

## **Response to Jowei Chen and Jonathan Rodden's February 18, 2014 Report**

April 28, 2014

Nolan McCarty  
Susan Dod Brown Professor of Politics and Public Affairs  
Chair, Department of Politics  
Princeton University

### **Introduction**

This report summarizes my response to the Supplemental Report of Professors Jowei Chen and Jonathan Rodden dated February 18, 2014. Chen's report responds to several criticisms raised by Stephen W. Hodge in his reports dated November 11, 2013 and December 31, 2013. Mr. Hodge noted several problems with the simulations which served as the basis of the previous reports of Professors Jonathan Rodden and Jowei Chen. These included:

1. Unequal district populations
2. Excessive splitting of municipal boundaries
3. Examples of extremely non-complex districts and lower levels of mean compactness
4. A substantial number of plans with non-contiguous districts
5. The failure of the simulations to produce districts with supermajority Hispanic populations

In his memo, Professor Chen describes revisions to his simulation model that purportedly respond to problems 1, 2, 3, and 4. He also reports on findings from a subset of his simulations in response to 5.

## Background on Randomization and Inference

Before I address the details of Professor Chen's response, let me address some conceptual issues about what inferences one might reasonably draw from simulation exercises such as the one conducted by Professors Chen and Rodden. The following assumptions underlie their interpretation of the results.

1. They must assume that their procedure selects a random sample of plans from the set of all legal plans. They must assume that all legal plans are equally likely to be generated or if some plans are more likely to be generated, those plans must be substantively similar to the ones that are less commonly sampled. If on the contrary, a plan's likelihood of being sampled is related to its partisan composition in any way, the inferences from their methodology would be invalid. For example, assume that Republican-advantaged, but legal, plans were less likely to be sampled. Their procedure would suggest a Republican bias in the districting process even where none existed. As the properties of the sample generated by their procedure and its relationship to the population of all legal plans are unknown, there is no principled way to rule out this possibility.<sup>1</sup>

2. Professors Chen and Rodden must also assume that they have fully taken into account any relevant legal requirements about the shape or composition of districts. Were they not to account for some legal requirement that would have an effect on the partisan composition of districts, their inferences about the existence or extent of partisan intent would be invalid. In their reports, Chen and Rodden apply two different approaches to this concern. The first, and I believe more appropriate, approach is to impose *ex ante* a set of constraints on their simulations that the legislature followed for legal reasons. For example, Chen and Rodden hold the three African-American majority districts created by the legislature fixed and simulate the remaining 24 districts. They also conduct simulations holding intact the same counties that are intact in the enacted plan. The new simulations hold more municipalities intact, but fewer than in the enacted plan. But they do not use this approach for all relevant legal requirements. For majority Latino districts, compactness and contiguity, Chen and Rodden use a procedure which discards all simulated plans that do not meet some desired criteria and analyze only those plans that do. If such a procedure produced a random sample of all legal plans, their inferences would be valid.

---

<sup>1</sup> The analogy to random sampling for a survey is instructive. Some types of survey respondents are easier to contact than others. But because we have a great deal of information about the population through the Census, researchers can make adjustments to account for the harder-to-reach populations. In the case of the Chen-Rodden simulations, we have no idea about whether certain plans are hard-to-reach (less likely to be sampled than others) nor do we know enough about the set of legal plans so as to make any adjustments.

But as I discuss below, it is possible that these procedures make the problems described under point 1 worse.

3. Valid inferences from their procedure also require that the results be robust to the measure of partisanship used. As I pointed out in my first report, the inferences about partisan intent change dramatically when the McCain vote share is uniformly increased or decreased by a small amount. In my second report, I show that when the analysis is done properly, using the most compelling measure of partisanship, an estimate of the probability of a Republican House victory, there is insufficient evidence to reject the null hypothesis of no partisan intent.

I now turn to Professor Chen's specific response to some of the issues raised by Mr. Hodge to argue that the response and the new analysis continues to fall short of the standards for proper inferences described above.

### **Compactness**

To address Mr. Hodge's concerns about compactness, Chen and Rodden revise their procedure to drop any simulated plan where the average compactness of the districts falls below the average compactness of the districts in the enacted plan. This procedure implies that all simulated plans are more compact on average than the enacted plans. I have two concerns about their response. First, the augmented procedure no longer produces a random sample of plans, but rather a sample of plans where random districting naturally produce compact districts on average. This sample may well be different from a random sample of plans that meet a compactness requirement. This would be the case if some types of compact districts were more likely to be randomly generated than others. For example, it seems plausible that compact districts where the suburban fringe is placed in urban districts are more likely to be generated than compact districts where that fringe is placed in suburban districts. Such a bias would be directly related to the partisan composition of the districts.<sup>2</sup>

Second, their mechanistic approach to ensuring compactness will bias against plans that include a district in south Florida such as District 26 of the enacted plan. Such a district is naturally less compact due to its proximity to the Florida Keys. The enacted plan and the plaintiffs' plans design this majority Hispanic district by attaching Monroe County to a large section of Miami-Dade County. Of the districts that Chen and Rodden do not hold constant in their simulations, this district is the least compact in the enacted plan. But a more compact district that includes

---

<sup>2</sup> Chen and Rodden use a similar procedure to deal with non-contiguous districts. Doing so raises the same conceptual concerns as the treatment of compactness, but is likely to have less impact given the small numbers of non-contiguous districts in their simulations.

Monroe County would include attaching it to the southern parts of Lee and Collier County, something done in none of the plaintiffs' plans. Such a different configuration would have knock-on effects for the other Hispanic majority districts such as 25 and 27 of the enacted plan (both of which are also largely replicated in the plaintiffs' plans). This distortion may be very consequential given the complexities of drawing legally compliant Hispanic districts in Florida (as discussed below).

### **Hispanic Voting Strength**

As noted above, Chen and Rodden are inconsistent in their approaches to modeling legal constraints. This inconsistency is especially apparent in how they handle majority-minority districts. They retain the enacted majority African-American districts in their simulations, but they treat majority Hispanic districts quite differently. In their first two reports, Chen and Rodden simply ignored the issue. In their response to Mr. Hodge, they conduct an analysis of the small subset of simulations that produced at least three districts with large Hispanic supermajorities.

This asymmetric treatment of African-American and Hispanic districts is hard to justify. If anything the approach should have been reversed. Because of the overwhelming Democratic partisanship of African-Americans, a majority black district is almost certain to elect a black Democrat as the group's candidate of choice. But due to the greater degree of partisan heterogeneity of Florida's Hispanics, a majority Hispanic district does not guarantee the election of a candidate of choice. Indeed, if the Hispanic majority is sufficiently divided on partisan lines, the district is likely to elect a white Democrat. Given the subtleties involved in ensuring Hispanic voters an ability to elect a candidate of their choice, it would have been more reasonable to leave their design to human mapmakers and simulate the remaining districts.<sup>3</sup>

There are also several problems with Chen and Rodden's new approach to Hispanic districts. The first and most basic is that we do not know how these simulated districts would perform in terms of electing the Hispanic candidate of choice. Second, as discussed above, given the lack of knowledge about the set of all possible legal plans with three Hispanic districts, we have no way of knowing whether theirs is indeed a random sample of all possible plans with such supermajorities. If plans with certain partisan characteristics are more likely to be sampled than others, it would not be appropriate to make inferences about partisan intent. Third, the number of simulated plans with three Hispanic supermajority districts is very small. Only 160 of 1000 reach the threshold of three districts with more than 65% Hispanic. The enacted plan has three districts where the Hispanic voting age population meets or exceeds 68.9%. Only 20 of their simulations meet these thresholds. Even if this set of simulated districts were a random sample

---

<sup>3</sup> An alternative to holding constant the legislature's Hispanic supermajority districts might be to hold constant those from the plaintiffs' plans.

of all possible districts with three Hispanic supermajority districts, the sample may not be large enough to precisely estimate the likelihood of 17 or more McCain districts.<sup>4</sup>

Chen and Rodden's random simulations also rarely produce coalition districts with a majority Hispanic and Black voting age population such as districts 9 and 14 in the enacted plan. In fact, while the enacted plan creates 8 districts in which black and Hispanic VAP exceed 50%, only 5 of Chen and Rodden's simulations produce more than 6. Both Romo Maps A and B contain 7 such districts.

The failure to incorporate the Hispanic supermajority and coalition districts into their simulation has two potential effects on the outcomes. The first is a direct effect. Some of these districts may by their nature require the concentration of Democratic voters in ways that create so-called "wasted" Democratic votes. The second is the indirect effect that the creation of these special districts has on surrounding districts. For example, the decision to create the coalition district 14 has a constraining effect on the boundaries of district 13 just as the creation of Hispanic districts in south Florida impacts the boundaries of the non-Hispanic districts. In south Florida, the creation of the Hispanic districts 25-27 and the African American districts 20 and 24 place constraints on how the non-minority districts such as 21 and 23 are drawn. In their initial report, Chen and Rodden criticize these districts for being too Democratic and interpret them as evidence of "packing" Democratic voters. But plaintiffs' plans Romo A and B created almost identical versions of those districts. The partisan performance of the districts in the plaintiffs' plans is almost identical to that of the enacted plan.<sup>5</sup> So Chen and Rodden's analysis would suggest that the plaintiffs are also engaged in packing. But an alternative interpretation is more plausible: Chen and Rodden's simulations are distorted by their failure to account for voting rights concerns that constrained both the legislative and the plaintiffs' plans.

By not imposing the coalition and Hispanic supermajority districts on their simulations, Chen and Rodden are unable to fully capture the direct and indirect effects of meeting these VRA requirements. The effect of the omission may well be to replace a coalition district and a marginal Republican district with two white Democratic districts around Tampa Bay and the loss of a Hispanic district in South Florida.

## **Measuring Partisanship**

In my previous two reports, I have shown that the inferences from Chen and Rodden's methodology are not robust to small changes in the measure of district partisanship. In my April 8, 2013 report, I showed that small perturbations of the McCain share (either increasing it or decreasing it) produced very different results with respect to evidence for partisan intent. In my

---

<sup>4</sup> Chen and Rodden do analyze the larger set of plans (648) than have three districts that exceed 60% Hispanic VAP. But that is a significantly lower threshold than that applied in the enacted plan or most of the plaintiffs' plans.

<sup>5</sup> In the enacted plan, the McCain vote shares are 36.1 and 37.8 for district 21 and 23, respectively. The McCain votes shares are 35.8 and 38.8 for districts 21 and 23 in both Romo A and B.

second report, I showed that substituting any other Florida statewide election return for the McCain vote also eliminated any evidence in favor of partisan intent. Moreover, I demonstrated that when the analysis is conducted properly, an alternative measure based on the probability of a Republican victory in each districts also provided little evidence of partisan intent.

Despite these criticisms, the latest report from Chen and Rodden revert to using unadjusted McCain two-party vote shares as their measure of district partisanship. To show that their new simulations have not resolved this issue, I reanalyzed the output of their simulations after applying a uniform swing of .014 to McCain's two party vote share (so as to simulate a tied election). When the swing is added, the number of simulations producing 17 or more McCain districts is 93 or 9.3% of the simulations.

Next, following the procedure described in Chen and Rodden's October 21, 2013 report, I used a logit model to translate each McCain district vote share into the probability that a Republican would win that district. I call this estimate Rep\_Prob.<sup>6</sup> There are two ways to use Rep\_Prob to analyze Chen and Rodden's simulations. The simplest is to look at how many simulated districts have an estimate of Rep\_Prob > .5 indicating a Republican advantage. On average, their simulations produce 17.3 such districts – essentially the same number the Republicans won under the enacted plan. The second, more sophisticated, approach is the one that I took in my November 11, 2013 report. There I used these probabilities to simulate 1000 sets of election outcomes for each of their 1000 simulated district plans. I was then able to report how many of the 100,000 (1000 elections x 1000 plans) simulations produced 17 or more Republican seats.<sup>7</sup> In Figure 1, I plot the distribution of Republican seats across these 100,000 simulations. It is clear that when a more accurate measure of a district's propensity to elect a Republican is used, the outcome of 17 Republican seats is not rare at all. In fact, 17 seats is the modal outcome. Republicans obtain 17 or more seats in 54.8% of the simulations.

## Conclusion

Professor Chen's report claims that his simulations establish that it is "virtually impossible for a nonpartisan districting procedure to produce a congressional plan as extreme as the Florida Legislature's enacted plan" (page 1). This claim is very misleading in social scientific terms. A more accurate statement might be "it is very improbable that my computerized model of the districting process which ignores partisanship would produce a plan with 17 McCain districts." There are many reasons why the two statements differ in meaningful ways. First, no statistical or simulation analysis can establish that something cannot happen simply because it is not observed

---

<sup>6</sup> Based on the estimates of the logit model, the translation is  $Rep\_Prob = \frac{\exp(-21.6 + 46.1 * McCain\_Share)}{1 + \exp(-21.6 + 46.1 * McCain\_Share)}$ . This implies that a district with a McCain share of .5 will be won by a Republican with probability .81. This fact cast doubt on Chen and Rodden's suggestion that Republicans manipulated the districting process by engineering districts just of above the .5 McCain vote threshold. Such districts in fact lean strongly Republican in House races.

<sup>7</sup> In addition to using different simulated districts, these results will differ from my November 11, 2013 report in that I am only using McCain vote in the logit models whereas other statewide elections were used previously. But as I argued there, this should not have a large impact as the McCain vote is highly correlated with those other statewide races such that the inclusion of those races have very little explanatory power.

in the data. This is the classical problem of induction. Just as it would be a fallacy to assume all swans are white until the appearance of a black swan, it is a fallacy to assume all plans with 17 McCain districts are illegal simply because they are not produced by an ostensibly neutral model.

Second, Chen and Rodden's simulations are but a model of how a non-partisan districting process might look. It does not and cannot account for all of the factors that real-world mapmakers must consider. Consequently, it is difficult to rule out that it is one of these omitted factors is responsible for the deviation between the enacted plan and those produced by Chen and Rodden's model. As argued above, the failure to fully account for the Voting Rights Act provisions for Latino voters might be one such factor.

Finally, as I have stressed throughout my reports, the use of the McCain vote as a proxy for the partisanship of the districts is very problematic. Slight swings in this measure or its conversion to Republican electoral probabilities lead to very different simulated outcomes.<sup>8</sup>

---

<sup>8</sup> See my reports dated April 8, 2013 and November 11, 2013.

Figure 1

