

## Uncertainty and Democratic Participation in Policy Forums

John Scholz

Will Flanders

An important component of effective deliberative forums is participation by all entities with a vested interest in the outcome. However, previous studies have not sufficiently addressed the fundamental question of what factors predict participation in deliberative bodies to begin with. This paper tests several hypotheses related to participation in the context of three collaborative water management institutions in the Americas. Specifically, we argue that two types of uncertainty on the part of organizational leaders: behavioral and scientific, are important predictors of participation in deliberative forums. Results consistent with these expectations help us gain leverage on the factors that matter to organizational leaders in determining the viability of forum participation, and offer guidance towards the normative goal of broadening participation in deliberative forums.

## Introduction

While the traditional policy literature suggests that hierarchical structures may be necessary to resolve Common Pool Resource (CPR) problems (Hausken 1995; Dolsak & Ostrom 2003), scholars in recent years have found that collaborative resource management institutions that incorporate local knowledge and the diverse interests of area stakeholders can be more effective in overcoming the collective action dilemmas that are pervasive in such circumstances (Hayek 1945; Ostrom 1990). The benefits of collaborative institutions include greater adaptability to changing circumstances within the CPR (Kenney 1997) and a larger opportunity for fostering of norms of reciprocity between participants (Leach et. al. 2002, Menzel, Buchecker & Schulz 2013) than other methods of CPR management. That said, realizing the benefits of collaborative institutions requires the existence of venues for local actors to come together for discussion and debate. The deliberative forum is one such venue.

Normative democratic theorists have long extolled deliberative forums that foster consideration of all sides of important issues (Dahl 1998). At the heart of this deliberative democratic concept is a belief that consensus building is possible through the honest efforts of disparate interests sharing their perspectives openly with one another (Cohen 1989). Such interactions have been found to reduce animosity between groups from different perspectives (Allport 1954), and increase the ability of participants to diffuse future conflicts (Putnam 2000). institutions-from the New England town hall to television talk shows-are organized around the principle that conversation between individuals holding adversarial viewpoints can lead to a growth in mutual understanding and build bridges to more acceptable universally implemented policies (Page 1996). The key feature that differentiates deliberation from other forms of public discourse is the exchange of ideas in the give-and-take fashion that it fosters. Oftentimes, people

choose to self-censor the information they expose themselves to in order to reduce the discomfort resulting from cognitive dissonance (Festinger 1957; Taber, Lodge & Kucsova 2009). The inescapability of exposure to refuting viewpoints and the potential for exposure to previously unconsidered alternatives may lead participants to move beyond simply hearing out alternative viewpoints to seriously considering them (Dahl 1998; Bohman & Rehg 1998). That said, such exchanges of information are only possible if all sides of a particular issue are willing to participate in the deliberative process. While the case has been made that widespread participation can have negative consequences under certain circumstances (Irvin and Stansbury 2004), it could be said that the general thrust of the literature has been to endorse the virtue of participation by as many actors as possible. While, in general, we follow this main line of research, there is nothing in this paper that requires acceptance that broad participation is preferable. Indeed, the findings in this paper could be used by proponents of both expanding and shrinking the participatory pool. This paper examines the factors that are important in predicting whether or not organizations will choose to involve themselves in deliberative forums that focus on resolving CPR dilemmas.

We make the case that participants are chiefly concerned with the goals of influence and learning in making a decision to participate in a forum, and that uncertainty in each of these areas will diminish the incentive to participate.

We test our hypotheses using a unique data set that includes measures of both types of uncertainty, as well as participation in forums within three estuary management settings that vary in their level of institutionalization: the Greater Tampa Bay area in Florida (hereafter, Tampa), the Parana River Delta in Argentina (hereafter, Parana), and the Sacramento-San Joaquin Delta in California (hereafter California). We analyze participation in the many forums in these

regions that focus on similar water management topics, but vary in the types of organizations that choose to participate as well as in the levels of certainty that participants express. The layout of the paper is as follows. We first discuss the role of uncertainty in the participation framework overall, and then the specific roles for behavioral and scientific uncertainty. We then present results testing the hypothesized effects of uncertainty on participation before offering some implications for CPR forum leaders.

### The Role of Uncertainty in Participation

In this paper, we focus on two of the most widely accepted causes of participation in deliberative democracy—the desire to influence others and to learn more about the topic at hand. Both of these goals are consistent with the normative purpose of deliberative forums in bringing about “consensus and enlightenment (Barabas 2004),” and also with the empirical evidence on what forums can accomplish (Fishkin and Luskin 1999). Both relate to the motivation to participate in order to improve the expected policy outcomes. The extent to which one is uncertain about the beliefs of others or about the subject matter of forums should impact participation.

Our model runs counter to that of a simple rational choice account, in which potential participants select the path that will maximize their utility over all potential outcomes. This framework assumes that organizations (and decision makers within them) have access to complete information (Aumann 1987). In the context of deciding whether to participate or not, organizational leaders would simply evaluate whether they are made more or less likely to achieve their goals through joining a forum, and use that as the basis to determine their participation. However, scholars have long recognized that models based on complete

information provide inaccurate descriptions of the ‘real world’ in most cases (e.g. Simon 1957). Rather than having complete information, people must often make up their minds in a state of uncertainty that would not support rational calculation.

Participation has been studied in a variety of contexts in political science over the decades. Previous accounts have related participation to social capital (Putnam 2000), and access to resources (Wolfinger and Rosenstone 1980; Brady, Verba and Schlozman 1995). However, fewer have looked at the role which uncertainty plays in participation. The major exception to this is the literature on uncertainty in the decision to participate in elections, where uncertainty regarding the likelihood of being a decisive voter decreases the probability of participation (Downs 1957; Riker and Ordeshook 1970). These game-theoretic accounts have been lent credence by empirical evidence that people vote less frequently when elections are not close (Foster 1984; Blais 2000). While this literature is informative, it is important to lay out the differences between CPR forum participation and participation in an election. One might be inclined to argue that CPR forums function in a similar way—in that an organization should only desire to participate if they are a decisive vote on whether to approve a policy or not—but we argue that forum participation is quite different. Whereas the voting decision is solitary, with no opportunity to influence others in the process, the CPR forum is collaboration-oriented, with the potential to bring others towards a particular organization’s viewpoint providing a driving motivation (Adams 2004). Thus, uncertainty regarding the ways in which influence can be gained over other participants is likely to be a driving force in the decision to participate more so than uncertainty regarding one’s ability to be a ‘swing vote’ might alter the likelihood of election participation. We refer to this concept as *Behavioral certainty*.

The second main purpose of forum participation that separates it from participation in an election is the garnering of additional knowledge about the topic at hand that deliberative forums encourage (Barabas 2004; Button & Mattson 1999). In the context of a CPR forum, the most pertinent information has to do with the relationship between the policy alternatives under consideration and the potential outcomes that will likely result from these alternatives. This relationship frequently involves complex technical knowledge and may be unclear even to the most sophisticated participants. We refer to this concept as *Scientific Uncertainty*.

#### *Behavioral certainty (Influence Goal)*

This concept of uncertainty among ostensibly rational actors is a key component of the theory of bounded rationality (Simon 1957). In most cases, one cannot be entirely sure of the preferences of other actors, and this can have important implications for the decision of whether to participate in a CPR forum. If the goal of forum participation is to move policy in the direction preferred by organizational leaders (Rawls 1993; Shiffman 2002), organizational representatives must enter a forum armed with knowledge of the sorts of appeals that are most likely to be effective in influencing other participants and developing winning coalitions. For instance, an environmental group advocating for conservation would want to provide different information to a forum filled with representatives of industry than they would to a forum filled with other environmental groups.

*Behavioral certainty* can be defined as the extent to which organizational leaders have knowledge about the policy outcomes preferred by other participants, as well as the strategies that these participants are likely to utilize in attempting to achieve their goals. The investment

of time and resources in a forum is more likely to be effective when representatives have the ability to make appeals based on information about other's preferences.

However, obtaining information about the preferences of others can be a costly endeavor for several reasons. Firstly, leaders of other organizations have an incentive not to reveal their true preferences. This is a common tactic in negotiation that allows the non-revealer to potentially gain more favorable outcomes (Admati & Perry 1987; Merlo & Wilson 1998). At best, the hesitancy of others to reveal their preferences makes determining their true goals more difficult. At worst, it may be impossible. Secondly, gathering information about the preferences of other organizations may require the expenditure of additional resources on research and monitoring, and this may not be cost-effective for organizations for which the CPR is of subsidiary, rather than primary, interest. To the extent that knowledge of the preferences of others is important to organizations in determining the efficacy of participation, uncertainty about these preferences should decrease participation.

#### *Scientific Uncertainty (Learning Goal)*

An additional purpose of forum participation is to gather information about the topic at hand and to determine what the best course of action should be to obtain a desired outcome. In some sense, this represents the normative ideal of a forum, in which actors participating with open minds seek to expand their knowledge and improve their decision-making abilities (Barabas 2004; Cohen 1989).

Many scholars have suggested that a state of uncertainty is an unpleasant state to be in; and that people are motivated to take action to reduce uncertainty (Berger and Calabrese 1975). While the extent to which individuals desire to reduce uncertainty may vary based on factors

such as their need for cognition (Olson, Camp and Fuller 1984), a common response to uncertainty is to increase one's information seeking behavior (Mignerey, Rubin & Gorden 1995). In the context of a CPR dilemma, deliberative forums are likely to be a venue through which additional information can be learned, and the type of information certainty that is likely to matter is how strong the scientific evidence is on particular policy solutions for the CPR. We refer to this concept as *scientific uncertainty*.

Whatever the source of an organizational leader's scientific uncertainty, those that already have a high degree of certainty about the best solutions to a particular CPR dilemma are unlikely to be extensively changed by encountering new information (Bullock 2009, Flanders forthcoming) and, consequently, have little incentive to seek out additional information on the topic.

### **Hypotheses**

Following the best evidence from the literature, we expect that uncertainty about the agenda of other organizations within a forum will increase the transaction costs of participation, as organizational leaders will have a lower level of clarity about their ability to influence others. As an organization's ability to predict the preferences of others decreases, so will participation.

*H1. Higher (lower) certainty about the behavior of other organizations will encourage (discourage) participation in collaborative institutions*

When people have a great deal of certainty about a particular topic in a CPR forum, their incentive to learn more information about the topic is decreased, as new information is unlikely to significantly shift their viewpoint. Organizational leaders who express a high level of certainty



about a topic will see lessened utility from forum participation than will a similar leader who has a low level of certainty.

*H2. Low (High) uncertainty regarding the scientific basis for policy changes will discourage (encourage) participation in collaborative institutions.*

## **Data and Methods**

We test these hypotheses with survey data gathered from three estuary systems: the Tampa Bay and San Francisco Bay areas in the United States; and the Parana River Delta in Argentina. These three sites were selected based on the differences in the level of institutionalization that exist in each, as well as differences in the sort of water management issues that they focus on.

A web-based survey was conducted by the Indiana Center for Survey Research for the California and Tampa estuaries. Researchers involved in this project conducted a web and media-based search for any major water forums within each estuary, and contacted participating organizations via email to request their involvement in the project. To ensure that as broad a sample as possible was collected, land-use forums that deal with water issues only occasionally were also included. This resulted in a number of organizations being included on the list that were not at all involved with water policy, and these were dropped. This list of forum participants was expanded through the use of a snowball question within the survey that asked respondents to name additional forum participants with whom they had contact. 331 organizations in Tampa responded, as did 354 organizations in California.

Similar to the California and Tampa surveys, a sample of the participants in Parana's water management forums was developed through media and web-based searches, which were

used to identify the names of participating organizations. 261 individuals within organizations in Parana were contacted over the phone to answer the survey by Gestion Consultora, an Argentinian survey company. Of this sample, 177 responded to the survey

### *The Dependent Variables*

There are a number of ways that the concept of ‘participation’ could be operationalized. An organization could be deeply committed to involvement in a single forum, or could be involved to a lesser extent in a large number of forums. We argue that each is a meaningful method of organizational participation, and include three dependent variables designed to capture both the breadth and depth of organizational involvement in CPR forums. The first dependent variable is *Frequency of Participation*. This is a measure of the number of meetings, on average, that a respondent organization estimates they have attended in the previous year across all forums that they attended. This captures participation in multiple forums and shows, to some extent, the depth of involvement in water management throughout the estuary. The other two measures are designed to capture the breadth of participation. *Named Forums* measures respondent participation in forums that were important enough to them to be named by them on the survey; suggestive of strong ties between the organization and the particular forum. The final measure, *Total Forum Count*, adds participation in forums that were also attended, but not important enough in the mind of the respondent to be named. These additional ties are similar to the weak ties that previous research has identified as being critical to success (Granovetter 1973), as they tend to build relationships beyond one’s core group to more disparate connections with more distant actors. Taken together, these three measures are designed to account for the extensiveness and diversity of forums that organizations participate in. While the correlations

between these three measures are positive, none are stronger than .36, suggesting that each is picking up on some unique aspects of participation.

### Independent Variables

Our key independent variables, *Behavioral certainty* and *Scientific Uncertainty*, were created from single questions surveys. To assess the degree to which respondents were sure about the interests of others within the CPR, they were asked:

*“For water issues most important to [you | the organization you represent], would you say that [you know | your organization knows] the policy interests of the most active water management stakeholders in the [region name] region?”*

Responses were given on a 10 point scale ranging from “*Don’t know their interests*” to “*Definitely know their interests.*” To assess *Scientific Uncertainty*, respondents were asked:

*“In your opinion, how adequate is the currently-available scientific knowledge to understand the future impacts of water policies?”*

Once again, responses were on a 10 point scale, this time ranging from “*Not Adequate*” to “*Very Adequate.*” We also control for whether or not participation in forums was required.

### Control Variables

While we are most interested in the impact of uncertainty on participation in this paper, we recognize and control for several other factors identified in the literature as potentially impacting participation. The first factor that we control for is *Efficacy*. *Efficacy* was assessed through the question: *How effective has [your | your primary organization’s] participation been in shaping policy outcomes important to your organization?* Efficacy has long been considered

an important predictor of participation in a variety of political activities from voting (Almond and Verba 1963) to crime commission (Sampson et. al. 1997). In this case, we expect lower feelings of efficacy to discourage groups from participating in Forums. We also control for the level of *Conflict* within Forums. Conflictual environments are more costly in the economic sense, as well as more mentally taxing to participate in. Researchers have found that people tend to participate less when they find themselves in situations of conflict (McClurg 2006; Mutz 2006). Finally, we control for whether or not participation in the Forum is required for the organization as this will have an obvious impact on the likelihood of attending.

### **Uncertainty and Participation: The Endogeneity Problem**

While we argue that uncertainty reduces the probability of participation, we recognize the reality that there is likely a good deal of reciprocal causality in this case, particularly between behavioral certainty and participation. Participation can reduce uncertainty just as uncertainty can decrease participation. While the largest drop in uncertainty is likely to come after one's initial participation in a forum, and our sample only includes organizations that have participated at least once, this concern is important enough to warrant the use of an alternative model. To overcome this potential endogeneity problem, we utilize two-stage models to exogenize the endogenous variables through the use of instruments. The first stage utilizes instrumental variables as exogenous proxies for problematically endogenous behavioral certainty. The second stage estimates the relevant model for our paper, using the exogenous instruments. We identified two variables that we argue could theoretically serve as instruments. The first instrument is *Issues*; which is a measure of how many issue areas a particular organization is involved in. The second instrument is *Involve*, which is a measure of how critical water planning issues are to the respondent organization). Each variable is theoretically justifiable as an instrument. For

example, being involved in a greater number of issues is likely to increase one's knowledge and certainty about the behavior of other actors in the forum, but not to directly impact participation.

Beyond being theoretically exogenous, we provide statistical evidence in support of using the two variables as instruments. While satisfying the exclusion restriction is critical to any use of instrumental variables, it is often impossible to test (Sovey & Green 2011; Baum, Shaffer & Stillman 2007). Fortunately, in situations for which there are more instruments than endogenous variables, a Sargan statistic can be used to validate exclusion (Sargan 1964). This is the case in our data, in which we have two instrumental variables for the single endogenous one. The results of the first stage regression are reported in Appendix A1. Included in this table is the Sargan statistic, which supports the null of no impact of the instruments other than through the instrumented variables. We also report the weak identification F-test value. This value (24.61) far exceeds the rule of thumb value of '10,' (Stock, Wright and Yogo 2002), suggesting that the instruments are sufficiently correlated with the instrumented variables. The single stage model not accounting for endogeneity is found in appendix A2. The results in this table do not differ substantially from those reported below.<sup>1</sup>

While a two stage-ordered probit or tobit analysis might appear *prima facie* to be more appropriate for the data that we have, scholars have argued of late that such modeled are inefficient, and that it is often advisable to utilize two-state least square instead (Alvarez 1997). A two-stage probit (for the *Frequency* and *Named Forums*) and tobit model (for the right-censored *Forums*) are included in Appendix A3. The results are generally not effected by the choice of model, though the impact of scientific certainty is significantly attenuated.

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<sup>1</sup> There was a significant amount of missingness in the independent variables in this analysis. To account for the missingness, multiple imputation methods were utilized. The non-imputed results do not vary substantively, and are available upon request from the authors.

## **Results**

### *Hypotheses 1 & 2*

The results from the 2<sup>nd</sup> stage regression testing the first two hypotheses are reported in Table 2 for each version of the dependent variable, and the 1<sup>st</sup> stage results are reported in Appendix A1. All effects should be interpreted as relative to the excluded *California* dummy variable, the effect of which is estimated by the constant term.

The initial results support the hypotheses that behavioral certainty increases participation across all dimensions of participation. Again note that, in both types of *uncertainty*, low numbers connote greater uncertainty and higher numbers greater certainty. Across all three measures of participation, the extent to which organizations are certain about the interests of other water management organizations leads to higher participation by that organization. For an organization in the California estuary with mean scores on all the other variables, an increase from the lowest to the highest category of behavioral certainty leads to an increase in the predicted response to the *Frequency* question of 2.35 on its 5-point scale, which represents nearly half the observed range of the variable.

**Table 2. 2sls Regression: Impact of Key Variables on Three Aspects of Participation-2<sup>nd</sup> Stage Results**

VARIABLES	Frequency	Forums	Named Forums
Behavioral certainty	0.269*** (0.0609)	1.416*** (0.312)	0.915*** (0.146)
Scientific Uncertainty	-0.0537*** (0.0187)	-0.0651 (0.114)	-0.148*** (0.0455)
Efficacy	0.0199 (0.0227)	0.0283 (0.143)	-0.0576 (0.0566)
Conflict	-0.0754 (0.0685)	-0.110 (0.426)	-0.275* (0.167)
Tampa	-0.431*** (0.0933)	-3.697*** (0.566)	-0.263 (0.237)
Parana	-0.378**		0.394

	(0.148)		(0.362)
Required	0.507***	1.651**	-0.0260
	(0.128)	(0.775)	(0.323)
Constant	0.835**	-0.921	-2.403***
	(0.375)	(2.018)	(0.908)
Observations	481	371	514
R-squared	0.036	0.032	0.700

Numbers represent the second-stage results of two-stage least squares analyses of each dependent variable. Standard errors in parentheses\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, two-tailed test

In the 2-stage last squares model, *Scientific Uncertainty* has an impact in the expected direction on two aspects of participation. While the effects are smaller in magnitude than the effects of *Behavioral Uncertainty*, they are nonetheless statistically and substantively significant.

Somewhat surprisingly, with one exception, conflict and efficacy are not significant predictors of participation once these uncertainties are accounted in either the two-stage model. This could perhaps be evidence for a ceiling effect, whereby organizations that have chosen to participate in forums have a heightened level of efficacy already, as even a minimal level of participation suggests some belief in one's ability to bring about policy change. However, the efficacy variable is fairly dispersed, with a standard deviation of 2.52 on its 10-point scale. Thus, it appears that, to some extent, organizations choose to participate in forums for something more than an expectation of personal gain. The insignificance of *conflict* is also is not explainable by a ceiling effect; as the standard deviation of conflict is .667 on a 3-point scale, indicating good dispersion. This is suggestive, though not conclusive, evidence that our hypotheses have identified a key differentiating factor between participation in forums and participation in other venues. If being decisive were a critical factor, as suggested in the voting

literature, organizations should be more likely to participate at moderate levels of conflict. This is not borne out in the results.<sup>2</sup>

While the results in Tables 2 and 3 effectively average across all three estuaries in our sample, we next determine whether differences in institutionalization vary the effects each estuary. Table 4 depicts the results of the same two-stage models run in Table 2 run separately within each estuary; the same controls are included in the analysis but excluded from the table for clarity. Note that the “*Named Forums*” data was not collected in Parana, accounting for the absence of results in that column. To some extent, the observed overall effects are most clearly visible in California.

Across each dimension of participation, the results from California strongly support H1 while the results from Tampa generally do. With the single exception of *Frequency* in Tampa, behavioral certainty increases participation to a highly significant extent in the two American estuaries. It appears that much of the aggregate results for *Scientific Uncertainty* are driven primarily by its effects in the California estuary. While the Tampa and Parana results are generally in the correct direction, they do not reach normal standards of statistical significance.

**Table 4. Effect of Key Variables in Each Estuary**

	<b>Estuary</b>		
	Tampa	California	Parana
<b>Frequency</b>			
Behavioral Certainty	0.251(0.172)	0.261(0.057)***	0.434(2.837)
Scientific Uncertainty	- 0.015(0.039)	-0.053 (0.024)**	-0.079(0.179)
<b>Forum Count</b>			
Behavioral Certainty	1.354(0.538)**	0.664(0.117)***	2.759(3.02)
Scientific Uncertainty	-0.217(0.158)	-0.145(0.053)***	-0.172(0.300)
<b>Named Forums</b>			
Behavioral Certainty	4.264(1.750)**	0.629(0.285)**	--

<sup>2</sup> We also tried a specification with a squared version of the conflict variable, as well as its interaction with behavioral uncertainty. None of these was found to be a significant predictor of participation.



Scientific Uncertainty	-0.488(0.453)	-0.019(0.128)	--
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Note: Numbers represent the second-stage results of a two-stage probit and tobit analysis of each dependent variable within each estuary. Probit is used in the case of the two categorical, non-censored variables (Frequency, and Name Forums). Tobit is used in the case of the censored variable (Forums). Standard errors in parentheses\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, two-tailed test.

All of the effects are quite muted in the case of Parana. While the coefficients are generally in the correct direction, neither type of certainty has a significant impact on participation. Despite the exceptions in Parana, we find consistent evidence in support of rejecting the null for hypothesis 1: familiarity with the interests and goals of others makes organizational leaders more likely to participate. While the lack of statistical significance in anything but the California estuary makes us a bit more hesitant regarding the impact of *Scientific Uncertainty*, that the effects are in the correct direction in each of the other estuaries, along with having strong effects in the aggregate, allows for a rejection of the null for hypothesis 2 .

### Participation in Deliberative Forums: Conclusions

The concept of deliberative forums has become increasingly popular in recent years, in both academic circles (Ostrom 1990; Ostrom 2005) and among policy makers. While the concept of forums is normatively pleasing to many, such forums require broad-based participation in order to achieve the goals for which they are established. This paper is the first to examine some of the key predictors of forum participation. A key point is that participation in forums requires different theories and explanations than the factors that have been found to be important in predicting things like voting, as the deliberative forum is about influence and information than about being a decisive player.

In order to get a diverse set of actors to join in, it seems to be important that those with a stake in a particular forum take steps to reduce behavioral certainty by making the positions of participants clear. There are a number of ways that this could be done; things as simple as listing the names of participating organizations on a forum web page with a short description of their position might go a long way in reducing behavioral certainty. While this seems within the realm of possibility, the question of what impact policy makers should attempt to have on scientific uncertainty is far less clear. The effect of reducing scientific uncertainty was found to be quite ambiguous. While scientific uncertainty reduced participation in the 2sls model, the implementation of better models showed no effects of scientific uncertainty on participation. This could be due to scientific uncertainty pulling people in different directions-while they may be more motivated to participate to learn more about the topic, they are also less likely to enter a forum with sufficient knowledge to participate actively and move policy in the direction they might prefer. It may also be evidence that, while deliberative forums do serve the normative goal of bringing advocates of varying positions together, they are less effective in bringing together open-minded actors desirous of learning more about the topic at hand.

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Appendix A1. First Stage Regression Results from Table 2

	<i>Frequency</i>	<i>Named Forums</i>	<i>Forum Count</i>
Efficacy	0.1660431***	0.1995023***	0.1717972***
Conflict	0.2374726	0.1418741	0.2039922
Science	0.1718449***	0.1393693***	0.1518744***
Tampa	-0.1264363	-0.0971085	-0.1585267
Parana	-1.443135***	(omitted)	-1.36616***
Required Forum	-0.4108102	-0.3729754	-0.2951938
Issues	0.2037682***	0.2040324***	0.1880922***
Involve	0.3074737***	0.4309547***	0.3408338***
Constant	3.860446***	3.535802***	3.868508***
F Test	24.51	31.54	28.63
Sargan Statistic Chi-sq(1) (P value)	0.398(0.5283)	1.89(16.92)	0.27(0.630)

Note: Table depicts the impact of key variables from OLS regression on the first stage dependent variable, behavioral certainty. F-test values exceeding 10 suggest that instruments are appropriate, as well supporting the null of Sargan statistic that the instruments used are valid.

Appendix A2: Single-Stage Ordered Probit/Tobit Results

VARIABLES	Frequency	Named Forums	Forum Count
Science	-0.0390* (0.0212)	-0.0271 (0.0183)	0.0903 (0.1282)
Behavioral Certainty	0.122*** (0.0242)	0.116*** (0.0237)	0.305** (0.137)

Required Forum	0.607*** (0.150)	-0.112 (0.168)	1.633* (0.901)
Efficacy	0.0818*** (0.0230)	0.0877*** (0.0217)	0.446*** (0.130)
Conflict	-0.0161 (0.0875)	-0.0624 (0.0782)	0.204 (0.462)
Tampa	-0.631*** (0.112)	-0.284** (0.110)	-5.000*** (0.589)
Parana	-0.870*** (0.153)	-0.449*** (0.137)	-- --
Observations	483	516	373

Note: Numbers represent the single-stage version of results of an ordered probit and tobit analysis of each dependent variable. Ordered probit is used in the case of the two categorical, non-censored variables (Frequency, and Name Forums). Tobit is used in the case of the censored variable (Forums). Standard errors in parentheses\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, two-tailed test.

#### Appendix A3: 2<sup>nd</sup> Stage Ordered Logit and Tobit Results

Variables	Frequency	Named Forums	Forums
<i>Behavioral certainty</i>	0.19545*** (0.0417)	0.3449*** (0.0336)	1.3558*** (0.3649)
<i>Scientific Uncertainty</i>	-0.02661 (0.0196)	-0.00683 (0.0141)	-0.04000 (0.1310)
<i>Required Forum</i>	0.5991*** (0.1406)	(0.0732) .1229876	2.3766*** (0.9076)
<i>Efficacy</i>	0.0610*** (0.0216)	0.0440*** (0.0184)	-0.02248 (0.1560)
<i>Conflict</i>	-0.0207385 (0.0822)	-0.0862 (0.0614)	-0.3281 (0.4789)
<i>Tampa</i>	-0.6210*** (0.1048)	-0.1746*** (0.0839)	- 4.4078*** .5996097
<i>Parana</i>	-0.8760*** (0.1441)	-0.4016*** (0.113)	-- --
Observations	528	528	388