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On the Acoustics of Policy Learning : Can Co-Participation in Policy Forums Break Up Echo Chambers?

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8

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20

21 **Abstract**

22 Overcoming common-pool resource dilemmas requires learning across different sectors of
23 society. However, policy actors frequently entrench themselves in so-called echo chambers by
24 preferring to rely on information from those whose policy beliefs resemble their own. Policy
25 forums can reduce the limiting effects of echo chambers by encouraging actors with diverse
26 knowledge bases to exchange information and learn from one another. This paper applies

27 exponential random graph models to network data from the South African tree plantation
28 policy domain to investigate how belief homophily, reputational influence, and forum co-
29 participation shape information exchange behaviour. Results show that echo chambers are
30 important determinants of information exchange ties and that reputational influence is likely to
31 “deepen” the echo. Results also show that the more forums that a pair of actors co-participate
32 in, the more likely they are to exchange information. This applies to information exchange
33 generally, as well as information exchange with trusted partners. Findings indicate that forums
34 enable both cognitive learning (as knowledge gains) and relational learning (as improved
35 relations). Nonetheless, when echo chambers are strong, and many forums are polarised,
36 then forum co-participation may not break up echo chambers.

37

38 **Keywords**

39 Adaptive governance; Forest landscape restoration; Policy forums; Policy networks; Social
40 learning; South Africa

41

42 **1. Introduction**

43 Policy-makers and practitioners at all levels struggle with how to address the parallel social
44 and ecological pressures facing our societies and the common-pool resources that we depend
45 on, especially where economic interests collide with environmental and social concerns
46 (Biermann et al. 2012; Song 2018). In South Africa, examples of such common-pool
47 resources are arable land, potable water, and biological diversity, all of which are affected by
48 decisions over the development of fast-growing plantations of alien trees in large-scale
49 monocultures (Bennett and Kruger 2013; Witt 2014). The tree plantation sector and the
50 related policy network is characterised by controversies across a multitude of actors and their
51 diverse interests, and the underlying power relations, beliefs, and knowledge bases.
52 Determining which policy instruments to select, if any, in response to pressures on common-

53 pool resources, requires policy actors to exchange information and to learn from one another,
54 either to realise major policy change, or to strategically maintain the current status quo (Ansell
55 and Gash 2008; Gerlak et al. 2018).

56

57 When actors gather and disseminate information, they gain access to knowledge, can
58 navigate the credibility of the information in circulation, exert influence, pool critical resources,
59 and build coalitions to improve the prospect of a favourable policy outcome (Leifeld and
60 Schneider 2012). Realising the benefits and avoiding the costs associated with creating
61 contacts (Feiock 2013), however, can lead to the formation of “echo chambers” – a tendency
62 for policy actors to rely on information from those with beliefs that resemble and reinforce their
63 own, while neglecting sources of information that contest or undermine them (Jasny et al.
64 2018; Jasny, Waggle, and Fisher 2015). Echo chambers are problematic because their
65 existence may prevent actors from questioning embedded rules, roles, practices,
66 assumptions, taboos, and beliefs, which is necessary for recognising and solving problems
67 (Koontz et al. 2015). On the other hand, policy forums (Fischer and Leifeld 2015), alternatively
68 described as working groups (Klijn, Koppenjan, and Termeer 1995), advisory groups
69 (Agrawala 1999), bridging organisations (Berkes 2009), stakeholder roundtables (Ponte
70 2014), and collaborative institutions (Lubell 2004), can enable learning by inviting policy actors
71 to step outside their echo chambers. Yet, diversity rarely comes without inefficiencies and
72 power asymmetries, both of which can influence the likelihood that a forum would break up an
73 echo chamber (Fischer and Maag 2019; Reed et al. 2018).

74

75 In this paper, we ask if participation in policy forums can break up echo chambers in the South
76 African tree plantation policy network – where powerful sectoral economic interests are
77 present and there is a need to adapt to environmental change and create economic

78 opportunities for a growing population while the legacy of apartheid and social inequalities
79 remains still tangible (Biggs et al. 2015; Bishop 2006; Reid and Vogel 2006). Using
80 Exponential Random Graph Models (ERGMs), we investigate if actors in this network tend to
81 exchange information (and build trust accordingly) with i) those with policy beliefs similar to
82 their own (i.e. echo chamber effect), ii) those that have a reputation of being influential (i.e.
83 resource pooling effect), or iii) those that they encounter in forums. By testing well-established
84 hypotheses about policy actors' behaviour in a novel context and in relationship to different
85 forms of learning, we can explore their nuances in our empirical case and contribute to the
86 wider literature on policy learning.

87

88 This paper is organised as follows. First, we present the arguments from which we develop
89 our three hypotheses. Second, we outline our empirical case, data, and methods. Third, we
90 describe the actors' participation in forums and present the ERGM results. Finally, we discuss
91 our results and the implications of our findings for our empirical case, theory, and future
92 research.

93

94 **2. Theoretical framework and hypotheses**

95 Policy to address common-pool resource dilemmas is increasingly crafted in polycentric,
96 complex institutional systems – that is, collections of actors, resources, and formal rule-based
97 institutions under which actors order their informal interactions to attain various policy goals
98 (Berardo and Lubell 2019). Networks, in turn, offer a useful lens for their analysis (Bodin et al.
99 2019; Scott and Ulibarri 2019).

100

101 The diversity of policy institutions embedded in complex institutional systems lays the
102 foundations for policy learning (Henry 2018; Ostrom 2005). Policy learning, meaning the

103 acquisition, translation, and dissemination of information among actors with diverse bases of
104 knowledge (Heikkila and Gerlak 2013), encompasses the cognitive and social dynamics that
105 help actors to challenge those institutions. Here, we divide such dynamics into cognitive and
106 relational learning. Cognitive learning refers to knowledge gains that occur through the
107 acquisition or restructuring of knowledge and any consequent changes in perspectives.
108 Relational learning, on the other hand, refers to processes that enable and lead to
109 improvements in the relations between actors (Koontz 2014). Information exchange allows
110 cognitive learning to take place when actors interact with one another by sharing diverse
111 perspectives and experiences, as well as co-producing knowledge that is relational and
112 collectively oriented (Muro and Jeffrey 2008; Schusler, Decker, and Pfeffer 2003). This
113 process includes an emergent collective property through group interactions that fosters
114 relational learning through consensus, commitment, and trust accumulation (Ison, Blackmore,
115 and Iaquinio 2013). Both are potential outcomes of institutional arrangements that introduce
116 actors to new ideas and enable them to engage in deliberation with knowledgeable others
117 from different backgrounds (Siddiki, Kim, and Leach 2017).

118
119 Loci of such learning can be policy forums. Policy actors can often choose which, if any,
120 forums they wish to attend, which they do by weighing up the advantages (e.g. learning) and
121 disadvantages (e.g. time) of participation (Feiock 2013; North 1990). The reach and longevity
122 of each forum, however, conditions the diversity and engagement of participants. In this
123 paper, “forums” serve as an overarching concept capturing all kinds of events or venues that
124 promote co-ordination among policy actors across private, public, and social sectors of society
125 (Maag and Fischer 2018; Wagner and Ylä-Anttila 2018).

126

127 However, one must not mistake learning for its possible outcomes. The same outcomes can
128 be achieved through other mechanisms and learning can occur in the absence of any salient
129 outcome (Reed et al. 2010). Rather, learning moulds the institutions to “fit” the context in
130 which they exist (Lebel et al. 2013). It remains unclear how actors learn from one another and
131 how does learning occur in different policy contexts (Moyson and Scholten 2018). Given that
132 information exchange is instrumental for achieving any degree of policy change as an
133 outcome from learning, we present three hypotheses regarding policy actors’ information
134 exchange behaviour: i) belief homophily; ii) reputational influence; and iii) co-participation in
135 policy forums.

136

137 Empirical investigations across multiple policy contexts have consistently found that policy
138 actors with similar beliefs tend to form relational ties (e.g. Henry, Lubell, and McCoy 2011;
139 Ingold and Fischer 2014; Matti and Sandström 2013). Following several contributions to the
140 literature, we refer to this tendency as belief homophily (Henry, Lubell, and McCoy 2011). The
141 idea that belief homophily breeds connections in policy networks is a special case of the more
142 general notion of “homophily” – the well-documented selection bias that drives human beings
143 to limit their social worlds to those who are similar in one way or another (Goodreau, Kitts, and
144 Morris 2009; McPherson, Smith-Lovin, and Cook 2001).

145

146 The policy beliefs held by actors in a geographic and substantive policy context can be highly
147 resistant to change, even in the face of contradictory evidence. In line with the Advocacy
148 Coalition Framework (ACF) (Jenkins-Smith et al. 2014), we attribute this resistance to biased
149 assimilation, a cognitive bias which causes actors to systematically chase information from
150 sources that support their prior beliefs (Dandekar, Goel, and Lee 2013; Lord, Ross, and
151 Lepper 1979). When actors fail to interpret information in the same way it may breed distrust

152 and erode co-ordination efforts (Leach and Sabatier 2005). In information exchange networks,
153 biased assimilation can lead to actors forming echo chambers (Jasny, Waggle, and Fisher
154 2015), which, perhaps unlike coalitions founded on more intensive forms of co-ordination, can
155 relatively rapidly reorganise around beliefs concerning salient policy instruments (Jasny et al.
156 2018).

157

158 Working with like-minded actors who share the same strategies is advantageous and often
159 instrumental for turning policy beliefs into actual policy (Baumgartner and Jones 1991; König
160 and Bräuninger 1998). In other words, communicating with those that think alike is likely to
161 carry the highest utility. Consequently, communication occurs inside echo chambers rather
162 than between them. From another perspective, but in line with the learning component of the
163 ACF, actors might well be willing to exchange information with those that they may disagree to
164 convince them of their own ideals and optimal policy design (Sabatier and Jenkins-Smith
165 1993).

166

167 The political and economic implications of interventions that would effectively address the
168 environmental and societal problems in South Africa might encourage those in an influential
169 position in society to defend their prior attitudes and actively neglect incongruent arguments
170 without having to recognise the full scale and implications of the problems. However, those in
171 favour of radical interventions to change the status quo might also ignore those with
172 information that would discredit the seriousness of the problem, perhaps perceiving such
173 information to be offensive. It can be difficult for policy actors to admit that they are wrong
174 (Leach et al. 2014). We set out our first hypothesis concerning the role of belief homophily in
175 shaping information exchange behaviour:

176

177 *H1: Policy actors tend to exchange information with those with policy beliefs that are more*
178 *similar to their own*

179

180 Scholars informed by Resource Dependence Theory (RDT) have challenged the assumption
181 that belief homophily is the most significant factor that causes policy actors to come together.
182 The RDT builds on a more general notion of organisational resources determining co-
183 ordination among organisations (Pfeffer and Salancik 1978). When applied in the policy
184 studies literature, the RDT has been used to argue that no single actor possesses enough
185 resources to influence policy alone, and that this causes actors to pool resources to control or
186 absorb uncertainty (Stokman and Berveling 1998; Weible 2005). Forming a relationship with
187 influential actors that have access to or control over critical resources (e.g. finances,
188 intelligence, personnel, and technology) is likely to provide the most utility.

189

190 RDT, however, does not necessarily compete with the belief homophily hypothesis. For
191 example, Henry (2011) finds that co-ordination on the basis of influence attribution is
192 conditional on belief homophily. Direct co-ordination with influential actors can be costly in the
193 sense that one must compete for attention with many others. Rendering additional benefits,
194 that burden can be reduced by turning to like-minded influential actors (D'Souza et al. 2007).
195 When led by actors that are instrumental to policy success, the benefits of working with others
196 can be substantial (Hojnacki 1997). From this perspective, the resource pooling effect is more
197 likely to "deepen" the echo in the chamber, complementing, rather than contesting, the role of
198 beliefs in shaping actors' information exchange behaviour. Weible (2005), however, offers
199 another viewpoint, suggesting that when influential actors oversee critical resources, they
200 implicitly force others to co-ordinate with them regardless of their policy beliefs.

201

202 Reputational influence comprises an important sign of quality. It provides a subjective, yet
203 encompassing view of influence by uncovering parts of the “hidden” face of power in politics
204 (Bachrach and Baratz 1962). These include the ability to control critical resources and exploit
205 an informal, but extensive structural position in the network (Fischer and Sciarini 2015).
206 Reputational influence determines how others understand the different policy actors and their
207 roles, which directly feeds to their ability to forge policy outcomes (Ingold and Leifeld 2016).
208 Influential actors, in turn, have considerable latitude in choosing their channels (and content)
209 of communication (Leifeld and Schneider 2012; Moeliono et al. 2014). We rephrase Weible's
210 (2005) original hypothesis as follows:

211

212 *H2: Policy actors tend to exchange information with those that have a reputation of being*
213 *especially influential*

214

215 Policy forums as institutionalised forms of exchange can enable policy learning by allowing
216 participants to deliberate and circulate information with actors beyond their regular co-
217 operation networks (Fischer and Leifeld 2015). In complex policy or managerial environments,
218 convening diverse sets of actors in forums can bring resources and expertise together to
219 increase understanding of an issue and related technicalities (Maggioni, Nelson, and
220 Mazmanian 2012). They can also foster more appropriate approaches that acknowledge how
221 policies affect different stakeholders (Levesque et al. 2017).

222

223 In reality, the picture drawn of forums that deal with common-pool resource dilemmas
224 affecting many actors in different ways is often less rosy. Instead of seeking to learn from the
225 variety of viewpoints to which an actor is exposed, they may participate in a variety of forums
226 to spread influence and achieve their goals. Decisions made (or awaited to be made) in one

227 forum can hold back those to be made in other forums (Mewhirter and Berardo 2019).
228 Participants may opt to participate in forums that jointly provide the highest utility, dismissing
229 those that they perceive as an inefficient use of resources (Scott and Thomas 2015; Smaldino
230 and Lubell 2011). A biased representation of actors with selfish or opportunistic motivations
231 can impede learning by bringing forward selective information and narrowing down the range
232 of policy options (Lockie 2013; McAllister, McCrea, and Lubell 2014). High costs of
233 participation can reinforce the influence of already resourceful actors, who may be
234 advantaged by creating or destroying forums, which increases the chances that will obtain
235 their preferred distribution of costs and benefits (Gallemore et al. 2015).

236

237 Nevertheless, by participating in forums actors can reduce the transaction costs associated
238 with voicing concerns, expressing preferences, bargaining for contractual terms, and learning
239 (North 1990). The costs of collecting information about the nature of a dilemma, as well as the
240 actors and policy instruments at play, are also reduced by attending forums. The expectation
241 is that the benefits of participation outweigh its costs (Feiock 2013).

242

243 Recent research on the role of forum co-participation in explaining actors' co-ordination efforts
244 has yielded inconsistent findings. Wagner and Ylä-Anttila (2018), for example, find that actors'
245 in the Irish climate policy network did not source policy advice from those that they encounter
246 at forums. Others have found that when actors participate in more of the same forums that
247 they are more likely to co-operate, co-implement policy, or engage to informal consultations
248 (Fischer and Sciarini 2016; Hamilton and Lubell 2018; Scott and Thomas 2015). However, the
249 odds of participants being exposed to new ideas and information in policy forums, which result
250 in new relations, can be high (Siddiki, Kim, and Leach 2017). Those that co-participate in
251 multiple forums are more likely to be aware of each other's existence and the types of

252 information that they possess, increasing the odds of them forging a relationship. Based on
253 these arguments, we formulate our last hypothesis as follows:

254

255 *H3: The likelihood that policy actors exchange information increases as they participate in*
256 *more of the same policy forums*

257

258 Policy dilemmas tend to involve uncertainty over information, and trust in the reliability and
259 accuracy of information is essential for policy learning (Henry 2009; Sabatier and Jenkins-
260 Smith 1993). Importantly, beliefs may influence trust in information and, by proxy, trust in
261 actions. The credibility of information can be hard for most actors to evaluate and they are
262 thus likely to read information on the basis of how well it is in line with their own beliefs, and
263 build trust accordingly (Henry and Dietz 2011, 2012). The psychological safety brought about
264 by trust, in turn, enables the willing contribution of one's ideas and actions to collective effort
265 (Edmondson 2004).

266

267 For this reason, we test whether the behavioural dynamics of information exchange differ from
268 those of information exchange with trusted partners. Information exchange is thought to be a
269 less intensive, and less risky, form of an interaction than building and maintaining trust.

270 Moreover, and unlike information exchange, any institutional rule cannot mandate a climate of
271 trust. We expect to see stronger positive effects of belief homophily and reputational influence
272 on the latter, and forum co-participation on the former. In other words, we expect to see forum
273 co-participation as a function of cognitive rather than relational learning. This way, we
274 contribute to a more nuanced understanding of these hypotheses across policy contexts, and
275 in the context of different learning processes.

276

277 **3. Case, data and methods**

278 **3.1 Case**

279 South Africa is a semi-arid country, where the mountainous catchments receive most of the
280 rainfall responsible for sustaining the perennial streamflow (Dye and Versfeld 2007). The early
281 colonial governments, followed by national governments since 1910, encouraged and
282 eventually embarked on large-scale planting of alien trees to supply local uses (Kruger and
283 Bennett 2013). However, the trees that appeared in the upstream soon led to conflicts with
284 downstream water users. The debate went on until the government started regulating the
285 extent of plantations in 1972 based on their effects on streamflow estimated from a series of
286 controlled catchment experiments. The National Water Act of 1998 revised this piece of
287 regulation and made the planting of alien trees, some of which encroach riparian areas and
288 displace native species, a subject to complex licensing and fees (van Wilgen and Richardson
289 2014; Witt 2014). Since, the plantation extent has shrunk from 1.53 million hectares in mid-
290 1990s to 1.22 million hectares in 2016 due to land conversions and various damage agents.
291 South African climate projections suggest that water stress will increase and that this will
292 reduce the already small area available for tree planting (DEA 2018; Warburton and Schulze
293 2008).

294
295 In a country with an unemployment rate floating around 25% and half of a growing population
296 living in poverty (DNT 2016), tree plantations support an economic sector with contributions to
297 foreign trade balance and the creation of basic jobs in the rural areas. The pine and eucalypt
298 plantations, the majority of which are under private ownership, concentrate in the five
299 provinces along the eastern seaboard (Figure 1).

300

301 *Figure 1. Tree plantations in South Africa (own elaboration based on DEA, 2014).*

302

303 Since the end of apartheid, South Africa has been going through a land reform process under
304 the Restitution of Land Rights Act of 1994. Those who were either forcefully relocated or
305 forced to become labour tenants under the racially discriminatory Land Act of 1913 are
306 entitled to a restitution of that property or an equitable redress (Cousins 2009). Although the
307 currently valid window for claims closed in 1998, progress has been slow due to some lands
308 having been acquired legally somewhere between 1913 and the present. The government
309 has redistributed its own lands, while often remaining a shareholder on behalf of the actual
310 beneficiaries in order to maintain production, pay dividends to beneficiaries, and to enable
311 knowledge transfer (Dlomo and Pitcher 2005). Land reform was designed to become a means
312 of wider decolonisation of South Africa, but critics argue that the approach taken reproduces
313 the paternalistic relations of the apartheid and contributes to elite capture (Kepe and Hall
314 2018). Around 40% of the private plantation land and 70% of the plantation land that still
315 belongs to the government remain under claim (Chirwa et al. 2015).

316

317 The overarching objective in South Africa is to achieve large-scale poverty alleviation without
318 undermining the ability of natural ecosystems to support the well-being of future (and current)
319 generations (Biggs et al. 2015). Contention over the objectives and solutions, as well as the
320 scientific validity of policies, however, has become a distinctive feature of the national tree
321 plantation policy domain (Bennett and Kruger 2013; Dye 2013; Tewari 2001; van Wilgen and
322 Richardson 2012; Witt 2014). While information asymmetries reportedly continue to limit the
323 previously disadvantaged groups' agency and trust in formal institutions (Goldin 2010), there
324 are many other sectors of society that share an interest in the scarce common-pool resources
325 of South Africa, including the government, private sector, labour unions, and civil society.
326 There are also several policy forums at different scales of operation and debates about

327 suitable policy instruments, including indicative land use zoning to expand tree plantations in
328 the provinces of KwaZulu-Natal and Eastern Cape.

329

330 **3.2 Data**

331 We collected data in South Africa in 2017 using semi-structured face-to-face interviews with
332 55 organisations affected by or interested in tree plantations as a specific form of land use.
333 Because organisations are in the vanguard of modern politics and form the context through
334 which learning occurs (Knoke et al. 1996), we chose to focus on the learning of organisations
335 rather than individuals. We identified the focal organisations by drafting a list, a roster, of
336 organisations based on publicly available information, which three independent experts with a
337 deep knowledge of the given policy context then reviewed. Based on their comments, the
338 roster was refined and increased to 59 organisations. Supplementary information (SI) includes
339 the final roster in its entirety. Four organisations either declined to be interviewed or could not
340 participate due to recent changes in their administration. We omitted these four organisations
341 from our analysis.

342

343 We identified and contacted the representatives of the 59 organisations through various
344 means, including contact directories and contact information for specific individuals received
345 from other representatives. We sought representatives that were in an executive position in
346 each organisation (e.g. executive and deputy directors, senior advisors, professors and
347 principal investigators, national and provincial co-ordinators, and government commissioners)
348 to ensure that the views articulated were those of the organisations, rather than the individual.
349 Representatives were assured their titles and names would remain confidential, and it was
350 explained to them how the data would be treated once the project was complete. We also

351 asked for the consent of all representatives, without which we would not have conducted the
352 interview. All interviews were in English.

353

354 We collected data on policy beliefs by asking the representatives to set out their preferred
355 vision for the future of tree plantations in South Africa and to elaborate on their realistic
356 expectations. We then asked them to cite any specific challenges that they saw as barriers to
357 realising this vision. By using open-ended questions, we sought to understand the tensions
358 between the multitude of framings and meanings attached to ideas and concepts relevant to
359 the policy context (Hajer 1995). We also asked specific questions about the consequences
360 and feasibility of indicative land use zoning in Eastern Cape, as well as on the efficiency,
361 equity and effectiveness of various policies and decision-making processes in the domain.
362 Hence, each organisation was encouraged and inclined to bring forward the issues most
363 salient to them at the time of data collection.

364

365 All interviews were transcribed before coding them using the discourse network analysis
366 (DNA) software (Leifeld 2010). DNA combines qualitative content analysis with social network
367 analysis to create relational data by connecting actors into networks based on their agreement
368 or disagreement with specific concepts (Leifeld 2017). In our case, these concepts are
369 categories of policy beliefs. The DNA software, which relies on researcher expertise and their
370 informed judgment, involves analysing the statements made by organisations and creating
371 links between the two. Organisations that express a common stance for or against a belief
372 category form a network tie. The more beliefs that a pair of actors share, the deeper the
373 connection between the two.

374

375 In total, we extracted 656 different statements from the interviews with the 55 organisations.
376 These were coded using 40 different belief categories. For this study, we focus on 12 beliefs,
377 including stances for and against (as separate categories) three general policy beliefs and
378 three specific policy instruments. Statements that fall under these 12 belief categories
379 represent 33% of all statements made. We chose these categories because a large share of
380 actors made statements either in favour or against them, meaning that they are the most
381 salient issues to the actors in the network. In addition, patterns of co-ordination often form on
382 the basis of more general empirical or normative policy beliefs (Jenkins-Smith et al. 2014), but
383 sometimes also on the basis of beliefs concerning specific policy instruments alone (Jasny et
384 al. 2018; Leifeld 2013).

385

386 The general policy beliefs concern:

387

- 388 i. the validity and role of environmental regulation in the policy domain;
- 389 ii. the balance of social costs and benefits of tree plantations and associated industrial
390 activities; and
- 391 iii. the conditionality of using land reform as a means of an equitable decolonisation in South
392 Africa.

393

394 The policy instruments' belief categories concern:

395

- 396 i. the role of voluntary certification to sustainability standards developed by multi-stakeholder
397 initiatives;
- 398 ii. multi-functional and locally controlled management of tree plantations; and
- 399 iii. the consequences of the indicative zoning of Eastern Cape for tree plantations.

400

401 We also collected relational data during the interviews by presenting the roster of network
402 actors to the representatives of each organisation and by asking them to indicate which actors
403 they recognised as information exchange partners. We controlled for the voluntary nature of
404 information exchange by allowing the representatives to tick an “only when necessary” option.
405 We also asked them to indicate which actors they considered to be especially influential, and
406 to indicate which actors they co-operated with by exchanging funds, resources, or in any other
407 way, such as collective bargaining. In addition, we asked them to rank how highly they trusted
408 those organisations that they identified as information exchange partners on a five-point scale
409 from zero to complete. The cut-off point for past interactions was set at the last three years.
410 We collected data on organisations’ participation in twelve policy forums identified through an
411 analysis of scientific and grey literature, policy documents, and websites, although the
412 interview data complemented these data (see SI).

413

414 **3.3 Methods and variables**

415 We test our three hypotheses by fitting a series of Exponential Random Graph Models
416 (ERGMs) to our network data using the statnet package for the R programming language
417 (Goodreau et al. 2008; Handcock et al. 2003). ERGMs allow us to investigate multiple
418 theoretical hypotheses about network dynamics simultaneously and to understand how they
419 interact to produce an observed network (Cranmer and Desmarais 2011). In other words, they
420 allow us to determine, with some confidence, the factors associated with the formation of
421 information exchange ties between actors (and build trust accordingly).

422

423 ERGMs allow for statistical inference on relational network data, which by definition are non-
424 independent. Generalised Linear Models (GLMs) are unable to account for this non-

425 independence and would therefore erroneously attribute explanatory power to exogenous
426 factors: probability values of exogenous factors would turn out being too optimistic, standard
427 errors too small, and error terms would be correlated across observations (Cranmer and
428 Desmarais 2011). Non-independence implies that the probability of observing a given
429 configuration of ties and nodes might depend upon the structural attributes of the network.
430 ERGMs test if the observed network configuration is explainable by the set of network
431 statistics and covariates included in a model, with the probability of these being present in a
432 network expressed in terms of parameter estimates and their standard errors. However, when
433 testing causal hypotheses of social behaviour using stochastic ERGMs and cross-sectional
434 data, the method is limited to identifying characteristic signatures of an evolutionary trajectory
435 and cannot always rule out local social processes that generate dyadic relationships and
436 depend on the local social environment (Robins et al. 2007).

437

438 Our first dependent variable, the information exchange network, corresponds to a binary
439 adjacency matrix, in which the rows and columns represent the 55 organisations in the
440 network, with the presence or absence of information ties marked by one or zero, respectively.
441 The ties are asymmetric and self-loops are not possible since organisations cannot exchange
442 information with themselves. Although the network does not contain information about which
443 direction each actor sends information, its directedness indicates which actors identified
444 others as their information exchange partners. We investigate the trust accumulation aspect of
445 relational learning using our second dependent variable. We construct this variable by taking
446 the intersection of high trust (four or five on our five-point scale) and voluntary information
447 exchange, resulting in a directed and binary adjacency matrix that represents a trusted
448 information exchange network.

449

450 We test our first hypothesis on “belief homophily” using a distance matrix that quantifies the
451 similarity in the beliefs of each pair of actors. We first convert the original output from the DNA
452 software, a 55x12 organisation-belief matrix (opposing stances as separate categories) into a
453 55x6 matrix, where we code stances for (or agreement) or against (or disagreement) each of
454 the six beliefs as +1 (for), 0 (neutrality), or -1 (against). We use this matrix to construct a
455 dissimilarity matrix containing the Manhattan distance between the beliefs of each pair of
456 actors in the network (Cranmer et al. 2017). By subtracting each dissimilarity value from the
457 maximum dissimilarity value, we receive a similarity matrix that we use to operationalise belief
458 homophily in our model. This matrix is equivalent to an undirected and weighted network, with
459 larger distances between pairs of actors implying more similar beliefs.

460

461 We include two endogenous terms to model the existence of network structures that capture
462 information exchange dynamics indicative of echo chambers. The Geometrically Weighted
463 Edge-wise Shared Partner (“GWESP”) term models the tendency for actors in networks to
464 close triads, capturing how frequently two directly linked actors are simultaneously indirectly
465 linked to one another through a third actor (Hunter 2007). The Geometrically Weighted Dyad-
466 wise Shared Partner (“GWDSP”) term captures the presence of configurations where actor i
467 and actor j are both linked to actor k , regardless of whether i and j are linked to one another.
468 Echo chamber effects are present in a network when actors have a tendency to close triads
469 and where behaviour that would leave triads open is unlikely to occur.

470

471 We test our second hypothesis on “reputational influence” using a variable that we construct
472 by summing up the influence judgments that each actor passively received from the other
473 actors in the network (Fischer and Sciarini 2015). Actors with higher scores have more
474 reputational influence. There is a risk, however, that our representatives employed different

475 criteria to form their judgements, navigating a range of cues. They could have misperceived
476 the influence of others or used the subjective measure instrumentally to boost their own
477 influence. We will thus control for the institutional determinants of influence attribution by
478 including an “institutional influence” variable to account for the ties incoming to government
479 departments with formal decision-making authority (König and Bräuninger 1998). This is an
480 important control term in the South African context, where the same tripartite alliance has
481 retained its absolute majority of the seats in legislature since 1994.

482

483 We test our third hypothesis on “forum co-participation” by converting the data on actors’
484 participation in the twelve policy forums into an undirected co-participation matrix. Each cell in
485 the matrix includes the count of the number of times that two actors participated in forums
486 together. We include a “forums participated” variable to control for the number of forums that
487 each actor participated in. This allows us to distinguish between information exchange ties
488 that are formed by actors that have a greater propensity to participate in forums from those
489 that are formed between pairs of actors that participated in the same forums.

490

491 We add several control variables that capture or represent relationships frequently observed
492 in policy networks. The “edges” term is included to account for the propensity of actors to
493 report their information exchange behaviour in the first place, and is similar to the intercept in a
494 linear regression. We include a “reciprocity” term to model the tendency for actors to
495 reciprocate recognition as an information exchange partner. We control for the tendency for
496 actors to exchange information with those with which they co-operate by including a binary
497 adjacency matrix of the co-operation network (“co-operation”). Finally, we include the
498 Geometrically Weighted In-degree (“GWI”) term to control for the presence of preferential
499 attachment. If actors establish ties preferentially to more popular actors, the resulting

500 distribution of the number of ties that actors share with others are geometrically discounted
501 and summed to the statistic (Barabási and Albert 1999; Cranmer et al. 2017).

502

503 **4. Results**

504 ***4.1 Participation in forums***

505 Before turning to our ERGM results, we provide a descriptive analysis of the forums data and
506 of the beliefs of those that participated in the forums. Figure 2 describes the policy beliefs
507 raised in the interviews and over which the actors disagree. These include stances for and
508 against the general policy beliefs and for and against the three specific policy instruments
509 beliefs. The three general policy beliefs seem more divisive than the beliefs concerning policy
510 instruments, which are supported and resisted by less uniform assemblages of organisations.

511

512 *Figure 2. Polarisation over salient policy beliefs by actor type.*

513

514 In the eight policy forums with the most participants, actors with beliefs that span nearly the full
515 breadth of all the beliefs expressed have many opportunities to encounter one another. In
516 Figure 3, the x-axis shows the eight forums with most participants. The y-axis refers to the
517 normalised belief distance between each pair of actors, and every point on the graph refers to
518 a pair of actors that participated in each forum. Points at the bottom of the graph refer to pairs
519 of actors with more dissimilar beliefs, while points towards the top refer to pairs of actors with
520 more similar beliefs. Table 1 provides descriptive information about the most popular forums.

521

522 *Figure 3. Normalised belief distance between pairs of actors in the most popular forums (FSS:*
523 *Forest Science Symposium; TPCP: Tree Protection Co-operative Programme; FSCC: Forest*
524 *Sector Charter Council; BDWG: Baboon Damage Working Group; Stream Flow Reduction*

525 *Activity License Application Advisory Committee KwaZulu-Natal; Stream Flow Reduction*
526 *Activity License Application Advisory Committee Mpumalanga; National Forest Research*
527 *Forum; FSC: Forest Stewardship Council).*

528

529 *Table 1. Descriptive information for the most popular forums.*

530

531 The interest group representing tree growers is the only actor that participated in the eight
532 forums with the most participants. The Department of Agriculture, Forestry and Fisheries and
533 the largest individual private landowning organisation in South Africa both participated in six
534 forums. A scientific research and development organisation established through an Act of
535 Parliament in 1945 and a state-owned corporation in control of the most productive
536 government plantations participate in five forums each.

537

538 Civil society organisations are not frequent participants in the eight forums. The larger-scale
539 and perhaps better-recognised groups, however, do participate in the Forest Stewardship
540 Council, an international multi-stakeholder roundtable. Organisations representing rural
541 communities and land reform beneficiaries – the ones most likely to experience the impact of
542 plantation policies – are nearly non-existent in both the network and the forums. Our data
543 shows that influential business interests, sometimes in conjunction with state interests, have a
544 much wider representation, suggesting that the forums analysed here could well be failing to
545 break up echo chambers. Participation in a single forum is both the median and the mode,
546 although eleven organisations did not participate in any forums.

547

548 **4.2 Results for the ERGMs**

549 Model A in Table 2, below, presents our results using the information network as the
550 dependent variable. Model B presents the results when the dependent variable is the
551 information exchange ties between trusted partners. After comparing the AIC, BIC, log-
552 likelihood, and the area under curve (AUC) and precision-recall (PR) measures for goodness-
553 of-fit (see SI), we find that model A provides the best fit to our data. It supports all three of our
554 hypotheses. First, it confirms that actors in the South African tree plantation policy network
555 tend to exchange information with those with more similar beliefs to their own. Second, actors
556 tend to exchange information with those with more reputational influence. Third, the more
557 forums that a pair of actors co-participate in, the more likely they are to exchange information.

558
559 *Table 2. Results for the ERGMs with standard errors in parentheses.*

560
561 The parameter estimate for the belief homophily shows a positive and significant effect in
562 model A, which thereby confirms the existence of an ‘echo’. The presence of a positive
563 GWESP term and a negative GWDSP term provide evidence that the 55 organisations
564 involved in the contentious debate over tree plantations in South Africa are likely to follow the
565 behavioural pattern of closing triads rather than leaving them open. The positive and
566 significant GWESP term indicates that a pair of actors, of which at least one recognises
567 another as an information exchange partner, is more likely than chance to have multiple
568 shared partners. The negative and significant GWDSP indicates that information exchange
569 behaviour that creates open triangles is unlikely to occur. These results indicate that actors
570 are inclined to establish ‘chamber’ type structures, where actors exchange information within
571 closed triads rather than with actors from across the network. This provides further evidence
572 to support our first hypothesis: actors tend to exchange information with actors with beliefs

573 that reinforce those of their own rather than with those whose views would challenge or
574 undermine them.

575

576 Our second hypothesis tests if policy actors exchange information with those that have a
577 reputation of being especially influential. The parameter estimate for the reputational influence
578 variable in Table 1 shows a positive and significant effect in model A, meaning that actors in
579 the policy network are likely to form information exchange ties with those that have a
580 reputation of being influential among the members of the network. Our 55 organisations do not
581 recognise government departments with formal decision-making authority as information
582 exchange partners more often than expected by chance.

583

584 We formulated our third hypothesis to investigate if the likelihood that policy actors exchange
585 information with one another increases as they participate in more of the same policy forums.
586 This hypothesis receives support in model A: co-participation in forums enables the
587 knowledge acquisition aspect of cognitive learning. Because we factually build model A in
588 steps (see SI), and the inclusion of the forum co-participation variable improves the model fit,
589 we may also draw that echo chambers are weaker among those that co-participate in forums
590 relative to those that do not. The control term for number of forums that each actor participates
591 is insignificant, indicating that those that are inclined to participate in more forums are not
592 more likely than chance to create information exchange ties with more actors.

593

594 The negative and significant edge statistic confirms that the density of the network is relatively
595 low and that the patterns of ties captured by the other terms in the models account for the bulk
596 of the observed behaviour. The reciprocity term is significant, implying that actors recognise
597 one another as information exchange partners. Inclusion of the co-operation network in the

598 model improves fit (see SI), indicating that those that co-operate also tend to exchange
599 information. Although the GWI term is positive and significant, its inclusion does not improve
600 model fit much. Actors tend to preferentially attach to popular actors, which is occurring in
601 parallel to the reputational influence effect, suggesting an overlap between these two effects.

602

603 Echo chambers and reputational influence continue to play a significant role in network
604 formation when information exchange with trusted partners network is the dependent variable
605 (model B). Organisations that participate in the same forums are more likely to develop trusted
606 information exchange ties with one another than would occur by chance. This means that the
607 interactions that occur in forums potentially enable not just the knowledge acquisition aspect
608 of cognitive learning, but also the trust accumulation aspect of relational learning. However,
609 comparing models A and B, the significance of forum co-participation is slightly lower in model
610 B, and the coefficient drops from 0.32 to 0.11. More importantly, the median probability of an
611 information exchange tie existing between a pair of actors that co-participate in at least one
612 forum is substantially higher for the information exchange network (0.62) than for the trusted
613 information exchange network (0.32) (see SI). Forum co-participation, as opposed to belief
614 homophily and reputational influence, is thus more likely to function for cognitive (knowledge
615 gains) than relational learning (improved relations). The result for the institutional influence
616 term in model B also differs to that in model A, indicating that being a government department
617 is negatively associated with being recognised as a partner in the trusted information
618 exchange network. In sum, we find evidence supporting all three hypotheses for both
619 dependent variables.

620

621 We also conducted tests to see whether the results for the ERGMs are trustworthy by
622 simulating 500 networks based on the model parameters to compare the observed network

623 with (see SI). With some random variation, the distributions match the observed distributions
624 of the same statistics satisfactorily for both models A and B.

625

626 **Discussion and conclusions**

627 Policy learning has been linked with different types of outcomes, including major policy
628 change (Gerlak et al. 2018; Moyson and Scholten 2018). However, the questions about where
629 policy actors obtain the information that informs their learning, and about which factors enable
630 or impede learning, deserve equal attention. This paper contributed to this strand of literature
631 by investigating how belief homophily, reputational influence, and co-participation in policy
632 forums explain information exchange and trust building among actors in the South African tree
633 plantation policy network.

634

635 Our approach entailed an examination of whether the actors exchanged information with
636 those with policy beliefs similar to their own, with those that had a reputation of being
637 influential, and with those that they encounter at forums organised to foster co-ordination. Our
638 ERGM results show that actors exchange information with those with similar beliefs to their
639 own and that they tend to close information exchange triads rather than leaving them open,
640 suggesting that structures representative of echo chambers play a significant role in network
641 formation. Results indicate that reputational influence has a complementary effect on
642 information exchange behaviour. Given the leeway that powerful actors possess in choosing
643 with whom to communicate and what to share (Moeliono et al. 2014), this effect helps
644 maintaining the existing power dynamics and potentially allows those in powerful positions to
645 orchestrate the echo in the chamber. These two observations were consistent for both the
646 information exchange network and the trusted information exchange network. However, forum
647 co-participation had a stronger effect on the former.

648

649 Our descriptive analysis of participation in forums revealed that actors with rather dissimilar
650 beliefs co-participate in the most popular forums. When we contrast these findings with those
651 from the ERGMs, forums seem to attract organisations with dissimilar beliefs while also
652 providing them with opportunities to exchange information and build trust accordingly.
653 However, not all relevant actors, particularly those living with the effects of land use and land
654 use change, are present or heard from in the forums. Actors representing business and state
655 interests dominate many of the forums and the entire institutional system, meaning that their
656 policy beliefs are quite likely to be known by others. Those who organise forums also tended
657 to be aligned with these interests, placing them in a favourable structural position to influence
658 who can participate, what gets discussed, what objectives are agreed on, and the range of
659 policy options to be considered.

660

661 Our findings suggest that policy forums that foster co-ordination among policy actors from
662 varying backgrounds principally work for the knowledge acquisition aspect of cognitive
663 learning (as knowledge gains). However, they also enable the trust accumulation aspect of
664 relational learning. This means that the interactions that occur in forums potentially enable not
665 just the knowledge acquisition aspect of cognitive learning, but also the trust accumulation
666 aspect of relational learning. In the context of South African tree plantation policy, however,
667 these findings occur in parallel to the existence of echo chambers. Although policy learning –
668 acquisition, translation, and dissemination of information among actors with diverse bases of
669 knowledge – is likely to occur in forums, forum co-participation does not necessarily break up
670 the echo chambers fortified with the belief homophily effect, resource pooling effect, and
671 tendencies to close triads. Echo chambers seem difficult to escape already in terms of sole
672 information exchange behaviour, and even more so when interactions are more intensive and

673 potentially more risky. Belief homophily and resource pooling are also likely to drive actors'
674 behaviour in forums, especially in the most polarised ones, but co-participation will
675 nevertheless increase the odds of two actors with dissimilar policy beliefs engaging one
676 another. In turn, we suspect the tendency to form echo chambers to be stronger among those
677 that do not participate in forums (relative to those that do), the extent to which, however, we
678 are unable to determine with our data.

679

680 In this paper, we have tested well-established hypotheses concerning policy actors'
681 behaviour, but in a novel and turbulent policy context and in relation to two different types of
682 learning. We used ERGMs to test our three hypotheses simultaneously, which remains a
683 novel approach in research on policy learning. A similar approach with slightly different
684 parametrisation of the ERGMs was recently applied by Wagner and Ylä-Anttila (2018), who
685 investigated the Irish climate policy network and found that actors tended to rely on policy
686 advice from those with which they shared similar policy beliefs. In contrast to our findings,
687 however, forum co-participation did not increase the likelihood of pairs of actors forming
688 network ties. The behavioural dynamics that we observe in the networks analysed here
689 resemble those identified by Fischer, Ingold, and Ivanova (2017) and Leifeld and Schneider
690 (2012). Jasny et al. (2018), however, found that echo chambers could rapidly reorganise
691 around specific policy instruments – in this case, around the Obama Administration's Clean
692 Power Plan – and amplify convergence among policy actors. Following the recently enacted
693 laws concerning the “expropriation of land without compensation” and the carbon tax, similar
694 reorganisation might well occur in the South Africa tree plantation policy domain.

695

696 Our analysis arrives with some notable limitations. First, our research design only elicited data
697 on the exchange of information, which means that we can distinguish neither between

698 senders and receivers of information nor between political, technical, or scientific information.
699 Such dimensions of information exchange, however, have been studied elsewhere, including
700 by Fischer, Ingold, and Ivanova (2017). Our focus was on understanding what fosters and
701 impedes different types of learning based on information exchange. Second, our
702 operationalisation of policy learning is relatively narrow. It relies on recognitions of information
703 exchange partners and self-reported trust of other organisations. This operationalisation,
704 however, allowed us to measure the interactions and beliefs among the actors, and use
705 statistical inference in their analysis. Third, social interactions occur on an evolutionary
706 trajectory that shift between states of co-operation and defection (Imhof, Fudenberg, and
707 Nowak 2005). Redundancy and defection are inherent features of complex institutional
708 systems, which is important to consider when assessing the goodness-of-fit of our models.
709 Due to the nature of cross-sectional data, we were unable to investigate whether actors'
710 beliefs converged after meeting those that think differently about the planting of alien trees in
711 drying South Africa.

712

713 The literature remains rather divided over the benefits of organising forums to promote co-
714 ordination across the different sectors of society. Hamilton and Lubell (2018) find that co-
715 participation in forums positively contributes to co-operative behaviour in an Eastern African
716 transboundary setting. Relying on the general notion of homophily, they suggest that forums
717 at lower spatial levels are more likely to attract those that are spatially closer to one another
718 and know the context, culture, and problems well. Herzog and Ingold (2019) support the view
719 that forum co-participation contributes to co-operation in another transboundary setting in the
720 Rhine catchment area. In this context, sharing an understanding of the degree of threat the
721 common-pool resource is facing facilitated co-operation. Researchers have also highlighted

722 the contributions of leadership and facilitation (e.g. small working groups) to forum success
723 (Levesque et al. 2017; Leys and Vanclay 2011; Ospina and Saz-Carranza 2010).

724

725 Maag and Fischer (2018) and Reed et al. (2018) have recently opened new chapters in the
726 understanding of the dynamics occurring in forums and the factors that contribute to their
727 success. This occurs in parallel with recent advancements in the understanding of the
728 behaviour of policy actors in complex institutional systems with multiple interdependent forums
729 (Berardo and Lubell 2019; Mewhirter and Berardo 2019). Testing of related hypotheses, both
730 well and less established ones, in different policy contexts, and in the context of different
731 intensities of interactions, warrants further attention. The use of longitudinal data would help
732 clarify whether there is an order of precedence between the echo (belief homophily) and the
733 chamber (triad closure) in the formation and dissolution of echo chambers, and for the broader
734 significance of echo chambers for policy success or failure.

735

736 **References**

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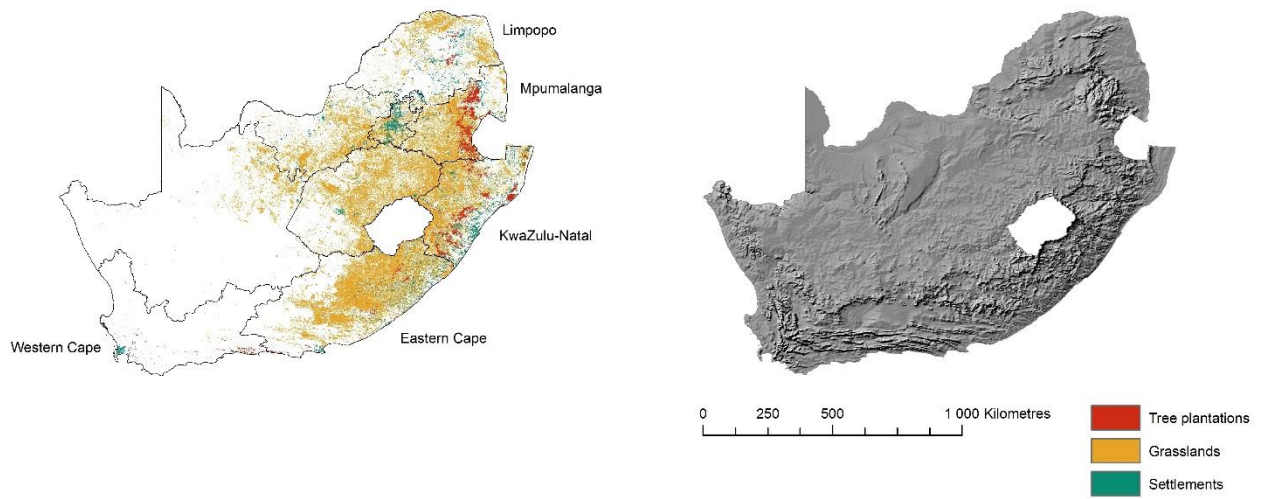
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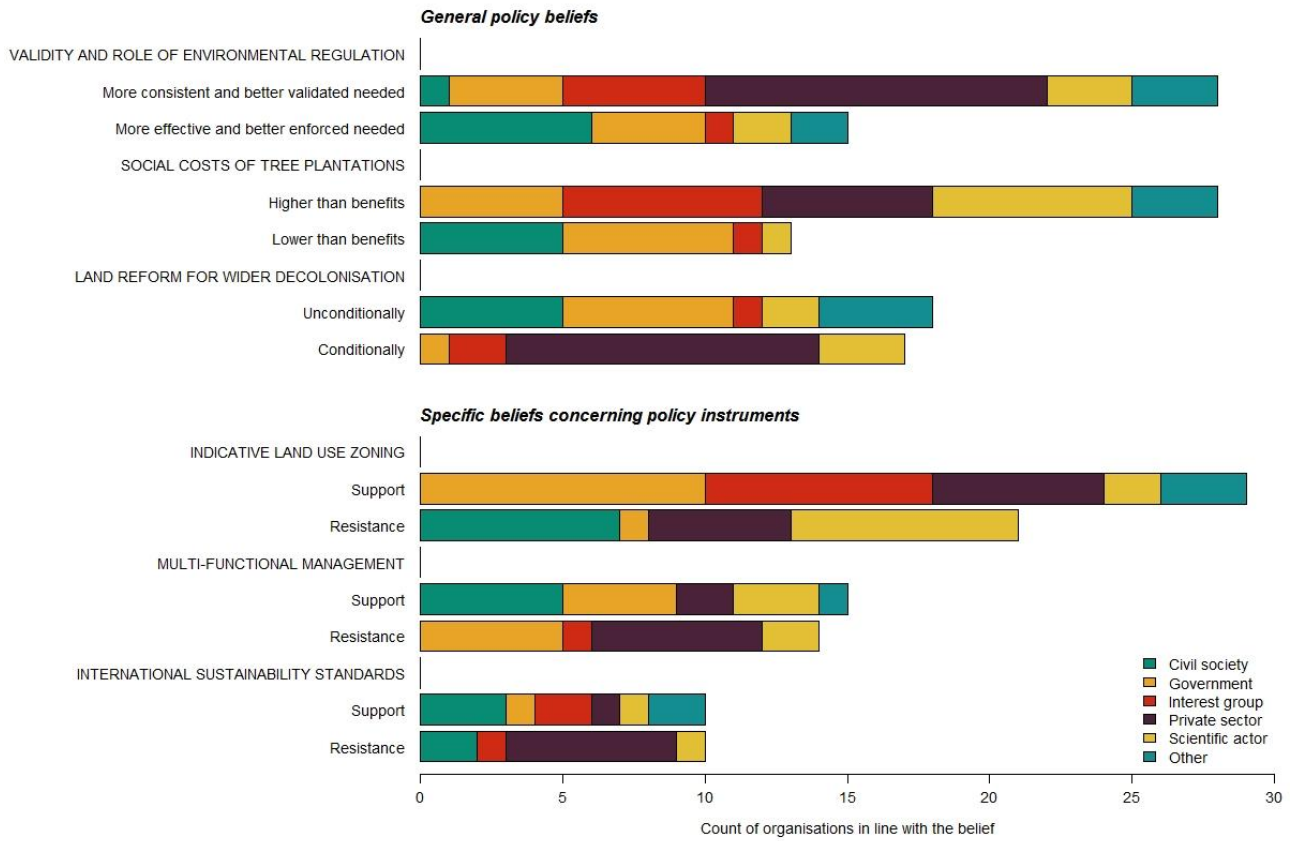
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1024 Figure 1. Tree plantations in South Africa (own elaboration based on DEA, 2014).

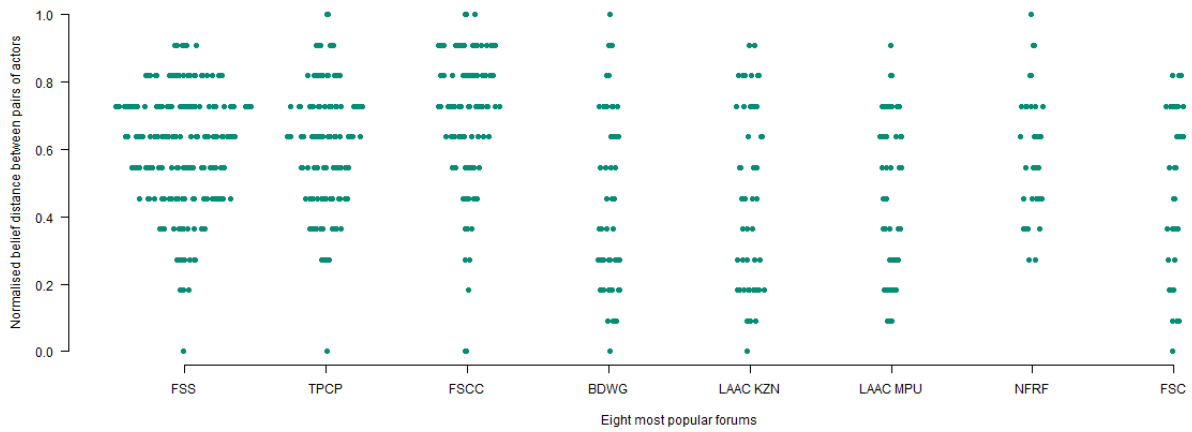
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1027 Figure 2. Polarisation over salient policy beliefs by actor type.

1028



1029

1030 Figure 3. Normalised belief distance between pairs of actors in the most popular forums (FSS:
 1031 Forest Science Symposium; TPCP: Tree Protection Co-operative Programme; FSCC: Forest
 1032 Sector Charter Council; BDWG: Baboon Damage Working Group; Stream Flow Reduction
 1033 Activity License Application Advisory Committee KwaZulu-Natal; Stream Flow Reduction
 1034 Activity License Application Advisory Committee Mpumalanga; National Forest Research
 1035 Forum; FSC: Forest Stewardship Council).

1036

1037 Table 1. Descriptive information for the most popular forums.

| Acronym | Name | Organiser | Spatial scale | Affiliation diversity | | | | | | | Belief distance | | | | |
|----------|---|------------------|---------------------------|-----------------------|----|----|----|----|----|----|-----------------|------|------|------|------|
| | | | | N | CS | GO | IG | PS | SC | OT | Min | Max | Mean | SD | IQR |
| FSS | Forest Science Symposium | Scientific actor | National | 21 | 0 | 1 | 1 | 10 | 9 | 0 | 0.00 | 0.91 | 0.60 | 0.17 | 0.27 |
| TPCP | Tree Protection Co-operative Programme | Scientific actor | National | 16 | 0 | 2 | 1 | 10 | 3 | 0 | 0.00 | 1.00 | 0.62 | 0.17 | 0.27 |
| FSCC | Forest Sector Charter Council | Government | National | 15 | 0 | 7 | 8 | 0 | 0 | 0 | 0.00 | 1.00 | 0.70 | 0.20 | 0.18 |
| BDWG | Baboon Damage Working Group | Private sector | Provincial: Mpumalanga | 11 | 3 | 2 | 1 | 5 | 0 | 0 | 0.00 | 1.00 | 0.46 | 0.26 | 0.41 |
| LAAC KZN | Stream Flow Reduction Activity License Application Advisory Committee | Government | Provincial: KwaZulu-Natal | 11 | 2 | 5 | 1 | 2 | 1 | 0 | 0.00 | 0.91 | 0.48 | 0.26 | 0.50 |
| LAAC MPU | Stream Flow Reduction Activity License Application Advisory Committee | Government | Provincial: Mpumalanga | 11 | 2 | 4 | 1 | 3 | 1 | 0 | 0.09 | 0.91 | 0.47 | 0.23 | 0.36 |
| NFRF | National Forest Research Forum | Government | National | 10 | 0 | 2 | 1 | 0 | 6 | 1 | 0.27 | 1.00 | 0.58 | 0.18 | 0.27 |
| FSC | Forest Stewardship Council | Civil society | International | 9 | 3 | 0 | 1 | 4 | 1 | 0 | 0.00 | 0.82 | 0.48 | 0.25 | 0.45 |

CS=Civil society, GO=Government, IG=Interest group, PS=Private sector, SC=Scientific actor, OT=Other

1038

1039 Table 2. Results for the ERGMs with standard errors in parentheses.

| | Model A Information exchange network <i>Information acquisition aspect of cognitive learning</i> <i>Density = 0.40</i> | Model B Trusted information exchange network <i>Trust accumulation aspect of relational learning</i> <i>Density = 0.27</i> |
|-----------------------------|---|---|
| Edges | -4.28 (0.47) *** | -3.12 (0.29) *** |
| Exogenous variables | | |
| Belief homophily (H1) | 0.08 (0.02) *** | 0.09 (0.02) *** |
| Reputational influence (H2) | 0.07 (0.01) *** | 0.04 (0.01) *** |
| Institutional influence | -0.19 (0.14) | -0.57 (0.12) *** |
| Forum co-participation (H3) | 0.30 (0.05) *** | 0.10 (0.04) * |
| Forums participated | 0.01 (0.01) | 0.00 (0.01) |
| Co-operation | 1.25 (0.10) *** | 1.19 (0.10) *** |
| Endogenous terms | | |
| Reciprocity | 1.28 (0.13) *** | 0.59 (0.14) *** |
| GWESP ($d = 1.0$) | 0.74 (0.15) *** | 0.50 (0.07) *** |
| GWDSF ($d = 1.0$) | -0.11 (0.01) *** | -0.13 (0.01) *** |
| GW($d = 1.0$) | 3.72 (1.52) * | 1.31 (0.55) * |
| Goodness-of-fit | | |
| AIC | 3043 | 2616 |
| BIC | 3109 | 2682 |
| Log-likelihood | -1511 | -1297 |
| AUC-PR | 0.73 | 0.58 |
| AUC-PR null | 0.40 | 0.29 |

1040