Who joins a forum – and who does not? Evaluating Drivers of Forum Participation in Polycentric Governance Systems

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Abstract

In polycentric governance systems, decisions that influence a given policy issue are often made across a series of forums: venues where actors meet to resolve collective action problems. Here, we examine who does and does not participate in forums, and the factors driving that participation. We analyse forum participation patterns of 307 actors involved in Swiss water governance, who could participate in water governance forums. We find that the majority of actors do not participate in any forums. Results from a Bayesian multi-level logistic regression model show that especially those concerned with a broader range of policy issues and those that have more organizational resources at their disposal are more likely to participate. To a lesser extent, this also holds for organizations that represent policy beliefs consistent with median beliefs in the system. A belief that increased cross-sectoral coordination is needed to promote more effective governance does not have a discernible impact on participation. These results question the integrative characteristics often attributed to forums in polycentric governance more generally.

Evidence for practice:

- Forums bring together a diversity of actors to foster coordination in polycentric governance systems.
- Yet, forums are not per se representative, as specific types of actors tend to select into forums rather than others.
- We find that generally, actors with more resources and a broader issue portfolio are more likely to participate in forums.
- Our results question the integrative role of forums; when it comes to assessing their impact, investigating who is left outside should be considered as important as evaluating what happens within forums.

Resource governance (e.g., of a watershed or forest) is often challenging due to the existence of interconnected collective action problems that span jurisdictional boundaries (Lubell 2013). Against this complexity, hierarchical decision-making structures have proven largely ineffective at addressing policy problems (Emerson, Nabatchi, and Balogh 2012). Instead, resources tend to be governed through polycentric systems that feature networks of policy actors interacting across a series of forums: institutionalized decision-making venues where relevant actors repeatedly interact and (potentially) develop solutions to problems that impact their mutual interests (Berardo and Lubell 2016, 2019; Bryson, Crosby, and Stone 2006; Fischer and Leifeld 2015). Within forums, actors representing various government agencies, NGOs, interest groups, and private entities negotiate over viable policy solutions, often lobbying for solutions that align with their organizational interests (Mewhirter, Coleman, and Berardo 2019): the extent to which actors prioritize solutions that best address the policy problem relative to those that yield disproportionate benefits varies across actors in the system (McAllister, McCrea, and Lubell 2014). In addition to deriving policy solutions, actors may possess other organizational goals that spark their forum participation including, for example, building political networks, influencing agenda setting, and/or augmenting organizational reputation (Fischer and Leifeld 2015; Koontz and Johnson 2004).

Prior research in this area has focused on understanding how the dynamic linkages of actors and forums impact the effectiveness of individual forum outputs and the governance system as a whole (Bodin 2017; Lubell et al. 2017). Findings suggest that one of the most consistent determinants of forum and system effectiveness involves participant composition, that is, who participates within and across forums (Fischer and Schläpfer 2017; Lubell et al. 2017; Mewhirter, McLaughlin, and Fischer 2019). While these studies demonstrate that achieving forum and system success is largely impacted by securing meaningful participation from a range of key actors (Bodin 2017; Bodin and Crona 2009; Smaldino and Lubell 2011),

assessments related to actor-level factors that drive forum participation are limited (see Olivier and Berardo 2021 as an exception).

In this article, we fill this gap by developing a series of hypotheses regarding the actor-level factors that affect forum participation. Similar to studies examining the multitude of forum features influencing forum outputs (see Fischer and Schläpfer 2017; Lubell et al. 2017), we recognize the likelihood of a myriad of actor-level variables driving actor participation efforts. As one of the first studies designed to test actor-level variables on participation patterns, we draw on arguments spanning theories of polycentrism (Ecology of Games: Lubell 2013; Berardo and Lubell 2019; Ostrom 2010) and collective/collaborative decision-making more generally (Bodin and Tengo 2012; Ansell and Gash 2008; Koontz and Thomas 2006) to narrow the scope of theoretically relevant variables to a cohesive set of factors[1]. Specifically, we argue that the number of policy issues an actor is active in, the extent to which an actor's policy beliefs deviate from median beliefs in the system, the extent to which an actor believes that cross-sectoral coordination is needed to promote effective governance, and an actor's resource capacity will impact forum participation efforts.

Our empirical analyses make use of survey data collected from 307 actors involved in Swiss water governance. The survey allows us to examine whether and to what extent these actors select into ten of the most central water governance forums operating at the national level. We find that the majority of actors involved in Swiss water governance do not participate in any of the listed forums. Results from a Bayesian multi-level logistic regression model show that especially the breadth of actors' issue portfolio and the amount of resources at their disposal influences forum participation. The amount their policy beliefs deviate from median beliefs in the system has a likely negative impact, whereas there is no robust effect of actors' perceived need for coordination in governance.

As opposed to other studies that only evaluate participation efforts of forum participants (Mewhirter, Coleman, and Berardo 2019; Hileman and Bodin 2019; Fischer and Maag 2019; Mancilla Garcia and Bodin 2019), our sample does not discriminate in this regard and includes data covering a much broader swath of potential forum participants. Crucially, this includes actors who do not (but could) participate in any forums. Studying actors who do *and* do not participate in forums helps us avoid a possible selection bias in analysing what drives participation: a likely occurrence if only forum participants are studied.

The substantive and theoretical implications of this paper are significant for several reasons. First, assessing forums by exclusively examining participants disregards existing concerns in the literature that forums may perpetuate power asymmetries and generate inequitable policies that simply reinforce certain interests (Fung 2015; Bidwell and Ryan 2006; Choi and Robertson 2014; Scott and Thomas 2017). It also highlights the limitations of political/institutional opportunity structures purportedly created by forums designed to overcome the challenges associated with hierarchical decision-making. If forums are asymmetrically dominated by actors with broad issue portfolios, average beliefs, and significant resources, more marginalised efforts/interests may be stymied (Choi and Robertson 2014; Reed 2008; Koontz and Thomas 2006).

Forums in Polycentric Governance Systems

The existence of policy forums designed to manage complex interconnected collective action problems is a reality for the vast majority of resource governance systems (Cairney, Heikkila, and Wood 2019; Berardo and Lubell 2019).[1] Forums are established for many reasons, but notably due to "sector failure" (Bryson, Crosby, and Stone 2006) or "sector interdependence" where cross-sectoral coordination is seen as an efficient mechanism to solve complicated policy problems (Bryson, Crosby, and Stone 2006; Emerson, Nabatchi, and Balogh 2012; Maag and Fischer 2018). Forums function as venues for recurring and

organized interactions among actors such as government agencies, NGOs, and interest groups. Collectively, the broader range of authority and diverse knowledge base of participants allows for the (potential) generation of solutions that better resolve underlying policy problems (relative to the status quo; Fischer and Leifeld 2015). Scholars have long recognized, however, that the benefits ascribed to forums are only actualized when i) a critical mass of relevant policy actors participate, ii) all actors have the capacity to meaningfully engage in policy processes, and iii) mutually beneficial solutions exist (Lubell, Mewhirter, and Berardo 2020; Scott and Thomas 2017). Forums that lack such conditions are unlikely to generate effective policy outputs (Ansell and Gash 2008).

In contrast to less formal policy networks often discussed in the literature (e.g., information sharing and reputational networks), forums tend to be fairly institutionalized in terms of the rules and norms guiding forum membership as well as deliberation and rule-making practices (Hileman and Bodin 2019; Hamilton 2018). Within and across systems, forums vary with regards to the scope of issues they address, the types of actors they attract, and their degree of interdependence with other forums (Fischer and Leifeld 2015; Berardo and Lubell 2019; Mancilla Garcia and Bodin 2019). While individual forums are most often structurally independent of one another (Berardo and Lubell 2019), they are often functionally "linked" when they address overlapping/interdependent policy problems (Metz et al. 2020) or when they share common participants (Jasny and Lubell 2015; Kimmich 2013; Mewhirter, McLaughin, and Fischer 2019; Mewhirter and Berardo 2019). When linked, actor strategies and forum decisions may be co-determined by dynamics occurring in linked forums (McGinnis 2011; Mewhirter and McLaughlin 2021; Kimmich 2013).

This complexity and interdependence of governance systems exacerbates the challenges actors face on where to invest their limited resources (Mewhirter, Coleman, and Berardo 2019; Mancilla Garcia and Bodin 2019). While actors within forums are generally

interested in resolving forum-specific issues, they have preferred policy solutions that they pursue during forum negotiations (Scott and Thomas 2017; Lubell et al. 2010). In addition, actors may have alternate goals they pursue within forums, which may include fostering organizational learning, building organizational reputation, serving as neutral facilitators, and/or setting the agenda (Scott and Thomas 2017; Koontz and Johnson 2004; Scharpf 2006; Malkamäkki et al. 2019).

Drivers of Forum Participation

The most general mechanism in the existing literature used to explain forum participation posits that boundedly rational actors-who have imperfect information about the presence and characteristics of forums in a system- tend to participate in forums when i) they are aware of their existence, and ii) the prospective benefits outweigh the anticipated costs (Fischer and Sciarini 2016; Lubell 2013). However, the cost-benefit considerations implied by this transaction cost approach are often only assumed, with scant theory to guide us on how actor-specific factors impact actor incentives. We therefore draw on arguments developed within and discussed across the various theories of polycentrism and collaborative governance (Lubell 2013; Berardo and Lubell 2019; Ostrom 2010; Bodin and Tengo 2012; Ansell and Gash 2008; Koontz and Thomas 2006) to derive how four actor-level features impact their propensity to participate in policy forums: breadth of issue involvement, relative deviance of policy beliefs from overall system trends, attitudes toward cross-scale coordination in governance, and ex-ante resource distributions.

Breadth of Issue Involvement

In many polycentric governance systems, an array of forums exists, each of which addresses a subset of issues related to the broader resource at hand (Ostrom 2010; Lubell 2013). The type and scope of issues addressed varies across individual forums (Mancilla Garcia and Bodin 2019). For instance, within a water governance system, one forum may

solely address water supply whereas another may address water quality and biodiversity, concurrently. Research demonstrates that forum outputs—ranging from reframing of an issue over agenda setting to new proposals for legislation—can simultaneously impact the basis for discussions/decisions in other causally interdependent forums: a phenomena referred to as "institutional externalities" (Lubell 2013; McGinnis 2011; Mewhirter, Lubell, and Berardo 2018). For example, a forum addressing aquatic biodiversity that agrees to protect certain fish species may have a profound impact on forums focusing on conditions for hydropower operations. As such, externalities originating from one forum may influence the state of one or more policy issues, and subsequently, the within-forum processes and resulting outputs of forums linked to these issues. In other words, forum interlinkages are a function of issue interlinkages, which maintain consequences for an actor's forum participation decisions.

Actors involved in a governance system—who are potential forum participants—each deal with a subset of issues related to their organizational goals and mission. When deciding whether to participate in a given forum, actors must assess if and to what extent potential forum outputs will affect an issue they are concerned with. To discern this, actors must understand which forums directly impact their interests as well as how forums might—through the generation of institutional externalities—indirectly impact their interests. Given this assumption, as the number of issues that an actor is concerned with increases, so too will the total number of forums in a given system that have both a direct and indirect impact on their interests. As such, the likely number of forums to consider for participation increases as well. Given this, we expect that, on average, actors who are involved in a broader subset of issues will participate in a greater number of forums.

H1: Actors involved in a greater number of issues are more likely to participate in forums.

Deviance of Policy Beliefs from Median System Trends

Resource governance scholarship has long recognized the role that actors' belief systems play in shaping patterns of collaborative engagement (Calanni et al. 2015; Weible 2005; Henry 2011; Matti and Sandstrom 2011). Beliefs can involve worldviews and value systems at the most general level, which materialize into concrete policy beliefs and instrument preferences at the level of issues dealt with in specific policy-making processes (Sabatier 1987). The extent to which two or more actors share common beliefs regarding policy problems and the policy alternatives meant to correct them can influence the manner in which those actors participate across a given governance system (Ingold, Fischer, and Cairney 2017). Most prominently, findings suggest that shared belief systems facilitate the development of collaborative ties among actors (e.g., sharing information, co-developing grants, drafting position papers, etc.: Henry, Lubell, and McCoy 2011; Weible 2005).

When deciding whether and to what extent actors should participate across the range of forums that potentially influence their interests, actors must anticipate the degree to which their own beliefs are compatible with those of other potential participants. Especially in the small-scale, federalist and highly participatory and integrated political system, most actors likely know about the compatibility of their beliefs with others, and with the average beliefs in the field (though this may vary across actors and systems).

Actors with compatible belief systems likely share somewhat complementary conceptualizations of the policy problem and their preferred solutions (Bentrup 2001; Ansell and Gash 2008; Heikkila and Gerlak 2005). Such homogeneity in beliefs may act like an echo chamber of ideas and information within forums, which can promote cooperation and generate favourable forum decisions (Sunstein 2001; Feiock et al. 2009; Bidwell and Ryan 2006; Malkamäkki et al. 2019)[3]. If actors discern that their beliefs will be largely compatible with others, then they can anticipate that the costs associated with problem identification, bargaining with others, and design of forum processes will be relatively low. As such, actors

may deem forum participation as a wise investment of resources, leading to a greater breadth of participation.

H2a: Actors whose belief systems are compatible with the majority of others in the system are more likely to participate in forums.

Alternatively, one could surmise that actors who have congruent belief systems with others may perceive less of a need to participate in any given forum, as their preferences will be represented by other participants. Here, actors can eschew the costs (even minimal ones) associated with forum participation while reaping the benefits of forum outputs (i.e., "free-riding"). Conversely, actors who know that their beliefs are misaligned with others, fearing the "tyranny of the majority" (Mill 1966), may inject themselves into forum processes to shape outputs in a manner more compatible with their own interests (knowing that if they don't, nobody else will). As actor beliefs deviate further from others in the system (to the extent that no mutually beneficial policy solutions exist), actors may deliberately select into forums with the intention of disrupting forum processes, and stalling/preventing the generation of outputs.

H2b: Actors whose belief systems are incompatible with the majority of others in the system are more likely to participate in forums.

Beliefs about the Relative Importance of Cross-sectoral Coordination

Forums often develop due to fragmentation, interdependence, and/or sector failure (Bryson, Crosby, and Stone 2006; Emerson, Nabatchi, and Balogh 2012; Maag and Fischer 2018). In such instances, coordination between actors from different sectors, or generally across scales, is perceived as an effective means to govern complex political systems (Bryson, Crosby, and Stone 2006; Ansell and Gash 2008; Maag and Fischer 2018). While forums may specialize in facilitating cross-sectoral/scale coordination, successful governance hinges on an array of other conditions, including adequate finances, sufficient scientific

information, stakeholder commitment, policy compliance, and effective implementation (Bidwell and Ryan 2006; Sundar 2001; Foster and Garduno 2013; Emerson, Nabatchi, and Balogh 2012; Larson and Soto 2008; McLaughlin et al. 2020). Given that actors represent a variety of organizational types and operate in different phases of the governance system/policy process, they likely possess distinct organizational views on the more critical factors inhibiting or advancing successful governance. This has a direct effect on their likelihood for participating in forums. For instance, actors who deem deficient government provisions as a significant determinant of system performance may be inclined to spend their organizational resources lobbying local and or state officials for increased funding. Given this, they may not dispose of sufficient organizational resources to invest in an object of secondary importance to them, such as participating in forums. Conversely, those actors who contend a lack of cross-scale/sector coordination as a primary obstruction to successful governance will tend to view forums as significant institutional corrections worth investment.

H3: Actors that strongly feel that a lack of cross-sectoral coordination among policy actors is inhibiting successful resource governance are more likely to participate in forums.

Resources

While forums provide the space for actors to pool resources and authority in an effort to (potentially) address interconnected problems, the costs associated with forum engagement may prove prohibitive for some actors (Yaffe and Wondolleck 2003). At a minimum, such costs include the time, technical, and financial resources required to i) attend forum meetings, ii) learn about policy problems, iii) identify and develop various policy alternatives, iv) learn about the interests and bargaining tactics of other participants, v) negotiate with other participants, and vi) implement outputs (Mewhirter and Berardo 2019). Those who have alternate goals outside of devising outputs (e.g., building organizational reputation or developing new contacts) face additional costs. Actors who lack sufficient time (or do not

have partners who can attend on their behalf) may be forced to prioritize forums that have the largest direct impact on their interests, eschewing those that are deemed to be a lower priority. Actors who are particularly time-strapped may not be able to attend forums at all.

Resource distributions may also impact the payoffs one expects to receive from forum participation, which subsequently impacts their willingness to join. As documented in multiple studies, "resource based power" (Purdy 2012) can have a dramatic impact on collaborative processes and outputs (see Scott and Thomas 2017 p. 546). For instance, actors who have greater resources can achieve greater technical expertise over issue areas, allowing them to better control deliberations and model policy alternatives (Bradford 1998; Echeverria 2001; Purdy 2012). Alternatively, actors in forums may kowtow to resource endowed actors in forums in hopes of receiving benefits/favors elsewhere (Purdy 2012; Ran and Qi 2018). An actor's ex-ante resource endowment may have a dramatic impact on the anticipated benefits of their forum participation, through the leverage they expect to have over forum deliberations. Resource rich actors may anticipate a high degree of leverage, and thus, anticipate that the benefits of participation outweigh the costs. Those who lack such resources may anticipate having little influence over forum direction, and thus, believe that the prospective benefits from participation are outweighed by participation costs.

H4: Actors with more resources are more likely to participate in forums.

Case, Data and Methods

Switzerland is the "Water Castle" of Europe, as several main European watercourses, such as the Rhone or Rhine rivers, have their origin in the Swiss Alps. The integrative and consensus-oriented direct-democratic political system and federalist state structure (Sciarini et al. 2015) facilitates dealing with the boundary spanning nature of water. Multi-level

governance (Hooghe and Marks 2001) is also important, as the national and sub-national levels share a complex set of competencies, not least in water, natural resource management, and environmental politics (Linder and Vatter 2001).

In order to identify all potential actors that might or might not participate in Swiss water-related forums, we started by gathering a complete set of water-relevant issues in Switzerland in a bottom-up approach relying on document analysis. A team of coders analyzed newspaper articles and parliamentary protocols that were retrieved from databases of the a) national parliament, b) one sub-national parliament (Bern), c) a leading national newspaper ("Neue Zürcher Zeitung"), and d) a regional newspaper ("Berner Zeitung"), based on three keywords: water, lake, and waterbody (in German). They marked water governance issues, when they appeared in a document and grouped them together in an iterative process (see Brandenberger et al. (2021) for a detailed description of the document analysis procedure). The coding procedure resulted in a list of 8 issue fields and 66 sub-issues eventually used in this study, covering an encompassing variety of aspects of Swiss water governance, ranging from recreational boating to hydropower plant construction.

While coding issues, the coders also marked the names of any organizational actor occurring in relation to an issue in any document. This provided us with an actor list used as a starting sample of organizational actors involved in Swiss water governance. The bottom-up document analysis procedure also ensured that a) issues and actors related to water governance were identified independently of forums, and b) aspects of water governance on both national and sub-national levels were covered.

Based on the information gathered from the document analysis, we then conducted a nation-wide online survey among actors in water governance. We surveyed all organizational actors identified in the document analysis by reaching out to representatives of organizations heading water-related activities of an actor. Main actor groups included administrative

agencies on various jurisdictional levels, municipalities, civil society organizations, interest groups, service providers, utilities, and engineering firms. After a first round of surveys in the summer of 2016, we used snowball sampling to identify previously unidentified actor(s). For this, the survey asked respondents to name other relevant actors in their field that they had either exchanged information with or regarded as allies or opponents in water governance issues they were active in. We then conducted a second survey round in the spring of 2017. Over both rounds, we sent the survey to 476 actors, of which 307 participated, resulting in a response rate of 66%.

Dependent Variable: Forum Participation

To assess forum participation, we used a survey question that asked respondents to indicate whether they actively participated (during the last three years) in the ten explicitly water-related forums active at the Swiss national level.[4] To ensure the study captures all water-relevant forums, forums were identified based on a combination of document analysis, expert interviews, and snowballing among managers of environmental forums in Switzerland (as documented in Maag and Fischer (2018)). The forum with the highest participation among survey respondents was the Swiss Water Association (VSA), in which 63 respondents (21% of respondents) participated. The three smallest forums were the Swiss Hydrogeological Society, the Swiss Hydrological Commission (CHy) and the Swiss water partnership, where between 5 and 6 actors participated (see table A2 in the appendix for additional details). We excluded one of the ten forums (the Geneva Water Hub) from the analysis, because only one actor indicated participation in it and we could therefore not justify its inclusion as one of the most important forums in Swiss water governance. We attribute this to the fact that the forum was a relatively new forum at the time the survey was conducted and mainly deals with international water governance issues.

Figure 1 here

Figure 1 shows the distribution of forum participation by actors (median = 0, SD = 1.3, min = 0, max = 7). It illustrates the respective number of actors who indicated that they participated in a given number of forums, ranging from zero to the empirically observed maximum of seven. The figure illustrates that complete non-participation is very common (175 actors, 57%). This already lends credence to our argument that it is crucial to investigate non-participation as well as participation.

Independent variables: Breadth of Issue Involvement, Belief Deviance, Belief in Importance of Cross-Sectoral Coordination, and Resources

The breadth of an actor's issue involvement was assessed as follows. During the survey, actors were asked to indicate in which out of eight water-related issue fields they were active within the last three years. Issue fields presented to actors were biodiversity, spatial planning, water pollution, water and leisure, snow and glaciers, protection from water and flooding, urban water management, and energy. After selecting any of these issue fields, actors needed to indicate in which of more specific 66 sub-issues within these fields (ranging from four to 15 sub-issues per field) they were active in. Breadth of issue involvement was measured as the absolute number of sub-issues per actor (median = 7 issues, SD = 8.2, min = 1, max = 50, see also figure A1 in the appendix).

For assessing an actors' deviance of policy beliefs from overall system trends, we assessed actors' beliefs based on a set of items related to current water-related policy debates in Switzerland (8 items: list of translated questions in appendix table A1). Per item, actors were asked to indicate agreement or disagreement with a statement related to each debate on a four-point Likert scale (strongly agree, agree, disagree, strongly disagree). To arrive at a

measure of overall deviance per actor from the general trend in the system, we computed the sum of each actor's deviations from the median belief for every survey item. To do so, we recoded the four-point Likert scale used in all items to range from 1 (disagree) to 4 (agree). A high value on the summary measure of deviance (median = 6, SD = 3.8, min = 0, max = 21, see figure A2 in the appendix) indicates that an actor strays from the most prevalent opinion of actors in many debates (see appendix figure A3 for distributions of answers to all individual belief questions).

Actors' beliefs in the importance for cross-sectoral coordination is assessed based on three survey items. The respective question asked whether actors thought that more or less coordination (or no change as a middle category) was needed among public administration, society and research in general. The question was asked separately for issues of drinking water, flood protection, and protection of water bodies, resulting in a total of three items expressing whether actors perceived a need for more or less coordination. We recoded the three-point scale used in all items to range from 1 (less coordination needed) over 2 (no change) to 3 (more coordination needed). As a measure of overall perceived need for more cross-scale coordination we used the sum across items normalized for each actor by the total on non-missing answers (mean = 0.81, SD = 0.16, min = 0, max = 1, see figure A4 in the appendix).

Finally, we utilize a proxy measure for the organizational resources available to an actor for participating in water governance. To do so, we ask survey respondents about the number of full-time equivalent positions in their organization (median=22, mean=247, sd=1328, min=0, max=14,000) and the number of these positions dealing with water issues (median=7, mean=18, sd=57, min=0, max=700). The measure, which directly captures one type of resource (staff), is likely highly correlated with alternate resource types (e.g., funding, technical expertise, political capital, etc.) and thus, indicative of the broader, latent construct.

Other Covariates

We attributed an organizational type to each actor, combining an actor's jurisdictional level with its societal sector. Types used were higher-level (state and national) administration, local administration (municipalities), private sector (mostly private energy producers and engineering firms), science, interest groups and a category of other actors not fitting these categories (such as political parties or public utilities).

Model Structure

To approach model building, we first formalized our causal model about relations between all variables outlined above in a directed acyclic graph (DAG), illustrated in Figure 2. This allowed us to select a set of relevant covariates (given the causal model) to include in our statistical models for each of our hypotheses (see appendix section "Causal graph" for a detailed elaboration) in order to be able make statements about direct non-confounded effects of our variables of interest (Pearl 2000).

Figure 2 here

We treat participation in each forum as a binary variable. Each actor thus has 10 forum choices in our data. The resulting distribution of forum participation among actors is characterized by a high proportion of zeros (i.e., zero inflation). This is on the one hand due to the fact that participating in more than two or three forums is prohibitively resource-intensive for actors. On the other hand, crucially, many actors do not participate in forums at all.

We model this assumed data-generating process using a Bayesian multi-level logistic regression model. Our multi-level modeling includes four types of varying effects (intercepts). First, we estimate varying effects per forum, recognizing that some forums

generally attract more actors (they are larger). Second, a varying effect across types of actors models differing participation patterns across actor types. Third, we also include a varying effect for every combination of forum and actor type, as some forums attract more actors of a given type (eg. some are more private sector oriented or others attract more state actors). Fourth, we also fit a varying effect for each actor, as actors each had 10 forum choices. This is crucial, as it enables the model to take zero-inflation into account, as some actors have a lower probability of participation across all forums. Importantly, using this partial pooling across actors leads to a model that outperforms models that model zero-inflation explicitly in terms of information criteria and robustness. We also explored alternative model specifications with varying slopes in addition to intercepts, which did however not outperform the varying intercepts model (see online repository for detailed results of model comparisons). By explicitly taking into account variation in participation across forums, types of actors and within actors we thus both do our assumed data-generating process justice and gain precision in estimating our population-level parameters of interest.

The likelihood section of the model definition appears below:

$$part_{i,j} \sim Bernoulli(p_{forum_{i,j}})$$

$$logit\left(p_{forum_{i,j}}\right) = \bar{\alpha} +$$

$$\gamma_{TYPE[i]} + \delta_{FORUM[j]} + \varepsilon_{TYPE[i],FORUM[j]} +$$

$$\zeta_{ACTOR[i]} +$$

$$\beta_1 bel + \beta_2 iss + \beta_3 coord +$$

$$\beta_{4a} res + \beta_{4b} reswater * res$$

$part_{i,j}$ is a binary variable measuring participation in a given forum *j* by a given actor *i*. $p_{forum_{i,j}}$ is the probability of joining a forum for an actor. The logit link ensures the mapping

of the linear model to probability. iss is standardized issue breadth, bel is standardized belief deviation, *coord* is standardized belief in the importance of cross-scale coordination. We use *res* to denote the log-transformed number of full-time equivalent positions (FTEs) in an organization and *reswater* to denote the log-transformed number of FTEs dealing with water issues. In both cases, the log is taken after adding one to each observation to have instances of zero FTEs equal to zero on the log scale. We include the main effect of *res* and an interaction among *res* and *reswater.* The main effect for *res* accounts for organizations that are simply very large but not necessarily devoted to water issues. The interaction effect should allow for a varying slope if an organization is further also very focused on water. Note that we do not include a main effect for *reswater* as, as a proportion of *res*, it can by definition not be larger and must be zero when *res* is zero. We impute missing data within the model in some cases for *bel, coord, res* and *reswater* (see appendix section "Imputation").

We set weakly informative or relatively uninformative priors for most model parameters, mainly to ensure parameter estimation stayed within reasonable bounds. Based on Gelman (2008) we use Cauchy distributions with center zero and scale 2 for all β parameters and scale 5 for intercepts. For all other parameters we use a quite wide Student-*t* prior distribution with 3 degrees of freedom, median zero and scale 2.5.

We used the interface to Stan (Stan Development Team 2020) provided in the R package *brms* (Bürkner 2017) to fit the model in R (R Core Team 2020), drawing 1000 posterior samples from four parallel MCMC chains after a burn-in of 1000. Convergence was assessed based on visual inspection of traceplots and R-hat diagnostics (Gelman 2013), which were consistently one for all parameters, indicating that the chains had converged. All analytical steps can be replicated using anonymized data and R scripts made available in an online repository at https://doi.org/10.5281/zenodo.5155159.

Results

Figure 3 illustrates our main results. The figure shows model-based predictions for the direct effects of increasing our key independent variables on the probability of an actor joining a forum, given the statistical and causal model, including uncertainty. The predictions are made based on 4000 draws from the posterior. They show effects while holding all other variables constant at their mean values. The predictions are population-level effects; they are marginalized over the clusters used in fitting the multi-level model. As such they show the effect of hypothetically intervening on a variable for an average actor, averaged across forums and actor types. Appendix figure A6 provides illustrations summarizing the results marginal of actors, forums and actor types to illustrate the variance the model accorded to these clusters. For the variables issue breadth (subfigure a), belief in importance of cross-sectoral coordination (b) and belief deviance (c), the predictions are made across 80% percent of the empirically observed range, excluding the lowest and highest decile, in order to avoid overinterpreting extreme, but uncommon values. For the effect of organizational resources as the total number of FTE staff (e), the lowest decile is included, while the interaction with the percentage of FTE staff within the organization focused on water issues is shown (for visual clarity, credible intervals are not shown). For the effect of the percentage of FTE staff (d), while holding organizational size constant (at the median 20 employees), the full range is shown.

Figure 3 here

The clearest results illustrated in Figure 3 are clearly positive and substantial effects of actors' increasing issue breadth (a) and total resources (e) on the likelihood of forum participation. For organizational resources, the results are worth exploring in detail. An increase in not necessarily water-related, but overall resources leads to a substantial increase

in the probability of joining a forum for small- to medium-sized organizations (e). The effect tapers off slightly afterwards, but is still noteworthy. Having resources focused on water makes participation in water-related forums only slightly more likely for a median-sized organization (d), but has a larger effect on organizations with more resources. The probability of forum participation rises more steeply with resources for organizations where a quarter of employees works on water issues versus organizations fully dedicated to them (e).

Belief deviance from median beliefs is likely negatively associated with the probability of forum participation (c). This is further illustrated by the large proportion of the model parameter's posterior distribution that is smaller than zero (see appendix figure A5). The strength of the effect is however quite uncertain. For the overall perceived need for coordination, there is almost no discernible effect that can be made out.

Discussion and Conclusion

A rich body of research investigates the types of actor and forum characteristics impacting the effectiveness of forum and system outputs (Mewhirter and Berardo 2019; Lubell et al. 2017; Mewhirter, Coleman, and Berardo 2019). However, there is a dearth of research exploring the actor-level factors driving forum participation, an unusual omission given the importance of actor participation and commitment to successful resource governance (Smaldino and Lubell 2011; Berardo, Olivier, and Lavers 2015; Lubell et al. 2017). Our paper fills this gap, positing that breadth of actors' issue portfolios, perceived needs for coordination, belief deviance from the mainstream, and resource capacity impact i) whether an organization selects into a forum governance network, and ii) breadth of their forum participation. Based on a Bayesian multi-level logistic regression model, we find that the breadth of actors' issue portfolios, and resources influence forum participation, their

belief systems do so to a smaller and uncertain extent, whereas their perceived need for coordination does not seem to matter.

The results reported in this paper offer contributions to various bodies of literature including EGT, polycentrism, and collaborative governance. We find evidence in support of hypothesis H1, suggesting that forum participation becomes more likely if an actor is involved in an increasing number of policy issues within the overall governance system. This aligns with theoretical frameworks conceptualizing policy systems as complex, interlinked sets of venues (Lubell 2013). Actors who deal with many policy issues seem to perceive the associated increase in institutional externalities that affect them and adapt by partaking in a larger number of forum venues.

We find some evidence that supports our belief deviance hypothesis H2a over the competing hypothesis H2b, but it is not decisive. Inasmuch we find a slight negative effect of belief deviance on participation, our results align with a series of previous findings extolling the role belief systems play in actor decision-making (Sabatier 1987; Weible 2005). In our case, actors with increasing belief deviance from the overall system trend are somewhat less likely to participate in forums. This offers support for our suggested mechanism that belief compatibility eases forum participation costs such as negotiating with other actors and/or developing solutions to policy problems. We have to stress that we find only weak support however and we see our results first and foremost as a call to investigate further if this effect exists in a stronger form in other governance systems, as other studies suggest (Olivier and Berardo 2021; Wagner and Ylä-Anttila 2020). In this regard, such studies should also seek to account for reverse causality, that is, that forum participation – over time – makes policy beliefs of actors more homogeneous, which was not completely possible in our study.

We emphasize the need for more research in this area, as a finding of negatively affected forum participation with increasing belief deviance holds implications for one of the

core functions of polycentric governance systems: learning (Lubell 2013; Ostrom 2010). Learning about complex policy problems "typically requires actors to draw from a range of knowledge domains and expertise" (Bodin 2017 p. 357), a function more efficiently achieved through heterophily (Bodin, Sandstrom, and Crona 2017; Berardo and Lubell 2019; Siddiki et al. 2017; Maltamäkki et al. 2019). Learning about policy problems, solution alternatives, and the broader ecosystem promotes more holistic/enduring policies and institutions (Gerlak and Heikkila 2011; Bodin, Sandstrom, and Crona 2017; Siddiki et al. 2017). Learning opportunities may suffer in homogeneous forums, which may be more apt to streamline processes to appease actors' compatible interests and overlapping belief systems. Ultimately, proclivities toward homophilic participation patterns may generate myopic forum outputs that fail to account for system interdependence (Bidwell and Ryan 2006; Mewhirter, McLaughlin, and Fischer 2019).

Our results regarding hypothesis H3 suggest that perceived importance of cross-sectoral coordination does not influence actor participation efforts. This finding complements recent work by Olivier and Berardo (2021) who draw on arguments from the risk hypothesis (Berardo and Scholz 2010) to derive somewhat different expectations regarding coordination perceptions and forum participation. However, they too find no association between actors' perceptions of salient coordination problems and their participation patterns. Such findings are especially relevant for the EGT and collaborative governance literatures, challenging the wide-spread supposition that forums serve as the primary space to resolve collective action problems (Lubell 2013; Berardo and Lubell 2019; Ansell and Gash 2008; Fischer and Leifeld 2015). If those actors "on the ground" and directly involved in decision-making are less concerned with this defining forum characteristic, then institutional modifications or different forum structural arrangements may benefit governance systems. Perhaps, actors are exploiting informal collaborative networks as conduits for knowledge/resource exchange and

solving policy issues more than forum settings. This could be due to forums simply not attracting the “right” actors or functioning suboptimally. If forums serve as “talk shops" for certain actors to reinforce their priorities or are inequitably distributing gains (another core tenet of polycentric systems: Berardo and Lubell 2019; Lubell 2004), actors may migrate to other venues or tackle problems independently. Though speculative, these contentions should be disarticulated in future studies. It is important to note that participating in forums may serve to influence actors’ beliefs concerning the significance of coordination, that is, actors participating in forums ostensibly designed to facilitate coordination may modify their beliefs dependent upon their success. If an actor is successful in a forum, they may perceive coordination as ex-post important. Empirically capturing such a dynamic is difficult and should be teased out in future studies.

Regarding hypothesis H4, we find strong evidence supporting a positive and substantial effect of organizational resources on the probability for forum participation. This is in line with previous research. It suggests that forum participation does indeed extract sufficient resources of actors to make participation a decision not lightly taken by resources-poor actors. As such, if important decision and coordination is undertaken in forums, they could constitute a discernible pathway for resource based power to materialize (Purdy 2012), not only in Swiss water governance, but in polycentric governance systems in general.

Our analysis is unique in that it includes actors who do not (but could) participate in any forums and thus avoids a potential bias due to selection on the dependent variable when studying forum participation. Complete non-participation in any forum is very common among actors in the Swiss water governance system; thus, investigating non-participation as well as participation is crucially important. Our findings that issue breadth and organizational resources are related to forum participation indeed suggest that forums may not be as inclusive and representative of the entire water governance system.

While we believe that our results provide persuasive evidence regarding the impact of actor attributes on forum participation patterns, some limitations apply. First, we have not explicitly dealt with the question of access rules to forums. Forums in our sample generally state that they are open to all actors relevant to the substantive issue the forum deals with. Still, we cannot exclude that in some cases, (informal) institutional rules of individual forums could indeed influence forum participation.

Second, we cannot say anything about how actor goals and/or intentions impact actor participation. Actors might participate in forums in order to solve problems, to push given issues on the agenda, to block decision-making, or for many other reasons (Fischer and Leifeld 2015; Fischer and Maag 2019). Results in this article only suggest that broader issue portfolios, greater resources and average policy beliefs increase forum participation, but the exact causal mechanisms behind these results need to be fleshed out in future studies.

Third, we have analysed participation in one or several forums and estimated varying effects across forums, mainly to increase the precision of our population-level model estimates. We have however not developed hypotheses on why participation could differ for different types of forums. The amount of variation across forums we observe hints toward avenues for future research, which should design studies distinguishing forums with e.g. government orientation, interest group orientation, or research orientation (Maag and Fischer 2019), in order to investigate likely causes of our observed forum-level variation.

Fourth, given that most actors don't participate in forums, and that participation seems to be biased towards specific types of actors, one could question the importance of forums for Swiss water policy, and for polycentric and collaborative governance systems more generally. On the one hand, however, we have to consider that forums might very well serve a function of aggregating the most important views of highly active and resourceful actors, and thus still provide important inputs to decision-making or implementation, even if they

might not foster equal democratic participation more than other institutions. On the other hand, especially in the consensus-oriented and federalist Swiss political system (Sciarini et al. 2015), national-level forums as included in this study are only one of several participation options for actors, besides, e.g., more regional or local forums, or formal or informal participation in policy-making and implementation in substates and municipalities that might be more relevant and accessible, especially for local actors.

Fifth, whereas our theoretical development solely considers how actor-specific features shape forum participation patterns, we do not address actor knowledge of forums to begin with: something Lubell (2013, p. 545) identifies as a potential barrier to collaborative engagement. While we do not believe that lack of knowledge should impact participation patterns in the ten forums used in our analysis (as they represent the most central forums in the system), it could well impact participation in smaller, less central/peripheral forums in the Swiss system, or in other systems that feature a much wider array of central forums. Future research should examine variation in actor knowledge about forums, and the factors that impact such variation.

Finally, while we identify a number (of potentially many) factors that impact forum participation, this is by no means an exhaustive list. Our hope is that this paper serves as a starting point for polycentrism scholars, demonstrating how extant theories can be used to identify drivers of participation. Notably, our focus on the role of actor-specific attributes excludes an examination of the role of actor and/or organizational networks (e.g., information-exchange, co-membership, and shared-personnel networks). Given the wealth of evidence demonstrating that such networks impact actor behaviour and between-actor dynamics in polycentric systems (see Bodin 2017 and Bodin et al. 2019), we anticipate that network features may hold important implications for forum selection. For instance, does network centrality in an information exchange network lead to increased forum participation

(perhaps due to a desire to co-participate with familiar alters) or decreased participation (by making it redundant)? Does co-participation in one forum impact the likelihood that two or more actors select into alternate forums? Identifying how the array (and multiplicity) of networks in a given system drive participation is an important "next step" for polycentrism scholars.

Returning to our initial reasons for studying the question of forum participation tackled in this study, we believe there is ample reason to consider forums an essential component of what makes polycentric governance systems tick. We hope our study serves as a reminder that in investigating the impact of forums, it can be as important to scrutinize the actors who do *not* participate in forums as what is going on within forums.

Notes

[1] Besides forums, many other labels are used in the relevant literature such as "boundary organizations" or "bridging organizations", if forums themselves are considered organizational actors (Carr & Wilkinson, 2005; Kowalski & Jenkins, 2015) or various combinations of "platform", "partnership", or "collaboration" with attributes such as "cross-sectoral", "multisector", "multi-stakeholder", or "collaborative".

[2] It is important to note the likelihood that other factors on the actor level link with participation efforts. While we developed our set of actor-level factors associated with forum participation based specifically on their importance to actor performance in broader polycentric governance literatures, future work should continue to theorize and test other organizational factors.

[3]While homogeneity may facilitate cooperation within a forum, it may also produce "closed group thinking" that lacks innovation or fails to account for system interdependence (Ernston et al. 2010; Crona and Bodin 2006; Koontz and Johnson 2004).

[4] The ten forums are: 1) Swiss Society for Hydrology and Limnology; 2) Swiss Society for Hydrogeology; 3) Swiss Hydrological Commission; 4) Water-Agenda 21; 5) Association of Swiss Experts for Wastewater and Water Protection; 6) Swiss Association for Water Management; 7) Swiss Water Partnership; 8) Swiss Association of the Gas and Water Domain; 9) InfraWatt – Association for the Use of Energy from Wastewater, Waste, Heating and Drinking Water; 10) Geneva Water Hub

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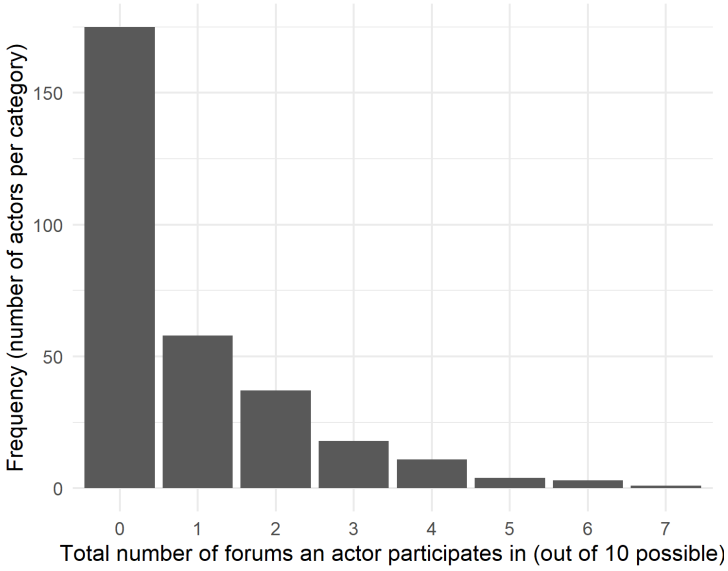

Figure 1: Distribution of number of forums organizational actors (n = 307) participate in.

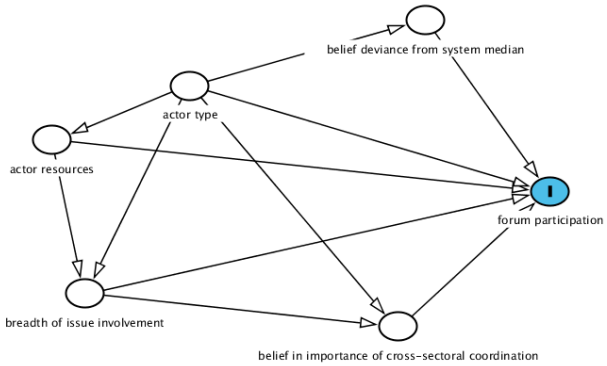

Figure 2: Directed acyclic graph, specifying causal model used to design statistical model. Created with dagitty (Textor 2016).

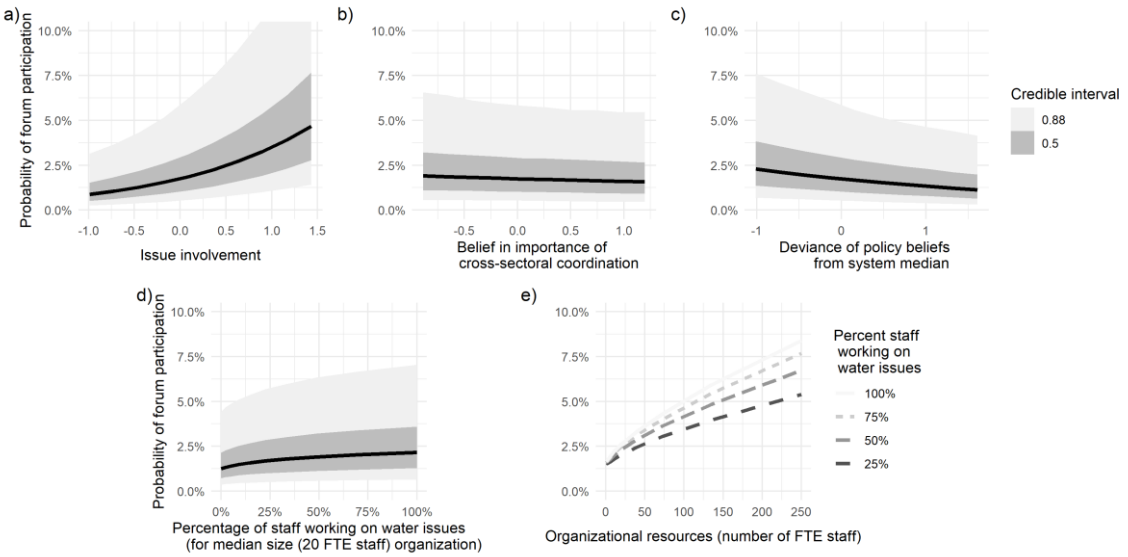

Figure 3: Marginal, population-level effects of increasing independent variables on the probability of forum participation, based on 4000 posterior draws. Black lines denote posterior mean predictions. Shaded areas indicate 50% and 88% credible intervals. In plots a), b) and c), a one unit increase amounts to a one standard deviation increase in the measure and the range of values shown amounts to 80% of the empirically observed range (with the top and bottom decile removed). In plot e), only the top decile is excluded.

Appendix

Descriptive statistics

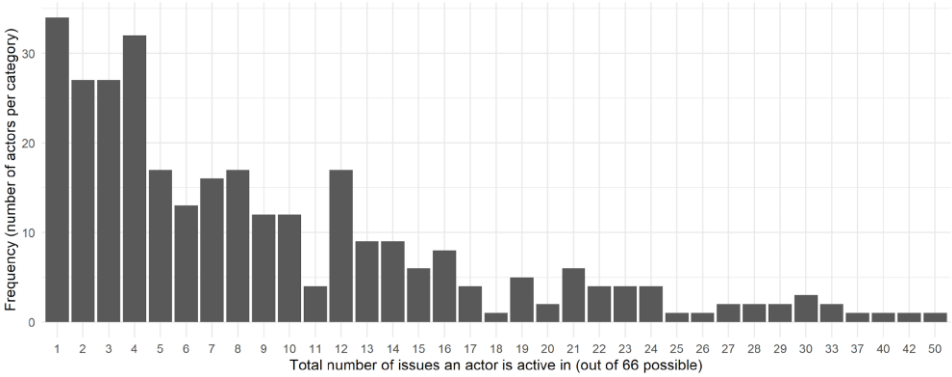

Figure A1. Breadth of issue involvement of actors (n = 307)

Table A1: Translation of policy belief survey items

Item	Original text (German)	Translation
1	Der Eintrag von Dünger in die Gewässer sollte verringert werden.	Fertilizer input into streams should be reduced.
2	Wasserkraftprojekte sollten die Landschaftsqualität nicht beeinträchtigen dürfen.	Hydropower projects should not diminish landscape quality.
3	Die Wasserkraft sollte aufgrund ihrer wirtschaftlichen Lage stärker vom Staat unterstützt werden.	Hydropower operators should be more strongly supported by the state due to their economic situation.
4	Der Erhalt von Landwirtschaftsflächen ist allgemein wichtiger als die Revitalisierung der Gewässer.	Preserving area for agriculture is generally more important than revitalizing streams.
5	Kleinwasserkraftwerke haben ein grosses Potential, zur Erreichung der Energiewende beizutragen.	Small hydropower plants have a great potential to aid in achieving the transition to a sustainable energy system.
6	Die Kantone sollten regionale Zusammenschlüsse in der Siedlungswasserwirtschaft stärker fördern.	The cantons should more strongly support regional mergers of municipal water supply structures.
7	Das Mitspracherecht der Gemeinden ist beim Bau von neuen Wasserkraftwerken von grosser Bedeutung.	It is of high importance that local municipalities have a say in hydropower construction projects.
8	Wasserbauliche Massnahmen sind zu stark durch das neue Gewässerschutzgesetz eingeschränkt.	Measures for flood protection are too strongly encumbered by the new Federal Act on the Protection of Waters.

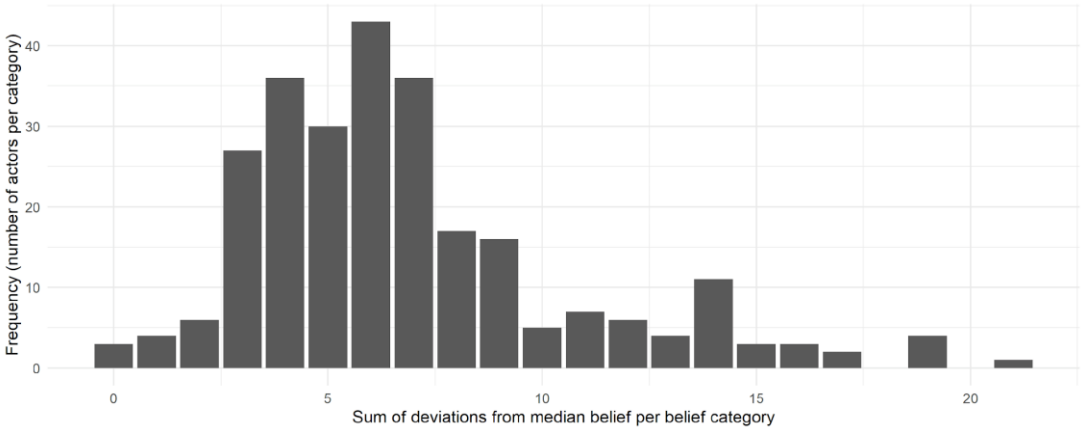

Figure A2. Deviance of policy beliefs from overall system trends of actors (n = 307)

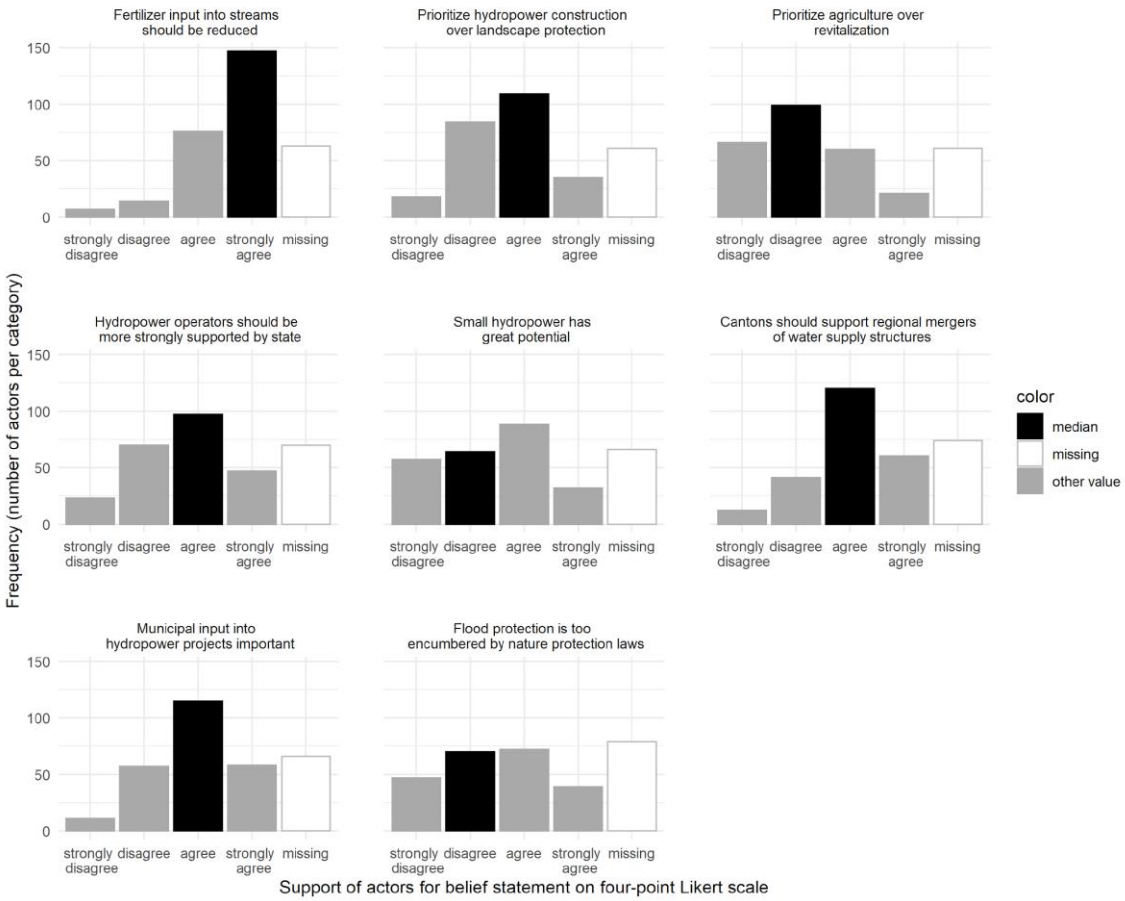

Figure A3: Distributions of beliefs of actors (n = 307) used to construct overall belief deviance variable (sum of distances from median). Titles of sub-plots are abbreviated translations of original questions asked. See table A1 for exact translations and original text.

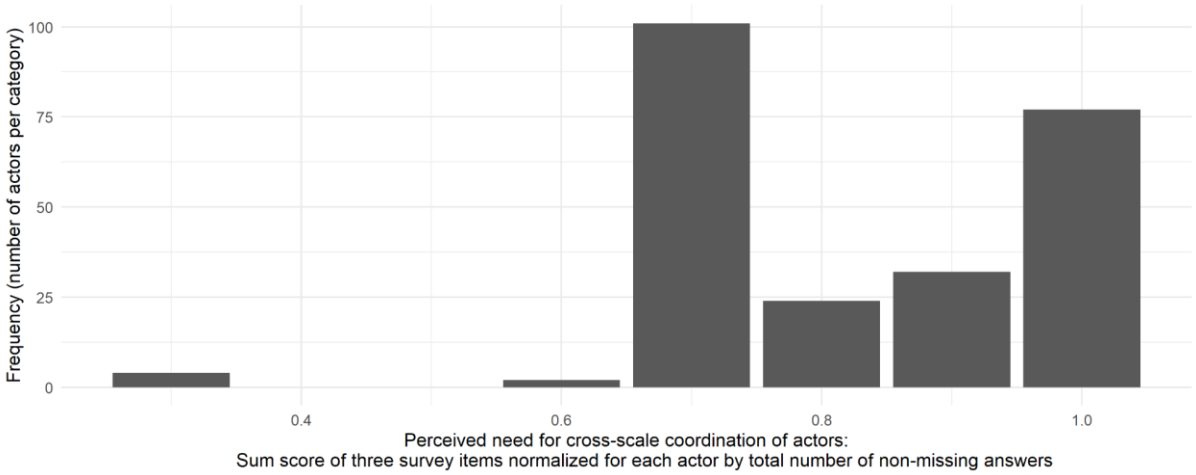

Figure A4. Distribution of aggregated beliefs about importance of cross-sectoral coordination of actors (n = 307).

Table A2: Swiss national-level water forums - overview

Water forum	***Summary of topic / mission (from website)***	***Subgroups***	***number of participants in survey sample***
Swiss Hydrological and Limnological Society	*Bundling and efficient use of expertise for the protection of waters and the use of water resources*	*-*	*17*
Swiss Hydrogeological Society	*Professional association for experts on hydrogeology from science, practice and public administration*	*-*	*6*
Swiss Hydrological Commission (CHy)	*Coordination and representation of Swiss hydrology in national and international committees and organisations*	*-*	*5*
Water Agenda 21	*Networking of actors in the Swiss water domain, identification and*	*Water Basin Management,*	*56*

	development of overarching issues	*Hydropower, River Restoration*	
Swiss Water Association (VSA)	*Professional association of experts in wastewater and water protection*	*Micropollutants, Water bodies, Wastewater Treatment, Urban Drainage, Canalization, Industry and Trade*	*63*
Swiss Society for Water Management (SWV)	*Professional association dealing with issues of hydropower, flood protection, and hydraulic engineering*	*Flood Protection and Water Management, Hydropower*	*42*
Swiss Water Partnership	*Promote a strong Swiss voice and to facilitate the water dialogue in international and development matters*		*6*
Infrawatt	*Fostering the recovering of energy from wastewater and drinking water*		*19*
Swiss Society for Gas and Water Industry (SVGW)	*Networking and knowledge diffusion for experts from industry, science and public administration*	*Water, Water Quality and Treatment, Extraction/Storage/ Distribution*	*60*
Geneva Water Hub	*Centre discussing hydropolitics for peace and security*		*1*

Causal Graph

An illustration of the directed acyclic graph (DAG) used as is shown in Figure 2 in the main text, while this appendix section further contains dagitty code (Textor 2016) to replicate the graph and outline some of the DAG's core assumptions and implications for modeling beyond the hypotheses about the effects of our main independent variables of interest and forum participation we outline in the main text.

First, we assume that there is an influence of breadth of issue involvement on an actor's belief in the importance of cross-scale coordination, because actors involved in many issues are confronted with a larger number of potential scenarios where coordination might be perceived as necessary. This has the consequence that adjusting for issue breadth is necessary in order to measure the effect of belief in cross-scale coordination, in order to close a backdoor path running through breadth of issue involvement.

Second, we assume an influence of actor type on all of our independent variables. We assume that national-level administrative actors are more likely to view cross-scale coordination as important, due to the fact that they are often formally mandated to coordinate actors from various sections of society or lower-level actor through hierarchical formal power. By contrast, private actors might have a lower likelihood to participate both in forums (at all), as well as in many forums, as governance is not their primary organizational purpose. They might be also less likely to be supportive of both coordination and network management, as this might introduce transaction costs for them. This has consequences for our models, as we need to adjust for type in order to estimate direct effects of all our independent variables.

Third, we assume, as forum participation is likely to induce transaction costs, that actors with more organization resources are more likely to participate in forums, but also

more likely to be involved in many governance issues (Mewhirter, Coleman, and Berardo 2019; Mancilla Garcia and Bodin 2019). This means that we have to adjust for actor resources to estimate the direct effect of breadth of issue involvement.

Fourth, we assume that some actor types have more resources at their disposal than others, such as higher-level administrative actors compared to local municipalities. This does however not imply any necessary adjustment, as we already adjust for type.

Consequently, given our DAG, we are able to design a single model to test the direct causal effect implied in all our hypotheses by adjusting for actor type, actor resources and including all independent variables.

Dagitty code for causal graph

The following code in dagitty (Textor 2016) syntax allows for a replication of our causal graph on dagitty.net or within R, using the dagitty R package.

```
dag {
bb="0,0,1,1"
"actor resources" [adjusted,pos="0.106,0.388"]
"actor type" [adjusted,pos="0.295,0.287"]
"belief deviance from system median" [adjusted,pos="0.616,0.166"]
"belief in importance of cross-sectoral coordination" [adjusted,pos="0.579,0.734"]
"breadth of issue involvement" [adjusted,pos="0.151,0.673"]
"forum participation" [outcome,pos="0.787,0.483"]
"actor resources" -> "breadth of issue involvement"
"actor resources" -> "forum participation"
"actor type" -> "actor resources"
"actor type" -> "belief deviance from system median"
"actor type" -> "belief in importance of cross-sectoral coordination"
"actor type" -> "breadth of issue involvement"
"actor type" -> "forum participation"
"belief deviance from system median" -> "forum participation"
"belief in importance of cross-sectoral coordination" -> "forum participation"
"breadth of issue involvement" -> "belief in importance of cross-sectoral
coordination"
"breadth of issue involvement" -> "forum participation"
}
```

Imputation

About 22% percent of belief items went unanswered (see figure A3). In cases where actors did provide answers to at least one belief item, we imputed zero in all other items. We assumed, because actors did engage with the question, that actors did not feel competent or sufficiently engaged in a policy debate to take a position on a specific belief item. In the computation of an actor's deviation from median beliefs, such zero-imputed beliefs therefore did not contribute, which aligns with the goal of the measure. We treated data as completely missing when all answers on belief items were absent (missing = 43, 14% of total). It seems plausible that missingness is in part caused by actor type and actor resources, but likely not by forum participation. Given our causal model expressed in the DAG, this would apply that imputation of missing data in the context of our model should be possible without confounding the direct effects we are interested in. As such, we impute the missing variables directly in the model (see below). This is preferable to multiple imputation beforehand, as the uncertainty in imputing is explicitly modelled, and reflected in the posterior. We apply the same principle to impute missing data for *coord* (missing = 21,8% of total), *res* (missing = 14, 5% of total) and *reswater* (missing = 9, 3% of total).

Imputation section of the model specification:

$$\nu_{bel} \sim Normal(0,2)$$

$$\nu_{coord} \sim Normal(0,2)$$

$$\nu_{res} \sim Exponential(1)$$

$$\nu_{reswater} \sim Exponential(1) + \kappa_1 res$$

Additional modeling results

Population-level coefficient plots

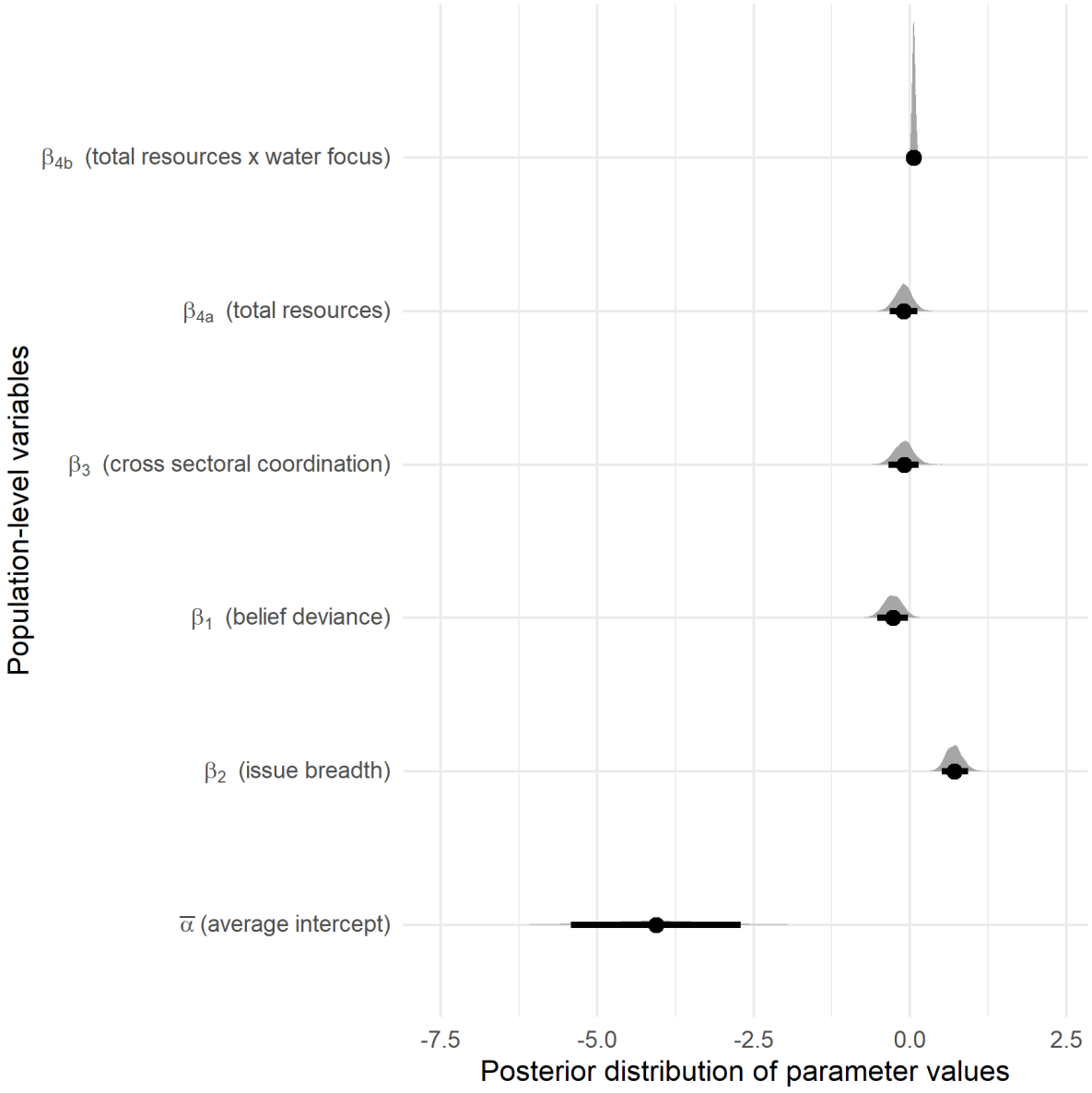

Figure A5. Posterior distributions of population-level model parameters.

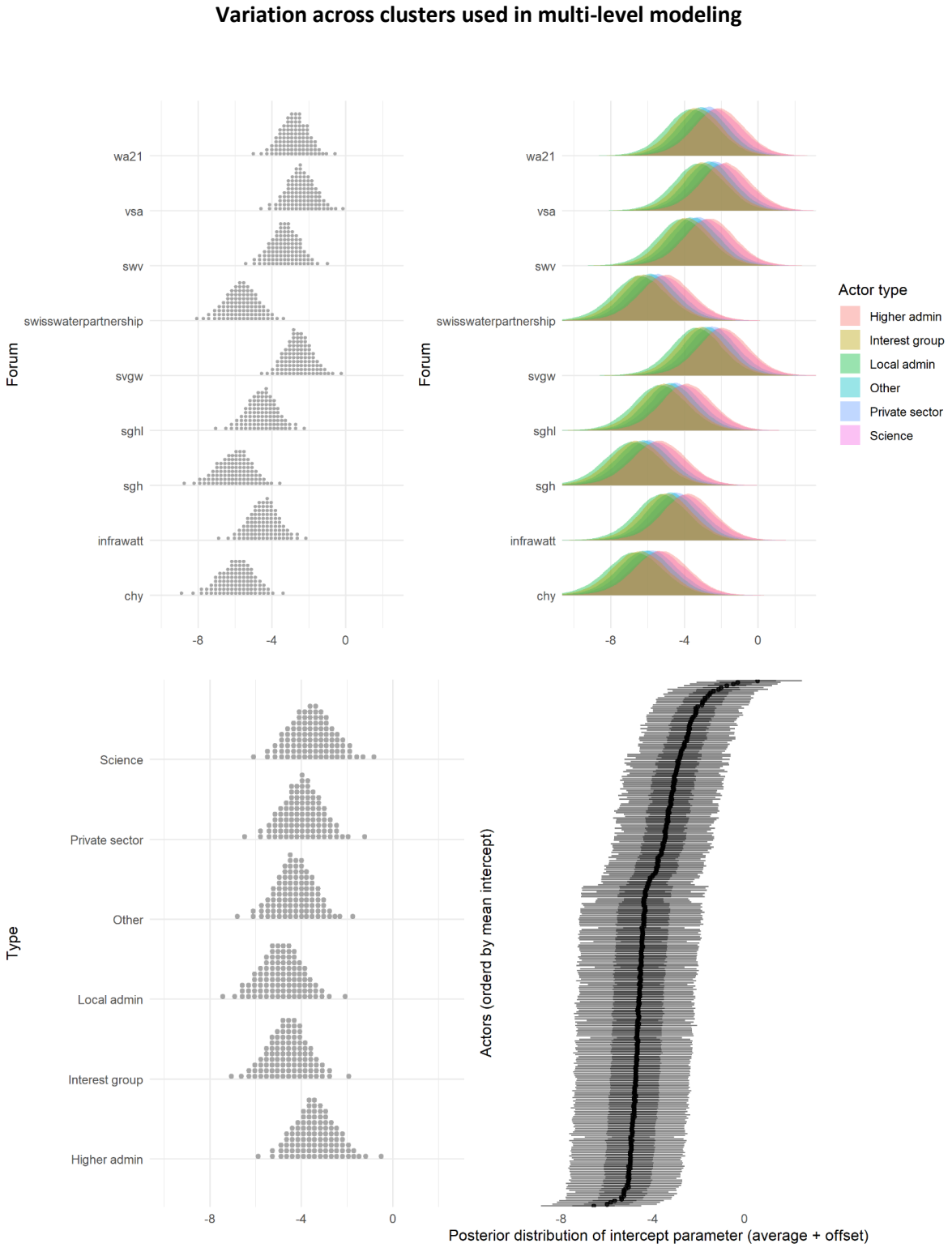

Figure A6. Posterior distributions of varying intercepts for all clusters modelled.