2007; Goodreau, Handcock et al. 2008). These models take an observed whole network as its dependent variable and models this network as the aggregation of local selection forces. These local forces can involve the characteristics of nodes (e.g. actor income), the characteristics of links between nodes (e.g., the difference in incomes between two actors), and endogenous network effects (e.g., the current structure of the local network). Importantly, the inclusion of endogenous network effects overcomes the limitations of alternative statistical techniques that assume the independence of observations. Thus researchers can explicitly model the dependencies between observations that arise due to the relational character of network data. In the model the probability of observing a particular network, ***y***, is given with the exponential function:

$$P(\boldsymbol{Y} = \boldsymbol{y} \mid \boldsymbol{X}) = \exp[\theta^T g(\boldsymbol{y}, \boldsymbol{X})] / \kappa(\theta)$$

In this equation ***Y*** represents the random sets of relationships within a network, ***X*** is a set of characteristics of the actors within the network, g(***y, X***) is a vector of individual-level network characteristics, Θ is a vector of coefficients, and $\kappa(\Theta)$ is a normalizing constant. This probability is equivalent to stating that the log-odds of any tie in a network being present given the current state of the network is:

$$\boldsymbol{logit}(\boldsymbol{Y_{ij}} = \boldsymbol{1}) = \theta^T \delta[g(\boldsymbol{y}, \boldsymbol{X})]_{ij}$$

Here Y_{ij} =1 indicates that there is a tie between actors i and j in the network Y and $\delta[g(\boldsymbol{y}, \boldsymbol{X})]_{ij}$ is the change in $g(\boldsymbol{y}, \boldsymbol{X})$ when the value of y_{ij} changes from 0 to 1. The intuition behind these models is similar to the intuition behind other qualitative choice models (Train 1986). Actor *i* has some objective function based on $g(\boldsymbol{y}, \boldsymbol{X})$, the set of their network relationships given the network as a whole, and chooses to form a relationship ij when that relationship increases individual utility (Amati 2012). These models are estimated employing Markov-Chain Monte Carlo techniques. In this paper we estimated the model employing the statnet package available in the R statistical environment (Handcock, Hunter et al. 2003).

The empirical focus of the study is a system of community-representing voluntary organizations created by a 1999 neighborhood governance reform in Los Angeles. The charter reform established advisory councils to promote a broad range of goals including promotion of civic participation, representation of diverse community interests, and advisement with the goal of making government more responsive to local preferences. The councils were self-organizing, as community members worked together to establish boundaries, develop by-laws, and apply to the city for certification. The city provided modest resource support, most importantly a small staff of community organizers that assist with management issues and a $50,000 yearly grant to each council for organizational operations and community projects. The average council has a 21-member, elected volunteer board and represents a community of about 38,000 residents.

The network data analyzed in this study come from a 2006 sociometric survey of neighborhood council board members that captured both the internal relationships within councils and the external relationships the council maintained with stakeholders, the city and other neighborhood councils. At the time of the survey, there were 85 certified boards, though two were inactive and were dropped from the analysis. The boards, although still relatively new and active, had formalized operations. The average board had been certified for 3¾ years and there were just 5 boards that had been in operation for less than 2 years.

During the survey, project members attended board meetings to describe the survey and its purposes. The web-based survey was initially emailed to all members and two follow-up emails were also sent. After this initial wave, non-responders were contacted by phone to take the survey on-line or could complete the survey on the phone. To accommodate the large number of new immigrants in Los Angeles, respondents were able to take the survey in Spanish

and Korean. There were a total 1499 board members at the time and 702 took the survey, for a response rate of 47%., distributed across NCs.

The key set of social network items presented respondents with a list of all of the other neighborhood councils, and asked that they nominate up to six with which they had been in contact during the two week period just prior to the most recent neighborhood council meeting. Two additional items of interest collected information on the range of city and neighborhood groups with which the member was in contact. The first included lists of city offices (e.g. mayor, city council, city departments) and the second listed stakeholder groups (e.g. homeowners, social service agencies, businesses), and respondents were asked with which of these groups they had been in contact. In addition to these network data, the survey collected information about the demographic characteristics and political attitudes of board members and of the demographic characteristics of the communities that they represent using 2000 census tract data matched to boundaries of neighborhood councils.

These data on relationships are aggregated to the board level and displayed in Figure 3. When at least one member of board A indicated that they had been in contact with board B, we record the presence of a directed tie between boards A and B. To measure the degree to which a board is in contact either with city officials or community stakeholders, we averaged the number of contacts between all board members. For board level demographics and political attitudes we take the average of the boards members.

Measures. We capture the individual level determinants of network choices through a mix of measures characterizing network structure and nodes. We include a term for reciprocity which captures whether a new tie reciprocates an existing tie. To capture the degree of transitivity in the network we include a term for geometrically weighted edgewise shared partners which measures a general tendency toward of actors to form relationship with alters with whom they already share a connection (Hunter 2007).

We test for homophily based on a number of different neighborhood-level characteristics. There are four continuous measures: the percentage of residents who are homeowners, the percentage of residents that have a bachelor's degree, the average political ideology of board members measured on a 5-point scale between very conservative to very liberal, and the average

level of distrust of government expressed by board members.[3] For these continuous measures, we calculate the absolute difference between two potential neighborhoods and include this difference in the model. In these cases, a negative coefficient indicates the presence of homophily because neighborhoods that are more different are less likely to form a tie.

A very important characteristic that can drive homophily is the racial composition of neighborhoods. We employed cluster analysis on the percentages of census based racial categories in each neighborhood. This analysis identified four distinct clusters in the data: majority white neighborhoods, majority Latino neighborhoods, majority African-American neighborhoods, and mixed neighborhoods. We include these four classes in the model and measure whether neighborhoods in the same class are more likely to form a tie. In this case a positive coefficient indicates the presence of homophily.

The effect of proximity is controlled by coding the location of each neighborhood within one of the seven planning regions in Los Angeles. We include a single measure when two nodes are in the same region and estimate whether being in the same region increases the probability of forming a relationship.[4]

We also include three measures of the degree to which actors seek out resources in their network environments. First, we include a network term for two-paths. This measure indicates the number of two-step relationships, those that connect A to B and B to C, when one new relationship is formed. For example, if B is connected to C and D, a connection between A and B would create two two-paths. Such two-paths are a measure of spanning structural holes (Berardo and Scholz 2010; Henry, Lubell et al. 2011) and indicate efforts to expand one's network to new areas. We also include two terms that measure the degree of information controlled by a neighborhood council, the average number of contacts each neighborhood council board member had with city officials and neighborhood stakeholders. The assumption is that councils with more contacts would have more information to share. To estimate whether

[3] This measure asked board members "how much of the time do you think you can trust local government to do what is right?" They could respond on a 4-point scale between hardly ever to just about always.
[4] We also estimated models that included the driving distances between the headquarters of each pair of neighborhood councils and which allowed the effect of proximity to vary between regions. Neither of these variations had any major effects on the model outcomes, and we dropped these variations for the sake of parsimony.

actors are more likely to form relationships with information rich councils, this measure is then interacted with indegree, the number of contacts by other councils made to this council.

Controls. We include a range of variables to control for the propensity of each council to form relationships. The edges variable controls for the overall tendency to form relationships in this network. A model that includes only this edge variable simply estimates the log-odds of the proportion of dyads for which there are relationships (e.g. the density of the graph). We also control for a number of covariates including an index of the number of previous associational memberships by board members, and the average number of contacts of board members with the city and stakeholders, the average education of the community, the proportion of homeowners in the community. We also control for the racial makeup of each community.

III. Findings

A. The Macro Network Structure and Democratic Deliberation

The macro-structure of the Los Angeles neighborhood council system does appear to support a measurable process of civic networking. Considering the theorized linkages between network structures and social capital resources, one can relate key features of the observed network and relate them to the norms of democratic governance. For example, a successful institutional innovation seeking to promote civic participation should be open and inclusive providing all stakeholders an equitable opportunity to participate. In addition, it should promote participation and deliberation in a manner that mitigates rather than amplifies pre-existing socio-economic advantages of higher strata social groups (Purcell 2008). In network terms, these criteria suggest that they network should not have isolated groups separate from the core of the network. It should not have a hierarchical structure where some stakeholders hold much more prominent positions, and the degree to which some groups are more central actors, this structure should not correlate with social status.

The inter-council network displayed in Figure 3 suggests that the inter-council network that emerged from Los Angeles' neighborhood council reform satisfies many, though not all of these prerequisites. The network has a moderate level of connectedness with a density of .076, indicating that 7.6 % of the possible directed connections between councils are observed to be

connected. The average board communicated with 6.23 other boards and the cost of maintaining these relationships probably places an upper cap on the density of this network. The network, nevertheless, is fully connected, meaning that there are no isolated councils precluded from participating in the dialogue among councils. Furthermore the neighborhood councils have relatively close ties in the sense that there is not a high degree of separation between one neighborhood council and another. In network terminology, the average geodesic distance between councils is 2.3, meaning that a message has to travel less than 3 hops (e.g., from A to B to C to D) on average to reach from one board to another. Considering the geographic scale of Los Angeles (at more than 400 square miles) and its history of disconnectedness, this is a notable development.

Also, the observed level of hierarchy in the network is low. Hierarchy can be measured by comparing the network to a tree network like a formal organization in which the head manages several high level executives who in turn manage a number of mid-level executives, and so on (Krackhardt 1994). This measure varies between 0 and 1, where a tree network with the maximum amount of hierarchy scores 1. This neighborhood council network scores .094 on this measure, higher than would be expected in a random network with this level of density, but still relatively low.

Another measure of hierarchy is the degree to which a network has a core-periphery structure in which a small number of actors form a densely connected core and are surrounded by a sparsely connected periphery of actors that are connected to the core but not to each other. Having a densely connected core with peripheral actors can impeded broad sharing of information and promote the influence of a concentrated elite and impede diverse representation. Such structures are common in social networks (Borgatti and Everett 2000). This council network somewhat surprisingly lacks an exclusive core. Using UCINET 6.38, we permutated the network to maximize the fit between an ideal core-periphery network, and the correlation between this permutated network and the ideal is only .233, and the density of the core network only increases to .209 (Borgatti, Everett et al. 2002).

In other dimensions the Los Angeles council network falls short of structures that would be expected to support democratic participation and deliberation. To promote bridging social capital and to enable councils to address city-wide issues it would be desirable for councils to

connect directly to their counterparts in disparate parts of the city. The Los Angeles neighborhood network includes few links that span significant distances. Table 1 displays the mixing matrix for the network, the number of Interboard ties that occur within and between regions of the city. It demonstrates that few links span significant distances given that 84% of all ties are between councils in either the same area or in an adjacent area (the grey shaded cells in Table 2). Also, for the councils to negotiate differences and come to a shared understanding of citywide interests it would be desirable to see a high level of mixing between neighborhoods characterized by different economic and social characteristics. The network however displays relative racial homophily. Looking at the 4 types of neighborhoods identified by our cluster analysis, there are 28 majority White councils, 39 majority Latino councils, 4 majority African American councils, and 12 mixed councils. Table 2 displays the ties between neighborhood councils in these 4 groups, and shows that within-group ties occur much more frequently than would be expected by chance.

Finally, to the degree that some actors in the network are more central than others, this network does tend to advantage higher socioeconomic status neighborhoods. Figure 4 shows the relationship between the education levels of neighborhoods and the eigenvector centrality of that neighborhood council. Eigenvector centrality is a measure of the prominence of network node that takes into account the number of other actors that are connected to that node and the importance of the connecting actor.[5] As can be seen, higher status neighborhoods also tend to be more prominent in the network, thereby advantaging the already advantaged stakeholders.

We now turn to an empirical analysis that assesses how micro-individual motives likely shaped the emergence of this network form.

B. Micro Motives and the Macro Effects of Reform

The estimated coefficients from our exponential random graph model are displayed in Table 4. The model performs well with most estimated coefficients achieving statistical significance. In addition, it is standard practice with ERGMs to verify that the estimated coefficients tend to generate reasonable networks that resemble the observed network. While the maximum likelihood estimates are the best estimates for generating the observed network on

[5] This measure of centrality shares many similarities to Googles system that assign page ranks to web content.

average, it is possible that each individual network generated based on the estimated local processes would differ substantially from the observed network. When this occurs, the estimates are deemed to be degenerate. (Hunter, Handcock et al. 2008).

This check is performed by simulating a large number of networks based on the estimated coefficients and verifying that the network level characteristics of the simulated networks are similar to the characteristics of the observed network. This comparison is particularly telling because the network level statistics are not directly modeled in the ergm, rather they emerge based on the micro-level processes in the model. Figure 5 displays the results for six different network level statistics based on the simulation of 100 networks. In the graph for each network statistics, the box plots display the range of results for the simulated networks and the dark lines represent the value of that network statistic in the observed network.

Overall, the results of the simulation indicate that the estimated coefficients do an excellent job of generating networks with characteristics that are quite similar to the observed network, providing strong support that the model is capturing key elements of the network generation process. The first statistic is the geodesic distance distribution which gives the proportion of pairs of actors that are separated by a path of a certain length. Specifically, it gives the proportion of actor pairs that are directly connected with a path length of one (e.g. A-B), the proportion that are connected with a path length of two (e.g., if A-B-C, then A is connected to C through a two path), and so on. The next are the degree distributions for in degrees and out degrees. These statistics are the proportion of actors that have 1, 2, etc. ties out to (or in from) other actors. The fourth statistic is the edgewise shared partners distribution, which is the proportion of ties between actors that connect 2 actors that are also jointly connected to 1, 2, etc. other actors. The fifth statistic is the triad census which counts the proportion of groups of 3 actors that are connected in each of the 16 possible configurations (Morris, Handcock et al. 2008). Finally the sixth is the correlation between the eigenvector centrality of each actor and education that we displayed in Figure 4.

Turning now to the examination of specific hypotheses, the results provide broad and statistically significant support for the hypotheses that actors sought to form strong, trust based relationships in developing network ties. The positive and statistically significant coefficients for reciprocity and transitivity indicate that these actors choose to form into tight clusters in

which alters are well known and connected through multiple paths. The results on the effects of homophily further support the importance of bonding social capital. Neighborhoods tend to form relationships with other neighborhoods that have similar levels of homeownership and education. Boards with similar levels of trust in government are also more likely to have relationships, though similarity of board political ideology does not appear to support boards with more similar political ideologies are not attracted to one another.

The observed effects of neighborhood racial composition on network structure vary. There is a greater likelihood of ties between two neighborhoods each of which are majority white. Similar but empirically weaker results are evident for majority African-American neighborhoods. In contrast, there is no evidence of homophily among Latino neighborhoods or mixed-race neighborhoods. These results differ somewhat from the pattern of mixing shown in Table 2, where all racial categories are more likely to interact with other similar neighborhoods. This difference is probably due to the significant degree of geographic segregation in Los Angeles. We control for proximity which is also found to predict greater a higher probability of forming a relationship and the interaction between proximity and racial makeup of neighborhoods can explain the lack of statistical significance of the Latino and Mixed parameters.

In contrast, the results provide less support for the hypothesis that actors seek to extend their networks in ways that expand the degree of resources to which they have access. The coefficient for two-paths is statistically significant but the sign is counter to expectations. Actors are actually less likely to form a relationship if it creates an additional two-path. Similarly, the two variables that measure the informational resources controlled by potential partners (e.g. access to city or community contacts) are either negative or not statistically significant.

This pattern wherein actors forming collective action networks focus on strong, trust-based ties over extensive resource-seeking ties conforms with existing work in a range of contexts including water shed management and economic development activities by local governments (Berardo and Scholz 2010; Feiock, In Won Lee et al. 2010; Henry, Lubell et al. 2011). The positive role of similar levels of distrust in government also highlight the importance of common policy beliefs and the role of trust in these networks two effects that have been found in previous network studies (Henry, Lubell et al. 2011).

The extent that prestige and status seeking affect network structure is a novel aspect of this study and here the results are mixed. Our model includes two measures of the social status of neighborhoods, the proportion of residents with a BA or higher degree and the proportion who are homeowners. The coefficients for both of these measures are statistically significant, but their signs differ. Neighborhoods with more highly educated residents do appear to attract more ties, supporting the status seeking hypothesis. In contrast, neighborhoods with higher levels of homeownership do not attract more ties. This result may reflect the political dynamics of the Los Angeles context. Los Angeles has both low homeownership rates and a history of active homeowner associations prior to the neighborhood councils reform (Purcell 2001; Purcell 2008). It is possible that the lack of observed relationship is due to a sort of substitution effect, in which councils connect to neighborhoods with many homeowners through the preexisting strong homeowners associations rather than the neighborhood council.

A particularly interesting implication of the findings is that a modest tendency toward status seeking can be highly consequential for the macro structure of the network. The strengths of the forces that tend to privilege higher income councils are weak, as the probability that two majority white councils with average levels of income and in different regions of Los Angeles will form a tie is just 3.5%.[6] Increasing the income of these councils by one standard deviation only increases the probability of tie formation to 4.3%. These positive, though weak, forces operate over many interactions over an extended period and in the end have consequential effects on the macro structure of the network. To demonstrate this importance of the income-related coefficients on the central position attained by higher income boards, we simulated 1000 networks while holding the three coefficients to zero, and then correlated the centrality of each board with income. As seen in Figure 6, the networks generated without these weak income-based forces no longer tend to provide advantages of centrality to higher income neighborhoods. This view of SES bias as the accumulation of many small advantages over time in consonant with others who have argued how SES bias is the manifestation of the accrual of resources from early in life and developed in multiple institutional settings (Brady, Verba et al. 1995).

[6] The estimated coefficients of the model are employed to predict the probability of observing different types of ties between councils (Goodreau, Handcock et al. 2008).

VI. Discussion and Conclusion

Much has been written about the fraying of American's civic fabric and the decline of mutual association, voluntarism and civic participation (Skocpol 1999; Putnam 2000). Participatory reforms are heralded as means to deepen democracy by pulling people out of ballet boxes and away from their checkbooks to work with their neighbors and associates (Barber 1984; Skocpol 2003; Fung 2004). What is lacking from much of the discussion is a fine-grained consideration of how actors within participatory create new political networks that can strengthen social capital and improve democratic functioning. Varied motivations drive the social interactions elicited by institutional reform with consequences for the emergent structure of political networks and their consequent role within a governance arena.

Our analysis of network governance in Los Angeles suggests that the observed pattern of relationships reflect norms of trust, proximity, and homophily. Neighborhood councils tend to cluster tightly, linking to others that are geographically proximate and that have pre-existing ties to their network of contacts. Furthermore councils are more likely to have relationships with those who have similar levels of income, homeownership and trust in government. The forces that lead to bonding-type relationships appear stronger than the factors that would lead to relationships that support resource exchange, given the results that gaining access to novel areas of the network (e.g. two-paths) and information rich councils are either negatively associated with the formation of relationships or not a major factor.

These results temper the prospects of broad benefits from institutional reform. The close clustering of neighborhood councils that are more similar and geographically proximate are likely to facilitate communication and mobilization around regional issues. Nevertheless, the emergence of tight clusters of neighborhood councils suggests that emergent networks may constrain the capacity of these participatory institutions to mediate between neighborhoods and the organs of government, a major purported benefit of civic associations (Cohen and Rogers 1995). For example, Hill and Matsubayashi (2005) found that the density of bonding-type civic associations actually decreased the congruence between neighborhood and elite agendas.

The effects of homophily with respect to race and income also appear to limit the potential for deliberation and cooperation across diverse neighborhood groups. Neighborhood

councils in majority white districts are significantly less likely to form ties with councils that are majority Latino or African American. It should be noted, however, that the effects of socioeconomic self-sorting can be complex. For example, in an analysis of internal council networks in Los Angeles, the authors the authors find that the standard socioeconomic bias in participation paradoxically leads to a higher than expected level of "crosstalk" within some groups, due to the presence of higher income individuals within councils located in low-income neighborhoods (Weare, Musso and Jun, 2009). Thus, the system appears to promote engagement of diverse viewpoint within but not across neighborhood councils.

The results also provide a fresh perspective on the role of socio-economic status in political participation. Income plays a role in network formation on several fronts. Higher income neighborhood councils are more likely to communicate with other and are more likely to be contacted by other neighborhood councils. In addition, network emergence is affected by income-based homophily. These forces conspire to privilege higher income councils by making them more central players in the overall network, which may reinforce the advantages higher-income groups accrue from political participation. The study further suggests that the individual tendency toward status seeking need not be particularly strong to produce a network that ultimately places higher-income neighborhood councils in a position of centrality.

The study does have limitations. The generalizability of the results is unclear given that Los Angeles differs from many other settings that have supported participatory reforms. It is a particularly large and diverse city with a history of unresponsive governance, which distinguishes it from the medium sized cities with more homogeneous populations that have experienced successful reform efforts (Thomas 1986; Berry, Portney et al. 1993). Consequently, replicating this study in other contexts would be quite illuminating. Also, the organizational motivations for forging particular ties are inferred based on individual and network characteristics rather than observed directly, suggesting that confirmation of civic motivations through either survey data or case study research would complement these findings. Nevertheless, the analysis is a rigorous approach to assessing participatory reform that overcomes the limitations of evaluations based on case study or individual surveys without a network component.

Most importantly, the study suggests that participatory reform can result in measurable social capital, even in an environment that is hostile to civic engagement. Los Angeles presents numerous barriers to participation: a highly individualistic political culture; massive geographic scale; a lack of civic spaces; and a progressive-era governance structure that is complex and impenetrable by the lay person (Musso, Weare, et al. 2006). The city has been rocked by rapid population change and has a very high proportion of non-citizens and renters, groups that have been shown to be considerably less likely to engage politically. In this respect, while Los Angeles is not representative of most cities, the ability of a participatory network to take hold suggests that it is a viable reform elsewhere. At the same time, the demonstrable effect of status-seeking on network structure, and the powerful effects of homophily would appear to limit debate among groups that are diverse with respect to race and socioeconomic status. This is a serious limitation from a standpoint of representative democracy, and suggests that future reforms should incorporate specific institutional features to foster such debate.

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Figure 1: Individual vs. Macro-level Incentives for Tie Formation

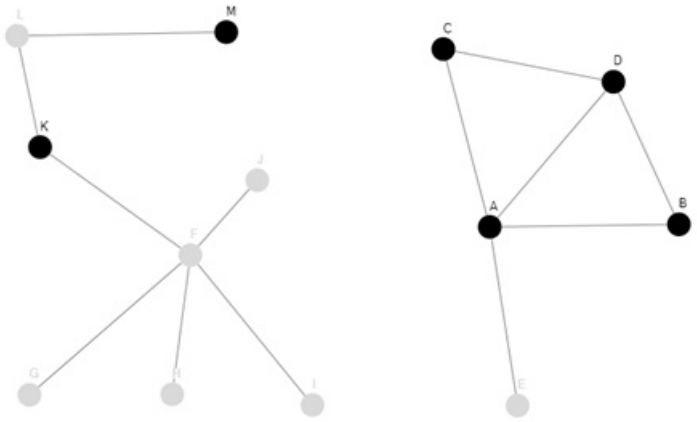
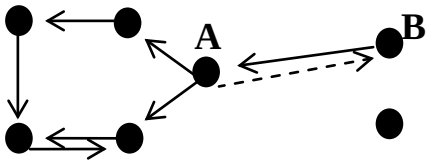
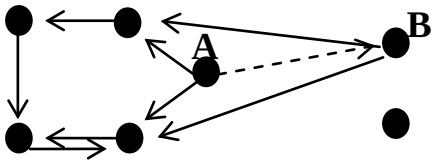
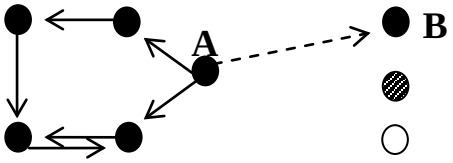
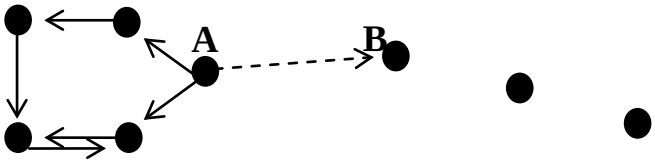
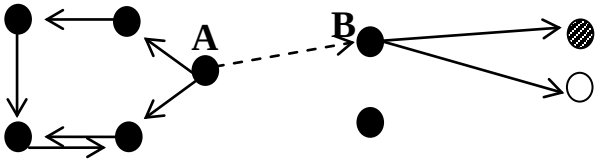
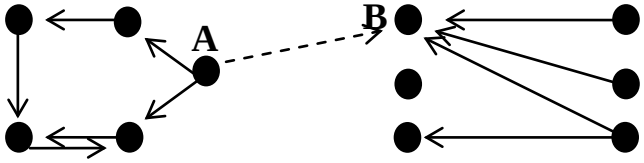


Figure 2: Expected Network Formation

	Existing Network New Possible Alters
2a. Reciprocity	
2b. Transitivity	
2c. Homophily	
2d. Proximity	
2e. Two-paths	
2g. Status seeking	

Existing links

New link predicted by network formation process

Figure 3: The Network of Los Angeles Neighborhood Councils

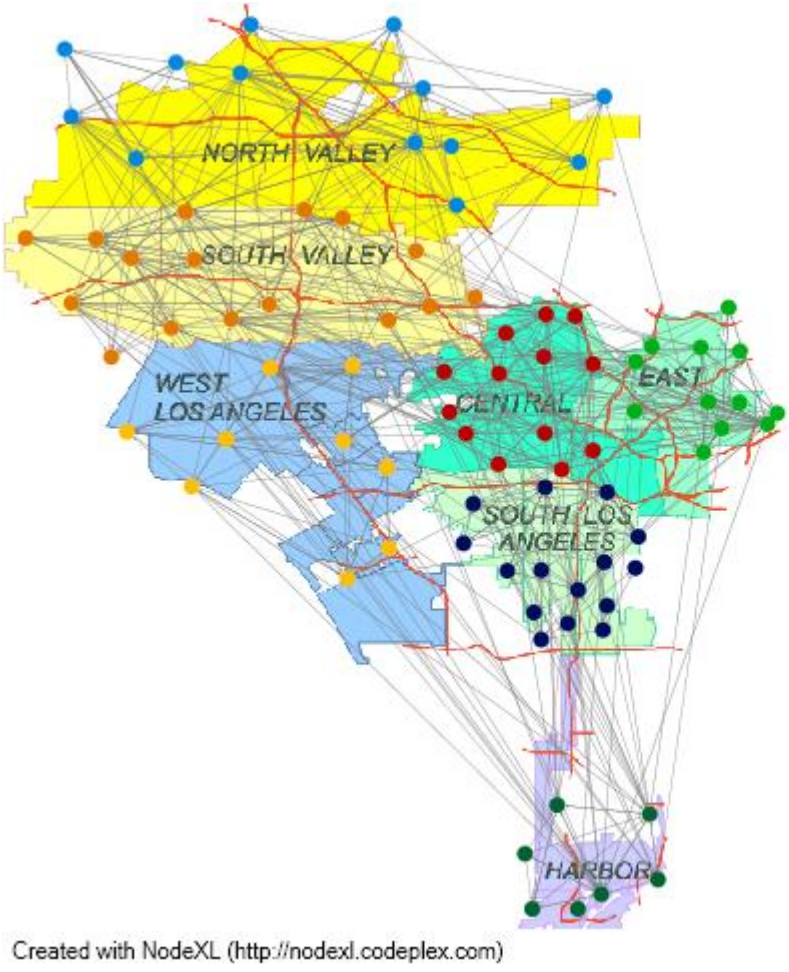


Figure 4: Proportion of Neighborhood Residents with BA degree and the Eigenvector Centrality of the Board

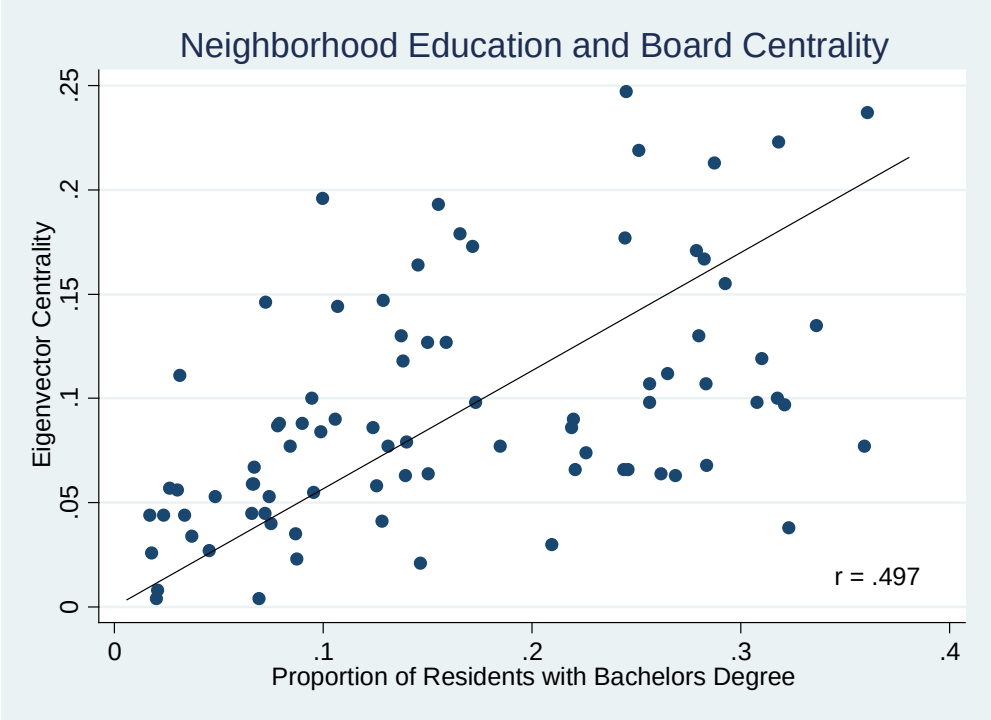
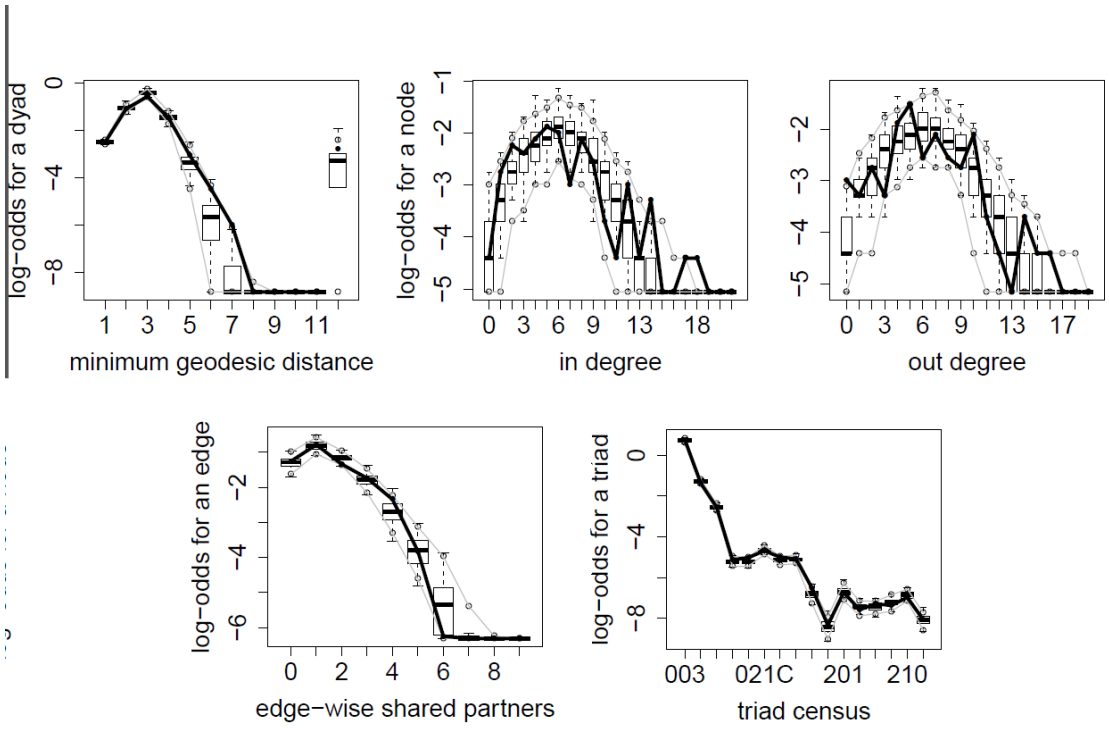


Figure 5: Goodness of Fit Tests -- Graph Level Statistics of Simulated Networks



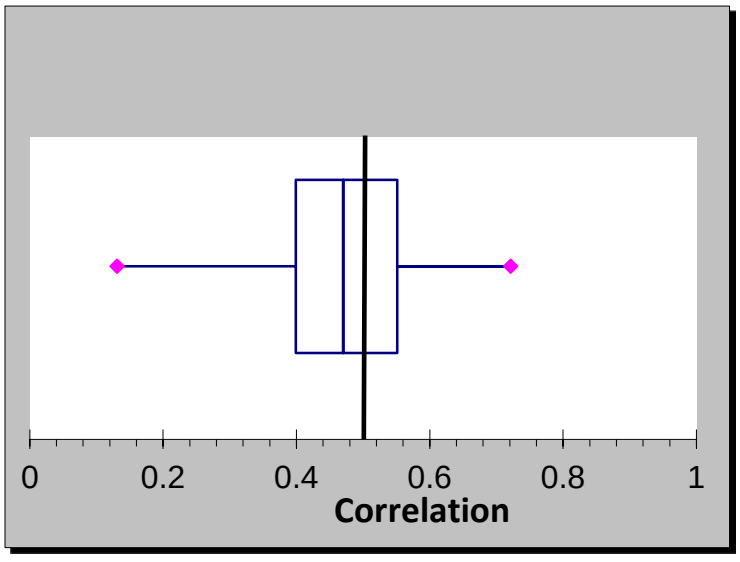


Table 1: Mixing Matrix Between Neighborhoods by Region

	North Valley	South Valley	Central	East	South	West	Harbor	Total
North Valley	51	24	4	2	1	2	4	88
South Valley	15	65	10	4	2	4	7	107
Central	2	11	38	16	7	7	4	85
East	1	4	15	55	2	2	3	82
South	2	2	9	2	42	3	2	62
West	2	5	7	5	1	37	3	60
Harbor	1	2	6	2	2	0	19	32

$X^2 = 951.4$ $p < .001$

Table 2: Mixing Matrix Between Neighborhoods by Racial Composition

	White	Mixed	Latino	Black	Total
White	122	38	54	4	218
Mixed	36	15	27	1	79
Latino	43	30	113	11	197
Black	3	1	16	2	22

$X^2 = 78.12$ $p < .001$

Table 3: Model Results

	Estimated Log of odds ratio	Std. Error
Controls		
Edges	-4.165***	0.162
Associational memberships	0.012***	0.001
Outdegree – Education	1.500***	0.080
Outdegree – Homeownerhsip	-0.027	0.033
Outdegree – City contacts	0.0488***	0.006
Outdegree – Community contacts	0.036***	0.007
Degree – % White	0.249***	0.021
Degree – % African American	-0.260***	0.040
Degree – % Latino	0.345***	0.016
Reciprocity	0.995***	0.172
Transitivity		
Shared Partners (Gwesp fixed.0.5)	0.829***	0.067
Homophily		
Homeownership	-0.195**	0.063
Education	-2.307***	0.136
Ideology	0.035*	0.014
Distrust in Government	-0.138***	0.026
Community Racial Characteristics		
Majority White	0.191***	0.035
Mixed	0.185	0.099
Majority African American	0.063*	0.027
Majority Latino	-0.205	0.459
Proximity		
Region	1.391***	0.023
Access to Resources/Information		
Two paths	-0.063***	0.012
Indegree – City contacts	0.007	0.006
Indegree – Community contacts	-0.032***	0.007
Prestige		
Indegree -- Education	0.869***	0.087
Indegree --Homeownerhsip	-0.640***	0.035

*** 0.001 ** 0.01 * 0.05 AIC: 2750.9

Figure 6
Correlation between Education and Eigenvector Centrality for 1000 Simulations of Neighborhood Council Network when Education Coefficients = 0