

# **Institutional Externalities and Stakeholder Performance in Complex Governance Systems**

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Solving public policy problems is a complicated task because decisions that affect how these problems are tackled are made across a series of interdependent policy forums that commonly experience "institutional externalities"—instances where the decisions made in one forum affect the policy problems or process of political decision-making in other forums (Feiock 2005, 2013; Lubell 2013; Lubell, Henry, McCoy 2011). This phenomenon is acute in environmental policy, where different policy forums exist to address various interrelated environmental issues and stakeholders participate at multiple levels within polycentric governance systems (Berardo, Olivier and Lavers 2015). Consider, for example, the Tampa Bay watershed governance system—one of the research sites examined in this paper—where over 300 unique forums are active in the region. While some of these forums are relatively small and deal with specific, localized issues, many others deal with multiple, interconnected problems including water supply and distribution, water quality, biodiversity, flooding, land-use, and climate change (Lubell et al. 2016). The presence of externalities between “linked” forums can potentially impact the rate by which political actors achieve their forum specific goals (either for better or worse: Lubell 2013). Many different types of policy subsystems feature complex governance systems, and the existence of institutional externalities is a core hypothesis of the recently developed “ecology of games framework” (EGF), which integrates transaction costs analysis with the concept of polycentric institutions (Jasny and Lubell 2015; Lubell 2013).

While work building of the EGF has theorized that externalities both exist and have the capacity to influence stakeholder performance in linked forums, two problems remain. First, the theoretical underpinnings explaining how externalities impact stakeholder performance are largely underdeveloped. Second, the very existence of institutional externalities and consequently, proof that they impact stakeholder behavior in linked forums has yet to be

empirically established. In this paper, we attempt to fill in both of these gaps by: 1) developing a theoretical framework that specifies the means by which externalities affect actor performance; 2) empirically investigating whether and to what extent externalities actually exist in two complex watershed governance systems; 3) testing the extent to which the externalities in such systems are, on average, helping or hindering actor performance in forums.

We posit that each forum constitutes a political contracting process in which actors pursue their preferred policies, build political and social capital, and learn about policy problems: actors that face significant transaction costs in a given forum will be less able to achieve their forum specific goals, relative to those that face fewer costs (Krueger 1974; Leach, Pelkey and Sabatier 2002; Lubell, Henry and McCoy 2010; Fischer and Leifeld 2015). We theorize that institutional externalities have the capacity to affect the costs associated with the contracting process of another forum and that the "direction" of a given externality can vary across actors in the same forum: positive externalities are received when the costs associated with pursuing one's goals in a forum decrease; negative externalities occur when costs increase. The extent to which receiving a negative or positive externality affects one's performance in a linked forum is determined by the "strength" of the externality: the extent to which the policy problem or political environment of a given forum is altered. In the presence of a weak externality, the expected effects of both positive and negative externalities are minimal. If the presence of a strong externality, positive externalities are expected to lead to increased influence in affected forums, whereas negative externalities lead to decreased influence.

Our empirical analysis evaluates both the extent to which externalities exist and their average impact on stakeholder performance in two complex water governance systems: the greater Tampa Bay watershed (Florida, US), and the Sacramento-San Joaquin Delta (California,

US). The study builds on previous research examining the structure and function of complex governance institutions (cites, but blinded for review), and utilizes a survey of key stakeholders that asks respondents to indicate the extent to which they are achieving their goals *in the primary policy forum* in which they participate. In addition, each respondent indicates whether or not they participate in a range of other forums that are known to exist in the governance system and ask the respondent to indicate the extent to which the alternative forums positively or negatively affect the outcomes in the primary forum. By aggregating answers to these questions across respondents, we are able to construct an innovative measure about the potential size of institutional externalities across all the forums, and test if that externality positively or negatively influences actor payoffs in the primary forum. Overall, we find that the strength of observed externalities are negatively associated with actor performance in linked forums, demonstrating that, on average, the presence of externalities are hindering actor performance. Further analyses demonstrate that the negative impacts of externalities are mitigated when actors are politically effective within the forum responsible for generating the externality.

This analysis makes several contributions to research in political science, policy, and public administration. First, from a theoretical perspective, the existence of institutional externalities is a basic hypothesis of the EGF and thus we directly test a theory of the policy process in polycentric systems. Second, institutional externalities are one of the main consequences of fragmented systems, where it is difficult to pursue overall mutually beneficial outcomes because the political calculus of actors does not usually account for institutional externalities. Third, from the perspective of political actors, the presence of institutional externalities requires developing political strategies that navigates across the entire political system, not just focusing on negotiations within a particular forum. Lastly, policy forums that

help actors achieve their goals are more likely to become institutionalized and therefore understanding these processes provides insight into the evolution and political stability of polycentric governance systems. In short, empirically analyzing the idea of institutional externalities advances policy theory while also providing insights into the overall effectiveness of public policy and the behavior of political actors.

### **Externalities and Actor Performance**

This section is composed of three parts. In the first, we provide a working definition of institutional externalities and explain when they are expected to arise in polycentric governance settings. In the second section, we examine how institutional externalities affect the capacity of actors to shape contracting processes in the forums in which they participate. In the third, we examine the relationship between externality strength and direction on actor performance.

#### **Defining Institutional Externalities**

A core tenet of the EGF is that complex governance systems feature considerable overlap among forums that have joint jurisdiction the same policy issue (e.g.; both forums make decisions about water supply), or consider separate policy issues that are connected through some type of biophysical or social process (e.g.; one forum addresses water supply and the other addresses endangered species (Lubell 2013; Lubell et al. 2016; Smaldino and Lubell 2014). As systems become increasingly fragmented, the extent to which forum overlap exists across the system is expected to increase as well (Klibanoff and Morduch 1995). Such fragmentation increases the incidence of institutional externalities in which decisions made in one forum affect the decisions made in other forums across the system (Jasny and Lubell 2015).

At least two forms of institutional externalities are said to occur in complex governance systems: problem externalities and policy externalities. Problem externalities are *direct* when

two forums have joint jurisdiction over the same problem such as water supply, or *indirect* when one forum has jurisdiction that is linked through some biophysical process to a different issue within the jurisdiction of another forum. Consider, for instance, the decisions made by the Bay Area Stormwater Management Association of Agencies (BASMAA) forum in California. The forum—consisting of representatives from nine municipal stormwater management agencies, as well as various state, local, and regional agency representatives—is charged with coordinating stormwater treatment procedures across nine municipalities ([basmaa.org](http://basmaa.org)). The rate by which the reached solutions and implementation efforts of BASMAA leads to environmental improvements or deteriorations directly impacts other forums concerned with interconnected problems such as water quality, biodiversity, as climate change. For instance, a failed coordination effort by BASMAA could potentially lead to increases in nitrogen levels in corresponding bodies of water, affecting a wide range of issues, including, but not limited to: algal blooms, fish stocks and sea grass health. Forums that are concerned with these affected issues will receive an indirect externality in that the state of the policy issues addressed by each forum will change, dependent on the decisions made in BASMAA.

Policy-oriented externalities are those that limit the policy options available in a linked forum. When this occurs, actors in linked forum must work around the new political conditions to devise policies that address their policy problem. For example, recent efforts by conservation based forums in San Francisco Bay (CA) to better protect the habitat of the Clapper Rail (a shorebird) created legal barriers through which forums charged with removing invasive sea grass must navigate (Lubell 2013). Invasive grass based forums can no longer consider policy alternatives that threaten the Clapper Rail, reducing the range of policy options available.

## **Externalities and Forum Performance**

Concurrent with previous EGF research, we posit that the degree to which actors accomplish their forum specific goals is largely a function the costs associated with developing political contracts within forums, and that these costs vary between actors in the same forum. Lubell et al. (2016), for instance, identifies a comprehensive list of actor specific transaction costs that affect individual perceptions of forum effectiveness. In their study, the authors find that actors that are more experienced, possess a greater amount of resources, have greater levels of political and scientific knowledge as well as those that participate both with greater frequency and a across a broader range of forums are found to face fewer obstacles within the individual forums in which they participate, thus allowing them to better achieve their goals. Building on this research, we posit that the costs associated with developing political contracts within a given forum are not solely a function of actor or even forum-specific factors, but are inexorably connected to decisions made in other forums across the governance system.

Externalities can affect the costs associated with achieving one's goals in other forums across the system. Throughout the remainder of the paper we refer to both policy oriented and problem oriented externalities collectively as externalities. Positive externalities occur when the costs associated with achieving one's desired goals in a forum are reduced; negative externalities occur when those costs are increased. Importantly, this conceptualization of externalities holds that the same externality can be viewed negatively or positively by different participants in the same forum. In this section we explore two ways in which externalities affect costs.

First, externalities can create barriers or opportunities for specific goals or policy plans, which affect the rate by which they can be attained. Consider for intendance, two hypothetical forums in a given estuary. The first forum is charged with restoring sea grass, the second

regulates recreational fishing. Stakeholders X and Y participate in Forum 2: Stakeholder X is a local fisherman who prefers unrestricted fishing; Stakeholder Y is a conservationist that prefers that sea grass is protected at all costs. If Forum 1 passes a law that forbids boats from entering specific zones in the estuary, it will directly restrict specific policy solutions that may be under consideration in Forum 2. Stakeholder X, whose preferred policy option is now restricted will be forced to select her "second-best" policy alternative, and pursue it. Such actions require a significant expenditure of resources, decreasing the rate by which ex-ante distributions translate into goal success. Thus, Stakeholder X will perceive this as a negative externality. Alternatively, stakeholder Y will receive a positive externality. While there are numerous potential threats to Stakeholder Y's ultimate goal (save all the sea grass), she no longer has to worry about recreational fishing's affect and can now dedicate her limited resources to other matters. Holding all else constant, she will be more successful at accomplishing her goals, relative to her expected success had the externality not occurred.

Second, externalities can set precedence, increasing the rate by which specific goals are valued or reach the forum agenda. Consider for instance, large, sweeping policies made by central forums or government authorities in the region that signal the direction that policies will be heading (for example, the prioritization of business over conservation, or vice versa). When this occurs, actors whose goals align with the new environment should have a stronger capacity to achieve their policy goals, relative to those whose goals diverge from the shift. Similarly, when a problem oriented externality occurs, it can shift the way in way in which different topics of conversation and efforts are organized and prioritized which can impact the rate by which individual's goals have the capacity to reach the forum agenda. Note that effect of precedence setting implies a hierarchical relationship among forums. Here, forums that are central to a

governance system (those that make decisions that affect a wide range of interests, are composed of important actors, have stronger rule making authority, etc.) have a greater propensity to generate this effect, as compared to more localized, smaller forums.

Consider again, two hypothetical resource management forums in a hypothetical municipality: Forum 1 is a regulatory forum where government agencies make decision regarding non-point source pollution; Forum 2 is workshop where local farmers meet, share ideas, and form voluntary agreements regarding sustainability practices in the region. If Forum 1 passes a policy restricting use of widely used pesticides, discussions regarding alternative practices and non-pesticide based farming are likely to occupy the forum agenda and decisions/agreements that are made are more likely to reflect an anti-pesticide agenda. Those whose forum goals ex-ante aligned with this topic (for example: they wanted to learn more about these practices; they are advocates that want to push others towards non-pesticide based farming) will receive a positive externality whereas those whose interests are harmed by the change will suffer from a negative externality.

### **The Impact of Externality Strength & Direction on Actor Performance**

The extent to which an externality is expected to affect a given actor's performance in forums affected by that externality is determined by the strength of the externality. In this context, the strength of the externality is synonymous with the rate at which the physical or political environment is altered. When a weak externality occurs, negative and positive externalities are expected to have minimal impacts on the cost associated with forum participation. When a sufficiently strong externality occurs, however, positive externalities will lead to sufficient increases in actor success whereas negative externalities will be associated with strong decreases. Concurrent with previous work (Jasny and Lubell 2015; Lubell 2013), we posit

that the strength of institutional externalities is predominately determined by the extent to which two forums “overlap” and that this process is endogenous to the decentralization process.

Moreover, we expect that as decentralization decreases and decision making becomes more fragmented, the propensity by which forums “overlap” increase as well

The propensity by which externalities actually exist, and their relative strength, can have a stark impact on the general effectiveness of actors that participate in complex governance systems (and consequently, the effectiveness of the forums). In systems where externalities are consistently positive, then the strength of externalities will be positively associated with actor performance in individual forums (on average), as actors will benefit more from stronger positive externalities (relative to weaker ones). If this is the case, then increasingly fragmented systems come with unforeseen benefits that promote both individual success and decision making efficiency. If, however, externalities are generally negative, then the strength of externalities will be negatively associated with actor performance in individual forums. If the effects of externalities in a given system are equally mixed, then strength of externalities will have no impact on actor performance (on average, given the heterogeneous effect).

### **Evaluating the Existence and Impact of Externalities on Actor Performance**

We examine the existence of externalities of externalities and their impact on actor performance with data collected in two complex water governance systems: the Tampa Bay Watershed (FL, US), and the Sacramento-San Joaquin Delta (CA, US). Note that we remain completely agnostic with regard to the expected impact of externalities on actor performance in these systems. Our analysis simply serves as a test of the existence of externalities and an exploration of their impact in the systems under consideration.

The first study site includes the water resources restricted by the geographic boundaries of the Southwest Florida Water Management District (SWFWMD), a regional agency established by Florida in 1961. The mission of SWFWMD, originally a flood control agency, has rapidly expanded, and is currently charged with the oversight of all major water related issues such as flood protection, water use, well construction and environmental resource permitting, water conservation, education, land acquisition, water resource and supply development, and supportive data collection and analysis efforts. The District is responsible for the management of all relevant water sources in sixteen diverse counties and serve a population of more than 5 million people, the majority of whom live in the Tampa Bay watershed. For simplification we refer to the study area as Tampa Bay, although it includes several water sources outside of those boundaries.

The Sacramento-San Joaquin Delta (hereafter the California Delta) is the second research site. With a multitude of different distinct water districts, the California Delta is a highly decentralized system that has developed over many decades, resulting in considerable institutional development. The decisions made in the forums that compose the complex governance system of the California Delta affect a wide range of actors; as such, the number of participants as well as the heterogeneity of interests in individual forums is quite high. Due to several years of extreme drought and continued overuse, water scarcity is much higher in the California Delta relative to Tampa Bay. Resource scarcity combined with the number of competing interests in the region has led to high levels of conflict between stakeholders.

### **Data Collection**

In order to empirically examine the relationship between externalities and actor performance, we utilize survey data collected from stakeholders that participated in forums in both sites. The web-based survey was administered by the Indiana Center for Survey Research in

2014. The names and email addresses for the target participants were gathered from a previous survey collected in 2010 as part of an NSF-funded project (see [watergovernance.net](http://watergovernance.net) for more information). Additional participants were gathered from media and web searches for all water management forums in the region.

In Tampa, 1256 names and email addresses of forum participants were collected in the search. After multiple reminders, a total of 230 actors took the survey (at least partially), 118 refused, and 222 were no longer eligible. The American Association for Public Opinion Research (AAPOR) estimated response rate is 22-30% depending on estimation method. In the California Delta, 1481 forum participants were identified. Of these, 322 participants completed at least a portion of the survey, 141 refused, and 222 were no longer eligible. The AAPOR estimated response rate ranges from 26-34% depending on estimation method. Summary statistics for all variables used in the analysis are included in Table A1 in the Appendix.

### **Survey Overview**

The theory detailed in this paper claims that externalities exist in complex governance systems and that their existence can potentially impact actor performance in linked forums. *The empirical test focuses specifically on how an actor's performance in the forum that is most important to them (referred to as their "primary forum") is affected strength of the externality generated by each of the alternate forums in which one participates.*

In doing so, we can reveal how the strength of an individual externality affects the performance of in an affected forum. If, on average, positive externalities are dominant in the system, then stronger externalities will be associated with better performances in the primary forum (they are getting more of a good thing). If, however, negative externalities are dominant, then externality strength will be negatively associated with primary forum performance. If, on

average, externalities neither help nor hinder actors (either because they have no impact or because the effects are mixed), then externalities will not be associated with actor performance in primary forums.

To make the survey manageable, actors were asked first to identify the forum that was most important to them (or their organization) in the past year. After listing their primary forum, they were then asked several questions about their performance in that forum. In total, 32 primary forums were identified in Tampa Bay and 46 primary forums were identified in the California Delta. Next, the respondents in each estuary were asked to identify whether they participated in any other forums from a provided list. The listed forums are those found to be the most important forums each region.<sup>2</sup> These forums tend to deal with broad issues that are salient to a large portion of stakeholders, thus, have a strong probability of generating externalities for other forums. Respondents were then asked several questions regarding their performance in each of the selected forums, as well as questions regarding how the policy outputs of their alternate forums affected the decision making environment of their primary forum.

The basic approach allows one to test how an actor's performance in their primary forum is affected by the strength of the externality generated by the alternate forum on the primary forum. The approach, however, does not allow for one to analyze possible feedback loops (i.e.

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<sup>2</sup> The list of potential forums was developed on the basis of a past survey in 2010, through interviews conducted with stakeholders in each region, along with internet searches. This resulted in a list of 10 forums for Tampa Bay and 15 in the California Delta, limitations roughly proportionate to the difference in the number of forums in each estuary. A more thorough analysis of the selection process is provided in the Appendix.

increases in alternate forum performance based on primary forum performance conditional on the strength of a reciprocal externality) or how performance in an alternate forum is affected by performance in other alternate forums (again, conditional on between forum interdependence). Furthermore, the survey only captures externalities created by the listed forums (when others could exist). While solving both of these limitations would be useful, gathering the data to do so would require a significant extension to the survey, likely leading to increased respondent dropout. For the sake examining the relationships detailed in this paper, it is more pertinent to achieve an adequate sample size than to be able to examine more nuanced features of system level interactions.

### **Dependent Variables**

This paper is concerned with the capacity of actors to meaningfully participate in forums and achieve their forum-specific goals. To evaluate this, we utilize the dependent variable, *performance in primary forum*. Again, this question is asked in reference to the *primary forum* that the respondent previously identified. *Performance in primary forum* is measured from the following question: “how effective has your organization's participation during the past year been in shaping water management decisions in the XXX watershed to reflect your organization's needs?” The measure utilizes a 0-10 scale where: 0=very ineffective; 10= very effective.

### **Independent Variable**

As previously discussed, the respondents in each estuary were asked to identify whether they participated in any other forums from a provided list. Once the list of alternate forums were identified, participants were asked a series of questions regarding participation in each of their alternate forums.

The primary analytical task is to establish the extent to which the different forums may affect each other, which we call *strength of externality*. Calculating this measure required several steps. After identifying which of the alternate forums that a respondent participated in, each respondent was asked the following question for each of the listed forums in which the actor participated: "In some cases, other forums may positively or negatively influence what occurs in {listed primary forum}, the primary forum you described in previous questions. In your opinion, what kind of influence, if any, did the following forums have on {listed primary forum} during the past year? A score of 0 indicates that the forum had a "major negative influence", a score of 5 indicates "no influence" and a value of 10 signifies a "major positive influence."

After gathering this information, we transform their response to a folded scale using the following equation: *Absolute Value (5-response)*. For example, if a respondent chose 0, indicating a major negative externality, we code this as 5. If the respondent chose 8, indicating a fairly positive externality, we code this as 3. Thus, this captures the extent to which each actor perceives the strength of an externality between a related forum and their primary forum, regardless of the direction of that externality.

Finally, for each actor's alternative forum-primary forum dyad we calculate the mean value of externalities reported for that dyad *by all other actors in the dataset* (not including the individual actor's response). The mean value of externalities reported by all other actors in the dataset is then assigned to the excluded actor. Thus, the final *strength of externality* variable identifies the extent to which each non-primary forum in which an actor participates generates externalities for their primary forum without considering that actor's individual response.

There are several reasons for calculating the measure in this manner. First, by virtue of eliminating the individual actor's response from consideration we alleviate the concern of

common source bias— that perceptions of externality strength and externality performance are likely correlated within-respondent and are not capturing distinct factors (Meier and O'Toole 2013; Favero and Bullock 2015). Furthermore, by using a folded scale, we account for variation in perceptions of 'negative' and 'positive' externalities among participants: what some perceive as a positive externality can be perceived as a negative externality by others. The aim of this approach is to create a relatively objective measure for *strength of externality* using perceptions of externality strength. Another way to think about this measure is that it characterizes the level of interdependence between each pair of forums, by averaging over the experiences of multiple policy participants within the forum.

### **Control Variables**

We include several control variables. Variable inclusion is contingent on factors that potentially correlate with the key independent variables and the dependent variables simultaneously, leading to biased estimates.

The variable *government employee* is a dichotomous variable that indicates whether an actor is representing the interests of a government agency. We expect that government actors have access to a greater amount of resources and possess higher levels of expertise, allowing them disproportionate influence in all both their primary forum as well as other forums in which they participate. Another variable, *experience*, indicates the extent to which an actor is well versed in participating in the governance system. Actors that are more experienced likely have access to greater political capital and have learned effective strategies for pushing forward their preferred policy solution. The variable is measured by asking respondents the extent to which they are involved in discussions on water related issues in the region. The answers are placed on a scale ranging from 1-5 with the following values: 1 (Incidental to my primary work, with very

rare or occasional involvement); 2 (incidental to my primary work, but with routine involvement); 3 (a major aspect of my work for less than a year); 4 (a major aspect of my work for 1-5 years); and 5(a major aspect of my work for more than 5 years).

The variable *number of forums* details the number of forums that an actor participated in across the governance system. The numbers range from 1-11 in Tampa Bay and 1-15 in California. *Number of forums* can affect payoffs in one of two ways: actors that participate in many forums face greater resource constraints in any one forum, limiting their effectiveness across forums; actors that participate in a greater number of forums build political resources and connections that they then utilize in forums that have the greatest impact on their interests.

The variable *scientific knowledge* reflects an actor's technical capacity regarding the policy alternatives under consideration and their impact on the issues that they govern. Actors that have greater technical capacity will be better able to identify which policy alternatives match better match their preferences. Actors with greater technical capacity may also be better informed regarding how shaping externalities in EGFs actually affect them in their primary forum. Furthermore, actors with greater scientific knowledge regarding policy issues may have increased prestige among forum participants, allowing them greater influence over policy debate. *Scientific knowledge* is measured from the following question: "In your opinion, how adequate is the currently-available scientific knowledge to understand the future impacts of water policies in the {Tampa Bay region | California Delta}?" A score of 0 means "not adequate" and a score 10 means "very adequate."

We include two variables that indicate the extent to which an actor's interactions with participants can be characterized as amiable or contentious. To capture this, we utilize two variables, *cooperation* and *conflict in primary forum*. *Cooperation* captures the extent to which

an actor perceives that actors in the governance system are working together to attain a common goal, or are failing to collaborate. Perceived cooperation among stakeholders will vary from actor to actor based on the subset of forums that actors select into as well as the stakeholders with whom respondents interact. Actors who fail to develop relationships with others in the system will have a difficult time pursuing their interests across forums. *Cooperation* is measure from the following question: "In your opinion, how would you describe the overall cooperation between water management stakeholders in the {Tampa Bay region | California Delta}? *Conflict in primary forum* controls for the level of competition between stakeholders in their primary forum. Actors in more contentious forums will likely have a more difficult time shaping policy outputs. *Conflict in primary forum* is operationalized from the following question: which one of the following statements best characterizes the typical decision processes about water-related issues in the forum in the past year?" Answers range from 1-3 where: 1= For most decisions in this venue, most groups can gain as long as they can develop a common policy; 2=Although most groups can gain from most decisions, there is conflict over who will gain the most; 3= For most decisions, one group's gain involves another group's loss.

We include two variables that measure issue diffusion at the actor and primary forum level. The first, *actor issues*, captures how many issues that are governed across the system affect an actor's interest. Actors that have more diffuse interests will likely have a more difficult time pushing for agendas within a given forum that simultaneously satisfy all of their desires. Furthermore, actors with more diffuse interests are more susceptible to the effect of externalities as even small effects are likely to affect some aspect of their interests. *Issues in primary forum* refers to the number of issues a primary forum is responsible. Here, some forums may only manage a single issue whereas other deal with multiple issues simultaneously. AFs that deal with

more issues are more likely receive externalities from other forums. Forums that deal with more issues may also draw more actors, increasing the rate of competition within them, decreasing a given actor's capacity to influence outputs. To calculate *issues in primary forum* respondents were asked to identify which of the following issues their primary forum addressed in the previous year: water supply reliability; water quality; biodiversity; land use flood control; climate change. The measure is the mean number of items selected by actors that participated in a given forum. To measure *actor issues*, we rely on a count variable that indicates how many of the following issues a respondent deemed as relevant to their interests: water supply reliability; water quality; biodiversity; land use; flood control; climate change; other.

Finally, we include the variable, *performance in alternate*, which asks the same question specified as the dependent variable for each alternate forum in which an actor participates. This variable is included to control for aggregate levels of influence not captured in the model.

### **Empirical Analysis and Results**

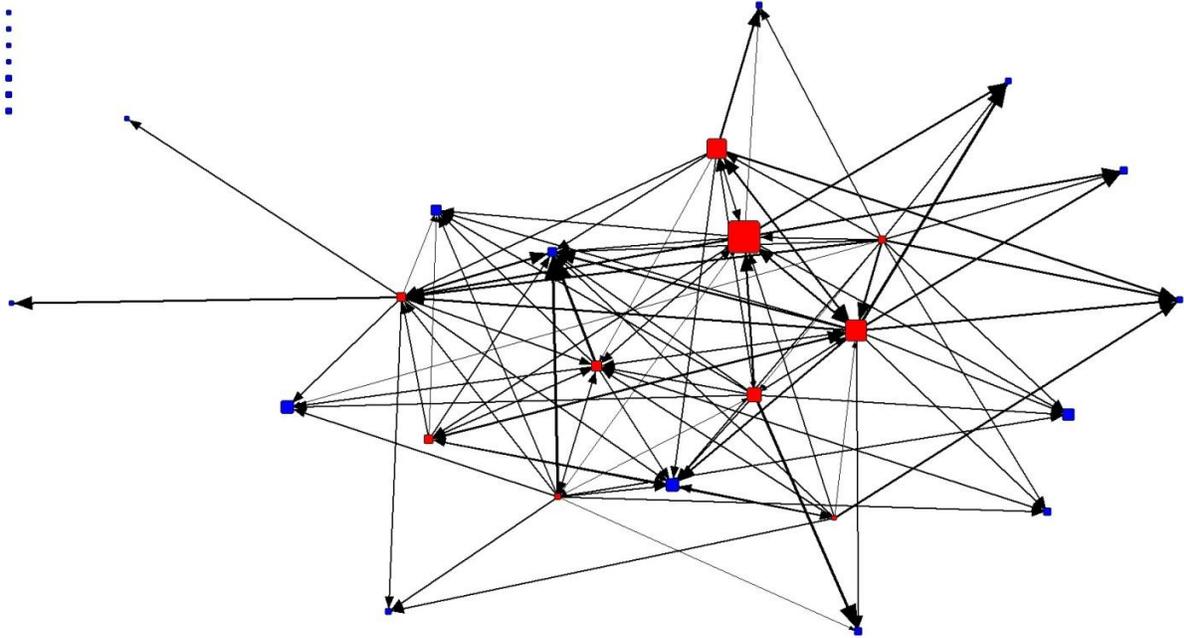
This section is composed of two parts. First, we analyze whether and to what extent institutional externalities actually exist in the systems under evaluation. Second, we provide an empirical analysis testing the extent to which the presence of institutional externalities actually impact actor performance in linked forums. If *strength of externality* is positively associated with *performance in primary forum* then we would find support for the notion that, on average, the presence of externalities is leading to positive spillovers for participants in linked forums. If a negative association is found, we will conclude externalities tend to create more problems for forum participants.

## **Do Externalities Exist?**

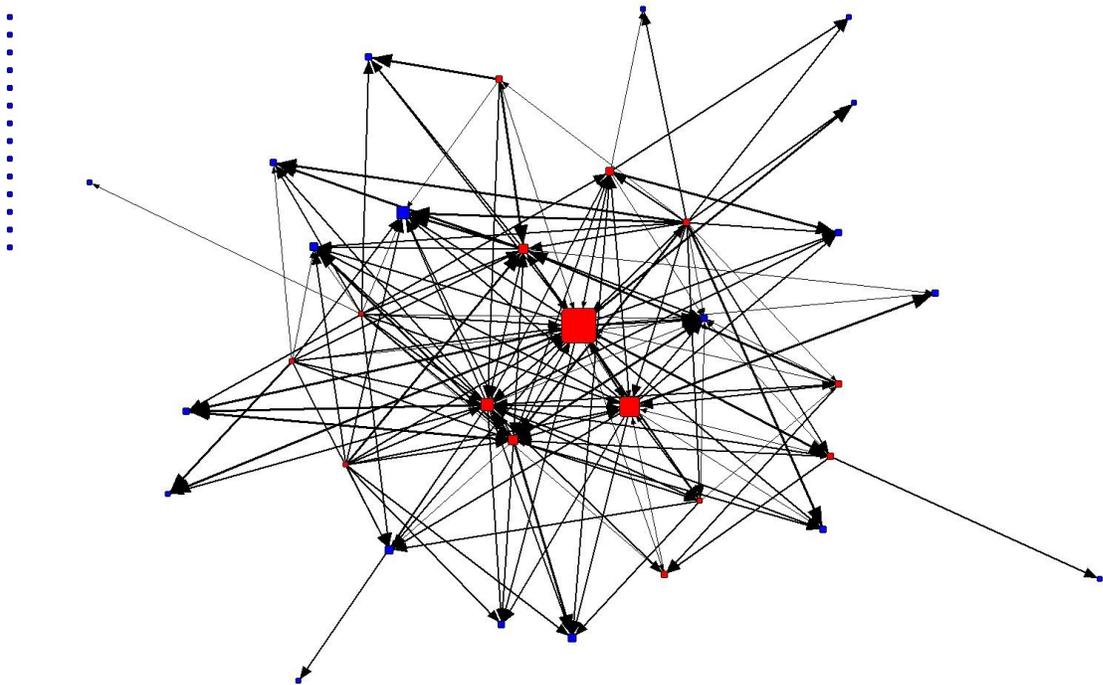
A simple glance at the descriptive statistic for the *strength of externality* variable in Table A1 in the Appendix shows that, on average, actors perceive that the alternative forums in which they participate generate fairly large externalities on their primary forum (mean of 2.4 in Tampa Bay, and 2.19 in the California Delta). What the descriptive statistics cannot demonstrate, however, are how and to what extent these externalities are spread between forums.

The network graphs in Figures 1 and 2 provide a better look at the complexity of each governance system. Tampa Bay is represented in Figure 2, while California is depicted in Figure 3. In the figures, the nodes are the individual forums in the region. The red nodes signify the central forums listed in the survey which are expected to generate externalities and the blue nodes are other forums that actors identified in the survey as their most important forum. The size of the nodes reflect the number of respondents that identified the forum as their primary forum (larger meaning more people indicated it was their primary forum). The lines between the forums signify that an externality is occurring between the forums and the arrow sign shows the direction of that externality. Note that 55 respondents from Tampa Bay and 98 respondents from California identified one of the central forums as their most important forum, and did so prior to seeing the list. Nodes that are not connected to the rest of the network through an externality are considered unaffected by decisions made across the system. The size of the line and arrow are determined by the size of the externality generated (wider lines and larger arrows show larger externalities).

**Figure 2: The Forum Networks and Reported Externalities between Forums in Tampa Bay**



**Figure 4. 3: The Forum Networks and Reported Externalities between Forums in the CA Delta**



As seen in the figures, both regions are considerably complex. The political environment for the vast majority of forums tend to be affected by the decisions made in multiple other forums across the region, since most of the nodes are connected to multiple central ones. That said, 14 of the 46 forums identified in the California Delta and 5 out of the 32 forums identified in Tampa Bay can be considered as fully independent from decisions made in the central forums. Such findings provide an illustration of the assumptions that the forum structure is highly interdependent and that the decisions made in one forum tend to be strongly influenced by the decisions made in multiple, related forums.

### **The Impact of Externalities on Actor Performance: An Empirical Investigation**

Next, we analyze how an actor's *performance in primary forum* is affected by the *strength of externality* in each forum in which they participate. The unit of analysis is the actor-alternate forum-primary forum triad. As such, multiple observations are included for each actor contingent on how many of the listed alternate forums in which they participated. For instance, if a respondent indicated that their primary forum was not one identified in the provided list, and they participated in two of the listed forums, then that actor would have two observations in the dataset: the first row would include information regarding the strength of the externality of alternate forum 1 and performance in alternate forum 1 as well as the actor's reported influence in their primary forum; the second row would include information regarding the strength of the externality of alternate forum 2 and performance in alternate forum 2 as well as the actor's influence in their primary forum. Furthermore, multiple observations are given for the multiple alternate forum-primary forum dyads in the dataset, dependent on the number of respondents that identified a given forum as their primary forum and also participated in a given alternate forum.

To adjust for these interdependencies we utilize an OLS model with robust standard errors clustered by respondent and alternate forum-primary forum dyad. This method is consistent with the procedures detailed by Cameron, Gelback and Miller (2011). While this model accounts for the two forms of interdependence observed in the dataset, there are likely other dependencies as well. For instance, two actors either work together and/or share similar policy goals in the same forum will likely have correlated responses. To account for autocollinearity caused by unobserved factors we use a random permutation model. The results and an accompanying explanation of the model are presented in Table A2 in the Appendix. The results are consistent with the two-way clustered regressions.

Please note that all empirical tests utilize a pooled dataset including respondents from the Tampa and California Delta sites. Pooling this data allows for a general test of the hypotheses, without analyzing differences in effects between governance systems. A dummy variable, *CA Dummy*, is included to control for differences in the dependent variable predictions attributable to differences between sites.

Table 1 reports the results testing the effect of *strength of externality* on *performance in primary forum*. The effect of coefficient for *strength of externality* is negative and significant, indicating that, on average, the presence of externalities is harming actor performance in linked forums across the system. Consider, for instance the scenario under which an actor participates in two forums: their primary forum and a second forum. If the second forum does not produce an externality (*strength of externality=0*), then *performance in primary forum* is expected to equal 7.76, holding all other variables at their means. If the second forum produces a strong externality (*strength of externality=5*), the actor is expected to yield a *performance in primary forum* value of 6.63: a decrease of 14.5%.

**Table 1: Main Regression Results**

<b>VARIABLES</b>	<b>Influence in Primary Forum</b>
Strength of Externality	-.17** (.07)
Performance in Alt	.31*** (.05)
Government Employee	.56 (.39)
Scientific Knowledge	.13 (.08)
Cooperation	.19** (.08)
Actor Issues	.14 (.11)
Experience	.42*** (.13)
Number of Forums	.08 (.07)
Conflict in PF	-.62*** (.24)
Forum Issues	-.22** (.11)
Constant	1.49 (1.41)
Observations	564
R-squared	.47

**Standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1**

### **Mitigating Negative Externalities**

While the results detail that, on average, externalities promote barriers that limited actor performance, it is possible that some actors are better able to mitigate these effects. While a wide array of variables could be considered, we posit that those most likely to effectively mitigate the effects of a given externality are simply those that are more politically effective within the externality generating forum, itself. Here, those who have more influence over the political contracting processes within the externality generating forum *could potentially* shape the

direction of the EGF by making sure that the decisions made in the linked forum do not alter or impact the environment or decision making procedures of their primary forum in a manner that increases the costs associated with pursuing their particular interests in their primary forum.

Those who are ineffective in linked forum will not be afforded this advantage.

To test this, we re-estimate our model and include an interaction term between *performance in alt* and *strength of externality*. The results are presented in Table 2, below and the general relationship between the independent variables and the dependent variables is demonstrated in the fitted values graphs in Figure 3. The figure plots the expected value of the *performance in primary forum* when *performance in alt* is set at its minimum and maximum across varying values of *strength of externality*, holding all other variables at their means.

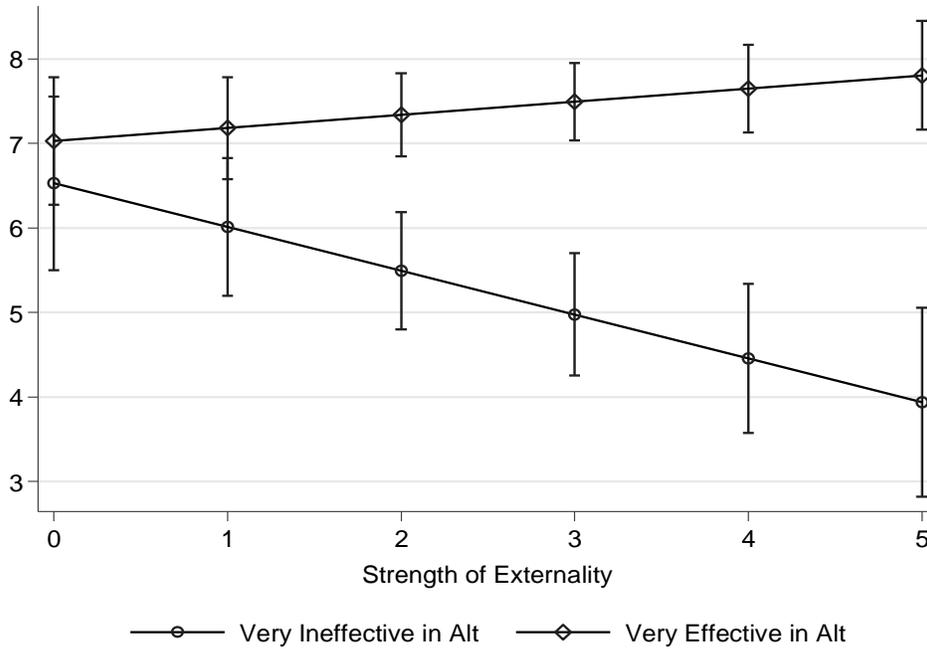
In the Figure, the y-intercept (where *strength of externality*=0) can be interpreted as the expected value of the dependent variable when no externality occurs. As one would expect, when *strength of externality* is held at zero, there is no difference in the expected value of the *performance in primary forum* when *performance in alt* is set at its minimum or maximum values. In other words, when a forum does not generate an externality for one's primary forum, success in the alternate forum has no impact on *performance in primary forum*. As *strength of externality* increases past zero, externalities begin to occur, reaching their maximum when *strength of externality* reaches 5.

**Table 2: Model Estimates of Interaction Effects (Pooled)**

VARIABLES	Payoff in Primary Forum
<b>Main Independent Variables</b>	
Performance in Alt	.05 (.08)
Strength of Externality	-.52*** (.17)
Performance in Alt*Strength of Externality	.07*** (.02)
<b>Control Variables</b>	
Government Employee	.42 (.36)
Scientific Knowledge	.08 (.08)
Cooperation	.13 (.09)
Actor Issues	-.06 (.11)
Experience	.08 (.17)
Number of Forums	-.13 (.10)
Conflict in PF	-1.19*** (.22)
Forum Issues	-.13 (.10)
CA Dummy	-.03 (.42)
Constant	7.13 (1.33)
Observations	549
R-squared	.47

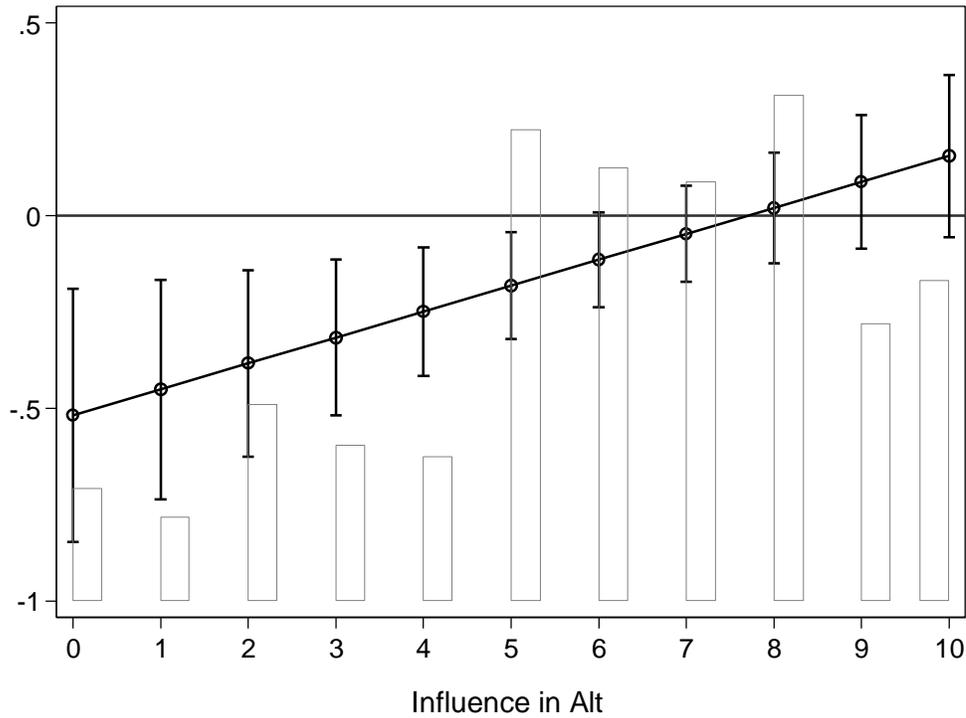
**Standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1**

**Figure 3: Predicted Value of Payoff in Primary Forum Across Varying Levels of Strength of Externality when *Performance in alt* is set at its Minimum and Maximum Values**



To better examine this relationship, we estimate the marginal effects of a one unit increase in *strength of externality* at varying levels of *performance in alt*. A histogram plotting the distribution of *performance in alt* is embedded in the plot. The plot provides insight as to how much influence one must yield in the alternate forum to avoid the negative impacts of a one unit increase in the *strength of an externality* as well as the amount of occurrences in which actors in the dataset reported *performance in alt* values above and below this threshold. As shown in the figure, the negative effect of an increase in *strength of externality* neutralizes when *performance in alt* reaches 6. Approximately 47.8 % of observations are at or above this value.

**Figure 4.5: The Marginal Effect of a One Unit Increase in *Strength of Externality* on *Payoff* in *Primary Forum* at Varying Levels of *Performance in Alt***



### Discussion & Conclusion

The paper posits that in complex governance systems there exists the potential for institutional externalities—instances in which the decisions made in one forum alter the policy problem or political environment of other forums in the system. Importantly, the findings demonstrate that, on average, the presence of an externality can lead to decreases in effectiveness within the affected forum. Actors that wish to avoid these effects can potentially select into the forums responsible for generating the externality and attempt to influence policy outputs in them. The empirical results show two major findings. First, externalities are quite common in complex governance systems—most forums tend to receive externalities from multiple forums in the system (Figures 2 and 3). Second, only once an actor achieves a fairly large amount of influence in the EGF can they expect to avoid the negative impacts of the externality (Figure 5).

The findings suggest that institutional complexity poses a significant problem for the majority of actors engaged in complex governance systems as attaining influence in one's primary forum involves the successful participation across the governance system. The extent to which this poses problems for a given actor is contingent on the extent to which one's primary forum is affected by other forums in the systems as well as the capacity to shape decision making procedures in linked forums. That is, as systems become more interactive with greater externalities, actors with less resources and ability to influence the central forums face a growing difficulty in influencing the forums of greatest interest to them. This position is rather troubling given that decentralization is promoted as a means to promote equity (Klibinoff and Morduch 1995). While greater fragmentation may enfranchise localized actors to participate in policy forums that affect their interest it also may inadvertently drive up the costs of participation. Actors that lack the resources to effectively participate may eventually drop out of the governance system. If this occurs at high rates, the system could reduce down to a large, complex institutional arrangement governed by the same actors that would dominate top-down governance approaches.

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## Appendix

**Table A1: Summary Statistics for Tampa Bay and the CA Delta**

VARIABLES	Observations	Mean	Standard Dev	Min	Max
<b>Tampa Bay</b>					
Influence in Primary Forum	335	7.61	2.08	0	10
Performance in alt	340	6.97	2.16	0	10
Strength of Externality	181	2.40	1.50	0	5
Government Employee	416	.74	.44	0	1
Cooperation	406	7.90	1.64	1	10
Scientific Certainty	412	8.58	1.67	0	10
Actor Issues	416	3.18	1.40	0	6
Experience	416	4.33	1.26	1	5
Number of Forums	416	5.61	2.76	1	11
Forum Issues	416	3.09	1.53	0	6
Conflict in Primary Forum	406	1.29	.55	1	3
<b>California Delta</b>					
Influence in Primary Forum	724	6.15	2.42	0	10
Performance in alt	740	5.76	2.75	0	10
Strength of Externality	501	2.19	.98	0	5
Government Employee	882	.53	.50	0	1
Cooperation	857	4.40	2.16	0	10
Scientific Certainty	882	8.99	1.37	2	10
Actor Issues	882	4.03	1.72	0	7
Experience	882	4.37	1.16	1	5
Number of Forums	882	7.69	3.31	1	16
Forum Issues	874	4.19	1.69	0	6
Conflict in Primary Forum	850	1.91	.80	1	3

**Table A2: Random Permutation Results for Primary & Alternate Model**

VARIABLES	Influence in Primary Forum	Influence in Primary Forum
Strength of Externality	-.16*** (.00)	-.66*** (.00)
Efficacy in Alt	.33*** (.00)	.14* (.08)
Efficacy in Alt*Strength of Externality		.08** (.01)
Government Employee	.44 (1.00)	.40* (.09)
Scientific Knowledge	.14 (1.00)	.13** (.02)
Cooperation	.18 (1.00)	.17*** (.00)
Actor Issues	.14*** (.00)	.12* (.10)
Experience	.37 (1.00)	.34*** (.00)
Number of Forums	.10* (.08)	.11*** (.02)
Conflict in PF	-.57 (1.00)	-.54*** (.00)
Forum Issues	-.23*** (.00)	-.22*** (.00)
CA Dummy	-.02 (1.00)	.06 (.87)
Constant	1.85 (.87)	2.96 (1.00)

Proportion of the extreme listed below coefficients: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### **Alternate Specification: Random Permutation Regression**

A random permutation regression is one in which the significance of a variable's coefficient calculated via OLS regression is determined by its magnitude in relation to the distribution of its possible coefficient values when the dependent variable vector is permuted (1000 times). It provides an appropriate (and conservative) estimate of statistical significance, making no assumptions regarding distributions or independence between observations. The procedure is described in greater detail below.

A random permutation regression involves two stages. In the first stage of the procedure, a standard OLS multiple-regression is run, and parameter estimates are stored. In the second stage, the dependent variable vector is randomly permuted; an OLS regression is calculated, and parameter estimates are stored. This procedure is repeated (1000 times). Once completed, the first stage estimate for each variable is compared against the distribution of coefficient values that were generated in the randomized, second stage regressions.

A proportion of the extreme value is calculated, specifying the proportion of coefficients calculated in the second stage which has a greater absolute value than the coefficient calculated in the first stage. In doing so, the coefficient is compared against possible coefficients that arise due to the structure of the dataset. Using the absolute value as the standard provides a test comparable to the standard two-tailed test, since coefficients larger than the absolute value fall in the two tails of the standard distribution that are farther from zero than the observed value. Lower proportions of random-values that exceed the estimate in stage one demonstrate lower likelihoods that the estimated in the first stage occurred by chance (Dekker, Krackhardt and Snijders 2003; Labianca et al. 1998). As with traditional 2-tailed significance tests in OLS, estimates under .10 (two-tailed) or .05 (one-tailed for directional hypotheses) are considered 'significant' (Bowler and Brass 2006).

Results for the random permutation regressions for all sites are found in Table A4. The findings are consistent with that presented in the paper. The notable exception is the results for Parana. As we see, the effect of degree centrality is significant in the permutation model, but only nears significance in the cross classified regression.

## **Selection of Important Forums**

Selecting the ‘most important’ forums in the Tampa Bay and CA Delta involved utilizing both quantitative and qualitative analysis of forums in the region. To empirically assess which forums are most important to governance decisions in the region, we utilized data collected in a 2010 survey of stakeholders’ perceptions of all water management forums in the region (funded by NSF Grant SES-0921154). The analysis consisted of a cluster analysis on the forum level. Clustering was based off of the number of stakeholders that participated in the forum, the average intensity of participation that stakeholders exhibited in the forums (how often they attended the forum), the average level of importance stakeholders assigned to the forum (the extent to which policy decision affected their interest), as well as the average level of importance of the stakeholders (measured by the number of connections they possess across the governance system). The clustering revealed three unique forum governance system: a core; a core-periphery; a periphery. As we are concerned with the ‘most important’ forums, only the core was considered for the 2014 survey.

Once the core was identified, forums that were no longer active were removed. we verified that the identified forums were truly the ‘most important’ through a series of phone interviews with important policy actors in the region (generally, actors that were either listed as the head of important organizations that are active in the region or those that sit on the board of directors of such organizations). During the interview, we asked participants to identify which forums they feel have the greatest impact on the overall governance goals of the TBWMS. After, actors were read the list of forums identified in the cluster analysis, and were asked to rank them as ‘important’ ‘somewhat important’ or ‘not important’. Overall, the qualitative findings confirmed my preliminary analysis. While responses varied by respondent, the vast majority of responses identified the listed forums as important or somewhat important. Furthermore, almost no respondents expressed concern regarding forums that we did not consider.