Do Open Comment Processes Increase Regulatory Compliance? Evidence from a Public Goods Experiment

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Introduction:

A fundamental challenge for all agri-environmental program administrators is the problem of how to motivate compliance with new regulatory measures (Classen 2012; Meyer 2014). Non-compliance jeopardizes the success of new policy interventions and can have serious negative externalities for both producers and rural communities (e.g., water contamination from exceeding effluent regulations). Traditionally, policymakers have dealt with this challenge by budgeting for costly monitoring programs to mitigate non-compliance. Insights from the behavioral economics and environmental governance literature, however, suggest that including stakeholders in the policy-making process may reduce noncompliance (Dannenburg et al. 2014; Gallier et al., 2014). While many agri-environmental administrators have openly encouraged participation through stakeholder meetings and public comment provisions, there has been no formal study of the effects of these activities on the compliance among participants. Building on recent scholarship, the goal of this research is to test the participation-compliance relationship and answer the question: do non-voting participation mechanisms increase regulatory compliance rates?

A deeper understanding of the participation-compliance relationship promises to benefit agricultural stakeholders and agri-environmental administrators alike. First, this research has the potential to support the reduction of *ex-post* monitoring and compliance costs, freeing up resources for other outreach uses. By determining if *ex-ante* participation mechanisms can improve compliance outcomes and their related implementation costs, this research may present economically viable institutional changes that may positively influence stakeholder behavior. If instead stakeholder comment mechanisms fail to raise compliance rates, this work will suggest an area where agri-environmental administrators may want to reduce costs or reconsider how they are implemented. Additionally, the research design supports more efficient regulatory outcomes by lowering the high barriers to private information policymakers often face. For example, in the case of environmental regulation, producers are the experts on how much a policy change will cost to implement in their own operation. Formalizing the information flows between producers and regulators will lower inefficiencies leading to potential Pareto improvements (Langbein & Kerwin 1985). Finally, this work supports producers in the agri-environmental sector by fostering more transparent and inclusive regulatory institutions. Formal participation mechanisms ensure that all stakeholders have a chance to provide input to regulators that increases the democratic nature of the policymaking process.

In this paper, we focus on how participation via open comment – where individuals provide unstructured feedback about their optimal regulatory policy – impacts individual compliance outcomes in a laboratory setting. Conceptualizing agri-environmental regulation as a mandated contribution towards public goods, the experimental protocol test the following hypotheses: **(H1)** Open comment participation will increase contribution levels to the public goods in all treatments. **(H2)** In the absence of enforcement mechanisms, individuals who engage in open comment participation will exhibit greater levels of compliance with the resulting contribution rule. **(H3)** The positive effect of participation on compliance increases as the expected costs of noncompliance increase. To test these hypotheses, we implement a public goods contribution experiment using a voluntary contribution mechanism (VCM). In the standard VCM setting, individuals are endowed with tokens that can be deposited in either a private account or a group account. Different rates of return make it Pareto optimal for all individuals to allocate their tokens to the group account, yet individual incentives may drive players to only contribute to a private account. We introduce a participation mechanism in the form of a comment mechanism regarding the contribution rule into this standard VCM setting. In this preliminary version of the research, we focus on open comment participation mechanisms in

the absence of enforcement mechanisms. While the contribution and design sections lay out the framework for testing both mechanisms, this represents work that will be completed in the future.

Contribution to Existing Literature:

This research aims to address two major gaps in the experimental literature. The first is to formally extend the analysis of participation mechanisms – also referred to as cooperation mechanisms – from majority-rule voting to regulatory comment mechanisms. When individuals participate in choosing contribution rules (endogenous implementation) through majority-rule voting mechanisms, they are more likely to follow those rules post-implementation (Dannenburg et al. 2014). This finding has been shown to hold in a myriad of settings including farming, taxation, and worker productivity (Bardhan 2000, Feld & Frey 2007, Black & Lynch 2001). Dal Bó et al. (2010) show in a laboratory setting that, even after controlling for selection effects, individual compliance with a policy is greater when democratic voting is permitted. These positive effects of endogenously determined rules on compliance rates have been shown to be contingent on achieving a sufficient majority vote (Gallier et al., 2014). While voting remains a straightforward participation mechanism to measure and implement, social scientists have acknowledged that participation can take many forms (e.g., voting, writing a legislator, open comment processes, etc.) and is not restricted to majority rule outcomes (Brady et al. 1995). By expanding the definition of participation beyond voting to include non-voting participation mechanisms, this experiment more accurately captures the types of regulatory participation mechanisms that agri-environmental stakeholders often face in practice. Such mechanisms are frequently used by firms, organizations, and community groups and include private comment mechanisms, public stakeholder meetings, and even lobbying efforts (Langbein & Kerwin 1985; Lachapelle 2008). To bridge this gap, this study focuses on open-comment mechanisms where individuals are invited to propose rules to a regulatory body. Designed to mimic the stakeholder meetings agri-environmental administrators often host for producers and interested stakeholders, we seek to determine the potential impacts of this type of participation while controlling for selection effects in a laboratory setting.

Future treatments in this experimental protocol will incorporate the interaction of new participation mechanisms with variable expected costs of non-compliance. Enforcement and sanctioning has been a robust area of research, particularly in work at the intersection of economics and law. Early theory argues that individuals comply with rules when the expected costs of not doing so are sufficiently large (Becker 1968, Polinsky & Shavell 2000). More recent work has focused on social norms such as reciprocity and legitimacy as the mechanism through which individuals obey rules and regulations (De Groot and Steg 2009; Sanfey et al. 2014; McDonald et al. 2014). Tyran and Feld (2006) show that while severe sanctions almost always enjoy compliance, mild sanctions only enjoy broad compliance when chosen via a majority vote mechanism. This suggests that the compliance decision is indeed a function of participation and individual beliefs. Further developing the choice of punishment mechanism, Kroll et al. (2007) show that voting alone does not increase compliance but if the voters can endogenously enforce the punishment then compliance increases. Finally, recent experimental work by Kamei et al. (2015) finds that informal sanctions are more popular and efficient with participants when formal sanctions entail costs to the group as a whole. In this project, we conceptualize enforcement costs as a function of both the level of the fine and the probability of being caught to reflect the complexity of most agri-environmental monitoring schemes (Lippert et al. 2014). Future treatments will test the relationship between participation and compliance under various enforcement schemes by varying the punishment probabilities while holding the level of the punishment constant.

Experimental Design:

To test the relationship between participation and compliance, we implement a public goods contribution game with a voluntary contribution mechanism (VCM). In the standard VCM setting, individuals are endowed with points that can be deposited in either a private account or a group account. Different rates of return make it Pareto optimal for all individuals to allocate their points to the group account, yet individual incentives may drive players to only contribute to a private account.[1]

The experiment has two treatments and uses a 2X3 design (see Table 1). The first treatment is along the dimension of participation, where individuals are offered the chance to submit private comments on their preferences for a minimum contribution threshold to the group account. Once comments are submitted, an individual (randomly selected to be the "Policymaker") reads the comments and chooses a minimum contribution rule (MCR). The rule can be any whole number of points ranging from zero to the entire endowment. Having the rule be determined endogenously better reflects the formation of agri-environmental regulation in practice: e.g., individuals who comment are attempting to influence the final outcome of the regulation but have no guarantee that their comments will be taken into account. The control group are not invited to submit comments yet play the same VCM game. This means that a "Policymaker" will still determine the MCR to the group account but with no comments.

Table 1: Experimental Design

Participation Treatments	Enforcement Treatments		
	No Enforcement	Low Probability	High Probability
No Participation	40 Observations	40 Observations	40 Observations
Open Comment	40 Observations	40 Observations	40 Observations

In a future draft, the second treatment will be applied along the enforcement dimension. An individual is faced with both a direct punishment cost such as a fine and a probability of their noncompliance being observed. Thus, when individuals are making compliance decisions they will take into account the expected cost of noncompliance rather than only the value of the punishment. Table 1 shows the 2 types of enforcement treatments that will be applied in this experiment in addition to the no enforcement treatment. I plan to hold the level of the punishment constant, but vary the probability of an individual being caught in a state of noncompliance. Following Sefton et al. (2007), all treatments/sessions will include two stages. Stage 1 will always involve 5 rounds of a standard VCM game to acquaint participants with the play of the game followed by Stage 2 (25 rounds) that include the treatment condition. Having 25 rounds in stage 2 will allow for the groups to be randomized so that every participant has the opportunity to play the role of Policymaker at least once during the game.

Play of Game:

In this preliminary draft, we focus on the participation treatments in the absence of enforcement mechanisms. The game was designed using the web-based experimental software oTree, and run with undergraduates in a computer lab at Michigan State University between April 19-21, 2016 (Chen et al. 2016). Treatments were conducted in four sessions, two treatment sessions with a comment mechanism and two control sessions with no comment mechanism. At

[1] For an example see Sefton, Shupp and Walker (2007)

the beginning of each session, 20 participants were randomly divided into four groups of five students. These individuals then played a standard VCM game to familiarize themselves with how the game works.

The rest of the experiment consisted of 5 individual games. At the beginning of each game, participants were randomly assigned to a role. The first role is referred to as "Player". There are 4 Players in each group. The second role is referred to as the Policymaker. Each group has a single Policymaker. A participant's role remained the same for all five rounds of the game yet the experiment was structured so that each participant had the opportunity to be the policymaker during one of the five games.

Consistent with the standard VCM setting, Players were given an endowment (25 points), and asked to divide those points between a group account and an individual account. Players keep the full value of any points allocated to the private account. For each point allocated to the group account, Players earn .4 points and each other Player in the group earned .4 points. This means that each point placed in the group account returns 1.6 points to the group as a whole at the end of a round. All groups in a session faced the same contribution rules during the course of play.

In open comment treatments, all Players were asked to type comments about their preferences for a minimum allocation rule to the group account. In this context, the minimum allocation rule is the minimum number of points that the Policymaker believes each Player should put in the group account during each round. The minimum allocation rule can be any amount from 0 to 25 points. After all Players submitted their comments about the minimum allocation rule, these comments were provided to the Policymaker. Note that the Policymaker is the same for all five rounds of each game. Additionally, the minimum allocation rule chosen at the beginning of the game is the same for all five rounds. For completing the task of reading the comments and choosing a minimum allocation rule, the Policymaker is paid a salary of 25 points per round. In the no comment treatment, the Policymaker chooses a MCR with no input from the Players. Once the rule is chosen, it is communicated to the participants, and the standard VCM game proceeds. At the end of each 5 period game, participants were randomized into new roles and groups as described above and the process is repeated. The control group does not receive any information or instructions concerning a comment mechanism nor do either the control or treatment group face any enforcement mechanism.

Participant earnings were recorded at the end of every round and at the end of the experiment, point earnings were totaled across all 5 games and converted to dollars at a rate of $0.03 per point. Sessions took approximately XX minutes and participants were paid their earnings in cash at the end of the experiment and earned an average of $$$$.

Results:

We first examine the effects of the open-comment participation treatments on individual contributions to the group account. Ordinary Least Squares (OLS) regression of the points allocated to the group account on the level of the MCR selected by the Policymaker as well as a set of dummy variables accounting for both the round and the game are presented in Table 1. Model 1 presents the standard OLS regression while Model 2 includes all interaction terms between treatment, round number, and game number. In both models, we find that open comment participation has a positive and significant effect on the number of points allocated to the group account.[2] Additionally, open comment participation serves to speed the decay in the level of individual contributions to the group account over time. While previous literature has

[2] Significant at the .01 level.

noted that VCM contributions decay over time, individuals who are able to comment on a MCR have a significantly larger rate of decay beginning in round 3 than individuals who do not participate (Sefton et al. 2007). One explanation for this effect is that individuals who participate in choosing an MCR have an expectation of cooperation by other group members. If this cooperation is not observed, individuals may be more likely to withhold contributions from the group account as a form of private punishment for group noncompliance. Similar to previous studies, increases in the MCR also increase individual contributions to the group account. Additionally, contributions to the group account decline across rounds within a game which is consistent with previous research.

We next examine noncompliance directly. This is important to understand if participation changes the extent to which individuals deviate from endogenous rule choice. In this experiment, we examine two measures of noncompliance: relative noncompliance and binary noncompliance. Relative noncompliance is the proportion of the MCR not accounted for by the individual allocation to the group account. For example, if the MCR is 10 points, an individual who contributes 3 tokens will have a score of 0.7 for their relative noncompliance measure. Higher values indicate that the individual contribution is further away from the chosen rule. Thus the relative noncompliance measure ranges between 0 and 1 where a score of 1 implies no points were contributed to the group account (and the MCR was nonzero). The second measure is simply whether or not an individual complies with the contribution rule. We code compliance as a 0 and noncompliance as a 1. In both cases, individuals who contribute more tokens than the MCR target are counted as compliant.

The effects of open comment participation on relative noncompliance is measured using both OLS and Tobit regressions and reported in Table 2. Across all models, we find evidence that open comment participation significantly decreases individual noncompliance by reducing the difference between the token allocation and the MCR. The effects are more pronounced for the Tobit models because we are explicitly modeling the process that accounts for a measured value of 0 relative noncompliance. In both the OLS and the Tobit models, F-tests reveal that the coefficients on the dummy variables for the game number as well as the interaction terms between the game and the treatment status are jointly indistinguishable from zero (p-value of 0.21 and 0.22 respectively) so they are excluded from Models 3 and 6. In addition to the direct effects on relative noncompliance, Model 6 reveals that treatment status has a significant interaction with the round number. This indicates that individuals who have the ability to comment on the MCR increase their deviations below the MCR in later rounds of the game more than individuals who do not have the ability to comment on the rule, a finding consistent with changes in contributions to the group account. It is also important to note here that in all models, a higher MCR increases relative noncompliance. Higher contribution rules (representing a higher proportion of the endowment) are more difficult to comply with given the dominant strategy of the game to allocate zero tokens to the group account. Table 3 presents the results from logit models to estimate the effects of treatment on binary measures of noncompliance. The pattern of the results are similar to those observed in Table 2 for relative noncompliance.

Finally, Table 4 presents the average partial effects (APE) for the most parsimonious specifications of both relative noncompliance and binary noncompliance. The APE captures the average effect of treatment after taking into account the interaction terms between treatment and round numbers. Here we see that open comment participation decreases relative noncompliance (proportion of MCR not allocated to group account) by 0.139 in the OLS specification and 0.169 in the Tobit specification. Again, the increased effect in the Tobit model is due to the fact that we have explicitly modeled the higher number of individuals in compliance. In the logit model for binary noncompliance, we observe that treatment status reduces the probability that an individual

will be noncompliant by .192 percentage points. This is a nontrivial share and significant at the .01 level.

Conclusions and Policy Implications:

Agri-environmental programs often incorporate stakeholder participation elements in an effort to increase community ownership of policies designed to protect environmental resources (Hajer 1995; Fischer 2000). Participation – acting through increased levels of ownership – is then expected to increase individual rates of compliance with regulatory policies. Utilizing a novel lab experiment, this research leverages a public goods contribution experiment to test the effects of a specific type of stakeholder participation scheme on individual compliance outcomes across a variety of contribution rules. We find significant evidence that the implemented type of non-voting participation mechanisms reduces the probability that an individual will engage in noncompliant behavior and reduces the extent of noncompliant behavior. At the same time, exposure to the open comment treatment also increases individual contributions to a public good, a finding consistent with previous research on majority-rule voting as a participation mechanism. Additionally, we find evidence that exposure to participation schemes results in a faster decay in individual compliance over time suggesting that the impacts of this type of participation mechanism may be transitory.

This research indicates several clear policy implications. First, participation mechanisms appear to be a viable means for reducing noncompliance and therefore monitoring and enforcement costs. Making stakeholder participation schemes (i.e. private comments) available to individuals during the policymaking or regulatory process may be a low-cost mechanism to promote local ownership of regulatory policies and initial compliance with new policies and rules. Second, the finding that this effect is transitory suggests that there may be a role to extend the current participation framework to allow individuals to communicate with policymakers in future periods that would maintain the positive effects on compliance. This research suggests that increased democratization of policymaking processes through mechanisms that do not require tying the hands of policymakers through a commitment to majority rule voting should be incorporated into a broad array of agri-environmental programs.

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Table 1: Effect of Participation Treatment on Contribution Levels

	(1) OLS	(2) OLS
Dependent Variable:	Points Contributed to Group Account	
	Model 1	Model 2
Treatment	2.837**	6.606***
	(1.323)	(1.616)
Minimum Contribution Rule	0.427***	0.408***
	(0.0787)	(0.0762)
Game 2	-0.291	-0.800
	(1.305)	(1.589)
Game 3	-3.993**	-1.301
	(1.581)	(1.828)
Game 4	-3.189*	-1.930
	(1.694)	(2.031)
Game 5	-3.203*	-1.721
	(1.705)	(1.847)
Round 2	-1.297***	-0.757*
	(0.333)	(0.395)
Round 3	-2.687***	-1.757***
	(0.515)	(0.581)
Round 4	-3.657***	-2.293***
	(0.559)	(0.644)
Round 5	-5.700***	-3.536***
	(0.624)	(0.653)
Treat * Game 2		1.011
		(2.438)
Treat * Game 3		-4.891
		(3.082)
Treat * Game 4		-2.223
		(3.313)
Treat * Game 5		-2.622
		(3.203)
Treat * Round 2		-1.012
		(0.645)
Treat * Round 3		-1.743*
		(0.991)
Treat * Round 4		-2.557**
		(1.060)
Treat * Round 5		-4.058***
		(1.131)
Constant	7.494***	5.739***
	(1.124)	(0.968)
Observations	1,500	1,500
R-squared	0.259	0.276

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2: Effects of Treatment on Relative Noncompliance

	(1) OLS	(2) OLS	(3) OLS	(4) Tobit	(5) Tobit	(6) Tobit
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Treatment	-0.118*	-0.175*	-0.176***	-0.271**	-0.452*	-0.458***
	(0.0631)	(0.0926)	(0.0520)	(0.126)	(0.250)	(0.124)
MCR	0.00979**	0.0104**	0.0124***	0.0238***	0.0248***	0.0310***
	(0.00394)	(0.00394)	(0.00373)	(0.00917)	(0.00912)	(0.00835)
Game 2	0.0620	0.119		0.140	0.249	
	(0.0722)	(0.120)		(0.177)	(0.267)	
Game 3	0.172**	0.118		0.365**	0.275	
	(0.0784)	(0.119)		(0.176)	(0.253)	
Game 4	0.170**	0.150		0.381**	0.312	
	(0.0850)	(0.133)		(0.175)	(0.266)	
Game 5	0.153*	0.120		0.333*	0.278	
	(0.0793)	(0.110)		(0.176)	(0.237)	
Round 2	0.0597***	0.0422*	0.0422*	0.144***	0.0767	0.0798
	(0.0158)	(0.0246)	(0.0246)	(0.0350)	(0.0493)	(0.0494)
Round 3	0.144***	0.130***	0.130***	0.333***	0.260***	0.262***
	(0.0228)	(0.0330)	(0.0329)	(0.0410)	(0.0525)	(0.0527)
Round 4	0.191***	0.165***	0.165***	0.415***	0.340***	0.341***
	(0.0234)	(0.0325)	(0.0324)	(0.0403)	(0.0476)	(0.0472)
Round 5	0.287***	0.245***	0.245***	0.565***	0.453***	0.455***
	(0.0268)	(0.0355)	(0.0354)	(0.0505)	(0.0625)	(0.0629)
Treat * Game 2		-0.109			-0.219	
		(0.145)			(0.343)	
Treat * Game 3		0.0949			0.158	
		(0.157)			(0.341)	
Treat * Game 4		0.0328			0.121	
		(0.173)			(0.354)	
Treat * Game 5		0.0582			0.0938	
		(0.156)			(0.330)	
Treat * Round 2		0.0327	0.0327		0.132*	0.129*
		(0.0317)	(0.0316)		(0.0694)	(0.0688)
Treat * Round 3		0.0270	0.0270		0.143*	0.137*
		(0.0456)	(0.0455)		(0.0821)	(0.0819)
Treat * Round 4		0.0474	0.0474		0.147*	0.136*
		(0.0465)	(0.0463)		(0.0794)	(0.0790)
Treat * Round 5		0.0787	0.0787		0.217**	0.210**
		(0.0526)	(0.0525)		(0.0919)	(0.0915)
Constant	-0.000158	0.0223	0.0988*	-0.753***	-0.672***	-0.531***
	(0.0655)	(0.0756)	(0.0508)	(0.173)	(0.197)	(0.148)
Observations	1,500	1,500	1,500	1,500	1,500	1,500
R-squared	0.127	0.134	0.102			

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effects of Treatment on Binary Noncompliance

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Treatment	-0.761**	-1.197*	-1.209***
	(0.362)	(0.628)	(0.355)
Minimum Contribution Rule	0.0706***	0.0724***	0.0865***
	(0.0238)	(0.0236)	(0.0232)
Game 2	0.226	0.430	
	(0.438)	(0.650)	
Game 3	0.901*	0.753	
	(0.476)	(0.681)	
Game 4	0.924**	0.682	
	(0.465)	(0.692)	
Game 5	0.826*	0.801	
	(0.447)	(0.670)	
Round 2	0.334***	0.131	0.129
	(0.0989)	(0.121)	(0.119)
Round 3	0.814***	0.577***	0.566***
	(0.123)	(0.139)	(0.131)
Round 4	0.963***	0.832***	0.815***
	(0.123)	(0.153)	(0.145)
Round 5	1.315***	1.027***	1.007***
	(0.138)	(0.163)	(0.160)
Treat * Game 2		-0.403	
		(0.869)	
Treat * Game 3		0.269	
		(0.944)	
Treat * Game 4		0.453	
		(0.926)	
Treat * Game 5		0.0379	
		(0.870)	
Treat * Round 2		0.400**	0.376**
		(0.189)	(0.181)
Treat * Round 3		0.470**	0.427**
		(0.228)	(0.211)
Treat * Round 4		0.272	0.231
		(0.238)	(0.222)
Treat * Round 5		0.569**	0.508**
		(0.264)	(0.249)
Constant	-2.125***	-1.931***	-1.557***
	(0.414)	(0.464)	(0.340)
Observations	1,500	1,500	1,500

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Marginal Effects of Treatment on Noncompliance

	(1)	(2)	(3)
Dependent Variable	Rel. Noncomp.	Rel. Noncomp.	Binary Noncomp.
Model	OLS	Tobit	Logit
Treatment	-0.139**	-0.169**	-0.192***
	(0.0629)	(0.0690)	(0.0724)
MCR	0.0124***	0.0160***	0.0192***
	(0.00373)	(0.00447)	(0.00453)
Round 2	0.0597***	0.0574***	0.0700***
	(0.0156)	(0.0154)	(0.0203)
Round 3	0.144***	0.149***	0.177***
	(0.0227)	(0.0228)	(0.0250)
Round 4	0.191***	0.193***	0.210***
	(0.0233)	(0.0241)	(0.0257)
Round 5	0.287***	0.287***	0.287***
	(0.0264)	(0.0275)	(0.0270)
Observations	1,500	1,500	1,500

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