

**Empirical Validation of Automated Redistricting Algorithms on the Virginia
House of Delegates District Map**

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Redistricting

- Explain what districts are
- Explain how the redistricting process generally works

Gerrymandering

- Explain what gerrymandering is.

Ways to combat gerrymandering

Automated Redistricting Algorithms

- Explain what the goals of these things are

Metrics to detect gerrymandering

- Explain what the goals of these are

Overview of Method

- Actually introduce the rest of the paper.

Results

This section provides an overview of the results from my method.

Overall Measures

	alg	control	mcmc	smc
type	measure			
compact	ecc	0.777428	0.774128	0.816295
	fh	2.15416e+21	1.66564e+21	1.84849e+21
	pp	0.185835	0.172610	0.165511
fair	dseats	7.00000	9.00000	7.28000
	bias	-0.136364	-0.136364	0.0436364
	dec	0.0406080	-0.485947	-0.0304248
	effgap	-0.00292268	-0.179412	-0.0170277
	effgapeqpop	-0.0220841	0.172966	0.0204446
	lopwin	0.0886207	0.000318324	0.0664807
	meanmed	0.0680291	0.0533195	-0.0159417
	resp	0.00000	9.09091	0.363636
	taugap	-1.14986	-0.0848905	-0.368612

Table 1

Mean Fairness and Compactness Measures for MCMC, SMC, and Control

Table 1 shows the mean fairness and compactness measures for the redistricting plans generated by the two algorithms and the existing congressional districts.

For the Edge-Cut Compactness and Fryer-Holden score, the table contains the mean of the respective measures for the 100 plans generated by the algorithms. For the Polsby-Popper score, the table contains the mean of the district-level mean Polsby-Popper score for all 100 plans. The compactness measures were normalized so that values of 1

indicate more compact districts and values of 0 represent the least compact districts.

The fairness measures in the table are all the mean of said fairness measure for each redistricting plan generated by each algorithm. "dseats" is the average number of seats that Democrats would have held had the 2018 General Election taken place with said redistricting plan. All other remaining fairness measures have been normalized, where values of 0 indicate fairness and deviation in either direction indicates a partisan imbalance.

Compactness

Partisan Fairness

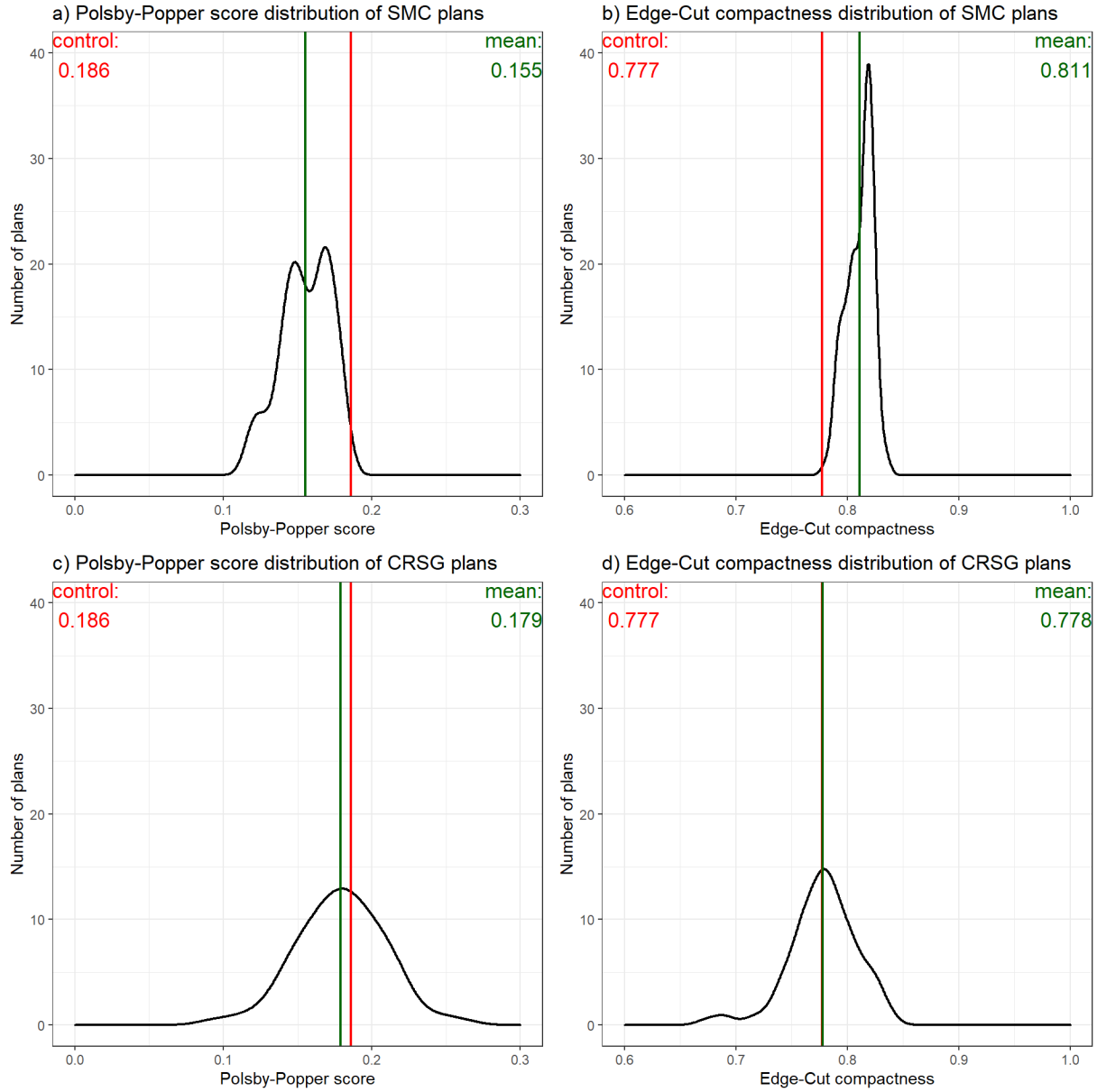
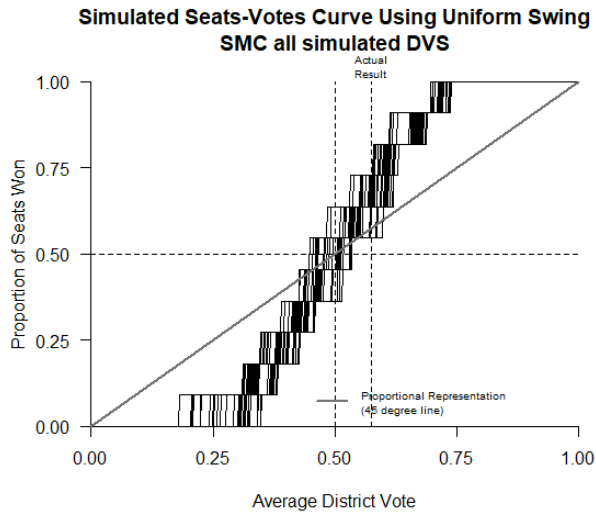
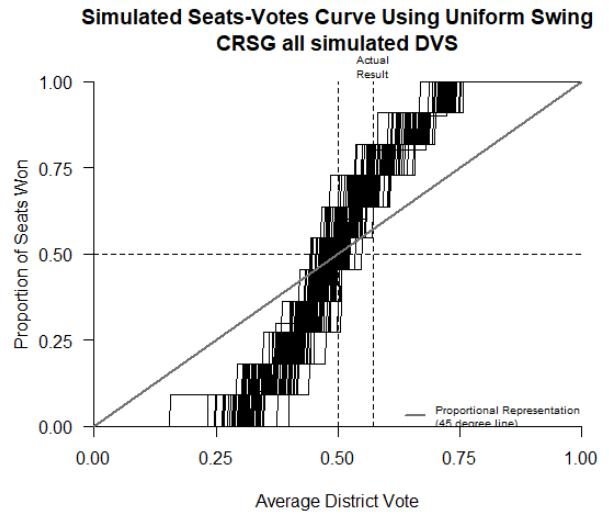
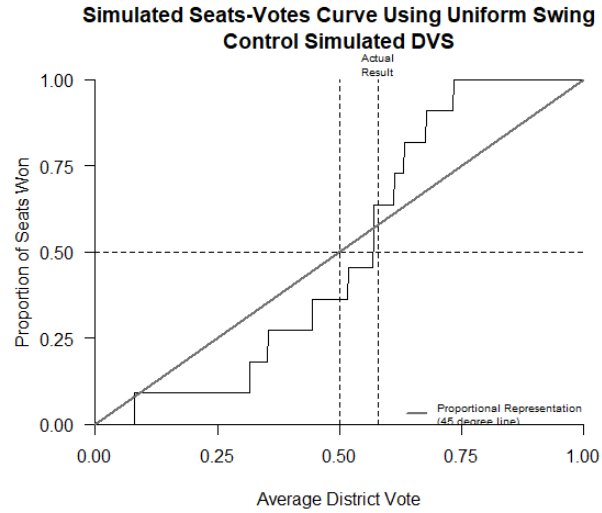


Figure 10

Distributions of compactness measures.

(a) *SMC Seats-Votes Curve*(b) *CRSG Seats-Votes Curve*(c) *Real Seats-Votes Curve***Figure 11***Seats Votes Curves*

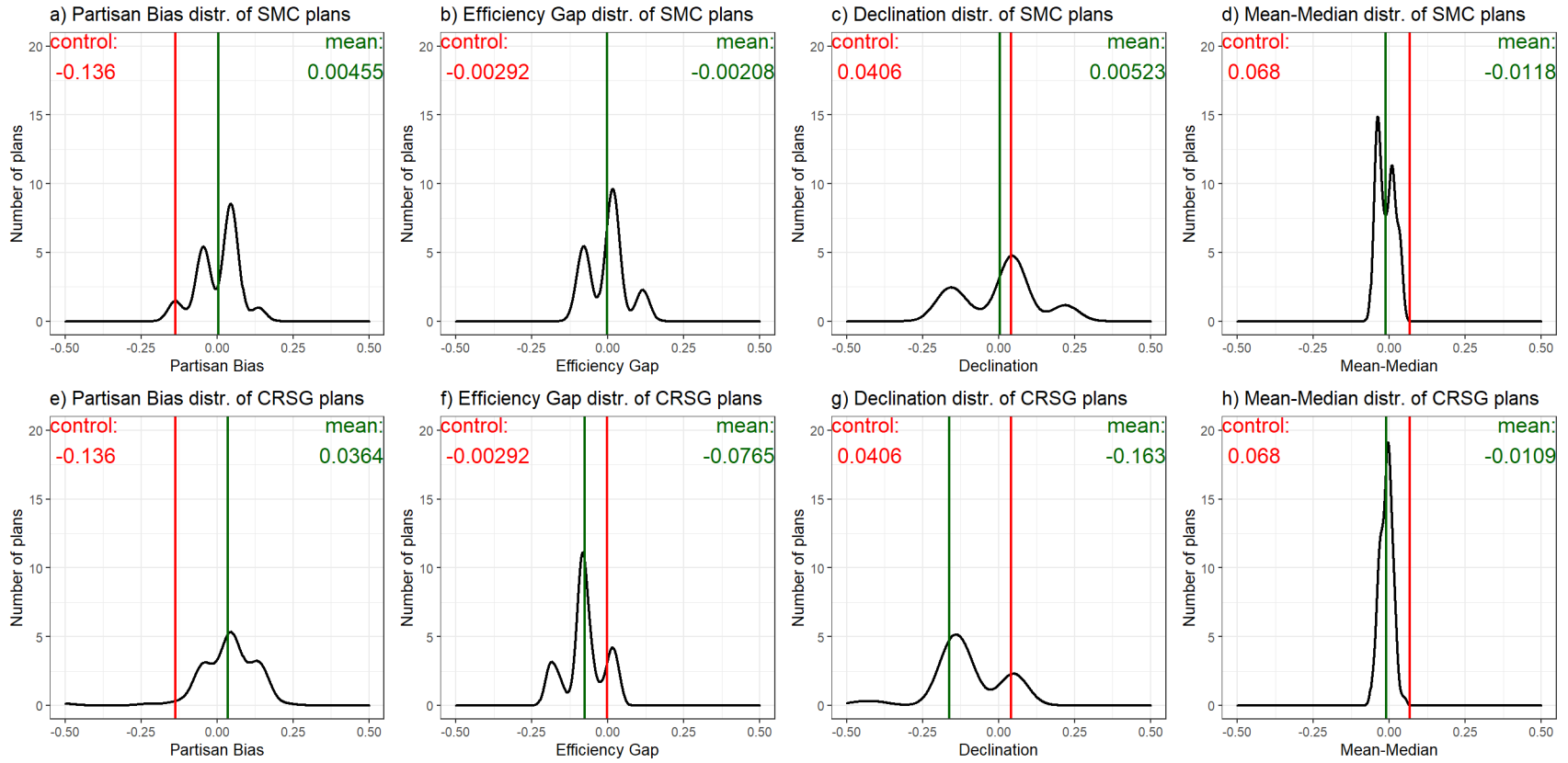


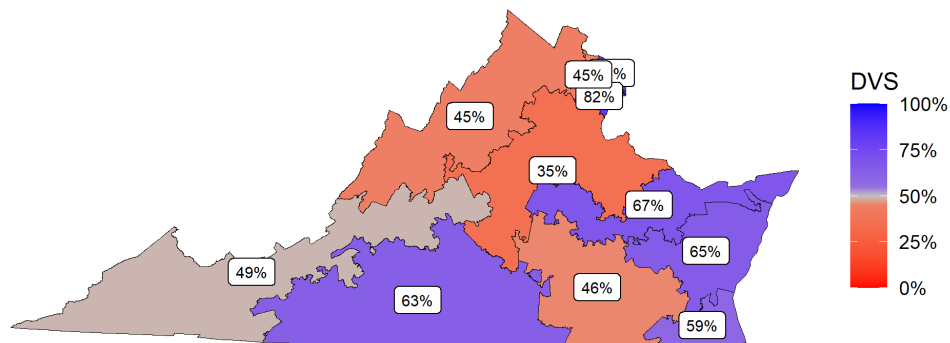
Figure 12

Distributions of fairness measures

2018 General Election Simulation

Election under Fairest SMC District

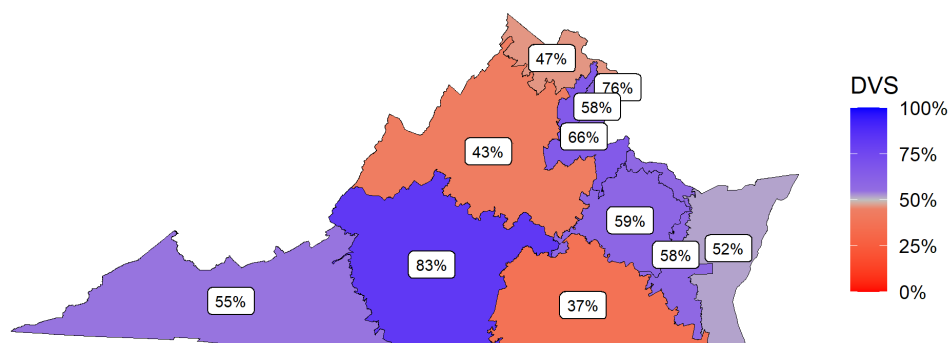
Compared to 57.0% popular DVS



6/11 Democratic Seats

Election under Fairest CRSG District

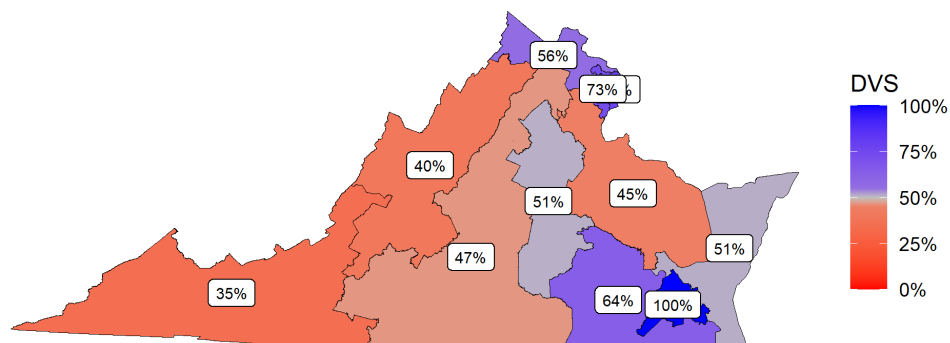
Compared to 57.0% popular DVS



8/11 Democratic Seats

Election under Fairest Control District

Compared to 57.0% popular DVS



7/11 Democratic Seats

Figure 13

Simulated election results