The design of the Clean Power Plan as a complex ecology of policy games

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Abstract

In this paper, we examine stakeholder participation during the design of the Clean Power Plan, the cornerstone rule devised by the Obama administration to tackle climate change by lowering greenhouse emissions from power plants in the U.S. We code information from publicly available documents detailing the complex interactions involving EPA staff and stakeholders before the rule published in final form, and examine the patterns of participation of more than 1200 stakeholders in 266 meetings that took place between June of 2013 and October of 2015. We see the forums where stakeholders interact as realizations of policy games that give actors the chance to learn about the potential scope and content of the rule but also build ties with other stakeholders, which in turn could be the foundation for formal coalitions that exert influence in the rulemaking process. Our results show that the subset of stakeholders who can be potentially more affected by the content of the Clean Power Plan are more likely to overlap in their forum attendance patterns, in comparison to other types of stakeholders. These participation patterns help illustrate the unprecedented level of conflict that the rule generated, which ultimately led to its demise in early 2017.

Keywords: Clean Power Plan, Climate Change, Environmental Protection Agency, Rulemaking process, Conflict.

1. Introduction

The regulatory process in democratic systems is commonly the turf of vigorous political battles. This is patently clear in the U.S., where the bureaucratic rulemaking process is permeated by the influence exerted by myriad policy actors, including the president, the courts, bureaucrats, interest groups, and congressmen (Kerwin, 2003). This is so by design. The Administrative Procedure Act of 1946 (5 U.S.C. 553), establishes that when federal agencies design rules, they must ensure that stakeholders (anybody affected by or with an interest in the rule) can formally participate in the rulemaking process. This participation can be accomplished in a number of ways, the most common of which is the opening of a notice-and-comment period that gives stakeholders the opportunity to comment on a draft version of the rule (i.e. before the final rule is adopted).

But participation in the rulemaking process is not limited to this public comment period. In fact, participation can occur both before and after this stage. Before public comment happens, agencies can engage in ex parte discussions with stakeholders who are particularly interested in the content or scope of a potential rule (Naughton, Schmid, Yackee, & Zhan, 2009; Yackee, 2012). After an agency passes a final rule, stakeholders might (as they very often do) challenge parts or the whole of a rule in court (Kerwin 2003).

While scholars have rigorously studied the different stages of the rulemaking process, a few limitations are common across most of the scholarship produced in this area. Two of them are of special interest to us. First, researchers rarely study more than one stage at the same time. This is somewhat problematic because it is difficult to properly understand the rule making process without paying attention to it holistically. Second, even though there is ample evidence that stakeholders engage in coalition lobbying to further their policymaking goals during the rulemaking process (Beyers & Braun, 2014; Furlong & Kerwin, 2005; Heinz, 1993; Hula, 1999; Nelson & Yackee, 2012), scholars usually assume that coalitions form *ex-ante*, and pay less attention to the fact that the patterns of interactions that take place during the regulatory process may in fact affect the formation of coalitions. In this paper, we tackle these two limitations by asking a simple question: Do policy actors that participate in the earlier stages of the rulemaking process establish ties with others with whom they share policy interests?

We use a case study approach to find out how stakeholder participate in the earlier stages of a complex rulemaking process as they participate in the "ecology of games" (author, 2016; Lubell, 2013) that forms when the stakeholders attend certain forums in which they can learn about and discuss the content of the regulation. The regulation we study is the Standards of Performance for Greenhouse Gas Emissions from Existing Sources: Electric Utility Generating Units, colloquially known as the Clean Power Plan. The rule was President Obamas cornerstone policy effort to curve greenhouse gases produced by power plants in the U.S., and has been highly litigated. On March 28th, 2017 President Trump signed an executive order calling on the EPA's Administrator to take steps to dismantling the rule. We code publicly available information about meetings organized by the EPA and other actors to discuss the content of the rule both before and after its publication in draft form. In so doing, we collect information on attendees to the meetings, and fully map the patterns of attendance while examining the propensity of stakeholder to attend meetings with actors that have similar interests.

Our research is both important on theoretical and methodological grounds. Theoretically, we offer insights on how to apply the Ecology of Games framework to the study of regulatory processes. Methodologically, our research shows a series of steps that can be followed to mine the vast amounts of information on different rulemaking processes led by federal agencies in the U.S.

The following section quickly describes the rulemaking process in the U.S. Later sections describe our hypotheses, methodological approach and results. We conclude the paper by discussing some implications of our work and needed future steps in this area of research.

2. A Short Description of the Rulemaking Process in the U.S.

In the United States, the rulemaking process at the federal level consists formally of three main stages. The first stage is the *pre-proposal*, which usually starts when an agency decides to craft a rule (always after it has received the consent of Congress to create a rule through a statutory delegation of authority). During this stage, the agency does two things. First, it drafts the rule while evaluating the problem or issue that the rule should be able to address. This is usually done after the agency contacts relevant stakeholders and collects information from different sources that can be used to draft the rule. Second, it submits the rule for interagency review, as needed. Studies show that stakeholders that can make their voices heard in this early stage are more likely to secure their imprint into the final rule (Cook & Rinfret, 2013; Fritschler & Rudder, 2006; Magat, Krupnick, & Harrington, 1986; West, 2009; Yackee, 2012).

The second stage is the formal proposal, which starts right after the agency publishes a Notice of Proposed Rulemaking (NPRM) in the Federal Register when a draft of the rule is ready. At that point, the drafting agency formally invites the public to comment on the draft rule. This is known as the notice-and-comment period and usually extends from 60 to 120 days, depending on the agency. The invitation to comment is not at the discretion of the agency, but a result of clear directives contained in the Administrative Procedure Act of 1946 (5 U.S.C. 553). In addition to comments, the drafting agency can also convey meetings during this stage to reach out to stakeholders and increase the possibility that rules obtain greater public buy-in.

The final stage is the final rule publication, which happens after the agency has been able to take comments and input into account and modify (or not) the draft rule that was presented during the formal proposal stage. It is after the publication or rules that litigation usually becomes a worthwhile strategy for at least certain stakeholders that are involved in the rulemaking process (Kerwin 2003; Whitford, 2003).

In this paper, we are concerned with studying the interactions that take place among stakeholders in meetings that occur during the first two stages of the process.

3. The Clean Power Plan

To test the hypotheses, we observe stakeholder participation in meetings during the first two stages of development of the Standards of Performance for Greenhouse Gas Emissions from Existing Electric Utility Generating Units (a.k.a. the Clean Power Plan). This rule was drafted by the Environmental Protection Agency (EPA) after President Obama issued a Presidential memorandum in June of 2013 directing the agency to create greenhouse gas standards for the power sector under the authority granted to the agency by section 111(d) of the Clean Air Act.

The Clean Power Plan is the cornerstone of the U.S. Intended Nationally Determined Contribution (INDC) to reduce greenhouse gas emissions by 26 to 28% by 2025. INDCs were presented by every nation attending the Paris Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), which took place on November of 2015. INDCs contain national commitments to reduce greenhouse gases and are seen as a central component to coordinate a joint response to mitigate climate change on a planetary scale. Considering that the U.S. has the highest greenhouse gas emissions per capita in the planet, many see the Clean Power Plan as a regulatory instrument of critical importance for climate change mitigation.

The presidential memorandum also directed the EPA to require States to submit implementation plans for the rule no later than June 30, 2016. The Environmental Protection Agency started working on the rule, and published the draft in the Federal Register on June 18, 2014, inviting comments for a period of 120 days (which was later extended to 165 days). By the end of the comment period, the EPA received a very significant number of comments, most of which were submitted by anonymous individuals.

While the design of the Clean Power Plan has been touted as an example of cooperative federalism, with the EPA formulating guidelines that drew on existing state actions such as the northeastern Regional Greenhouse Gas Initiative (Bulman-Pozen & Metzger 2016), political conflict during this period was extremely high. For instance, early in 2015 the Republican Senate Majority Leader Mitch McConnell sent a letter to state governors urging them to resist the President’s Clean Power Plan, prompting responses from some governors calling the plan a presidential attempt to impose a radical liberal climate change agenda (Davenport, 2015).

The final rule was released in August 2015, and established interim and final CO2 emission performance rates for coal, oil, and natural gas-fired power plants. The rule place a heavy load on state governments, establishing both interim and final targets for CO_2 emissions for each individual state, and requiring them to develop and implement plans to achieve those goals (interim CO_2 emissions would have to be reached between 2022 to 2029, while final CO_2 emission performance rates would have to be achieved by 2030). The rule included a description of the best system of emissions reduction (BSER) that states could use to arrive at those targets, though the adoption of that system was left to the states. [4]

[4] The BSER has three building blocks. The first one is to reduce the carbon intensity of electricity generation by improving the efficiency of existing coal-fired power plants. The second block is to substitute increased electricity generation from natural gas plants for reduced generation from coal-fired power plants. The final block is to substitute increased electricity generation from new zero-emitting renewable sources such as wind and solar for reduced generation from coal-fired power plants.

As soon as it was released, the rule was challenged in federal courts by state governments, industrial interest groups, business associations and utility companies (almost 40 lawsuits were filed). In October 2015, a coalition of states and other stakeholders opposing the rule brought suits against EPA to ask for a stay on the clean power plan to the D.C. Circuit, which declined the petition. In January 2016, this request was filed with the United States Supreme Court. The court granted the stay in February, halting implementation of the rule pending the resolution of legal challenges against it in court. On March 28th, 2017 President Trump signed an executive order in which he calls for the EPA Administrator to take steps to dismantling the rule. The same day, Scott Pruitt (the EPA Administrator) requested that the court put the 2015 case on hold, as the agency would not further defend the rule. On April 28th 2017, the D.C. Circuit Court of Appeals shelved lawsuits over the plan’s legality over the objections of environmental groups, 18 states and cities including New York, Chicago and Philadelphia.

4. The Rulemaking Process as an Ecology of Games

Studying the influence of policy stakeholders in the policy making process in the U.S. has been a venerable preoccupation for social scientists since Schattschneider (1960, p. 35) criticized the pluralist view of American democracy as being naïve about the disproportionate amount of power yielded over the policy making process by social-economic elites. From the early view of policy making processes as driven by iron triangles formed by bureaucratic agencies, their clientele, and congressional committees, to more modern views of policy making as the result of the complex operation of issue or policy networks formed by actors with unique resources and coordinating capacity, scholars have examined in detail some of the variables that explain the influence of certain actors over others in both the design and implementation of policy (Baumgartner & Jones, 1993; Berry, 1999; D. Carpenter, Esterling, & Lazer, 2003; D. P. Carpenter, Esterling, & Lazer, 2004; Grossmann, 2012; Heclo, 1978; Patashnik, 2003).

In the specific realm of bureaucratic rulemaking, social scientists have developed a strong tradition of studies exploring how actors can achieve a greater level of influence in the process. Magat et al. (1986) studied technical rules issued by the Environmental Protection Agency, highlighting the important agenda-setting role played by early participants in the rulemaking process. Yackee (2012) analyzed government documents from federal government agencies and found that ex parte lobbying in which stakeholders share policy and political information with regulators during the pre-proposal stage of rulemaking can help explain changes in rules. Another example of this line of study is the work of Cook and Rinfret (2013), who examined the process leading to the design of the Mandatory Reporting of Greenhouse Gases Rule in 2009 and showed how the EPA convened more than 100 meetings with hundreds of stakeholders to gauge their views on a potential rule. They found that involvement during this stage was particularly beneficial for stakeholders because they became more prepared to influence the language of the rule after the draft had been proposed by the agency. In other words, participating in meetings gave stakeholders valuable information that allowed them to learn about the issue at hand, and about the interests of other stakeholders. West (2009) also studied the EPA and showed that the agency puts different mechanisms in place during the pre-proposal stage that can serve as forums for the exchange of ideas among stakeholders and members of the agency, such as workshops, focus groups, public meetings held in different locations, advisory committees, etc.

Here, we argue that the availability of these forums creates an "ecology of games", which is formed by both stakeholders and the games they play (i.e. the forums they attend). The "ecology of games" as a metaphor to study complex decision-making systems is not new. Norton Long (1958) originally proposed it to study the complex patterns of political interactions that take place in local areas where a multitude of policy topics need to be simultaneously attended to. More recently, Lubell (2013) rescued the term to describe polycentric governance systems, and others have utilized it to gauge both the complexity of such systems and the effects that this complexity may have on individual behavior (author, 2016; author, 2015; Lubell, Robins, & Wang, 2014). Using social network analysis (SNA) techniques, this line of research conceives polycentric governance systems as networks that are basically composed of two types of nodes: policy stakeholders, and the venues where they interact to learn about problems and advance their policy goals. A considerable stock of research has demonstrated that exchanges that take place in policy forums may be conducive to the formation of coalitions, the development of trust-based relationships, and higher levels of learning about policy options to tackle certain problems, among others (Fischer, 2015; Sabatier, 1987; Schneider et al, 2003).

We posit three main hypotheses about the patterns of interactions that we expect to observe in the ecology of games that forms when actors participate in meetings to discuss the rule. The first hypothesis is concerned simply with the level of activity and clustering in patterns of participation in the ecology of games as the regulatory process moves from the pre-proposal stage to the formal proposal stage. As we described in an earlier section, scholars have shown that agencies can engage in ex parte discussions with stakeholders that are concerned or interested in a particular rule that is under consideration (Naughton et al., 2009; Yackee, 2012). These discussions are not necessarily inclusive of actors who may have only a tangential interest in the rule, but rather are more likely to involve stakeholders with a sustained interest. Yet because these discussions happen before the agency produces a finalized draft (and some of them even before a draft has been initiated), meetings are less likely to involve the same actors repeatedly. However, after a draft has been released, and particularly in the case of controversial regulations such as the one we study here, one should expect to see that at least certain stakeholders have a greater presence in the ecology of games (i.e. they participate in more meetings). If this is the case, then the likelihood of observing a greater level of clustering in the system should increase, as a subset of stakeholders starts overlapping in meetings with each other. Thus our first hypothesis is stated as follows:

H1. *The level of global clustering in the ecology of games to discuss the Clean Power Plan should be higher after the draft rule is published.*

In addition to hypothesis 1, which centers in the global level of clustering in the whole ecology, we also advance two hypothesis about the level of clustering and homophily that we should observe at the individual level when stakeholders participate in the rulemaking process. The two hypotheses are based on the assumption that individual risk perceptions should have an impact on the pattern of participation of stakeholders in meetings. Risk perception has been said to affect how policy actors behave in complex policy making systems. Berardo and Scholz (2010), for instance, advanced and tested what they call the risk hypothesis, according to which actors who perceive themselves to be in riskier situations should be more likely to form bonding social structures in their networks, which are characterized by highly clustered relationships among policy actors with similar positions or interests.

Berardo and Scholz found evidence in support of the risk hypotheses in policy networks of 22 U.S. estuaries, and since the publication of their results, their findings have been replicated in different policy subsystems both in the U.S. and other countries (Andrew & Carr, 2012; Angst & Hirschi, 2016; Feiock, Lee, Park, & Lee, 2010; Lubell et al., 2014). Here, we argue that the risk hypothesis can be adapted to the study of the rulemaking process and involvement in the ecology of games. After all, the design and implementation of regulatory policy often curtails the potential negative effects of certain economic activity and in so doing is likely to negatively affect the utility function of at least some stakeholders (i.e. those being targeted by the new regulations). If this is the case, and the risk hypothesis applies, then we should see the affected actors as being more likely to engage in highly clustered network structures in the ecology of games, in order to close ranks when discussing a rule that they consider relevant to their interests. In the case of the Clean Power Plan, the most affected parties are the energy generation sector (i.e. “the industry”) but also the state governments that are tasked with developing plans to accomplish goals that many of them perceive as being imposed from above without proper consultation.

H2. State governments and stakeholders from the industry sector will exhibit greater levels of clustering when participating in the ecology of games in comparison to other groups of stakeholders, particularly after the rule is published in draft form.

A final hypothesis is not concerned with the level of overlapping patterns that actors develop in the meetings they attend, but rather the character of that overlap. The risk hypothesis as we described it in the previous paragraphs was concerned with the structure of interactions, but had less to say about how certain characteristics of the actors impacted their propensity to interact with each other. Here, we argue that the stakeholders who are more likely to be heavily impacted by the rule are not only more likely to be engaged in highly clustered structures, but also that they should tend to participate together in meetings.

In social network analysis, the tendency of actors to create ties to others of similar characteristics is known as homophily (McPherson, Smith-Lovin, & Cook, 2001), and has been used to explain a wide range of phenomena, from the perception of procedural fairness in collaborative processes (author, 2013) to the level of collaboration among local governments in regional planning networks based on the similarity of their constituencies (Gerber, Henry, & Lubell, 2013).

In the specific case of regulatory processes, one would expect that stakeholders who are in a risky position would not only tend to build bonding structures, as predicted by hypothesis 2, but also that they simply build more ties with other stakeholders that are in a similar risky situation.

H3. *State government stakeholders and industry stakeholders will exhibit a greater tendency to participate in forums with other stakeholders of their same type in comparison to other groups of stakeholders, particularly after the rule is published in draft form.*

5. Data Collection

To test our hypothesis, we analyze the patterns of participation of stakeholders in meetings organized to discuss the potential scope and content of the rule before the publication of the draft on June 18th 2014 (pre-proposal stage), and after the draft was released (formal proposal stage). The EPA staff has uploaded all information about meetings (including attendance lists) in the rule's docket.[5] The authors developed a codebook to code these data and a research team composed by Holm and 8 undergraduate students performed the coding over a 10 week span. This time-intensive coding exercise resulted in the identification of 5067 individuals who participated in a total of 266 meetings.[6] Since many of these individuals represented organizations, we aggregated the data at the organizational level and ended up with 1315 total stakeholders (a minority of these were actually individuals who participated in meetings simply as concerned citizens).

With this information, we created two different two-mode matrices to perform our analyses.[7] The first matrix contains the information about participation in meetings that took place from June 2013 until June 18th 2014 (the pre-proposal or pre-draft stage). The matrix has cells x_{ij} indicating whether stakeholder *i* participated in meeting *j*. The matrix is valued, because some stakeholders could have been represented by multiple individuals at a meeting. For instance, if an organization sent 3 individuals to a meeting, then the *ij* cell for that stakeholder and meeting would contain a value of 3. The second matrix is also a two-mode matrix built in the same way, but containing only meetings that took place after June 18th 2014, and before the publication of the rule in final form (the formal proposal or post-draft stage).

We then coded each of the 1315 stakeholders with a categorical variable capturing stakeholder type. The 9 values in this variable are: 1) Local/Regional government, 2) state government, 3) federal government, 4) environmental NGO, 5) industry group or

[5] https://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=commentDueDate&po=0&D=EPA-HQ-OAR-2013-0602&docst=Meeting+Materials

[6] Even though the docket has information for 277 meetings, we found that some of the information about a few individual meetings was inaccurate. For instance, some of the information collapsed attendance to two different meetings and considered attendees as attending one meeting instead of two. Once we cleaned the database, we ended up with more than 300 meetings. There we three main types of meetings: conference phone calls, meetings in physical venues where multiple stakeholders could attend, and webinars. We coded all meetings, but decided to include only phone calls and physical meetings in this analysis because it was not clear that webinars produced the conditions to assure that stakeholders could be aware of the identity of other attendees and the positions they had in regard to the rule. The docket from which we obtained the information does not detail how participation in meetings is decided. For instance, there is no information describing whether participation in meetings is mostly affected by the EPA's decision to invite specific stakeholders, or by the stakeholders own strategies to decide where to participate. To obtain clarification on this point, we contacted a member of the EPA staff working on the rule, who explained that in the big majority of cases (and particularly in the second stage of the process), stakeholders voluntarily reached the EPA to request a meeting to discuss the possible content of the rule, and that in most instances these requests came from stakeholders who were opposed to the contents of the rule (EPA staff member, personal communication, May 19th 2017).

[7] A two mode matrix is composed by two types of nodes. In our case, the first type of node is the policy stakeholder, and the second type is the forum to which they may (or not) attend.

organization, 6) municipal utilities, 7) university/research institution, 8) other type of organizational actor, and 9) individual citizen. [8]

6. Measuring Clustering and Homophily in the Ecology of Games

To test hypothesis 1, we compare the global clustering coefficient for each of the networks (before and after publication of the draft). We use the `Tnet` package in R to calculate the scores, which operationalizes the clustering coefficient for weighted two-mode networks as described by Opsahl (2013). Opsahl proposed a new coefficient for two-mode networks that measures closure involving three nodes at a time from the primary mode or node set (the stakeholders in our case). The coefficient is the result of a simple division: number of closed 4-paths in the network over the number of total 4-paths that exist in the network. Figure 1 illustrates the difference between an open (panel A) and closed 4-path (panel B).

[figure 1 here]

The value of the coefficient ranges from 0 (where all 4 paths are open as in panel A), to 1 (where all 4 paths are closed as in panel B—only possible in a fully connected network).[9]

In addition to calculating the global clustering coefficient, `Tnet` allows for the calculation of individual clustering scores for each node of the primary node. We use this calculation to test hypothesis 2, which states that certain types of stakeholders will exhibit higher levels of clustering. Formally, the local clustering coefficient for individual nodes in a two-mode network is calculated by dividing the number of closed 4 paths centered on node *i*, over the number of 4 paths centered in the same node. Again, the coefficient ranges from 0 to 1.[10] After obtaining the individual scores, we calculate the mean of such scores by stakeholder type in order to test hypothesis 2.

To test hypothesis 3 we need to measure homophily in participation in meetings, and we do so based on stakeholder type. We proceed in fourth steps. First, we multiply each of the two mode networks (before and after publication of the draft) by its transpose to obtain one-mode matrices. In these matrices, stakeholders are located in both rows and columns, and a cell x_{kl} shows the number of meetings in which organizations *k* and *l* participated together. The second step is to dichotomize the matrices, which now will simply contain a value of 1 in the cells if the organizations participated in any meetings together, and 0 otherwise. Third, we input these matrices into UCINet (Borgatti, Everett, & Freeman, 2002), and calculate the E-I index (Krackhardt & Stern, 1988) by

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[8] Our originally categorization included 19 different categories, but many of them produced few cases (media, tribes, consultants, etc.) and so we group them under the "other type of organizational actor" category.

[9] The coefficient can be weighted in a number of ways when the ties in the network are valued, as is the case with our networks (since certain stakeholders might send multiple representatives to the events). Opsahl and Panzarasa (2009) describe four ways in which each triplet in the network can be weighted: Arithmetic mean, Geometric mean, Maximum Value, and Minimum. We calculate the global coefficients in our networks using the Geometric mean, since this is more appropriate in situations in which there is variance in the strength of the ties involving the members of the triad. In practice, the four methods render very similar scores, particularly for large networks. For more on the calculation of the coefficient, see Opsahl and Panzarasa (2009).

[10] We also weigh the local coefficient according to the geometric mean

organizational type. The EI index measures a network's tendency toward homophily by measuring how many of the nodes' links are directed toward other nodes with whom they share some attribute of interest (i.e. the organizational types in our case). The index is calculated as follows:

$$E - I\ Index\ = \frac{EL - IL}{EL + IL} \quad [1]$$

where *EL* represents the number of "external" links (i.e. links between nodes who are of a different organizational type), and *IL* represents the "internal" links (i.e. links between nodes who share the same organizational type). The index ranges from -1 (complete homophily, in which all links are internal and thus complete insularity exists) to 1 (complete heterophily, in which all links are external and thus no insularity by organizational type exists). Finally, the fourth step is to compare the E-I index scores by stakeholder types to gauge whether state government and industry stakeholders are more homophilic in comparison to other types, as stated in hypothesis 3.

7. Results

Figure 2 shows the participation of stakeholders (circles) in the forums (gray squares) organized to discuss the content and scope of the Clean Power Plan before the rule was published in draft form (pre-proposal stage). Figure 3 shows the participation or stakeholders in forums after the publication of the draft, during the formal proposal stage.

[figure 2 here]

[figure 3 here]

Table 1 summarizes some of the main differences between the two networks. Perhaps the most important one is that the overall level of activity is much higher after the publication of the draft, as it would be expected.

[table 1 here]

Both the number of stakeholders participating in forums, and the number of forums themselves grow by almost 500% after the publication of the rule in draft form. Also, all 9 categories of stakeholders see their participation level increase by a considerable margin from the first to the second stage. Not taking into account the "other" and "individual" categories, the organizational types that are prevalent are Environmental Industry Group or Organization, and State Government, not surprisingly given the strong implications that the Clean Power Plan has for these groups of actors. The remaining quantity of interest in the table is the coefficient for Global Clustering, which we use to test hypothesis 1.

In support of the hypothesis, we see a considerable increase in the value from the pre-draft stage to the after-draft stage, which indicates that there is a much larger proportion of closed 4-paths in the network. While almost 2% of all 4-paths were closed in the network of meetings that took place before the draft was released, the number climbs to almost 14% after the release in the draft. This indicates that stakeholders are actually overlapping with each other more, as they attend multiple meetings where they can meet repeatedly. At the very least, this repeated interactions can provide stakeholders with better information about who the most interested players are in the rulemaking process, which may have an effect on their individual strategies down the line on how to support or oppose the rule (though this is a claim that needs to be subject to empirical validation).

But is this increase in the global clustering score distributed uniformly among stakeholder types or not? Hypothesis 2 stated that state government stakeholders and industry stakeholders should actually exhibit greater levels of clustering in comparison to other groups of stakeholders. Unfortunately, the hypothesis cannot be tested for the pre-proposal stage because only 19 out of 139 stakeholders (~14 % of actors) actually have an individual local clustering score, a clearly insufficient number to perform statistical tests of differences in means by stakeholder types. The local clustering coefficient is undefined for nodes with only one connection (i.e. participating in one forum only), and thus most actors do not have a coefficient. This, of course, is by itself a valuable finding since it illustrates the fact that the network in the first stage of the regulatory process is just too sparse, with most actors having simply attended one meeting to gather some information about the potential content of the rule. But we can test the hypothesis for the formal-proposal stage, because in this case 314 actors out of 1258 (~25%) have individual local clustering scores. Table 2 shows the mean score of local clustering values by stakeholder type.

[table 2 here]

The mean scores for Industry Group or Organization (i.e. industry stakeholders), and State Government (i.e. state government stakeholders) do not surpass the scores of all other stakeholder type categories, so a rejection of hypothesis 2 is in order. To sort out significant differences in the scores by stakeholder types, we performed a pairwise comparison of means using the `pwmean` command in Stata with the `mcompare` option, which implements Tukey's *honestly significant difference test*. This method is conservative in assessing differences and uses the studentized range distribution instead of the t distribution.[11] Results showed that there are no significant differences between any pair of types of stakeholders, and so we reject our hypothesis 2. We include the full output of the test in the Appendix.

Even though the results show a lack of support for hypothesis 2, which prevents us from concluding that the level of closure in the network varies by stakeholder type, it is still possible that there are differences in how different stakeholders participate in forums, as hypothesized in H3. According to that hypothesis, state government and industry stakeholders should be more likely to overlap with other actors of the same type when they attend meeting.

Table 3 includes the results from our calculations of the E-I index using the routine available in UCINET, which we use to test hypothesis 3. The first row of the table contains the observed E-I value. Under the observed E-I value are the expected values that would be produced in a network of the same size and with the same number of groups of types

[11] One of the assumptions that must hold for the use of Tukey's test is that there is equal within-group variance across the groups associated with each mean. We performed a Levene's test using the `robvar` command in Stata and the assumption holds for this particular dependent variable.

of stakeholders if the ties were distributed randomly. To assess whether the values of the E-I index in the observed network are significantly different than it would be expected under conditions of random mixing, UCINET perform a default of 5000 permutations in which the blocking of groups and the overall density in the network is maintained, but where the actual ties are distributed randomly. These permutations produce a sampling distribution of the numbers of internal and external ties that result from the runs, which can then be used to compare it to the observed value and determine the frequency with which the observed ties could result from sampling from a randomly distributed population. The full output for the observed network-level E-I values are included in the appendix. The table also contains raw scores by stakeholder type.

[table 3 here]

While we did not hypothesize about the changes of the E-I value at the whole network level (only at the individual level based on stakeholder type), it is interesting to note that the observed value for the second stage (after draft release) is actually lower than the expected value, and that this difference is statistically significant at the .01 level. This means that the network is less heterophilic than it would be expected if the ties were drawn randomly. In other words, we observe a network that is more homophilic than it would be expected by chance. This was not the case in the first stage of the process. These results can be read as complementary with the global clustering scores, which showed that clustering increased in the second stage as well. Overall, we believe it is plausible that, after the contents of the rule became known, actors may be have begun to interact in ways that could have potentially allowed them to draw some collective strength from their overlapping patterns of participation in meetings.

In regards to scores by stakeholder types, the E-I values in Table 3 for each of the stakeholder types show that state government and industry stakeholders have indeed lower E-I values than the rest of stakeholder types, which indicates that they are more homophilic in their meeting attendance patterns as predicted by hypothesis 3. But are these differences significant? UCINET does not produce a statistical test to gauge whether the differences reported in table 3 are significant or not. However, the software calculates scores for individual actors, so we proceed as we did with the local clustering scores, and perform pairwise comparison of means by stakeholder types. Table 4 shows the mean scores by stakeholder type.

[table 4 here]

We cannot use the `pwmean` command in Stata to test for difference of means among stakeholder types because the assumption of homogeneous variance within groups does not hold in this case.[12] Thus, we used the `pwmc` module to compute pairwise multiple comparisons with unequal variances in Stata. This module implements Dunnett's C, GH and T2 procedures, as proposed by Dunnett (1980), Games & Howell (1976), and Tamhane, (1979), all three of which are designed to assess difference among groups with unequal variances. All three procedures render similar results for our data, and so we report Dunnett’s output in tables 4 and 5 (full output for the Dunnett’s procedure can

[12] We performed a Levene’s test to check whether the assumption held; readers can visually inspect the distribution of cases in figures A1 and A2 in the appendix.

be found in the appendix).

We summarize the results of significant differences identified through Dunnett's procedure in tables 4 and 5. The tables show the differences between categories of stakeholders only when these differences are significant at the .01 level. The value in the cell is simply obtained by subtracting the mean score of the stakeholder type in the column from the mean score of the stakeholder type in the row. Thus, a positive value means that the mean score of the EI index for stakeholder type in the row is statistically significantly higher than the EI scores for the stakeholder type in the column (i.e. the stakeholder type in the row is more heterophilic than the stakeholder type in the column). Conversely, a negative value means that the stakeholder type in the row is more homophilic than the stakeholder type in the column.

[table 5 here]

[table 6 here]

The results support hypothesis 3, since they show that state government and industry stakeholders have a mean score for the E-I index that is significantly lower than other categories. State governments score lower than local/regional governments, municipal utilities, and universities/research institutions, while industry stakeholders also score lower against all those types, plus environmental NGOs. In no instance do state governments or industry stakeholders have a higher score in relation to another stakeholder type. Interestingly, the differences deepen after the rule was published in draft form. In the second stage, both state governments and industry stakeholders score lower as a group than local/regional governments, federal governments, environmental NGOs, municipal utilities, universities/research institutions, and other types of organizations. In other words, both state governments and industry stakeholders attend meetings where other stakeholders of their same type are more likely to be present.

This marked tendency toward homophily for these types of stakeholders could be caused by a number of reasons, but our personal communication with the EPA staff (see footnote #4) suggests that there could be a coordinated effort by those actors to attend meetings *en masse* in order to exert more effective pressure on the EPA, as the agency developed the rule. This would fall in line squarely with previous findings that convincingly show how interest groups and stakeholders often self-organized in coalitions to influence the policymaking process (Heaney, 2014; Kriesi, Adam, & Jochum, 2006; Leifeld & Schneider, 2012). If this is the case, then one could claim that this self-organization pattern driven by homophily that we have shown for both state government and industry stakeholders would be fundamentally oriented towards shifting the rulemaking process into favorable policy outcomes for the involved stakeholders. We think that this tendency to homophily in the ecology of games of the rulemaking process, paired with findings of the overrepresentation of business interests during notice-and-comment periods (Golden 1998) at the very least sheds light on the capacity of these types of actors to mobilize in order to exert considerable influence on the content of rules.

8. Conclusion

In this paper, we have examined stakeholder participation in the process leading to the design of the Obama administration's Clean Power Plan, the cornerstone rule designed to tackle climate change by lowering greenhouse emissions from power plants in the U.S. Using an ecology of games approach, we coded publicly available information to show the complex patterns of participation of more than 1200 stakeholders in 266 meetings that took place between June of 2013 and October of 2015. We see the forums where stakeholders interact as realizations of policy games that give actors the chance to learn about the potential scope and content of the rule but also build ties with other stakeholders.

Our results show that the subset of stakeholders that can be potentially more affected by the content of the Clean Power Plan are more likely to overlap in their forum attendance patterns, in comparison to other types of stakeholders. We view this result as evidence of a process of homophily (social selection based on shared attributes) that can have important implications for the functioning of the rulemaking process.

Despite the time intensive nature of our research effort, and the fact that we offered a new way of examining how the earlier stages of the rulemaking process may unfold (a methodological approach that can be adapted to the study of other rules), our work is not free of limitations.

First, in this work we cannot really gauge the content of the discussions that took place in the forums we study. In the information that is available online, there are no detailed minutes for the meetings, and thus we remain ignorant about what sorts of informational exchanges take place among stakeholders. Without this information it is impossible to speculate about the real chances that stakeholders have to learn from each other and form coalitions that can exert pressure in the rulemaking agency.

A second limitation of our approach is that we base our analysis on a categorization of stakeholders that is necessarily very broad. Thus, one has to assume that all stakeholders of a given type face similar incentives to participate in the rulemaking process. This is not realistic. In our "industry" category, for example, we have both companies for whom coal might be the main source for electricity generation in the power plants they operate, while others might be at the cutting edge of development of alternative, greener sources of energy. These stakeholders would obviously have very different positions about the main tenets contained in the CPP, yet we cannot distinguish their differences with our current approach.

A final limitation is that the rule we study is not representative of the big majority of rulemaking processes that take place in the U.S. The Clean Power Plan is definitely an outlier among governmental regulations passed at the federal level, which in almost all cases receive far less attention. Just like most issues are lobbied by a small number of groups (Baumgartner & Leech, 2001), most rules don't attract the level of attention that the CPP did, and so our findings showing homophily in participation in forums might not necessarily hold for other rulemaking processes. Furthermore, simply because most rules are not this controversial, the rulemaking agency might not even have informational meetings – or at least not as many. This would render our approach inadequate for the study of smaller rules.

While our results cannot be used to make wide generalizations, they could still be of value for scholars with an interested in mid-range theories to explain rulemaking processes that result in regulations of critical importance for both the environment and economic development. Examples of these processes abound (the EPA's Clean Water Rule, the

Bureau of Land Management's methane venting and flaring rule, etc.) and are likely to continue to generate political controversy, particularly as the rift between the pro-development and pro-environment camps continues to deepen in a highly polarized political environment.

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Figures and Tables

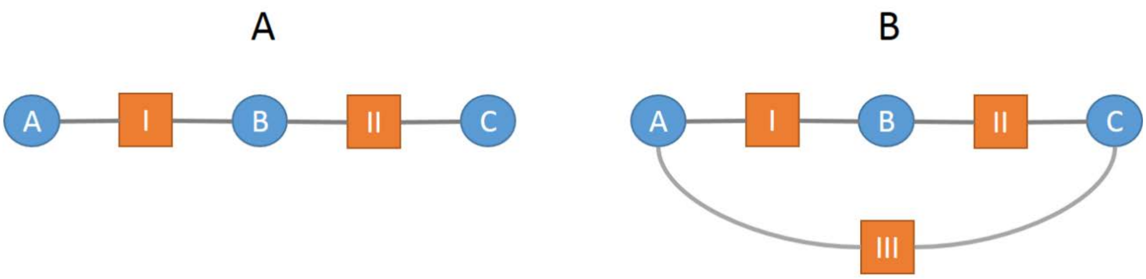

Figure 1. Open and Closed 4-paths in two mode networks

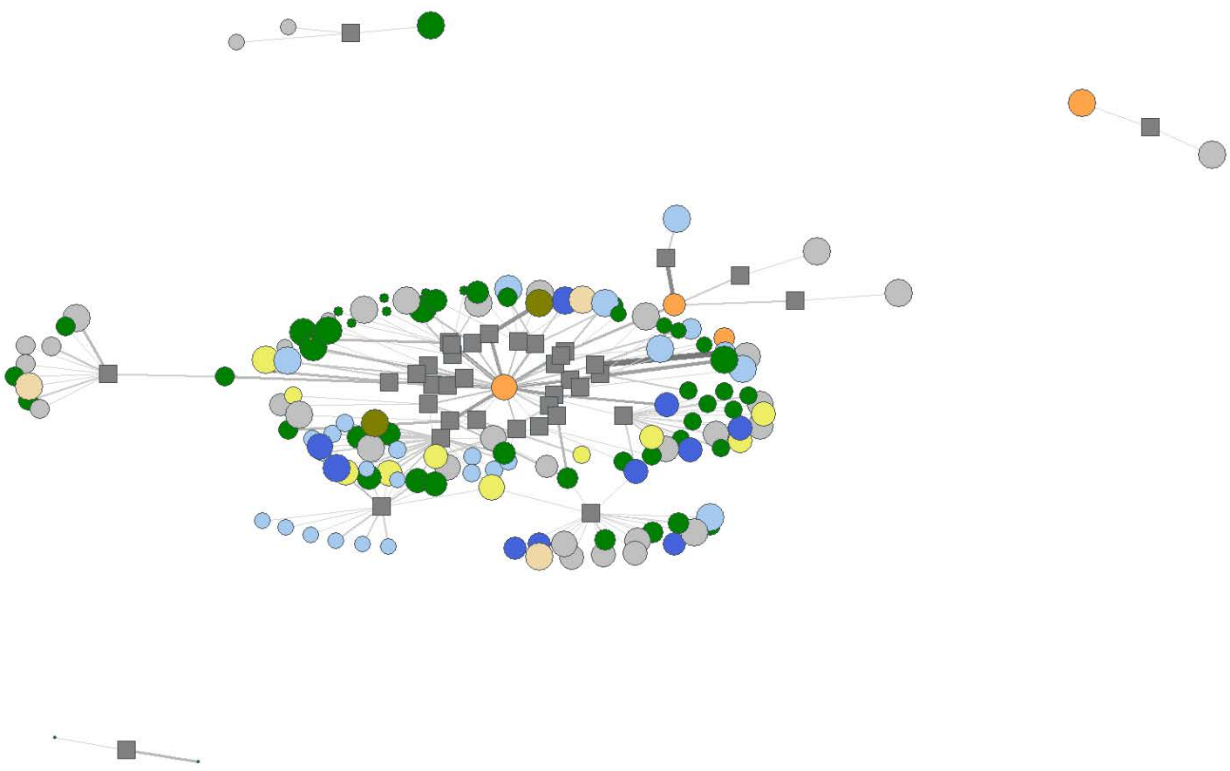

Figure 2: Participation of Stakeholders in Events before the Release of the Draft Rule[13]

[13] Figures 2 and 3 were produced with Netdraw. Round nodes are stakeholders, and dark grey squares are forums. Stakeholders are colored by their type as follows: local government (light brown), state government (light blue), federal government (orange), environmental NGO (yellow), industry group or organization (green), municipal utilities (bronze), university/research organization (dark blue), other type of organization (light gray), and individual (pink). Nodes are sized by their individual E-I index. Larger nodes have higher E-I index scores (higher heterophily in their attendance to forums).

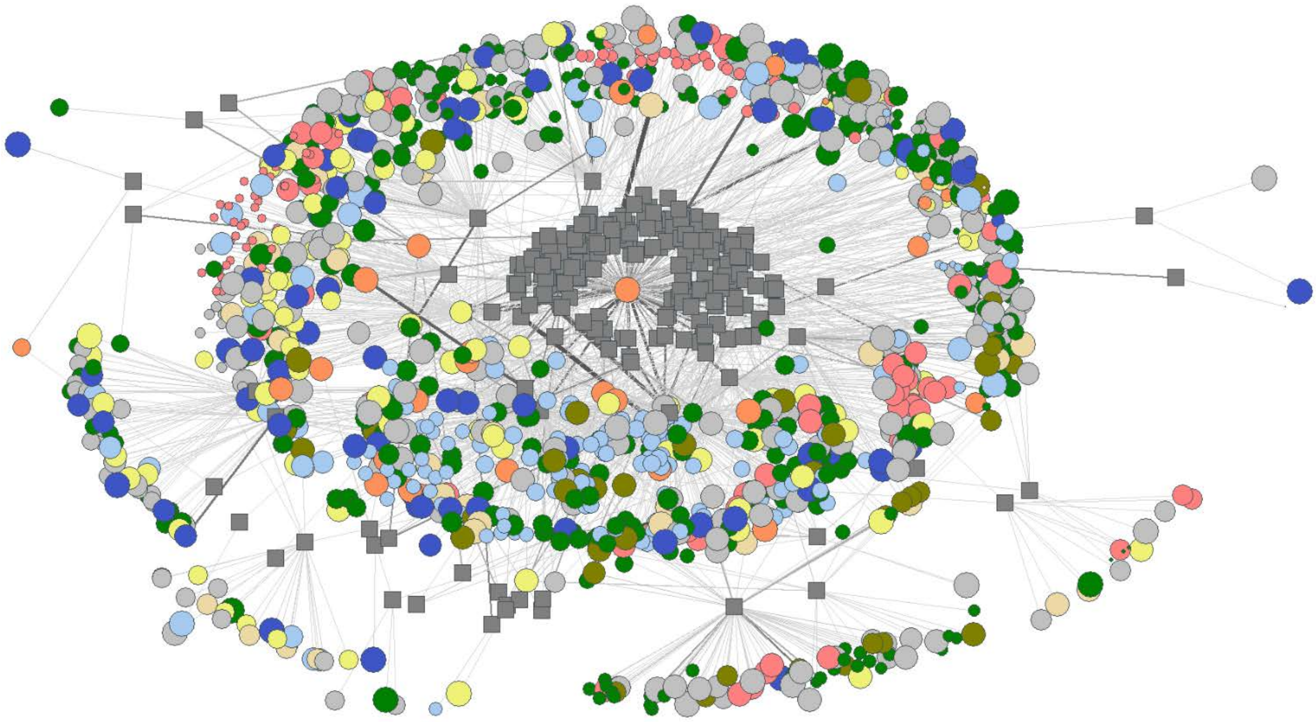

Figure 3: Participation of Stakeholders in Events after the Release of the Draft Rule

Table 1. Characteristics of Networks of Stakeholders and Events Before and After the Publication of the Clean Power Plan in Draft Form

	Before Draft Release	**After Draft Release**
Network Descriptives		
# of Events	39	227
# of Stakeholders	139	1258
Global Clustering (geometric mean)	0.016	0.137
Stakeholder Type (frequency; %)		
Local/Regional Government	3 (2.16)	47 (3.74)
State Government	26 (18.71)	185 (14.71)
Federal Government	6 (4.32)	31 (2.46)
Environmental NGO	10 (7.19)	98 (7.79)
Industry Group or Org.	48 (34.53)	351 (27.90)
Municipal Utilities	2 (1.44)	43 (3.42)
University/Research Institution	10 (7.19)	78 (6.20)
Other	33 (23.74)	288 (22.89)
Individual	1 (0.80)	137 (10.89)

Table 2: Mean Local Clustering Value by Stakeholder Type after Draft Publication

Stakeholder Type	**Mean Value (Std. Error)**	**95% Conf. Interval**	
Local/Regional Government	0.112 (0.047)	0.019	0.204
State Government	0.182 (0.013)	0.157	0.208
Federal Government	0.211 (0.032)	0.147	0.275
Environmental Group or	0.198 (0.037)	0.124	0.270
Industry Group or Organization	0.156 (0.011)	0.134	0.178
Municipal Utilities	0.091 (0.012)	0.067	0.115
University/Research Institution	0.226 (0.047)	0.133	0.319
Others	0.176 (0.018)	0.140	0.212
Individual	0.227 (0.035)	0.158	0.296

Table 3: E-I Index Results Before and After the Release of the Draft Rule

	Before Draft Release	After Draft Release
Observed Network-Level E-I Value	0.520	0.507***
Expected (mean) E-I Value under random distribution	0.557	0.648
E-I value per org type		
Local/Regional Government	1.000	0.890
State Government	0.239	0.311
Federal Government	0.855	0.916
Environmental NGO	0.786	0.770
Industry Group or Organization	0.397	0.356
Municipal Utilities	1.000	0.856
University/Research Institution	0.749	0.884
Other	0.572	0.636
Individual	-	0.429

A value as extreme as the observed value is produced in: *** less than 1% of permutations.

Table 4: Mean E-I index value by Stakeholder Type Before and After Draft Publication.

	Before Draft Release		After Draft Release	
Stakeholder Type	**Mean Value (Std. Error)**	**95% C.I.**	**Mean Value (Std. Error)**	**95% C.I.**
Local/Regional Government	1.000 (0.000)	-	0.634 (0.085)	(0.468 0.800)
State Government	0.415 (0.075)	(0.267 0.563)	0.316 (0.022)	(0.273 0.359)
Federal Government	0.170 (0.378)	(-0.578 0.917)	0.663 (0.073)	(0.519 0.807)
Environmental Group or	0.703 (0.087)	(0.531 0.874)	0.664 (0.028)	(0.609 0.718)
Industry Group or Organization	0.298 (0.070)	(0.159 0.437)	0.258 (0.019)	(0.220 0.296)
Municipal Utilities	1.000 (0.000)	-	0.792 (0.025)	(0.743 0.841)
University/Research Institution	0.753 (0.045)	(0.664 0.841)	0.845 (0.024)	(0.798 0.893)
Others	0.535 (0.062)	(0.412 0.658)	0.487 (0.026)	(0.435 0.538)
Individual	-	-	0.215 (0.048)	(0.120 0.310)

Table 5: Pairwise Comparison of Means in E-I index scores by Stakeholders Types Before Draft Publication

	Local/Reg Gov	State Gov	Federal Gov	Envir NGO	Industry	Mun Utilities	Univ/ Research	Other
Local/Regional Gov								
State Gov	-0.585							
Federal Gov								
Environmental NGO								
Industry Group or Organization	-0.702			-0.405				
Municipal Utilities		0.585			0.701			
University/Research Institution	-0.247	0.337			0.454	-0.247		
Other	-0.465					-0.465		

Table 6: Pairwise Comparison of Means in E-I index scores by Stakeholders Types After Draft Publication (based on Dunnet's pairwise comparison of means with unequal variance)

	Local/Reg Gov	State Gov	Federal Gov	Envir NGO	Industry	Mun Utilites	Univ/ Research	Other	Individual
Local/Regional Gov									
State Gov	-0.318								
Federal Gov		0.348							
Environmental NGO		0.348							
Industry Group or Organization	-0.376		-0.405	-0.406					
Municipal Utilities		0.476		0.128	0.534				
University/Research Institution		0.530		0.182	0.588				
Others		0.171		-0.177	0.229	-0.305	-0.359		
Individual	-0.419		-0.449	-0.449		-0.577	-0.631	-0.272	

Appendix

E-I Index Before Publication of Rule Draft

```
# of Permutations:                       5000
Random seed:                             27843

1942 ties.

Whole Network Results
```

		1 Freq	2 Pct	3 Possible	4 Density
1	Internal	466.000	0.240	4246.000	0.110
2	External	1476.000	0.760	14936.000	0.099
3	E-I	1010.000	0.520	10690.000	0.557

```
Max possible external ties: 14936.000
Max possible internal ties: 4246.000

E-I Index: 0.520
Expected value for E-I index is: 0.557

Max possible E-I given density & group sizes: 1.000
Min possible E-I given density & group sizes: -1.000

Re-scaled E-I index: 0.520

Permutation Test
Number of iterations = 5000
```

		1 Obs	2 Min	3 Avg	4 Max	5 SD	6 P >= Ob	7 P <= Ob
1	Internal	0.240	0.164	0.221	0.313	0.020	0.179	0.833
2	External	0.760	0.687	0.779	0.836	0.020	0.833	0.179
3	E-I	0.520	0.374	0.558	0.673	0.041	0.833	0.179

```
Group level E-I Index
```

		1 Interna	2 Externa	3 Total	4 E-I
1	1	0.000	31.000	31.000	1.000
2	2	166.000	270.000	436.000	0.239
3	3	8.000	102.000	110.000	0.855
4	4	24.000	200.000	224.000	0.786
5	5	166.000	385.000	551.000	0.397
6	6	0.000	28.000	28.000	1.000
7	7	26.000	181.000	207.000	0.749
8	8	76.000	279.000	355.000	0.572

E-I Index After Publication of Rule Draft

```
# of Permutations:                      5000
Random seed:                            12870
Whole Networ
k Results
```

		1 Freq	2 Pct	3 Possible	4 Density
1	Internal	39316.000	0.246	278588.000	0.141
2	External	120258.000	0.754	1302718.000	0.092
3	E-I	80942.000	0.507	1024130.000	0.648

Max possible external ties: 1302718.000
Max possible internal ties: 278588.000

E-I Index: 0.507
Expected value for E-I index is: 0.648

Max possible E-I given density & group sizes: 1.000
Min possible E-I given density & group sizes: -1.000

Re-scaled E-I index: 0.507

Permutation Test
Number of iterations = 5000

		1 Obs	2 Min	3 Avg	4 Max	5 SD	6 P >= Ob	7 P <= Ob
1	Internal	0.246	0.161	0.176	0.199	0.005	0.000	1.000
2	External	0.754	0.801	0.824	0.839	0.005	1.000	0.000
3	E-I	0.507	0.603	0.647	0.679	0.010	1.000	0.000

Group level E-I Index

		1 Internal	2 External	3 Total	4 E-I
1	1	234.000	4005.000	4239.000	0.890
2	2	14494.000	27570.000	42064.000	0.311
3	3	250.000	5721.000	5971.000	0.916
4	4	1370.000	10530.000	11900.000	0.770
5	5	14142.000	29773.000	43915.000	0.356
6	6	480.000	6195.000	6675.000	0.856
7	7	466.000	7570.000	8036.000	0.884
8	8	4620.000	20733.000	25353.000	0.636
9	9	3260.000	8161.000	11421.000	0.429

Pairwise Comparison of means in Local Clustering Coefficient by Stakeholder Types after Publication of Rule Draft

```
pwmean lcgm , over(actororgrecode_new) effects mcompare(tukey)

Pairwise comparisons of means with equal variances

over         : actororgrecode_new

--------------------------------
                  |    Number of
                  |  Comparisons
------------------+-------------
actororgrecode_new |          36
--------------------------------

------------------------------------------------------------------------------------
                  |                                 Tukey                Tukey
             lcgm |   Contrast   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------+-----------------------------------------------------------------
actororgrecode_new |
           2 vs 1  |   .0704852   .0578628     1.22   0.952     -.110291    .2512614
           3 vs 1  |   .0993191   .0641405     1.55   0.831    -.1010702    .2997084
           4 vs 1  |   .0857408   .0615658     1.39   0.900    -.1066046    .2780862
           5 vs 1  |   .0440947   .0578785     0.76   0.998    -.1367306      .22492
           6 vs 1  |  -.0211434   .0645944    -0.33   1.000    -.2229509    .1806641
           7 vs 1  |   .1139416    .071874     1.59   0.812     -.110609    .3384922
           8 vs 1  |   .0644949   .0590311     1.09   0.975    -.1199316    .2489214
           9 vs 1  |   .1150168   .0920725     1.25   0.945    -.1726382    .4026718
           3 vs 2  |   .0288339   .0332279     0.87   0.994    -.0749776    .1326455
           4 vs 2  |   .0152556   .0279364     0.55   1.000    -.0720239    .1025352
           5 vs 2  |  -.0263905   .0184394    -1.43   0.885    -.0839992    .0312182
           6 vs 2  |  -.0916286    .034096    -2.69   0.157     -.198152    .0148948
           7 vs 2  |   .0434564   .0464324     0.94   0.991     -.101609    .1885218
           8 vs 2  |  -.0059903   .0217892    -0.27   1.000    -.0740646    .0620841
           9 vs 2  |   .0445316   .0739421     0.60   1.000    -.1864801    .2755433
           4 vs 3  |  -.0135783   .0393236    -0.35   1.000    -.1364341    .1092775
           5 vs 3  |  -.0552244   .0332553    -1.66   0.770    -.1591214    .0486726
           6 vs 3  |  -.1204625    .043914    -2.74   0.137    -.2576597    .0167347
           7 vs 3  |   .0146225   .0540544     0.27   1.000    -.1542556    .1835005
           8 vs 3  |  -.0348242   .0352232    -0.99   0.987    -.1448694     .075221
           9 vs 3  |   .0156977   .0789515     0.20   1.000    -.2309645    .2623599
           5 vs 4  |  -.0416461   .0279689    -1.49   0.860    -.1290273     .045735
           6 vs 4  |  -.1068842   .0400598    -2.67   0.164    -.2320399    .0182715
           7 vs 4  |   .0282008   .0509728     0.55   1.000    -.1310496    .1874511
           8 vs 4  |  -.0212459   .0302823    -0.70   0.999    -.1158547    .0733629
           9 vs 4  |    .029276   .0768745     0.38   1.000    -.2108971     .269449
           6 vs 5  |  -.0652381   .0341226    -1.91   0.606    -.1718448    .0413686
           7 vs 5  |   .0698469    .046452     1.50   0.853    -.0752796    .2149734
           8 vs 5  |   .0204002   .0218309     0.93   0.991    -.0478044    .0886048
           9 vs 5  |   .0709221   .0739544     0.96   0.989     -.160128    .3019722
           7 vs 6  |    .135085   .0545923     2.47   0.249    -.0354735    .3056434
           8 vs 6  |   .0856383   .0360432     2.38   0.301    -.0269687    .1982453
           9 vs 6  |   .1361602   .0793207     1.72   0.736    -.1116555    .3839759
           8 vs 7  |  -.0494467   .0478806    -1.03   0.982    -.1990364     .100143
           9 vs 7  |   .0010752   .0853535     0.01   1.000    -.2655882    .2677386
           9 vs 8  |   .0505219   .0748599     0.67   0.999    -.1833573    .2844011
```

Games and Howell' s Pairwise comparison of means for EI index values by Stakeholder Types with unequal variances After Publication of Rule Draft

ei_actororgrecode_new	Diff.	Std.Err	Games and Howell [95% Conf.	Interval]
actororgrecode_new				
2 vs 1	-.5848485	.0749597	-.8322293	-.3374676
3 vs 1	-.8302721	.3777368	-2.588406	.9278622
4 vs 1	-.2971625	.0866776	-.6300866	.0357615
5 vs 1	-.7017374	.070259	-.9245479	-.4789268
6 vs 1	0	0	0	0
7 vs 1	-.2474205	.0448421	-.4196567	-.0751843
8 vs 1	-.4649853	.0622487	-.6662215	-.2637491
3 vs 2	-.2454236	.3851027	-1.980928	1.490081
4 vs 2	.2876859	.1145947	-.0934815	.6688534
5 vs 2	-.1168889	.1027389	-.4390565	.2052788
6 vs 2	.5848485	.0749597	.3374676	.8322293
7 vs 2	.337428	.0873486	.0555845	.6192714
8 vs 2	.1198632	.0974364	-.1876802	.4274065
4 vs 3	.5331096	.387554	-1.196746	2.262965
5 vs 3	.1285347	.3842153	-1.609319	1.866389
6 vs 3	.8302721	.3777368	-.9278622	2.588406
7 vs 3	.5828516	.3803892	-1.166521	2.332224
8 vs 3	.3652868	.3828316	-1.376565	2.107138
5 vs 4	-.4045748	.1115766	-.7757975	-.0333521
6 vs 4	.2971625	.0866776	-.0357615	.6300866
7 vs 4	.049742	.09759	-.2965871	.3960712
8 vs 4	-.1678228	.1067141	-.5290115	.193366
6 vs 5	.7017374	.070259	.4789268	.9245479
7 vs 5	.4543168	.0833495	.1906811	.7179526
8 vs 5	.236752	.0938681	-.0554453	.5289494
7 vs 6	-.2474205	.0448421	-.4196567	-.0751843
8 vs 6	-.4649853	.0622487	-.6662215	-.2637491
8 vs 7	-.2175648	.0767184	-.4633717	.0282422

Dunnett's Pairwise comparison of means for EI index values by Stakeholder Types with unequal variances After Publication of Rule Draft

Pairwise comparisons of means (unequal variances)

ei_actororgrecode_new	Diff.	Std.Err	Dunnett's C [95% Conf.	Interval]
actororgrecode_new				
2 vs 1	-.3185231	.0874778	-.6025137	-.0345324
3 vs 1	.0290947	.1120762	-.3395987	.397788
4 vs 1	.0292814	.0890417	-.2597429	.3183056
5 vs 1	-.3763953	.0868697	-.6584655	-.094325
6 vs 1	.1577121	.0882209	-.1294339	.4448582
7 vs 1	.2112028	.0880722	-.074942	.4973476
8 vs 1	-.1475806	.0885957	-.4348586	.1396974
9 vs 1	-.4194939	.0973735	-.7339096	-.1050781
3 vs 2	.3476178	.0766615	.0930128	.6022227
4 vs 2	.3478044	.0352754	.2363418	.4592671
5 vs 2	-.0578722	.0293644	-.1498211	.0340767
6 vs 2	.4762352	.033149	.3697777	.5826927
7 vs 2	.5297259	.0327512	.4259715	.6334803
8 vs 2	.1709424	.0341339	.0640614	.2778235
9 vs 2	-.1009708	.0528916	-.2675838	.0656422
4 vs 3	.0001867	.0784415	-.2600171	.2603904
5 vs 3	-.40549	.075967	-.6579537	-.1530262
6 vs 3	.1286175	.0775085	-.1295199	.3867548
7 vs 3	.1821081	.0773392	-.074902	.4391182
8 vs 3	-.1766753	.0779348	-.4349315	.0815808
9 vs 3	-.4485886	.0877851	-.7366931	-.160484
5 vs 4	-.4056766	.0337393	-.5121513	-.299202
6 vs 4	.1284308	.0370799	.0091937	.2476679
7 vs 4	.1819214	.0367247	.0650949	.298748
8 vs 4	-.176862	.037963	-.2964683	-.0572557
9 vs 4	-.4487752	.05544	-.6238254	-.2737251
6 vs 5	.5341074	.0315093	.4328852	.6353296
7 vs 5	.5875981	.0310906	.4892221	.6859741
8 vs 5	.2288146	.0325439	.1271442	.330485
9 vs 5	-.0430986	.0518797	-.206417	.1202198
7 vs 6	.0534907	.0346873	-.0585819	.1655633
8 vs 6	-.3052928	.0359957	-.4202421	-.1903435
9 vs 6	-.577206	.0541118	-.7491064	-.4053056
8 vs 7	-.3587835	.0356297	-.4712403	-.2463266
9 vs 7	-.6306967	.0538691	-.8009422	-.4604512
9 vs 8	-.2719132	.0547207	-.4440811	-.0997453

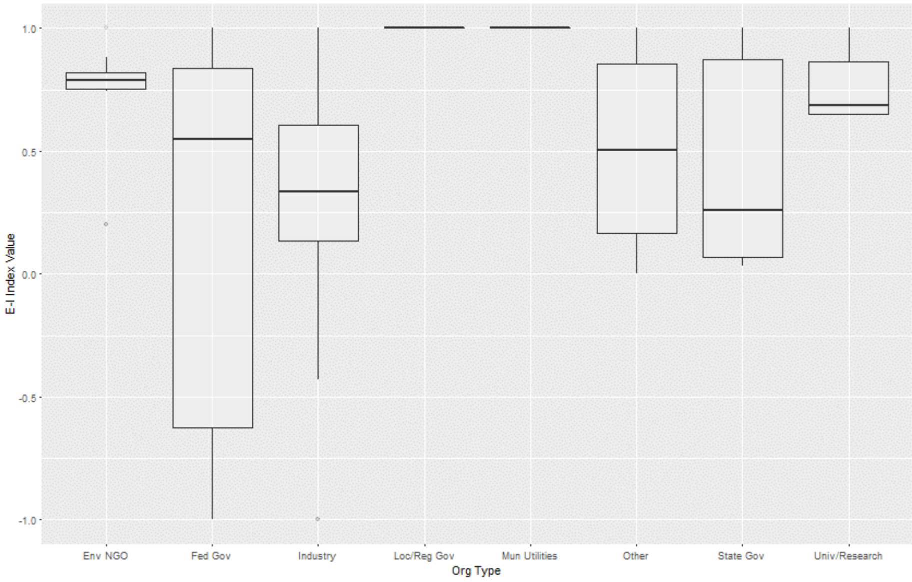

Figure A1. Boxplot of distribution of E-I index values before the publication of the Draft Rule, by Stakeholder type

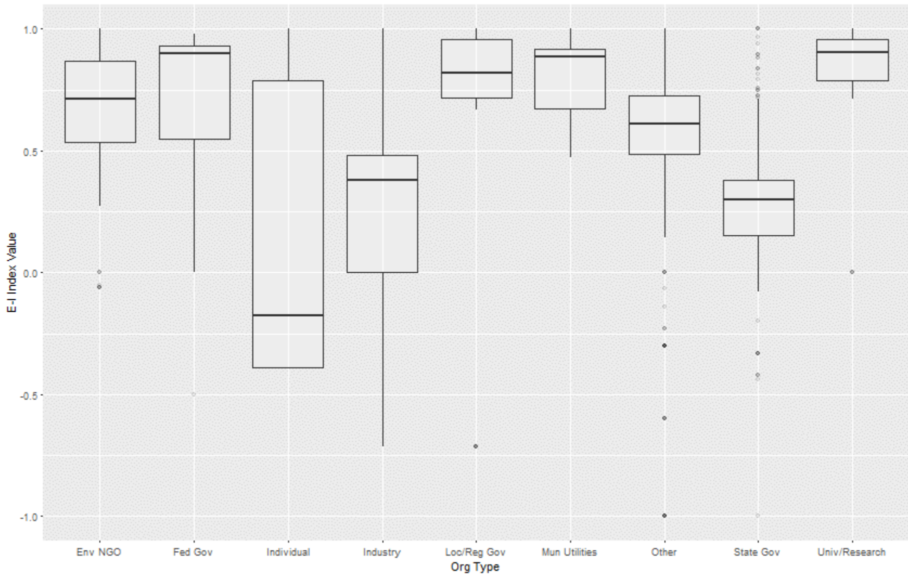

Figure A2. Boxplot of distribution of E-I index values after the publication of the Draft Rule, by Stakeholder type