IN THE SUPREME COURT OF OHIO

LEAGUE OF WOMEN VOTERS OF OHIO, et al.,	
Petitioners	**Case No. 2021-1193**
v.	**Original Action Pursuant to Ohio Const., Art. XI**
OHIO REDISTRICTING COMMISSION, et al.,	
Respondents.	

AFFIDAVIT OF CHRISTOPHER WARSHAW

Franklin County
/ss
State of Ohio

Now comes affiant Christopher Warshaw, having been first duly cautioned and sworn, deposes and states as follows:

1. I am over the age of 18 and fully competent to make this declaration. I have personal knowledge of the statements and facts contained herein.
2. For the purposes of this litigation, I have been asked by counsel for Relators to analyze relevant data and provide my expert opinions.
3. To that end, I have personally prepared the report attached to this affidavit as Exhibit A, and swear to its authenticity and to the faithfulness of the opinions expressed and, to the best of my knowledge, the accuracy of the factual statements made therein.

FURTHER AFFIANT SAYETH NAUGHT.

Executed on 01/25/2022, 2022.

Christopher S. Warshaw
Signed on 2022/01/25 14:00:11 -8:00

Christopher Warshaw

Sworn and subscribed before me this 01/25/2022, 2022.

Signed on 2022/01/25 14:00:11 -8:00

Notary Public

Theresa M Sabo
Commission # 2016-RE-619622
Electronic Notary Public
State of Ohio
My Comm Exp. Nov 28, 2026

Notary Stamp 2022/01/25 15:00:11 PST F44D7AAFB343

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Warshaw Affidavit.pdf

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tess.sabo@gmail.com
I, Theresa M Sabo, did witness the participants named above electronically sign this document.

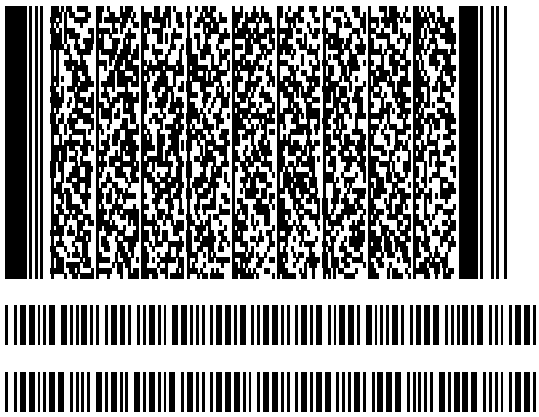

EXHIBIT A

An Evaluation of the Partisan Bias in Ohio's Revised State Legislative Districting Plan

Christopher Warshaw*

January 25, 2022

*Associate Professor, Department of Political Science, George Washington University. warshaw@gwu.edu. Note that the analyses and views in this report are my own, and do not represent the views of George Washington University.

Contents

1 Introduction

My name is Christopher Warshaw. I am an Associate Professor of Political Science at George Washington University. Previously, I was an Associate Professor at the Massachusetts Institute of Technology (MIT) from July 2016 - July 2017, and an Assistant Professor at MIT from July 2012 - July 2016.

I have been asked by counsel representing the League of Women Voters plaintiffs in this case to analyze relevant data and provide my expert opinions about whether Ohio's revised, enacted state legislative districting plans meet the criteria in Article XI, Section 6 of Ohio's Constitution. I have also been asked to evaluate whether Professor Rodden's proposed plans, submitted to the Commission on January 20, appear to satisfy the constitutional criteria.

More specifically, I have been asked:

- To evaluate whether the revised plans meet the requirement of Article XI, Section 6(B) that the "statewide proportion of districts whose voters, based on statewide state and federal partisan general election results during the last ten years, favor each political party [] correspond[s] closely to the statewide preferences of the voters of Ohio."

- To evaluate whether the revised plans appear to meet the requirement of Article XI, Section 6(A) that "No general assembly district plan shall be drawn primarily to favor or disfavor a political party" based on a variety of standard academic metrics typically used to assess the degree of partisan bias in a districting plan.

2 Qualifications, Publications and Compensation

My Ph.D. is in Political Science, from Stanford University, where my graduate training included courses in political science and statistics. I also have a J.D. from Stanford Law School. My academic research focuses on public opinion, representation, elections, and polarization in American Politics. I have written multiple papers that focus on elections and two papers that focus specifically on partisan gerrymandering. I also have a forthcoming book that includes an extensive analysis on the causes and consequences of partisan gerrymandering in state governments.

My curriculum vitae is attached to this report. All publications that I have authored and published appear in my curriculum vitae. My work is published or forthcoming in peer-reviewed journals such as: the *American Political Science Review*, the *American*

Journal of Political Science, the *Journal of Politics*, *Political Analysis*, *Political Science Research and Methods*, the *British Journal of Political Science*, *Political Behavior*, *Science Advances*, the *Election Law Journal*, *Nature Energy*, *Public Choice*, and edited volumes from Cambridge University Press and Oxford University Press. My book entitled *Dynamic Democracy in the American States* is forthcoming from the University of Chicago Press. My non-academic writing has been published in the *New York Times* and the *Washington Post*. My work has also been discussed in the *Economist* and many other prominent media outlets.

My opinions in this case are based on the knowledge I have amassed over my education, training and experience, including a detailed review of the relevant academic literature. They also follow from statistical analysis of the following data:

- In order to calculate partisan bias in state legislative elections, I examined:
  - Precinct-level data on recent statewide Ohio elections: I use precinct-level data on Ohio's statewide elections between 2016-20 from the Voting and Election Science Team (University of Florida, Wichita State University). I obtained these data from the Harvard Dataverse.[1] As far as I know, there are no publicly available datasets with precinct-level returns from 2012-14 that are linked to precinct boundaries (e.g., shapefiles). For these elections, I obtained data via the ACLU that their expert Bill Cooper put together.[2] I merge the precinct-level returns to the proposed plans by assigning precincts to the district that has the greatest overlap with it.[3]

1. See `https://dataverse.harvard.edu/dataverse/electionscience`.

2. Cooper provided the following description of the data via Counsel: "The 2012 results are disaggregated to the block level (based on block centroids) from the statewide 2012 precinct file. The 2014 results are based on a geocoding of about 3.15 million voters who cast ballots in Nov. 2014. These addresses were matched to census blocks and the blocks were aggregated to the precinct level. These "virtual" precincts were next matched to the 2014 election results and then disaggregated back to the block level, with block-level matches. When aggregated to the congressional level, the differences are measured in the tenths of a percent for House contests. As a final step, these datasets were aggregated from the block-level to the 2010 VTD level. Finally, it is important to note that there is a 2% to 3% undercount statewide for all votes cast in the 2014 election." My initial report on Ohio's state-legislative plans was unable to address this undercount. For this report, the VTD-level totals in Lorain County (which is where most of these missing votes are located) were approximated using the official precinct 2014 returns. First, after identifying the township, city, or village of each 2014 precinct, the official precinct-level returns were aggregated up to that level. Those municipality-level returns were then disaggregated for each candidate down to the VTDs in each municipality, proportionally to the vote counts for the candidate running for the same office and party in the 2018 midterm cycle.

3. This approach is slightly different from the one I used in my initial report, which joined precincts to the district where the geographic center of the precinct was located. There is very little substantive difference between the two approaches. But my current approach appears to better match the methodology used by the Commission in its analysis.

- Estimates of the partisan bias in previous state legislative elections: As part of my peer reviewed academic research, I have estimated the partisan bias of districting plans used in previous state legislative elections around the country from 1972-2020 (Stephanopoulos and Warshaw 2020). This analysis was based on state legislative election results from 1972-2020 collected by Carl Klarner and a large team of collaborators (Klarner et al. 2013). I also utilize data on presidential election returns in state legislative districts. For elections between 1972 and 1991, I used data on county-level presidential election returns from 1972-1988 collected by the Inter-university Consortium for Political and Social Research (ICPSR 2006) and mapped these returns to state legislative districts. For elections between 1992 and 2001, I used data on presidential election returns in the 2000 election collected by McDonald (2014) and Wright et al. (2009). For elections between 2002 and 2011, I used data on the 2004 and 2008 presidential elections collected by Rogers (2017). For elections between 2012 and 2020, I used data on presidential election returns from the DailyKos website and PlanScore.org.
- The Plan Score website: PlanScore is a project of the nonpartisan Campaign Legal Center (CLC) that enables people to score proposed maps for their partisan, demographic, racial, and geometric features. I am on the social science advisory team for PlanScore.

I have previously provided expert reports in this case, as well as five other redistricting-related cases and several Census-related cases (see my CV for a current list). I am being compensated at a rate of $325 per hour. The opinions in this report are my own, and do not represent the views of George Washington University.

3 Summary

This report examines whether Ohio's revised, enacted state legislative maps meet the criteria in the Ohio Constitution. Article XI, Section 6 of Ohio's Constitution requires that the Redistricting Commission "attempt to draw a general assembly district plan" that meets the following standards related to partisan fairness. Section 6(A) prohibits a district plan from being "drawn primarily to favor or disfavor a political party." Section 6(B) states that "the statewide proportion of districts whose voters, based on statewide state and federal partisan general election results during the last ten years, favor each political party shall correspond closely to the statewide preferences of the voters of Ohio."

My report provides evidence relevant to evaluating both of these criteria. Ohio's Constitutional criteria requiring that districting plans refrain from benefiting a particular political party are related to a long-line of Political Science literature on democratic representation. The relationship between the distribution of partisan support in the electorate and the partisan composition of the government—what Powell (2004) calls "vote–seat representation"—is a critical link in the longer representational chain between citizens' preferences and governments' policies. If the relationship between votes and seats systematically advantages one party over another, then some citizens will enjoy more influence—more "voice"—over political outcomes than others (Caughey, Tausanovitch, and Warshaw 2017). I use a variety of approaches to evaluate the proposed plans using standard metrics by which political scientists quantify discrepancies between vote-seat representation.

Consistent with the approach in my previous report submitted in this case, I first evaluate the revised, enacted plans based on the proportionality metric embedded in the State's Constitution using a composite of previous statewide elections that occurred between 2012-2020.[4] My analysis is based on Article XI, Section 6 of Ohio's Constitution, which states that the "statewide state and federal partisan general election results during the last ten years" shall be used to determine the proportion of voters supporting each party.

I use a variety of different approaches to aggregate election results from the past decade. All of these approaches, however, indicate that the revised, enacted plans fail to satisfy the requirement for proportionality. In the 2020 presidential election, Democrat Joe Biden received about 46% of the two-party vote.[5] But he would have only won 37% of the state House districts and 36% of the state Senate districts in the revised, enacted plans. In the 2018 gubernatorial election, Democrat Richard Cordray did a little bit better. He received about 48% of the two-party vote. Yet again, however, he would have only won 42% of the state House districts and 42% of the state Senate districts under the revised, enacted plans. So, neither of these recent elections yield a proportional relationship between Democrats' (or Republicans') share of the two-party vote and their share of the seats in the legislature. In fact, Republicans won a greater percentage of the seats than their share of the statewide vote in all 9 out of the 9 races between 2016 and 2020 on both the revised, enacted state House and Senate plans.

The revised plans are not even proportionate when I use the Commission's approach of summing the raw votes from elections between 2016 and 2020.[6] Based on this approach,

4. The proportionality metric is described in depth on pp. 7-8 of my September 23rd report.

5. Following standard convention, throughout my analysis I focus on two-party vote shares.

6. Their analysis appears to sum the raw votes in each district for the 9 statewide elections between

Democrats receive 7% fewer seats than votes on the Commission's revised state Senate plan and 4% fewer seats than votes on the Commission's revised state House plan.

When I expand the universe of elections to focus on all the available statewide elections in Ohio between 2012-2020, I find that the revised, enacted state House and state Senate plans lead to an even higher Republican share of the seats than their share of the statewide vote. Indeed, across five different methods of aggregating statewide elections, the Democrats' statewide two-party vote share averaged about 46%, but they only receive the majority of the votes in 36-37% of the seats in the state House and state Senate.[7] This is just 2 percentage points less disproportionate than the plans the Ohio Supreme Court recently struck down. In contrast, Professor Rodden's plan yields a likely outcome that is much more proportionate with the two parties' statewide vote shares than the Commission's plans. On his plan, the average of various ways of aggregating elections from 2012-2020 indicates that Democrats receive the majority of the votes in about 39% of the seats in the state Senate and 40% of the seats in the state House.

Next, I evaluate the partisan bias in the plans using a number of generally accepted partisan bias metrics that political scientists use to quantify discrepancies between vote-seat representation.[8] For this analysis, I use two approaches to project future elections. First, I use a composite of previous statewide election results between 2012-2020. This approach is based on Article XI, Section 6 of Ohio's Constitution, which states that the "statewide state and federal partisan general election results during the last ten years" shall be used to determine the proportion of voters supporting each party.[9] Second, I evaluate the enacted plans using a more sophisticated, predictive model from the PlanScore.org website. PlanScore uses a statistical model of the relationship between districts' latent partisanship and election outcomes. This enables it to estimate district-level vote shares for a new map and the corresponding partisan bias metrics.[10] Based on these two approaches,

2016 and 2020 (see the Commission's Section 8(C)(2) Statement). Based on these summed votes, they determine whether Democrats or Republicans would win each district on a plan. On p. 7, I discuss important methodological weaknesses in this approach.

7. I weight the composite scores to give each election cycle equal weight in the index. The seat-level projections are based on the 13 statewide elections where I have precinct-level data. In these elections, the Democrats' statewide two-party vote share averaged 45%.

8. These metrics are described in depth on pp. 8-14 of my September 23rd report. Note that the exact calculation methods for the efficiency gap and declination differ slightly across sources. To calculate the efficiency gap I use the formula:

$$EG = S_D^{margin} - 2 * V_D^{margin} \quad (1)$$

where S_D^{margin} is the Democratic Party's seat margin (the seat share minus 0.5) and V_D^{margin} is the Democratic Party's vote margin (McGhee 2017, 11-12). I use the declination formula discussed in Warrington (2018, 42).

9. I weight the composite scores to give each election cycle equal weight in the index.

10. See `https://planscore.campaignlegal.org/models/data/2021D/` for more details.

I characterize the bias in Ohio's plan using four different metrics of partisan bias.[11] I also place the bias in Ohio's plan into historical perspective.

This analysis indicates that the revised, enacted plans have a very large pro-Republican bias based on both ways of projecting future elections and all four metrics of partisan fairness. In fact, the pro-Republican bias in Ohio's state legislative districting plans is an outlier compared to other states over the past 50 years. This suggests that the plan was drawn to favor legislative candidates from the Republican Party. Professor Rodden's plans perform much better based on each of the partisan bias metrics I examine.

Overall, my analysis indicates that the revised, enacted plan appears to be drawn to favor one political party based on a variety of metrics, and the two-parties' seat shares do not correspond closely to their vote shares. Moreover, the revised, enacted plans make marginal improvements at best to the bias contained in the original, enacted plans that the Ohio Supreme Court recently held violated the State Constitution. My analysis indicates that Professor Rodden's plan better meets the requirements of Article XI, Section 6 of Ohio's Constitution.

4 Partisan Bias in Ohio's Proposed State Legislative Districting Plans

In this section, I will provide a comprehensive evaluation of the partisan fairness of Ohio's enacted state legislative districting plan (see Figure 1 for maps of the enacted plans).

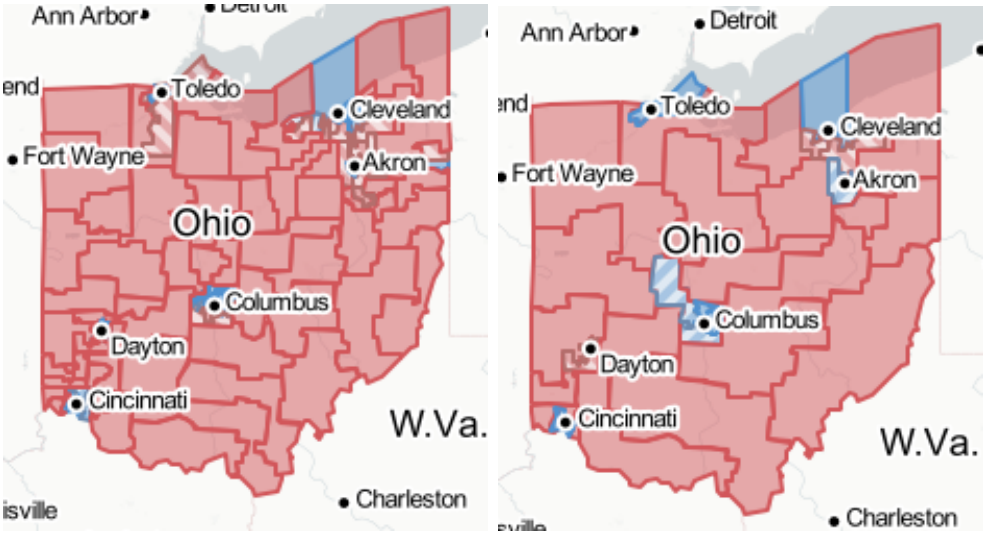

Figure 1: Maps of Revised, Enacted state House and Senate Districts from PlanScore.org

11. See pp. 8-14 of my initial report for details on these metrics.

4.1 Analysis based on Proportionality Metric

First, I evaluate the revised, enacted plans based on the proportionality metric embedded in the State's Constitution using a composite of previous statewide election results between 2012-2020.[12] This approach is based on Article XI, Section 6 of Ohio's Constitution, which states that the "statewide state and federal partisan general election results during the last ten years" shall be used to determine the proportion of voters supporting each party.

While the Ohio Constitution clearly states that the past decade of elections shall be used for this analysis, it does not provide guidance on how these elections should be aggregated. Thus, I use five different aggregate methods in this section.

1. I use the methodology used by the Commission. Their analysis appears to sum the raw votes in each district for the 9 statewide elections between 2016 and 2020 (see the Commission's Section 8(C)(2) Statement). Based on these summed votes, they determine whether Democrats or Republicans would win each district on a plan. However, there are three important weaknesses of this approach. First, it only includes three election years. Moreover, it implicitly overweights the 2018 election cycle, since six of the nine election contests in this composite occurred during this cycle. This was a very strong election year for Democrats. So this is likely to overestimate Democratic performance in future elections. This could be addressed by weighting each election year equally (as I do in #2 and #4 below) or including the 2012 and 2014 election years to capture the full range of elections over the past decade (as the Constitution requires, and I do in #4 and #5 below). Third, the Commission's approach yields a single, deterministic estimate of the winner of each district. So a district that one party is projected to win by .01% of the vote would count the same as one they are projected to win by 10%. In reality, however, the district where one party is projected to win by .01% is likely to be won by each party about half the time.

2. Next, I average across the two parties' seat and vote shares for the 9 statewide elections between 2016 and 2020. I weight the elections, though, so that each election cycle counts equally in the index. I then average across election cycles. This ensures

12. These elections include the 2012 Presidential election, the 2012 Senate election, the 2014 gubernatorial election, the 2014 Secretary of State election, the 2016 Presidential election, the 2016 Senate election, the 2018 Senate election, the 2018 gubernatorial election, the 2018 attorney's general election, the 2018 Secretary of State election, the 2018 Auditor election, the 2018 Treasurer, and the 2020 Presidential election. Geographic data on the other three statewide elections in 2014 is not readily available. But this probably doesn't affect my results much since these elections were similar to the average of the 2014 gubernatorial and Secretary of State elections.

that a wave year for one party does not overly influence the index. It also avoids a deterministic evaluation where a district that a party is projected to win by .01% of the vote would count the same as one they are projected to win by 10%.

3. Next, I take the average of the two parties' seat and vote shares across the 9 elections where I have precinct-level data from 2016-2020. This approach weights each contest during this period equally rather than weighting each election cycle equally.

4. Next, I average across the two parties' seat and vote shares across the 13 elections where I have precinct-level data from 2012-2020. Once again, I weight the elections so that each election cycle counts equally in the index. I then average across election cycles. I believe that this approach is the most reliable and legally sound one since it accounts for elections across the full decade as the Ohio Constitution requires. I used this approach in my report dated September 23rd, and this is also the approach I typically use in my evaluations of state districting plans.

5. Lastly, I take the average of the two parties' seat and vote shares across the 13 elections where I have precinct-level data from 2012-2020. This approach weights each contest over the past decade equally rather than weighting each election cycle equally.

4.1.1 Proportionality of State Senate plans

Table 1 shows the proportionality of the state Senate plans using the composites of recent statewide elections. The top panel shows the proportionality of the Commission's original, enacted map for 2022-2030. When I use the Commission's approach of aggregating the raw votes in the statewide elections from 2016-2020, Democrats are projected to receive 30% of the seats, which is 16.5% less than their share of the statewide vote.[13] The plan looks only slightly more proportional using the two other approaches for aggregating previous elections. When I average across all five approaches for aggregating previous elections, Democrats are projected to receive 13.5% less seats than votes under this plan. The Ohio Supreme Court recently found that this plan clearly fails the proportionality test established by the Constitution.

The middle panel shows the proportionality of the Commission's revised, enacted map for 2022-2030. When I use the Commission's approach of aggregating the raw votes in the

13. Democrats receive 46.8% of the votes when we aggregate the raw votes across the 9 statewide elections from 2016-2020. The Commission focuses on a benchmark of 46% vote share, which appears to be based on all the elections from 2012-2020. But an apples to apples comparison demands that we use the same elections to calculate each party's share of the statewide vote and their share of the seats.

statewide elections from 2016-2020, Democrats are projected to receive 39% of the seats, which is 7% less than their share of the statewide vote. Thus, the Commission's revised, enacted plan is not proportional even when using their method of aggregating votes from the limited set of 2016-2020 elections to project future elections.

Modeling Approach	Dem. Voteshare	Dem. Seatshare	Proportionality Bias
Commission's Original Plan			
2016-20 Composite (summing raw votes)	47%	30%	-16.5%
2016-20 Composite (weight each year equally)	46%	32%	-13.5%
2016-20 Composite (weight each contest equally)	47%	34%	-12.6%
2012-20 Composite (weight each year equally)	45%	32%	-12.7%
2012-20 Composite (weight each contest equally)	46%	34%	-12.3%
Average	46%	32%	-13.5%
Commission's Revised Plan			
2016-20 Composite (summing raw votes)	47%	39%	-7.4%
2016-20 Composite (weight each year equally)	46%	35%	-10.7%
2016-20 Composite (weight each contest equally)	47%	38%	-9.3%
2012-20 Composite (weight each year equally)	45%	34%	-11.0%
2012-20 Composite (weight each contest equally)	46%	36%	-9.9%
Average	46%	36%	-9.7%
Prof. Rodden's plan			
2016-20 Composite (summing raw votes)	47%	45%	-1.3%
2016-20 Composite (weight each year equally)	46%	38%	-8.1%
2016-20 Composite (weight each contest equally)	47%	41%	-5.9%
2012-20 Composite (weight each year equally)	45%	35%	-10.4%
2012-20 Composite (weight each contest equally)	46%	38%	-8.3%
Average	46%	39%	-6.8%

Table 1: Proportionality metrics for state Senate plan

Moreover, the Commission's aggregation approach yields 4 districts on its plan where Democrats obtain between 50 and 51% of the vote in statewide elections from 2016-2020. In reality, these districts are roughly tossups between the two parties rather than solidly Democratic ones. There are also no tossup Republican districts in this vote range. This implies that other aggregation methods are likely to show that the plan is more disproportionate.

In fact, when I use other plausible methods of projecting future elections based on previous election results, the plan is much less proportional than based on the Commission's approach. When I average across all five approaches for aggregating previous elections, Democrats are projected to receive 10% less seats than votes under this plan. So this plan too appears to fail to satisfy the requirement for proportionality.

Finally, the bottom panel of Table 1 shows the proportionality of Professor Rodden's

Senate plan. This map is substantially more proportional than the Commission's revised, enacted plan. When I use the Commission's approach of aggregating the raw votes in the statewide elections from 2016-2020, the plan is nearly perfectly proportional (Democrats receive 47% of the votes and 45% of the seats). The plan is less proportional using the other methods, but it is still much more balanced than the Commission's revised, enacted plan. When I average across all five approaches for aggregating previous elections, Democrats are projected to receive 7% less seats than votes under this plan. So Professor Rodden's plan appears to come closer to satisfying Ohio's constitutional criterion than the Commission's revised, enacted plan.

4.1.2 Proportionality of State House plans

Table 2 shows the proportionality of the state House plans using the composites of recent statewide elections. The top panel shows the proportionality of the Commission's original, enacted map for 2022-2030. When I use the Commission's approach of aggregating the raw votes in the statewide elections from 2016-2020, Democrats are projected to receive 9.4% fewer seats than their share of the statewide vote. The plan looks even less proportional using the two other approaches for aggregating previous elections. When I average across all five approaches for aggregating elections, Democrats are projected to receive 11% less seats than votes under this plan. The Supreme Court recently found that this plan clearly fails the proportionality test established by the Constitution.

The middle panel shows the proportionality of the Commission's revised, enacted map for 2022-2030. When I use the Commission's approach of aggregating the raw votes in the statewide elections from 2016-2020, Democrats are projected to receive 42% of the seats, which is 4.4% less than their share of the statewide vote. Thus, the Commission's revised, enacted plan is not proportional even when using their method of summing votes from the 2016-2020 elections to project future elections.

Moreover, the Commission's approach yields 12 districts where Democrats obtain between 50 and 51% of the vote in statewide elections from 2016-2020, and 14 districts where Democrats obtain between 50 and 52% of the vote. In reality, these districts are roughly tossups between the two parties rather than solidly Democratic ones. In addition, there are no districts where Republicans receive between 50-52% of the vote. The combination of these facts implies that other aggregation methods are likely to show that the plan is even more disproportionate than the Commission's method.

So it is not surprising that when I use other plausible methods of aggregating previous election results, the plan is substantially less proportional than it looks based on the Commission's method of summing the raw votes in each district. Indeed, the plan is barely

Modeling Approach	Dem. Voteshare	Dem. Seatshare	Proportionality Bias
Commission's Original Plan			
2016-20 Composite (summing raw votes)	47%	37%	-9.4%
2016-20 Composite (weight each year equally)	46%	34%	-11.2%
2016-20 Composite (weight each contest equally)	47%	36%	-10.6%
2012-20 Composite (weight each year equally)	45%	33%	-11.7%
2012-20 Composite (weight each contest equally)	46%	35%	-11.2%
Average	46%	35%	-10.8%
Commission's Revised Plan			
2016-20 Composite (summing raw votes)	47%	42%	-4.4%
2016-20 Composite (weight each year equally)	46%	35%	-10.6%
2016-20 Composite (weight each contest equally)	47%	38%	-9.1%
2012-20 Composite (weight each year equally)	45%	34%	-10.7%
2012-20 Composite (weight each contest equally)	46%	36%	-9.6%
Average	46%	37%	-8.9%
Prof. Rodden's plan			
2016-20 Composite (summing raw votes)	47%	42%	-4.4%
2016-20 Composite (weight each year equally)	46%	40%	-5.7%
2016-20 Composite (weight each contest equally)	47%	42%	-5.1%
2012-20 Composite (weight each year equally)	45%	37%	-8.1%
2012-20 Composite (weight each contest equally)	46%	39%	-7.1%
Average	46%	40%	-6.1%

Table 2: Proportionality metrics for State House plan

more proportional than the original, enacted plan that the Supreme Court struck down. When I average across all five approaches for aggregating previous elections, Democrats are projected to receive 9% less seats than votes under this plan (compared to 11% on the original, enacted plan). So this plan too appears to fail to satisfy the requirement for proportionality.

Finally, the bottom panel of Table 2 shows the proportionality of Professor Rodden's proposed House plan. When I use the Commission's approach of aggregating the raw votes in the statewide elections from 2016-2020, Democrats are projected to receive 42% of the seats, which is 4.4% less than their share of the statewide vote. This is identical to the revised, enacted plan. However, the plan is much more proportional than the Commission's plan using other aggregation methods. When I average across all five approaches for aggregating previous elections, Democrats are projected to receive 6% less seats than votes under this plan (compared to 11% for the original, enacted plan and 9% for the revised, enacted plan).

4.2 Evaluation using Additional Partisan Bias Metrics

In this section, I evaluate the Commission's enacted plans using the other generally accepted partisan bias metrics I discussed in my initial report. These metrics further support the conclusion that Ohio's revised, enacted plans violate Article XI, Section 6(A) of Ohio's Constitution because they are drawn to favor a particular political party.

For this analysis, I use two approaches to project future elections. First, I use a composite of previous statewide election results between 2012-2020. This approach is based on the approach discussed in Article XI, Section 6 of Ohio's Constitution, which states that the "statewide state and federal partisan general election results during the last ten years" shall be used to determine the proportion of voters supporting each party. I aggregate these election results to estimate the Democratic and Republican vote shares in each district of the enacted state legislative plans in each statewide contest, and then calculate the partisan bias metrics for each contest. I then take the average of the partisan bias metrics across the past decade, giving each election cycle equal weight in the index. This approach implicitly assumes that future election results will look like the average of these recent statewide elections. In the appendix, I show the partisan bias metrics using a variety of other aggregation approaches. The results are very similar to the ones I present here.

Second, I evaluate the enacted plans using a more sophisticated, predictive model from the PlanScore.org website. PlanScore uses a statistical model of the relationship between districts' latent partisanship and election outcomes. This enables it to estimate district-level vote shares for a new map and the corresponding partisan gerrymandering metrics.[14] Based on these two approaches, I characterize the bias in Ohio's plan using each of the metrics discussed above. I also place the bias in Ohio's plan into historical perspective.

These metrics further support the conclusion that Ohio's revised, enacted plan violates Article XI, Section 6(A) of Ohio's Constitution because they are drawn to favor a particular political party.

4.2.1 Composite partisan bias metrics for State Senate plans

First, I use the composite of previous statewide election results from 2012-2020 to estimate the various metrics. For the state Senate, the average efficiency gap of the original, enacted plan based on these previous election results is -8%. This is more extreme than 66% of previous plans and more pro-Republican than 83% of previous plans. The other metrics

14. See `https://planscore.campaignlegal.org/models/data/2021D/` for more details.

also show that Ohio's original, enacted Senate plan has a substantial pro-Republican bias. When we average across all four metrics, the plan is more extreme than 76% of previous plans and more pro-Republican than 85% of previous plans.

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Original Plan			
Efficiency Gap	-7.7%	66%	83%
Mean-Median Diff	-3.7%	73%	79%
Declination	-.447	76%	86%
Symmetry Bias	-11.1%	89%	92%
Average		76%	85%
Commission's Revised Plan			
Efficiency Gap	-6.0%	55%	76%
Mean-Median Diff	-3.4%	69%	77%
Declination	-.357	69%	81%
Symmetry Bias	-9.5%	83%	87%
Average		69%	80%
Prof. Rodden's plan			
Efficiency Gap	-5.4%	50%	73%
Mean-Median Diff	-1.3%	28%	54%
Declination	-.256	56%	73%
Symmetry Bias	-1.7%	18%	47%
Average		38%	62%

Table 3: Additional partisan bias metrics for state Senate plan based on composite election results from 2012-2020 (each year weighted equally)

Unfortunately, the revised, enacted plan makes only modest improvement on these metrics. The efficiency gap of the revised, enacted plan based on these previous election results is -6%. This is more extreme than 55% of previous plans and more pro-Republican than 76% of previous plans. The other metrics also show that Ohio's revised, enacted plan has a substantial pro-Republican bias. For instance, the -9.5% value for the symmetry metric indicates that Republicans are likely to win nearly 60% of the seats when they win half the votes. When we average across all four metrics, the plan is more extreme than 69% of previous plans and more pro-Republican than 80% of previous plans.

Professor Rodden's plan offers a marked improvement on the various partisan bias metrics. The average efficiency gap of the Rodden plan based on these previous election results is -5%. The other metrics also show that the Rodden plan is much less biased than the Commission's revised, enacted plan. For instance, the -1.7% value for the symmetry metric indicates that Republicans are likely to win about 52% of the seats when they win half the votes. When we average across all four metrics, the plan is more extreme than just 38% of previous plans and more pro-Republican than 62% of previous plans.

4.2.2 Composite partisan bias metrics for State House plans

For the state House, average efficiency gap of the original enacted plan based on these previous election results is -7%. This is more extreme than 66% of previous plans and more pro-Republican than 86% of previous plans. The other metrics also show that Ohio's original, enacted House plan has a large pro-Republican bias. When we average across all four metrics, the plan is more extreme than 78% of previous plans and more pro-Republican than 89% of previous plans.

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Enacted Plan			
Efficiency Gap	-6.7%	66%	86%
Mean-Median Diff	-3.9%	72%	82%
Declination	-.564	86%	93%
Symmetry Bias	-11.1%	91%	95%
Average		78%	89%
Commission's Revised Plan			
Efficiency Gap	-5.7%	60%	82%
Mean-Median Diff	-3.9%	74%	83%
Declination	-.515	82%	91%
Symmetry Bias	-8.0%	78%	86%
Average		74%	86%
Prof. Rodden's plan			
Efficiency Gap	-3.1%	32%	71%
Mean-Median Diff	-3.1%	61%	77%
Declination	-.328	65%	81%
Symmetry Bias	-4.8%	52%	73%
Average		53%	76%

Table 4: Additional partisan bias metrics for state House plan based on composite election results from 2012-2020 (each year weighted equally)

Once again, the revised state House plan makes only modest improvement on these metrics. The efficiency gap of the revised, enacted plan based on these previous election results is -6%. This is more extreme than 60% of previous plans and more pro-Republican than 82% of previous plans. The other metrics also show that Ohio's revised plan has a substantial pro-Republican bias. For instance, the composite election results indicate that Republicans would win about 58% of the seats on this plan when they win half the votes. When we average across all four metrics, the plan is more extreme than 74% of previous plans and more pro-Republican than 86% of previous plans.

Professor Rodden's plan offers a substantial improvement on the various partisan bias metrics. The average efficiency gap of the Rodden plan based on these previous election

results is -3.1%. The other metrics also show that the Rodden plan is much less biased than the Commission's revised, enacted plan. When we average across all four metrics, the plan is more extreme than 53% of previous plans and more pro-Republican than 76% of previous plans.

4.2.3 PlanScore partisan bias metrics for State Senate plans

Next, I use the PlanScore website to evaluate the enacted state legislative plans. PlanScore uses a statistical model to predict the results of each district in the enacted plan based on relationship between past legislative elections over the past decade and recent presidential election results.[15] It then calculates various partisan bias metrics. In this case, PlanScore provides estimates of the efficiency gap and declination.[16]

Metric	Value	Favors Rep's in this % of Scenarios	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Enacted Plan				
Efficiency Gap	-9.3%	99%	81%	92%
Declination	-.50	99%	83%	90%
Average		99%	82%	91%
Commission's Revised Plan				
Efficiency Gap	-8.8%	99%	78%	90%
Declination	-.46	99%	80%	90%
Average		99%	79%	90%
Prof. Rodden's plan				
Efficiency Gap	-2.8%	75%	30%	63%
Declination	-.11	77%	35%	60%
Average		76%	33%	62%

Table 5: PlanScore partisan bias metrics for state Senate plan

The efficiency gap and declination metrics estimated by PlanScore are very similar to my estimates based on a composite of recent election results. Across these two metrics, the original enacted state Senate plan favors Republicans in 99% of PlanScore's scenarios (Table 5).[17] It is more extreme than 82% of previous plans and more pro-Republican than 91% of previous plans. The revised state Senate plan receives nearly identical scores. Once again, it favors Republicans in 99% of PlanScore's scenarios.[18] It is more extreme than

15. The model is described in more detail on this web page: `https://planscore.campaignlegal.org/models/data/2021D/`.

16. The partisan symmetry and mean-median difference scores are only shown when the parties' statewide vote shares fall between 45% and 55% because outside this range the metrics' assumptions are less plausible (McGhee 2017, 9). In the PlanScore model, the Democrats' two-party vote share is just below 45%.

17. See `https://planscore.campaignlegal.org/plan.html?20220123T011316.128938011Z`

18. See `https://planscore.campaignlegal.org/plan.html?20220123T011000.098868238Z`

79% of previous plans and more pro-Republican than 90% of previous plans.

Similarly to my analysis using the composite of recent elections, PlanScore indicates that Professor Rodden's plan offers a substantial improvement on partisan bias metrics.[19] The average efficiency gap of the Rodden plan based on these previous election results is just -2.8% (compared to -8.8% for the revised, enacted Senate plan). When we average across both metrics, the plan is more extreme than just 33% of previous plans and more pro-Republican than 62% of previous plans.

4.2.4 PlanScore partisan bias metrics for State House plans

PlanScore indicates that the original, enacted state House plan also has a substantial pro-Republican bias. The state House plan favors Republicans in 99% of the scenarios estimated by PlanScore (Table 6).[20] Moreover, it is more extreme than 74% of previous plans and more pro-Republican than 90% of previous plans. The revised state House plan receives nearly identical scores. In fact, PlanScore's analysis indicates it is slightly *more biased* than the original plan. Once again, it favors Republicans in 99% of PlanScore's scenarios.[21] It is more extreme than 76% of previous plans and more pro-Republican than 91% of previous plans.

Metric	Value	Favors Rep's in this % of Scenarios	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Enacted Plan				
Efficiency Gap	-6.1%	99%	64%	88%
Declination	-.49	99%	83%	92%
Average		99%	74%	90%
Commission's Revised Plan				
Efficiency Gap	-6.5%	99%	68%	90%
Declination	-.51	99%	83%	92%
Average		99%	76%	91%
Prof. Rodden's plan				
Efficiency Gap	-1.9%	83%	26%	66%
Declination	-.22	97%	49%	70%
Average		90%	38%	68%

Table 6: PlanScore partisan bias metrics for state House plan

Similarly to my analysis using the composite of recent elections, PlanScore indicates that Professor Rodden's plan is much more fair than the Commission's revised, enacted

19. See `https://planscore.campaignlegal.org/plan.html?20220123T180145.863527786Z`
20. See `https://planscore.campaignlegal.org/plan.html?20220123T011338.526178875Z`
21. See `https://planscore.campaignlegal.org/plan.html?20220123T011032.338471133Z`

plan.[22] The average efficiency gap of the Rodden plan based on PlanScore is -1.9% (compared to -6.5% for the Commission's revised plan), and it has a relatively modest pro-Republican declination. When we average across both metrics, the plan is more extreme than just 38% of previous plans and more pro-Republican than 68% of previous plans.

5 Conclusion

Based on my evaluations of the enacted plans and Professor Rodden's proposed plans, I reach the following conclusions:

- The statewide proportions of districts whose voters favor each political party in Ohio's revised, enacted state legislative districting plans do not correspond closely to the statewide preferences of the voters of Ohio. Based on a variety of different analyses, I find that Republicans are likely to get a much larger share of the seats in the revised, enacted maps than their share of the statewide vote. Moreover, the new plans make only marginal improvements in proportionality compared to the previously enacted plans that were found to be unconstitutional.

- The plans appear to be drawn to favor the Republican Party. Based on a variety of metrics, the pro-Republican bias in Ohio's state legislative districting plans is very large relative to other states over the past 50 years. This suggests that the plan was drawn to favor legislative candidates from the Republican Party.

- Professor Rodden's plans better adhere to Ohio's constitutional requirements for partisan fairness than the revised, enacted plans. They are more proportional than the revised, enacted plans. They are also more fair based on a variety of generally accepted Political Science metrics of partisan bias in districting.

22. See `https://planscore.campaignlegal.org/plan.html?20220123T175924.784840930Z`

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Supplementary Appendix

In this appendix, I present the partisan bias metrics I discuss in Sections 4.2.1 and 4.2.2 of my main report using alternative ways of aggregating the composite of previous elections. Specifically, I present results where I weight each contest equally from 2012-2020 and results where I weight each contest equally from 2016-2020.

A1. Additional composite partisan bias metrics for state Senate plans

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Original Plan			
Efficiency Gap	-8.3%	70%	85%
Mean-Median Diff	-3.4%	70%	77%
Declination	-.437	75%	85%
Symmetry Bias	-10.6%	88%	92%
Average		76%	85%
Commission's Revised Plan			
Efficiency Gap	-6.0%	55%	76%
Mean-Median Diff	-3.3%	69%	76%
Declination	-.326	69%	81%
Symmetry Bias	-8.5%	76%	83%
Average		66%	79%
Prof. Rodden's plan			
Efficiency Gap	-4.4%	42%	69%
Mean-Median Diff	-0.9%	19%	49%
Declination	-.198	48%	68%
Symmetry Bias	-1.7%	18%	47%
Average		38%	58%

Table A1: Additional partisan bias metrics for state Senate plan based on composite election results from 2012-2020 (each contest weighted equally)

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Original Plan			
Efficiency Gap	-9.6%	77%	88%
Mean-Median Diff	-3.5%	71%	78%
Declination	-.445	75%	86%
Symmetry Bias	-10.6%	88%	92%
Average		78%	86%
Commission's Revised Plan			
Efficiency Gap	-6.3%	57%	78%
Mean-Median Diff	-3.5%	72%	79%
Declination	-.293	62%	77%
Symmetry Bias	-7.2%	68%	78%
Average		65%	78%
Prof. Rodden's plan			
Efficiency Gap	-2.9%	29%	62%
Mean-Median Diff	-1.6%	36%	58%
Declination	-.089	23%	54%
Symmetry Bias	-2.9%	32%	55%
Average		30%	57%

Table A2: Additional partisan bias metrics for state Senate plan based on composite election results from 2016-2020 (each contest weighted equally)

A2. Additional composite partisan bias metrics for state House plans

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Original Plan			
Efficiency Gap	-7.3%	70%	88%
Mean-Median Diff	-4.1%	76%	84%
Declination	-.547	84%	92%
Symmetry Bias	-11.3%	92%	95%
Average		81%	90%
Commission's Revised Plan			
Efficiency Gap	-5.7%	59%	82%
Mean-Median Diff	-4.0%	76%	84%
Declination	-.465	78%	89%
Symmetry Bias	-7.7%	76%	85%
Average		72%	85%
Prof. Rodden's plan			
Efficiency Gap	-3.2%	34%	72%
Mean-Median Diff	-2.9%	58%	76%
Declination	-.292	59%	77%
Symmetry Bias	-4.5%	49%	72%
Average		50%	74%

Table A3: Additional partisan bias metrics for state House plan based on composite election results from 2012-2020 (each contest weighted equally)

Metric	Value	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
Commission's Original Plan			
Efficiency Gap	-7.6%	72%	89%
Mean-Median Diff	-4.3%	79%	86%
Declination	-.515	82%	91%
Symmetry Bias	-10.8%	90%	94%
Average		81%	90%
Commission's Revised Plan			
Efficiency Gap	-6.0%	61%	83%
Mean-Median Diff	-4.5%	81%	86%
Declination	-.425	74%	86%
Symmetry Bias	-6.7%	68%	81%
Average		71%	84%
Prof. Rodden's plan			
Efficiency Gap	-2.1%	23%	66%
Mean-Median Diff	-3.2%	62%	77%
Declination	-.169	37%	64%
Symmetry Bias	-4.2%	46%	70%
Average		42%	70%

Table A4: Additional partisan bias metrics for state House plan based on composite election results from 2016-2020 (each contest weighted equally)

EXHIBIT A

Curriculum Vitae

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Academic Employment

George Washington University, Washington, DC

Associate Professor (2020-present)

Assistant Professor, 2017 - 2020

Massachusetts Institute of Technology, Cambridge, MA

Associate Professor of Political Science (without tenure), 2016 - 2017

Assistant Professor of Political Science, 2012 - 2016

Education

Stanford University, Ph.D., Political Science, 2012

Fields: American Politics, Comparative Politics, and Political Methodology (Statistics)

Stanford Law School, Juris Doctorate, 2011

Williams College, B.A., *magna cum laude*, 2002

Research Interests

American Politics, Representation, Elections, Public Opinion, State & Local Politics, Environmental Politics and Policy, Statistical Methodology

Research

Publications

Book

"Dynamic Democracy: Public Opinion, Elections, and Policy Making in the American States." Forthcoming. University of Chicago Press. (with Devin Caughey)

Peer Reviewed Articles

24. "The Effect of Television Advertising in United States Elections." Forthcoming. *American Political Science Review*. (with John Sides and Lynn Vavreck).

23. "Using Screeners to Measure Respondent Attention on Self-Administered Surveys: Which Items and How Many?" 2021. *Political Science Research and Methods*. 9(2): 430–437. (with Adam Berinsky, Michele Margolis, and Mike Sances)
22. "The Impact of Partisan Gerrymandering on Political Parties." 2020. *Legislative Studies Quarterly*. 45(4): 609-643. (with Nicholas Stephanopoulos)
21. "Fatalities from COVID-19 are reducing Americans' support for Republicans at every level of federal office." 2020. *Science Advances*. (with Lynn Vavreck and Ryan Baxter-King)
20. "Accountability for the Local Economy at All Levels of Government in United States Elections." 2020. *American Political Science Review*. 114(3): 660-676. (with Justin de Benedictis-Kessner)
19. "Politics in Forgotten Governments: The Partisan Composition of County Legislatures and County Fiscal Policies." 2020. *Journal of Politics*. 82(2): 460-475. (with Justin de Benedictis-Kessner)
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11. "Does the Ideological Proximity Between Candidates and Voters Affect Voting in U.S. House Elections?" 2018. *Political Behavior*. 40(1): 223-245. (with Chris Tausanovitch)
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5. "Mayoral Partisanship and Municipal Fiscal Policy." 2016. *Journal of Politics*. 78(4): 1124-1138. (with Justin de Benedictis-Kessner)

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1. "How Should We Measure District-Level Public Opinion on Individual Issues?" 2012. *Journal of Politics*. 74(1): 203-219. (with Jonathan Rodden)

Editor Reviewed Articles in Journals and Law Reviews

4. "A preference for constant costs." 2020. *Nature Climate Change*. News & Views. 10: 978–979
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1. "Business as Usual? Analyzing the Doctrinal Development of Environmental Standing Doctrine since 1976." 2011. *Harvard Law and Policy Review*. Volume 5.2. (with Gregory Wannier).

Book Chapters

5. "Elections and Parties in Environmental Politics." 2020. *Handbook on U.S. Environmental Policy*. David Konisky, ed. (with Parrish Bergquist)
4. "Latent Constructs in Public Opinion." 2018. *Oxford Handbook on Polling and Polling Methods*. R. Michael Alvarez and Lonna Atkeson, ed. Oxford: Oxford University Press.
3. "The Application of Big Data in Surveys to the Study of Elections, Public Opinion, and Representation." 2016. *Data Analytics in Social Science, Government, and Industry*. R. Michael Alvarez, ed. Cambridge: Cambridge University Press.
2. "The Political Economy of Expropriation and Privatization in the Oil Sector." 2012. *Oil and Governance: State-Owned Enterprises and the World Energy Supply*. David G. Victor, David Hults, and Mark Thurber, eds. Cambridge: Cambridge University Press.
1. "Democratization and Countermajoritarian Institutions: The Role of Power and Constitutional Design In Self-Enforcing Democracy." 2012. *Comparative Constitutional Design*. Cambridge: Cambridge University Press. (with Susan Alberts and Barry R. Weingast).

Policy Reports

1. "Reforming Baltimore's Mayoral Elections." 2020. Abell Foundation Report. `https://www.abell.org/publications/reforming-baltimores-mayoral-elections`

Articles Under Review

"The Effect of Fox News Channel on U.S. Elections: 2000-2020" (with Elliott Ash, Sergio Galletta, and Matteo Pinna)

"Moderates" (with Anthony Fowler, Seth Hill, Jeff Lewis, Chris Tausanovitch, Lynn Vavreck)
(Invited to revise and resubmit at the *American Political Science Review*)

"Partisan Polarization in the Mass Public in South Korea and the United States"

"How Partisanship in Cities Influences Housing Policy" (with Justin de Benedictis-Kessner and Dan Jones)

Works in Progress

"Electoral Accountability for Ideological Extremism in American Elections" (with Devin Caughey)

"Gerrymandering in Local Governments" (with Yamil Valez)

"When Mass Opinion Goes to the Ballot Box: A National Assessment of State Level Issue Opinion and Ballot Initiative Results" (with Jonathan Robinson and John Sides)

"Inequalities in Participation, Voting, and Representation in Local Governments" (with Justin de Benedictis-Kessner and John Sides)

"The Ideology of State Party Platforms " (with Justin Phillips and Gerald Gamm)

Non-Academic Writing

"Here are six big takeaways from the 2020 elections." *Washington Post*. November 7, 2020. (with Emily Thorson)

"TV ads still win elections. And Democrats are buying a lot more of them." *Washington Post*. October 28, 2020. (with John Sides and Lynn Vavreck)

"How Local Covid Deaths Are Affecting Vote Choice." *New York Times*. July 28, 2020. (with Lynn Vavreck)

"Allowing Only Older Americans to Vote by Mail Leads to Severe Racial Disparities." *Election Law Blog*. July 1, 2020.

"A coronavirus recession would hurt all kinds of Republican candidates – not just Trump." *Washington Post*, Monkey Cage. March 18, 2020. (with Justin de Benedictis-Kessner).

"The Supreme Court is deciding a gerrymandering case. Here's the social science that the Justices need to know." *Washington Post*, Monkey Cage. June 1, 2019.

"New research shows just how badly a citizenship question would hurt the 2020 Census." *Washington Post*, Monkey Cage. April 22, 2019. (with Matt Barreto, Matthew A. Baum, Bryce J. Dietrich, Rebecca Goldstein, and Maya Sen)

"G.O.P. Senators Might Not Realize It, but Not One State Supports the Health Bill." *New York Times*. June 14, 2017. (with David Broockman)

Invited Talks

2021-2022: American University

2020-2021: University of Maryland; Stony Brook University

2019-2020: Princeton; UC Berkeley

2018-2019: Stanford; Northeast Political Methodology Meeting at NYU; University of Maryland

2017-2018: USC PIPE Symposium on Studying Subnational Policy Making; BYU; University of Chicago Conference on Political Polarization

2016-2017: University of Virginia; UCLA

2015-2016: Washington University in St. Louis; Texas A&M; Arizona State University Conference on Campaigns, Elections and Representation

2014-2015: Yale; Columbia; Duke

2013-2014: Princeton; Boston University; Rochester University

2012-2013: MIT American Politics Conference; Columbia Representation Conference; Princeton Media & Politics Conference; Annual Meeting of the Society for Political Methodology

Grants

Russell Sage Foundation, 2019-2021 ($119,475)

GW UFF, 2019-2020 ($14,433)

MIT Elections Lab, 2019-2020 ($14,000)

Jeptha H. and Emily V. Wade Award, 2014-2016 ($59,686)

MIT Energy Institute (MITEI) Seed Grant, 2014-2016 ($137,147)

MIT SHASS Research Fund, 2012-2014 ($8,734)

Software

dgo: Dynamic Estimation of Group-Level Opinion. 2017. R package. `https://CRAN.R-project.org/package=dgo`. (with James Dunham and Devin Caughey)

Awards and Honors

OVPR Early Career Scholar at George Washington University, 2019.

APSA award for best journal article on State Politics & Policy in 2016.

Award for best paper on State Politics & Policy at the 2014 American Political Science Conference.

Graduate Fellowship, Dept. of Political Science, Stanford University, 2006-2012

David A. Wells Prize in Political Economy for Best Undergraduate Economics Thesis, Williams College, 2002

Phi Beta Kappa, Williams College, 2002

Teaching Experience

Instructor:

Measurement Models (Graduate-level) (GW), 2020

Political Representation (Graduate-level) (GW), 2019

Elections (GW), 2018, 2019, 2021

Multi-level and Panel Models (Graduate-level) (GW), 2017, 2018, 2019, 2021

Public Opinion (GW), 2017

American Political Institutions (Graduate-level) (MIT), 2014, 2016

Public Opinion and Elections (MIT), 2016

Energy Policy (MIT), 2013

Democracy in America (MIT), 2013, 2014

Constitutional Law & Judicial Politics (MIT), 2013, 2015

Making Public Policy (MIT), 2012, 2014

Teaching Assistant:

Introduction to American Law (Stanford University), 2010

Judicial Politics and Constitutional Law (Stanford University), 2009

Political Economy of Energy Policy (Stanford University), 2008

Introduction to International Relations (Stanford University), 2008

Introduction to Public Policy (Stanford University), 2007

Introduction to Econometrics (Williams College), 2002

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Kerry Synan (Dissertation committee co-chair)

Jared Heern (Dissertation committee member)

Colin Emrich (Graduates in 2021, Dissertation committee member)

Massachusetts Institute of Technology:

Leah Stokes (Graduated in 2015, Dissertation committee member)

Krista Loose (2016, Dissertation committee member)

Tom O'Grady (2017, Dissertation committee member)

Justin de Benedictis-Kessner (2017, Dissertation committee member)

Alex Copulsky (2017, Masters thesis committee member)

James Dunham (2018, Dissertation committee member)

Parrish Bergquist (2018, Dissertation committee member)

Meg Goldberg (2019, Dissertation committee member)

University Service

George Washington University:

Member, Academic Program Review Committee, Sociology Dept., 2021

Coordinator, Graduate Political Science Admissions Committee, 2019-2020

Coordinator, American Politics Workshop, 2018-2020

Member, Methods Exam Committee, 2017-2020

Member, Graduate Political Science Admissions Committee, 2018-2019

Massachusetts Institute of Technology:

Member, Energy Education Task Force, 2012-2017

Parking and Transit Committee, 2013-2017

Member, Graduate Political Science Admissions Committee, 2013-2015

Faculty Fellow, Burchard Scholars, 2013-2015

Stanford University (as graduate student):

President, Stanford Environmental Law Society, 2009-2010

Executive Board Member, Stanford Environmental Law Society 2008-2010

Member, University Committee on Graduate Studies, 2007-2009

Member, University Library Committee, 2007-2008

President, Political Science Graduate Students Association, 2007-2008

Professional Service

Reviewer: American Political Science Review, American Journal of Political Science, Journal of Politics, Political Analysis, Political Behavior, Econometrica, Quarterly Journal of Political Science, Legislative Studies Quarterly, Political Research Quarterly, American Politics Research, British Journal of Political Science, Journal of Law and Courts, Public Opinion Quarterly, Political Science Research and Methods, State Politics and Policy Quarterly, Journal of Experimental Political Science, Nature Climate Change, Urban Affairs Review, Journal of Health Politics, Policy and Law, Perspectives on Politics, Review of Economics and Statistics, Cambridge University Press

Member, Best Dissertation Committee, Urban Politics Section of the American Political Science Assoc., 2021

Member, Program Committee, Midwest Political Science Association Conference, 2020

Lead Organizer, Local Political Economy APSA Pre-Conference at George Washington University, 2019

Member, Planning Committee, Cooperative Congressional Election Study (CCES), 2018

Member, Best Paper Committee, State Politics Section of the American Political Science Assoc., 2018

Editorial Board, Journal of Politics, 2017-18

Executive Committee, Urban Politics Section of the American Political Science Association, 2015-2017

Organizing Committee, Conference on Ideal Point Models at MIT, http://idealpoint.tahk.us, 2015

Member, Best Paper Committee, Urban Politics Section of the American Political Science Assoc., 2015

Consulting

Partisan Gerrymandering:

Expert, *League of Women Voters of Ohio* v. *Ohio Redistricting Commission* (2021), Congressional districts

Expert, *League of Women Voters of Ohio* v. *Ohio Redistricting Commission* (2021), State Legislative Districts

Expert, *League of Women Voters* vs. *Kent County Apportionment Commission* (2021)

Expert, *APRI et al.* v. *v. Smith et al.* (2018-2019)

Expert, *League of Women Voters of Michigan* v. *Johnson* (2018-2019)

Expert, *League of Women Voters of Pennsylvania* v. *the Commonwealth of Pennsylvania* (2017-18)

Census:

Expert, *La Union del Pueblo Entero , et al.* v. *Trump*, Effect of Excluding Undocumented Immigrants from Census on Apportionment (2020)

Expert, *Common Cause et al.* v. *Trump*, Effect of Excluding Undocumented Immigrants from Census on Apportionment (2020)

Expert, *State of New York* v. *Trump*, Effect of Excluding Undocumented Immigrants from Census on Apportionment (2020)

Expert, *New York Immigration Coalition* v. *US Dept of Commerce* & *State of NY* v. *US Dept of Commerce*, Effects of Undercount on Census due to Citizenship Question (2018)

Policy Reports:

Consultant, *Abell Foundation*, Report on Potential Institutional Reforms for Baltimore's City Elections

Community Service

PlanScore: Social Science Advisory Team (2020-2021)

Sierra Club: National Board of Directors (2009-2015)

Last updated: January 25, 2022

CERTIFICATE OF SERVICE

I, Freda J. Levenson, hereby certify that on this 25th day of January, 2022, I caused a true and correct copy of the foregoing document to be served by email upon the counsel listed below:

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Erik Clark, ejclark@organlegal.com

Counsel for Respondent Ohio Redistricting Commission

/s/ Freda J. Levenson
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Counsel for Relators