IN THE SUPREME COURT OF PENNSYLVANIA

Nos. 11 MM 2022, 16 MM 2022, 18 MM 2022, 4 WM 2022, 7 WM 2022, 11 WM 2022, 12 WM 2022

IN RE: PETITIONS FOR REVIEW CHALLENGING THE FINAL 2021 LEGISLATIVE REAPPORTIONMENT PLAN

CONSOLIDATED BRIEF OF JOANNA E. MCCLINTON IN RESPONSE TO PETITIONS FOR REVIEW

Daniel T. Brier
Donna A. Walsh
Patrick J. Brier
Richard L. Armezzani
Myers, Brier & Kelly, LLP
425 Biden Street, Suite 200
Scranton, PA 18503

Michael A. Comber
Reisinger Comber & Miller LLC
300 Koppers Building
436 Seventh Avenue
Pittsburgh, PA 15219

Attorneys for Joanna E. McClinton,
Leader of the Democratic Caucus of the Pennsylvania House of Representatives
and Member of the Legislative Reapportionment Commission

TABLE OF CONTENTS

TABLE OF AUTHORITIES

STATUTES

I. INTRODUCTION

The final plan approved by the Legislative Reapportionment Commission

("Commission") on February 4, 2022 is the product of an exceptionally robust,

transparent and inclusive process, was informed by nationally recognized experts

in the fields of demography, quantitative social science, redistricting and voting

rights, and satisfies all constitutional and statutory requirements. As the Leader of

the House Democratic Caucus and a member of the Commission, Respondent

Joanna E. McClinton proudly supported the final plan.

Leader McClinton's Republican counterpart in the Pennsylvania House of

Representatives, Majority Leader Kerry Benninghoff, having been the beneficiary

of decades of gerrymandered House maps, challenges the final plan as a partisan

gerrymander even though it outperforms previous and other offered plans on

objective redistricting metrics and even though it is universally acknowledged as

having a slight Republican bias.

Leader Benninghoff opens his brief with an *ad hominem* attack on Leader

McClinton. He claims that, during a question and answer session on October 18,

2021, she vowed to win control of the House of Representatives through

"redistricting." Benninghoff Br. at 6. What Leader McClinton ***actually*** said is that

Democrats will "pick up seats . . . *[t]hrough fairer maps*." (Emphasis added.) She

explained: "[W]hen we see a reset opportunity it is simply for a fairer map. It's

not . . . some sort of grab . . . . That is not what our caucus is trying to do or achieve. We just want fairer lines . . . ."[1] By misquoting Leader McClinton, attacking Chairman Mark A. Nordenberg's motivations and claiming that decisions with which he personally, disagrees must have been unlawful, Leader Benninghoff is trying to accomplish the very thing the guarantee of equal representation in the Free and Equal Elections Clause is intended to protect against: "the exclusion [of individuals] from the legislative process 'by persons who gained power and intended to keep it.'" *League of Women Voters v. Commonwealth*, 178 A.3d 737, 806 (Pa. 2018) (quoting John L. Gedid, *"History of the Pennsylvania Constitution"* as appearing in Ken Gormley, ed., *"The Pennsylvania Constitution A Treatise on Rights and Liberties,"* 48 (2004)).

Beyond the rhetoric and unfair attacks, however, lies the truth. Measured against all relevant standards and metrics, the Commission approved a final plan consistent with all elements of the law. The House and Senate plans satisfy all constitutional and statutory requirements and allow all citizens an equal opportunity to translate their votes into representation. There is no basis to find otherwise. None of the appellants have met their burden of establishing that the final plan is contrary to law. This Court should not hesitate to conclude that the

---

[1] The full recording of Leader McClinton's comments to the Harrisburg Press Club on October 18, 2021 is available at https://youtu.be/wBRV1OtxcDw?t=1382 (last visited March 11, 2022).

final plan is lawful and the fast-approaching elections for the General Assembly

should proceed using the new maps. Leader McClinton joins the Commission in

urging the Court to deny all appeals and declare under Article II, Section 17(e) that

the final plan "shall have the force of law" until the next reapportionment.

II. STATEMENT OF THE CASE

A. The Commission

Responsibility for reapportioning the Commonwealth following the

decennial census is constitutionally entrusted to the Commission. Pa. Const. art. II,

§ 17(a). The Pennsylvania Constitution directs that the Commission shall consist

of the majority and minority leaders of the Pennsylvania Senate and the

Pennsylvania House of Representatives, specifically: Senate Majority Leader Kim

Ward; Senate Minority Leader Jay Costa; House Majority Leader Kerry

Benninghoff; and Leader McClinton. Pa. Const. art. II, § 17(b). The fifth member

of the Commission and its Chairman is Mark A. Nordenberg, who was appointed

by this Court after the other Commissioners failed to agree on a fifth member. *Id.*

Due to complications resulting from the COVID-19 pandemic, there was

significant delay in the official reporting of the Federal decennial census data

which triggers the reapportionment process. Pa. Const. art. II, § 17(c). Census

data was delivered to the Commission more than four months after the April 1,

2021 deadline. 13 U.S.C. § 141(c). Data in a "legacy" format was first made

available on August 12, 2021. LRC.Tr. 839-841. Data was provided to the Commission in a more user-friendly version on September 16, 2021. Chairman Report at 13. The Legislative Data Processing Center ("LDPC") thereafter made necessary adjustments which rendered the data "usable" to the Commission as of October 5, 2021. *Id.* at 15. Nine days later, on October 14, 2021, the LDPC provided adjusted data that reallocated certain incarcerated individuals to their home communities pursuant to Resolutions 4A and 5A passed by the Commission on August 24, 2021 and September 21, 2021, respectively. LRC.R.-Tabs 15b, 17b. The Commission thereafter had 90 days to file a preliminary reapportionment plan. Pa. Const. art. II, § 17(c).

Both before and after usable census data was received, the Commission solicited and received input from the public, special interest groups, elected officials and candidates. The Commission conducted a total of 16 public meetings at which more than 180 witnesses testified, including experts in redistricting, citizen participation, mapping perspectives and the Voting Rights Act.

Through these diligent efforts, the Commission developed a preliminary reapportionment plan which was approved at a public meeting on December 16, 2021.[2]

---

[2] The commission took action 27 days before the 90 days allotted for preparation of a preliminary plan in Article II, Section 17(c).

4

The Commission thereafter had a period of 30 days to make corrections to the plan. Pa. Const. art. II, § 17(c). During the correction period, which expired on January 18, 2022, the Commission collected thousands of additional written comments from interested Pennsylvania citizens, conducted additional public hearings, and received additional testimony from both expert and lay witnesses, including experts in the fields of political science, quantitative social science and the Voting Rights Act. The experts presented by Leader McClinton included: Kosuke Imai, Ph.D., Professor of Government and Statistics and affiliate of the Institute for Quantitative Social Science at Harvard University; Matt Barreto, Ph.D., Professor of Political Science and Chicana/o and Central American Studies and founder of the Latino Policy & Politics Initiative and Voting Rights Project at UCLA; and Christopher Warshaw, Ph.D., Associate Professor of Political Science at George Washington University.

The Commission approved the final reapportionment plan by a 4-1 vote on Friday, February 4, 2022. Leader McClinton, Senator Costa, Senate Majority Leader Ward and Chairman Nordenberg voted in favor of the plan. In addition to addressing many concerns raised by Pennsylvanians, the final plan improved upon important metrics in the preliminary plan by, *inter alia*, reducing overall population deviation and by further reducing municipal splits. A comparison chart detailing relevant metrics for the 2022 House plan and other plans is attached as

Exhibit "A." By every objective measure, the final House plan materially

outperforms the existing House plan, avoids vote dilution and has a slight pro-

Republican bias. It is unassailably lawful.

B.   The Appellants and Their Claims

The appeals fall into two general categories: appeals challenging local

decisions and the appeal filed by Leader Benninghoff, parts or all of which other

appellants incorporated into or repeated in their filings.

The localized challenges include: (1) the appeal docketed at 4 WM 2022

filed by Ryan Covert, Erik Hulick and Darlene J. Covert (collectively, "Covert

Appellants") challenging the impact of the final plan on Butler County; (2) the

appeal docketed at 7 WM 2022 filed by Todd Elliott Koger challenging the

decision to remove Wilkinsburg from House District 24; (3) the appeal docketed at

No. 11 WM 2022 filed by Jackie Hutz raising the identical challenges to the Butler

County draw as the Covert Appellants; (4) the appeal docketed at No. 18 MM 2022

filed by Gabriel Ingram, Ruth Moton, Mark Kirchgasser and Susan Powell

(collectively, "Ingram Appellants") challenging the impact of the final plan on

Middletown Township; and (5) the appeal docketed at No. 12 WM 2022 filed by

Edward J. Kress challenging decisions made with respect to House District 24.

Two of the Ingram Appellants and Mr. Kress submitted exceptions to the

Commission asserting the same localized challenges that are the focus of their

appeals. *See* LRC.R.-Tab 39 (775, 1488, 2314, 5715). The Covert Appellants and Mr. Koger did not submit exceptions.

Leader Benninghoff, in his capacity as Majority Leader of the Pennsylvania House of Representatives, a member of the Commission and a registered voter in Centre County, filed the appeal at No. 11 MM 2022. He alleges that the final plan divides municipalities although not absolutely necessary, Pet. For Review ¶¶ 39-46, 94-98; that the total population deviation of 8.65% is higher than necessary and "there is a strong partisan skew to the population deviation" among some districts, *id.* ¶¶ 55-58; that a constitutional amendment or statute was necessary to reallocate incarcerated persons to their home communities, *id.* ¶¶ 60-64; that the final plan "excessively" pairs Republican incumbents, *id.* ¶ 65; that "race was purported to be the predominant factor" in drawing the final plan, *id.* ¶ 66, and that the final plan improperly decreases minority populations in certain districts, *id.* ¶¶ 66-93. He touts his own plan which he first presented at a press conference just two hours before the public meeting convened by the Commission on February 4, 2022 to vote on the final plan. *Id.* ¶ 8. He offered his plan as an amendment to the final plan at the meeting, but the amendment failed to garner a majority of votes. *Id.*

Another appellant, Eric Roe, whose appeal is docketed at No. 16 MM 2022, repeated the arguments advanced by Leader Benninghoff. The exceptions which he submitted to the Commission include only a challenge to splits in Scranton,

Lower Paxton, Berks County and State College.[3] Other appellants, including the

Covert Appellants, Ms. Hutz and Mr. Roe, incorporated the arguments in Leader

Benninghoff's appeal.

C.   Intervention by Leader McClinton

Pursuant to Rule 1531(a) of the Pennsylvania Rules of Appellate Procedure,

on March 4 and 10, 2022, Leader McClinton filed notices to intervene as of right in

the Covert, Benninghoff, Koger, Ingram, Hutz, Kress and Roe appeals.[4]

III.   SCOPE AND STANDARD OF REVIEW

The scope of review in these appeals is plenary, subject to the restrictions

that a successful challenge must encompass the final plan as a whole and only

those claims presented to the Commission prior to the approval of the final plan

may be raised on appeal. *Holt v. 2011 Legislative Reapportionment Comm'n*, 38

A.3d 711, 733 (Pa. 2012) ("*Holt I*").

---

[3] Mr. Roe also raised the issue of majority-minority districts in his exceptions, but he took a different position than he takes in his appeal to this Court. Mr. Roe argued in his exceptions that additional majority-minority districts were required to be drawn, but in his appeal he now parrots Leader Benninghoff's argument that there was no evidentiary basis to draw any majority-minority districts. *Compare* Exceptions to Prelim. House Plan at 8-9, LRC.R.-Tab 40 (6500-6510) *with* Pet. For Review ¶ 51.

[4] The appeals filed by Senator Lisa Boscola and the "Math/Science Professors," docketed at Nos. 14 MM 2022 and No. 17 MM 2022, respectively, are addressed exclusively at the Senate map. Leader Benninghoff did not intervene in those matters.

The burden lies squarely with the appellants. A final plan may be found to be unconstitutional only if the appellant establishes that it is "contrary to law." Pa. Const. art. II, § 17(d).

IV. SUMMARY OF ARGUMENT

The final plan satisfies all constitutional redistricting requirements. It includes 203 districts that are compact and contiguous within the range of minor population deviations and it includes fewer subdivisions splits than the plan approved in the last reapportionment cycle. The final House plan scores very well on every partisan fairness metric, which this Court described as "tools for objective evaluation of proposed . . . districting plans to determine their political fairness and avoid vote dilution based on political affiliation." *Carter v. Chapman*, --- A.3d ---, 2022 WL 702894, at *11 (Pa. Mar. 8, 2022). Further, it is within the range of simulated plans generated by a computer algorithm without any consideration of party affiliation or anything other than the criteria required by the Pennsylvania Constitution.

Appellants have not proffered any valid basis for concluding that the final plan dilutes the votes of any Pennsylvania elector, regardless of who they are, where they live or which party they support. The final plan is not contrary to law. This Court should declare under Article II, Section 17(e) that the final plan shall

have the force of law and shall be used in all elections to the General Assembly until the next reapportionment.

V. ARGUMENT

A. State Legislative Redistricting Must Adhere to the U.S. and Pennsylvania Constitutions and the Voting Rights Act.

The criteria governing state legislative redistricting are well known to the Court. They derive primarily from Article II, Section 16 of the Pennsylvania Constitution which directs in pertinent part:

> The Commonwealth shall be divided into fifty senatorial and two hundred three representative districts, which shall be composed of compact and contiguous territory as nearly equal in population as practicable. . . . Unless absolutely necessary no county, city, incorporated town, borough, township or ward shall be divided in forming either a senatorial or representative district.

Pa. Const. art. II, § 16.

Redistricting must also comply with Article I, Section 5 of the Pennsylvania Constitution which "mandates clearly and unambiguously, and in the broadest possible terms, that *all* elections conducted in this Commonwealth must be 'free and equal.'" *League of Women Voters v. Commonwealth*, 178 A.3d 737, 804 (Pa. 2018) ("*LOWV*") (emphasis in original). The Free and Equal Elections clause directs:

> Elections shall be free and equal; and no power, civil or military, shall at any time interfere to prevent the free exercise of the right of suffrage.

Pa. Const. art. I, § 5.

In addition, redistricting must accord with the Voting Rights Act which

forbids any "standard, practice, or procedure . . . imposed or applied by any State .

. . in a manner which results in a denial or abridgement of the right of any citizen

of the United States to vote on account of race or color" or due to membership in a

language minority group. 52 U.S.C. § 10301(a); *see also* 52 U.S.C. §§

10303(f)(2), 10310(c)(3). Section 2(b) provides that a denial or abridgment occurs

where,

> based on the totality of the circumstances, it is shown
> that the political processes leading to nomination or
> election in the State . . . are not equally open to
> participation by members of a class of citizens
> protected by subsection (a) of this section in that the
> members have less opportunity than other members of
> the electorate to participate in the political process and
> to elect representatives of their choice. . . .

52 U.S.C. § 10301(b). "Section 2 thus prohibits any practice or procedure that,

'interact[ing] with social and historical conditions,' impairs the ability of a

protected class to elect its candidate of choice on an equal basis with other voters."

Voinovich v. Quilter, 507 U.S. 146, 153 (1993) (quoting *Thornburg v. Gingles*, 478

U.S. 30, 47 (1986)). The Act is intended to help effectuate the Fifteenth

Amendment's guarantee that no citizen's right to vote shall "be denied or abridged

. . . on account of race, color or previous condition of servitude." U.S. Const., Am.

15; *see also Voinovich*, 507 U.S. at 152.

11

With regard to the requirements in the Pennsylvania Constitution, this Court

has emphasized that "[t]he law in this area remains complex and dynamic" and the

Commission "retain[s] considerable discretion in fashioning a plan that comports

with all constitutional requirements." *Holt I*, 38 A.3d at 761; *id.* at 738

("Considerable discretion is reposed in the LRC to accomplish this task, which

requires a balancing of multiple mandates . . . ."). Further, this Court has declined

to impose "immovable 'guideposts'" or "firm parameters" that would satisfy the

constitutional directives with respect to population equality, subdivision splits,

compactness or contiguity. *Id.* at 736, 757. "By necessity, a reapportionment plan

is not required to solve every possible problem or objection in order to pass

constitutional muster." *Holt v. 2011 Legislative Reapportionment Comm'n*, 67

A.3d 1211, 1240 (Pa. 2013) ("*Holt II*"). That there may exist an alternate plan that

some may believe to be preferable or better than the final plan is not a proper basis

for striking a plan that otherwise satisfies constitutional requirements. *Holt I*, 38

A.3d at 751 (citing *Albert v. 2001 Legislative Reapportionment Comm'n*, 790 A.2d

989, 995 (Pa. 2002)); *id.* at 732 ("'[T]he mere existence of a plan described as

being 'preferable' or 'better' did not alone suffice to prove the unconstitutionality

of the proposed plan."); *see also In re 1981 Reapportionment Plan for Pa. Gen.*

Assembly, 442 A.2d 661, 667 (Pa. 1981) ("[T]he role of the Court in reviewing a

reapportionment plan is not to substitute a more 'preferable' plan for that of the

Commission, but only to assure that constitutional requirements have been met.")
(citation omitted).

> **B.   The Final Plan Fully Satisfies All Constitutional Requirements and Ensures Voters Equal Opportunity To Translate Their Votes Into Representation.**

On every metric and according to every standard measure, the final plan satisfies all redistricting requirements. As a result, there is no legal basis to invalidate the plan under this Court's "limited scope of review." *Albert*, 790 A.2d at 995 ("[T]he limited scope of review requires this Court to determine whether the final plan satisfies the constitutional requirement[s] . . . .").

The districts in the final House plan are significantly compact under the standard methods of measuring of compactness: the Polsby-Popper and Reock methods. The Polsby-Popper compactness score is the mean of the ratio of each district's area to the area of a hypothetical circle with the same perimeter. The higher the score, the greater the geographic compactness. *See LOWV*, 178 A.3d at 771 (describing Polsby-Popper measure). The Reock compactness score is the mean of the ratio of each district's area to the area of the smallest bounding circle that can be drawn to completely contain the district. The higher the score, the more compact the district. *Id.* The final House map scores 0.35 on the Polsby-Popper method and 0.42 on the Reock method. It is more compact than the map approved in *Holt II. Holt II*, 67 A.3d at 1218 (final House plan scored 0.277 under

Polsby-Popper and 0.39 under Reock); *see also* Comparison Chart. Tellingly, none of the appellants challenge the final plan on compactness grounds.

The final House map also fully satisfies the contiguity requirement. With the exception of several non-contiguous municipalities which are respected, all districts are fully contiguous.

The districts in the final House map are also nearly equal in population. The map has population deviation of 8.65%, well within the Commission's discretion which this Court acknowledged, *Holt I*, 38 A.3d at 761 ("we do not direct a specific range for the deviation from population equality," but rather "we deem the LRC to retain considerable discretion in fashioning a plan that comports with all constitutional requirements"), and under the 10% threshold for "minor deviations" and thus presumptively constitutional under the Fourteenth Amendment to the U.S. Constitution, *see Voinovich*, 507 U.S. at 161 (holding that apportionment plan with maximum population deviation under 10% falls within category of "minor deviations" which "are insufficient to make out a prima facie case of invidious discrimination under the Fourteenth Amendment so as to require justification by the State") (citation and internal quotation marks omitted). Further, a maximum total deviation of 8.65% is comparable to deviations previously determined not to violate applicable law. *See, e.g., Holt II*, 67 A.3d at 1224 (approving House plan with total population deviation of 7.88% and Senate plan with total population

deviation of 7.96%); *see also Brown v. Thomson*, 462 U.S. 835, 839 (1983) (average deviation of 16% average and maximum deviation of 89%); *White v. Register*, 412 U.S. 755, 764 (1973) (maximum deviation of 9.9% between districts).

None of the appellants argue—nor can they—that a deviation of 8.65% is contrary to law. Leader Benninghoff suggests that this measure is "significantly higher" than the 7.87% and 7.96% deviations deemed not contrary to law in *Holt II* and "unnecessarily stretches the bounds of what is permissible," Benninghoff Br. at 14, 39, but the deviation in the final House plan is in line with the deviations in *Holt II* and is certainly not disqualifying. The Commission need not devise a reapportionment plan that "pursue[s] the narrowest possible deviation, at the expense of other, legitimate state objectives, such as are reflected in our charter of government." *Holt I*, 38 A.3d at 760. "There obviously is discretion vested in the LRC to determine what is most practicable." *Holt II*, 67 A.3d at 1239. The final House map is well within the Commission's discretion which has been repeatedly acknowledged by this Court and therefore cannot be deemed contrary to law.

Unable to deny this reality, Leader Benninghoff (and the appellants who replicate his argument) tries to avoid it by picking individual districts which he claims demonstrate a "partisan skew." Benninghoff Br. at 39. Even if Leader Benninghoff were able to marshal competent evidence in support of this theory—

and he did not[5]—his focus on selected districts does not in any way suggest the plan "as a whole" is contrary to law with respect to population deviation. *Holt I*, 38 A.3d at 400. In short, there is no meritorious challenge to population equality.

Nor is there any basis to conclude that the final House map unnecessarily splits political subdivisions. As this Court recognized in *Holt II*, "even in pursuit of protecting the integrity of political subdivisions, the question is not one of mere mathematics or computer schematics: multiple constitutional and practical (geography, demographic distribution) values must be balanced in this exercise in line-drawing." *Holt II*, 67 A.3d at 1238. Although not obligated to justify divisions, *id.* at 1239-40, Chairman Nordenberg carefully described various values and interests that the Commission balanced in determining whether it was necessary to split counties and municipalities. Chairman Report at 36, 45-51. As a result of these good faith efforts, the final House map splits only 45 out of 67 counties and 54 out of 2560 municipalities. *Id.* at 71. While there are no "immovable guideposts" or "firm parameters" on the Commission's exercise of discretion in devising a plan, *Holt I*, 38 A.3d at 736, 757, the splits in the final House plan represent a substantial reduction from the numbers characterized as

---

[5] Leader Benninghoff characterizes certain districts as "Democrat-leaning" and others as "Republican-leaning" but he does not explain the criteria used to distinguish between them. Nor does he offer any expert support for his sharp advocacy. He fails to substantiate his theory that districts were populated to disadvantage his political party. *See infra* pp. 34-35.

"remarkably small" by this Court in *Holt II* where the final House map split 50

counties and 68 municipalities. *Holt II*, 67 A.3d at 1240. Even Leader

Benninghoff's proffered expert, Dr. Michael Barber, agrees that the final plan

"appears to perform well at having few municipal splits."[6]

Leader Benninghoff and the appellants who adopted his arguments do not

challenge the House plan based on the number of splits, but rather they challenge

particular splits in the plan. Benninghoff Br. at 42-47. This is not a basis to

invalidate the plan. *Holt I*, 67 A.3d at 1240 ("our focus necessarily must be on the

plan as a whole rather than on individual splits and districts"); *In re 1981*

Reapportionment Plan, 442 A.2d at 667 ("Mere dissatisfaction with the fact that

certain political subdivisions have been divided . . . is not sufficient to invalidate

---

[6] Leaving aside the flaws in his methodology and his lack of experience which
are addressed below, *see infra* pp. 23-34, Dr. Barber agrees that the final plan
compares favorably to his 50,000 computer-simulated plans with respect to district
population deviations, boundary splits and compactness. He wrote:

> The Commission proposal and the simulations are within
> the same range of district population deviations from the
> target district size. The proposal splits 45 counties 186
> times. This is in line with the simulations in terms of the
> number of counties split. The proposal divides 56
> municipalities 92 times. This is lower than the range
> produced by the simulations. On the whole, the proposal
> appears to perform well at having few municipal splits.

See Suppl. Barber Report at 7 (attached to Leader Benninghoff Petition for Review
as Appendix A).

the Final Reapportionment Plan as unconstitutional."). Given the discretion

afforded to the Commission to balance competing interests and this Court's

holding in *Holt II* that a larger number of splits is not constitutionally

disqualifying, it must be concluded that the final plan is not contrary to law with

regard to subdivision splits.

Finally, the final House plan also satisfies the constitutional directive that

"all voters have an equal opportunity to translate their votes into representation."

LOWV, 178 A.3d at 804. As this Court acknowledged just this week, "[p]artisan

fairness metrics provide tools for objective evaluation of proposed . . . redistricting

plans to determine their political fairness and avoid vote dilution based on political

affiliation." *Carter v. Chapman*, 2022 WL 702895 at *11. Using these very same

metrics, Christopher Warshaw, Ph.D., a professor of political science at George

Washington University and a recognized expert in the field of American politics,

political representation and elections, confirmed that the final plan satisfies the

threshold principle that "the party that wins a significant majority of the statewide

vote should also win a majority of the seats." Warshaw Suppl. Report (attached as

Exhibit "B") at 16. Using standard measures of partisan fairness, including

symmetry bias, mean-median difference, efficiency gap and declination, Dr.

Warshaw concluded that the final House map is relatively neutral, with a slight

pro-Republican bias. *Id.* at 16-17. The predictive model developed by the non-

partisan group PlanScore yielded similar results. *Id.* at 10-11. Dr. Warshaw
further concluded that the final House plan "has very similar partisan bias metrics
as the congressional plan" recently approved by this Court. *Id.* at 14. Leader
Benninghoff's own expert, Dr. Barber, agrees that the final House plan has a slight
Republican bias, which he calculated as a 1.5% mean-median difference and an
efficiency gap of 2.7%. *Id.* at 16; *see also* Suppl. Barber Report at 0056a, 0059a).
There is thus no basis to conclude that the final House plan is biased against
Republicans or dilutes Republican votes.

The final House map meets all constitutional requirements and therefore
must be recognized as having "the force of law" in accordance with Article II,
Section 17(e).

C.   All Appeals Challenging Local Decisions Are Properly Denied.

The appeals filed by the Covert Appellants, Mr. Koger, Mr. Roe, Ms. Hutz,
the Ingram Appellants, Mr. Kress and, to a large extent, Leader Benninghoff all
challenge local decisions. The Covert Appellants and Ms. Hutz claim that the final
plan fails to respect school districts and county and municipal boundaries in and
around their homes in Butler County. Mr. Koger claims that House District 24 was
drawn to carve out his residence in Wilkinsburg and eliminate his candidacy for
representative of the district. Mr. Kress similarly challenges the decision to move
Wilkinsburg to District 24. The Ingram Appellants challenge the decision to split

Middletown Township and nearby school districts.[7] Leader Benninghoff and Mr. Roe challenge specific municipal splits and population deviations among certain counties. These challenges focus on the impact of the plan on particular political subdivisions rather than the plan as a whole and therefore necessarily fail on their face.

It is well settled that "a successful challenge must encompass the Final plan as a whole." *Holt I*, 38 A.3d at 733. This Court has repeatedly made clear that "localized challenges simply cannot succeed." *Holt I*, 38 A.3d at 736 n.24; *Albert*, 790 A.2d at 995 ("proper constitutional analysis" requires examination of "the plan as a whole"); *In re 1981 Reapportionment Plan*, 442 A.2d at 668 ("Mere dissatisfaction with the fact that certain political subdivisions have been divided or have been included within particular legislative districts is not sufficient to invalidate the Final Reapportionment Plan as unconstitutional.").

Because the Covert Appellants, Mr. Koger, Mr. Roe, Ms. Hutz, the Ingram Appellants, Mr. Kress and, to a large extent, Leader Benninghoff take issue with

---

[7] School districts are not referenced in Article II, Section 16 and therefore division of any school district is not grounds for invalidating the final plan. This provides additional grounds for denying the Ingram Appellants appeal.

discrete parts of the final plan rather than the final plan as a whole, their appeals

cannot succeed and must be denied for this reason alone.[8]

D. All Appeals Raising New Arguments Not Presented Below Must Be Denied.

The Covert Appellants, Ms. Hutz, the Ingram Appellants, Mr. Koger, Mr.

Kress and Mr. Roe first asserted their challenges in appeals to this Court. Two of

the Ingram Appellants filed exceptions challenging district lines as they relate to

Middletown Township, but they seek to appeal additional issues. Similarly, Mr.

Kress filed an exception challenging decisions relating to Shaler Township, but

seeks to raise additional arguments in his appeal. Mr. Roe also seeks to raise new

issues. Having failed to first present these arguments to the Commission,

appellants cannot raise them in their appeals in this Court. *Holt I*, 38 A.3d at 733;

In re 1981 Reapportionment Plan, 442 A.3d at 666 n.7. New issues may not

properly be considered by this Court.[9]

---

[8]   Mr. Koger's appeal suffers from an additional fatal flaw. His essential
complaint is that he will not be able to run in a district with boundaries of his
choice, but this is not a valid basis to disqualify the final plan. *See In re 1991 Pa.
Legis. Reapportionment Comm'n*, 609 A.2d 132, 142 (Pa. 1992) (candidate's "right
to run for office does not rise to a constitutionally protected level requiring the
Legislative Reapportionment Commission to tailor its plan around the residences
of political aspirants who seek to challenge a specific incumbent").

[9]   The Covert Appellants also included a new claim for reimbursement of their
counsel fees under 42 Pa. C.S.A. § 2503 as a result of the delay in approving the
final plan. That section, however, does not apply to pre-litigation conduct. *Bucks*

E.   The Final Plan Is Not a Political Gerrymander.

Unable to allege that the final plan violates the redistricting requirements in

Article I, Section 16, Leader Benninghoff offers an indiscriminate collection of

arguments in support of his belief that the final plan is a political gerrymander

intended to benefit Democrats. He claims that the final plan splits certain

municipalities in ways that he believes favor Democrats, that more Republican

incumbents than Democrat incumbents were paired to run against each other and

that some Republican-leaning districts are overpopulated to the disadvantage of

Republicans. Benninghoff Br. at 38-62. Each of these arguments fails. Even if

such localized challenges were appropriate—and they are not—none of Leader

Benninghoff's arguments suggest that the final plan as a whole subordinates

traditional redistricting criteria to partisan gain and he offers no proof that the final

plan is biased in favor of Democrats. Further, Leader Benninghoff wholly fails to

establish the necessary elements for a claim of political gerrymandering.

As this Court made clear following the reapportionment three decades ago,

to make out a claim of political gerrymandering, a party must show: (1) intentional

discrimination against an identifiable political group; (2) an actual discriminating

effect on that group; and (3) a history of disproportionate results appearing in

---

Cnty Servs., Inc. v. Philadelphia Parking Auth., 71 A.3d 379, 393 (Pa. Commw.
2013). There is no basis for any award of fees relating to the Commission process.

conjunction with strong indicia of lack of political power and the denial of fair

representation. *Albert*, 790 A.2d at 998 n.10 (*citing In re 1991 Pa. Legis.

Reapportionment Comm'n*, 609 A.2d at 142). Leader Benninghoff does not cite

the relevant standard in his brief and falls far short of satisfying it.

Leader Benninghof points to no evidence of intentional discrimination

against Republicans or a discriminating effect on Republicans. Rather, as

exclusive support for his argument, Leader Benninghoff relies on a novel theory

proposed by Michael Barber, Ph.D., an associate professor of political science at

Brigham Young University. Dr. Barber opined that Republicans enjoy a political

advantage in Pennsylvania by virtue of where Republican voters tend to reside, that

it is not possible in Pennsylvania to reduce pro-Republican bias without violating

traditional redistricting principles, and that the final plan is "a partisan outlier"

when compared to computer-simulated plans that he generated using only

traditional redistricting criteria. Benninghoff Br. at 42-43, 46, 48.

Dr. Barber purports to ground his theory of political geography exclusively

on the writings of Dr. Jonathan A. Rodden, a professor of political science at

Stanford University and a well-respected expert in redistricting. Dr. Barber quotes

extensively from Dr. Rodden's work in the opinion which was submitted to this

Court. For example, on page 17 of his report, Dr. Barber quotes Dr. Rodden's

book "*Why Cities Lose: The Deep Roots of the Urban-Rural Political Divide*" as

follows:

> Democrats would need a redistricting process that
> intentionally carved up large cities like pizza slices or
> spokes of a wheel, so as to combine some very
> Democratic urban neighborhoods with some Republican
> exurbs in an effort to spread Democrats more efficiently
> across districts.

Suppl. Barber Report at 17. This, however, is not what Dr. Rodden said. The

complete quote from Dr. Rodden's book makes clear that "the details," such as

location and scale matter:

> The details of political geography are crucial. In a
> context like western Pennsylvania at the scale of
> congressional districts, where Democrats are highly
> concentrated in a big city, to achieve a seat share that is
> anywhere near its vote share, the Democrats would need
> a redistricting process that intentionally carved up large
> cities like pizza slices or spokes of a wheel, so as to
> combine some very Democratic urban neighborhoods
> with some Republican exurbs in an effort to spread
> Democrats more efficiently across districts.

Why Cities Lose, at 155. Dr. Barber also omitted what Dr. Rodden said in the very

next paragraph, which is that partisan manipulation is not necessary to draw fair

districts throughout Pennsylvania:

> [T]here are also settings like eastern Pennsylvania at the
> scale of congressional districts, where the size and
> distribution of Democratic cities is such that a
> nonpartisan redistricting process would serve them (the
> Democrats) reasonably well. Without partisan
> manipulation, Democratic suburbs and cities in eastern

24

> Pennsylvania would string together to form Democratic
> districts. In that setting, the only way to produce
> substantial Republican advantage is through artful
> gerrymandering.

Id. at 156. Importantly, as Dr. Rodden reaffirms in his written report prepared for this case, nowhere in his book does he claim that it is universally impossible, or even difficult, to draw fair redistricting plans that respect traditional district boundaries. Rodden Report (attached as Exhibit "C") at 9. Dr. Barber flagrantly misquoted the authoritative work on which he principally based his opinions. That itself is a red flag.

Dr. Rodden made clear in his report that it is *not* necessary to "amble around the state" and "pinwheel" and "pie-up" municipalities to secure a Democratic majority as Dr. Barber claims. Rodden Report at 9. To the contrary, as Dr. Rodden detailed in his report, "Dr. Barber's evidence points very strongly in the opposite direction":

> [A]ll of Dr. Barber's evidence points very strongly in the
> opposite direction. Dr. Barber explained that he used an
> algorithm that attempted to generate plans that were as
> compact as possible while also minimizing splits of
> counties and municipalities. Dr. Barber's algorithm,
> however, failed to reduce the number of county and
> municipal splits to match the Final House Plan. In Table
> 1 of his report, Dr. Barber reveals that the median
> simulation split 46 counties, but the Final House Plan
> actually performed *better,* splitting 45 counties.
> Moreover, Table 1 reveals that the number of
> municipalities split, as well as the total number of

municipal splits, was substantially lower than the entire range of his simulations. That is to say, the Final House Plan split fewer municipalities than even the very best of his 50,000 simulations, leading Dr. Barber to comment that "the proposal appears to perform well at having few municipal splits." Indeed, the Final House Plan is also more compact than all of Dr. Barber's 500,000 plans.

The central claim of Dr. Barber's report is that in order to produce more Democratic seats than the modal computer-generated plan, relative to the "unbiased" simulations, the Commission sacrificed compactness and the unity of municipalities. Yet this simply cannot be, since the Final House Plan is more compact, and splits fewer municipalities, than *any* of the simulated plans.

Id. at 9. The central premise of Dr. Barber's thesis is a fiction.

Even to the naked eye, it is apparent that the cities that Dr. Barber singled out—Allentown, Lancaster, Reading, Harrisburg, State College and Scranton—are not carved up like "pizza slices" or "spokes of a wheel" in the final plan as he claims. The map itself refutes Dr. Barber's theory of political geography. Further, and most importantly, as Dr. Rodden details in his report, there is no evidence that the Commission's map departs from traditional redistricting principles in any of these areas. *Id.* at 21. Indeed, the final plan "outperformed the entire ensemble of simulations on measures of county splits, municipal splits, and compactness." *Id.* What really distinguishes Dr. Barber's political geography theory is that no experts share his opinion and that Dr. Barber had to distort Dr. Rodden's work

to create a false foundational predicate for his conclusions.[10]

Dr. Barber's efforts to suggest partisan bias from computer simulations are equally unpersuasive. Importantly, Dr. Barber's academic work did not focus on redistricting. He is not an expert in computational social science, computer science or statistical methods. He never published on any of these topics, his academic work did not focus on redistricting and he was not involved in developing the algorithm that he used for his simulations. The algorithm that Dr. Barber claims to have used was developed by Kosuke Imai, Ph.D., who was offered as an expert by Leader McClinton. Dr. Imai has been unable to replicate Dr. Barber's work or methodology. Other experts have also been unable to repeat his work.[11] Perhaps

---

[10] Leader Benninghoff refers to Dr. Barber's conclusions based on his simulations as "statistically significant," Pet. For Review ¶ 3, but Dr. Barber admitted under cross-examination in the congressional map litigation that his use of the word "outlier" in his analysis is "subjective" and is not intended to convey statistically significant conclusions. Jan. 27, 2022 Tr. in *Carter v. Chapman* (7 MM 2022) at 574:15-575:1 (attached as Exhibit "F").

[11] As Chairman Nordenberg noted in his Report at page 58, Dr. Imai is not the only expert who has been unable to repeat Dr. Barber's work. Dr. Moon Duchin, a professor of mathematics at Tufts University and an expert whose testimony was presented to this Court in the congressional map litigation, described her efforts to replicate Dr. Barber's methodology as follows: "I have made a very serious attempt at replication . . . and have not been able to figure out how Dr. Barber arrives at his numbers, exactly. . . [E]ither the discrepancy owes to the problematic way he blends elections together . . . or he is actually using a different method from the one he describes in his report." *See* 2d Aff. of Dr. Moon Duchin on Remedies, *North Carolina League of Conservation Voters v. Hall*, Nos. 21 CV 015426, 21 CVS 500085 (N.C. Super.) at 13.

most damning, the simulations that Dr. Barber prepared for Leader Benninghoff represent only the second time that he ever professionally used an algorithm to generate simulated district maps—the first time was in January 2022. Jan. 27, 2022 Tr. in *Carter v. Chapman* (7 MM 2022) at 561:4-12 (attached as Exhibit "F"). He cannot credibly claim to have specialized expertise in simulating redistricting plans.

Dr. Barber is plainly not qualified to offer opinion testimony on partisan influence in the redistricting process or the use of algorithms to generate simulated maps. His lack of relevant training and expertise and his inexperience prompted Chairman Nordenberg to discount his conclusions.[12] Likewise, his opinions are not entitled to any weight in these appeals. *See, e.g., Grady v. Frito-Lay, Inc.*, 839 A.2d 1038, 1047 (Pa. 2003) (expert testimony inadmissible where proponent fails to establish that expert's methodology was generally accepted); *Commonwealth v. Crawford*, 364 A.2d 660, 664 (Pa. 1976) ("An expert may express his opinion only on matters which are within his or her scientific training and experience.") (citation omitted); *Commonwealth v. Bruno*, 188 A. 327, 328 (Pa. 1936) ("In the absence of

---

[12] At the public hearing on February 4, 2022, Chairman Nordenberg observed: "When I reviewed the resume of the young faculty member called as an expert by the House republican Caucus, . . . what really caught my attention is that this academic expert has not published a single academic article in the areas for which his expert testimony was being presented." LRC Tr. 1751.

indication that he was an expert in the particular field with which his examination dealt, he stood in exactly the same position as a layman, whose testimony on such a matter would obviously be inadmissible.").

Other courts have rejected Dr. Barber's opinions for similar reasons. Last month, the Ohio Supreme Court rejected Dr. Barber's analysis of political geography offered in support of the congressional district plan passed by the Ohio General Assembly. The Ohio Supreme Court explained that "the body of petitioners' various expert evidence significantly outweighs the evidence offered by [Dr. Barber and the other respondents' experts] as to both sufficiency and credibility . . . ." *Adams v. DeWine*, --- N.E.3d ---, 2022 WL 129092, at *11 (Oh. Jan. 14, 2022). In another case in which Dr. Barber offered opinions on political geography, the Superior Court of North Carolina identified a litany of "shortcomings in Dr. Barber's analysis" and, as a result, gave "little weight to his testimony." *Common Cause v. Lewis*, No. 18 CVS 014001, 2019 WL 4569584, at *94-95 (N.C. Super. Ct. Sept. 3, 2019).[13]

---

[13] Dr. Barber's opinions have also been rejected in cases not involving redistricting or political geography. For example, in *Jones v. DeSantis*, 462 F. Supp. 3d 1196 (N.D. Fla 2020), the district court stated with respect to Dr. Barber: "I do not credit the testimony. Indeed, one in search of a textbook dismantling of unfounded expert testimony would look long and hard to find a better example than the cross-examination of this expert." *Id.* at 1246-47.

The conclusions that Dr. Barber drew from his non-replicable computer simulations have also been thoroughly debunked by recognized experts in computer simulations and redistricting. Dr. Imai, regarded by many as the world's leading quantitative social scientist and the creator of the algorithm that was used by Dr. Barber, Chairman Report at 43, performed his own computer simulations and concluded that the final House map is well within the range of simulated plans that he generated. As the histograms below demonstrate, the number of likely Democratic districts under the final House plan (denoted by the red vertical line) falls squarely within the range of outcomes in 5,000 computer-simulated plans that Dr. Imai generated using only the race-blind criteria in Article II, Section 16:
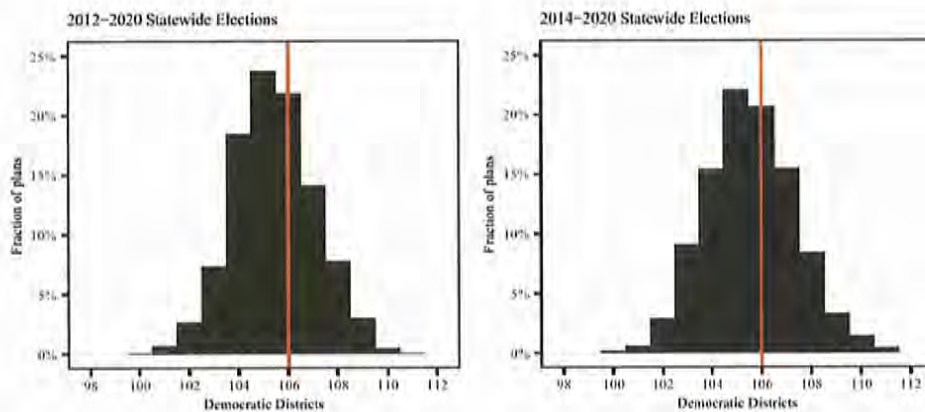
Figure 1: The likely number of Democratic districts across 5,000 *race-blind* simulated plans. Democratic districts are tallied based on an average of statewide elections for the 2012–2020 cycles (left) and the 2014–2020 cycles (right). The red vertical lines represent the results under the final House plan, which fall well within the simulation ranges.

Imai Suppl. Report at 9 (attached as Exhibit "D"). Based on the simulations and as detailed in his report, Dr. Imai conclusively ruled out that the final plan is *not* a

partisan gerrymander. In a powerful endorsement of the final House plan Dr. Imai concluded: "In sum, all of all of my simulation analyses, regardless of whether and how they consider race in addition to constitutional criteria, lead to the same conclusion that the final House plan is not a partisan gerrymander. This implies that he additional consideration of race in the final House plan does not favor any political party." *Id.* at 13.

Leader Benninghoff points to Dr. Imai's earlier analysis of the preliminary plan as ostensible support for the notion that the final plan is an outlier, Benninghoff Br. at 50, but Dr. Imai's analysis of the final plan reaches exactly the opposite conclusion. As Dr. Imai detailed in his supplemental report, after he improved his algorithm to match the number of municipal splits to the number in the final House plan, Suppl. Imai Report at 10, the simulated plans that he generated conclusively disproved the claim of partisan gerrymandering, *id.* at 6. He repeated his analysis three times: first, without any consideration of race; second, requiring creation of eight majority Black districts and four majority Hispanic districts to correspond with the final plan; and third, with a total of 25 majority-minority coalition districts to correspond with the final plan. *Id.* at 7-8. In each case, the expected number of districts under the final House plan *falls within the range of simulations.* According to Dr. Imai, "[t]he results imply that the final House plan is not a partisan gerrymander even without any consideration

of race, sharply contradicting the conclusion of Professor Barber's race-blind simulation analysis." *Id.* at 9.

In his analysis, Dr. Barber failed to utilize the number of municipality splits in the final plan. None of Dr. Barber's simulated plans had as few splits as the final plan. Dr. Imai further opines that Dr. Barber's "failure to minimize the number of municipality splits . . . likely contributed to his conclusion that is opposite of mine." *Id.* at 10. The significance, however, is clear and inarguable.

Dr. Imai highlights the material differences in the number of municipality splits in the starkly different simulations performed Drs. Imai and Barber:

SUPPLEMENTARY EXPERT REPORT

	Final House plan	My race-blind simulation median	range	Professor Barber's simulation median	range
Split municipalities	56	51	[39, 66]	82	[61, 105]
Municipality splits	92	100	[84, 116]	119	[98, 140]

Table 1: Number of Split Municipalities and Number of Municipality Splits under the Final House and Simulated Plans. My race-blind simulation splits a fewer number of municipalities and generates a fewer number of municipality splits than Professor Barber's race-blind simulation. The corresponding numbers under the final House plan are well within my simulation ranges. In contrast, none of Professor Barber's simulated plans has as few split municipalities and municipality splits as the final House plan.

Dispositively, Dr. Imai's simulations are consistent with the municipal splits in the final House plan; Dr. Barber did not generate any simulations with as few municipal splits at the final House plan.

When Dr. Imai improved the algorithm to match the number of municipal and county splits in the final plan, the final plan falls squarely within the range of computer-generated redistricting maps regardless of whether or not race is considered. None of the appellants offer any credible evidence for concluding otherwise.

As noted above, Dr. Warshaw separately measured the degree of partisan bias in the preliminary and final plans using four standard metrics: symmetry bias; mean-median; efficiency gap; and declination. Dr. Warshaw, whose testimony was referenced in *LOWV*, determined that the final plan is relatively fair according the same partisan fairness metrics referenced with approval in *LOWV* and more recently in *Carter*. Suppl. Warshaw Report at 16-17. Dr. Warshaw's metrics, their explanations and his findings are summarized below:

Metric	What It Measures	Value	How It Is Interpreted
Symmetry Bias	Whether a party that receives half the vote would win half the seats	2.7% R	When Democrats win 50% of the votes on the enacted House plan, they are likely to win 47.3% of the seats.
Mean-Median Difference	Difference between party's vote share in median district and average vote share	1.4% R	Democrats need to win a 1.4% higher statewide voteshare than Republicans do to win half of the seats.
Efficiency Gap	Gap in inefficient votes for each party: Votes cast in losing races or number of votes over 50% needed to win.	2.5% R	Votes for Republican candidates were inefficient at a rate 2.5% lower that votes for Democratic candidates.
Declination	Measures asymmetry in vote distribution among districts.	0.173 R	Indicates a symmetry in the distribution of votes across districts that slightly favors Republicans.

This chart confirms that by every objective measure the final House plan favors

Republicans.

The other circumstances that Leader Benninghoff points to as ostensible

support for his claim of partisan gerrymandering—population deviations between

districts and pairing Republican incumbents—are not indicative or even suggestive

of partisan bias. To the contrary, the record confirms that several of the districts in

Leader Benninghoff's self-selected list of purportedly "malapportioned districts"

were drawn by his own team (55, 57, 59 and 85).[14] Leader Benninghoff cannot

credibly accuse the Commission of malapportionment based on a cherry-picked

slice of districts that includes four overpopulated Republican-leaning districts

which were incorporated by the Commission exactly as he proposed them. Dr.

Warshaw explains in his supplemental report, the way redistricting experts

measure so-called "wasted" votes is by calculating the efficiency gap and, under

that metric, the final House plan has a pro-Republican bias despite minor

population deviations among districts. Warshaw Suppl. Report at 6, n.11, 8-9. It

---

[14] Chairman Nordenberg explained at the public hearing on January 6, 2022 that twenty counties in the Commission's preliminary map, including Cameron, Westmoreland and Union Counties, were identical to submissions made by House Republicans. LRC Tr. 1037-1038.

is just not enough for Leader Benninghoff to argue that population deviations among districts were motivated by partisanship.[15]

Nor is it reasonable to infer partisan bias from incumbent pairings. Rather, as Chairman Nordenberg explained, the party holding a substantial majority of the seats and most of the seats in the western part of the state which lost significant population since the last census would naturally be subject to more incumbent pairings. Chairman Report at 72-73. And three of the pairings involve incumbents, Reps. Snyder, Longietti and Sonney, who already announced plans to retire. *Id.* at 72-73. It strains credulity to refer to these districts as incumbent pairings. Again, no fair inference of partisan bias is warranted.

Put simply, Leader Benninghoff has utterly failed to demonstrate that the final plan—which was approved by the Senate Republican Leader — intentionally favors Democrats. The unrebutted evidence conclusively refutes his suggestion. Nor has Leader Benninghoff established the third element of a political gerrymandering claim: a history of lack of political power and denial of fair representation. To the contrary, under every relevant metric, the 2012 House plan

---

[15] This case is in no way analogous to *Larios v. Cox*, 300 F. Supp. 2d 1320, 1342-43 (N.D. Ga. 2004), where "the principal drafter" of the plan at issue admitted that she intentionally created districts with negative population deviations in rural south Georgia to retain legislative influence for rural legislators despite substantial losses of population growth and that "the vast majority" of districts in the state "fit the same pattern." *Larios* is plainly inapposite.

unreasonably favored Republicans despite a significant voter registration

advantage in favor of Democrats.[16]

Leader Benninghoff fails in every respect to make out even a *prima facie*

claim of political gerrymandering. His appeal is properly denied.

F. **Leader Benninghoff Has Failed To Establish That the Final Plan Was Based Predominantly on Race and Dilutes Minority Voting Power.**

Leader Benninghoff makes the inconsistent arguments that race was the

predominant factor motivating boundaries in the final plan in violation of the

Fourteenth and Fifteenth Amendments to the U.S. Constitution and that the plan

also dilutes minority voting power in violation of the Voting Rights Act ("VRA"),

52 U.S.C. § 10301, and Article I, Section 29 of the Pennsylvania Constitution. He

fails to make out a claim under either theory. To the contrary, the unrebutted

evidence presented to the Commission establishes that district lines fully comport

with the mandates of the VRA and do not transgress the Fourteenth or Fifteenth

Amendments.

1. **Districts were not drawn predominantly based on race.**

Racial gerrymandering claims proceed "district-by-district." *Alabama Legis.*

Black Caucus v. Alabama, 575 U.S. 254, 262 (2015) ("A racial gerrymandering

---

[16] *See Pennsylvania*, PlanScore, https://planscore.campaignlegal.org/pennsylvania/#!2014-plan-statehouse-eg (last visited March 11, 2022).

claim . . . applies to the boundaries of individual districts. . . . It does not apply to a State considered as an undifferentiated 'whole.'"). A plaintiff pursuing a racially gerrymandering claim must show that "race was the predominant factor motivating the legislature's decision to place a significant number of voters within or without a particular district." *Miller v. Johnson*, 515 U.S. 900, 916 (1995).

Although he references the district-by-district standard in his brief, Leader Benninghoff does not attack any particular district as the alleged product of racial gerrymandering and does not identify any traditional redistricting criteria that was allegedly subordinated in any district in the final plan. Rather, he argues that race must have predominated in the drawing of district boundaries because Leader McClinton's staff provided a chart that included blank boxes for the minority composition of districts in Bucks County, the Chairman observed that new majority-minority districts without an incumbent provide "special opportunities" for minority candidates and the Commission's mapping expert cautioned against diluting minority voting strength in Dauphin County. Pet. For Review ¶¶ 66-73. Even if Leader Benninghoff had standing to challenge any of these districts—and he does not—he fails to establish that the Commission "subordinated traditional race-neutral districting principles to racial considerations." *Alabama Legis. Black Caucus*, 575 U.S. at 272 (quoting *Miller*, 515 U.S. at 916) (internal punctuation marks and emphasis omitted). At best, the circumstances he references show that

the Commission was aware of and responsive to the impact of redistricting on minority groups—as it was required to be—not that race was the predominant reason for placing any particular voters in any particular district. Consciousness of race is simply not evidence of intentional discrimination. *See Miller*, 515 U.S. at 916 ("Redistricting legislatures will . . . almost always be aware of racial demographics; but it does not follow that race predominates in the redistricting process.").

The context here is critically important. Pennsylvania experienced significant growth in minority populations over the last decade. It was incumbent on the Commission to understand and account for this growth both to ensure that the final plan does not dilute voting opportunities for minority populations and to fulfill the guarantees of equality of representation in the Free and Equal Elections Clause. The Commission has considerable discretion to balance competing interests and its good faith must be presumed. As the Supreme Court explained: "The courts, in assessing the sufficiency of a challenge to a districting plan, must be sensitive to the complex interplay of forces that enter a . . . redistricting calculus. Redistricting legislatures will, for example, almost always be aware of racial demographics; but it does not follow that race predominates in the redistricting process." *Id.* at 915-16 (citation omitted). For this reason, the good faith of a redistricting body "must be presumed. *Id.* at 915 (citation omitted).

Here, Leader Benninghoff has not pointed to any evidence that suggests the Commissioners were not acting in good faith or that improper racial motivations prompted any particular district draw. His unbecoming stab at asserting a racial gerrymandering claim with baseless innuendo and irrelevancy necessarily fails.[17]

2. The final plan does not dilute minority voting strength.

Trying to have it both ways, Leader Benninghoff argues, on the one hand, that the Commission lacked a "strong basis in evidence" for creating majority-minority districts "anywhere in the Commonwealth" and, on the other hand, that the Commission violated the VRA by reducing minority voting strength in Allentown, Philadelphia, Lancaster and Reading. Pet. For Review ¶¶ 81-93. His arguments misapprehend applicable law and ignore the fulsome record developed before the Commission.

Leader Benninghoff fails to appreciate that states retain broad discretion in how they achieve the goals of the VRA. *League of United Latin Am. Citizens v. Perry*, 548 U.S. 399, 429 (2006) ("*LULAC*") (plurality opinion) (citation omitted). As a result, states are free to draw crossover districts—where a minority population makes up less than a majority but is large enough to elect candidates of its choice

---

[17] Leader Benninghoff's own expert, Dr. Barber, concluded that his 50,000 race-blind computer simulations generated a comparable number of majority-minority and minority opportunity districts as the final plan. Suppl. Barber Report at 8-9. Leader Benninghoff's own expert thus refutes his claim that the final plan was predominantly motivated by race.

with help from the majority—consistent with traditional proper reapportionment factors. *Bartlett v. Strickland*, 556 U.S. 1, 23-24 (2009) ("a legislative determination, based on proper factors, to create two crossover districts may observe to diminish the significance and influence of race by encouraging minority and majority voters to work together toward a common goal. The option to draw such districts gives legislatures a choice that can lead to less racial isolation, not more.") (plurality opinion). Indeed, the goals of the VRA are also equally served by creating minority influence districts—defined as districts in which minorities do not constitute a majority but are sufficiently numerous to have a significant impact at the ballot box most of the time. *See, e.g., Page v. Bartels*, 144 F. Supp. 2d 346, 365-66 (D.N.J. 2001) (three-judge court) (finding no violation of VRA where minority population in new district was reduced from 53% to 27% because minority voters retained reasonable opportunity to elect candidates of their choice). Majority-minority districts—where minorities make up more than 50%—are only required where the *Gingles* factors are met. *Bartlett*, 556 U.S. at 11.

The final plan is the product of appropriate review and analysis concerning the significant changes in minority populations since the last decennial census and the resulting implications for the VRA. Dr. Matt Barreto, Professor of Political Science and Chicana/o Studies at the University of California, Los Angeles and Faculty Director of the UCLA Voting Rights Project, analyzed Pennsylvania

voting patterns and concluded that the *Gingles* requirements are satisfied and, specifically, that white voters outside of Pittsburgh and Philadelphia demonstrate considerable block voting sufficient to usually defeat the minority's preferred candidate. Dr. Barreto's conclusions provide a strong basis to support the majority-minority districts in those areas of the final plan.

Leader Benninghoff misapprehends the analysis required by the VRA and the record developed in this case in arguing that any decrease in minority voting age population equates with a VRA violation. Contrary to Leader Benninghoff's insinuation, there is no magic formula or magic number for determining whether minority voting rights are diluted. Redistricting requires a careful balance to ensure that minority voters are not cracked among districts or packed into districts. The Supreme Court has recognized that "dilution of racial minority group voting strength may be caused either by the dispersal of blacks into districts in which they constitute an ineffective minority of voters or from the concentration of blacks into districts where they constitute an excessive majority." *Voinovich*, 507 U.S. at 153-54 (citation and internal quotation marks omitted). Numerical percentages are not controlling in this analysis, but rather "all significant circumstances" must be taken into account in assessing whether minority voters retain the ability to elect their preferred candidates in accordance with the VRA. *Alabama Legis. Black Caucus*, 575 U.S. at 276-77. The relevant question for purposes of the VRA is whether a

41

district will perform with respect to minority candidates of choice. *See, e.g.,*
Abbott v. Perez, 138 S. Ct. 2305, 2332-33 (2018).

Dr. Barreto carefully reviewed and analyzed the impact of district
boundaries in the final plan on minority populations and offered his unrebutted
expert opinion that the final plan does not dilute the voting strength of any
minority population. His conclusions are unequivocal: "the Final Plan fully
complies with the VRA and does not impair any minority group's ability to elect
representatives of their choice." Barreto Suppl. Report (attached Exhibit "E") at 6.
Leader Benninghoff offered no expert opinion that might arguably support his
insinuation that majority-minority districts were unnecessary or his argument that
minority voting strength was diluted. The factual record before the Commission
supports the opposite conclusion. Leader Benninghoff's conclusory claims of
minority vote dilution were expressly rejected by three elected Latino members of
the House. Tellingly, three minority members supported the Commission's
preliminary plan:

> In Allentown, where Latinos now make up more than
> 50% of the population, the LRC plan also increases
> minority opportunities. The map unpacks House District
> 22 to increase the Latino population in House District
> 134 to nearly 40%, resulting in two districts in which the
> Latino community should be able to elect their
> candidates of choice.
> . . .

> In closing, Latino representation is lacking in
> Pennsylvania, particularly when you consider the growth
> that has occurred across Pennsylvania over the last
> decade.

LRC.R.-Tab. 40 (6511-6512). Further, Representative Donna Bullock, who

Chair's the Pennsylvania Legislative Black Caucus, also rejected Leader

Benninghoff's claim of minority vote dilution. Representative Bullock expressed

the following to Chairman Nordenberg:

> I want to thank you, Chairman Nordenberg, for your
> tireless efforts in this redistricting cycle and for
> recognizing that the diversity of this Commonwealth is a
> strength. Your efforts have led to a plan that will
> uplift—rather that dilute—our voices.

LRC.R.-Tab. 40 (6515-6516).

Leader Benninghoff submitted a report from Jonathan N. Katz, Ph.D., a

Professor of Social Sciences and Statistics at the California Institute of

Technology, which criticized the use of ecological inference (EI) to measure

racially polarized voting, Pet. For Review at App. J, but those same criticisms were

soundly rejected in *Luna v. County of Kern*, 291 F. Supp. 3d 1088, 1124-25 (E.D.

Cal. 2018). The district court in *Luna* found that Dr. Katz's criticisms were

"undercut by his own work in previous cases, where he performed ER [ecological

regression] and EI [ecological inference] analyses. . ." and that "Defendants have

provided the court with no basis upon which to depart from those cases which have

relied upon ER and EI analyses. . . ." *Id.* at 1125.

Leader Benninghoff has not offered any reliable expert testimony that suggests that any particular majority-minority district in the final plan is not required or that any particular district boundary dilutes minority voting strength. Neither Dr. Katz nor Dr. Barber offered an opinion based on Pennsylvania election data that there is a lack of racially polarized voting or that minority voting strength in any particular district will likely render it non-performing for minority candidates of choice. After reviewing Leader Benninghoff's Petition for Review, Dr. Barreto concluded: "[t]here is no evidence of minority vote dilution even presented by Leader Benninghoff, he simply makes a claim with no social science data or analysis to support the claim." Barreto Suppl. Report at 2-3. Leader Benninghoff falls far short of establishing that the final plan violates the VRA. His appeal on this basis is properly denied.

G. It Was Well Within The Commission's Constitutional Authority To Reallocate Incarcerated Persons to Their Home Communities.

Leader Benninghoff argues that the Commission was not authorized to reallocate some incarcerated persons to their home communities for purposes of redistricting and offers his personal opinions as to why the Commission should have decided the other way. Benninghoff Br. at 79-85. He is wrong on the issue of authority. Counting incarcerated persons in the communities they call home was most certainly within the Commission's constitutional authority and also comports with Pennsylvania public policy as declared by the General Assembly.

That Leader Benninghoff continues to disagree is no basis to invalidate the final plan.

The Commission is constitutionally entrusted with authority to "reapportion[] the Commonwealth." Pa. Const. art. II, § 17(a).[18] The only limits on the Commission's authority are the specific redistricting criteria in Article II, Section 16. While that section directs that reapportionment shall occur after "the Federal decennial census," Pa. Const. art. II, § 17(b), nothing in Article II, Section II or elsewhere in the Constitution directs or requires that the Commission adopt or incorporate any particular U.S. Census Bureau rule or custom in apportioning Pennsylvania legislative districts. The broad grant of constitutional authority to the Commission to "reapportion the Commonwealth" thus necessarily includes the authority to decide who gets counted where. *See, e.g., PECO Energy Co. v. Pa. Public Utility Comm'n*, 791 A.2d 1155, 1159 (Pa. 2002) (commission vested with powers necessarily implied from enabling provision); *Commw., Dep't of Env'tal*

---

[18] Parenthetically, the Supreme Court has made clear that "the Equal Protection Clause does not require the States to use total population figures derived from the federal census as the standard by which substantial population equivalency is to be measured." *Burns v. Reynolds*, 384 U.S. 73, 91 (1966). Rather, the decision to include or exclude transients, temporary residents or persons denied the right to vote as a result of a criminal conviction "involves choices about the nature of representation" that do not implicate constitutional concerns unless the choice to include or exclude such groups "is one the Constitution forbids." *Id.* at 92.

Res. v. Butler Cnty. Mushroom Farm, 454 A.2d 1, 6 (Pa. 1982) ("power of

administrative agencies includes such powers as are implied necessarily").[19]

Leader Benninghoff argues the decision to reallocate incarcerated persons

should not have proceeded on "straight party-lines" and without a "full,

deliberative and public process," Benninghoff Br. at 80, but the vote was not on

party lines and there was a robust public process. As Chairman Nordenberg

detailed in his report, the issue was the subject of extensive citizen testimony and

submissions as well as expert testimony. Chairman Report at 16-17 & n.9; *id.* at

22-32. The Commission initially voted to approve the reallocation proposal at a

public meeting on August 24, 2021. The vote was 3-2, with Leader McClinton,

Senator Costa and the Chair voting in favor. It was not a "party line" vote. The

Commission also discussed the issue at the public meeting on September 21, 2022,

this time resolving to amend the prior resolution to require only that persons with

more than ten years left to serve on their sentences be considered as residents of

their pre-incarceration community for redistricting purposes. *Id.* at 25. The

---

[19] Leader Benninghoff cites no authority which suggests otherwise and there is no such authority. Instead, he relies exclusively on an excerpt from this Court's decision in *Washington v. Dep't of Pub. Welfare of Commonwealth*, 188 A.3d 1135, 1147 (Pa. 2018), which concerned constitutional restrictions on "the legislative process" in Article III of the Pennsylvania Constitution and, specifically, the requirement that bills be considered on three different days in each House. *Washington* has nothing to do with reapportionment and cannot be read as limiting the Commission's authority in reapportioning the Commonwealth.

amendment was approved by a 3-2 vote, with Leader Benninghoff, Senator Ward and the Chair voting in favor. Leader Benninghoff's suggestion that all incarcerated persons should have been treated the same rings particularly hollow given his vote in favor of the amendment that required reallocation of only those with more than ten years left to serve.

Leader Benninghoff claims that "nearly every state" that reallocated incarcerated persons did so by legislation, Benninghoff Br. at 80-81, but this is not accurate. In California, the legislature acknowledged the plenary authority of the commission in that it merely "request[ed]" that the commission deem prisoners residents of their last known addresses rather than the prison. Cal. Elec. Code § 21003(d). The Colorado Supreme Court made clear that "key tasks in the redistricting process" rest with the commission. *In re Interrogatories on Senate Bill 21-247 Submitted by Colorado General Assembly*, 488 P.3d 1008, 1020 (Colo. 2012). In Montana, the Redistricting and Apportionment Commission recently took steps to reallocate prisoners without any legislative direction. *See* Nov. 9, 2021 Commission Minutes available at https://leg.mt.gov/content/Districting/2020/Meetings/November-9-2021/DAC-minutes-Nov-9-2021 (last visited March 11, 2022). In any event, how other states elect to manage redistricting is of no moment in interpreting powers conferred on the Commission by the Pennsylvania Constitution.

Leader Benninghoff further argues that there was no good reason for reallocating incarcerated persons and not college students, Benninghoff Br. at 83, but Pennsylvania public policy and other legal contexts do just that. The General Assembly has declared that, for the purpose of registration and voting, "no individual who is confined in a penal institution shall be deemed a resident of the election district where the institution is located. The individual shall be deemed to reside where the individual was last registered before being confined in the penal institution . . . ." 25 Pa. C.S.A. § 1302(a)(3).[20] Allocating incarcerated individuals to their home districts gave effect to this clear expression of public policy. *See Wolf v. Scarnati*, 233 A.3d 679, 707 (Pa. 2020) ("setting public policy is properly done in the General Assembly"). Further, allocating incarcerated persons to their home districts comported with their treatment in other legal contexts. *See, e.g., Robinson v. Temple Univ. Health Servs.*, 506 F. App'x 112, 115 (3d Cir. 2012) (for purposes of diversity jurisdiction, "[t]he traditional view is that a prisoner remains a citizen of the state of which he was a citizen before his imprisonment") (citations omitted); *United States v. Stabler*, 169 F.2d 995, 998 (3d Cir. 1948) (in relation to naturalization proceedings, "[i]t is clear that one does not acquire a domicil while

---

[20] That section also provides more generally that, "'[f]or the purpose of registration and voting, no individual shall be deemed to have gained a residence by reason of presence or lost a residence by reason of absence in any of the following circumstances . . . [b]eing in an institution at public expense." 25 Pa. C.S.A. § 1302(a)(1).

imprisoned" because "with 'residence' as well as with 'domicil,' some picking out of a place to live in by an individual concerned is involved"); *In re EDP Med. Computer Sys., Inc.*, 178 B.R. 57, 62 (M.D. Pa. 1995) (for purposes of venue, corporate president's "residence and domicile" remained in New York "throughout the period of his incarceration" in Pennsylvania).

Leader Benninghoff makes much out of the fact that this is the first time that a commission adjusted census data for residences of incarcerated persons, Benninghoff Br. at 79, but the U.S. Census Bureau expressly acknowledges that states may properly count incarcerated persons at their homes.[21] The Bureau "recognizes that some states have decided, or may decide in the future, to 'move' their prisoner population back to the prisoners' pre-incarceration addresses for redistricting and other purposes" and, for this specific reason, "offers a product that states can request, in order to assist them in their goals of reallocating their own

---

[21]   The decennial census is intended to count the number of persons in a state, not to assign those persons among districts within a state. There is no federal or state statute that requires that prisoners, transients or temporary visitors be allocated to any particular place for purposes of the census. Instead, the Bureau develops residence criteria as a means of ensuring that persons are only counted once. Its concept of "usual residence" is admittedly not the same as voting residence or legal residence. *See* Final 2020 Census Residence Criteria and Residence Situations, 83 FR 5525-01, 2018 WL 742266 (Feb. 8, 2018). Further, the Bureau undertakes a review of its rules every decade to keep pace with societal change. *Id.* at 5526. Those rules can and do change over time. *See, e.g., Franklin v. Massachusetts*, 112 S. Ct. 2786 (1992) (noting that federal overseas personnel were allocated to family home in 1900 and beginning again with the 1970 census).

prisoner population counts." *See* Final 2020 Census Residence Criteria and

Residence Situations, 83 FR 5525-01, 2018 WL 742266 at *5528 (Feb. 8, 2018).[22]

The "standard Redistricting Data" supplied by the Bureau segregated data

concerning group quarters, including correctional facilities. *Id.* Contrary to

Leader Benninghoff's claim, the decision to reallocate prisoners did not "cause[]

significant unnecessary delays." Benninghoff Br. at 84. As detailed in the

Chairman's report, the reallocation added only nine days to the process and the

Commission more than made up any arguably lost time by approving a preliminary

plan in less than the allotted period (63 days out of the allotted 90 days). Chairman

Report at 16-17, 30-31.

There is no doubt that the Commission had the authority to correct the

unassailable distortional disparity in the census data affecting prisoners by

reallocating incarcerated persons to their home communities. The decision to

---

[22] Notably, in *Fletcher v. Lamone*, a three-judge court convened pursuant to 28 U.S.C. § 2284(a) rejected a constitutional challenge to Maryland's "No Representation Without Population Act" which "correct[s] census data for the distortional effects of the Census Bureau's practice of counting prison inmates as residents of their place of incarceration." 831 F. Supp. 2d 887, 890 (D. Md. 2011), *aff'd mem.*, 133 S. Ct. 29 (2012). The *Fletcher* Court explained that, with respect to prisoners, such adjustments are appropriate because "prisoners are counted [by the Census Bureau] where they are incarcerated for pragmatic and administrative reasons, not legal ones." *Id.* at 895.

reallocate provides no reason to invalidate the final plan.[23]

H.   The New Maps Must Be Used in the Primary.

Leader Benninghoff and several appellants have suggested that the Court

should require that the 2012 maps be used in the upcoming primary election. To

do so would violate Article II, Section 17(e). That section expressly states that,

"[w]hen the Supreme Court has finally decided an appeal . . . the reapportionment

plan shall have the force of law and the districts therein provided shall be used

thereafter in elections to the General Assembly until the next reapportionment . . .

." Pa. Const. art II, § 17(e). There is no discretion to use any other map. *See In re*

1991 Pa. Legis. Reapportionment, 609 A.2d at 139 (holding that Court lacks power

to declare plan effective after date of general election). Once the appeals are

denied, as Leader McClinton submits they should be, the final plan will have the

---

[23] A districting scheme that counted prisoners as residents of their place of incarceration was held to violate the Equal Protection Clause in *Calvin v. Jefferson Cnty. Bd. of Commr's*, 172 F. Supp. 3d 1292 (N.D. Fla. 2016). The *Calvin* Court explained that packing "a large number of nonvoters who also lack a meaningful representational nexus with that body" into a small subset of legislative districts "impermissibly dilutes the voting *and* representational strength of denizens in other districts and violates the Equal Protection Clause." *Id.* at 1315 (emphasis in original). "To treat the inmates the same as actual constituents makes no sense under any theory of one person, one vote, and indeed under any theory of representative democracy." *Id.* at 1326. So too here. Counting prisoners as residents of the districts in which they are incarcerated artificially inflates the voting power of electors in those districts and deflates the voting power of electors in other districts in violation of the Pennsylvania and U.S. Constitutions.

force of law and must be used in the upcoming primary and thereafter until the

next reapportionment.

I. CONCLUSION

Appellants bear a "heavy burden" in establishing that a final plan as a whole

is unlawful. *Holt I*, 38 A.3d at 718 (quoting *Albert*, 790 A.2d at 998). None of the

appellants have met their heavy burden. The appeals should be dismissed, and the

final plan confirmed for use until the next reapportionment as required by Article

II, Section 17(e).

Respectfully submitted:

/s/ Daniel T. Brier
Daniel T. Brier
Donna A. Walsh
Patrick J. Brier
Richard L. Armezzani

Myers, Brier & Kelly, LLP
425 Biden Street, Suite 200
Scranton, PA 18503

Reisinger Comber & Miller LLC
300 Koppers Building
436 Seventh Avenue
Pittsburgh, PA 15219

/s/ Michael A. Comber
Michael A. Comber

Date: March 11, 2022

CERTIFICATE OF COMPLIANCE

I certify that this filing complies with the provisions of the *Public Access Policy of the Unified Judicial System of Pennsylvania: Case Records of the Appellate and Trial Courts* that requires filing confidential information and documents differently than non-confidential information and documents.

/s/ Daniel T. Brier
Daniel T. Brier

Date: March 11, 2022

EXHIBIT A   Comparison Chart

EXHIBIT B   Supplemental Expert Report of Christopher Warshaw, Ph.D.

EXHIBIT C   Supplemental Expert Report of Jonathan A. Rodden, Ph.D.

EXHIBIT D   Supplemental Expert Report of Kosuke Imai, Ph.D.

EXHIBIT E   Supplemental Expert Report of Matthew Barreto, Ph.D.

EXHIBIT F   Excerpts from Carter Transcript

Exhibit A

HOUSE PLAN OBJECTIVE METRIC COMPARISON					
Redistricting Principle	Metric	Final LRC Plan	Preliminary LRC Plan	House Plan 2013-2021	Proposed Benninghoff Plan
Non-Contiguous Districts		7	9	10	8
Compactness	Polsby-Popper	0.35	0.35	0.28	0.36
	Reock	0.42	0.42	0.39	0.42
Respect for Political Subdivisions	Split Counties	45	45	50	46
	Number of County Splits	186	184	221	186
	Split Municipalities	54	61	68	41
	Number of Municipal Splits	92	102	124	76
Population Equality	Overall Deviation	8.65%	9.29%	7.88%	7.99%
	Average Deviation	2.07%	2.00%	1.98%	1.99%
Partisan Fairness	Plan Score Efficiency Gap	+2.3%R	+2.3%R	+6.9%R	+3.7%R
	Plan Score Declination	+0.14R	+0.14R	+0.44R	+0.22R
	Plan Score Partisan Bias	+2.3%R	+2.5%R	+7.5%R	+3.7%R
	Plan Score Mean-Median Difference	+1.1%R	+1.0%R	+6.2%R	+1.6%R

Exhibit B

An Evaluation of the Partisan Fairness of the Pennsylvania Legislative Reapportionment Commission's Enacted State House Districting Plan

Christopher Warshaw[*]

March 9, 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 from July 2016 - July 2017, and an Assistant Professor at MIT from July 2012 - July 2016.

I have been asked by counsel representing the House Democratic Caucus to analyze relevant data and provide my expert opinions to the Legislative Reapportionment Commission (LRC) about its enacted State House districting plan. This report updates the report I submitted to the LRC on January 7th about its preliminary plan in advance of my testimony on January 14th, 2022.

2   Qualifications and Publications

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 over 20 peer reviewed papers on these topics. Moreover, I have written multiple papers that focus on elections and two articles 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*, the *Annual Review of Political Science*, *Political Behavior*, *Legislative Studies Quarterly*, *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:

- GIS Files with the 2014-2020 Pennsylvania State House plan and the enacted 2022-30 plan): I obtained both plans from the Legislative Reapportionment Commission's website.

- Precinct-level data on recent statewide Pennsylvania elections: I use precinct-level data on Pennsylvania'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] I obtained precinct-level data on elections from 2012-14 from the MGGG Redistricting Lab.[2] Finally, I obtained data on state legislative election results from the House Democratic Caucus since they were not available from public sources.

- 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 enacted 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 seven redistricting-related cases:

---

1. See https://dataverse.harvard.edu/dataverse/electionscience.
2. See https://github.com/mggg-states/PA-shapefiles.

- Between 2017 and 2019, I provided reports for *League of Women Voters of Pennsylvania v. Commonwealth of Pennsylvania*, No. 159 MM 2017, *League of Women Voters of Michigan* v. *Johnson*, 17-14148 (E.D. Mich), and *APRI et al.* v. *Smith et al.*, No. 18-cv-357 (S.D. Ohio). My testimony was found to be credible in each of these cases and was extensively cited by the judges in their decisions. In the Pennsylvania Supreme Court's seminal decision that struck down its gerrymandered U.S. House plan, my testimony and analysis was extensively cited by Justice Todd's majority opinion.

- In the current redistricting cycle, I have provided reports in *League of Women Voters* v. *Ohio Redistricting Commission*, No. 2021-1193, *League of Women Voters vs. Kent County Apportionment Commission*, *League of Women Voters of Ohio* v. *Ohio Redistricting Commission*, No. 2021-1449, and *League of Women Voters of Michigan* vs *Michigan Independent Citizens Redistricting Commission*.

In addition, I have provided expert testimony and reports in several cases related to the U.S. Census: *State of New York et al.* v. *United States Department of Commerce*, 18-cv-2921 (S.D.N.Y.), *New York* v. *Trump*; *Common Cause* v. *Trump*, 20-cv-2023 (D.D.C.), and *La Union Del Pueblo Entero (LUPE)* v. *Trump*, 19-2710 (D. Md.).

The opinions in this report are my own, and do not represent the views of George Washington University.

3 Summary

As the Pennsylvania Supreme Court wrote in *League of Women Voters of Pennsylvania v. Commonwealth of Pennsylvania*, No. 159 MM 2017, "for our form of government to operate as intended, each and every [] voter must have the same free and equal opportunity to select his or her representatives" (p. 118). Indeed, 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 elections and political outcomes than others (Caughey, Tausanovitch, and Warshaw 2017).

I use three complementary methodologies to project future election results in order to evaluate the partisan fairness of Pennsylvania's enacted House plan. First, I use a composite of previous statewide election results between 2014-2020 to analyze the enacted

House plan.[3] Second, I analyze the results of the 2020 State House election on the enacted House plan. Third, I complement this approach using the open source PlanScore.org website, which is a project of the Campaign Legal Center.[4] PlanScore uses a statistical model to estimate district-level vote shares for a new map based on the relationship between presidential election results and legislative results between 2014-2020.[5] Based on these three approaches, I characterize the bias in Pennsylvania's plans based on a large set of established metrics of partisan fairness and place the bias in Pennsylvania's plans into historical perspective.[6] I also analyze whether the enacted House plan is responsive to shifts in voters' preferences.

All of these analyses indicate that the enacted House plan is fair with just a small pro-Republican bias. Indeed, one important feature of the enacted House plan is that it enables the party that wins the majority of the votes to nearly always win the majority of the seats. In the actual 2020 State House election, Republicans received 50.5% of the two-party vote and Republicans would win 50.7% of the seats in the enacted House plan.[7] In the 2020 presidential election, Democrat Joe Biden received about 50.6% of the two-party vote and he would have won 103 out of the 203 (50.7%) of the State House districts.[8] Based on the statewide elections in Pennsylvania between 2014-2020, the Democrats' statewide two-party vote share averaged about 54% of the vote and they would win nearly exactly the same proportion of the seats on the enacted House plan (54.5%).[9] Historically, there is a winner's bonus where the party that wins 54% of the votes typically receives about 58% of the seats. So recent statewide elections indicate a modest pro-Republican bias in the enacted House plan using a wide variety of Political Science metrics for partisan fairness.

I also reach the conclusion that the enacted House plan is relatively neutral, with a small pro-Republican bias, using the predictive model on the PlanScore website. PlanScore projects that Republicans would get about 50.3% of the statewide vote, but Republicans are expected to win 53% of the seats in Pennsylvania's enacted House plan (and

---

3. These include the following elections: 2016 Presidential, 2020 Presidential, 2014 Governor, 2018 Governor, 2016 Attorney General, 2020 Attorney General, 2016 Senate, 2018 Senate, 2016 Treasurer, 2020 Treasurer, 2016 Auditor, and 2020 Auditor election.

4. I am on the social science advisory board of Plan Score, but do not have any role in PlanScore's evaluation of individual maps.

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

6. These metrics are described in depth on pp. 5-16 of my January 7th report on the LRC's preliminary state house plan.

7. I impute uncontested State House elections using the presidential election results.

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

9. I weight the composite scores to give each election cycle equal weight in the index. The seat-level projections are based on the 12 statewide elections where I have precinct-level data. If instead I simply average across contests, Democrats win 52% of the votes and 52% of the seats on the enacted House plan.

Democrats would win 47% of the seats).[10] Across 1000 simulations, PlanScore indicates that the enacted House plan favors Republican candidates in 95% of scenarios. Based on generally accepted Political Science metrics for partisan fairness, PlanScore indicates that Pennsylvania's enacted House plan is relatively fair with a modest pro-Republican bias.

In addition, the partisan fairness metrics for the LRC's enacted House plan compare very favorably to the congressional plan recently approved by the Pennsylvania Supreme Court.

4   Background on Partisan Fairness

This section provides background about how social scientists conceptualize partisan fairness in a districting plan. Partisan advantage in a districting plan may arise either intentionally, due to a deliberate effort to benefit the line-drawing party and handicap the opposing party via gerrymandering (Kang 2017; Levitt 2017), or unintentionally as a result of factors such as political geography, candidate appeal, and electoral swings (Chen and Rodden 2013; Goedert 2014; Seabrook 2017). Whether districting bias is purposeful or accidental, it means that one party's voters are more "cracked" and "packed" than the other side's supporters. In cracked districts, voters' preferred candidates lose by relatively narrow margins; in packed districts, their candidates of choice win by enormous margins (Stephanopoulos and McGhee 2015). Thanks to disproportionate cracking and packing, the disfavored party is less able than the favored party to convert its statewide support among voters into legislative representation. This gives the favored party the ability to shift policies in its direction (Caughey, Tausanovitch, and Warshaw 2017) and build a durable advantage in downstream elections (Stephanopoulos and Warshaw 2020). It can even lead to undemocratic outcomes where the advantaged party wins the majority of the seats and controls the government while only winning a minority of the votes.

There are a number of approaches that have been proposed to measure partisan advantage in a districting plan. These approaches focus on asymmetries in the efficiency of the vote–seat relationships of the two parties. In recent years, at least 10 different approaches have been proposed (Gelman and King 1994; McGhee 2017; Katz, King, and Rosenblatt 2020). These metrics all stem from the fundamental idea that neither political party should have an unfair advantage in the translation of votes to seats that enables it to lock-in political power. While no measure is perfect, much of the recent literature has focused on a handful of related approaches that I described in my January 7th report

---

10. This is a probabilistic estimate based on 1000 simulations of possible elections using a model of the elections between 2014-2020.

(partisan symmetry, mean-median difference, the efficiency gap, and the declination).[11] All of these metrics are oriented in my report such that positive values favor Democrats and negative values favor Republicans. A score of zero on each metric indicates that neither party has an advantage in the translation of votes to seats. Thus, scores close to zero indicate that a plan is fair. I utilize these approaches to quantify the partisan fairness of the Commission's enacted House plan.

In his expert report that was submitted as an addendum to Leader Benninghofff's complaint, Professor Barber disputes this generally established conception of partisan fairness. He argues that "we do not know if [a redistricting plan] is biased until we compare it to a set of maps that we know were drawn using unbiased inputs" through simulations (54). This is not accurate. I do not know of any peer-reviewed study that has argued simulations should be used as the primary tool to evaluate the fairness or legality of a plan that does not otherwise provide either party an advantage according to generally accepted partisan bias metrics. Notably, Professor Barber's report does not provide any academic citations for his assertion that simulations should be the sole benchmark of bias in a districting plan. In fact, Katz, King, and Rosenblatt (2020, 176) argues that "purely relative measures" from simulations have "little value" for this purpose.[12] According to another recent paper, they are instead best used to "offer a sense of what might have been drawn absent the intent of the redistricting authority" (McGhee 2020, 176).[13] Katz, King, and Rosenblatt (2020, 176) argue they can "convey what is possible, such as plans with de minimis levels of partisan bias while also meeting other criteria."

---

11. These metrics are described in depth in my January 7, 2022 report on the LRC's preliminary House plan. 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:

$$EG = S_D^{margin} - 2 * V_D^{margin} \tag{1}$$

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). This turnout-adjusted version of the efficiency gap takes into account differences in population across districts, and penalizes the party whose districts are under-populated (see pp. 10-11 of my January 7th report). I use the declination formula discussed in Warrington (2018, 42).

12. To illustrate this point, they ask: "Is a plan fair if it is at the 50th percentile of possible plans but, when the parties split the vote equally, [one party] receives 85% of the seats?"

13. In court cases, this simulation approach has been used to evaluate whether an unfair plan (based on the metrics I described above) stems from a state's political geography or the intent of mapmakers to favor one political party.

5 Partisan Fairness of Pennsylvania's enacted State House Map

In this section, I will provide a detailed evaluation of the partisan fairness of Pennsylvania's enacted House plan (see Figure 1 for a map of the enacted House plan). In order to evaluate the enacted House plan, we need to predict future election results on this map. Unfortunately, there is no way to know, with certainty, the results of future elections. Thus, I use three complementary methodologies to predict future State House elections in Pennsylvania and generate the various metrics I discussed earlier.

Figure 1: Map of Enacted State House Districts from PlanScore.org

5.1 Composite of previous statewide elections

First, I use a composite of previous statewide election results between 2014-2020 re-aggregated to the enacted House plan.[14] For each year, I estimate each party's vote share, seat share, and the average of the partisan bias metrics across races. I then average

---

14. These include the following elections: 2016 Presidential, 2020 Presidential, 2014 Governor, 2018 Governor, 2016 Attorney General, 2020 Attorney General, 2016 Senate, 2018 Senate, 2016 Treasurer, 2020 Treasurer, 2016 Auditor, and 2020 Auditor election.

them together to produce a composite result. This approach implicitly assumes that future voting patterns will look like the average of these recent statewide elections.

| Metric | Value | 2014-2020 Composite | |
		> Biased than this % Elections	> Pro-Rep. than this % Elections
2014-2020 Plan			
Symmetry Bias	-7.7%	77%	85%
Mean-Median	-3.8%	70%	81%
Efficiency Gap	-5.8%	60%	83%
Declination	-.348	66%	82%
Average		68%	83%
Preliminary Plan			
Symmetry Bias	-2.5%	29%	61%
Mean-Median	-1.4%	31%	63%
Efficiency Gap	-2.6%	27%	69%
Declination	-.175	38%	65%
Average		31%	65%
Enacted Plan			
Symmetry Bias	-2.7%	31%	62%
Mean-Median	-1.4%	31%	63%
Efficiency Gap	-2.5%	26%	68%
Declination	-.173	38%	65%
Average		31%	65%

Table 1: Composite bias metrics for enacted House plan based on statewide elections

When I average across these statewide elections from 2014-2020, Democrats win 54% of the votes and 54.5% of the seats on the enacted House plan.[15] Thus, the plan satisfies the principle that the party that wins a significant majority of the statewide vote should also win a majority of the seats. However, Democrats did unusually well in these recent statewide elections. In state legislative elections, the two parties typically get closer to 50% of the statewide vote. Thus, another important benchmark is to examine what happens if each party evenly splits the votes. Basic fairness suggests that when the two parties split the votes they should also split the seats. But the composite election index indicates that when Democrats win 50% of the votes on the enacted House plan, they are likely to only win 47.3% of the seats. This leads to a pro-Republican bias on the symmetry metric of 2.7%.

The enacted House plan also has a small pro-Republican bias on the other metrics I evaluate (see bottom panel of Table 1). For instance, Republicans do about 1.4% better in the median district than in the mean district and Republicans have a 2.5% advantage

---

15. I weight the composite scores to give each election cycle equal weight in the index. The seat-level projections are based on the 12 statewide elections where I have precinct-level data.

in the Efficiency Gap.[16] Overall, the enacted House plan has a larger pro-Republican bias in the translation of votes to seats than 65% of previous plans over the past 50 years.

5.2   2020 State House election results

Next, I use the 2020 precinct-level State House results on both the 2014-20 map and re-aggregated to the enacted House plan to estimate the various metrics. This approach implicitly assumes that future elections will look like the 2020 election.[17] These endogenous election are likely to be an excellent predictor of future voting patterns in State House elections. But it is important to keep in mind that they could be affected by the individual candidates in each race as well as a host of other factors that wouldn't look exactly the same in future elections.

Metric	Value	More Biased than this % Historical Elections	More Pro-Republican than this % Historical Elections
2014-2020 Plan			
Symmetry Bias	-5.7%	60%	77%
Mean-Median Diff	-4.3%	79%	86%
Efficiency Gap	-4.8%	49%	78%
Declination	-.36	68%	83%
Average		64%	81%
Preliminary Plan			
Symmetry Bias	-0.2%	2%	49%
Mean-Median Diff	-1.9%	40%	68%
Efficiency Gap	0.7%	8%	51%
Declination	-.04	9%	50%
Average		15%	55%
Enacted Plan			
Symmetry Bias	-0.2%	2%	49%
Mean-Median Diff	-1.6%	35%	65%
Efficiency Gap	0.2%	2%	53%
Declination	-.076	17%	54%
Average		14%	55%

Table 2: Partisan bias metrics for State House plan based on 2020 State House election results re-aggregated onto enacted map

The enacted House plan is nearly perfectly unbiased based on the re-aggregated 2020

---

16. As I noted above in footnote 11, one advantage of the Efficiency Gap is that it accounts for differences in population and turnout across districts (McGhee 2017, 11-12).

17. As is commonly done in the academic literature, I impute uncontested State House elections using the presidential election results. In State House district 7, the Democratic candidate won even though former-President Trump won the majority of the vote. In this district, I adjust the presidential vote so that the Democratic vote share is 51% to ensure that the imputed results yield the correct number of Democratic and Republican seats.

State House results (bottom panel of Table 2). Republicans would win 50.5% of the votes and 50.7% of the seats on the enacted House plan. Moreover, both parties would receive nearly half the seats when the statewide vote is exactly evenly split. Thus, the symmetry bias is only .2%, which is right in the center of the historical distribution of partisan symmetries. The enacted House plan is also nearly perfectly neutral using the other metrics. Only the mean-median difference implies a significant Republican advantage in the translation of votes to seats. When we average across all four metrics, the plan is more extreme than 14% of prior plans, and thus more neutral than 86% of prior plans. When I average across the various metrics, it just has a very small pro-Republican advantage: it is more pro-Republican than 55% of previous plans.

5.3 PlanScore

Third, I evaluate the enacted House plan using a predictive model from the PlanScore.org website.[18] PlanScore uses a statistical model of the relationship between districts' latent partisanship and legislative election outcomes. This enables it to estimate district-level vote shares for a new map and the corresponding partisan gerrymandering metrics.[19] It then calculates various partisan bias metrics. Like the earlier approaches, PlanScore indicates that the enacted House plan is relatively neutral with a small pro-Republican bias (bottom panel of Table 3).

According to PlanScore, the enacted House plan has a small pro-Republican symmetry bias of -2.3%. This means that Republicans would win 52.3% of the seats if the two parties evenly split the votes. The enacted House plan favors Republicans in 95% of the scenarios estimated by PlanScore. The other metrics look similar to the symmetry metric. Across all the metrics, the enacted House plan is more pro-Republican than 64% of prior plans over the past five decades. Figure 2 graphically shows the bias of the enacted House plan compared to previous plans from 1972-2020.[20] Overall, the graphs show that the enacted House plan is close to the center of the distribution of previous plans over the past 50 years with just a small pro-Republican bias.

---

18. See https://planscore.campaignlegal.org/plan.html?20220210T141618.834838941Z for the enacted House plan and https://planscore.campaignlegal.org/plan.html?20220107T194310.216726037Z for the 2014-2020 plan.

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

20. Note that the PlanScore graphs are oriented so that pro-Republican scores have a positive value.

Metric	Value	Favors Rep's in this % of Scenarios	More Biased than this % Historical Plans	More Pro-Republican than this % Historical Plans
2014-2020 Plan				
Symmetry	-4.5%	99%	50%	72%
Mean-Median Diff.	-2.0%	99%	42%	68%
Efficiency Gap	-4.6%	99%	53%	81%
Declination	-.27	99%	57%	76%
Average		99%	51%	74%
Preliminary Plan				
Symmetry	-2.5%	94%	31%	61%
Mean-Median Diff.	-1.2%	94%	27%	61%
Efficiency Gap	-2.5%	95%	32%	70%
Declination	-.15	95%	37%	64%
Average		95%	32%	64%
Enacted Plan				
Symmetry	-2.3%	94%	30%	61%
Mean-Median Diff.	-1.1%	94%	25%	61%
Efficiency Gap	-2.5%	95%	32%	70%
Declination	-.14	95%	35%	63%
Average		95%	31%	64%

Table 3: PlanScore partisan bias metrics for enacted House plan

Efficiency Gap: 2.3% R

Votes for Republican candidates are expected to be inefficient at a rate 2.3% R lower than votes for Democratic candidates, favoring Republicans in 95% of predicted scenarios. Learn more >

Sensitivity Testing

Sensitivity testing shows us a plan's expected efficiency gap given a range of possible vote swings. It lets us evaluate the durability of a plan's skew.

Declination: 0.14 R

The difference between mean Democratic vote share in Democratic districts and mean Republican vote share in Republican districts along with the relative fraction of seats won by each party leads to a declination that favors Republicans in 95% of predicted scenarios. Learn more >

Partisan Bias: 2.3% R

Republicans would be expected to win 2.3% R extra seats in a hypothetical, perfectly tied election, favoring Republicans in 94% of predicted scenarios. Learn more >

Mean-Median Difference: 1.1% R

The median Republican vote share is expected to be 1.1% R higher than the mean Republican vote share, favoring Republicans in 94% of predicted scenarios. Learn more >
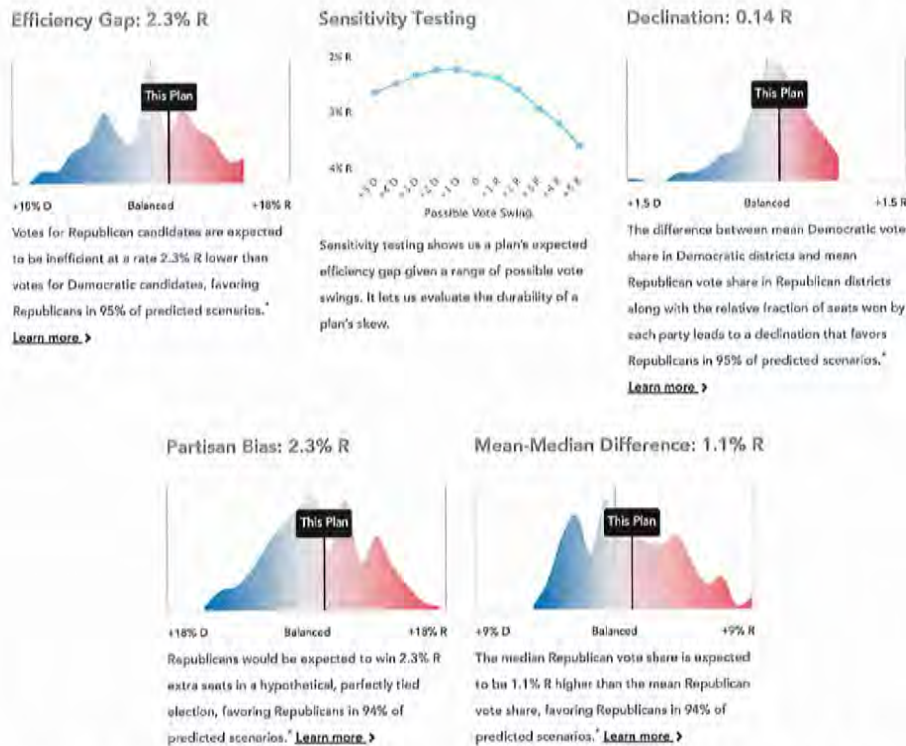
Figure 2: Graphs of PlanScore metrics enacted House plan compared to previous plans from 1972-2020

5.4 Responsiveness of Plan

Another benchmark for a districting plan is the responsiveness of the plan to changes in voters' preferences (Cox and Katz 1999). An unresponsive map ensures that the bias in a districting plan toward the advantaged party is insulated against changes in voters' preferences, and thus is durable across multiple election cycles.
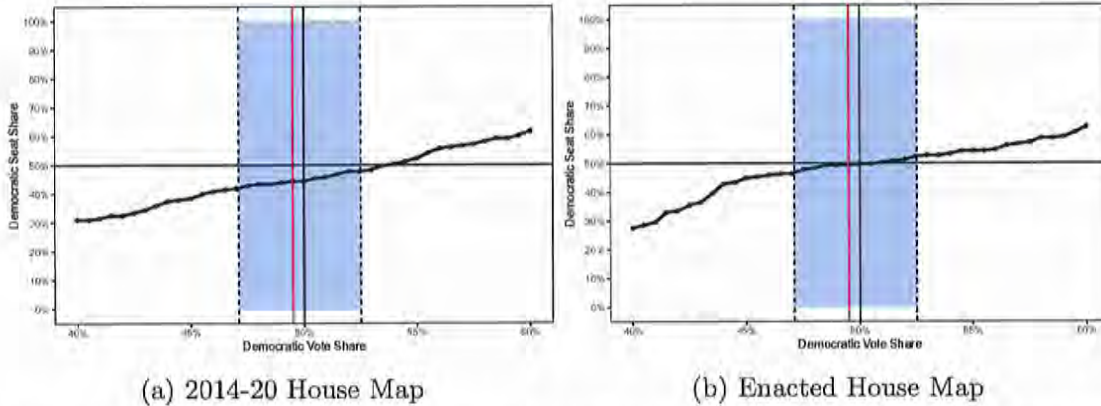

(a) 2014-20 House Map　　　　　　　(b) Enacted House Map

Figure 3: Vote-seat curve in Pennsylvania using uniform swings in 2020 election results on the 2014-20 districts and re-aggregated on the enacted House plan. The shaded area shows the range between the minimum and maximum Democratic statewide vote share in State House elections from 2014-2020. The red line shows the actual Democratic statewide vote share in the 2020 State House elections.

Figure 3 compares the responsiveness of the 2014-20 State House plan and the enacted House plan (using re-aggregated votes in the 2020 State House Elections). It shows the vote-seat curve in Pennsylvania using uniform swings in 2020 election results on the 2014-20 districts and re-aggregated on the enacted House plan. The shaded area shows the range between the minimum and maximum Democratic statewide vote share in State House elections from 2014-2020. The red line shows the actual Democratic statewide vote share in the 2020 State House elections.

The graph shows that both the 2014-2020 House plan and the enacted House plan are relatively responsive to shifts in voters' preferences. But the 2014-20 plan had a large pro-Republican bias, which is much smaller in the enacted House plan. Indeed, the Republican Party won a majority of the seats across all of the plausible range of stateside vote shares in the 2014-20 plan, while both parties could get at least half the seats in the enacted House plan.

5.5 Number of Competitive Districts

An important factor that affects the overall responsiveness of a plan is the number of competitive districts in a plan. I use a variety of approaches to estimate the number of competitive districts in both the 2014-20 State House plan and the enacted House plan (see Table 4). Overall, my analysis indicates that the previous plan and the enacted House plan are very similar in terms of the number of competitive seats. Moreover, both plans do about as well as the average percentage of seats that are competitive across other states' elections for their lower chambers in 2020.

Data:	2020 State House Results	Composite (2014-20)	PlanScore			Mean
Metric:	45-55	45-55	45-55	20%+ Prob. of Each Party Win.	50%+ Prob. Flip in Dec.	
Plan	(1)	(2)	(3)	(4)	(5)	(6)
Average Nationwide in 2020	13%					
2014-20 House Plan	13%	24%	23%	20%	25%	21%
Enacted House Plan	11%	16%	22%	15%	22%	17%

Table 4: Number of competitive districts using various data sources and metrics.

First, I use the actual 2020 State House results to examine the number of competitive districts. In column 1 of Table 4, I begin by tallying the number of districts where each party's two-party vote share was between 45 and 55%. This approach indicates that 13% of the districts on the 2014-20 plan were competitive and 11% of the districts on the enacted House plan were competitive. It is important to note, however, that a sharp threshold at 55% may not be the best measure of competitiveness.

Next, I use a composite of the 2014-2020 statewide election results to estimate the number of competitive districts. Once again, in column 2 of Table 4, I tally the number of districts where each party's two-party vote share was between 45 and 55%. This approach indicates that 24% of the districts on the 2014-20 plan were competitive and 16% of the districts on the enacted House plan were competitive.

Lastly, I use PlanScore to estimate the potential competitiveness of individual districts on the enacted House plan. In column 3 of Table 4, I show the number of districts where PlanScore estimates that each party's two-party vote share is expected to be between 45 and 55%. This approach indicates that 23% of the districts on the 2014-20 plan were competitive and 22% of the districts on the enacted House plan were competitive

It is also possible to use PlanScore to evaluate whether a district is likely to switch parties at least once per decade (Henderson, Hamel, and Goldzimer 2018). PlanScore conducts 1,000 simulations of possible electoral scenarios based on the results of the 2014-2020 congressional and state legislative elections in every state. Using these simulations,

PlanScore provides an estimate of the probability that each party will win each seat as well as whether they are likely to have at least a 50% chance of winning each seat once over the course of the decade. In column 4 of Table 4, I estimate the number of districts where each party has at least a 20% chance of winning according to PlanScore. This approach indicates that 20% of the districts on the 2014-20 plan were competitive and 15% of the districts on the enacted House plan were competitive. In column 5 of Table 4, I conduct a similar analysis where I tally the number of districts that each party would have at least a 50% chance of winning at least once over the course of the decade. This approach indicates that 25% of the districts on the 2014-20 plan were competitive and 22% of the districts on the enacted House plan were competitive

Finally, column 6 of Table 4 averages across all of these approaches. It indicates that 21% of the districts on the 2014-20 plan were competitive and 17% of the districts on the enacted House plan were competitive. Thus, the previous plan and the enacted House plan are fairly similar in terms of the number of competitive seats. The enacted House plan also has roughly the same percentage of seats that are competitive as other states' elections for their lower chambers in 2020.

6   Comparison of enacted House plan with Congressional plan and Benninghoff plan

In this section, I compare the enacted House plan to both the congressional plan recently approved by the Pennsylvania Supreme Court and Leader Benninghoff's proposed alternative plan. Overall, I find that the enacted House plan has very similar partisan bias metrics as the congressional plan recently approved by the Pennsylvania Supreme Court. Both plans look relatively fair with a small pro-Republican bias. In contrast, Leader Benninghoff's plan has a much more substantial degree of pro-Republican bias than either the enacted House plan or the enacted congressional plan.

Table 5 shows the detailed comparisons. The lefthand side of the panel shows partisan fairness metrics based on the composite of statewide elections from 2014-2020, while the righthand side shows the partisan fairness metrics from PlanScore.org. The top panel of Table 5 shows an evaluation of the partisan fairness of the recently enacted congressional plan. Each of the individual metrics using both the composite elections and PlanScore are close to zero with a small pro-Republican bias. When I compare the results of my analysis of the final congressional plan to other congressional elections around the country over the past 50 years, Pennsylvania's congressional plan is more pro-Republican than about

	Composite of Statewide Elections			PlanScore		
Metric	Value	More Biased than this % of Elections	More Pro-Rep. than this % of Elections	Value	More Biased than this % of Elections	More Pro-Rep. than this % of Elections
2022 Congressional Plan						
Symmetry Bias	-5.3%	42%	71%	-1.3%	12%	61%
Mean-Median Diff	-1.3%	18%	60%	-0.4%	7%	58%
Efficiency Gap	-0.9%	8%	58%	-1.8%	20%	66%
Declination	-.056	16%	52%	-.05	23%	59%
Average		21%	61%		16%	61%
Enacted LRC State House Plan						
Symmetry Bias	-2.7%	31%	62%	-2.3%	30%	61%
Mean-Median Diff	-1.4%	31%	63%	-1.1%	25%	61%
Efficiency Gap	-2.5%	26%	68%	-2.5%	32%	70%
Declination	-.173	38%	65%	-.14	35%	63%
Average		31%	65%		31%	64%
Benninghoff State House Plan						
Symmetry Bias	-5.7%	60%	77%	-3.7%	40%	65%
Mean-Median Diff	-4.3%	79%	86%	-1.6%	33%	63%
Efficiency Gap	-4.8%	49%	78%	-3.7%	42%	77%
Declination	-.36	68%	83%	-.22	49%	70%
Average		64%	81%		46%	69%

Table 5: Partisan bias metrics for Enacted House Plan and Recent Congressional Plans

61% of previous congressional plans.

The middle panel reiterates the metrics for the enacted House plan that I presented in the previous sections of this report. Each of the individual metrics using both the composite elections and PlanScore are close to zero with a small pro-Republican bias. This indicates that the enacted House Plan is relatively fair with a small degree of pro-Republican bias. When I compare the results of my analysis of the enacted House plan to other state house elections around the country over the past 50 years, my analysis indicates that it is more pro-Republican than about 64-65% of previous plans around the country. Thus, the partisan fairness of the enacted House plan looks very similar to the enacted congressional plan recently implemented by the Pennsylvania Supreme Court.

The bottom panel evaluates Leader Benninghoff's proposed state house plan. The partisan fairness metrics for this plan look totally unlike the congressional plan recently approved by the Pennsylvania Supreme Court. Leader Benninghoff's plan has a larger pro-Republican bias on each of the partisan fairness metrics. For instance, Republicans are likely to win about 54-56% of the seats on this plan in a tied statewide election. Overall, the plan is more pro-Republican than 69-81% of previous plans around the country. Leader Benninghoff's proposed has a much larger pro-Republican bias than either the final congressional plan or the enacted House plan.

7 Professor Barber's report

Professor Barber's expert report that was submitted as an addendum to Leader Benninghoff's complaint assesses a number of aspects of the enacted House plan. One of the things it assesses is the partisan fairness of the plan. Professor Barber concludes that the enacted House plan is a partisan gerrymander. Professor Barber's analysis does not actually indicate, however, that the enacted House plan is a partisan gerrymander.

Most importantly, he reaches almost identical conclusions as my analysis as-to the modest pro-Republican bias of the enacted House plan based on the efficiency gap and the mean-median difference. He claims that he uses a composite of the 2012-2020 statewide elections to predict two-party vote shares in each districts. Based on this composite index, Professor Barber finds that the enacted House plan has a pro-Republican mean-median difference of 1.5% (p. 56) and a pro-Republican Efficiency Gap of 2.7% (p. 59). Based on a composite of statewide elections from 2014-2020, I find a pro-Republican mean-median difference of 1.4% (p. 56) and a pro-Republican Efficiency Gap of 2.5%. So there is no disagreement that the proposed plan is relatively neutral on generally accepted partisan fairness metrics with a small pro-Republican advantage. Thus, both Professor Barber and my analysis indicate that the plan treats both parties' voters relatively symmetrically. As a result, neither party's voters are diluted and neither party's voters have more voice over political outcomes in Pennsylvania. For all these reasons, the enacted House plan is not a partisan gerrymander.

8 Conclusion

This report has evaluated the partisan fairness of the Legislative Reapportionment Commission's enacted Pennsylvania State House plan. Overall, there is no evidence that this plan is a partisan gerrymander. In my opinion, it is a generally fair plan.

- Based on three methods of projecting future elections and four different, generally accepted partisan bias metrics, I find that the enacted House plan is fair, with just a small pro-Republican bias. On this plan, the party that wins the majority of the votes is likely to usually win the majority of the seats. Neither party's voters are diluted on this plan and voters from both parties have a roughly equal opportunity to translate their votes into representation. Thus, the plan satisfies a key premise of democratic theory.

- The enacted House plan is much more fair than the 2014-2020 State House plan,

which had a large and durable pro-Republican bias.

- On some metrics, the enacted House plan is actually slightly more fair than the Preliminary Plan.[21]

- The plan is likely to be responsive to shifts in voters' preferences.

- The partisan fairness of the plan compares favorably to the congressional plan recently approved by the Pennsylvania Supreme Court.

---

21. See the initial report I submitted to the LRC on January 7th, my testimony on January 14th, and the analysis in Tables 1-3 above.

References

Caughey, Devin, Chris Tausanovitch, and Christopher Warshaw. 2017. "Partisan Gerry-mandering and the Political Process: Effects on Roll-Call Voting and State Policies." *Election Law Journal* 16 (4).

Chen, Jowei, and Jonathan Rodden. 2013. "Unintentional Gerrymandering: Political Ge-ography and Electoral Bias in Legislatures." *Quarterly Journal of Political Science* 8 (3): 239–269.

Cox, Gary W., and Jonathan N. Katz. 1999. "The reapportionment revolution and bias in US congressional elections." *American Journal of Political Science:* 812–841.

Gelman, Andrew, and Gary King. 1994. "A unified method of evaluating electoral systems and redistricting plans." *American Journal of Political Science* 38 (2): 514–554.

Goedert, Nicholas. 2014. "Gerrymandering or geography? How Democrats won the popu-lar vote but lost the Congress in 2012." *Research & Politics* 1 (1): 2053168014528683.

Henderson, John A, Brian T Hamel, and Aaron M Goldzimer. 2018. "Gerrymandering Incumbency: Does Nonpartisan Redistricting Increase Electoral Competition?" *The Journal of Politics* 80 (3): 1011–1016.

ICPSR. 2006. *State Legislative Election Returns in the United States, 1968-1989.*

Kang, Michael S. 2017. "Gerrymandering and the Constitutional Norm Against Govern-ment Partisanship." *Mich. L. Rev.* 116:351.

Katz, Jonathan N, Gary King, and Elizabeth Rosenblatt. 2020. "Theoretical foundations and empirical evaluations of partisan fairness in district-based democracies." *Amer-ican Political Science Review* 114 (1): 164–178.

Klarner, Carl, William Berry, Thomas Carsey, Malcolm Jewell, Richard Niemi, Lynda Powell, and James Snyder. 2013. *State Legislative Election Returns (1967–2010).* ICPSR34297-v1. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2013-01-11. doi:10.3886/ICPSR34297.v1.

Levitt, Justin. 2017. "Intent is Enough: Invidious Partisanship in Redistricting." *Wm. & Mary L. Rev.* 59:1993.

McDonald, Michael P. 2014. "Presidential vote within state legislative districts." *State Politics & Policy Quarterly* 14 (2): 196–204.

McGhee, Eric. 2017. "Measuring Efficiency in Redistricting." *Election Law Journal: Rules, Politics, and Policy.*

———. 2020. "Partisan Gerrymandering and Political Science." *Annual Review of Political Science* 23:171–185.

Powell, G. Bingham, Jr. 2004. "Political Representation in Comparative Politics." *Annual Review of Political Science* 7:273–296.

Rogers, Steven. 2017. "Electoral Accountability for State Legislative Roll Calls and Ideological Representation." *American Political Science Review* 111 (3): 555–571.

Seabrook, Nicholas R. 2017. *Drawing the Lines: Constraints on Partisan Gerrymandering in US Politics.* Cornell University Press.

Stephanopoulos, Nicholas O, and Christopher Warshaw. 2020. "The impact of partisan gerrymandering on political parties." *Legislative Studies Quarterly* 45 (4): 609–643.

Stephanopoulos, Nicholas O., and Eric M. McGhee. 2015. "Partisan Gerrymandering and the Efficiency Gap." *University of Chicago Law Review* 82 (2): 831–900.

Warrington, Gregory S. 2018. "Quantifying Gerrymandering Using the Vote Distribution." *Election Law Journal* 17 (1): 39–57.

Wright, Gerald, Tracy Osborn, Jon Winburn, and Jennifer Hayes Clark. 2009. "Patterns of representation in the American states and Congress." In *annual conference on State Politics and Policy, Chapel Hill, NC.*

Exhibit C

EXPERT REPORT OF JONATHAN RODDEN, Ph.D.

On behalf of the Pennsylvania House Democratic Caucus
March 10, 2022

I. INTRODUCTION

I have been asked to evaluate the report of Dr. Michael Barber that was included as Appendix A in the Petition for Review in *Benninghoff v. 2021 Legislative Reapportionment Commission*, filed on February 17, 2022. Much of Dr. Barber's testimony purports to be based on interpretations of my research on the political geography of Pennsylvania. I have been asked to evaluate Dr. Barber's interpretations, and, more broadly, his claim that the Pennsylvania Legislative Reapportionment Commission's final State House plan (hereinafter "Final House Plan") is "a significant deviation from a fair outcome," as well as certain of his specific claims about the sources of those purported deviations.

Dr. Barber contends that because Democrats in Pennsylvania are highly concentrated in cities and Republicans are more efficiently dispersed in exurban and rural areas, a "fair" or "unbiased" map must provide the Republican Party with a much higher seat share than its vote share—even in the event of a tied election. Furthermore, he avers that a "fair" or "unbiased" map is one whose overall partisanship resembles the modal outcome in a large ensemble of computer-generated redistricting plans.

"Bias" is a term that has a very specific meaning in the academic literature on redistricting. It refers to a situation in which a party can expect more than half the seats when it obtains half of the votes. Likewise, scholars typically refer to "partisan fairness" as a situation where a party with 50 percent of the votes can anticipate 50 percent of the seats. Dr. Barber appears to be using a very different concept, in which he considers a map to be "unbiased" or "fair" if it resembles the modal partisan outcome in a large ensemble of computer-generated maps.

This is not a notion of bias or fairness that appears anywhere in the academic literature. Using the standard definition, the Final House Plan is, in fact, biased in favor of the *Republican* Party, not the Democratic Party—a fact that is indeed likely driven by the relative urban concentration of Democrats that Dr. Barber describes.

Dr. Barber's key claim appears to be that the Final House Plan contains slightly more Democratic-leaning districts than the modal computer-generated plan in a handful of medium-sized Pennsylvania cities, and as a result, we can conclude that the Final House Plan subverted traditional redistricting principles in order to reverse any underlying geographic advantage for Republicans and instead favor Democrats. However, he provides no credible evidence to support his claim. In fact, his report contains considerable evidence to the contrary. Above all, the Final House Plan is more respectful of traditional redistricting principles than his computer-generated plans. Specifically, it is more compact and splits fewer counties and municipalities.

Lacking any systematic statewide evidence that the Final House Plan subverts traditional redistricting principles in order to help Democrats, Dr. Barber turns to a series of case studies of several medium-sized cities. However, these case studies also fail to generate any evidence that the traditional redistricting criteria outlined in the Pennsylvania Constitution have been subverted in favor of partisan goals.

II. QUALIFICATIONS AND EXPERIENCE

I am currently a tenured Professor of Political Science at Stanford University and the founder and director of the Stanford Spatial Social Science Lab—a center for research and teaching with a focus on the analysis of geo-spatial data in the social sciences. I am engaged in a variety of research projects involving large, fine-grained geo-spatial data sets including ballots and election results at the level of polling places, individual records of registered voters, census data, and survey responses. I am also a senior fellow at the Stanford Institute for Economic Policy Research and the Hoover Institution. Prior to my employment at Stanford, I was the Ford Professor of Political Science at the Massachusetts Institute of Technology. I received my Ph.D. from Yale University and my B.A. from the University of Michigan, Ann Arbor, both in political science. A copy of my current C.V. is included as Exhibit A.

In my current academic work, I conduct research on the relationship between the patterns of political representation, geographic location of demographic and partisan groups, and the drawing of electoral districts. I have published papers using statistical methods to assess political geography, balloting, and representation in a variety of academic journals, including *Statistics and Public Policy, Political Analysis, Proceedings of the National Academy of Science, American Economic Review Papers and Proceedings*, the *Journal of Economic Perspectives*, the *Virginia Law Review*, the *American Journal of Political Science*, the *British Journal of Political Science*, the *Annual Review of Political Science*, and the *Journal of Politics*. One of these papers was selected by the American Political Science Association as the winner of the Michael Wallerstein Award for the best paper on political economy published in the last year, and another received an award from the American Political Science Association section on social networks. In 2021, I received a John Simon Guggenheim Memorial Foundation Fellowship, and received the Martha Derthick Award of the American Political Science Association for "the best book published at least ten years ago that has made a lasting contribution to the study of federalism and intergovernmental relations."

I have recently written a series of papers, along with my co-authors, using automated redistricting algorithms in the context of redistricting. This work has been published in the *Quarterly Journal of Political Science, Election Law Journal*, and *Political Analysis*, and it has been featured in more popular publications like *The Wall Street Journal, The New York Times*, and *Boston Review*. I recently published a book, published by *Basic Books* in June of 2019, on the relationship between political districts, the residential geography of social groups, and their political representation in the United States and other countries that use winner-take-all electoral districts. The book was reviewed in *The New York Times, The New York Review of Books, Wall Street Journal, The Economist*, and *The Atlantic*, among others. This book, which was discussed in Dr. Barber's report, pays special attention to Pennsylvania.

I have expertise in the use of large data sets and geographic information systems (GIS), and conduct research and teaching in the area of applied statistics related to elections. My Ph.D. students frequently take academic and private sector jobs as statisticians and data scientists. I frequently work with geo-coded voter files and other large administrative data sets, including in recent papers published in the *Annals of Internal Medicine* and *The New England Journal of Medicine*. I have developed a national data set of geo-coded precinct-level election results that has been used extensively in policy-oriented research related to redistricting and representation.

I have been accepted and testified as an expert witness in a number of election law and redistricting cases: *Romo v. Detzner*, No. 2012-CA-000412 (Fla. Cir. Ct. 2012); *Mo. State Conference of the NAACP v. Ferguson-Florissant Sch. Dist.*, No. 4:2014-CV-02077 (E.D. Mo. 2014); *Lee v. Va. State Bd. of Elections*, No. 3:15-CV-00357 (E.D. Va. 2015); *Democratic Nat'l Committee et al. v. Hobbs et al.*, No. 16-1065-PHX-DLR (D. Ariz. 2016); *Bethune-Hill v. Virginia State Board of Elections*, No. 3:14-cv-00852-REP-AWA-BMK (E.D. Va. 2014); and *Jacobson et al. v. Lee*, No. 4:18-cv-00262 (N.D. Fla. 2018). In January 2022, the Supreme Court of Ohio credited my expert analysis in *Bennett v. Ohio Redistricting Commission*, No. 2012-1198 (Ohio 2022), and *Adams v. DeWine*, No. 2012-1428 (Ohio 2022), two redistricting cases challenging state legislative and congressional maps. I also worked with a coalition of academics to file Amicus Briefs in the Supreme Court of the United States in *Gill v. Whitford*, No. 16-1161, and *Rucho v. Common Cause*, No. 18-422. Much of the testimony in these cases had to do with geography, electoral districts, voting, ballots, and election administration. I recently worked as a consultant for the Maryland Redistricting Commission, and I drew a Pennsylvania Congressional redistricting plan, known as the "Carter Plan," that was chosen by the Pennsylvania Supreme Court for implementation. *Carter v. Chapman*, No. 7 MM 2022, 2022 WL 549106 (Pa. Feb. 23, 2022).

III. DATA SOURCES

In order to assess statewide partisanship, I have collected statewide election results for selected elections from 2012 to 2020 from the Pennsylvania Department of State.[1] The specific elections and results are detailed in Table 1 below. I also accessed precinct-level election results from the Pennsylvania Department of State for statewide elections from 2016 to 2020 that were matched to 2020 Pennsylvania vote tabulation districts by a team at Harvard University called the Algorithm-Assisted Redistricting Methodology Project.[2] I also used block-level 2020 population estimates produced by the United States Census Department for the purposes of legislative redistricting. I consulted geographic boundary files for the Final House Plan from its web page: redistricting.state.pa.us/maps. I also received shapefiles of the boundaries of the Benninghoff Amendment. I also consulted shapefiles of the boundaries of vote tabulation districts, census places, counties, and county subdivisions from the U.S. Census Department. From the National Historical GIS (nhgis.org), I also consulted data from the 2020 decennial census on race and ethnicity at the level of census block groups, as well as shapefiles for census block groups. In preparing this report, I used Maptitude, ArcGIS, R, and Stata software packages.

IV. ELECTORAL BIAS AND ELECTORAL FAIRNESS

On several occasions in his report, Dr. Barber makes the curious and confusing claim that the Final House Plan is "biased" or "unfair." Without explaining his logic or relating it to the very large body of academic literatures on votes, seats, and redistricting algorithms, he makes a rather unusual claim that maps generated by a computer algorithm are, by definition, "unbiased." On page 4, for instance, he writes "…in comparing the Commission's map to the simulated districts, we are comping [sic] a map to a set [sic] alternative maps that we know to be unbiased. If the Commission's map produces a similar outcome as the alternative set of maps, we may reasonably conclude that the Commission's plan is also unbiased. Alternatively, if the Commission's proposed

---

[1] https://www.electionreturns.pa.gov/ReportCenter/Reports
[2] https://alarm-redist.github.io/posts/2021-08-10-census-2020/

plan significantly diverges from the set of simulated maps, it may be the case that the proposed plan is biased in favor of one party." He goes on to generate a set of maps using a computer algorithm, and since he estimates that there are 107 Democratic-leaning districts in the Final House Plan, and the most common estimate among his ensemble of computer-generated plans is 97 such districts, he concludes that the Final House Plan is "biased," or as he puts it on page 10, a "significant deviation from a fair outcome."

These claims are confusing because in the academic literature on votes and seats in legislative elections, bias has a very specific definition that has nothing to do with computer simulations. In a two-party democracy, if a party receives 50 percent of the votes, but 50 percent plus x of the seats, the quantity x is known as electoral bias. For instance, a party with 50 percent of the votes that receives 53 percent of the seats enjoys a bias of 3 percent in its favor.

It is useful to apply this concept to the Final House Plan before commenting further on Dr. Barber's analysis. Dr. Barber characterizes the partisanship of each district in the Final House Plan, as well as in his computer-generated plans, by using statewide partisan elections from 2012 to 2020. I do not have access to his data, and thus cannot assess his estimates of the partisanship of each district. From the Secretary of State, however, I can ascertain that using the elections specified by Dr. Barber, the average Democratic vote share from 2012 to 2020 was 52.85 percent (see Table 1). Dr. Barber claims that 107 districts are Democratic leaning in the Final House Plan, which would be 52.7 percent of the seats. A common feature of votes and seats is the so-called "winner's bonus," whereby, in a two-party system, the party with greater than 50 percent of the vote receives more than a proportional share of seats. A party with 53 percent of the vote, for instance, can often expect more than 55 percent of the seats, even in a plan that is not drawn to produce partisan advantage for either party. However, according to Dr. Barber's analysis, the Democrats could expect a seat share slightly *below* their vote share under the Final House Plan, even though with almost 53 percent of the votes during the period he analyzed, one would expect them to benefit from the winner's bonus.

This is already a clear sign that the Final House Plan is not, in any sense, biased against the Republican Party. In order to calculate electoral bias, as defined above, election scholars typically consider a hypothetical election in which the overall votes are tied, which is achieved by applying a "uniform swing" across all districts, and then calculating the number of seats that would be won by each party in such a scenario. I do not have access to Dr. Barber's district-level estimates, and thus cannot use them to measure electoral bias. However, I do have access to precinct-level results of statewide elections from 2016 to 2020, which I can sum up within the boundaries of the Commission's districts and then generate an average district-level Democratic vote share for each district. When I do this, I find that there are not 107 Democratic-leaning districts in the Final House Plan, but 104, or 51.2 percent of the 203 districts—well below the Democrats' overall vote share, which exceeded 52 percent during this period.

Next, to calculate electoral bias, I apply a uniform swing toward the Republican Party in each district in order to examine a hypothetical tied statewide election. I do this separately for each statewide election and take an average over all elections. Using this approach, I ascertain that the Republican Party can expect an average electoral bias in its favor of around 1.5 percent under the Final House Plan.

Table 1: Pennsylvania Statewide Election Results, 2012-2020

	Democratic votes	Republican votes	Democratic vote share
2012 President	2,990,274	2,680,434	52.73%
2012 Senate	3,021,364	2,509,132	54.63%
2012 Attorney General	3,125,557	2,313,506	57.46%
2012 Auditor General	2,729,565	2,548,767	51.71%
2012 Treasurer	2,872,344	2,405,654	54.42%
2014 Governor	1,920,355	1,575,511	54.93%
2016 Presidential	2,926,441	2,970,733	49.62%
2016 U.S. Senate	2,865,012	2,951,702	49.25%
2016 Attorney General	3,057,010	2,891,325	51.39%
2016 Auditor General	2,958,818	2,667,318	52.59%
2016 Treasurer	2,991,404	2,610,811	53.40%
2018 U.S. Senate	2,792,437	2,134,848	56.67%
2018 Governor	2,895,652	2,039,882	58.67%
2020 Presidential	3,458,229	3,377,674	50.59%
2020 Attorney General	3,461,472	3,153,831	52.33%
2020 Auditor General	3,129,131	3,338,009	48.39%
2020 Treasurer	3,239,331	3,291,877	49.60%
2012-2020 Average			52.85%
2016-2020 Average			52.05%
2018-2020 Average			52.71%

Note: Democratic vote share is the Democratic share of the votes for the two major parties (Democrats and Republicans). The denominator does not include minor parties and write-in candidates.

Clearly, the Final House Plan is biased in favor of the Republicans, not the Democrats. In fact, Dr. Barber's analysis confirms this. On page 56, he indicates that according to another metric of partisan fairness—the mean-median difference—the Final House Plan favors the Republican Party as well. And on page 59, he indicates that the Final House Plan favors the Republican Party according to yet another metric: the efficiency gap.

Dr. Barber is arguing for a completely different view of partisan fairness than any I have encountered in the academic literature. His claim is that a "fair" or "unbiased" plan is one that resembles the most frequent outcome that emerges from a large ensemble of computer-generated plans. Using his 2012-2020 partisan metric, he assessed the partisanship of the amended plan introduced by Leader Benninghoff, (hereinafter "Benninghoff Plan") and determined that it has the same number of Democratic-leaning seats as the most common outcome in his computer-generated plans, thus making it a "fair" plan. As I described above for the Final House Plan, I have

aggregated the precinct-level votes within the boundaries of the Benninghoff Plan and calculated the average Democratic vote share in each district for statewide elections from 2016 to 2020.

According to this metric, the Benninghoff Plan has 94 Democratic-leaning seats. With 52.05 percent of the statewide vote (see Table 1), the Democratic Party can thus expect 46.3 percent of the seats under this plan. This is a most unusual definition of partisan fairness. Applying the uniform swing to each statewide election, I calculate an average bias of 5.11 percent, meaning that in the event of a tied election, given the distribution of votes across districts in the Benninghoff Plan, the Republican Party could expect 55.11 percent of the seats.

V.   THE ROLE OF ELECTORAL GEOGRAPHY

It is not clear why Dr. Barber views such clearly counter-majoritarian outcomes as normatively desirable or somehow required by the Pennsylvania Constitution or the majority opinion in *League of Women Voters*. His claim seems to be that since Democratic voting is highly correlated with population density, any reasonable application of traditional redistricting principles and other legal requirements would necessarily lead to a redistricting plan in which Democrats are inefficiently concentrated in extremely Democratic urban districts, while Republicans are more efficiently distributed in Republican-leaning suburbs and rural areas.

In making these claims, Dr. Barber draws heavily on my work, often in a misleading way. I have recently published a book about the spatial distribution of voters in the United States and other countries around the world, using the history of Pennsylvania as a running example.[3] In the book, I explore the history of labor unions and the geography of manufacturing, and then the more recent rise of racial, moral, and social issues in shaping political conflicts between the parties. I document how these forces have led to a growing correlation between population density and voting behavior over the last 75 years. Specifically, the urban core of most American cities, even including smaller Pennsylvania cities like Reading and Lancaster, have voted overwhelmingly for the Democratic Party, and the Republican vote share increases as one moves through the inner-ring suburbs, into the outer-ring suburbs and exurbs, and finally into the rural periphery.

I also demonstrate that the nature of this gradient varies a great deal from one city to another, and changes substantially over time. In particular, in the final chapter of the book, I explore a very recent transformation, where minorities have moved in large numbers away from the urban core of cities and into surrounding suburban areas. Moreover, as the Democratic Party has gained strength among college-educated professionals and the Republican Party has oriented itself increasingly toward whites without college degrees, growing suburban and even exurban communities in cities with many jobs in knowledge-based industries have realigned to the Democratic Party, with important implications for political geography.

In the book, I demonstrate that historical patterns of political geography are consequential for representation. I ask: what happens if we ignore race and the Voting Rights Act, county boundaries, communities of interest, and specific redistricting rules in states, and draw a series of

---

[3] Jonathan Rodden, *Why Cities Lose: The Deep Roots of the Urban-Rural Political Divide*. New York: Basic Books.

compact, contiguous districts using a simple computer algorithm? I discover that in decades past, such districts would often have been biased (as defined above) against the Democratic Party because their voters have been inefficiently concentrated in the precincts of urban core areas. That is, Democrats "wasted" too many votes in the districts they were able to win, while Republicans typically won by smaller majorities in the exurban districts that they were able to win.

The point of this exercise was to illuminate the importance of political geography— clarifying the implications of "pure" geographic partisan patterns by stripping away all the things that inform the redistricting process in the real world, like neighborhoods, communities, racial and ethnic groups, incumbents, and political parties. The point was not that the modal simulated map from an ensemble of naïve simulations is normatively desirable or reflective of a fair or even legal redistricting process. On the contrary, these simulations often produced unfair maps, and ones that would not pass legal muster in many states.

In the book, I suggested that there may be some settings where residential patterns of partisanship, combined with the location of state boundaries or bodies of water relative to cities and the spatial scale of the relevant districts, are so disadvantageous for the Democrats that in order to achieve zero pro-Republican bias, it might be necessary to draw districts that are relatively non-compact. For example, when small Democratic cities are arranged quite far from one another along the rail lines or canals of the 19th century period of industrial city formation, it may be the case that the only way to produce a single Democratic-leaning Congressional district is to draw a non-compact district that follows the historic rail line.

However, the book goes to great lengths to demonstrate that this is not universal, but rather, highly contingent on the specific state, region, and spatial scale (e.g., state legislature versus Congress). Dr. Barber seems to have drawn the mistaken conclusion from my research that due to a universal and inescapable pattern of political geography, it is not possible, in Pennsylvania or evidently anywhere else in the United States, to reduce pro-Republican bias without drawing districts that "amble about the state and divide municipalities so as to create districts that had less overwhelming Democratic support" (page 17). In the next sentence, he bases this claim directly on a lengthy quotation from my book. It is useful to review this quotation in context. I reproduce it here.

"The details of political geography are crucial. In a context like western Pennsylvania at the scale of congressional districts, where Democrats are highly concentrated in a big city, to achieve a seat share that is anywhere near its vote share, the Democrats would need a redistricting process that intentionally carved up large cities like pizza slices or spokes of a wheel, so as to combine some very Democratic urban neighborhoods with some Republican exurbs in an effort to spread Democrats more efficiently across districts."

Tellingly, Dr. Barber's use of this quotation omits the first sentence and most of the second sentence, beginning with "The Democrats," making it appear that those words are the beginning of the sentence. As the first sentence of the full quotation shows, the purpose of this paragraph was to point out not a universal rule, but precisely the opposite. I went on in the following paragraph to point out that "there are also settings, like eastern Pennsylvania at the scale of congressional districts, where the size and distribution of Democratic cities is such that a nonpartisan redistricting

process would serve them (the Democrats) reasonably well. Without partisan manipulation, Democratic suburbs and cities in eastern Pennsylvania would string together to form Democratic districts. In that setting, the only way to produce substantial Republican advantage is through artful gerrymandering" (p. 156).

Throughout the book, I emphasize important heterogeneity in the role of political geography across states, regions, and spatial scales. Nowhere does the book claim that it is universally impossible, or even difficult, to draw fair redistricting plans that respect traditional redistricting principles.

Moreover, it is not the case that one must intentionally focus on partisanship to arrive at a fair redistricting plan. Partisan fairness often goes hand in hand with the preservation of communities of interest. For instance, as described above, minority voters have been moving from the urban core to suburbs in many cities. Consider, for instance, a redistricting plan that included minority voters in the urban core with those in the suburbs using relatively compact districts that hold jurisdictions and neighborhoods together. Such a district might produce a Democratic district that would not have emerged in an alternative arrangement where the inner-ring suburban minority neighborhoods had been hived off from the city and surrounded in a mostly rural district.

Or consider a swath of suburbia composed of four small municipalities with a relatively large minority population. One arrangement might keep that swath together in a single state legislative district. Another arrangement might divide the minority group in half, combining two of the municipalities with neighboring white municipalities, and doing the same with the other two. These arrangements might be equally respectful of municipal boundaries and equally compact, but with different implications for both communities of interest and ultimately the partisanship of the districts.

Or instead of race or ethnicity, consider the metropolitan geography of education and employment. One suburban districting scheme might keep clusters of young knowledge-economy workers together in a single district, while another, with a similar level of compactness and municipal splits, might spread them among two relatively rural districts. Again, choices made by district-drawers with knowledge of local communities might create districts that are less biased against Democrats than a naïve computer algorithm that lacks such information.

VI. BARBER FAILS TO PROVIDE EVIDENCE THAT THE FINAL HOUSE PLAN UNDERMINES TRADITIONAL REDISTRICTING PRINCIPLES

In sum, it is simply not the case that because of its current political geography, it is necessary to "amble around the state" (p. 17, Barber Report) and "pinwheel" and "pie-up" municipalities (p. 18) in order to minimize pro-Republican bias. And as clarified above, the Commission did not, in fact, minimize pro-Republican bias; its plan is still notably biased in favor of the Republican Party. But the main question is empirical rather than theoretical: Does Dr. Barber provide any evidence of pinwheels, pie-slices, or non-compact, ambling districts that contradict traditional redistricting principals to favor Democrats?

In fact, all of Dr. Barber's evidence points very strongly in the opposite direction. Dr. Barber explained that he used an algorithm that attempted to generate plans that were as compact as possible while also minimizing splits of counties and municipalities. Dr. Barber's algorithm, however, failed to reduce the number of county and municipal splits to match the Final House Plan. In Table 1 of his report, Dr. Barber reveals that the median simulation split 46 counties, but the Final House Plan actually performed *better,* splitting 45 counties. Moreover, Table 1 reveals that the number of municipalities split, as well as the total number of municipal splits, was substantially lower than the entire range of his simulations. That is to say, the Final House Plan split fewer municipalities than even the very best of his 50,000 simulations, leading Dr. Barber to comment that "the proposal appears to perform well at having few municipal splits." Indeed, the Final House Plan is also more compact than all of Dr. Barber's 50,000 plans.

The central claim of Dr. Barber's report is that in order to produce more Democratic seats than the modal computer-generated plan, relative to the "unbiased" simulations, the Commission sacrificed compactness and the unity of municipalities. Yet, this simply cannot be, since the Final House Plan is more compact, and splits fewer municipalities, than *any* of the simulated plans.

Dr. Barber moves beyond the quantitative statewide analysis, focusing instead on a series of case studies. First, he makes an interesting observation: the number of Democratic-leaning seats in Philadelphia and Allegheny Counties is exactly the same as the modal outcome in the simulations, which, in his framework, indicates that districts in those counties were not drawn for partisan gain. His assertions about ambling, pinwheeling, and pie-ups are limited to the Lehigh Valley, the Scranton-Wilkes-Barre corridor, Lancaster, Reading, Harrisburg, and State College (see Table 2 of his report).

Specifically, his claim is that some Democratic cities contained a split that was not strictly necessary given the city's population. However, this simple observation means very little when divorced from the myriad other considerations facing district-drawers, including those specified in the Pennsylvania Constitution. In some instances, the split of a larger city allowed for fewer splits of surrounding municipalities. In others, such splits facilitated fewer transgressions of county boundaries. In other cases, by splitting a city, the Commission prevented the emergence of non-contiguities in the districts that are present in the structure of the boundaries of cities and vote tabulation districts that have very odd boundaries as a result of the haphazard process of historical annexations. Relatedly, in several cases these splits facilitated a more compact set of districts in the area. And finally, in some cases, these splits facilitated the preservation of communities of interest that spill over from larger cities to their neighboring municipalities.

Scranton and Wilkes-Barre

First, consider the counties of Lackawanna and Luzerne—home to Scranton and Wilkes-Barre. Scranton is larger than the size of a district, and it must be split once, and indeed, this is the case in the Final House Plan. Wilkes-Barre is smaller than the size of a House legislative district and need not be split. Indeed, it is not split in the Final House Plan. It is very difficult to understand what aspects of the Final House Plan in the Scranton-Wilkes-Barre corridor are deemed to be violations of traditional redistricting principles that may have been carried out to favor a political party.

Dr. Barber does not provide any of his computer-generated plans to use as a comparison map that he deems to be non-partisan, but he does endorse the Benninghoff Plan. Figure 1 provides images of both the Commission's map and the Benninghoff Plan. At first glance, the two maps look rather similar. However, upon closer inspection, we can see that the Final House Plan only splits Scranton once, placing part of the city in District 113 and part in District 114. The Benninghoff Plan, in contrast, splits Scranton between four districts: 113, 114, 112, and 118. Moreover, in the Final House Plan, Scranton is the only split in either Lackawanna or Luzerne Counties, whereas in addition to its multiple splits of Scranton, the Benninghoff Plan also splits Moosic Township in Lackawanna and West Pittston in Luzerne. Nor is the Benninghoff Plan more compact than the Final House Plan.[4]

In sum, in the Scranton-Wilkes-Barre corridor, which according to Table 2 in Dr. Barber's report, produces two more Democratic-leaning seats than the modal computer-generated plan, it is very difficult to see evidence of meandering, non-compact districts, pie-slices, or pinwheels. If anything, the Final House Plan conforms more clearly with traditional redistricting principles than does the alternative offered by Representative Benninghoff.

---

[4] The average Reock score for the districts of the Commission's plan in Lackawanna County is .42, whereas the average for the Benninghoff Plan is .39, indicating that the Commission's Plan is more compact. Using the Polsby-Popper score, however, the pattern is reversed, indicating that we cannot draw clear conclusions that one plan is more compact than the other. In Luzerne, the Commission's Plan is slightly more compact on average according to the Reock score (.41 versus .39), but the two plans are quite similar according to the Polsby-Popper score.

Figure 1: Scranton and Wilkes-Barre

Final House Plan
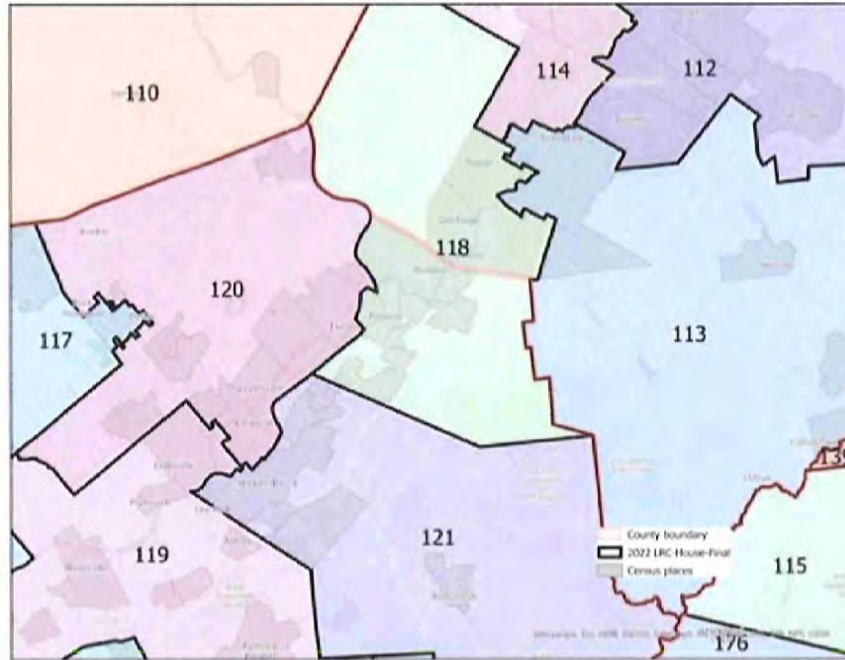
Benninghoff Plan
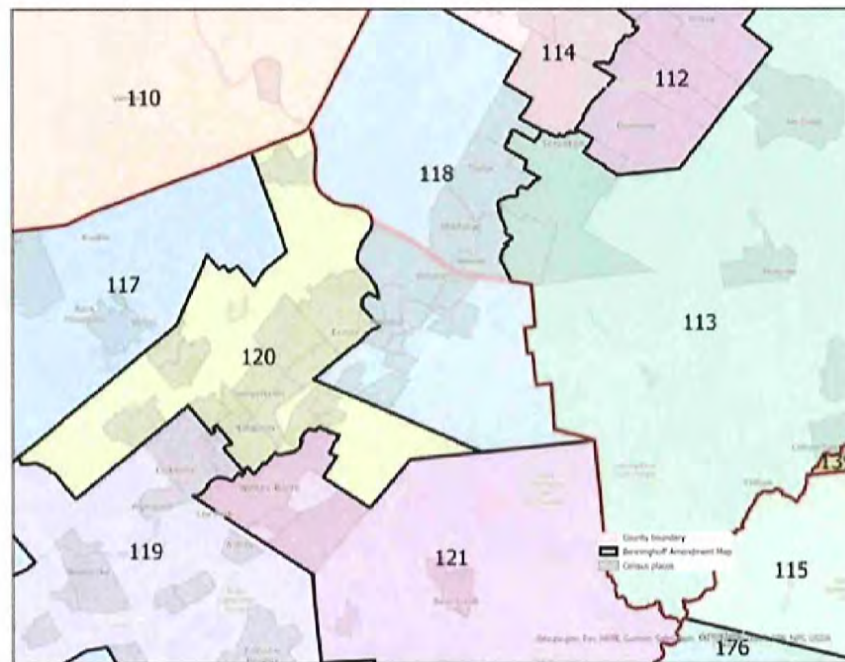
Lancaster

Next, let us consider Lancaster City and its surrounding communities. Again, Dr. Barber includes maps of districts that do not raise any red flags regarding traditional redistricting principles upon initial visual inspection. His only claim appears to be that since the city of Lancaster has a population just below the ideal population size of a Pennsylvania House district, it should be included in a single district. However, again, since he does not provide any other arrangements or discuss possible trade-offs associated with a single-district approach, it is difficult to know what to make of this critique. Figure 2 provides images of the Lancaster-area districts in the Commission's map and again, the Benninghoff Plan.

Let us begin with the Final House Plan. Note that there are two non-contiguous fragments of District 41 that appear as islands in District 96. This is because of the arrangement of townships and cities where, due to haphazard patterns of city annexation and incorporation over time, some vote tabulation districts—the basic building block of legislative districts in Pennsylvania—are themselves non-contiguous or separated from the rest of the municipal entity to which they belong. These non-contiguities are clearly undesirable, given possible confusion among residents of the isolated islands and possible mistakes in election administration. But these non-contiguities may under some conditions be unavoidable when drawing districts in Pennsylvania if attempting to keep vote tabulation districts whole.

By looking at the Benninghoff Plan, we can appreciate why it may be undesirable to create a single Lancaster district whose shape is dictated by the city boundaries. Not only does this produce a non-compact district with several appendages, claws, and arms, but it also creates a very large number of non-contiguities, especially amongst the Northern appendages of the city. To see this more clearly, Figure 3 zooms in on this area, demonstrating that by keeping Lancaster whole, Leader Benninghoff was forced to produce a very large number of "stranded" neighborhoods that are disconnected from the rest of the district. In my experience working on redistricting in the United States, I do not recall seeing that a district like this has been implemented.

A simple way to minimize the number of non-contiguities is to give up on the project of keeping Lancaster whole, instead combining sections of the city with surrounding townships whose vote tabulation districts are partially embedded in the city. This is the approach taken in the Final House Plan. Not only does this dramatically reduce the number of non-contiguities, but it also allows Lancaster Township to stay whole, rather than splitting it, as the Benninghoff Plan does. Another obvious advantage to the Commission's approach is compactness. The Polsby-Popper score of the Benninghoff Lancaster district (number 96) is only .05, whereas the average for the two Lancaster districts in the Final House Plan (96 and 49) is .17.

Again, as with Scranton and Wilkes-Barre, it is very difficult to see how the Lancaster area in the Final House Plan can be understood to be violative of traditional redistricting principles for partisan gain.

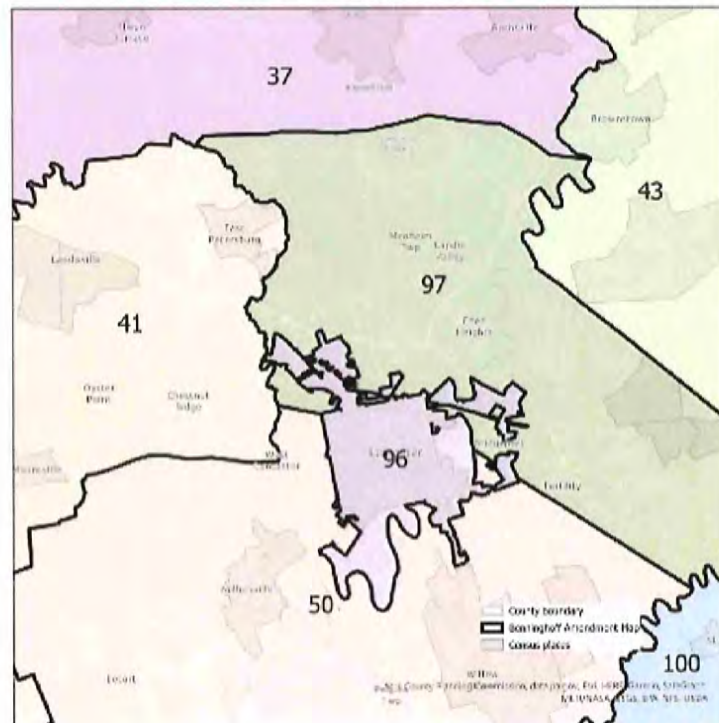**Figure 2: Lancaster**
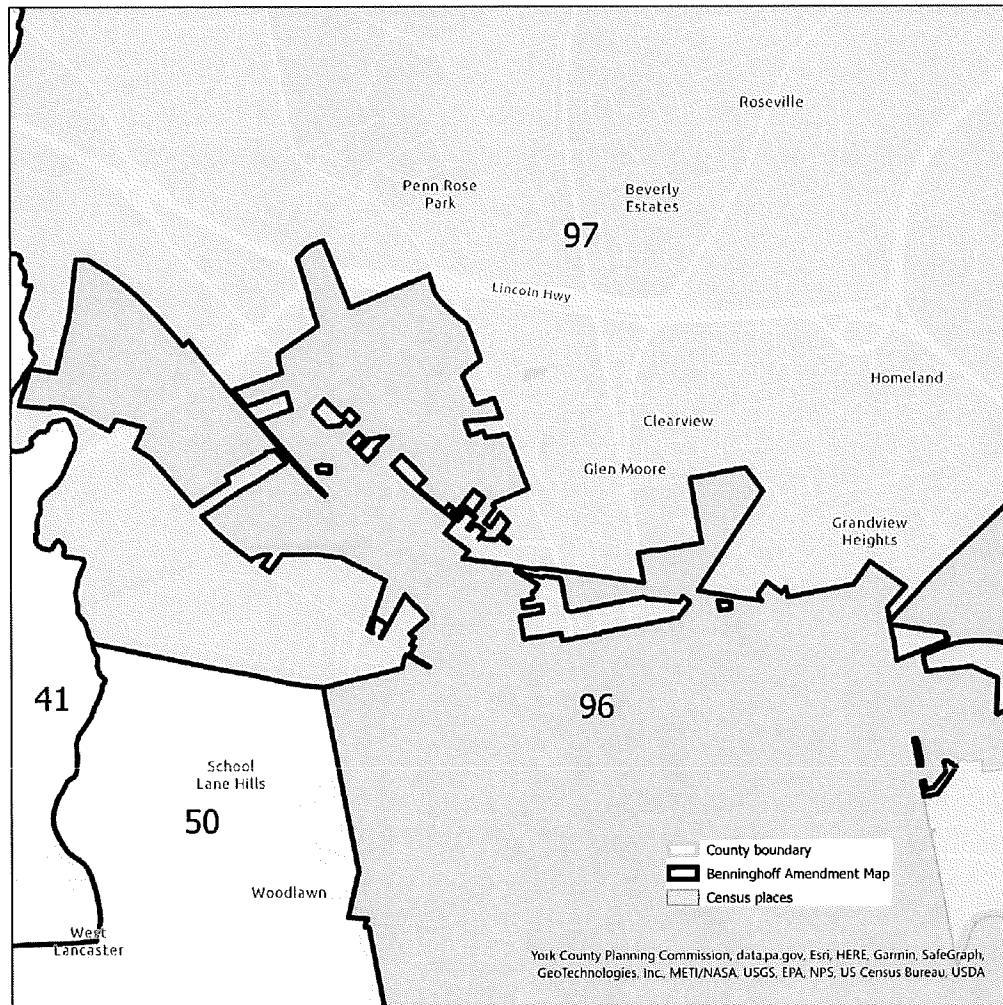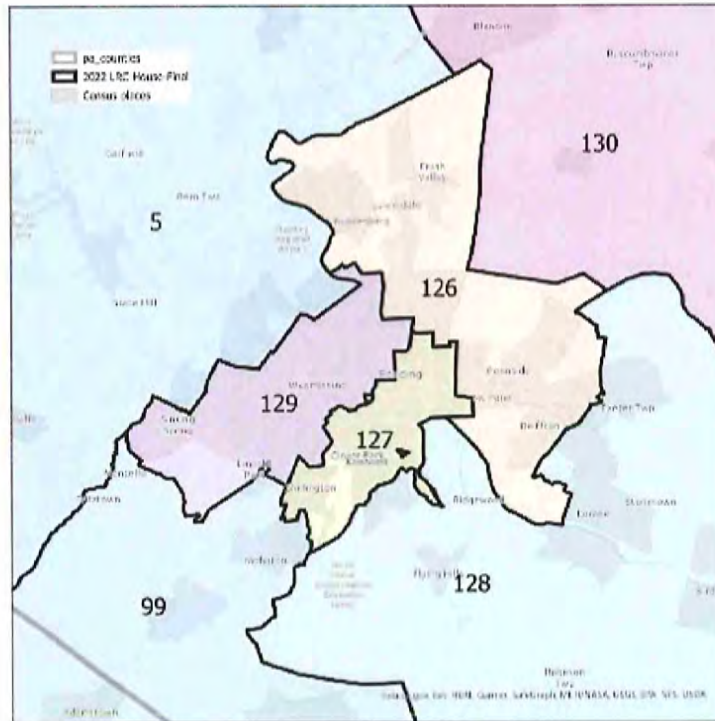
Final House Plan
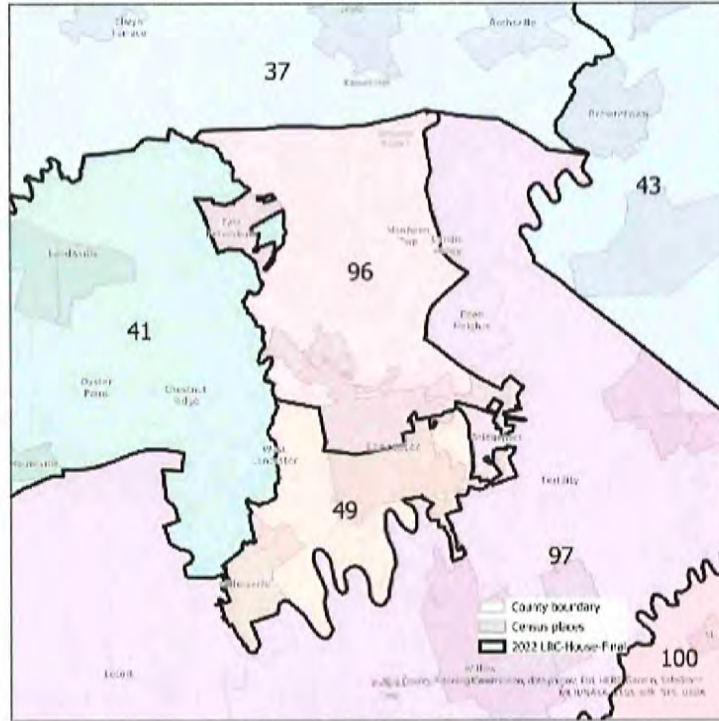
Benninghoff Plan

**Figure 3: Northern Lancaster City, Benninghoff Plan**

Reading

Dr. Barber also points to the city of Reading, referring to the districts as having a "pinwheel" shape that combines urban neighborhoods with distant suburbs. The Final House Plan's Reading districts, along with those in the Benninghoff Plan, are displayed in Figure 4. Comparing the two maps, it is not clear why Dr. Barber considers the Final House Plan to have a pinwheel shape. The Commission's approach to Berks County led to a more compact arrangement to the Southwest, and one that required fewer splits of the Berks County boundary (2) than the Benninghoff Plan (3).
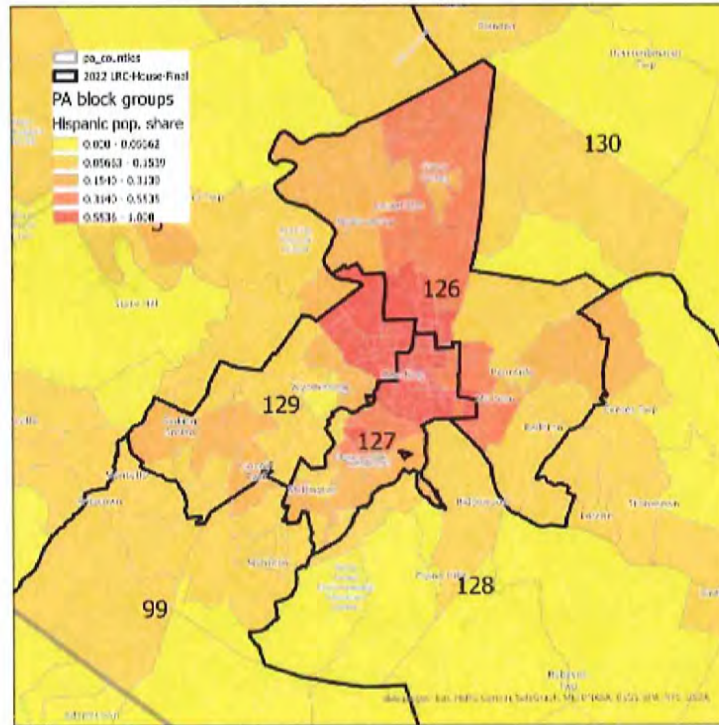
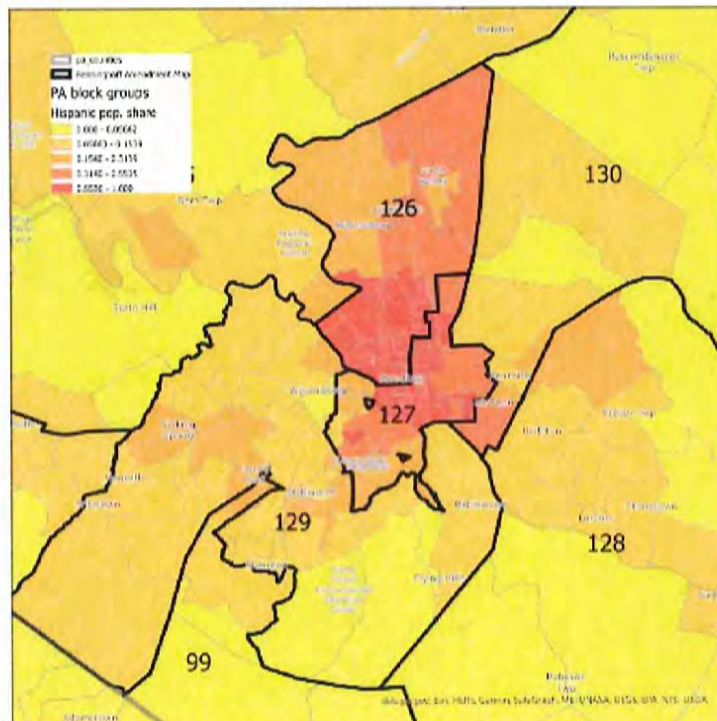## Figure 4: Reading
Final House Plan
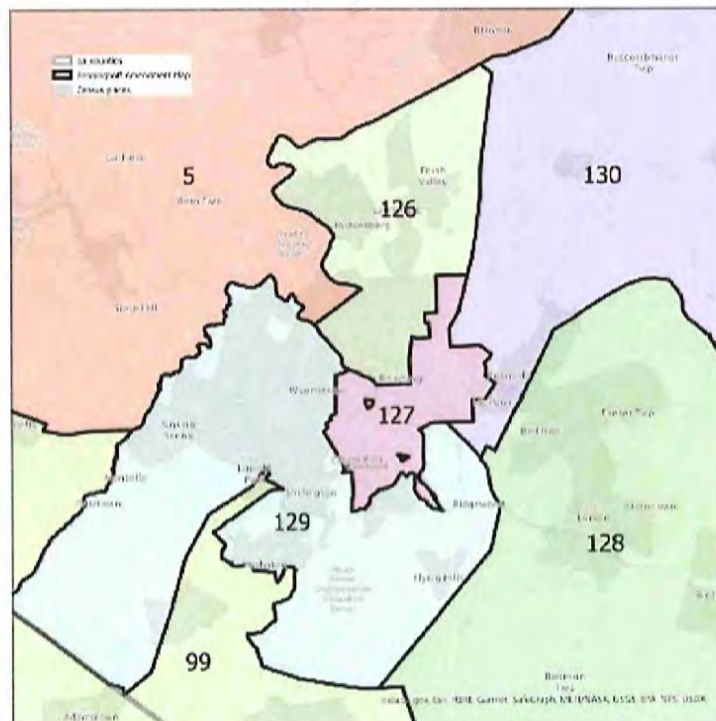
Benninghoff Plan

Figure 5: Hispanic Population Share, Reading

Final House Plan

Benninghoff Plan

Another feature of the Final House Plan can be appreciated with Figure 5, which adds a display of Hispanics as a share of the total population in each census block group. It demonstrates that there is a significant Hispanic population not only in Reading proper, but also in a series of suburban communities on both the East and West sides of the city. The Benninghoff Plan splits the suburban Hispanic community on the East side into four different districts: 126, 127, 128, and 130. District 130 reaches from the rural periphery all the way to the Reading border, extracting Mount Penn and its surroundings, and splitting the communities of Pennside and Stony Creek Mills along the way. In contrast, the Final House Plan keeps all of these suburban communities in the same district: 126.

Lehigh Valley

Next, let us consider the Lehigh Valley. Dr. Barber has no complaints about the boundaries of Easton or Bethlehem. However, Dr. Barber makes a claim about Allentown that is very similar to his claim about Lancaster. Since the population of Allentown is very slightly less than twice the target population for a district, he concludes that it must be divided into two districts. But as in Lancaster, this introduces a difficult trade-off related to compactness that can be appreciated by examining Figure 6. When trying to fit Allentown into only two districts, a district-drawer is placed into a straitjacket by its municipal boundaries. In the Benninghoff Plan, for instance, Districts 132 and 134 are forced into a very non-compact arrangement, whereas the Final House Plan, by splitting Allentown, was able to pursue a more compact arrangement, avoiding a highly non-compact district like Benninghoff's 134, which reaches all the way across the county via a narrow corridor that circumvents Allentown. This is a classic example of a basic trade-off in redistricting necessitating a municipal split.

Harrisburg

Harrisburg provides another example of this same trade-off. Harrisburg's population is somewhat lower than the target population of a district, so it is possible to keep it whole and combine it with other smaller communities in the vicinity. However, due to the narrow, non-compact arrangement of the city along the banks of the Susquehanna, and because of the structure of the borders of Dauphin County, this choice has knock-on effects when one is also trying to minimize county splits and avoid splitting other communities. This can be visualized in the second panel of Figure 7 below. In addition to the Harrisburg district, other surrounding districts, especially 104 and 125, are forced into a less compact arrangement in the Benninghoff Plan than in the Final House Plan, which splits Harrisburg in exchange for a more compact arrangement. The average Reock score for Dauphin County districts in the Final House Plan is .44, whereas it is .37 in the Benninghoff Plan. The average Polsby-Popper Score for Dauphin County is .32 in the Final House Plan, and .30 in the Benninghoff plan.

18

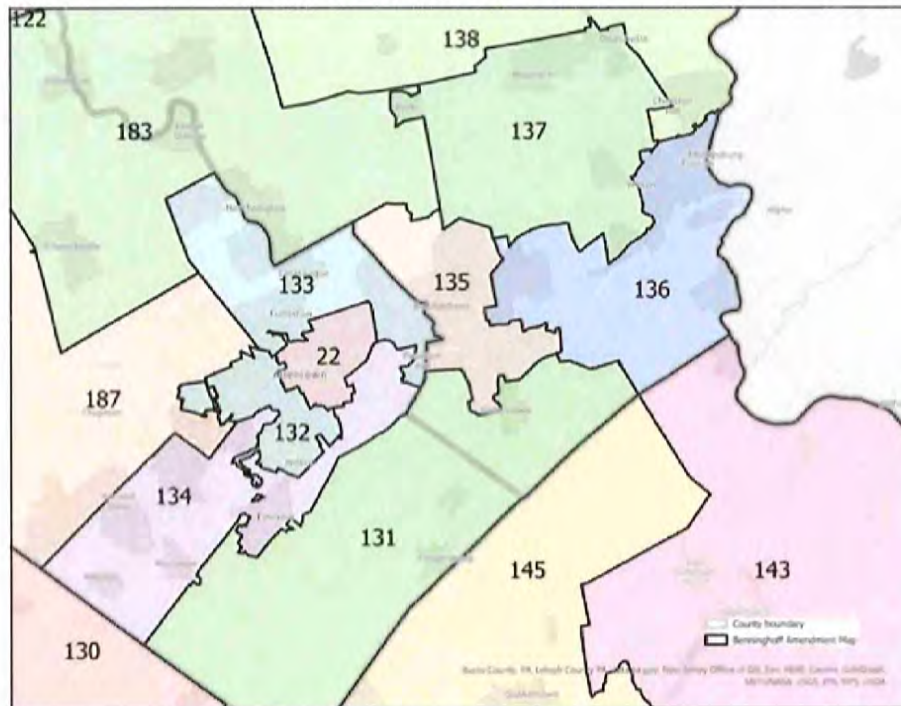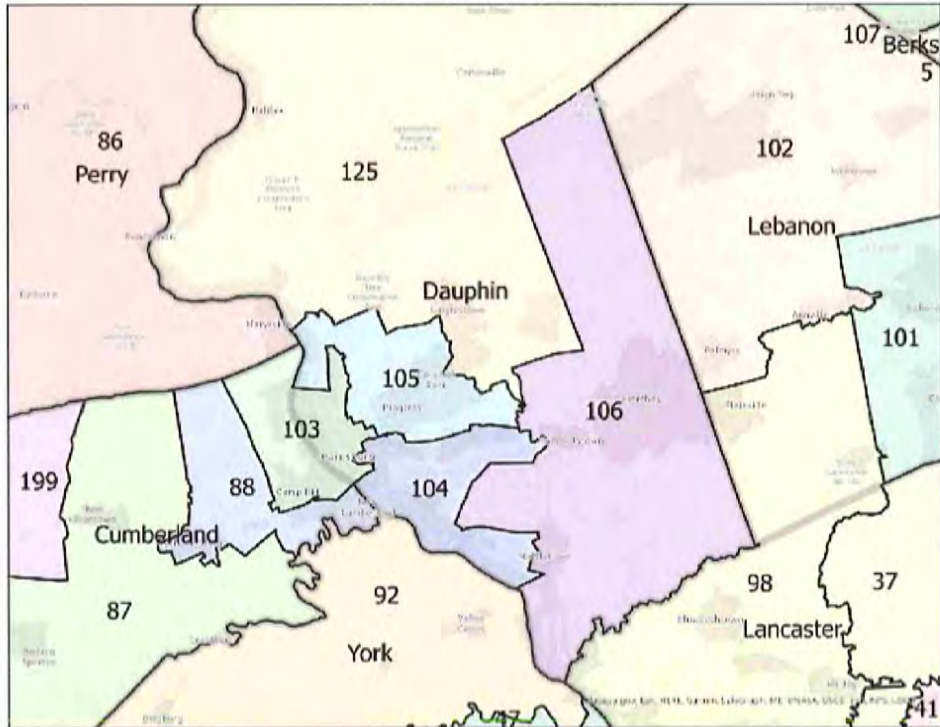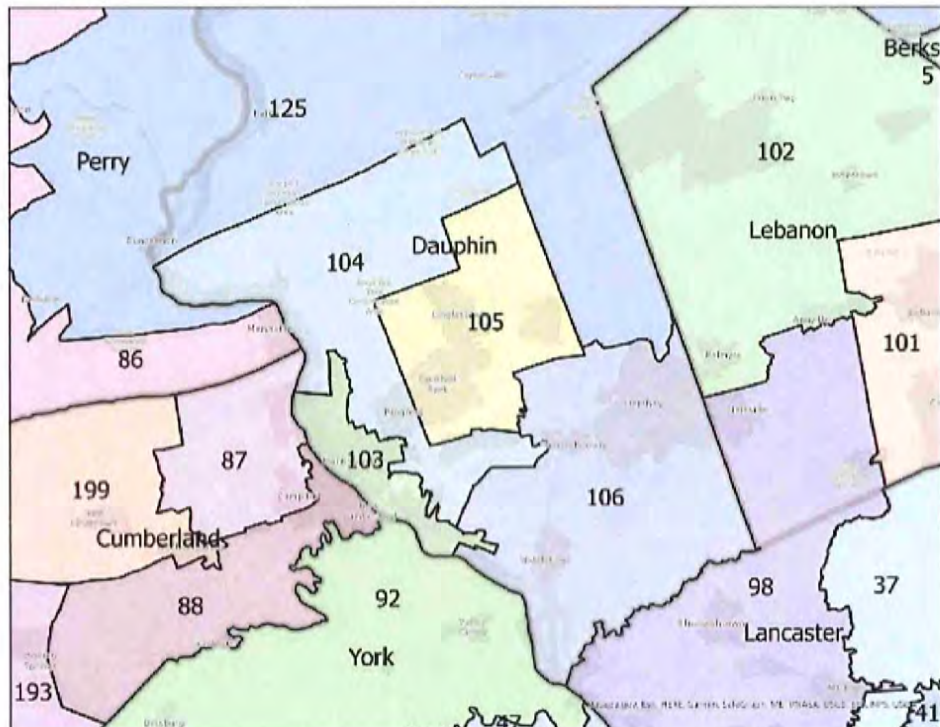**Figure 6: Lehigh Valley**
Final House Plan
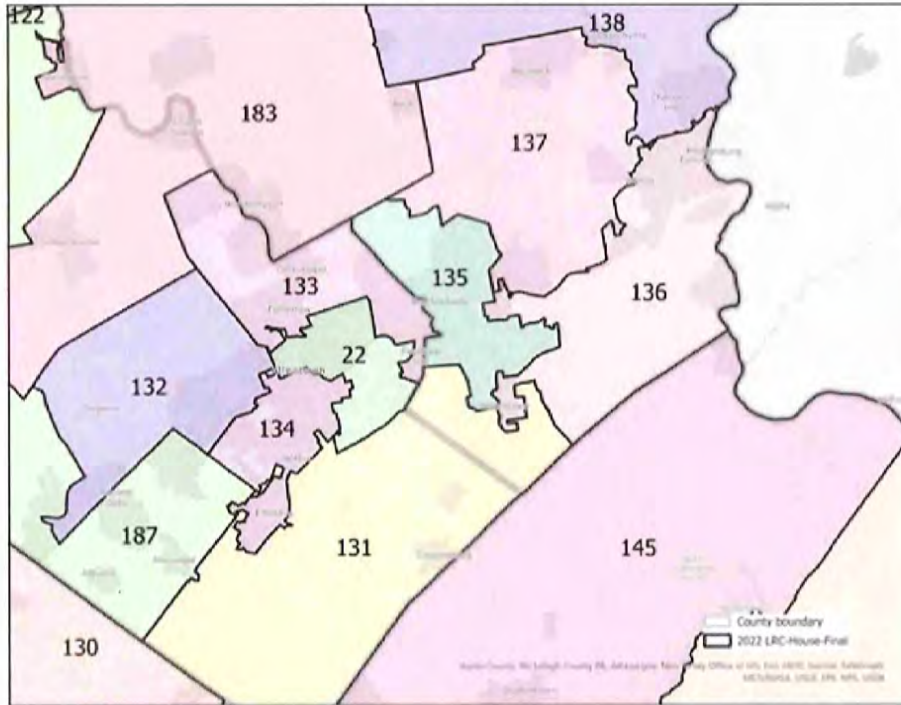
Benninghoff Plan

Figure 7: Metro Harrisburg

Final House Plan

Benninghoff Plan

Summary of Case Studies

Due to time constraints, I have not been able to provide an exhaustive assessment of the metropolitan districts in the Final House Plan or the Benninghoff Plan. Rather, based on an illustrative exploration of several of Dr. Barber's case studies, I have evaluated his claim that by simply visualizing maps of selected metro-area districts and considering the number of splits relative to city population counts, one can infer that traditional redistricting principles were subverted for partisan gain.

Dr. Barber's main observation is that in the Final House Plan, population counts indicate that districts could have been drawn in a handful of cities with one split fewer. However, the case studies discussed above reveal that divorced from other considerations like compactness, communities of interest, county boundaries, and splits of other surrounding municipalities, this observation tells us very little about whether, from the perspective of the Pennsylvania Constitution or traditional redistricting principles more broadly, these splits were necessary. In the illustrative cases reviewed above, removing the extra split would have involved a variety of countervailing compromises of other constitutional redistricting criteria.

VII.   CONCLUSION

Dr. Barber's report does not provide any evidence that the Commission's redistricting plan is biased in favor of the Democratic Party. In fact, likely because of aspects of Pennsylvania's political geography, it is somewhat biased in favor of the Republican Party. Dr. Barber's central claim appears to be that traditional redistricting criteria must have been subverted when drawing the Final House Plan because it is *insufficiently biased* in favor of Republicans relative to the modal plan in an ensemble of computer-generated plans. This claim is difficult to understand, since the Final House Plan outperformed the entire ensemble of simulations on measures of county splits, municipal splits, and compactness.

Furthermore, Dr. Barber's report points out a handful of specific instances where the Commission carried out a single additional city split beyond what was technically necessary. However, upon closer inspection, these choices reflected basic trade-offs that are well known in the redistricting community, above all between limiting municipal splits to situations of absolute necessity and 1) compactness; 2) contiguity; 3) county splits; and 4) the preservation of communities of interest.

I reserve the right to supplement or amend this Report to best inform the Court of my opinions and conclusions.

Jonathan Rodden, Ph.D.
March 10, 2022

21

Exhibit D

SUPPLEMENTARY EXPERT REPORT
Kosuke Imai, Ph.D.
March 9, 2022

Table of Contents

I.   INTRODUCTION AND SCOPE OF WORK

1.   My name is Kosuke Imai, Ph.D., and I am a Professor in the Department of Government and the Department of Statistics at Harvard University. I specialize in the development of statistical methods and computational algorithms and their applications to social science research. I am also affiliated with Harvard's Institute for Quantitative Social Science. My qualifications and experiences are described in my initial report (hereafter "initial report") on this matter submitted to the Pennsylvania Legislative Reapportionment Commission, entitled "Written Testimony Regarding the Preliminary State House Plan from the Pennsylvania Legislative Reapportionment Commission" (January 14, 2022).

2.   I have been engaged by counsel to statistically analyze relevant data and provide my expert opinions on whether the final State House plan approved by the Pennsylvania Legislative Reapportionment Commission (hereafter "final House plan") is a partisan gerrymander. In addition, I have been asked to comment on Professor Michael Barber's final expert report, entitled "Report on Redistricting Plan for the Pennsylvania House of Representatives of the Pennsylvania Legislative Reapportionment Commission," which presents the results of his race-blind redistricting simulation analysis regarding the final House plan. I have also reviewed the March 4, 2022 Report of Dr. Mark A. Nordenberg who served as the chair of the Pennsylvania Legislative Reapportionment Commission.

3.   In my initial report, I conducted three separate simulation analyses to evaluate the possible partisan bias of the preliminary State House plan (hereafter "preliminary House plan"). Specifically, I conducted a *race-blind simulation analysis* that uses no information about race but incorporates other criteria in the Pennsylvania Constitution. I also conducted two simulation analyses that consider race, in addition to constitutional criteria, when generating simulated plans. The first simulation analysis, which is referred to as the *Simulation A analysis*, ensures that, in addition to constitutional criteria, every simulated plan identifies a certain number of majority black and majority Hispanic districts. I also conducted a second simulation analysis, which I refer to as the *Simulation B analysis*. This simulation analysis ensures that every simulated plan includes a

3

certain number of majority-minority districts (MMDs). These MMDs include coalition districts as well as majority black and majority Hispanic districts. For both *Simulation A and B analyses*, the targets were based on the relevant aspects of the preliminary House plan.

4.   In this report, I evaluate the final House plan by conducting the same three simulation analyses as done in my initial report, but with one important improvement over my previous simulations. In particular, I was able to instruct the algorithm to further reduce the number of split municipalities and the total number of municipality splits under the simulated plans so that they are similar to the corresponding numbers under the final House plan. The consideration of municipality splits is important because Article II, § 16 of the Pennsylvania Constitution states that "Unless absolutely necessary no county, city, incorporated town, borough, township or ward shall be divided in forming either a senatorial or representative district." Due to time constraints, I did not make this improvement to the simulation algorithm that I used to evaluate the preliminary House plan. This improvement was partially informed by the Commission's prioritization of splitting larger municipalities as referenced in Dr. Nordenberg's Report.

5.   It is also important to note that Professor Barber's simulated plans split many more municipalities than the final House plan. The median number of split municipalities under his simulated plans is 82, which is more than 45% greater than 56 municipalities split under the final House plan. Indeed, as pointed out by Dr. Nordenberg, *"not one* of his 17,537 simulations has as few split municipalities as the Commission's Final Plan. [...] This also raises questions about his methodology" (emphasis added).[1] Thus, my improved *race-blind* simulation analysis allows me to investigate whether or not Professor Barber's conclusion holds up once the number of split municipalities is reduced to the range similar to that of the final House plan. Furthermore, I examine the partisan implications of considering race, in addition to constitutional criteria, in the final House plan by comparing the conclusions of my *race-blind* simulation analysis with those of *Simulation A and B analyses* that incorporate the information about race.

6.   As done in my initial report, for each of the three simulation analyses, I generated

---

1. Report of Mark A. Nordenberg, Chair of the 2021 Pennsylvania Legislative Reappointment Commission, Regarding the Commission's Final Plan. footnote 33.

a representative set of 5,000 alternative plans that could be drawn under the corresponding set of redistricting criteria. I then compared the likely number of Democratic districts under the final House plan with that under each set of 5,000 simulated plans. I could generate more simulated plans by running the algorithm longer, but 5,000 simulated plans yield sufficiently precise conclusions for the purpose of my analysis. To make my results comparable with those of Professor Barber's report, I used the same set of all statewide elections between 2012 and 2020 to compute the likely number of Democratic districts under each plan. In addition, I also include the results based on the 2016-2020 statewide elections, which were used by Professor Barber in his previous reports.

II.   SUMMARY OF OPINIONS

7.   My analysis of the final House plan yields the following findings:

- My *race-blind simulation analysis*, which keeps both the number of municipality splits in the simulated plans comparable to that of the final House plan, shows that the final House plan is not a partisan gerrymander. This important finding contradicts the conclusion of Professor Barber's race-blind simulation analysis, which has many more municipality splits than either the final House plan or my *race-blind* simulated plans. Comparison of this result with the previous finding from my initial report, which analyzed the preliminary House plan, implies that focused compliance with the Pennsylvania Constitution's requirement to minimize municipality splits is critical when assessing the partisan bias of the final House plan.

- My *Simulation A analysis*, which keeps the number of municipality splits in the simulated plans comparable to that of the final House plan, shows that additionally ensuring a certain number of majority black and majority Hispanic districts under each simulated plan leads to the same conclusion as the race-blind simulation analysis: the final House plan is not a partisan gerrymander. This result contradicts the conclusion of Professor Barber's race-blind simulation analysis but is consistent with the previous finding from my initial report.

- My *Simulation B analysis*, which keeps the number of municipality splits in the simulated plans comparable to that of the final House plan, shows that additionally ensuring a certain number of majority-minority districts under each simulated plan leads to the same conclusion as the race-blind simulation analysis: the final House plan is not a partisan gerrymander. This result contradicts the conclusion of Professor Barber's race-blind simulation analysis but is consistent with the previous finding from my initial report.

- All of my three simulation analyses, regardless of whether and how they consider race in addition to constitutional criteria, lead to the same conclusion that the final House plan is not a partisan gerrymander. This implies that the additional consideration of race along with the constitutional criteria in the final House plan does not favor any political party.

In sum, based on my analysis of the final House plan, I reject the conclusion drawn by Professor Barber that the final House plan is a partisan gerrymander.

III.   METHODOLOGY

8.   I conducted *race-blind* and alternative simulation analyses to evaluate the partisan outcomes expected under the final House plan. The *race-blind* and alternative simulation analyses I conducted only differ in terms of whether race was used as an additional input to the simulation algorithms with the constitutional criteria. The key difference between these simulation analyses and the corresponding simulation analyses described in my initial report is that the current simulation analyses yield simulated plans with the number of municipality splits comparable to that of the final House plan. This is achieved by placing additional constraints that reduce the number of split municipalities as well as the number of municipality splits. Otherwise, the simulation setups used in this report are essentially identical to those used in my initial report. Below, I provide a brief overview of my simulation analysis setups while leaving the details to Appendix A.

A.   Race-blind Simulation Setup

9.   The first set of 5,000 alternative plans were generated without any consideration of race. I call them *race-blind* simulated plans. My race-blind simulation procedure generated 5,000

alternative plans under the following five reapportionment criteria based on Article II § 16 of the Pennsylvania Constitution:

- there are a total of 203 geographically contiguous districts
- all districts do not exceed an overall population deviation of $\pm$ 5%
- simulated plans are encouraged to be more compact
- simulated plans are encouraged to split fewer number of counties
- simulated plans are encouraged to split fewer number of municipalities
- simulated plans are encouraged to have fewer number of municipality splits

10.   In my initial report, I explained that I had been unable to replicate Professor Barber's race-blind simulation analysis because his previous report did not specify the exact algorithm, constraints, and parameter values used in his analysis. Unfortunately, Professor Barber's latest report suffers from the same problem. Although his race-blind simulation analysis is based on the open-source software package `redist` (Kenny et al. 2020), which I developed with my collaborators, Professor Barber does not provide sufficiently detailed information about his algorithmic choices, again making it impossible for me to replicate his analysis.

B.   Alternative Simulation Setups Considering Race

11.   I also generated two alternative sets of 5,000 simulated plans using the information about race. As explained in my initial report, in addition to the constitutional criteria, I instructed my simulation algorithm to create the specified number of majority-minority districts (hereafter "VRA-related districts"), but otherwise followed the same redistricting criteria as the race-blind simulation procedure used for the first set. Like my race-blind analysis, these alternative simulation analyses do not use partisan information when generating simulated districts.

12.   I conducted two alternative simulation analyses that incorporate the consideration of race in addition to constitutional criteria. The *Simulation A analysis* ensures that every simulated plan has a total of 8 majority black districts and 4 majority Hispanic districts. I also conducted the so-called *Simulation B analysis,* which instructs the simulation algorithm to generate a total of 25 majority-minority districts (MMDs) in every simulated plan. These MMDs include 13 coalition

7

districts as well as the same set of 8 majority black and 4 majority Hispanic districts included in the *Simulation A* analysis. Other than the difference in the use of VRA-related districts, these two alternative sets of 5,000 simulated plans were generated under the same set of redistricting criteria listed above including the constitutional criteria.

C.   Partisan Outcome Measure

13.   To measure the partisan outcome under a given plan, I exactly follow Professor Barber's approach and compute the likely number of Democratic districts. Although there are other ways to measure partisan outcomes and biases under redistricting plans, this allows me to directly compare the results of my simulation analysis with those presented in Professor Barber's report. Specifically, I first tally a set of vote totals for each party at the precinct level across all statewide elections between 2012 and 2020, which were used by Professor Barber. Then, under a given redistricting plan, I calculate the number of districts out of the 203 total districts where Democrats have more votes than Republicans. This yields the total number of Democratic districts given the plan and election.[2] For the sake of completeness, I also report the results based on all statewide elections between 2014 and 2020, which were used by Professor Barber in his previous reports. The data sources are described in my initial report, whereas the information about the final House plan was obtained from the website of the Pennsylvania Legislative Reapportionment Commission.

IV.   EMPIRICAL FINDINGS REGARDING THE FINAL HOUSE PLAN

14.   I now present the results of my simulation analysis. I begin by discussing the results of my *race-blind* simulation analysis and then show the findings from my two alternative simulation analyses.

A.   Race-blind Simulation Analysis Results

15.   Figure 1 presents the likely number of Democratic districts across 5,000 *race-blind* simulated plans (grey histograms), using the 2012–2020 (left plot) and 2014–2020 (right plot)

---

2. Applying this method to my data, my calculation yields 106 Democratic districts whereas Professor Barber reports 107 districts. The cause of this small discrepancy is unclear, but it does not affect my conclusions.
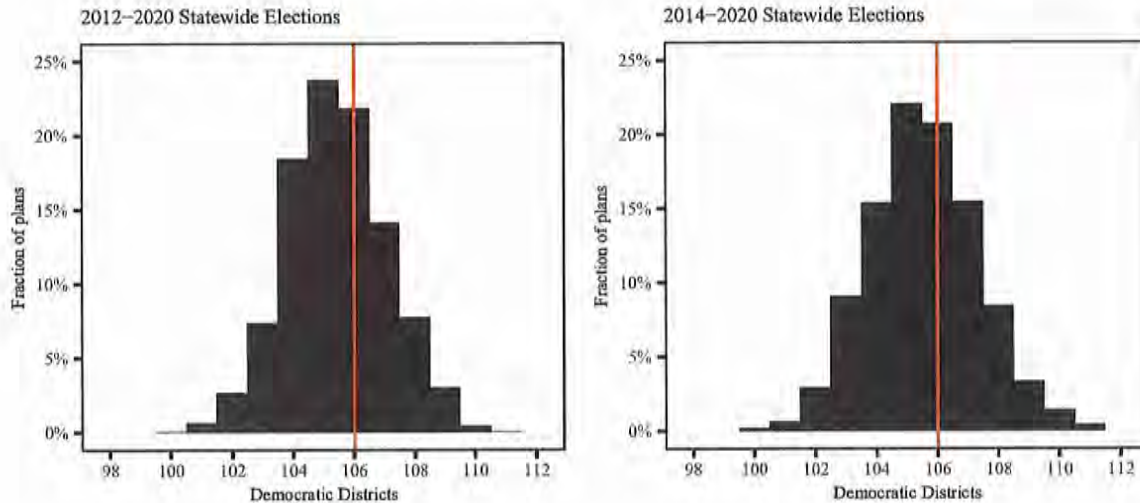
Figure 1: The likely number of Democratic districts across 5,000 *race-blind* simulated plans. Democratic districts are tallied based on an average of statewide elections for the 2012–2020 cycles (left) and the 2014–2020 cycles (right). The red vertical lines represent the results under the final House plan, which fall well within the simulation ranges.

statewide elections. The figure shows that according to the *race-blind* simulation, the most likely number of Democratic districts is 105, regardless of which election set I use. The expected number of Democratic districts under the final House plan (red vertical lines) is 106, which is well within the simulation ranges. In fact, under my *race-blind* simulation, the most likely number of Democratic district is greater by 8 districts than the corresponding number under Professor Barber's simulation analysis. Similarly, under my *race-blind* analysis the expected number of Democratic districts ranges from 100 to 111, whereas this range is [90, 105] under Professor Barber's analysis.

16.   The results imply that the final House plan is not a partisan gerrymander even without any consideration of race, sharply contradicting the conclusion of Professor Barber's race-blind simulation analysis.

17.   As mentioned earlier, I was unable to replicate Professor Barber's findings in part due to the lack of detailed information about the exact specification of his simulation analysis. This makes it difficult for me to figure out the exact reason why my *race-blind* simulation analysis differs from Professor Barber's race-blind simulation analysis.

	Final House plan	My race-blind simulation		Professor Barber's simulation	
		median	range	median	range
Split municipalities	56	51	[39, 66]	82	[61, 105]
Municipality splits	92	100	[84, 116]	119	[98, 140]

Table 1: Number of Split Municipalities and Number of Municipality Splits under the Final House and Simulated Plans. My race-blind simulation splits a fewer number of municipalities and generates a fewer number of municipality splits than Professor Barber's race-blind simulation. The corresponding numbers under the final House plan are well within my simulation ranges. In contrast, none of Professor Barber's simulated plans has as few split municipalities and municipality splits as the final House plan.

18.   One key difference, however, is that, as shown in Table 1, Professor Barber's simulated plans split many more municipalities and generate a greater number of municipality splits than my *race-blind* simulated plans. For example, the median number of split municipalities is 60% greater under Professor Barber's simulation than under my *race-blind* simulation. Moreover, none of Professor Barber's simulated plans has as few split municipalities and municipality splits as the final House plan. In contrast, the median number of municipality splits under my *race-blind* simulation is much closer to the corresponding number under the final House plan, which is well within the simulation range (see also the middle and right plots of Figure A.1 in Appendix B). Note that both my *race-blind* simulation and Professor Barber's simulation split about the same number of counties as the final House plan (see the left plot of Figure A.1 in Appendix B). This suggests that the failure to minimize the number of municipality splits under Professor Barber's simulation analysis likely contributed to his conclusion that is opposite of mine.

19.   In summary, after I improved the algorithm to reduce the number of municipality splits to the same level as the one in the final House plan, the *race-blind* simulation confirms that the final House plan is not a partisan gerrymander.

B.   Simulation A Results

20.   Figure 2 presents the results of the *Simulation A* analysis, which incorporates 8 majority black districts and 4 majority Hispanic districts, using the 2012–2020 (left plot) and 2014–2020 (right plot) statewide elections, respectively. Like my *race-blind* simulation analysis, both the number of split municipalities and the total number of municipality splits under the final

Figure 2: The likely number of Democratic districts across the *Simulation A* plans, each of which has 8 black majority and 4 Hispanic majority districts. Democratic districts are tallied based on an average of statewide elections for the 2012-2020 cycles (left) and the 2014-2020 cycles (right). The red vertical lines represent the results under the final House plan, which fall well within the simulation ranges.

House plan are well within the simulation range for this *Simulation A analysis* (see the middle and right plots of Figure A.2 in Appendix B). Regardless of which election set I use, the most likely number of Democratic districts under the *Simulation A* plans is 105, which is identical to the corresponding number under my *race-blind* simulation analysis. Importantly, this number differs, only by one district, from the expected number of Democratic districts under the final House plan (red vertical line).

21.   Thus, the *Simulation A* analysis, which considers race based on the identification of majority black and majority Hispanic districts, in addition to constitutional criteria, yields the same conclusion as my *race-blind* simulation analysis: the final House plan is not a partisan gerrymander. This finding contradicts the results of Professor Barber's race-blind simulation analysis, but is consistent with the result of my previous *Simulation A analysis* shown in my initial report.

C.   Simulation B Results

22.   Figure 3 presents the results of the *Simulation B* analysis, which incorporates a total of 25 majority-minority districts (MMDs), using the 2012–2020 (left plot) and 2014–2020

11
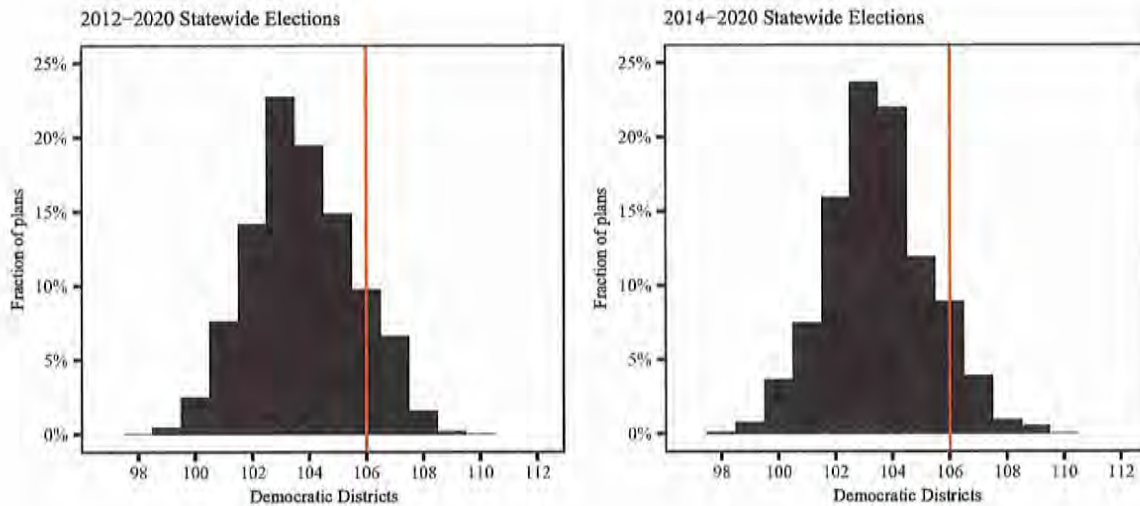
Figure 3: The likely number of Democratic districts across the *Simulation B* plans, each of which has 25 majority-minority districts. Democratic districts are tallied based on an average of statewide elections for the 2012-2020 cycles (left) and the 2014-2020 cycles (right). The red vertical lines represent the results under the final House plan, which fall well within the simulation ranges.

(right plot) statewide elections. Like my *race-blind* simulation analysis, both the number of split municipalities and the total num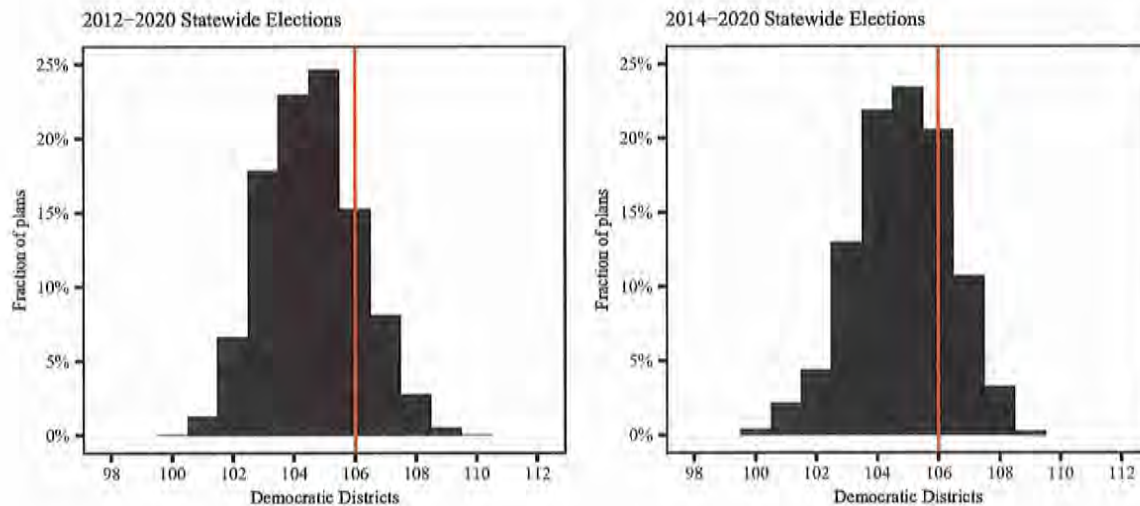ber of municipality splits under the final House plan are well within the simulation range for this *Simulation B analysis* (see the middle and right plots of Figure A.3 in Appendix B). Regardless of which election set I use, the most likely number of Democratic districts under the simulated plans is 103, which is only three districts less than what would be expected under the final House plan. Importantly, the expected number of Democratic districts under the final House plan is well within the simulation range.

23.   Therefore, the *Simulation B* analysis confirms the conclusion of my *race-blind* and *Simulation A* analyses that the final House plan is not a partisan gerrymander. This finding again contradicts the results of Professor Barber's race-blind simulation analysis but is consistent with the result of my previous *Simulation B analysis* shown in my initial report.

D.   **Comparison of the Three Simulation Analyses**

24.   Finally, I compare the results of the three simulation analyses shown above. The distribution of the expected number of Democratic seats under my *race-blind* simulation analysis

differs relatively little from those under the *Simulation A and B analyses.* In particular, regardless of which election set I use, the most likely number of Democratic districts is identical (i.e., 105 districts) between my *race-blind* simulation analysis and the *Simulation A analysis.* This number differs, only by one district, from the corresponding number under the final House plan. The findings of the *Simulation B analysis* are very similar though resulting simulated plans yield slightly fewer expected number of Democratic districts. Importantly, the expected number of Democratic districts under the final House plan falls well within the simulation range across all three simulation analyses, regardless of election set I use.

25. In sum, all of my simulation analyses, regardless of whether and how they consider race in addition to constitutional criteria, lead to the same conclusion that the final House plan is not a partisan gerrymander. This implies that the additional consideration of race in the final House plan does not favor any political party.

V. APPENDIX

A. Implementation Details

A.1. Race-blind simulation analysis

1. My *race-blind* simulation analysis largely follows that of my initial report and proceeds in two steps: I first divide the state into five clusters (Region A, B, C, D, and E) and a geographically larger remainder. Appendix B.1 of my initial report provides the definitions of these clusters, which are primarily based on counties. I use the merge-split MCMC algorithm in all of my simulations (Autry et al. 2021; Carter et al. 2019). I initialize the merge-split MCMC with the final House plan.[3] I divide the state into clusters to maintain sample diversity, along with continuity of analysis with *Simulation A* and *Simulation B*.

2. Article II § 16 of the Pennsylvania Constitution states districts "shall be composed of compact and contiguous territory as nearly equal in population as practicable." The merge algorithm generates contiguous districts by design. I used a population deviation threshold of

---

3. The exception is in Region B, where several districts are not contiguous due to discontiguous precincts. In those districts, I manually reassign the discontiguous pieces to their geographically adjacent districts so that the algorithm produces geographically contiguous districts.

	Counties C_{splits}	Municipalities		
		C_{splits}	$C_{\text{multisplits}}$	$C_{\text{totalsplits}}$
A	1	1	-	-
B	3.5	2	-	-
C	-	1	-	-
D	-	1	1.5	-
E	-	2	1.5	-
Remainder	4	5	0.5	-

Table A.1: The constraints used for my *race-blind* simulations. Spaces with - in them indicate no constraint of that type was used.

$\pm 5\%$. I use a compactness parameter of $\rho = 1$ in all simulations.

3.   The same article also states "Unless absolutely necessary no county, city, incorporated town, borough, township or ward shall be divided in forming either a senatorial or representative district." To address this, I use four types of constraints. First, I use the hierarchical split constraint of the merge-split MCMC algorithm applied to municipalities. Second, I use Gibbs constraints of the form $C_{\text{splits}} n_{\text{splits}}$. For this second constraint, C_{splits} is a tuning parameter, and n_{splits} is the number of administrative units that are split. The third constraint takes the form $C_{\text{multisplits}} n_{\text{multisplits}}$, where $C_{\text{multisplits}}$ is a tuning parameter and $n_{\text{multisplits}}$ is the number of administrative units split multiple times. The fourth type of constraint is of the form $C_{\text{totalsplits}} n_{\text{totalsplits}}$, where $C_{\text{totalsplits}}$ is a tuning parameter and $n_{\text{totalsplits}}$ is the total number of splits across all administrative units. I apply the second through fourth constraints to municipalities in each region. For a complete list of tuning parameters, see Table A.1. Values of the parameters were selected based on simulation experiments with the data while maintaining sample diversity. In general, higher values would yield districts with fewer county and municipality splits but diminish the diversity of maps generated.

4.   To conduct the simulations in smaller regions A, B, and C, I generate 100 distinct plans by sampling 10,000 total plans, dropping the first 5,000, and then saving every 50th plan thereafter. In the remainder, D, and E, I generate a total of 255,000 maps, dropping the first 5,000, and then saving every 50th plan thereafter. This yields 5,000 plans in the remainder. I then match the plans in each region to the plans in the remainder, with each regional plan corresponding to 50

14

	Counties	Municipalities		
	C_{splits}	C_{splits}	$C_{\text{multisplits}}$	$C_{\text{totalsplits}}$
A	1	1	-	-
B	3.5	2	1	1
C	-	0.5	0.1	0.5
D	-	1	1.5	-
E	-	2	1.5	-
Remainder	4	5	0.5	-

Table A.2: The constraints used for the *Simulation A* plans. Spaces with - in them indicate no constraint of that type was used.

	Counties	Municipalities		
	C_{splits}	C_{splits}	$C_{\text{multisplits}}$	$C_{\text{totalsplits}}$
A	1	1	-	-
B	3.5	2	1	0.5
C	-	0.5	0.1	0.5
D	-	1	1.5	-
E	-	2	1.5	-
Remainder	4	5	0.5	-

Table A.3: The constraints used for the *Simulation B* plans. Spaces with - in them indicate no constraint of that type was used.

remainder plans.

A.2. Alternative simulation analyses that incorporate the consideration of race

5.　Using a similar two-step approach as my *race-blind* simulation, I sample two alternative sets of simulated plans while incorporating race, in addition to constitutional criteria, into simulation algorithms. Following my initial report, I conducted these alternative simulations that consider particular VRA-related districts. Appendix C of my initial report provides the details of these VRA-related districts. As before, I used the merge-split MCMC algorithm in all regions (Autry et al. 2021; Carter et al. 2019). I directed the merge-split algorithm so that it would consider VRA-related districts within each region. I do so by building constraints into the algorithm, to generate maps that include the desired VRA-related districts with higher probabilities.

6.　As in the *race-blind* simulations, I use constraints on compactness, along with the four types of constraints on splitting municipalities and counties. I use the same population tolerance of $\pm 5\%$ and a compactness parameter of $\rho = 1$ as before. In some cases, the parameters

for the county and municipality splits changed to accommodate the VRA-related constraints, but the constraints remain the same across *Simulation A and B analyses*. For details on the parameter values, see Table A.2 and A.3.

7.   I use the same two types of constraints to target VRA-related districts as the ones used in my initial report (see Appendix B.2 of the initial report for details). I run two versions of the alternative analyses that incorporate race. The *Simulation A analysis* only imposes VRA-related constraints in Regions B and C. The *Simulation B analysis* imposes additional VRA-related constraints in Regions B and C, along with new VRA-related constraints in Region A. When generating plans, I follow the same process as in the *race-blind* simulations: I generate 5,000 plans that are discarded, and then I save every 50th plan thereafter until I have 100 plans that incorporate the VRA-constraints. In each case, if no additional VRA-constraints are imposed, I use the same plans generated under the *race-blind* simulations. In all cases, I use the same 5,000 plans generated for the remainder region.

B.   County and Municipality Splits of the Simulated and Final House Plans

8.   I now show that my simulation plans have a similar number of county and municipality splits when compared to the final House plan. The middle and right panels of Figures A.1, A.2, and A.3 demonstrate the simulated plans generally split a similar number of municipalities and have a similar number of total municipality splits in comparison to the final House plan. This is indicated by the fact that the number of municipality splits under the final House plan (vertical red lines) falls well within the distribution of the corresponding number under the simulated plans (grey histograms). In addition, the left panels of Figures A.1, A.2, and A.3 show that my simulated plans and the final House plan split a similar number of counties as well.

C.   Compactness of the Simulated and Final House Plans

9.   I find that my simulated plans are as compact as the final House plan when using the fraction of edges kept measure (DeFord, Duchin, and Solomon 2021; McCartan and Imai 2020). According to the Polsby-Popper measure (Polsby and Popper 1991), however, the final House plan is more compact than my simulated plans. Figure A.4 shows that the final House plan

16

Figure A.1: The number of county and municipality splits in the *race-blind* simulated plans (histogram). An administrative unit is deemed as split if any of its precincts are assigned to different districts. The left plot presents the total number of split counties. The middle plot shows the number of split municipalities while the right plot shows the total number of municipality splits. The red vertical line represents the final House plan, which fall well within the simulation ranges.
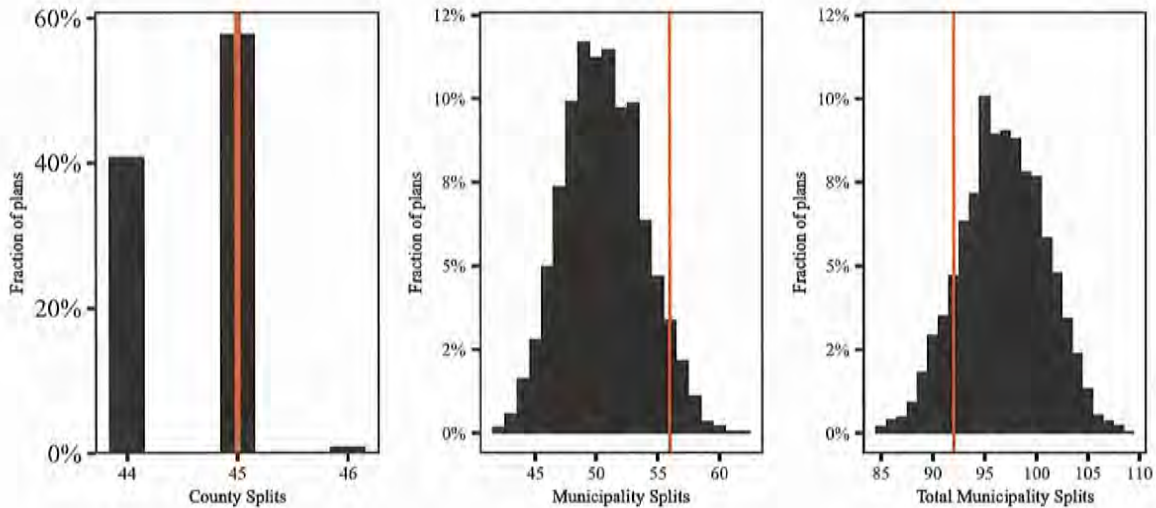
Figure A.2: The number of county and municipality splits in the *Simulation A* plans (histogram). An administrative unit is deemed as split if any of its precincts are assigned to different districts. The left plot presents the total number of split counties. The middle plot shows the number of split municipalities while the right plot shows the total number of municipality splits. The red vertical line represents the final House plan, which fall well within the simulation ranges.
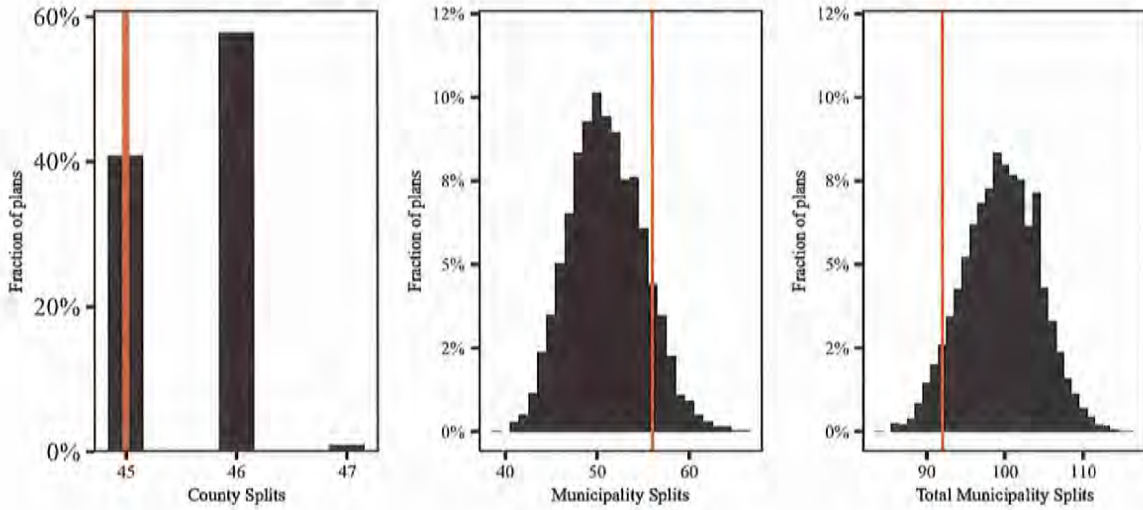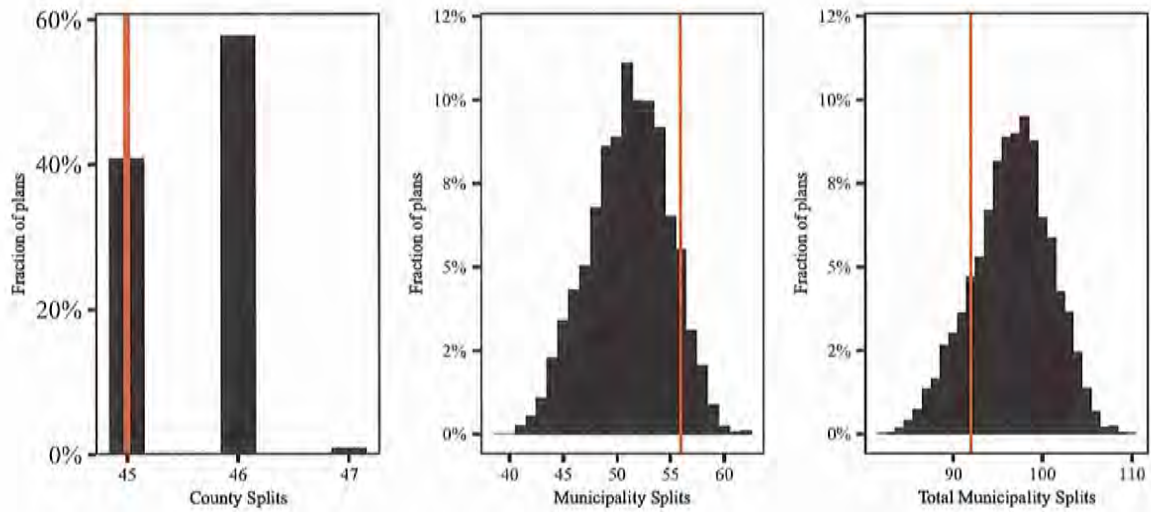
Figure A.3: The number of county and municipality splits in the *Simulation B* plans (histogram). An administrative unit is deemed as split if any of its precincts are assigned to different districts. The left plot presents the total number of split counties. The middle plot shows the number of split municipalities while the right plot shows the total number of municipality splits. The red vertical line represents the final House plan, which fall well within the simulation ranges.
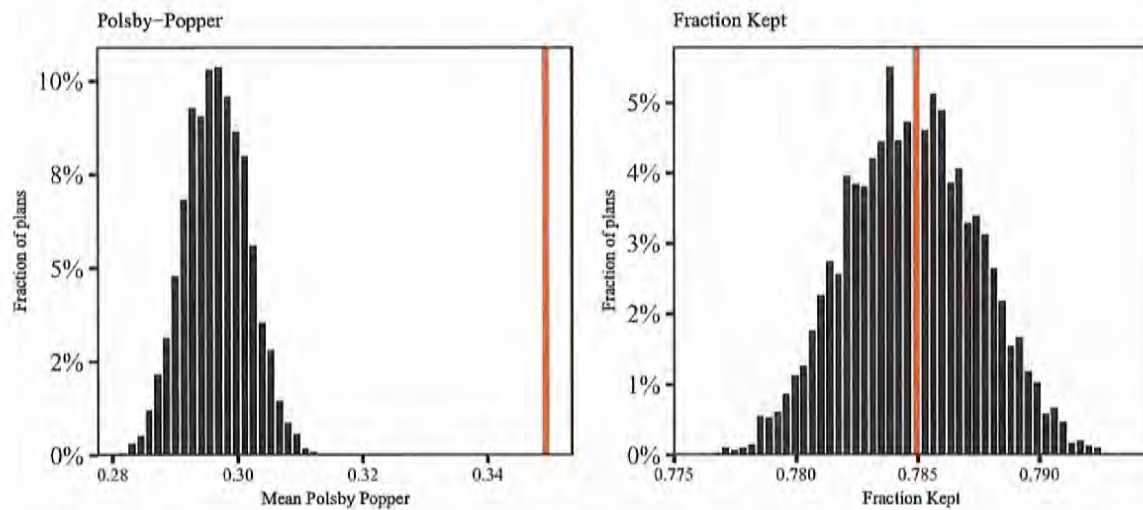
Figure A.4: The compactness of the *race-blind* simulated plans according to two measures – the average Polsby-Popper compactness (left) and fraction of edges kept (right). The red vertical line represents the final House plan.
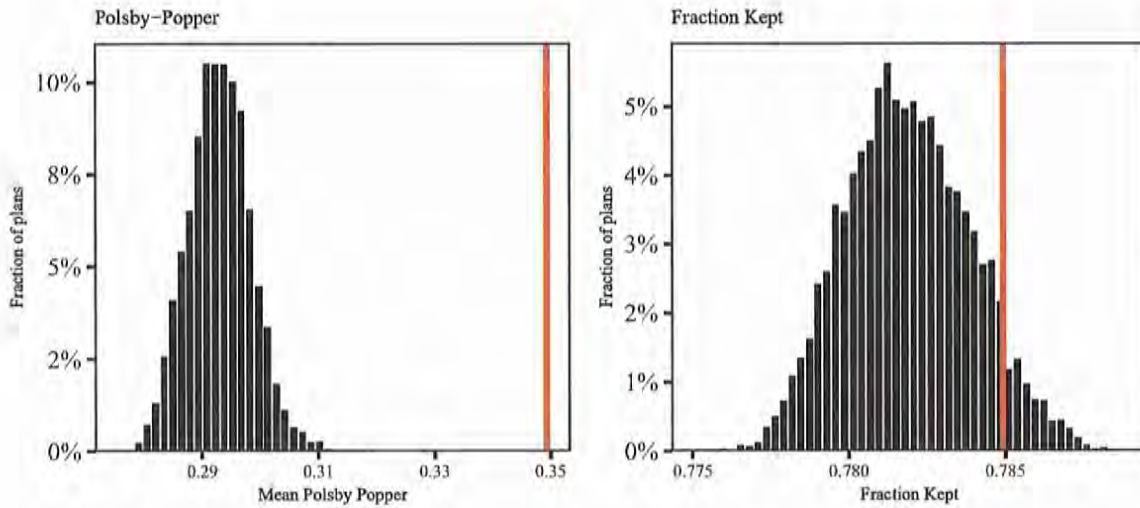
Figure A.5: The compactness of the *Simulation A* plans according to two measures – the average Polsby-Popper compactness (left) and fraction of edges kept (right). The red vertical line represents the final House plan.
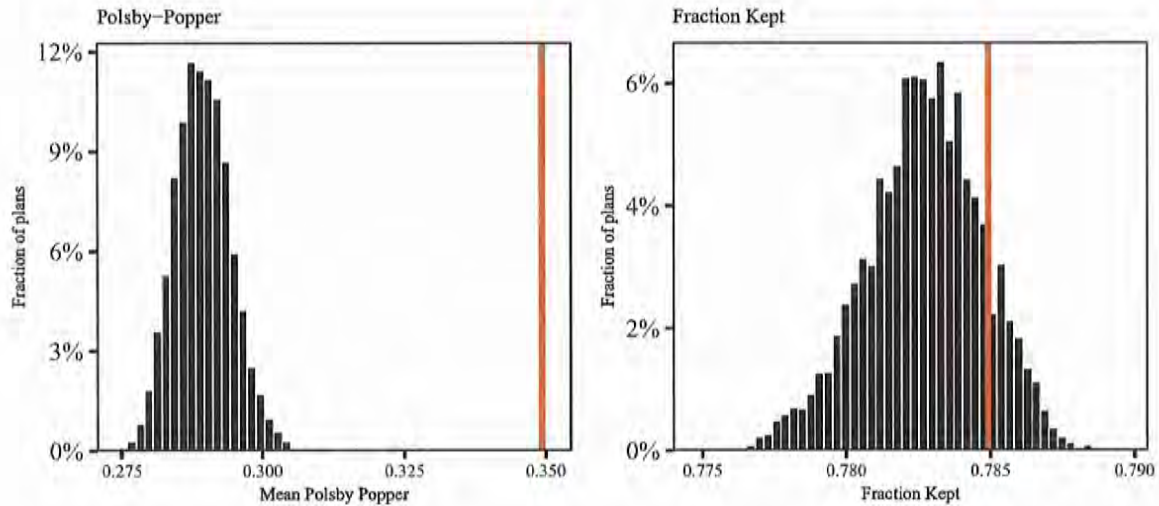
Figure A.6: The compactness of the *Simulation B* plans according to two measures – the average Polsby-Popper compactness (left) and fraction of edges kept (right). The red vertical line represents the final House plan.

is within the range of the *race-blind* simulated plans in terms of edge-removal compactness, and is more compact in terms of the average Polsby–Popper compactness. Figures A.5 and A.6 show similar results when comparing the final House plan to the *Simulation A* and *Simulation B* plans, respectively.

D. References

Autry, Eric A., Daniel Carter, Gregory J. Herschlag, Zach Hunter, and Jonathan C. Mattingly. 2021. "Metropolized Multiscale Forest Recombination for Redistricting." *Multiscale Modeling & Simulation* 19 (4): 1885–1914.

Carter, Daniel, Gregory Herschlag, Zach Hunter, and Jonathan Mattingly. 2019. "A Merge-Split Proposal for Reversible Monte Carlo Markov Chain Sampling of Redistricting Plans." *arXiv preprint arXiv:1911.01503.*

DeFord, Daryl, Moon Duchin, and Justin Solomon. 2021. "Recombination: A Family of Markov Chains for Redistricting." Https://hdsr.mitpress.mit.edu/pub/1ds8ptxu, *Harvard Data Science Review* (March 31). doi:10.1162/99608f92.eb30390f. `https://hdsr.mitpress.mit.edu/pub/1ds8ptxu.`

Kenny, Christopher T., Cory McCartan, Benjamin Fifield, and Kosuke Imai. 2020. *redist: Computational Algorithms for Redistricting Simulation.* `https://CRAN.R-project.org/package=redist.`

McCartan, Cory, and Kosuke Imai. 2020. "Sequential Monte Carlo for sampling balanced and compact redistricting plans." *arXiv preprint arXiv:2008.06131.*

Polsby, Daniel D, and Robert D Popper. 1991. "The third criterion: Compactness as a procedural safeguard against partisan gerrymandering." *Yale Law & Policy Review* 9 (2): 301–353.

Exhibit E

To: Chairman Mark Nordenberg, Pennsylvania Legislative Reapportionment Commission
From: Dr. Matt A. Barreto, Faculty Director, UCLA Voting Rights Project
Re: Final Assessment of Voting Rights Act compliance in Pennsylvania Redistricting
March 10, 2022

---

1. My name is Matt A. Barreto, and I am currently Professor of Political Science and Chicana/o Studies at the University of California, Los Angeles. I was appointed Full Professor with tenure at UCLA in 2015. Prior to that I was a tenured professor of Political Science at the University of Washington from 2005 to 2014. At UCLA, I am the faculty director of the Voting Rights Project in the Luskin School of Public Affairs and I teach a year-long course on the Voting Rights Act (VRA), focusing specifically on social science statistical analysis, demographics and voting patterns that are relevant in VRA expert reports. I have written expert reports and been qualified as an expert witness more than three dozen times in Federal and State voting rights and civil rights cases. I have been invited to give Congressional testimony about voting rights and co-authored a report on racially polarized voting that Congress relied on in their reauthorization of the VRA in 2006. I have published peer-reviewed, social science articles specifically about minority voting patterns, racially polarized voting, and have co-authored a software package specifically for use in understanding racial voting patterns in VRA cases. I have been retained as an expert consultant by counties and states across the country in 2021 to advise them on racial voting patterns as they relate to VRA compliance during redistricting. I have worked extensively with both plaintiffs' groups and on behalf of defendants in VRA lawsuits, always to provide independent analysis. As an expert witness in VRA lawsuits, my testimony has been relied on by courts to find in favor of both plaintiffs and defendants.

2. I have closely analyzed and reviewed the Legislative Reapportionment Commission's ("LRC") approved Preliminary and Final House Plans. In addition, I have carefully reviewed testimony and reports submitted by other experts, including Dr. Michael Barber and Dr. Jonathan Katz. I have also reviewed filed Petitions for Review including House Republican Majority Leader Benninghoff's Petition for Review, and the March 4 Report of LRC Chairman Mark A. Nordenberg. After careful review of the approved Preliminary and Final House Plans and all accompanying documentation and reports, I can state with confidence that the approved Final Plan fully complies with the Voting Rights Act ("VRA") and does not dilute minority voting strength or deprive minorities of equal voting opportunities.

3. First, it is important to clarify for the record that the "final" report submitted by Dr. Jonathan Katz on February 4, 2022 is substantively identical to his "preliminary" report submitted on January 14, 2022. Indeed, there is only one change: he added two sentences on page 1 stating he had reviewed the 2022 Final House Plan and he did not feel compelled to change his original analysis. However, his *original* report undertook no analysis related specifically

to either the LRC's Preliminary or Final House Plan, and his February 4 report is simply an exact copy of his original January 14 report. To be clear, as Chairman Nordenberg stated in his March 4, 2022 Report, Dr. Katz never offered any data or analysis to support his assertions. On January 18, 2022, I offered an extensive rebuttal to Dr. Katz[1] which is unrefuted. Dr. Katz attempted to draw inferences about Hispanic voting patterns in Pennsylvania, not based on Pennsylvania data, but rather based on Hispanic voter registration data in Bakersfield, California, which a federal court dismissed as not-relevant and short-sighted in that case. Rather than obtain Pennsylvania data and perform an analysis to present to the LRC, Dr. Katz re-referenced years-old and debunked data from California in an attempt to cast doubt on a well-established methodology of ecological inference to measure racially polarized voting. Indeed, ecological inference is regularly accepted by state and federal courts as a political science methodology to study racially polarized voting. Dr. Katz introduces no evidence whatsoever that racially polarized voting does not exist in Pennsylvania. In fact, racially polarized voting does exist across the Commonwealth of Pennsylvania, and there is no evidence to the contrary.

4. Second, Dr. Barber's simulation analysis is fatally flawed because he admits that he purposely did not consider compliance with the VRA. While Leader Benninghoff quotes Dr. Barber at length, reliance on Dr. Barber's simulations and findings cannot be taken seriously if the Commonwealth of Pennsylvania wishes to comply with the VRA. Dr. Barber admitted under questioning that his simulations did not consider compliance with the Federal Voting Rights Act, which every state redistricting body must do.

5. When Leader Benninghoff, again relying on Dr. Barber, states that the final plan dilutes minority votes, he is misguided in the concepts of packing and cracking, concepts with which experts of voting rights are quite familiar. A district does not have to be packed to 70% or more minority population in order to constitute a VRA-compliant district. Indeed, federal courts have regularly held that such high concentrations constitute packing, which prevents minority groups from having influence in a second, nearby district. In contrast, cracking occurs when the minority population is spread too thin and made too small to be able to have influence in electing representatives of the minority population's choice. Leader Benninghoff fails to understand, or ignores, this distinction. Further, neither Dr. Barber nor Leader Benninghoff offer any **performance analysis** of the adopted Final LRC House Plan in support of their insinuation that certain districts will not perform for minority candidates of choice. In contrast, I have carefully examined these districts (in both the LRC's Preliminary and Final House Plans) and determined with a reasonable degree of professional certainty that minority voters will be able to elect their representatives of choice. There is no evidence

---

[1] https://www.redistricting.state.pa.us/resources/Press/2022-01-18%20Barreto%20reply.pdf

of minority vote dilution even presented by Leader Benninghoff, he simply makes a claim with no social science data or analysis to support the claim.

6. Third, Leader Benninghoff offers no data, evidence or analysis in his Petition for Review to challenge any of the data, evidence and analysis I thoroughly lay out in my various reports and presentations. In Paragraph 75 of the Petition, he claims that I conceded that my analysis failed to show racially polarized voting. This is a categorically false assertion and one which I refuted before the LRC. My analysis presents a series of charts and ecological inference tables which analyze both white vs. non-white voters, and also specifically Black, Latino and Asian American voters. In Paragraph 11 of my January 7, 2022 report, I summarize my analysis: "In regions in Pennsylvania that have sizable populations of both White and minority voters, data across more than a dozen elections points to a clear pattern of racially polarized voting. **Black, Latino and Asian American** voters demonstrate unified and cohesive voting, siding for the same candidates with 75% to 90% support." I further explain that outside of Pittsburgh and Philadelphia, "White voters demonstrate considerable block voting against minority candidates of choice, often voting in the exact opposite pattern of **Blacks, Latinos, and Asian Americans.**" In the remainder of my January 7 report, in paragraphs 12 – 19, I make specific reference to Black, Latino and Asian American voting patterns, not lumping all minorities together as Leader Benninghoff inaccurately claims. For illustrative purposes only, I presented scatterplots of precinct data sorted along the x-axis of percent White in the voting precinct. However, these accompanying charts are merely additional datapoints to demonstrate clear racially polarized voting. Contrary to Leader Benninghoff's claim, I did run, analyze and report, voting patterns for Black, Latino, Asian and White voters in Pennsylvania. Leader Benninghoff is plainly wrong in claiming that I denied the existence of racially polarized voting. My analysis—which I hereby reaffirm—supports the opposite conclusion: there is racially polarized voting across Pennsylvania.

7. Additionally, during my January 14, 2022 presentation to the LRC, at which Leader Benninghoff questioned me, I presented a data table (see Slide 16[2]) with separate racially polarized voting estimates of White, Black and Latino voting patterns, as well as for minority voters overall. Thus, Leader Benninghoff's claim that my racially polarized voting analysis lumped together minorities and otherwise failed to show white-bloc oppositional voting is belied by the LRC's record. Finally, in my January 18, 2022 reply to Dr. Katz, I once again drew separate attention to Latino voting patterns on their own, an area that Dr, Katz baselessly called into question. This is found on Table 1 at the bottom of page 1 of my January 18 reply[3].

8. Finally, Leader Benninghoff also claims in his Petition for Review (Paragraph 75) that I failed to account for primary elections. However, there is no authority or court precedent

---

[2] https://www.redistricting.state.pa.us/resources/Press/2022-01-14%20Barreto%20Presentation.pdf
[3] https://www.redistricting.state.pa.us/resources/Press/2022-01-18%20Barreto%20reply.pdf

requiring that a racially polarized voting analysis examine primary elections. Indeed, expert researchers determine which types of elections are under scrutiny and relevant. In the case of the Commonwealth of Pennsylvania House Plan, it is November general elections which most clearly differentiate White and non-white voting preferences. Thus, for this particular inquiry, general elections are most relevant to understanding racially polarized voting. I note, however, that neither Leader Benninghoff nor Dr. Katz provided any racially polarized voting analysis involving any Pennsylvania election data, primary or general.

9. With respect to the brief filed by Leader Benninghoff on March 7, 2022, he is wrong in claiming that I have not proven racially polarized voting and the *Gingles* standards. Indeed, my analysis which is effectively unrebutted, has clearly demonstrated that across Pennsylvania voting patterns clearly meet the political science and legal definitions of racially polarized voting. Given that there is clear evidence that Whites bloc-vote against minority preferred candidates, state legislative districts won by Republican candidates represent instances in which the preferences of White voters were cohesive in blocking Black and Latino preferred candidates (Democrats). I made these points clear in my report submitted to the LRC on January 7[4], writing in Paragraph 11 "In contrast, White voters tend to block vote against minority candidates of choice" and "in most instances outside of these two large cities, White voters demonstrate considerable block voting against minority candidates of choice, often voting in the exact opposite pattern of Blacks, Latinos, and Asian Americans." In Paragraph 13, I make specific reference to the *Gingles* test writing "This provides evidence of the second component of racially polarized voting under the *Gingles* test of White block voting against minority candidates of choice." In total, Republicans won 13 state House seats in 2020 by a margin of less than 10 points in which whites bloc-voted against Black and Hispanic voter preferences. There are 25 state House districts which are between 15% to 33% non-white in which non-whites heavily vote for Democratic candidates of choice, but Whites bloc-vote against these candidates to override minority preferences and elect Republicans.

10. Further, Benninghoff's analysis is misguided in that he cites the *Gingles* standards as they exist in a Section 2 VRA lawsuit in which a plaintiff brings a challenge to an already enacted districting plan. To the contrary, redistricting bodies, like the LRC, have discretion in complying with constitutional criteria and the VRA to stave off minority vote dilution. Specifically Benninghoff writes that "under the third precondition, a plaintiff must prove that a white voting bloc consistently defeats the candidates of choice of the minority community." As noted in my Paragraph 9 just above, White voters are indeed bloc-voting against minority preferences. It is Leader Benninghoff who has supplied the LRC with no evidence to the contrary. If Whites were voting in coalition to support minority preferences, the State legislature would be overwhelmingly Democrat. But this is not the case because Whites are

---

[4] https://www.redistricting.state.pa.us/resources/Press/2022-01-14%20Barreto%20Testimony.pdf
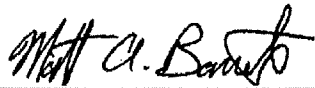
voting very heavily in favor of Republican candidates, who win election against the voting preferences of Black, Hispanic and Asian voters. While there is *some* limited evidence of white cross-over voting within the cities of Pittsburgh and Philadelphia, in 65 counties across the entire state, Whites are voting in strong majority against minority candidates of choice.

11. Throughout the March 7 brief filed by Leader Benninghoff he cites supposed evidence of cracking of the Hispanic and Black population; however each of the districts he cites support minority candidates of choice. Leader Benninghoff points to population data, not electoral performance data, to suggest that districts 126, 127, and 129 are weakened and dilute Hispanic votes. This is false. Given the strong Hispanic population growth in this region, my analysis confirms that the final plan does not impair or prevent minorities from electing candidates of their choice. Likewise, Leader Benninghoff states, again with no evidence, that Black votes are being diluted in districts 103 and 104, but again my analysis confirms that Black voters in both districts will have a fair opportunity to elect candidates of their choice. Finally, I have carefully reviewed Leader Benninghoff's claim that district 22 in the Final House Plan will fail to perform for minority candidates of choice. Based on my review of electoral performance data and the fact that this district, in the Final House Plan, has a 67% minority voting age population, it is my expert opinion that district 22 will very likely perform to elect minority candidates of choice. There is no empirical evidence to support Leader Benninghoff's claim regarding district 22.

12. With respect to the petition submitted by Mr. Gabriel Ingram et al. related to district 159, the claim in Paragraphs 43-44 that district 159 is not likely to remain a strong minority performing district is wrong. The Final Plan adult population of district 159 is 56% minority and 44% white. Further, Black voters remain the single largest segment of the electorate and performance analysis demonstrates district 159 will remain a strong minority performing district, as drawn in the Final Plan, President Biden carried with 70% of the vote in the precincts that make up district 159.

13. With respect to the allegations submitted by Mr. Koger related to district 24, there is no evidence that minority voting power is diluted or impaired. The overwhelming evidence shows that Democratic candidates, not Republicans, are the preference of Black voters in this district. Thus there is no evidence of vote dilution or disenfranchisement and no reason to believe that district 24 will impair minority voters' ability to elect the candidates of their choice.

14. Below I have analyzed the list of districts in the Final House Plan, questioned in the petitions for review. I have listed the Minority Voting Age Population (MVAP) and expected Electoral Performance confirming that, according to my analysis, these districts are likely to perform to elect minority candidates of choice.

Dist	Prior % MVAP	Final Plan % MVAP	Expected performance for Minority preferred candidate
22	71.1	67.3	66.3
24	59.5	52.2	89.4
49	9.5	53.3	66.8
96	54.0	26.6	60.3
103	66.4	38.0	62.4
104	26.2	57.5	65.8
126	48.8	42.8	54.5
127	75.6	64.1	64.8
129	17.5	47.3	58.4
132	53.4	31.2	57.1
134	15.3	51.3	59.8
159	64.9	56.0	69.9

15. In summary, after a thorough and careful review of the approved Final House Plan, it remains my opinion that the Final Plan fully complies with the VRA and does not impair any minority group's ability to elect representatives of their choice.

Matt A. Barreto, Ph.D.
March 10, 2022
Los Angeles, California

Exhibit F

IN THE COMMONWEALTH COURT OF

PENNSYLVANIA

*   *   *   *   *   *   *   *

Carol Ann Carter;   *
Monica Parrilla;   * CASES
Rebecca Poyourow;   * CONSOLIDATED
William Tung;   *
Roseanne Milazzo;   * No.
Burt Siegel;   * 464 MD 2021
Susan Cassanelli;   *
Lee Cassanelli;   *
Lynn Wachman;   *
Michael Guttman;   *
Maya Fonkeu;   *
Brady Hill;   *
Mary Ellen Balchunis;   *
Tom DeWall;   *
Stephanie McNulty;   *
And Janet Temin,   *
        Petitioners   *
    V.   *
Vernica Degraffenreid,   *
in her official   *
capacity as the Acting   *
Secretary of the   *
Commonwealth of   *
Pennsylvania; and   *
Jessica Mathis, in her   *
Official capacity as   *
Director for the   *
Pennsylvania Bureau of   *
Election Services and   *
Notaries,   *
        Respondents   *
* *

BEFORE: PATRICIA A. MCCULLOUGH, JUDGE

HEARING: Thursday, January 27, 20222

        9:40   a.m.

    Any reproduction of this transcript
    is prohibited without authorization
        by the certifying agency

1

Philip T. Gressman;   *
2   Ron Y. Donagi;   *
Kristopher R. Tapp;   *
3   Pamela Gorkin;   *
David P. Marsh;   *
4   James L. Rosenberger;   *
Amy Meyers;   *
5   Eugene Boman;   *
Gary Gordojn;   *
6   Liz McMahon;   * No.
Timothy G.Freman;   * 465 M.D. 2021
7   And Garth Isakk,   *
          Petitioners   *
8   V.   *
Vernica Degraffenreid,   *
9   in her official   *
capacity as the Acting   *
10 Secretary of the   *
Commonwealth of   *
11 Pennsylvania; and   *
Jessica Mathis, in her   *
12 Official capacity as   *
Director for the   *
13 Pennsylvania Bureau of   *
Election Services and   *
14 Notaries,   *
          Respondents   *
15   * * * * * * * *

16

17

18 LOCATION: Pennsylvania Judicial Center

19   601 Commonwealth Avenue

20   Suite 1500

21   Harrisburg, PA   17120

22 WITNESSES: Jonathan Rodden, Daryl

23 Deford, Moon Duchin, Michael Barber

24

25   Reporter: Nicole Montagano

574

09:17:51	1

method is appropriate in analyzing

these plans.

Q.   And so, I wasn't asking if you

could do that.   I was asking if --- if

you were, when you use the word

outlier, you're not using that in a

statistically significant context.

Correct?

A.   I am not using it in the

context of what scientists would refer

to as statistically significant.

That's a separate topic that applies

in a different area.   It does not

apply to this particular analysis.

Q.   So your use of the term outlier

is your subjective determination that

something is an outlier rather than an

objective determination based on a

statistical analysis.

Correct?

A.   It's subjective.   However, I

pointed out that it's you know, 98,

99, 100 percent of plans being less

Democratic.   I don't imagine that by

any measure that someone would say

09:18:45	1	that that was not an outlier.
09:18:46	2	Q. If we go to the mean-median
09:18:49	3	analysis that you discussed at page 21
09:18:51	4	of your rebuttal. This is Table 5.
09:19:02	5	Do you recall testifying about this on
09:19:04	6	Direct Examination, Doctor barber?
09:19:06	7	A. Yes.
09:19:06	8	Q. And do you recall that, if I
09:19:07	9	understand we're just going to look at
09:19:09	10	the mean-median value in the first
09:19:11	11	column. And I believe you testified
09:19:13	12	that closer to zero indicates less
09:19:16	13	bias.
09:19:16	14	Correct?
09:19:17	15	A. Yes, that's correct.
09:19:18	16	Q. Further from zero indicates
09:19:20	17	more bias then.
09:19:21	18	Correct?
09:19:22	19	A. Yes, that's correct.
09:19:23	20	Q. And here negative numbers
09:19:24	21	further from zero would be more biased
09:19:26	22	in favor of Republicans and positive
09:19:29	23	numbers would be more bias in favor of
09:19:31	24	Democrats.
09:19:32	25	Correct?

09:08:05	1	case.
09:08:05	2	Correct?
09:08:05	3	A. That's correct, yes.
09:08:06	4	Q. Have you used that algorithm
09:08:08	5	before?
09:08:09	6	A. I have, yes.
09:08:10	7	Q. How many times?
09:08:11	8	A. I have used it in analyzing the
09:08:13	9	Pennsylvania state legislative plan
09:08:16	10	for the House of Representatives, as
09:08:17	11	well as in the North Carolina State
09:08:22	12	House and State Senate.
09:08:22	13	Q. And is the North Carolina case
09:08:24	14	the one that you testified at trial in
09:08:26	15	on January 5th?
09:08:30	16	A. Yes, that's correct.
09:08:30	17	Q. And you testified at trial
09:08:31	18	there, I assume accurately, that your
09:08:34	19	academic work has not focused on
09:08:36	20	redistricting.
09:08:38	21	Correct?
09:08:38	22	A. So I think I --- yes. I think
09:08:39	23	I said in the testimony that I have
09:08:45	24	not published on these particular
09:08:46	25	topics, but that I teach about them in

1

2   C E R T I F I C A T E

3

4   I hereby certify that the foregoing

5   proceedings, hearing held before

6   Judge, was reported by me on 1/27/2022

7   and that I, Nicole Montagano, read

8   this transcript, and that I attest

9   that this transcript is a true and

10   accurate record of the proceeding.

11   Dated the 28 day of January, 2022

12

13

14   Nicole S. Montagano,

15   Court Reporter

16

17

18

19

20

21

22

23

24

25

CERTIFICATE OF SERVICE

I hereby certify that I served the foregoing Consolidated Brief in Response to Petitions for Review upon counsel via the Court's PACFile System which service satisfies the requirements of Pa. R. App. P. 121.

/s/ Daniel T. Brier
Daniel T. Brier

Date: March 11, 2022