

1 Researcher Engagement in Policy Deemed 2 Societally Beneficial Yet Unrewarded

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28 Abstract:

29 Public support for research depends, in part, on the eventual societal benefits from research.
30 Maintaining that support likely requires sustained engagement between the research community and
31 the broader public. Yet, there is little organized effort to evaluate and reward such engagement in
32 addition to research and teaching activities. Using data from an international survey of 1092 researchers
33 (634 established researchers and 458 students) in 55 countries and 315 research institutions, we find
34 that institutional recognition of engagement activities is perceived as being undervalued relative to its
35 societal benefit. Many researchers report that their institutions would not reward engagement activities
36 despite mission statements promoting engagement. Further, those institutions that actually measure
37 engagement activities are perceived to do so in a limited capacity (respondents perceived that on
38 average, 2 of the 7 dimensions of engagement we considered were reflected in evaluations). Most
39 researchers are strongly motivated to engage for selfless reasons, which suggests that strong self-
40 oriented incentives may have unintended effects. Perhaps by recognizing the important engagement
41 activities of researchers, institutions can better achieve their institutional missions and bolster the
42 crucial contributions of researchers to society.

43 **Key words:** science policy engagement; institutional reward; motivation; social benefit of research

44 Introduction

45 Public support for research has always been predicated on its immediate or eventual benefits to society
46 (Sarewitz and Pielke 2007; Baron 2016). However, realizing these benefits often requires that
47 researchers engage beyond academic communities, and such engagement actions depend in part on
48 institutional support (Hauser and Katz 1998; Franceschini, Galetto et al. 2014). Despite the stated goals
49 of research and scientific institutions to be for the public good, institutional values, strategies and

50 actions may dissuade researchers from activities that provide important public benefits (Hauser and
51 Katz 1998; Brembs, Button et al. 2013).

52 Researchers' activities are often grouped into four broad categories: research, teaching, internal service
53 (e.g. sitting on committees), and policy and public engagement (Lach, List et al. 2003; Singh, Tam et al.
54 2014). Engagement, defined as collaboration between research institutions and their larger
55 communities for the mutually beneficial exchange of knowledge and resources in a context of
56 partnership and reciprocity (Leshner 2003; Driscoll 2008), is broadly viewed as an important activity to
57 be encouraged (Singh, Tam et al. 2014). Engagement programs at universities developed in the 1980s as
58 a way to defend the public relevance of universities by ensuring academic involvement in societal
59 progress and innovation (Holland 2016). Many research and scientific institutions have societal and
60 policy engagement in their missions, yet previous research indicates that missions alone—without
61 consistent institutional support in the form of funding and reward structures—are not enough to
62 contribute to engagement (Ostrander 2004; Bernardo, Butcher et al. 2012; Fitzgerald, Bruns et al. 2016;
63 Holland 2016).

64 Whereas research and teaching have relatively well developed – though controversial – metrics and
65 processes for evaluation (e.g., impact factors, UK's Research Assessment Exercise, teaching evaluations
66 by students and peers), the evaluation of engagement is at best, nascent (Brembs, Button et al. 2013;
67 Baron 2016). A key complication for such metrics is that excellence in engagement is multi-dimensional
68 (Taylor 2007). We recognize at least seven dimensions, building upon factors that contribute to, and
69 outcomes that result from, successful engagement (Franz, Childers et al. 2012) via a group workshop at
70 the Global Young Academy. These dimensions of engagement include *reach* (the size of the audience),
71 *rigor* (quality of the research), *innovation* (novelty of engagement), *number* (quantity of effort), research
72 *depth* (amount of work behind each effort), *prominence* (perceived esteem of the effort), and *outcomes*
73 (changes as a results of the effort, see Table S1 for dimension descriptions). In recognizing the multi-

74 dimensional nature of engagement excellence, we can evaluate what aspects are most emphasized by
75 research institutions.

76 Alignment between goals and metrics is desirable. In the design of evaluation and reward structures,
77 existing perceptions of engagement are important—particularly the perceived societal benefit of
78 engagement and its motivations. Although perceptions may differ from reality, they are important
79 because they serve as the foundation for behaviour (Jones and Nisbett 1971; Lerner, Li et al. 2015). Such
80 perceptions are key for determining whether individual and institutional goals align with each other or
81 with evaluation metrics. Previous research indicates that motivated individuals engage more effectively
82 when they are committed to an organization that shares their values and supports their activities (Jin,
83 McDonald et al. 2016). When researchers are incentivized to perform activities seen as having little
84 value or when institutional rhetoric (that promotes activities of perceived societal benefit) is not
85 matched by evaluation metrics, researchers may adopt apathetic or cynical attitudes towards their work
86 (Colvin and Boswell 2007). Alternatively, they may take up activities with perceived societal benefit
87 (contributing broadly to a perceived better world) at the risk of their careers. In this study, we
88 investigated researchers' perceptions of social importance and institutional rewards of various
89 researchers' activities, with a focus on the evaluation of and motivation for engagement activities.

90 We conducted an international survey compiling perceptions of 634 established researchers and 458
91 students (together referred to as researchers) across 315 institutions in 55 countries. We included
92 current researchers as well as students to capture views of the current and emerging researchers. If
93 evaluation metrics aligned with institutional rhetoric regarding social benefit, we would expect to see a
94 close correlation between perceived societal benefit of and perceived reward for various endeavours
95 (i.e., research, teaching, internal service and engagement). We hypothesized further that engagement
96 activities are evaluated on an *ad hoc* basis and considered narrowly relative to dimensions of
97 engagement excellence. Finally, we expected that different motivations (including self-oriented ones

98 such as career benefits and selfless ones such as combatting poor policy) would correlate differently
99 with the five engagement activities that we considered (Singh, Tam et al. 2014).

100 Methods

101 We distributed an online survey questionnaire to established researchers and students around the
102 world. Survey dissemination was conducted using snowball sampling over researcher listservs (including
103 the listserv for the Society of Conservation Biology and the Ecological Society of America), as well as
104 through the Global Young Academy and the Leopold Leadership Fellows organization, asking recipients
105 to forward the survey to their colleague networks. Targeted sampling was also performed, with
106 invitations to partake and disseminate the survey to heads and deans of research organizations. The
107 survey was open to any researcher from any discipline or organization, though most respondents were
108 natural scientists and interdisciplinary scientists from academic institutions in North America (there was
109 also relatively strong representation from other countries such as Australia, Brazil, Japan, South Africa,
110 Turkey, and the United Kingdom, Table S4). Our questions focused on the institutional metrics and
111 perceived level of reward and societal benefit for various activities (research, teaching, internal service
112 and engagement) as well as how engagement is evaluated. We further broke down engagement into
113 five categories adapted from Singh et al. (Singh, Tam et al. 2014), adding a category of participatory
114 research with stakeholders.

115 In total, 634 established researchers and 458 students across 315 institutions and 55 countries
116 participated in the survey (Table S4). We used Likert scales to quantify directional categorical responses
117 to questions about societal benefit, institutional reward, and quantity of engagement, as well as levels
118 of agreement to statements of researcher motivations to engage. We concluded the survey by asking
119 respondents if they would like their institutions to consider different forms of engagement in

120 established metrics, with higher emphasis in rewards, or not at all. All demographic information was
121 collected at the end of the survey.

122 Because we used a snowball sampling approach, we risked a sampling bias that was in favour of
123 engagement. We tested for pro-engagement bias in the survey by first comparing the proportion of
124 research institutions with a mention for engagement or public service in our sample to a random sample
125 of universities around the world. We found a near-identical proportion (81% versus 82%). Second, we
126 compared responses in perceived institutional reward, societal benefit, perceptions on whether
127 researchers were doing more engagement than their institutions rewarded for, and motivations to
128 engage among members of the Leopold Leadership Program and the Global Young Academy (all whom
129 are members because of their desires to engage with policy and the public) with all other respondents.
130 We found all responses nearly identical in their response patterns, indicating that respondents with
131 known pro-engagement views did not bias the sample. While this might also indicate that all
132 respondents have pro-engagement bias and does not reflect the larger researcher community, we note
133 that our large sample may buffer against extreme responses, but that even a biased sample can
134 showcase a sub-population of pro-engagement researchers in institutions. If institutions are not
135 satisfying their motivations that means an entire group of researchers may be underserved by their
136 institutions, especially if those institutions have pro-engagement mission statements.

137 We used heatmaps and barplots to visualize data on perceptions, and model averaging methods to
138 explore the relationships between stated motivations to engage and levels of engagement behaviour
139 (i.e. how often experts actually contributed to different engagement activities). To aid in interpreting
140 the resulting regression coefficients of the model averaging, we put all explanatory variables on a
141 common scale by dividing each by two standard deviations (Gelman 2008). Model averaging is an
142 information theoretic approach (comparing models based on how well they account for information in
143 the data) that examines an exhaustive set of models that can be constructed given the independent

144 variables identified, and considers the fit of each model to the data(Burnham and Anderson 1998). For
145 each model, we used ordinary least squares multiple regression and calculated Akaike weights based on
146 the small sample size corrected Akaike's Information Criterion – a metric that balances model fit and
147 complexity (AICc); these weights were used to calculate model-averaged coefficients for each variable.
148 For each engagement activity for both established researcher and students, we explored all possible
149 2048 candidate models to generate the model-averaged coefficients. Where predictor variables (stated
150 motivations) had strong support (the 95% confidence of model-averaged coefficients did not cross 0) we
151 discuss the relationship between motivations and levels of engagement behaviour. We assessed the
152 explanatory power of our model-averaged results by comparing the rank of a null model (with no
153 independent variables) against our top-ranked models(Singh, Tam et al. 2014). All models except for
154 models predicting the frequency of students acting as a decision-maker were found to have high
155 explanatory power, as null models were ranked very low in every other engagement category for
156 established researchers and students (Tables S5 and S6). The low explanatory power for models of
157 students acting as a decision-maker likely reflect that very few students indicated that they acted as a
158 decision-maker at all.

159 We examined differences in responses among geographies (North America, Latin America, Europe,
160 Central Asia, North Africa, and the Middle East, East and South Asia, Sub-Saharan Africa, and Australia
161 and New Zealand) and disciplines within established researchers and students, and found that results
162 were surprisingly consistent among these classes. We also found that responses were largely consistent
163 between established researchers and students, though we chose to report these results separately
164 because of the different experiences the two groups have and the different implications the results have
165 between these two groups. We further examined differences between early career and late career
166 researchers (pre-and-post tenure) and students aiming for an academic career versus those aiming

167 elsewhere regarding their motivations. For all analyses we used the statistical software R (Team 2013).
168 Data is available (minus any personal identifying information) by requests to the corresponding author.

169 Results and Discussion

170 Engagement is valuable but garners little reward

171 Perceptions of the societal benefit of researcher activities did not align with perceived institutional
172 reward. These results were consistent across nations, genders, research disciplines, and also between
173 established researchers and students. Both established researchers and students almost invariably
174 perceived engagement to have high societal benefit (Figure 1, Table S3); however, the apparent
175 institutional reward was variable, with most respondents indicating slight reward across career stages
176 (Figure 1, Table S2). Research presents the opposite misalignment. Almost invariably, research was seen
177 to be highly rewarded across multiple evaluation processes (Figure 1, Table S2). Established researchers
178 reported greater perceived societal benefits of research than did students, though both groups viewed
179 research as having less societal benefit compared to teaching and engagement (Figure 1, Table S3).
180 Prevalent perceptions that research is highly rewarded are unsurprising given the many established
181 metrics used to judge research (e.g., publication counts, impact factors, h-indices), metrics which
182 contribute to securing grants and increasing an institution's renown. Perhaps more surprising is that
183 research was not uniformly perceived to contribute to high societal benefit. These results align with
184 arguments that research without engagement leaves important insights stranded from real-world
185 impact (Bowen and Graham 2013), or that there is a low likelihood that any individual research finding
186 will lead to benefits (either societal benefits in general or benefits to further research efforts) (Nielsen
187 2001).

188 Perceptions of institutional reward for teaching and internal service varied across career stages more
189 than for research and engagement (Table S2). Both established researchers and students perceived

190 moderate societal benefits and institutional reward for internal service. Perceptions of teaching
191 paralleled engagement, with student respondents perceiving fewer societal benefits than for
192 engagement, likely because students' main teaching activities are through teaching assistance. Notably,
193 both established researchers and students perceived the societal benefits of engagement at levels
194 comparable to how researchers perceived the societal benefits of teaching, which are perceived to be of
195 higher societal benefit than research or internal service (Table S3).

196 Institutional rewards were not aligned with stated institutional missions regarding engagement. We
197 found that 81% of the 315 research and scientific organizations represented in our sample included
198 engagement, social service, or public dissemination within their mission statements, stated values, and
199 organizational strategies. We corroborated this using a random sample of global universities: 41 of 50
200 universities include engagement, social service, or public dissemination within their mission statements
201 and institutional descriptions. This mission statement rhetoric did not alter the perception of whether
202 institutions reward researchers' engagement activities. Mission statements alone do not yield reward
203 systems for engagement, and they are insufficient to promote it (Fitzgerald, Bruns et al. 2016; Holland
204 2016; Jin, McDonald et al. 2016).

205 Engagement: hardly any is more than enough

206 Across multiple forms of engagement, many established researchers and students indicate that they are
207 doing more than their institutions reward—even those doing 1-3 engagement activities a year (Figure 2).
208 Most individuals who report zero engagement activities nevertheless report that they are doing as much
209 as their institutions reward. For example, 52% of survey participants who indicated that they do not
210 participate in advocating for policy positions or acting as a decision-maker reported that their institution
211 would not reward them for doing so.

212 Consistent with the paucity of institutional reward for engagement, we found low levels of reported
213 engagement activity across diverse forms of engagement (Fig 2). The apparent infrequency of
214 researchers taking a stand on policy positions or acting as a decision-maker may also reflect the
215 (contested) opinion that these activities may compromise academic rigor or integrity (Nielsen 2001), an
216 opinion perhaps reinforced by the lack of rewards for these activities. Among the respondents who
217 engage in policy advocacy or who act as a decision-maker, 35% indicated that institutions should place
218 more weight in evaluating these activities; 31% suggested that institutions should employ additional
219 metrics; 16% favoured institutions placing higher expectations on these activities; and only 12%
220 suggested that they should not be rewarded for these activities.

221 [Many dimensions of excellence are not perceived to be assessed](#)

222 Currently most institutions have only unstructured ways to assess engagement—when it is assessed at
223 all. Most respondents whose institutions assess engagement indicated that their institutions request
224 qualitative, free-written descriptions. While these free-form evaluations are not in themselves
225 problematic, researchers perceive that institutions only evaluate a limited set of dimensions from these
226 narratives. Respondents indicate that their institutions consider the number of engagement activities,
227 and how prominent the activities are (e.g., op-eds in prominent newspapers being more prominent than
228 posts on a seldom-visited blog, Figure S1). The actual outcomes of engagement activities are considered
229 infrequently (30% of established researchers and 16% of research students).

230 Our results indicate that the dimensions of engagement addressed by current evaluations do not align
231 with researcher motivations. For example, whereas ‘prominence’ (i.e., perceived esteem) was one of the
232 most frequently evaluated dimensions of engagement, ‘status’ (i.e., standing relative to other
233 researchers) was generally cited as a weak motivator for engagement. In contrast, many researchers and
234 students are motivated to engage for societal obligations and promoting public benefits (Singh, Tam et

235 al. 2014)—e.g., to educate or excite the public, to fulfil a sense of social responsibility, and to affect the
236 larger world (Figure 3). In short, many established researchers and students engage (or wish to engage)
237 specifically for the *outcomes* of engagement. Nevertheless, institutions often overlook outcomes of
238 engagement in their evaluations.

239 [Diverse motivations to engage, mostly selfless](#)

240 Researchers report diverse motivations for engagement, and these are mostly other-oriented (Figure 3;
241 e.g., engaging to foster a better world, to fulfil a sense of social responsibility, to excite the public and
242 build greater research comprehension, and to improve policymaking). In contrast, very few researchers
243 indicated that they are not motivated to engage at all. Across nations, career position, and disciplines,
244 individual-oriented motivations (e.g., raising status as a research personality, develop communication
245 skills and gain career benefits) were the least important motivations stated by respondents (Figure 3).
246 The prominence of other-oriented motivations found in this study is in agreement with psychological
247 research, which shows that acting on other-oriented motivations provides benefits, such as fostering a
248 sense of purpose and satisfying psychological and social needs (Crocker, Canevello et al. 2017). Only two
249 groups of respondents in our study appeared to have much of an interest in engagement for personal
250 gain (and these remained less important drivers than other-oriented ones, Figure 3): established
251 researchers with vertical mobility (i.e., untenured professors)—who indicate motivations for career
252 benefits and raising status—and research students seeking an academic career, who indicated
253 motivations for raising status.

254 [Incentives and other-oriented motives predict activity](#)

255 For both established researchers and students, stated motivations significantly predicted recent
256 engagement activity (Figure 4). For established researchers (but not students), perceived institutional
257 reward for engagement also correlated with engagement activities. Consistent with the above emphasis

258 on social motivations, many other-oriented motivations positively predict engagement behaviour. The
259 motivation to combat poor and ideological policymaking correlated positively with advocating for a
260 policy position (for both established researchers and students). Those who were more motivated to
261 develop communication skills were more likely to conduct participatory research with communities (for
262 established researchers). Some self-oriented motivations were actually negatively correlated with policy
263 advocacy (for students); e.g., those students indicating stronger motivations for career benefits were
264 less likely to advocate for policies. Established researchers who perceived institutional rewards for
265 engagement were more likely to integrate research into policy, act as a decision-maker, and conduct
266 participatory research. Similarly, disagreement with being unmotivated to engage was positively
267 correlated with interpreting research for policy (for established researchers).

268 Future Directions

269 Respondents perceived a paucity of rewards and evaluation metrics for engagement despite its
270 perceived high societal benefit. While our survey results may be a product of a selection bias for pro-
271 engagement participants, our tests for bias did not indicate this, which suggests that our findings are
272 more general across researchers (see Methods). At the very least we reveal that there are large groups
273 of researchers around the world who feel that their institutions (most often with mission statements
274 including engagement) do not adequately monitor and reward engagement. Similarly, our results report
275 perceptions, which may not accurately mirror the reality of reward for engagement. If perceptions are
276 indeed wrong across the wide swath of institutions and countries we investigated, our results could
277 indicate that engagement is not rewarded *enough* for researchers to perceive them and be encouraged
278 to engage.

279 Addressing the discrepancies between societal benefit and institutional reward is not straightforward.
280 Seeking to incentivize engagement, institutions could usher in new evaluation metrics and processes.

281 Some new metrics, or a broader application of existing ones, may well encourage researchers to engage
282 (Lane 2010). However, we would urge keeping two considerations firmly in mind. First, evaluation
283 processes that provide self-oriented benefits for activities may have unintended consequences (Bowles
284 2008), particularly given the strong other-oriented motivations at play. New self-oriented incentives can
285 ‘crowd out’ existing intrinsic motivations (Gneezy and Rustichini 2000), undermining or distorting the
286 desired behaviour. Designed correctly, e.g., to reinforce the prevailing notion that the activities are
287 socially beneficial, new incentives may actually leverage and augment existing motivations (Rode,
288 Gómez-Baggethun et al. 2015). Incentives that are likely to ‘crowd in’ existing motivations are generally
289 non-monetary, and often involve public recognition or institutional metrics and other signals that
290 engagement is a socially desirable behaviour.

291 Second, institutions would do well to mind Goodhart’s Law: metrics and rewards can quickly generate
292 perverse outcomes as individuals seek to fulfil metrics divorced of their underlying intent (Elton 2004).
293 Virtually all metrics are subject to such perversion, so perhaps the task at hand is to design adaptive
294 processes. The rise of peer reviews of teaching constitutes one such adaptive process: in contrast to the
295 largely quantitative nature of student teaching evaluations, which are subject to manipulations for
296 perverse outcomes, peer reviews of teaching are richly multidimensional. Perhaps similar processes
297 would be beneficial in evaluating the rigor, innovation, outcomes, and other dimensions of engagement.
298 Regardless of one’s favoured solutions, the discrepancies we highlight put the onus squarely on
299 institutions serious about societal benefit to reconsider their evaluation and reward structures regarding
300 engagement (Carpini, Cook et al. 2004). Among those employed in research positions, we detail
301 widespread agreement that societal benefit is found not only (or even primarily) in research *per se*, but
302 most strongly in teaching and engagement. Given that there is some evidence of a trade-off between
303 engagement activity and research output (Jin, McDonald et al. 2016), rewarding engagement in addition
304 to research can avoid disadvantaging the career advancement of researchers who engage. In short,

305 research institutions espousing public benefits would do well to acknowledge the importance of
306 engagement and teaching, and to reward these activities commensurate with their importance to
307 institutional missions.

308 Strong institutional support for teaching and engagement may be especially important to convey to
309 students and other emerging researchers, who are often excited to engage but who face the apparent
310 reality that only research is strongly valued by their institutions. Despite this ostensible institutional
311 value, our results indicate that students express uncertainty about the value of research *per se* to
312 society. Perhaps students would be served well by institutional reforms of assessment processes to
313 reflect not only the increasingly diverse research-based professions outside of academia (Cyranoski,
314 Gilbert et al. 2011), but also the strong motivations to engage. Doing so might help align institutional
315 engagement processes with their mission statements, and the motivations of the next generation of
316 researchers (Jin, McDonald et al. 2016).

317 The need for engagement has never been more critical (Taylor 2007; Baron 2010; Baron 2016; Richmond
318 2016). Nevertheless, research institutions' current practices make such activities difficult, effectively
319 imposing strong disincentives to spend time on tasks that are effectively uncompensated relative to
320 research, which is consistently rewarded. Now is the time to ensure that the *engagement* of research is
321 evaluated and rewarded; rewarding research production is not enough.

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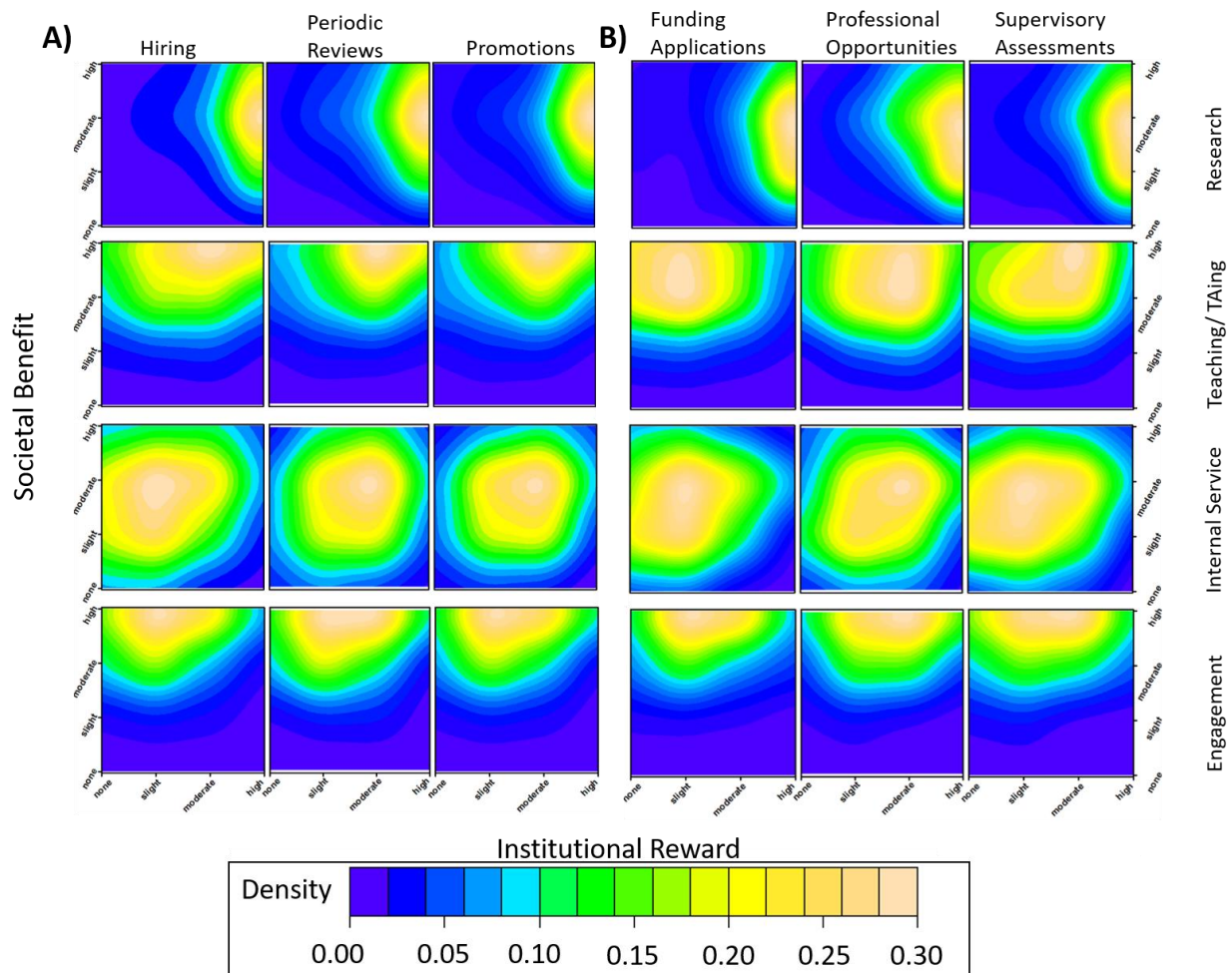
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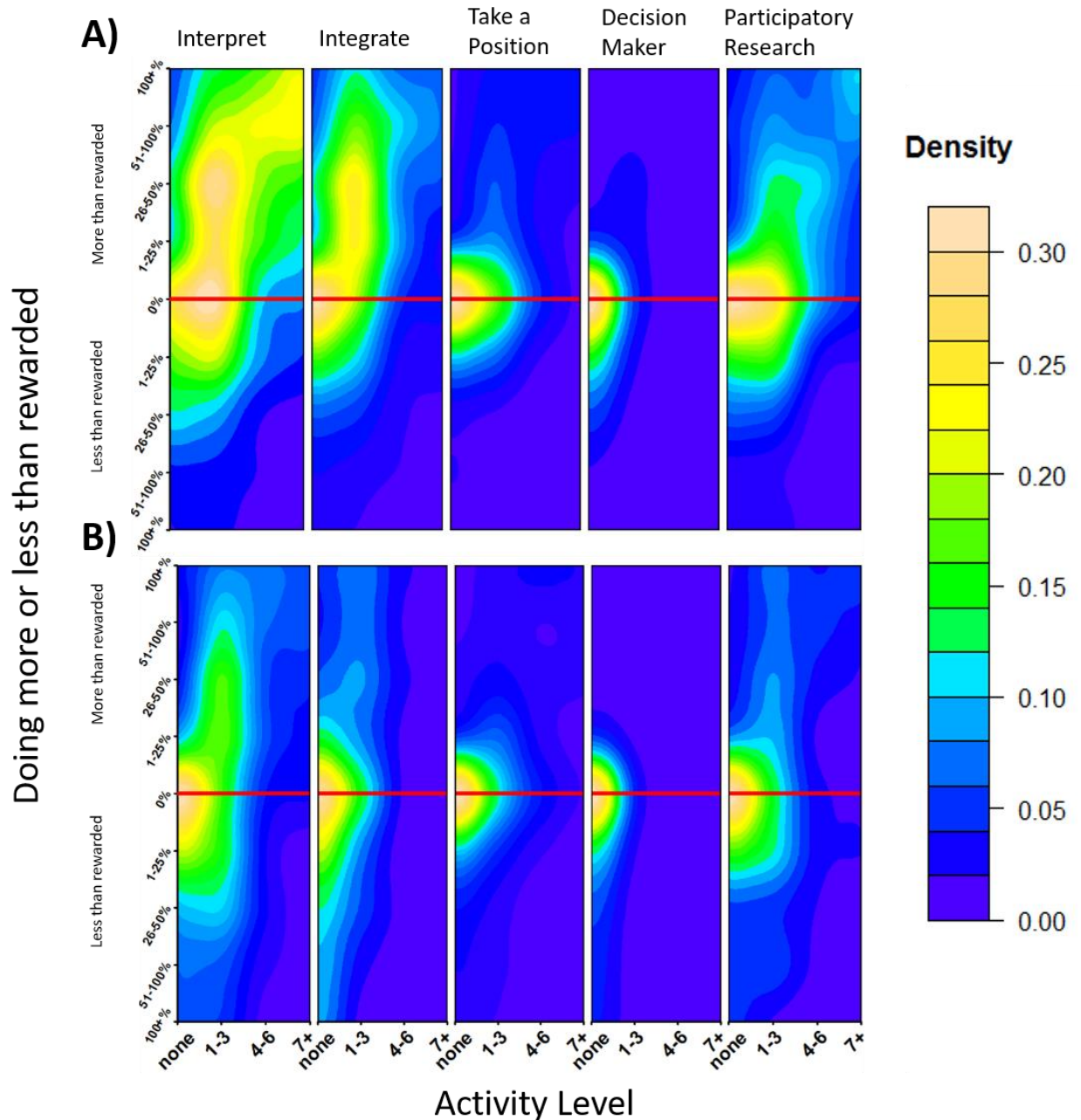
395 Figures:



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397 Figure 1. Perceptions of institutional reward and societal benefit of activities for A) established
 398 researchers and B) research students. The warmer colours (white, orange, yellow) denote regions of
 399 high frequency of response, whereas cooler colours (purple, blue, green) indicate lower frequency.

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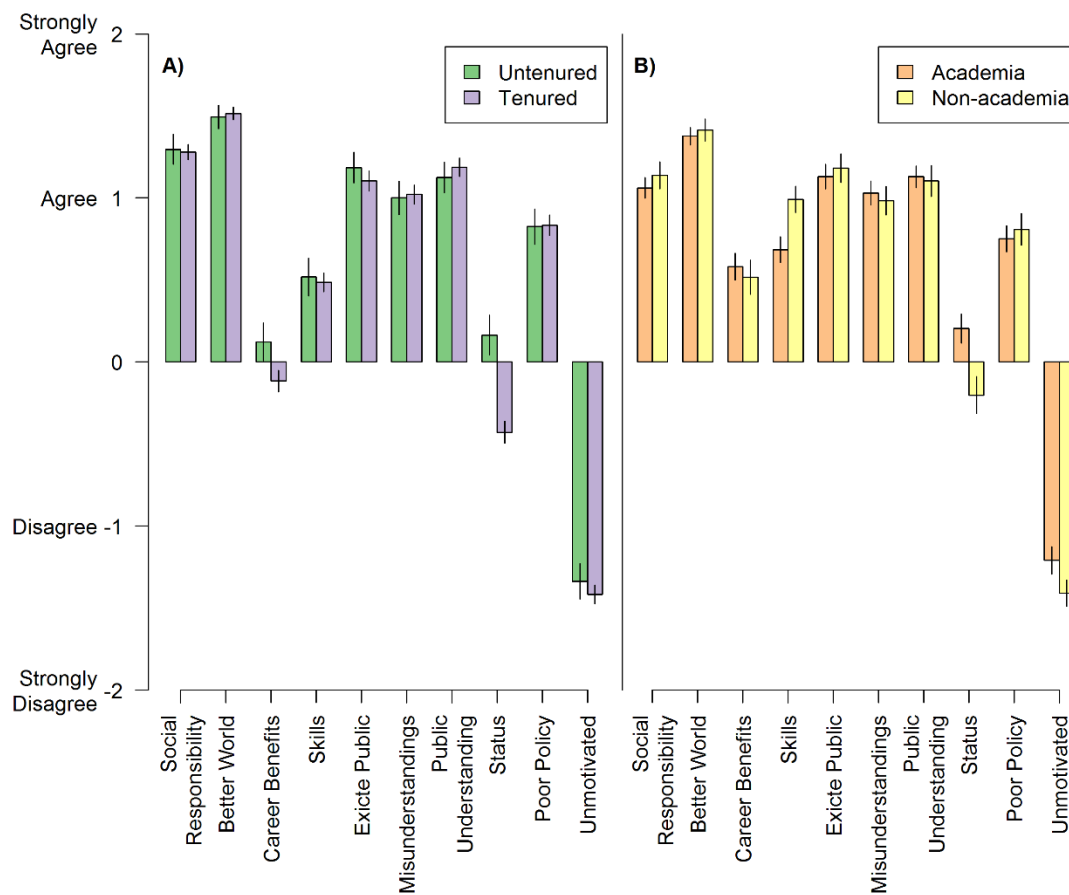
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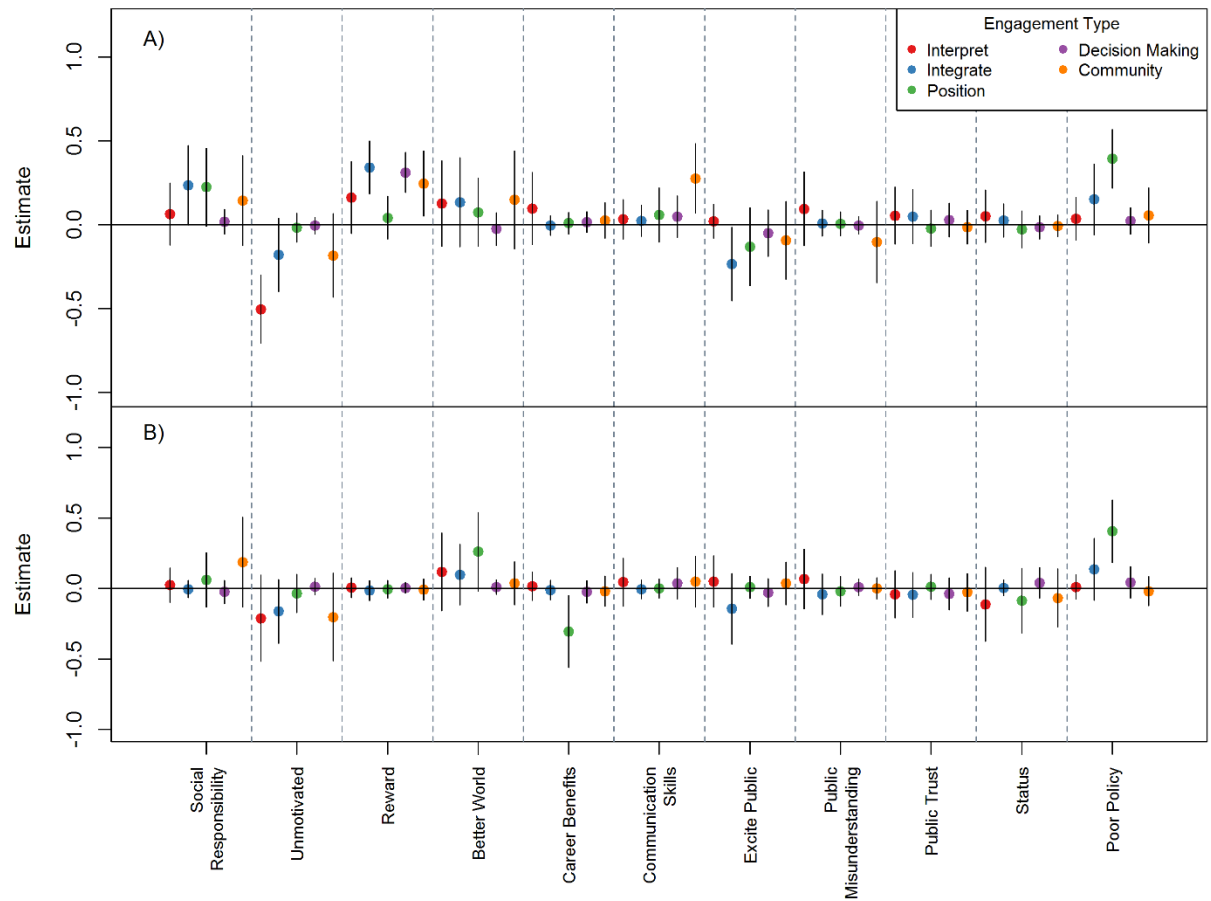
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Figure 2. The degree to which respondents think they are doing more or less engagement than rewarded by their institutions. Plots show responses for A) established researchers and B) research students. The warmer colours (white, orange, yellow) denote regions of high frequency of response, whereas cooler colours (purple, blue, green) indicate lower frequency. The x-axis scores correspond with frequencies of engagement activities in a year, and the y-axis scores

407 correspond to the extra engagement (as a percentages of current activity levels) that institutions
 408 would reward for (“less than rewarded”) or the amount of extra engagement (as a percentage
 409 of the level that institutions reward for) that participants engage in that institutions do not
 410 reward (“more than rewarded”).
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 414 Figure 3. Respondents' expressed agreement to statements about their motivation to engage for A)
 415 established researchers, separating tenured from untenured; and B) research students, separating those
 416 intending careers in academia from those not.



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418 Figure 4. Regression coefficients for how eleven motivations explain variation in each type of
 419 engagement activity (interpret, integrate, taking a position, acting as a decision-maker, and participatory
 420 research with communities). Points represent model-averaged standardized coefficient scores, and bars
 421 are 95% confidence intervals. Panels represent A) established researchers and B) students.

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