Thoughts between us

Proposed Response - change not implemented in paper

Proposed Response – change implemented in paper but not reviewed (if applicable)

Potentially Final Response

MS 2022074 “Gerrymandering in the Laboratory”

Responses to Editorial Team and Guide to Changes

**Editor Comments**

In your revision, I would like you to respond to all of the comments raised by the reviewers. Please pay particular attention to the following points for they must be addressed for the paper to reach the publication threshold:

Response: We greatly appreciate the opportunity to revise and resubmit our paper for further consideration to be published in Southern Economic Journal. Below, we describe how we have addressed each of the points raised with the previous version of our paper. We believe the revised version is much improved as a result of the constructive feedback that we received.

Point 1.  Both Reviewer 1 and 2 state that the experimental sample size is quite small. While I am always hesitant to go after the low hanging fruit of “collect more data”, 64 subjects just doesn’t seem like enough to be confident in the results.

Response: Let’s double the sample size – so run 8 more sessions with 8 people each.

Point 2.  Both reviewers identify the need for a more robust explanation of how the design choices were made. There is a disconnect between the research question and the experimental design. In relation to Reviewer 3, you need to establish why neutral framing is suitable to answer the question of gerrymandering.

Response: need to think about this.

Point 3.  The connection to the existing literature needs to be better explored.

Response: okay, we can talk more about other papers and compare our results.

Point 4. The current data analysis seems quite minimal; too many questions are left unanswered and unaddressed.

Response: okay, we can do more like what they ask below.

**Reviewer 1 Comments**

Major Comment 1. On Page 3, the authors state that “Therefore, we combine the notion of districting with a second stage Tullock style electoral competition...”. However, I did not find such “districting” strategies in the experiment. In the experiment, all maps are given by the experimenter, players cannot decide how to divide the districts. Because of that, I am question whether this study analyzes the gerrymandering behavior in the lab. If not, then I would suggest the authors to rephrase the introduction section.

Response: They get to pick the map in phase 2. We can clarify this more.

Major Comment 2. On Page 3, the authors state that one of their contributions is “the prior papers in this area have treated districting as a one stage game against nature, .... Therefore, we combine the notion of districting with a second stage Tullock style ...”. However, Shotts (2002) has already modelled such scenario as a multi-stage game. I noticed the authors have cited this paper, but it would be better if they can say more about how their study is different from Shotts (2002).

Response: Okay, we can do this.

Major Comment 3. The literature coverage and the fit of the study can be significantly improved. Besides Shotts (2002), below are other studies that may related to this paper. This list can be longer, I leave it to the authors to revisit the literature and presents the relevant fit, and contribution more appropriately than what it is now.

[1] Konishi, H., & Pan, C. Y. (2020). Partisan and bipartisan gerrymandering. Journal of Public Economic Theory, 22(5), 1183-1212.

[2] Bierbrauer, F., & Polborn, M. (2020). Competitive gerrymandering and the popular vote.

Response: Okay, we can do this.

Major Comment 4. In section 2: as the maps are given, zones within a district are equivalent, and players are asked to allocate a certain amount of endowment (80) to different districts. I feel this model is similar as the Blotto game. More specifically, within symmetric maps, the contests stated in this study are similar as the Blotto game with one (or three) battlefields; within asymmetric maps, the contests stated in this study are similar as the Blotto game with a head start. Therefore, I would like to see the authors provide an explanation to distinguish the difference between their model and the Blotto game.

Response: We need to explain why this is not a Blotto game. Budgets are not use it or lose it.

Major Comment 5. In section 2, the authors mentioned “the probability that Player i wins a non-preassigned zone in district d of map M is ei/(ei+ej).” What if ei + ej = 0? The probability of winnings equals 1⁄2 or 0?

Response: Okay, we can do this.

Major Comment 6. On page 6, the third paragraph, the authors mentioned “Thus, of the three symmetric maps Sym1,1 is socially optimal and yields the greatest expected profit to the players.” What are the intuition behinds that? Can we get some policy implications based on this finding?

Response: Okay, we can do this.

Major Comment 7. The total number of participants was only 64. Although this experiment employs a within-subject design, I am still worried the sample size is insufficient. It would be better if the authors can provide a power analysis, demonstrating that their sample size is sufficient.

Response: Let’s double the sample size. We can also do power calculations.

Major Comment 8. I highly suggest the authors to rephrase their experimental design section. After reading their experimental design, I still have no ideas of what research questions they are going to answer and what hypotheses they are going to verify. It would be better if they can explicitly list their research questions, or hypotheses before stating their results.

Response: Okay, we can do this.

Major Comment 9. It would be better if the authors can provide the standard deviations of the average expenditure in Table 2.

Response: Okay, we can do this.

Major Comment 10. The authors stated some deviations on Page 13 and 14, it would be better if they can provide some possible explanations on those deviations. For instance, why the total effort exerted in Sym1,3 is lower than that in Sym3,1?

Response: Okay, we can do this.

Major Comment 11. In Table 5 of section 7.1, why the effort exerted to W for player B in GerryA is significantly lower than the effort exerted to W for player A in GerryB? Would it have caused by the “order effect”?

Response: Maybe we can reverse the order to deal with this.

Major Comment 12. In section 7.2, it should be mentioned that whether the standard errors in parentheses are clustered or not.

Response: Okay, we can do this.

Major Comment 13. There are some typographical errors need to be corrected, I may not list them all, but I would recommend the authors to re-check the whole passage:

i) All footnotes are not numbered yet.

ii) On page 7, the second line, “... and an expected profit of 0...”.

iii) On page 8, the fifth line, “... all 3 districts...”.

Response: We have corrected these errors and worked to eliminate all other typos in the paper.

**Reviewer 2 Comments**

Evaluation: The experimental design seems well thought out and well suited to test the predictions. However, the sample size (n = 64) seems quite small, especially considering that individuals are rematched across rounds, and therefore, there are only eight total independent observations (sessions).

Response: Let’s double the sample size.

Main Comment 1. Regarding the theoretical prediction in the Sym3,1 map, the equilibrium described is symmetric but there is no evidence provided that this equilibrium is unique. This leaves open the question of whether there may be additional, asymmetric equilibria (which would make evaluating the experimental evidence somewhat more complicated). I believe Klumpp and Polborn (2006) would be helpful in resolving this.

Response: need to look into this.

Main Comment 2. Regarding experimental evidence of over-investment (discussed on page 12): is this behavior widespread across participants or driven by a handful of participants wildly over-investing? Does the pattern of over-investment differ by map? Some additional, individual level analysis here would provide a clearer picture of how individuals invest in these contests.

Response: Okay, we can do this.

Main Comment 3. Looking at percent over-investment (using Table 2 on page 12) and comparing across maps in cases where equilibrium investment is positive, average expenditures are nearly double the predicted value in all cases except Sym1,3, where it is less than 50% higher than predicted. It’s unclear to me what is driving this, but it seems that subjects may view this map differently in some way. The difference in overbidding also raises questions about overspreading (see, for example, Chowdhury et al. (2014)).

Response: We can look into this. Need to think more about it.

Main Comment 4. Following up on the previous comment, if it is the case that subjects view Sym1,3 as fundamentally different in some way, it raises the question of whether they also treat this map differently in the map selection stage. According to Figure 6, it is the second most commonly selected map in Stage 2 (though, unclear if the rate at which it is selected is significantly higher than other maps), and according to Figure 8, it is the most commonly selected map in Stage 3. Can this be explained by differences in investment behavior in the resulting contests?

Response: We can look into this. Need to think more about it.

Main Comment 5. Regression results presented in Table 3 (also, Table 7 in Appendix B) seem to be comparing total expenditures across maps in all districts. This seems a little difficult to interpret since in all maps except Sym3,1 the equilibrium involves investing zero in two of the three districts. Are the results similar if restricted to comparing only the districts where positive investment is predicted? What about districts where zero investment is predicted? What about the patterns of over-investment in districts with positive predicted investment compared to those where the predicted investment level is zero?

Response: We can look into this.

Main Comment 6. In the analysis of stage 2, the text states that it is assumed that a subject’s modal response indicates their preferred map. Were there any cases where a participant indicated three different maps? If so, how are these handled? More generally, could you use all three rounds to differentiate between a strong preference for gerrymandering (selected advantaged map all three times), weak preference (selected advantage two of the three times), etc.?

Response: We can expand on this.

Main Comment 7. While the primary focus of this study is gerrymandering, employing a Tullock con-

test in the second stage also relates it to existing contest literature. There is a fair amount of prior work on multi-battle contests that is not mentioned (see, for example, section 5 of Dechenaux et al. (2015) and work cited within). Discussing this literature and describing how the present study is related would help to better tie this study to the existing contest literature.

Response: We can connect more to the existing literature.

Minor Comment 1. (Page 6) Clarification: On page 6, the authors say “...of the three symmetric maps

Sym1,1 is socially optimal and yields the greatest expected profit to the players.” A more precise statement about what it means for an outcome to be socially optimal would be helpful. In this context (elections), it is not quite clear to me what it means for an outcome to be socially optimal. It is true that this map yields the greatest expected payoff to the players (political parties), but it seems that social optimality should also take into account voters’ welfare. Since voters are not modeled directly in this environment, it seems fine to side-step this but some additional discussion here would be nice.

Response: We can expand on this.

Minor Comment 2. (Page 7) Typo: “...Player B has a 25% chance of winning the contest and en expected profit of zero.” Should be “an”.

Response: We have corrected this error and worked to eliminate all other typos in the paper.

Minor Comment 3. (Page 8) Typo: “That is, the strategy method was used...preferred choices for all 3

district on all 5 maps each period.” Should be “districts”.

Response: We have corrected this error and worked to eliminate all other typos in the paper.

Minor Comment 4. (Page 10) Clarification: The text states that participants “went through several practice contests.” It would be helpful to clarify how many such practice rounds took place and whether these were against other participants or bots. If against other participants, is there any reason to believe that this might affect beliefs about how others play a contest, which could in turn affect the contests in the experiment?

Response: We can expand on this.

**Reviewer 3 Comments**

Comment 1. The authors highlight in several points of the paper that one of their key results is that, in the lab experiment, “subjects overwhelmingly engage in self-interested gerrymandering [...] despite the nearly unanimous claim among the subjects that they do not support gerrymandering.” The experiment has a neutral framing with no reference to politics or gerrymandering. The post-study survey of the authors does mention gerrymandering explicitly. Hence, it is natural to think that subjects simply do not support gerrymandering when done by politicians to rig the election results and representativeness, but they are ok with the practice of gerrymandering when done in the lab by students to obtain a higher payment. I see the comparison of gerrymandering observed in the lab by the authors and the support of gerrymandering in the post-study survey as neither surprising, informative, nor conclusive. The neutral framing of the experiment makes me doubt subjects perceived the experiment as one about gerrymandering (as understood in media and politics) at all.

Response: Not sure how to approach this. One option is to downplay the fact that subjects gerrymander but do not like it politically. Would adding a final round after the survey and where we tell them that this game is a model of gerrymandering and seeing if they do something different address this comment (the final round would be like phase 2 where they know their role and pick a map)? We really do not do a whole lot with the bids on maps in phase 2. So we could let them do phase 1 like the original (but reversed map order in response to R1 MC11) and then in the directions for phase 2 tell them about it being about gerrymandering – but then we have the small sample issue again since we would have 64 neutral and 64 non neutral.

Comment 2. It is clear from experimental economics as well as from the authors’ results of the experiment that subjects’ behavior greatly differs from Nash predictions; subjects even allocate positive resources to districts with no strategic value whatsoever. In this light, I see a potential structural problem when they select the 5 maps of Figure 1 and base the entire paper (theory and experiment) on those 5 maps, as these 5 maps are strategically equivalent in the Nash equilibrium, which is however not played in the lab. The arbitrary choice of the maps out of the set of strategically equivalent ones could thus affect the results of the experiment.

Response: I think we need to explain better that the maps are not strategically equivalent in the Nash equilibrium. We also need to emphasize that there are no other possible maps with 9 cells of which 3 are A and 3 are B.

Comment 3. The authors motivate the theoretical model on the basis that “the prior papers in this area have treated districting as a one stage game against nature, whereas in practice districting is only the first stage in a two stage game against another party.” I disagree with the statement, which seems to be the key motivating factor for the theoretical model the authors propose. In fact, for instance, Pegden, Procaccia and Yu (2017, “A partisan districting protocol with provably nonpartisan outcomes”) consider the districting problem as a competition between two parties taking turns drawing districts until the state is fully partitioned. Also, Ely (2019, “A Cake-Cutting Solution to Gerrymandering”) considers a districting game where parties choose sequentially.

Response: We need to look at these papers and edit our paper accordingly.

Minor Comment. On a minor note, there are typos, such as “en expected, “3 district”, and

“the the”.

Response: We have corrected these errors and worked to eliminate all other typos in the paper.