

January 01, 1997

Information and contact-making in policy networks: a model with evidence from the U.S. health policy domain

Daniel Carpenter
Princeton University

Kevin Esterling
University of Chicago

David Lazer
Princeton University

Recommended Citation

Carpenter, Daniel; Esterling, Kevin; and Lazer, David, "Information and contact-making in policy networks: a model with evidence from the U.S. health policy domain" (1997). *Computer and Information Science Faculty Publications*. Paper 2. <http://hdl.handle.net/2047/d20000314>

Information and Contact-Making in Policy Networks: A Model with Evidence from the U.S. Health Policy Domain

Daniel Carpenter
Princeton University
dcarpent@princeton.edu

Kevin Esterling
The University of Chicago
kest@polisci.spc.uchicago.edu

David Lazer
Princeton University
dlazer@worldnet.att.net

ABSTRACT

Theory: The political information that lobbyists seek is distributed in a communications network. Individual lobbyists must therefore choose their contacts carefully. We wed rational choice theory to network analysis in a *combinatorial optimization* model of lobbyists' choice of contacts in a network. The model demonstrates the growing importance of political "friends" relative to acquaintances as contacts when the competition for information among groups rises.

Hypotheses: Our model predicts that when the general demand for political information is low, a *cocktail equilibrium* prevails: lobbyists will invest their time in gaining "weak tie" political acquaintances rather than in gaining "strong tie" political friends (Granovetter 1973). As the demand for information rises, lobbyists follow a *chum strategy*, investing in strong ties.

Method: We test these hypotheses in an analysis of inter-organizational contact making in U.S. health politics, using the data of Laumann and Knoke (1987), with OLS regressions of average group contacts across policy events and maximum likelihood count models of contacts across interest groups.

Results: Both the events-level analysis and the group-level analysis show that as lobbyists' demand for information rises, they make more strong ties. We also find that older organizations have more strong ties by virtue of reputation effects, but we find no evidence for the hypothesis that strong-tie investments are increasing in a group's fiscal resources.

Note: Presented at the Annual Meetings of the American Political Science Association, Washington, D.C., 1997. An earlier and different version of this paper was prepared for presentation at the annual meetings of the Midwest Political Science Association, Chicago, Illinois, April 10-13, 1997. We thank John Brehm, Donal Green, Peter John, Jonathan Katz, Thomas Koenig, Ken Kollman, and Paul Teske for helpful comments on this earlier version.

“Increasingly, it is through networks of people who regard each other as knowledgeable, or at least as needing to be answered, that public policy issues tend to be refined, evidence debated, and alternative options worked out – though rarely in any controlled, well-organized way.”

-- Heclo, “Issue Networks and the Executive Establishment,” (1978: 104)

“More than mere technical experts, network people are policy activists who know each other through the issues. Those who emerge to positions of wider leadership... are experts in using experts, victuallers of knowledge in a world hungry for right decisions.”

-- Heclo (1978: 103)

Students and practitioners of politics have long understood that policy information is distributed in networks. The settings may differ but the principle is invariant. In politics, what you know depends upon *who* you know, and *how* you are positioned. The intuitive kernel of Heclo’s (1978) often-cited argument is that information is embedded in networks. And an intrinsic quality of networks is that no single actor controls them. Networks are not designed, but are the concatenation of myriad rational decisions as to whether to talk or not to talk, to acquaint or not to acquaint (e.g., Verbrugge 1977, Padgett and Ansell 1993). Without a theory of how these individual decisions are made, one may conclude with Heclo that contemporary lobbying is disorderly, unpredictable and increasingly outside of democratic control.

As a first step toward more general systematic theory of policy lobbying networks, we analyze how organized groups allocate their time and resources establishing contacts in a policy communication network. Lobbyists spend more time with some of their peers, less time with others. Allocation of time among contacts is an important facet of the lobbyist’s job, because it helps determine what and how much she knows about policy issues of the day.¹ Lobbyists find that access to policy information is critical; for example, lobbyists may get “access” to policymakers by virtue of their demonstrated ability to convey credible and useful information to Congress or the bureaucracy (Hansen 1991, Milbrath 1963, Bauer et al. 1972, Heclo 1978).

In this paper we analyze the social acquisition of information in policy networks. In order

to become informed, political actors must “invest” time in other lobbyists and experts from whom they can learn. Given limited time, they face a *time-allocation problem*: a trade-off between maintaining trusted contacts (“strong ties”) and more distant acquaintances (“weak ties”). In Browne’s thorough study of agricultural policymaking in the 1980s, he finds evidence for just such a trade-off (1988:55). We demonstrate theoretically and empirically that as lobbyists’ *demand for information* rises, they will invest more time in making “strong” trusted contacts than in making “weaker” acquaintance ties. This demand for information may be either *global*, which characterizes the degree to which groups are competing for information, or *group-specific*, which characterizes a group’s internal demand for policy information.

The basic intuition driving our theory is an unwritten but powerful rule of political and social life: friends help their friends first, their acquaintances later (Uzzi 1996). The priority of friends over acquaintances makes political “friendship” more valuable (in an informational sense) when there exists greater competition among groups for relevant policy information. As a result, when lobbyists receive new information that they are willing to transmit,² they pass it first to their strong ties. Under conditions where many groups need information, strong ties are desired. This argument builds on a large social networks literature, starting with Granovetter (1973), that shows that weak ties are more informative than strong ties from a formal structural perspective. Our analysis offers an amendment to the “strength of weak ties” literature: in a competitive information environment far more information flows through strong ties.

We derive model implications through simulation analysis, and test the implications with data on the communications network connecting national-level health policy lobbyists in the 1980s. These data were collected by Laumann and Knoke in their study *The Organizational State* (1987). Using these data, we test our theory in two ways. Our first test examines 85 events

in health politics in the 1980s. We find that the greater the level of interest in a given issue, the greater the average strong tie investments of groups involved in that issue. Our second test compares lobbying organizations. Using maximum likelihood count regressions, we find that groups' demand for information is positively and strongly associated with their number of strong ties. We also find that older organizations have more strong ties by virtue of the political "trust" and reputation that institutionalized presence in the Washington community brings. However, we find no evidence that an organization's fiscal resources affect its propensity to make strong or weak contacts.

In summary, we argue that lobbyists allocate their time and make contacts among other lobbyists in a way that is rational and predictable. We develop these findings in five sections. We first outline the principles underlying our approach to the study of policy networks. Then in Section II we present our computational (or simulation) models and derive model implications. We then offer hypotheses from these implications in Section III and discuss the data we use to test them. In Section IV we review the results of our statistical analyses of contact making in the health policy domain in Washington. We conclude in Section V.

I. Lobbying and Networks

A. First Principles of Lobbying in Networks. The existing literature on policy networks has focused on describing the structural characteristics of policy networks such as defining cliques among elites or network centrality. In contrast, we develop a micro-level theory of how lobbyists seek to structure their personal networks in order to maximize their information. In particular, we base our analysis of lobbyist contact-making and lobbying networks on three principles. The first principle is that

- *lobbyists maximize their chances of being informed on the issues in which they are interested.*

Whether one adopts a communications lobbying perspective (e.g. Bauer, Pool and Dexter 1971, Milbrath 1963) or a signaling perspective (Austen-Smith 1992, Austen-Smith and Wright 1992 and 1994, Rasmussen 1993, Hansen 1991; Kollman 1997) being informed (and being known to be informed) is a critical component of credibility and influence in lobbying. Studies in both traditions assume that credibility is a precondition for informational influence. In the Bauer, Pool, and Dexter study, for example, trade associations “became nodes in the communications process,” and as a consequence, “what they knew or failed to learn, what they heard or did not hear, what they said or failed to say, had a profound effect on what other people learned, heard, or said” (Bauer et al. 1971:325).

A second principle, no less important than the first, is that

- *policy information is socially distributed in the lobbying community.*

Signaling models, for simplicity, assume that groups acquire policy information at some set price.³ As Hecllo (1978) suggests, however, a network search for information may serve lobbyists better than simply purchasing it. In other words, the maintenance of informational contacts with other groups, who may serendipitously discover relevant information, offers more promise than conducting research anew for each policy issue. This is best illustrated in a remark from one of the lobbyists interviewed in the classic study of Lester Milbrath (1963:260):

My contacts trust me, and I think their trust is well placed. Most of the things they tell me are not of a secret nature; it’s just a development that they have discovered which they think I would be interested in. It is very difficult to get information if you go out digging for it.... Actually, you get much better information from people who know you, know what your interests are, and know that they can trust you.

As a voluminous literature on diffusion makes clear (e.g., Coleman 1966, Granovetter 1973, Burt

1987) getting information requires “networking,” or making contacts. We argue that lobbyists will choose their contacts so as to maximize their probability of getting needed information. This is consistent with Kerwin (1994: 201) who found that 100% of the interest groups he surveyed reported that they monitored rule making in part through communication with “colleagues in other groups.” For 41.7% of these groups such communications occurred more than once a week, and for 93.2%, at least once a month. Similarly, Golden (1998: 258) found that a majority of groups she surveyed relied on issue networks to gather information on rule making.

The final principle is that

- *The demand for policy information varies across issues and across groups.*

Some issues are more important, complex, and touch on the interests of more groups than do others, and this will determine the general demand for information for that issue. More health policy groups are likely to be interested, for example, in hospital cost containment than in DNA research. The greater the demand among groups for information relevant to a policy issue, the greater the competitiveness of the information environment for the issue. In addition, the intensity of a group’s internal need for information on an issue will vary across groups.

B. Cocktails or Chums? Contact-Making as a Strategic Choice. Because a considerable amount of relevant policy information is *socially* distributed among lobbying groups,⁴ information flow in a communications network will be governed by general rules of social interaction. In a competitive information environment, there is a natural tendency for friends to help friends first, and this suggests a qualitative distinction between friends and acquaintances as contacts (Uzzi 1996). In order to capture this distinction, we model lobbyists as following one (or a mixture) of two contact-making strategies.

First, lobbyists might invest their limited time in gaining “weak tie” acquaintances in a

“loose network” of contacts who know something about the policies in which they are interested. We casually name this a *cocktail strategy*. Second, lobbyists may invest their time in gaining valued “strong tie” lobbying partners, trusted political friends *in whom* they will invest more time and *from whom* they expect to receive more information and trust in return. We call this the *chum strategy*. We assume that a trusted friend requires more time to maintain as a contact than an acquaintance. The tradeoff in making contacts is that a lobbyist can make more weak than strong ties, but the added expense of strong ties brings preferential treatment. Given that one of her contacts has information, the lobbyist is more likely to receive it if that contact is strong rather than weak. We seek to model the optimal tradeoff in the mixture (or the choice not to mix) between these two pure strategies.

Granovetter’s “strength of weak ties” hypothesis (1973) suggests that lobbyists are better off investing time in acquaintances (or “weak ties”) because they are more likely to hear new or novel policy information through weak ties than through strong ties. This hypothesis follows from the observed structural features of communication networks: strong or trusted contacts tend to be densely socially inter-connected, and so the information that flows through strong ties tends to be redundant. In contrast, acquaintances tend to act as bridges between tightly knit cliques, and so it is through “weak ties” that information diffuses in a network (see also Schneider et al. 1997b:1205, and Browne 1988:55).⁵ Granovetter’s argument only extends to the formal structure of the information network, however, and does not take into account the variable degree of competitiveness for information across issues. One is more likely to hear novel information through a weak contact, but without political friends, one may hear nothing relevant to an issue that is characterized by a highly competitive environment. The model below shows that an all-strong ties network is a stable equilibrium when the demand for information for an issue is high.

The Problem of Strategic Information Transmission. We specify the strategic choice in contact making as a trade-off between weak and strong contacts. To simplify our analysis, we *assume* that information transmission occurs. This is of course problematic. Lobbyists may have information that they do not wish to pass on to anyone else, and even when they do wish to transmit information, they may be selective about whom they choose to give it. If information is not shared, then there is no policy network and our model does not apply. The documented existence of policy networks (Hecló 1978, Kingdon 1984, Laumann and Knoke 1987, Knoke et al 1996), however, suggests that much policy information is shared. We also argue that even if information transmission were so strategic that lobbyists talk only to ideological friends, our basic results would not change. Because lobbyists desire to obtain information but still face time constraints, the trade-off between weak and strong ties is still a fact of political life.⁶

II. A Combinatorial Optimization Model of Political Information Transmission through Contact Networks

To render our analysis more rigorous, we advance a combinatorial optimization model of contact making and information transmission, a model founded upon the pioneering efforts of Boorman (1975). We develop this model in two stages. We first set out the basic assumptions of political information transmission in a policy network and examine the flow of information when contacts are exogenous. In so doing we show the importance of friendship, or strong ties, as the demand for information rises. In a second stage we modify this basic model by allowing lobbyists to choose a portfolio of weak versus strong ties. The first analysis is thus a simulation of information flow in an exogenously specified network. The second analysis is a simulation of an n -person game in which the network exists only as a Nash equilibrium.⁷ Both analyses assume no

time horizon; play occurs in one stage.

Assumptions and Notation. *The Arrival of New Information (d).* We posit that, with probability d , a player called the “contact” (C) has some new information about a current policy issue that she is willing to pass onto the “lobbyist” (L) or some other lobbyist.

The Strong-Tie Priority Rule. The contact C will first check among her close friends to see if any of them are interested in the issue, and if so she will give the information to one of them. If none of her close friends are interested she will tell an acquaintance.

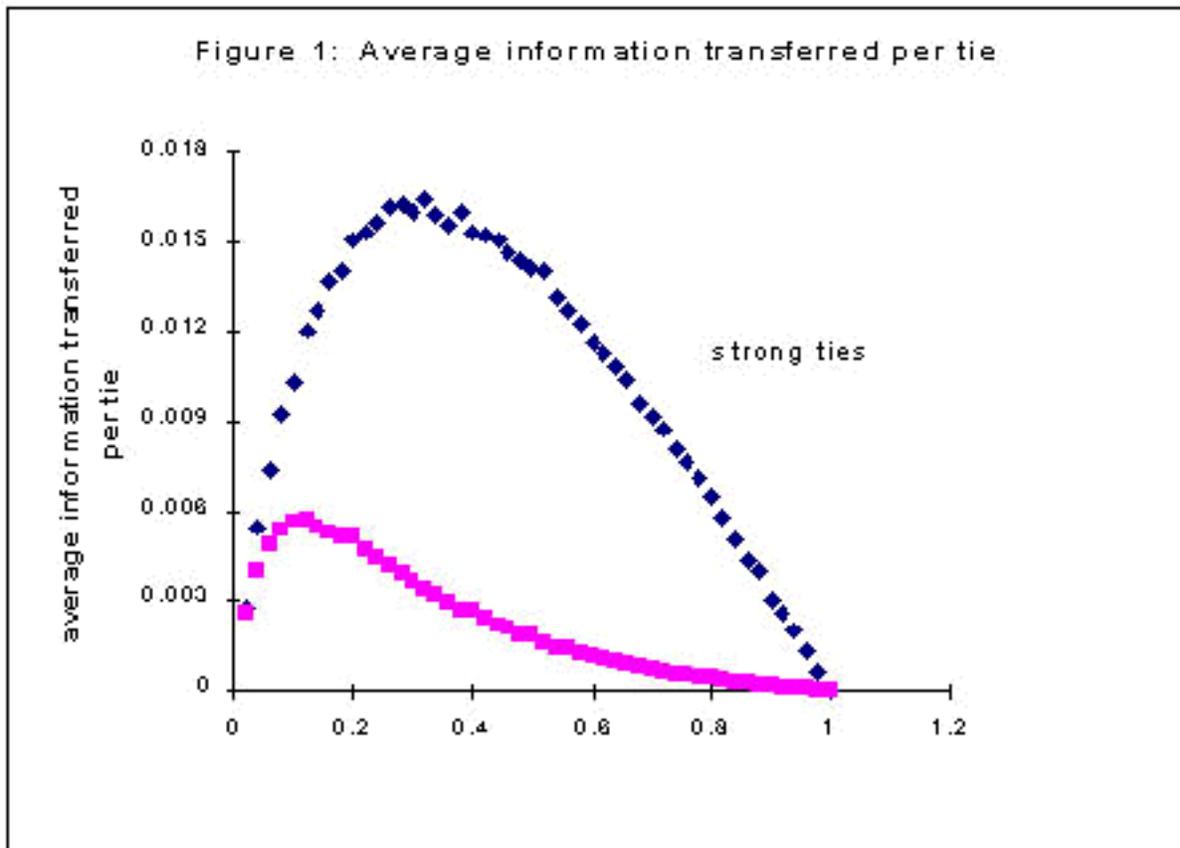
The Demand for Information in the Network (m). The total-network demand for information can be characterized by a probability m that another group will be interested in the policy issue, and thus interested in the information that C might have. The value for m is specific to an issue i , and so m varies across issues.

The One-Lobbyist to One Contact Restriction. If a lobbyist has information, she will pass that onto only one lobbyist to whom she is connected who needs information.⁸ For purposes of our model, information is transmitted only once. The receiver does not re-transmit the information.⁹

ANALYSIS ONE: INFORMATION TRANSMISSION WHEN TIES ARE EXOGENOUS. In order to examine how effective strong ties are at spreading information as compared to weak ties in the actual health care network, we have constructed a simulation of political information transmission based on the assumptions outlined above. These simulations of information flow use the measured strong and weak tie social networks among health policy organizations contained in the Laumann and Knoke (1987) data (see Section IV for measures). Groups that are assigned information become a contact C in the simulation. If C needs the information (with probability m), she keeps the information. If she does not need the information,

she randomly selects among her strong ties that need it.¹⁰ If none of her strong ties need information, then C selects among its weak ties (if any) that need information.

We set $m = .02, .04, \dots, .98$, and ran the simulation 1000 times for each value of m . To compare the relative efficiency of strong ties and weak ties in conveying information, Figure 1 presents the number of times information was transferred per strong tie and per weak tie in the simulation for each value of m , averaged over the 1000 replications per value of m . For example, a value of .016 average information transfer per tie means that information was transferred along approximately one out of sixty ties in the simulations.



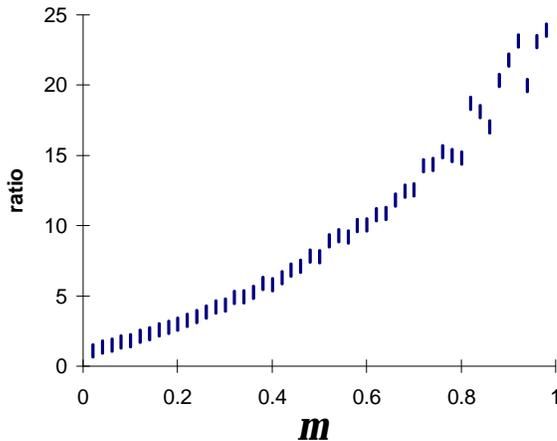
Theoretical Results. Our model yields several interesting findings. The first underpins the informational value of strong ties, and is demonstrated graphically in Figure 1.

Notice that, for both strong and weak ties, the average information transferred for each tie rises to a general mode, then returns to zero. (We demonstrate this non-monotonicity result in Appendix I.B., Corollary 1a.) The information transmitted by both strong and weak ties is 0 for $m = 0$ -- no one needs information, so no information is transmitted – and for $m = 1$ – if a lobbyist has information, she consumes it herself. A comparison of information transmitted by strong and weak ties for intermediate values of m yields Result 1:

Result 1: The Informational Value of Strong Ties. *For m s.t. $0 < m < 1$, the information transferred for each strong tie is greater than or equal to the information transferred for each weak tie.*

Since strong tie contacts have the first shot at information, it is unsurprising that for all levels of m in the simulations summarized in Figure 1 the information transferred for each strong tie is greater than the information transferred for each weak tie. More interesting is the fact that as m increases, the ratio of information conveyed by strong ties relative to weak ties increases. For $m = .02$, only 8% more information flows through strong ties than weak ties; for $m = .06$, 51% more information flows through strong ties. As m approaches 1, the information transmitted through both strong and weak ties approaches 0 -- where the information transmitted by weak ties approaches 0 much more rapidly. For example, for $m = .98$, an average of .00065 pieces of information are transmitted per strong tie, and just .000027 per weak tie. In other words, almost 24 times as much information flows through strong ties than weak! Figure 2 plots the ratio of information transferred through the average strong tie as compared to the average weak tie, as a function of the all-network demand for information.

Figure 2: Ratio of information transferred by strong ties vs. weak ties



The key insight here is that for information to get to strong tie contacts, information needs to get over one hurdle -- the lobbyist with the information. For information to pass to *weak* ties, however, that information needs to get over *two* hurdles: the contact who has the information, and *all* of her strong ties. The probability that the contact who has “discovered” some information will not need it is simply $1 - m$; the probability that none of the contact's strong ties will need it is $1 - (1 - m)^S$ (where S is the number of strong ties the contact has). While both hurdles increase as m increases, the first hurdle increases linearly, and the second exponentially. Thus, the value of strong ties *relative* to weak ties expands as information demand increases.

While interesting, these results assume that the network is exogenously specified. We now assume that the structure of the network is a result of rational contact making by lobbyists, such that interest groups rationally allocate their time between weak and strong ties.

ANALYSIS TWO: INFORMATION TRANSMISSION AND CONTACT-MAKING WHEN TIES ARE ENDOGENOUS. Our second analysis focuses upon the lobbyists' choice of contacts, given the dynamics of information flow set out in our first analysis.

Our model consists of an n -lobbyist non-cooperative game. We establish a mathematical structure for this game and then derive computational results. In this game, each lobbyist allocates time among weak and strong contacts so as to maximize the probability of gaining needed information. In their allocation strategies, lobbyists account for the strategies of other lobbyists and allocate their own time accordingly. We elaborate the model in Appendix I.C. In addition to the non-cooperative game Nash equilibria, we calculate what an efficient network, or “symmetric network optimum” would look like-- the number of strong and weak ties per group that maximizes the average informedness of members of the network.¹¹

Our model addresses the basic question facing all lobbyists: Given that those who *have* information are giving it to their friends first, how should lobbyists who want this information behave? Should they make as many close political friends as possible, or should they spread their time more evenly across acquaintances? Our model begins with this fundamental trade-off. Assume that each lobbying organization can establish an informational contact with another organization that is one of two types: weak (W) or strong (S). Assume further that it takes more effort to maintain a weak tie than a strong tie by a factor of I (such that $I > 1$), and that each lobbying organization has a time budget T for establishing contacts, as follows:

$$T = W + IS \quad (1)$$

T and I are constants, and W and S are integer variables. The choice problem for each organization is to allocate the budgeted time between making acquaintances and making friends.

We again begin with the assumption that a “contact” (C) receives new information that she is willing to transmit. The lobbyist seeking contacts, however, does not know which potential contact will receive information, and so chooses a strong and weak tie allocation to *ex ante* maximize the probability of hearing information, assuming informed contacts will behave as

follows: By the priority of strong ties, the contact C will first check among her political friends to see if any of them are interested in the issue. If none of her close friends are interested she will tell an acquaintance. Since C's strong ties are given priority, the probability that some of C's strong-tie contacts will be interested in the information is given in the model by $[1-(1-m)^S]$. This simple probability expression underpins our basic result. As the demand for information is higher (that is, the more important and complex the issue), the less likely the information will pass through the "barrier" comprised of the contact C's strong ties, and so the less likely that any acquaintance will even have a chance to hear it. Whether it is rational for lobbyists to invest in strong or weak ties, then, depends on the general *prominence* of the issue or issues in which they are involved, or equivalently, on the expected number of other lobbyists who will be interested in the issue.

The results of Analysis One seem to counsel making as many strong ties as possible, whatever the situation. Yet the lobbyist's choice is more complicated. If the demand for information is low, then the relative value of strong ties is considerably reduced. Under these conditions, the contacts who have information will often find that none of their strong ties need it, and so information will be transmitted through weak ties. Our basic results confirm the findings of Boorman (1975) and support this logic: investing in strong ties is not a Nash equilibrium when the demand for information is low.

Result 2: An Efficient Cocktail Equilibrium under Low Demand for Information:

When the demand for political information is low, an all weak-ties network is a unique Nash equilibrium and a symmetric network optimum.

For low levels of information demand, weak ties are almost as powerful in information transmission as strong ties (see Figure 1). If there is a significant "cost differential" between weak and strong ties, then rational information-seeking lobbyists will seek out weak ties.

At higher levels of information demand, the dynamics of rational contact-making change. When many lobbyists need information, then information transfer will usually occur through strong ties (see Figures 1 and 2). As a result, strong ties become relatively more valuable and rational lobbyists will shift their effort toward making strong ties at the expense of weak ties.

Result 3: The Prevalence of Chum Strategies with Greater Demand for Information. Greater levels of demand for information yield equilibria with more strong than weak ties. Specifically, as the demand for information rises, the fraction of time that rational lobbyists will spend pursuing strong contacts quickly goes to 1.

Finally, we also derive a hypothetical set of lobbyists' network investments under the counterfactual that the network is efficiently designed. Figure 3 plots the hypothetical allocation of a lobbyist's time pursuing strong contacts for different values of m under these two scenarios – Nash equilibrium and symmetric network optimum. Each point in the plot is the (equilibrium or optimal) allocation of time to strong-tie making for each issue, given the proportion of groups in the data set who need information. The maximum number of strong ties in our example is 10, and if a lobbyist invests in 10 strong ties then she has no weak ties under her time budget.

Result 4: Divergence of Rational Contact Making from Socially Efficient Network Structure under High Demand for Information. Lobbyists in a hypothetically efficient communication network would maximize their investment in strong ties only at moderate levels of information demand.

At high levels of informational demand, lobbyists in an efficient network would devote only about 20 percent of their time to making chums. This implies that, in relatively complex policy areas where many groups will be interested in the same issue, efficient communication networks in lobbying are unlikely to appear, as they are unstable with respect to individually rational contact making strategies.

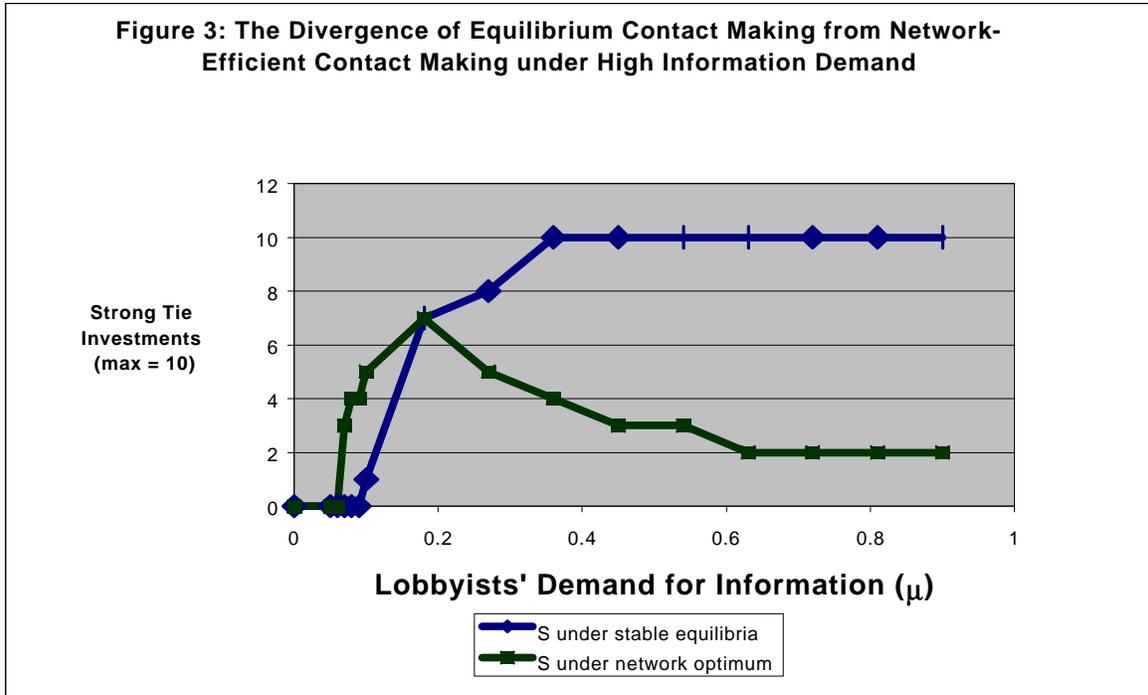


Figure 3 also demonstrates graphically the combined logic of Result 2 and Result 3. As the demand for information rises, the equilibrium investments of lobbyists in strong ties will increase.

III. Hypotheses and Data for the Empirical Analyses

Hypotheses. Combined with Result 2, Result 3 offers a very simple and testable implication: the greater the all-network demand for information, the more interest groups will invest in strong ties relative to weak ties.

Hypothesis 1: *The greater the all-network demand for information, the greater the strong-tie investments of groups in the network.*

Implications for Group-Specific Information Demand. Hypothesis 1 concerns the global (or all-network) demand for policy information, but our theory also has implications for

individual groups' demand for policy information. The demand for policy information varies across groups as well as across issues.¹² Our theory suggests that as a given group's demand for information rises relative to the all-network demand, its propensity for strong-tie investments grows. The reason is that groups with higher demand for information (relative to other groups) need information in the short-run, and so they will wish to have as many priority contacts as possible. A high-demand group wants to be in the first wave of information diffusion; it lacks the patience or disinterestedness to receive "scraps from the table" through weak ties.

Our theory thus suggests an additional hypothesis:

Hypothesis 2: *The greater a group's demand for political information, the greater the group's strong-tie investments.*

For simplicity, the computational model assumes that interest groups are homogeneous in type. Interest groups vary enormously along a number of dimensions, however, and some of these factors might affect the number of strong and weak ties of a group. First, groups vary in their fiscal resources, and one might posit that strong ties are a "luxury" good, such that those groups with more resources are able to afford more strong ties as compared to weak ties.

Hypothesis 3: *The larger the budget of an organization, the more it will invest in strong ties relative to weak ties.*

Second, lobbyists can establish weak ties quickly – over a "cocktail," perhaps. As Milbrath's (1963:260) respondent whom we quote in Section I implies, strong ties take longer to establish: "you get much better information from people who know you, know what your interests are, and know that they can trust you." These confidants, or strong ties, require time to cultivate. Thus, we expect older organizations to have relatively more strong ties.

Hypothesis 4: *Organization age will be positively related to the number of strong ties an organization has relative to the number of weak ties it has.*

Finally, we include a number of control variables that capture organization type, capacity, and internal organization (see below).

Data and Tests. We test the informational contact-making model in health care politics, where technical policy information is at a premium (Alford 1975, Brown 1983, Falkson 1980).¹³ We employ the rich data collected by Laumann and Knoke (1987) for their book *The Organizational State*. Laumann and Knoke surveyed informants from an exhaustive list of the most prominent and influential health lobbying organizations.¹⁴ Their sample of health lobbying organizations includes industry associations (such as the American Insurance Association and the Pharmaceutical Manufacturers Association (now PhRMA)), professional societies (American College of Cardiology, American Medical Association), health interest groups (Coalition for Health Funding, Arthritis Foundation), as well as more general interest groups, business firms, and relevant government agencies and congressional committees. The data set documents the full network of communication ties from each of these health policy organizations to each other, lobbying groups' internal organizational characteristics, and each organization's lobbying activity in a series of policy events that occurred between 1973 and 1980.

We test Hypotheses 2, 3 and 4 by examining the strong ties of individual groups in the Laumann and Knoke data. Yet a test at the level of individual groups is, by itself, insufficient for testing Hypothesis 1, which is a test about the effect of all-network information demand upon strong tie investments. For this reason, we test Hypothesis 1 in two ways. Since the network demand for information varies across issues, we use a data set of 85 "events" (or sub-issues) in health politics in the 1970s and 1980s. An "event" is defined as an occasion where a government actor considers making an authoritative decision (e.g. a committee may decide whether to report a bill on hospital cost containment), and several events may correspond to one issue.¹⁵ If

Hypothesis 1 is true, then we should observe a positive correlation *across events* between the demand for information and the strong tie investments by groups involved in the event.

In order to take a different slice at the data, we also test Hypothesis 1 at the individual group level. If the demand for information varies across issues but groups are differentially involved in those issues -- the American Cancer Society will have little incentive to weigh in on Medicaid formulary restrictions, for example -- then by Hypothesis 1 we should expect a positive correlation across interest groups between the information demand of the events they are involved in and their group-level strong tie investments.

We note that our data and measures are at the organizational level, while the model is couched at the individual or lobbyist level. However, we suggest that the incentive structure in the model is not dependent on the type of actor occupying the nodes of the network. In addition, like individuals, organizations have time constraints on their activities for a given level of staff, and the organizational leadership presumably allocates staff time to making contacts with respect to these constraints.

Dependent Variables

Y1: *Events-Level Analysis:* The average number of strong ties to other lobbying groups across all groups participating in event *i*. (In other words, Y1 is the average, for each event, of Y2.)

Y2: *Group-Level Analysis:* Strong ties to other health lobbying groups. A count of the number of a group's strong ties through which it receives information. A strong tie occurs if some other group reports that it has a relationship of "trusted exchange of sensitive and confidential advice" with the group.¹⁶

Independent variables

1a. *All-Network Demand for Information: Event-Level.* We use a simple measure of ***m*** recording for each event the fraction of all groups who reported a moderate or high level of interest in the event. Like ***m*** this fraction varies between 0 and 1, but we multiply the fraction by 100 to allow for percentage-point interpretation of the coefficients.

1b. *Proxy for All-Network Demand for Information, Individual Group Level.* For each issue in which the group is involved, we calculate the fraction of groups reporting a moderate or high level of interest in the event. Each interest group respondent was given a list of health issues that arose between 1973 and 1980 (inclusive), and was asked to indicate the group's level of interest in the issue on a five-point scale. An individual-level proxy for the all-network demand for information is the average of the event-level interests for all of the events in which the group participates.

2. *Number of staff employed to monitor Washington politics (Hypothesis #2, Measure #1).* A count of the number of full time equivalent staff members in the organization that "monitor the Washington scene about all kinds of national policy issues of interest to it."

3. *Number of hearings attended (Hypothesis #2, Measure #2).* A count of the number of times the group testified in congressional subcommittee hearings between 1973 and 1980, inclusive.

4. *Weak ties to other health lobbying groups.* A count of the number of a group's weak ties through which it receives information. A weak tie occurs if some other group "regularly and routinely discusses national health policy matters" with the group.

5. *Organization Budget (Hypothesis #3).* Recorded in 1980 dollar amounts, logged to improve maximum likelihood model convergence.

6. *Estimated mobilization capacity.* A count of the number of times other groups name the organization as one whose influence comes from its ability to "mobilize its members or employees to support a proposal."¹⁷

7. *Estimated public mobilization capacity.* A count of the number of times other groups name the organization as one whose influence comes from its ability to "mobilize general public opinion to support a proposal."

8. *Organization age (Hypothesis #4).* Recorded in years.

9. *Public interest group.* Coded 1 if the group describes its main function as a public interest group voluntary organization, 0 otherwise.

10. *President.* Coded 1 if the organization's president, C.E.O., executive director, or general manager is the principle person responsible "for its dealings with the national government or with other organizations about national policies" of interest to it, 0 otherwise. We include this variable to measure the degree of organizational centralization, as well as executive capacity. Although this variable is not central to our investigations, there is reason to believe that more centralized groups make more strong ties.

IV. Empirical Analysis: Contact-Making in U.S. Health Care Politics

Our results show that interest groups' investments in strong versus weak ties are neither entirely idiosyncratic nor injudicious. They are a function of global network characteristics (the all-network demand for information), the group-specific demand for information, and group age. We demonstrate this aggregating data first using the policy decision making event as the unit of analysis, then using the lobbying organization as the unit of analysis.

[Table 1 about here.]

A. Results from Events-Level Analysis. We first assess the relationship between the demand for information and contact-making by examining a set of 85 events or sub-issues in the health policy domain in the 1980s. Again, our model predicts that as the demand for information in an event rises, the strong tie investments of groups involved in the event will also increase. If, therefore, more groups are interested in a given event than another, we should expect the groups involved in that issue to have more strong ties. Our simple estimations, reported in Table 1, offer support for this hypothesis. The dependent variable is the average number of strong ties for groups reporting involvement in the event. The main independent variable is our measure of m that is, the proportion of all health interest groups in the data set reporting moderate to major interest in the event.

The bivariate correlation across events for our information demand measure and the average number of strong ties is .21. As Table 1 shows, however, when the groups' average weak ties are taken into account, both the size and statistical significance of the coefficient for information demand increase. In Model 4 of Table 1, which controls for the average number of weak ties and the autocorrelation of errors across adjacent events, a one standard-deviation increase – of 14.66 percentage points – in the fraction of groups interested in an event is

associated with two more strong ties for the average group involved. Alternative specifications of the model, including a control for autocorrelated errors across events, do not alter the basic finding: *as the demand for information in an event rises, the groups involved in that event will have more strong ties.*¹⁸

B. Results from Group-Level Analysis. The analysis in this section takes the group as the unit of analysis. The health care issues and events contained in the Laumann and Knoke survey occur over time between 1973 and 1980, inclusive. We do not observe the allocation of strong and weak ties for each group for each event, however. Instead we observe the groups' strong and weak tie allocations only at the time of the survey (summer of 1981) after all lobbying events had come and gone. We take each lobbying event as an opportunity for groups to make contacts, and each organization will have a more-or-less unique "profile" of issue-related events in which it was interested. We take the organization-level demand for information, m , to be the mean of the values of m corresponding to the group's unique set of lobbying events.¹⁹ A high value of m indicates that a group tends to be involved in issues that are of interest to many other groups in the issue network, that is, where the all-network demand for information is high. By Hypothesis 1, groups that tend to be involved in issues that are of interest to many other groups in the issue network should have disproportionately more strong ties.

Table 2 presents Poisson and negative binomial regressions of an interest group's strong ties on the demand for information variables, organization budget, organization age, and numerous controls.²⁰ Table 2 contains three pairs of regressions. The first two estimations are regressions of strong ties upon our measure of the *all-network* demand for information (m) and a set of controls. The next four estimations model strong ties as a function of *group-specific* information demand, measured first as number of staff employed to monitor Washington politics,

second as number of hearings attended.²¹

[Tables 2 and 3 about here.]

Group-Level Tests of Hypothesis 1: The Effect of All-Network Information Demand Upon Strong-Tie Investments. The group-level estimations also provide robust support for Hypothesis 1. The greater the involvement of interest group i in issues in which the demand for information (m) is high, the greater group i 's investment in strong ties, controlling for its weak ties. In both Poisson and negative binomial regressions in Tables 2 and 3, the impact of m upon strong ties is estimated to be positive and statistically distinguishable from zero. The impact of m is substantively significant as well: in the full negative binomial regression of Table 2, the marginal impact of a standard deviation change in m (.04), with all other variables set to their means, is 1.72 strong ties (the average interest group in this sample has 6.33 strong ties). Finally, these estimates are invariant to respecification of the count models; the reduced-model regression in Table 3 also yields a positive estimate of m

Tests of Hypothesis 2: Individual Groups' Demand for Information and Strong-Tie Investments. The estimations provide strong support for Hypothesis 2, which predicts a positive association between individual groups' demand for information and their investment in strong ties. Our first measure of the group-specific demand for information, the number of staff employed to monitor Washington policymaking, is positively associated with strong tie investments in all regressions. In Table 2, monitoring staff is positively associated with strong ties. This effect is distinguishable in the Poisson regression but becomes statistically insignificant in the full negative binomial regression. However, once the model is properly reduced in Table 3, the positive effect again becomes statistically distinguishable from zero. From the estimates in Table 3, the marginal effect upon strong ties of an additional monitoring staff member is 0.2934. Hence every 3

additional policy monitoring staff employed by a given interest group are associated with another expected strong tie for that group. Indeed, the average number of policy monitoring staff among the groups we study is 4.28, with a standard deviation of 5.30. Hence a one-standard-deviation increase in the monitoring staff variable yields an additional 1.5 strong ties (in expectation).

Our other measure of the demand for information, attendance at hearings, is also positively associated with strong tie investments. In the count regressions of Tables 2 and 3, the “hearings attended” variable has positive and robust coefficients across all specifications. We calculate marginal effects estimates from the reduced count-model specifications in Table 3. Each additional hearing attended is associated with 0.35 more strong ties. And since the standard deviation across groups in hearings attended is 5.96, a one-standard-deviation boost in hearings attended would yield *two* additional strong ties for the average group.

C. The Effects of Budget and Age upon Strong-tie Investments.

Tests of Hypothesis 3: The Insignificant Effect of Organization Budgets. Hypothesis 3, predicting the positive association between organizational resources and strong ties, receives no support from our analyses. In the full models of Table 2 as well as the reduced models of Table 3, the logged budget variable never yields a statistically significant coefficient estimate. Our interpretation is simple. Fiscal budgets are probably a poor indicator of social capital. It is for this reason that the weak ties variable, and not the organizational budget, consistently estimates positive across our strong tie regressions. Some lobbyists simply possess more contacts in Washington than do others, and this “social portfolio” seems to be unaffected by fiscal budgets.

Tests of Hypothesis 4: The Positive Effect of Age on Strong-Tie Investments. We turn finally to Hypothesis 4, which predicts the positive association of organization age and strong-tie investments. Our analyses provide modest support for this hypothesis. Across all specifications

in Tables 2 and 3, the association between organization age and strong ties is positive. The association is not always robust. In the negative binomial models of Table 2, the effect of organization age falls to statistical insignificance. In the reduced models of Table 3, however, organization age appears again to have a non-zero impact upon strong ties. In Model 1 and the fully reduced version of Model 2, age has a statistically distinguishable positive effect upon strong ties. Taking marginal effects estimates from the fully reduced Model 2 (center column of Table 3 results), every additional year of interest group age is associated with 0.023 strong ties. The mean of group age in our sample is 40.37 years, with a standard deviation of 31.89. Hence a one-standard-deviation boost in interest group age is associated with an increase of approximately 0.75 strong ties. Moving from the minimum of the age variable (4 years) to the maximum (136 years) would yield an additional *three* strong ties.

D. Evidence of the Divergence of Actual Contact-Making in Health Politics from Hypothetically Optimal Allocations.

As Laumann and Knoke report, and as we discover in our analysis of their dataset, the demand for information for health care politics is high for most issues. Health lobbyists, in other words, spend a lot of time in the critical area of our model, where the individually-rational strong-tie allocations diverge from what would make the network as a whole most efficient (see Figure 3). We therefore expect that in the long run, *rational lobbyists will over-invest in strong ties relative to what would make the communication network most efficient.*

Does contact-making in American health-care politics conform to this over-investment prediction? Testing for over-investment would demand a more thorough analysis than we are able to conduct in the space here. We have studied at length the efficiency of these lobbying networks in another paper (Authors 1997). Instead, we present evidence consistent with the

hypothesis of over-investment, in two forms.

We first present simple graphical evidence for over-investment. Simply put, a network composed of rational but inefficient strong-tie allocations predicts well the actual structure of health-care lobbying networks in Washington. A hypothetically efficient symmetric network – in which lobbyists’ allocations among strong and weak ties yield a symmetric network structure that minimizes the number of uninformed lobbyists – poorly predicts the actual structure of Washington lobbying. To show this, we construct a proportion parameter \mathbf{b} depicting the relative time allocation among strong and weak ties (see equation A-2). This proportion is constructed using the time budget identity of equation (1), and assumes a strong tie requires ten times the time to maintain than a weak tie. We construct two predictions for this parameter \mathbf{b} , one based upon the (Nash) equilibrium behavior of lobbyists under high all-network information demand,²² the other based upon the hypothetical behavior of lobbyists in an informationally efficient network. We call these estimates \mathbf{b}_{Nash} and \mathbf{b}_{Opt} , respectively, for all issues. We then use the identical averaging procedure taking into account the group’s lobbying history that we used to construct the organization-level μ (see Tables 2 and 3). Each organization will have one average allocation for the Nash model, and one for the socially optimal baseline, given the unique set of issues in which it was mobilized.

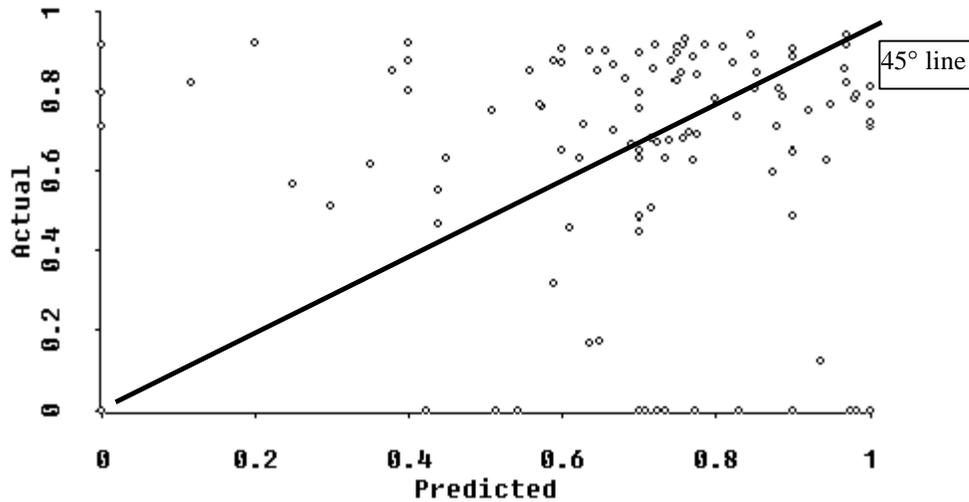


Figure 4 Predicted strong-tie allocations (under Nash equilibria) versus actual strong-tie allocations. (Note: Cases are organizations; “missing values” omitted.)

Figures 4 and 5 show the scatter of both Nash and optimal allocations relative to groups’ actual proportion of strong ties. The plots display a line of slope 1 that passes through the origin. For each plot, a scatter of points around the 45-degree line that is systematically neither over nor under the line would be consistent with the predicted allocations (from either model) for groups in this data set. Figure 4 plots the equilibrium model’s predictions (β_{Nash}) against lobbyists’ actual allocations; the Nash model neither overpredicts nor underpredicts the actual investments. Figure 5 plots the hypothetical optimum predictions (β_{Opt}) against the actual investments; notice here that the predictions based upon a hypothetically efficient network underpredict lobbyists’ investments in strong ties.

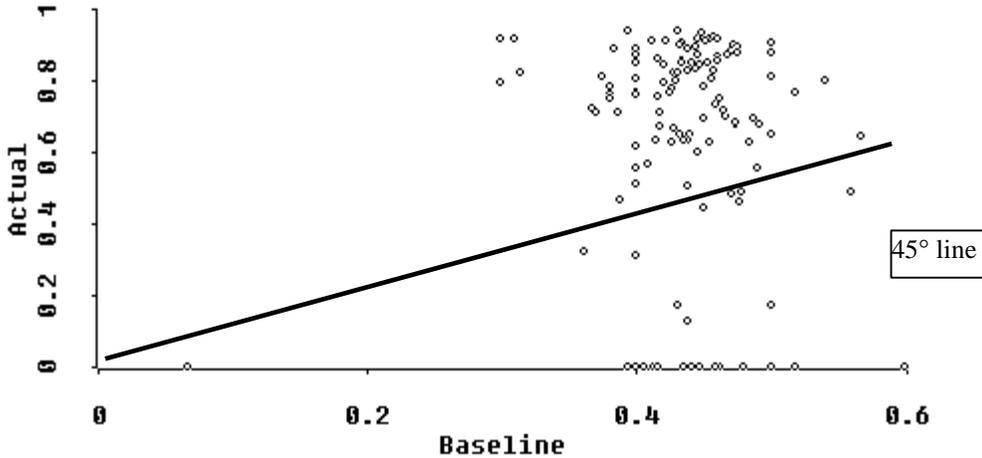


Figure 5: A "Socially Efficient" Network Under-Predicts Lobbyists' Actual Strong-Tie Allocations. (Note: Cases are organizations; "missing values" omitted)

To make this demonstration more precise, we offer the following statistical test. The mean of the residuals for the Nash graph in Figure 4, calculated as the vertical distance of the observation from the line $y = x$, is -0.005 . The t -value for the null hypothesis that the mean residual is zero $\{H_0 = 0\}$ is -0.37 . We cannot reject the null hypothesis of mean-zero residuals here; the Nash model systematically neither over-predicts nor under-predicts health-lobbying organizations' measured time allocations (see Figure 4). The corresponding residuals for the optimum allocation graph in Figure 5 have a mean of 0.20 . The t -value for the null hypothesis of mean-zero residuals is 7.69 ($p < 0.001$), showing that these groups indeed consistently choose more strong ties than is hypothetically efficient, as the scatter in Figure 5 lies above the 45-degree line (see Figure 5).

V. Conclusion: Crisis-Driven Contact Making and Access in the Long Term

Lobbyists aim to become well-informed. The information they seek is socially distributed, packed into networks of communication among other lobbyists and government officials. The

network structure of communications among policy experts plays a critical role in policy formation, much as Heclo hypothesized two decades ago.

We have argued that lobbyists choose their social ties according to well-defined strategies, and that their choice of strong ties over weak ties is a positive function of the average demand for information among groups in the network, their own demand for information, and their age. Our statistical analyses of lobbying networks in health care politics in the United States provide support for these arguments. We find that groups involved in issues where the demand for information is high tend to have more political “chums” relative to acquaintances. We also find evidence of greater strong tie investments among groups that employ more staff to monitor Washington policymaking, as well as among groups that attend more hearings. Finally, consistent with the idea that strong-ties are borne of trust, we find a modest positive association between the age of an interest group and its strong ties in Washington.

Our argument offers a troubling paradox for lobbyists wishing to gain information through contacts. Rational lobbyists who want to be informed in a high information demand policy area, where many groups also are interested in the issue at stake, will be led to establish a preponderance of strong ties. But as Granovetter (1973) shows, strong ties tend to provide redundant information in the long run compared to weak ties because of certain regularities in communication network structures. This implies that a group that tends to be mobilized in high information demand issues will tend to be disadvantaged in the long run relative to a group interested in low information demand issues. Groups mobilized in low information demand issues will rationally establish more weak ties, which are informationally efficient in the long run. In other words, the rational short-term pursuit of information through strong ties in high demand areas may conflict with long-run credibility, which demands weak ties. This paradox suggests a

"network tragedy" story in policy lobbying, since the social rules of information exchange that we identify appear to introduce inefficiencies into the information communication network. In health care politics, Washington interest groups may invest too much time in gaining chums as opposed to acquaintances to make all policy actors in the network best informed.

Until the last decade, the analysis of lobbying networks was imprecise and dominated by casual (yet still valuable) observation. We believe that the analyses of this paper outline a larger research agenda, one in which the predictions of a richer theory of politics meet with richer data on the strategic interactions of lobbyists and the resultant creation of "social capital" in national policymaking communities.

Appendix 1: Computational and Mathematical Appendix

I.A Simulation of information transmission when ties are exogenous (Analysis One):

In each simulation of information transmission, the strong and weak tie networks are the observed strong and weak tie health care networks (and are therefore the same for each simulation). d and m are given at the beginning of each simulation. The simulation proceeds in three steps:

- (1) Each individual in the network is assigned a “need” for information of 1 with probability m or 0 with probability $1-m$. Each individual is “informed” with probability d or “uninformed” with probability $1-d$.
- (2) Those individuals who are informed and not needy and have any strong-tie contacts that are uninformed and needy pass that information onto a strong tie contact.
- (3) Those individuals who are informed and not needy and do not have any strong-tie contacts that are uninformed and needy and do have any weak tie contacts that are uninformed and needy pass that information onto a weak tie contact.

For a given simulation it is possible to calculate the precise number of times information was passed through weak and strong ties. The numbers calculated in figures 1 and 2 were based the ratio of the number of times information was transmitted to the total number of that type of tie (averaged over 1000 replications). That is, for a given simulation, if there were 100 weak ties, and information was transmitted along a weak tie once, that ratio would be .01.

These simulations were done in XLISP-STAT 2.1 Release 3.45. Code is available from authors upon request.

I.B. Computational Demonstration of Selected Results

Demonstration of Result 1. A formal demonstration of Result 1 requires the following definition. Define an average information transfer function (AITF) as the number of times information was transferred per strong tie and per weak tie in the simulations, averaged over computational replications. This function was computed for both strong and weak ties, and the AITF for strong ties is never less than the AITF for weak ties.

Corollary 1a: Non-Monotonicity of Marginal Information Transfer Function. *As the demand for information increases, the average information transferred for each strong tie rises to a unique mode, then returns to zero.*

The explanation for this is fairly straightforward. Whether information will be transferred along a given tie is a product of (1) whether information is available, and (2) whether information is needed. (1) and (2) are negatively related. The probability that if lobbyist L has information that that information will be passed on is $1 - m$. If L has N contacts, that probability that any of them will need that information is $1 - (1 - m)^N$. The probability, then, that this information will be transferred is $(1 - m) - (1 - m)^{N+1}$.²³ This result is not central to our model but it underlies our Result 4 concerning the efficiency of the network.

Computational Demonstration of Corollary 1: Non-Monotonicity of the Average Information Transfer Function. The OLS regression line describing the computed AITF for strong ties is a three-term regression: $\text{AITF}(S) = -0.079 + 0.13*m - 0.048*(1 + m)^2$. The standard errors for the coefficients are (0.0066), (0.0090) and (0.0030), respectively. This model explains over 90 of the generated variance in the AITF by our simulations. Although significant third and fourth derivatives for the $\text{AITF}(S)$ function exist, they do not establish another mode, as they are

much smaller than the estimated (negative) second derivative.

I. C. Formal Structure of the Combinatorial Optimization Model (from Boorman 1975).²⁴

Let each lobbyist (or lobbying organization) be characterized by a time budget $T > 0$, identical for all lobbyists. The number of strong ties is denoted by S ; the number of weak ties, by W . Normalizing, let 1 be the time expenditure for weak ties and the proportion of T devoted to acquaintances is W . We let $I > 1$ be the per-contact time cost of a strong tie, and then the proportion of the lobbyist's time consumed by strong ties is IS . This completes the specification of the lobbyist's budget constraint, as follows

$$W + IS = T \tag{A-1}$$

For purposes below, we also define b , $0 \leq b \leq 1$, such that

$$W = (1 - b)T \quad \text{and} \quad S = \frac{bT}{I} \tag{A-2}$$

A homogeneous market for information is assumed. In a given period, a piece of information enters a population of n individual lobbyists (or organizations) and is received by one and only one lobbyist -- the "contact" -- hereafter noted as C . The player C is the randomly informed player whose information other lobbyists seek through the network. The problem is that lobbyists must make their strong and weak tie allocations without knowing who the contact is beforehand. In any round of play, each and every lobbyists has an equal chance of becoming informed.

Upon receiving information, then, C may or may not need it. If C needs the information, she keeps it and tells no one. If she does not need it, she passes it on according to the following two rules.

1. One-contact to one-lobbyist restriction: the "contact" C transmits information to at most one other lobbyist within any period.²⁵

2. Strong-Tie Priority Rule: Upon receiving political information which is not needed personally, C passes the information first to strong ties by randomizing among them; if

none of the strong ties of C need the information, then C randomizes across weak ties.

To simplify our analysis, we introduce a third rule:

3. Symmetry of Strategies: We analyze only those cases where all lobbyists are assumed to have identical breakdowns as between weak and strong ties.

Let m be the probability that a given lobbyist L needs the information in a particular policy domain, which is equivalent to the “demand for information” in policymaking. Also, let d represent the probability that L hears of information in the current round, *before* it has been transmitted socially to anyone else. In other words, d represents the probability that, in any given round of play, the information-seeker L is now the information-possessor C.

B. The Lobbyist’s Problem: Cocktails versus Trust. The lobbyist’s problem is then to choose a strategy – consisting of the double (S,W) , chosen subject to (1) – so as maximize the probability of obtaining political information from the randomly informed contact C. Now let P be the probability that L will get the desired information through contacts, written as follows

$$P \equiv 1 - Q = 1 - Q_s Q_w \tag{A-3}$$

where

Q_s = probability no political information is obtained through strong ties;
 Q_w = probability no political information is obtained through weak ties.

Consider then the situation in which C is a trusted friend (or “strong” tie) of L who first receives valued political information in the lobbyist network. The probability that this information is passed from C to her friend L is the probability that C hears the information first (d), does not need the information herself $(1-m)$, and actually passes the job to L as opposed to some other strong tie. Let s be this final probability, i.e. the probability that the contact C actually passes the information to L as opposed to another of her strong ties. Hence Q_s is

$$\begin{aligned}
Q_s &= \{(1-d) + dm + d(1-m)(1-s)\}^S \\
&= \{1-d(1-m)s\}^S
\end{aligned} \tag{A-4}$$

In a similar way,

$$\begin{aligned}
Q_w &= \{[1-d] + dm + d[1-m][1-(1-m)^s] + d[1-m]^{s+1}[1-\Omega]\}^W \\
&= \{1-d[1-m]^{s+1}\Omega\}^W
\end{aligned} \tag{A-5}$$

where W performs the same function for weak ties as S does for strong ties.²⁶

We now express S and W in terms of the exogenous parameter set (T, I, d, m) . If L is in a set of x other lobbyists, and m is the probability that any one of the remaining $x-1$ people also needs the political information sought by L , then the probability that L will receive the desired information is equivalent to (1) the probability that none of the other $x-1$ lobbyists will need the information (in which case L receives it with certainty), plus (2) the probability that L will receive the information if a set $\bullet \neq \emptyset$ of the other people also need it, summed over the appropriate probability weights. We express this probability as²⁷

$$\begin{aligned}
f(x) &= (1-m)^{x-1} + \sum_{k=1}^{x-1} (1-m)^{x-k-1} m^k \binom{[x-1]}{k} \binom{1}{k+1} \\
&= \frac{1 - (1-m)^x}{mx}
\end{aligned} \tag{A-6}$$

Equation (A-6) is the combinatorial optimization feature of our model. The computations we conduct are premised upon the assumption that (A-6) holds parametrically for all lobbyists. The reduced form of (A-6) is a feature of all of our simulations.

**Table 1: Event-Level Tests of the Relationship
between Information Demand and Strong-Tie Investments**

Dependent Variable is the average number of strong ties among all groups participating in the event.

(Standard Errors in parentheses.)

VARIABLE	Model 1 <i>m</i> only	Model 2 <i>m</i> + AR(1)	Model 3 <i>m</i> + weak ties	Model 4 <i>m</i> + weak ties + AR(1)
Constant	19.3257** (1.3441)	18.4716** (1.5072)	-5.4129* (2.7202)	-7.9253** (2.6739)
Demand for Information (<i>m</i>) (<i>Test of H1</i> : Measured as % of groups reporting moderate or strong interest in the event.)	0.0775* (0.0375)	0.1028** (0.0382)	0.1040** (0.0259)	0.1602** (0.0254)
Average Weak Ties of Groups Participating in Event	-----	-----	0.5030** (0.0520)	0.5161** (0.0484)
$r(e_t)$ (Autocorrelation Parameter)	-----	0.4069** (0.0997)	-----	0.5265** (0.0928)
MARGINAL EFFECTS (%-points ↑ in demand required for an additional average strong tie for all groups in the network)	14	10	10	6
Number of Events (df)	85 (83)	85 (82)	85 (82)	85 (81)
σ	5.0421	4.6239	3.4674	3.0360
Adjusted R ²	.0375		.5448	
Durbin-Watson	1.2093	2.1697	1.1152	2.2191
Dickey-Fuller τ	-6.2019**	-----	-----	-----

Note: ** denotes significance at $p < .01$. * denotes significance at $p < .05$. (All tests are two-tailed.) Source: Laumann and Knoke (1987). Dickey-Fuller test yields a rejection of a unit root in the dependent variable; we can reject the null hypothesis of non-stationarity across events.

**Table 2: The Demand for Information
and Lobbyists' "Social" Investment in Strong Ties**

Maximum Likelihood Count Regressions (Poisson and Negative Binomial);
Dependent Variable is number of strong ties of group *i*.

(Standard Errors in Parentheses)

VARIABLES	<i>Information Demand Measured as Average Group Interest Across Issues</i>		<i>Information Demand Measured as Number of Policy Monitoring Staff</i>		<i>Information Demand Measured as Number of Hearings Attended</i>	
	Poisson	Negative Binomial	Poisson	Negative Binomial	Poisson	Negative Binomial
Constant	-0.4909 (0.6472)	-0.6564 (318.92)	0.4025 (0.3889)	0.3811 (0.9378)	0.8368* (0.3764)	0.5852 (0.7971)
Weak Ties to Groups	0.0183** (0.0201)	0.0197** (0.0143)	0.0154** (0.0026)	0.0175* (0.0071)	0.0094** (0.0030)	0.0138* (0.0059)
Average Interest (for All Groups) Across Issues in which Group <i>i</i> is Involved (<i>m</i>) (Hypothesis #1)	7.3059** (1.8846)	6.8443* (3.1270)	-----	-----	-----	-----
Number of Staff Employed to Monitor Washington Politics (Hypothesis #2; Measure #1)	-----	-----	0.0220** (0.0080)	0.0273 (0.0288)	-----	-----
Number of Hearings Attended (Hypothesis #2; Measure #2)	-----	-----	-----	-----	0.0492** (0.0094)	0.0503* (0.0196)
ln(Budget) (Hypothesis #3)	0.0035 (0.0327)	0.0158 (0.0608)	0.0257 (0.0240)	0.0185 (0.0610)	-0.0020 (0.0223)	-0.0003 (0.0519)
Estimated Mobilization Capacity	-0.1206* (0.0511)	-0.1121 (0.0883)	-0.0394 (0.0402)	-0.0663 (0.0878)	-0.0045 (0.0027)	-0.0611 (0.0751)
Estimated Public Mobilization Capacity	0.0024 (0.0280)	0.0091 (0.0534)	0.0170 (0.0293)	0.0234 (0.0563)	-0.0491 (0.0404)	-0.0094 (0.0582)
Organization Age (years) (Hypothesis #4)	0.0043* (0.0017)	0.0040 (0.0033)	0.0030+ (0.0017)	0.0026 (0.0033)	0.0007 (0.0017)	0.0008 (0.0036)
Public Interest Group	-0.0437 (0.1218)	-0.0231 (0.2337)	0.0758 (0.1172)	0.0969 (0.2489)	0.0682 (0.1179)	0.0726 (0.2313)
President	-0.1015 (0.1093)	-0.1030 (318.91)	0.1698** (0.0532)	0.2061+ (0.1191)	0.2398** (0.0547)	0.2588* (0.1124)
<i>Dispersion</i>	-----	0.2887** (0.0893)	-----	0.3148** (0.0884)	-----	0.2633** (0.0908)
N (df)	63 (54)	63 (54)	68 (59)	68 (59)	68 (59)	68 (59)
LLF	-188.05	-167.37	-211.06	-183.80	-200.90	-180.60

Note: ** denotes significance at $p < .01$. * denotes significance at $p < .05$. + denotes significance at $p < .10$. (All tests are two-tailed.) Source: Laumann and Knoke (1987).

**Table 3: Reduced Count Models of
Lobbyists' Investment in Strong Ties**

Strong Ties as a Function of Information Demand, Budgets,
Organizational Age, and Weak Ties

(Standard Errors in Parentheses)

VARIABLES	Negative Binomial Regressions; Dependent Variable is number of strong ties of group <i>i</i> .				
	Model 1	Model 2	Model 2 Fully Reduced	Model 3	Model 3 Fully Reduced
Constant	-0.6076 (0.8333)	0.6565 (0.6340)	0.9967** (0.1838)	0.4911 (0.5390)	0.9418** (0.2121)
Weak Ties to Groups	0.0143** (0.0053)	0.0124* (0.0051)	0.0112* (0.0049)	0.0115* (0.0047)	0.0108** (0.0040)
Average Interest (for All Groups) Across Issues in which Group <i>i</i> is Involved (m) <i>(Hypothesis #1)</i>	3.7688+ (2.1115)	-----	-----	-----	-----
Number of Staff Employed to Monitor Washington Politics <i>(Hypothesis #2; Measure #1)</i>	-----	0.0330+ (0.0190)	0.0438** (0.0129)	-----	-----
Number of Hearings Attended <i>(Hypothesis #2; Measure #2)</i>	-----	-----	-----	0.0400* (0.0180)	0.0514** (0.0141)
ln(Budget) <i>(Hypothesis #3)</i>	0.0533 (0.0429)	0.0261 (0.0441)	-----	0.0289 (0.0362)	-----
Organization Age (years) <i>(Hypothesis #4)</i>	0.0057* (0.0026)	0.0035 (0.0024)	0.0043+ (0.0022)	0.0024 (0.0027)	-----
<i>Dispersion</i>	0.3174** (0.0873)	0.3164** (0.0777)	0.2994** (0.0690)	0.2901** (0.0723)	0.2779** (0.0665)
N	84	90	99	90	104
LLF	-228.87	-245.75	-268.10	-243.76	-279.28

Note: Model reduction occurs by elimination of variables whose absolute *t*-value is less than unity. Where all *t*-values (except for that of the constant term) are above unity, no model reduction occurs. ** denotes significance at $p < .01$. * denotes significance at $p < .05$. + denotes significance at $p < .10$. (All tests are two-tailed.) Source: Laumann and Knoke (1987).

References

- Alford, Robert D. 1975. *Health Care Politics: Ideological and Interest Group Barriers to Reform*. Chicago, Ill.: University of Chicago Press.
- Anselin, Luc. 1988. *Spatial Econometrics: Methods and Models* (New York; Kluwer Academic).
- Austen-Smith, David. 1992. Strategic Models of Talk in Political Decision Making. *International Political Science Review*, 13(1):45-58.
- Austen-Smith, David. 1997. "Endogenous Informational Lobbying," manuscript, Northwestern University.
- Austen-Smith, David, and William H. Riker. 1987. Asymmetric Information and the Coherence of Legislation. *American Political Science Review*, 81(3):987-918.
- Austen-Smith, David, and John R. Wright. 1992. Competitive Lobbying for a Legislator's Vote. *Social Choice and Welfare*, 9:229-257.
- Austen-Smith, David, and John R. Wright. 1994. Counteractive Lobbying. *American Journal of Political Science*, 38(1):25-44.
- Banks, Jeffrey S. 1991. *Signaling Games in Political Science*. Chur, Switzerland: Harwood Academic Publishers.
- Bauer, Raymond A., Ithiel De Sola Pool, and Lewis Anthony Dexter. 1972. *American Business and Public Policy: The Politics of Foreign Trade*, 2 ed. Chicago: Aldine Atherton.
- Boorman, Scott A. 1975. A Combinatorial Optimization Model for Transmission of Job Information Through Job Contact Networks. *Bell Journal of Economics*, 6(1):216-249.
- Brehm, John and Wendy Rahn. 1997. Individual-Level Evidence for the Causes and Consequences of Social Capital. *American Journal of Political Science*. 41(3):999-1023.
- Brown, Lawrence D. 1983. *Politics and Health Care Organization: HMOs as Federal Policy*. Washington, D.C.: The Brookings Institution.
- Browne, William P. 1988. *Private Interests, Public Policy, and American Agriculture*, (Lawrence; Kansas University Press).
- Burt, Ronald. 1987. Social Contagion and Innovation: Cohesion versus Structural Equivalence," *American Journal of Sociology*. 92: 1287-1335.
- Coleman, James, E. Katz, and H. Menzel. 1966. *Medical Innovation: A Diffusion Study*. Indianapolis, IN: Bobbs-Merrill.
- Deutsch, Karl W. 1966. *The Nerves of Government: Models of Political Communication and Control*, (New York: The Free Press).
- Falkson, Joseph. 1980. *HMOs and the Politics of Health System Reform*. Chicago, Ill.: American Hospital Association.
- Fritschler, A. Lee. 1989. *Smoking and Politics: Policymaking and the Federal Bureaucracy*. 4 ed. Englewood Cliffs, NJ: Prentice-Hall.

- Gais, Thomas L., Mark A. Peterson and Jack L. Walker. 1984. Interest Groups, Iron Triangles and Representative Institutions in American National Government. *British Journal of Political Science*, 14:161-185.
- Galbraith, John Kenneth. 1967. *The New Industrial State*. Boston, MA: Houghton Mifflin Co.
- Golden, Marissa Martino. 1998. "Interest Groups in the Rule-Making Process: Who Participates? Whose Voices Get Heard?" *Journal of Public Administration Research and Theory* 8 (2): 245-270.
- Granovetter, Mark. 1977 [1973]. The Strength of Weak Ties. In Samuel Leinhardt, ed., *Social Networks: A Developing Paradigm*, (New York: Academic Press) (originally published in *American Journal of sociology*, 78: 1360-1380).
- Hansen, John Mark. 1991. *Gaining Access: Congress and the Farm Lobby, 1919-1981*. Chicago: University of Chicago Press.
- Heclo, Hugh. 1978. Issue Networks and the Executive Establishment: Government Growth in an Age of Improvement. In *The New American Political System*. Anthony King, ed. Washington, D.C.: American Enterprise Institute.
- Heinz, John P., Edward O. Laumann, Robert L. Nelson, and Robert H. Salisbury. 1993. *The Hollow Core: Private Interests in National Policy Making*. Cambridge: Harvard University Press.
- Hojnacki, Marie and David Kimball. 1997. Organized Interests and the Decision of Whom to Lobby in Congress. Typescript. Penn State University.
- Kerwin, Cornelius. 1994. *Rulemaking: How Government Agencies Write Law and Make Policy*. Washington, DC: Congressional Quarterly Press.
- Kollman, Ken. 1997. "Inviting Friends to Lobby: Interest Groups, Ideological Bias, and Congressional Committees." *American Journal of Political Science*, 41(2):519-544.
- King, Gary. 1989. *Unifying Political Methodology: The Likelihood Theory of Statistical Inference*. New York: Cambridge University Press.
- Kingdon, John W. 1984. *Agendas, Alternatives, and Public Policies*. New York: HarperCollins.
- Laumann, Edward O., and David Knoke. 1987. *The Organizational State: Social Choice in National Policy Domains*. Madison, Wisc.: The University of Wisconsin Press.
- Leech, Beth L. 1997. Conflictual and Cooperative Lobbying Strategies. Paper presented at the 1997 Annual Meetings of the American Political Science Association, Washington, DC.
- Lindblom, Charles E. 1977. *Politics and Markets: The World's Political-Economic Systems*. New York: Basic Books.
- Mansbridge, Jane J. 1992. A Deliberative Theory of Interest Group Representation. In *The Politics of Interests: Interest Groups Transformed*. Mark P. Petracca, ed. Boulder, Co.: Westview Press.
- McCubbins, Mathew and Thomas Schwartz. 1987 [1984]. Congressional Oversight Overlooked: Police Patrols versus Fire Alarms. Congress: Structure and Policy. McCubbins and Sullivan, eds. New York: Cambridge University Press.
- Milbrath, Lester W. 1963. *The Washington Lobbyists*. Chicago: Rand McNally and Company.

- Peterson, Mark A. 1992. The Presidency and Organized Interests: White House Patterns of Interest Group Liaison. *American Political Science Review* 86 (3): 612-625.
- Putnam, Robert D. 1995. Bowling Alone: America's Declining Social Capital. *Journal of Democracy* pp. 63-78.
- Rasmusen, Eric. 1993. Lobbying when the decisionmaker can acquire independent information. *Public Choice* 77(4): 899-913.
- Schlozman, Kay Lehman, and John T. Tierney. 1986. *Organized Interests and American Democracy*. New York: Harper and Row.
- Schlozman, Kay Lehman, and John T. Tierney. 1988. More of the Same: Washington Pressure Group Activity in a Decade of Change. *Journal of Politics* 45 (1988): 351-75.
- Schneider, Mark, Paul Teske, Melissa Marschall, Michael Mintrom, and Christine Roch. 1997a. Institutional Arrangements and the Creation of Social Capital: The Effects of Public School Choice. *American Political Science Review* 91(1): 82-93.
- Schneider, Mark, Paul Teske, Christine Roch, and Melissa Marschall. 1997b. Networks to Nowhere: Segregation and Stratification in Networks of Information about Schools. *American Journal of Political Science* 41(4): 1201-1223.
- Verbrugge, Lois. 1977. The Structure of Adult Friendship Choices. *Social Forces* 56(2): 576-597.
- Wilson, James Q. 1995. *Political Organizations*. Princeton: Princeton University Press.
- Wright, John R. 1996. *Interest Groups and Congress: Lobbying, Contributions, and Influence*. Boston: Allyn and Bacon

ENDNOTES

¹ In a growing literature, scholars have examined the strategic problems of credibility in games of information transmission (Austen-Smith 1991, Austen-Smith and Wright 1992, 1994, Rasmusen 1993). In this paper, we examine one of the preconditions of informational credibility: *the problem of information acquisition*.

² The entirety of our analysis here assumes that lobbyists are willing to transmit information, but we recognize at the outset that information transmission is strategic. Lobbyists might have some information that they do not wish to transmit. Furthermore, if lobbyists do wish to communicate, they may wish to transmit information to some lobbyists and not others. We discuss this problem more thoroughly below, in the section "Strategic Information Transmission." We will also incorporate strategic information transmission explicitly into our analysis in further developments of our model and empirical analysis.

³ See for instance Austen-Smith and Wright's definition of an "information acquisition strategy"

as a *probability of payment* for information (1992:34).

⁴ For purposes of this paper we assume that lobbying organizations are unitary actors. Hence we use "lobbyist," "lobbying organization," "organization," and "group" interchangeably throughout the text.

⁵ Granovetter (1973) found strong support for the "strength of weak ties" hypothesis in his study of the Boston area labor market in the 1970's.

⁶ To see this, consider the logic of our model outlined in Section II. Suppose information transmission is strategic, such that a lobbyist is willing to share some information, but that she is sufficiently strategic that she shares it only with two other lobbyists who are ideologically similar to her (making a three-person network). Even under these extremely restrictive conditions, the uninformed lobbyists will face a decision as to how to invest their time among their two contacts. Given limited time, there will exist a trade-off between weak and strong ties and our model will apply.

⁷ It is not possible with a combinatorial model such as this to analytically derive the impact of a change of the collective demand for information on possible Nash equilibria and communication network optima (see Boorman 1975). We can, however, numerically calculate the Nash equilibrium (or equilibria) and collectively efficient optimum for each set of model parameter values. Appendix I summarizes the how we derive the Nash equilibria and collective optima for each set of parameter values.

⁸ If an interest group "needs" information it is assumed that it might receive (redundant) information from more than one tie. If none of a lobbyist's ties are in need, then it does not distribute its information.

⁹ For purposes of this paper, we assume that information sharing is a norm governing the network. (See the section "Strategic Information Transmission" above.) Our results may apply only to policy information that organizations are willing to share.

¹⁰ In each simulation each interest group is "assigned" information with probability d , and each interest group is assigned a need for information with probability m . d is assumed to equal .2 for these simulations; these findings are robust with respect to changes in d . See Appendix I for detailed summary of simulations.

¹¹ "Symmetric" because we assume that all groups choose the same number of strong and weak ties. Where the symmetric network optimum differs from the Nash equilibrium, it is Pareto superior to the Nash equilibrium.

¹² We can assume that this information is private or common. If we assume that group-specific demand is private information, then we can think of the individual group demands as having been drawn from a prior distribution the mean of which (m) is known and is the global demand for information. A group would know m and know its own demand for information, but it would know nothing of the demand of any other specific group.

¹³ The relative importance of information in health lobbying can be inferred from the “sample” of issues in the Laumann and Knoke (1987) dataset, which includes for example biomedical research issues such as DNA research and human experimentation, the organization of health care delivery issues such as HMOs and hospital cost containment, and regulation of food additives or medical devices.

¹⁴ The sample of organizations is not a probability sample drawn from a known population, but rather is an exhaustive list of organizations that are consequential or highly visible in health care lobbying. An organization was deemed consequential if it appeared with some degree of regularity between 1973 and 1980 in newspaper articles covering health care politics, congressional hearings, *amicus* filings in federal court, health lobbying registration lists, or was named by a panel of health politics experts. Laumann and Knoke used this method of non-random selection since there is no known universe for sampling health lobbying organizations, and since it avoids selecting organizations on their degree of connectedness (see Laumann and Knoke 1987:95). The survey informant was either the organization’s executive director, government affairs or staff specialist. Laumann and Knoke had an 89.4% response rate from health lobbying organizations yielding 135 observations (see Laumann and Knoke 1987:97-101).

¹⁵ Each interest group respondent was asked to indicate the nature of the group’s lobbying activity on a series of governmental health policy decisions between 1973 and 1980. For example, the group may have actively lobbied with a particular position, it may have just held a conference or seminar, or it may have held a position but did not actively lobby.

¹⁶ Our model gives predictions for how an interest group will allocate its available contact-making time between seeking out strong and weak contacts. We do not observe groups’ individual contact-making time budget. We only observe measures of domain strong and weak tie communication networks, as was realized after the full set of policy events had occurred. To measure groups’ allocations between weak and strong ties, we simply tabulate the number of weak and strong ties that each group has established. Our statistical models control for the group’s organizational capacity by including measures of each group’s resources.

¹⁷ In this measure and the next, the survey asked each group to choose five to ten other groups with which it is familiar, and to check the most important resource “on which that organization’s influence is based.”

¹⁸ The reason that controlling for weak ties strengthens the relationship between μ and strong ties is that the weak tie measure gives a measure of the group's "contact-making budget" -- some groups have more resources and can make more ties than other groups. Of course, the strong *positive* association between weak tie investments and strong tie investments may seem puzzling, given that that they are *negatively* related in the budget identity of our model. The reason is simple: some organizations have more social resources than others and can thus make more ties -- weak *and* strong. Our results suggest that a group's "social capital" as such is insignificantly related to its fiscal budget. In other words, the formal model's assumption of identical time (or

resource) budgets across lobbyists is certainly wrong empirically. Yet this does not alter the basic fact of a trade-off, which is difficult to measure across groups. Hence an organization's number of weak ties is a good control measure when predicting its number of strong ties.

One other difficulty with the dependent variable in Table 1 is that it is theoretically constrained to lie above 0, whereas ordinary least squares makes no such assumptions. However, the mean of this variable (21.86 strong ties per group) is four standard deviations (5.14) away from zero.

¹⁹ More formally, all events in the data set $\{1, 2, 3 \dots n\}$ have an associated $\mathbf{m} \{m_1, m_2, m_3 \dots m_n\}$. If an interest group lobbied over events $\{i, j, k\}$, the group's demand for information will be the average of m_i, m_j , and m_k .

²⁰ The negative binomial regression estimator operates as follows. Let the dependent variable S_i be the number of strong ties of group i . The observed S_i are assumed to be generated by a negative binomial distribution with mean \mathbf{x} and variance $\mathbf{x}(1 + \mathbf{t}\mathbf{x})$. Letting $g_{NB}(S_i)$ be the negative binomial probability distribution for S_i we have

$$g_{NB}(S_i) = Pr[S_i = k] = \Gamma(\mathbf{t}^{-1} + k) / [\Gamma(\mathbf{t}^{-1}) k!] u^{1/t} (1-u)^k, \text{ where } u = \mathbf{t}^{-1} / (\mathbf{t}^{-1} + \mathbf{x}).$$

The gradient and log-likelihood appear in Greene (1994).

²¹ We do not report a separate set of estimations where \mathbf{m} and the organization-specific demand measures appear jointly in the model. The reason we separate these measures here is that they are theoretically and empirically correlated; as the all-network demand for information rises, so too will that of individual organizations (by virtue of a simple accounting identity). Still, joint inclusion of \mathbf{m} and the organization-specific demand measures does not alter materially the results. If for instance \mathbf{m} and the monitoring staff variable are included in the same regression, both variables estimate positive and significant in the Poisson regression, and \mathbf{m} remains statistically significant in the negative binomial regression, while the coefficient on the monitoring staff measure is positive and with a t -statistic of 1.5. (Full estimations available from the authors upon request.)

²² Only approximately 54% of the issues with \mathbf{m} in this range are Nash stable. Issues with no stable Nash equilibria are ignored, i.e. counted as missing data.

²³ This function has a unique maximum at $\mathbf{m} = 1 - N \sqrt{\frac{1}{N+1}}$.

²⁴ We adopt the structure of Boorman (1975), and we emphasize that none of the mathematical structure or the analytic results here are our own. We are responsible, however, for the computational results, which generate the hypotheses we test.

²⁵ Assumption 1 facilitates combinatorial analysis, though it may seem unduly restrictive. We believe it justified for two reasons. First, it accords with the intuition that the value of information in politics is strictly (and steeply) decreasing in the number of people possessing it. To pass information to more than one person would be to so seriously erode its value as to make the information worthless upon second transmission – no one would pay for information upon second

transmission. Second, the assumption is not fundamental to the development of the theory. In further work we shall demonstrate how our results obtain even if Assumption 1 is relaxed.

²⁶ We note here that results (A-4) and (A-5) both depend upon an assumption (call it “Assumption 4”) that violates a well-established result of the sociological networks literature: *absence of triad closure*. A formal statement of the assumption is from Boorman, (p. 224): “There are no triads (A, B, C) in the network such that A is a contact of B, B is a contact of C, and A is also a contact of C, where each ‘contact’ may be either strong or weak.”

²⁷ Note for continuity at $x = 0$, $f(0) = \frac{-\ln(1-m)}{m}$ by l’Hospital’s rule.